Household Determinants of Teen Marriage: Sister Effects Across Four Low- and Middle-Income Countries

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This article investigates the household determinants of teen marriage in Ethiopia, India, Peru, and Vietnam using data from the international Young Lives study tracking a cohort of children from the ages of 8–19 over a 15-year period. First, we offer a descriptive and comparative overview of the prevalence of teen marriage among girls in geographically selected areas of the four countries, together with their sociodemographic determinants. Second, we place a specific focus on the role of gender and sibling sex-composition in shaping the probability of getting married by age 19. Drawing on the significant cross-country heterogeneity in household context, direction of marriage payments, and prevalence of arranged marriage, we test hypotheses relating to the availability of economic resources within the household and cultural norms surrounding the order and timing of marriage. We show that in Ethiopia, India, and Vietnam, presence and number of older sisters in the household are associated with a 30–50 percent lower likelihood of teen marriage, while the association is null in Peru. Also, we show that having a girl as next-youngest sibling does not significantly affect girls' likelihood of experiencing teen marriage, except in Ethiopia. Our results combined support theories of family-level resource constraints over sibling rivalry hypotheses. Our findings enrich and complement existing evidence on the role of sibling sex-composition on adolescent outcomes in low- and middle-income countries.

Worldwide, more than 700 million women alive today were married before their 18th birthday, and more than 250 million—about one in three of the above—entered into union before age 15 (UNICEF 2014). Although early marriage has decreased over the past 30 years, progress has spread unevenly across regions, and the practice remains pervasive across countries in Latin America and the Caribbean, South

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Asia, and sub-Saharan Africa (Koski, Clark, and Nandi 2017).[1] As of today, South Asia is home to almost half of all teen brides worldwide (42 percent), and India alone accounts for one-third of the global total (Vogelstein 2013). Yet sub-Saharan Africa is projected to overtake South Asia in having the world's highest number of teen brides by 2050. In this region, even doubling the current rate of decline would not be enough to reduce the absolute number of brides because of the rapid population growth (UNICEF 2014).

Early marriage is a key area of concern for development policy in low- and middle-income countries (LMICs). Although not the direct target of a Sustainable Development Goal (SDG) per se, reducing early marriage is critical to achieving at least half of the SDGs. For instance, girls from poorer families are more likely to marry early than girls from wealthier families, and early marriage disproportionately affects rural and disadvantaged girls creating cycles of poverty that reinforce inequalities (Otoo-Oyortey and Pobi 2003; Dahl 2010). Early marriage also keeps girls in poverty by depriving them of opportunities such as education and access to paid employment (Field and Ambrus 2008; Parsons et al. 2015). Women marrying in teenage years or younger often have little say in terms of when they marry and whom they marry (Jensen and Thornton 2003). As a consequence, teen brides may be unable to negotiate access to safe sex and medical care, leaving themselves vulnerable to health risks such as sexually transmitted infections and early pregnancies (Nour 2006), which in turn correlate with worse pregnancy outcomes for the mother and worse birth outcomes for the child (Fraser, Brockert, and Ward 1995; Ashcraft and Lang 2006; Raj 2010).

The growing availability of longitudinal data across LMICs has made it possible to better understand this phenomenon and trace the pathways that lead to some of the aforementioned outcomes. Longitudinal data similarly permit shedding light on the early-life determinants of teen marriage. Yet despite these developments, most socio-demographic research to date focuses on the implications of these life-course events for later-life outcomes (Dahl 2010; Glenn, Uecker, and Love. 2010; Kane et al. 2013; Sekhri and Debnath 2014), rather than on their drivers or root causes. This article attempts to fill this gap by shifting the focus onto the determinants of teen marriage across LMICs.

Family composition has been widely recognized as an important determinant of later-life outcomes. Among the household-related factors that matter the most, the literature has focused on variables such as family size, birth order and sibship size (two sides of the same coin), and sibling sex-composition. Studies on birth order and children's outcomes in high-income countries suggest that first-born children have better outcomes such as higher educational achievement, labor market earnings, likelihood of full-time employment, and so forth (Black, Devereux, and Salvanes 2005; Conley and Glauber 2006; Booth and Kee 2008; Bertoni and Brunello 2016). Conversely, later-born children in low-income countries tend to achieve more years of schooling, spend more time studying, and engage less in child labor (Ejrnaes and Pörtner 2004; Edmonds 2006; Emerson and Souza 2008; Seid and Gurmu 2015). Relatedly, sibship size and sex-composition are important predictors of later-life outcomes to the extent that they affect the availability of tangible and intangible family resources and they

1 "Early marriage" (or "child marriage") is defined by the United Nations as the formal or informal marriage of a child under the age of 18.

shape parents' differential expectations for sons and daughters, especially in contexts characterized by son preference and age- and gender-based hierarchies.

The present study contributes to scholarship on family influences on early-adulthood outcomes by focusing on the relationship between sibship structures and teen marriage. We provide two main contributions. First, we document the prevalence of teen marriage among girls—defined as marriage occurring by the age of 19—in geographically selected areas of Ethiopia, India, Peru, and Vietnam, together with their associated factors. We do so by using comparative data from the Young Lives (YL) international study of childhood poverty tracking a cohort of children born around 1994–95 and followed longitudinally from ages 8–19. As the fourth wave of data with information on marriage was released in April 2016, this is among the first YL studies shifting the focus from middle childhood and adolescence to early-adulthood outcomes.[2]

Second, we contribute knowledge on how the family's influence over children's life-course decisions—such as marriage arrangements—creates trade-offs among siblings, such that one sibling's presence and sex in the family affects other siblings' outcomes. Drawing on economic and cultural arguments, we test whether the presence and number of older sisters—and the sex-composition of siblings more generally—are key determinants of girls' teen marriage (henceforth, "sister effects"). Capitalizing on an empirical strategy previously adopted by Vogl (2013), we complement associational evidence with a "natural" experiment within the family that takes advantage of variation in younger siblings' sex. With this information, we further examine the role of sisters by testing whether a girl (say, "girl A") whose next-youngest sibling is a girl—hence girl A is the older sister herself—faces a different risk of marrying early as compared to a girl whose next-youngest sibling is a boy. In so doing, we acknowledge that the countries of interest are different, and we do not expect the hypotheses we raise—outlined in the following section—to hold similarly across all contexts. Quite the contrary, we are interested in documenting the ensuing heterogeneity and relate it to variation in household context, direction of marriage payments, and prevalence of arranged marriage.

Our findings enrich existing yet limited evidence on the role of household and sibling sex-composition on adolescent outcomes in LMICs and are of relevance for the design, implementation, evaluation, and understanding of policies aimed at reducing teen marriage, such as programs targeting birth spacing, family planning, and the reduction of arranged marriage.

BACKGROUND

Cross-Country Heterogeneity in the Direction of Marriage Payments and Prevalence of Arranged Marriage

Our study focuses on selected sentinel sites in Ethiopia, India, Peru, and Vietnam, four different countries with their own cultural specificities, norms, and traditions. Even when it comes to the nature of marriage and the practices surrounding it, these countries show remarkable

2 Roest (2016), Singh and Espinoza Revollo (2016), and Singh and Vennam (2016) have carried out preliminary investigations of the core predictors of teen marriage using Young Lives data, yet their focus is exclusively on India. Similarly, Favara, Lavado, and Sanchez (2016) have investigated childbearing, marriage, and cohabitation decisions using the YL Peruvian sample.

differences. For instance, to marry their daughters South Asian families pay dowries—net transfers from the bride's family—that often reach several times their annual income (Anderson 2007). YL data show that customs and practices around dowry differ between sites (Roest 2016). The practice is often cited as a key driver of child marriage and, indeed, YL has found instances where girls from poorer families are said to have been married younger because of the smaller dowry required for younger brides (Singh and Vennam 2016). Dowries have long been a custom in India and are presently an almost universal phenomenon (Rao 1993; Anderson 2003). Comparatively little research has explored marriage transfers—a term that broadly refers to marriage payments such as dowry and bride price—in the rest of South Asia, though several studies point to dowry payments now occurring in Bangladesh, Pakistan, and Sri Lanka (Ambrus, Field, and Torero 2010).

Bride prices—net transfers from the groom's family—are most prevalent in Africa; more than 90 percent of sub-Saharan societies traditionally make such marriage payments (Murdock 1967; Goody 1973). Oromia, one of the YL study sites in Ethiopia, provides evidence of a strong cultural practice that obliges girls to marry through the intervention of family and clans, where a large bride price is involved (Tafere and Chuta 2016). Vietnam is an interesting country in that it combines both prevalence of dowry and bride price depending on the region. Teerawichitchainan and Knodel (2012) recently documented a re-emergence of marriage payments in Vietnam as attesting to resilience of traditional values and the unraveling of the socialist agenda, and hypothesized that in the years to come bride price, dowry, and bidirectional transfers will continue to be prevalent and culturally functional—rather than economically functional. Conversely, in Latin America marriage payments disappeared toward the end of the colonial period in the nineteenth century (Nazzari 1991) and are nowadays virtually nonexistent. In general terms, the limited empirical evidence available also suggests that dowry is increasing with a bride's age, while bride price is at first increasing and then rapidly decreasing with a bride's age, meaning that under both customs, marrying a daughter earlier can be financially more attractive for her parents (Corno, Hildebrandt, and Voena 2017). This suggests that both practices are important—and somewhat similar—drivers of early marriage.

There's a general perception among scholars and policymakers that arranged marriages and parental influences declined significantly over the past two decades. Cherlin (2012) documents a substantial decline in parental control in East and Southeast Asia, in countries such as China, Indonesia, Japan, Malaysia, South Korea, and Taiwan. Yet elsewhere in the world the decrease in parents' power and authority has been slower, and mixed patterns have emerged that reflect both continuing parental influence and rising young adult influence. In South Asia, teenage marriages have declined from very high levels in the past, but they remain much more common than in East and Southeast Asia. Teenage marriages have also declined in Northern and Southern Africa, yet a belt of high levels of teenage marriages traverses the middle of the continent (Cherlin 2012). Evidence from Asia suggests that the search for a spouse is carried out in a more collaborative way and parents may give their children greater leeway to reject suggested choices, or parents may even allow their children to suggest potential mates to them. The resulting marriages are neither fully arranged nor fully self-chosen (Banerji and Vanneman 2009). In India, for instance, marriages arranged by parents without the consent of their daughters have declined, but what has increased the

TABLE 1 Overview of marriage practices and theoretical expectations in the four countries of interest

	Panel A			Panel B	
Country	Marriage payment	Type of payment	Prevalence of arranged marriage	Economic hypothesis (presence and number of older sisters)	Cultural hypothesis (next-youngest sibling is female)
Ethiopia	Yes	Bride price	Medium-high	No/positive association with teen marriage	Positive association with teen marriage
India	Yes	Dowry	High	Negative association with teen marriage	Positive association with teen marriage
Peru	No	No	No	No association	No association
Vietnam	Yes	Bride price/Dowry	Low	Negative (no/positive) association with teen marriage if dowry (bride price) prevails	No/positive association with teen marriage

SOURCE: Young Lives country notes, combined with information from Anderson (2003) and Corn, Hildebrandt, and Voena (2017).
NOTES: Arranged marriage is defined as a type of union in which the bride and groom are selected by individuals other than the couple, particularly by family members such as parents. Panel B describes theoretical expectations, and the sign of the association pertains to the predictors reported in parentheses, namely presence and number of older sisters for the "Economic hypothesis," and sex of next-youngest sibling for the "Cultural hypothesis."

most are parent-arranged marriages with the daughter's consent, resulting in a hybridization of customary Western and Indian practices (Allendorf and Pandian 2016).

Arranged marriage is less of an issue of concern in Latin American countries. Nonetheless, the aforementioned evidence of increasing hybridization of marriage forms leads us to share with Vogl (2013) the claim that the degree to which the family of origin controls marriage arrangements is continuous, rather than binary (arranged versus nonarranged). In other words, even in societies that no longer formally adhere to arranged marriage, the family of origin may still influence marriage timing and spouse selection in several ways and to varying degrees (Goode 1963; Goody 1983; Caldwell et al. 1998). Table 1 (Panel A) provides a summary overview of the marriage practices in the four countries of interest.

Sibship Configurations and Later-Life Outcomes: Economic and Cultural Hypotheses

Socio-demographic research on sibship structures has focused mostly on educational attainment and labor market success, yet sibling configurations may also be associated with outcomes such as teen marriage to the extent that they affect parents' expectations and allocation of household resources to a child (Yu, Su, and Chiu 2012). Studies of family formation that consider sibship effects rarely explore beyond the number of siblings (e.g., Raymo 2003). Nevertheless, as research on sibship characteristics and educational attainment shows, individuals' access to household resources may depend not only on their sibship size, but also on their ordinal position of birth and sibship sex-composition.

Perhaps the most prominent theory on the relationship between sibship characteristics and later-life outcomes derives from the concepts of family-level resource constraints and resource dilution (*economic hypothesis* or *resource constraints*). The resource dilution model contends that family resources are finite and, therefore, sibship configurations shape the amount of family resources accessible for each child (Downey 2001; Steelman et al. 2002). As long as family resources are relevant to parental and individual decisions about marriage—which is true in most contexts but particularly so where practices surrounding marriage involve the exchange of marriage payments—the resource dilution model should have implications for the associations between sibship size and/or birth order and the transition to marriage (Yu, Su, and Chiu 2002).

In contexts where dowry is prevalent, like India, a liquidity-constrained family with more than one daughter must delay its younger daughter's marriage to accumulate a second dowry, thus creating "resource competition" among sisters. Qualitative interviews from Young Lives have shown that the debt incurred through the marriage of older siblings does delay the marriage of younger daughters, as parents find themselves unable to meet the financial requirements until a later stage (Singh and Vennam 2016). Similarly, girls with older brothers who are married may be able to marry earlier as parents can recycle some of the economic resources received from the older son's dowry for their younger daughter. Conversely, where bride price is prevalent, like Ethiopia, these economic considerations may play out differently, and the expectations associated with bride wealth may be such that the birth-order-related effects of having an older sister are mitigated. In sum, sibship configurations affect the timing of marriage by creating dynamics of resource competition, and these dynamics vary as a function of the practices surrounding marriage payments and their direction (bride-to-groom versus groom-to-bride).

With YL data we can get a first indication of whether family-level resource-constraints hypotheses hold by examining whether the presence and number of older sisters in the household affect the probability of experiencing teen marriage. For these theories to hold, we would expect older sisters in the household to delay the marriage of younger sisters, that is, we expect to observe a negative relationship between the sister-related variables and teen marriage, particularly so where marriage payments flow from the bride's family to the groom's family, namely India and—to a smaller extent due to the combination of dowry and bride price—Vietnam.

In contexts where parents are actively involved in their daughter's marriage decisions and customs such as arranged marriage are rooted, economic considerations intersect widely with cultural practices (Boyden, Crivello, and Morrow 2015). There are several ways in which parental involvement operates (*cultural hypothesis* or *sibling rivalries*). One of them aligns with tradition, as parents often play a role in choosing their daughters' grooms. The other is more closely tied to parental preferences and suggests that parents tend to arrange their daughters' marriages in exact birth order, hence the oldest daughter should marry first, then the second one, and so forth. Considering that siblings of the same sex participate in the same marriage market, and the search for a suitable spouse takes time, parents might face a limited capability to find husbands for all their daughters, thus exacerbating sibling rivalries (Vogl 2013).

With YL data we can get an indication of whether sibling-rivalries hypotheses hold by complementing the previous set of predictions with an assessment of whether girls whose next-youngest siblings are female face a differential likelihood of teen marriage relative to girls whose next-youngest siblings are male. Under a sibling rivalry hypothesis whereby parents aim to marry all girls by a certain age, we would expect older sisters in the household to delay the marriage of younger sisters alongside younger sisters prompting older sisters to marry earlier; that is, we expect to observe a positive relationship between having a sister as next-youngest sibling and teen marriage. Due to the far higher prevalence of arranged marriages in Ethiopia and India, we hypothesize the sibling rivalry framework to more closely apply to these countries. As marriages in Peru do not typically involve marriage payments nor is arranged marriage a widespread practice, we predict for Peru a null relationship between the sister-related variables and teen marriage. In some sense, in this study Peru serves as a "control" country for which no real expectation is raised concerning the relationship between sibling sex-composition and teen marriage. Table 1 (Panel B) provides a summary overview of theoretical expectations for each country.

DATA AND METHODS

Data and Measures

We use data from the YL project, a unique longitudinal study of childhood poverty that follows the lives of 12,000 children in Ethiopia, India (Andhra Pradesh and Telangana), Peru, and Vietnam over a time span of 15 years. The data are clustered and cover 20 sentinel sites in each country, selected to represent the diversity of each country across rural and urban lines. Even though the survey is not nationally representative—it purposely oversamples poor areas—and cannot be used for monitoring welfare indicators over time in a way comparable to, for instance, the Demographic and Health Surveys (DHS) and the Welfare Monitoring Surveys (WMS), the YL sample is an appropriate and valuable medium for modeling, analyzing, and understanding the dynamics of child well-being in four different contexts (Outes-Leon and Sanchez 2008). For additional details on the sampling design, see Wilson, Huttly, and Fenn (2006).

In each country ~1,000 children in the older cohort (OC, born in 1994–95) and ~2,000 children in the younger cohort (YC, born in 2001–02) were surveyed. This study uses four waves of data from the older cohort, with children aged 8–9 years old in Round 1 (R1 - 2002), 11–12 years old in Round 2 (R2 - 2006), 14–15 years old in Round 3 (R3 - 2009), and 18–19 years old in Round 4 (R4 - 2014). We restrict the focus to girls for the following reasons. First, we are interested in uncovering how sisters' rivalries affect girls' probability of experiencing teen marriage, hence a focus on girls is more consistent with our theoretical framework. Second, the prevalence of teen marriage for boys is less than 2 percent in three out of the four countries, namely Ethiopia, India, and Peru. This choice restricts the sample from 3,722 children to 1,834 girls as of R1.[3] Of the 1,834 girls surveyed in R1, 168 dropped out of the study between R1 and R4. The analytical sample is hence 1,666 girls: 420 girls in Ethiopia, 487 in India, 294 in Peru, and 465 in Vietnam.

Note that attrition in the data is relatively low over a 12-year period, compared to many longitudinal studies in developing countries—from 5.8 percent in India to 14.3 percent in Ethiopia.[4] Attrition analyses reported in Appendix Table A1 show that girls missing in R4 were only marginally statistically different from the 1,666 girls present in all rounds in terms

3 The reason why the sample size is not 4,000 (1,000 per country) is because there was a smaller initial sample in Peru (around 700 children).

4 In the Young Lives study, the main reasons for attrition are migration (internal or abroad), household moves, marriage (of some older-cohort children whose in-laws may not wish them to participate), and the feeling that the study has not brought any tangible benefits from government. Working with the same field supervisors since Round 1 enabled the YL team to build stable relationships with the families, hence minimizing the likelihood of attrition.

of socio-demographic characteristics. In line with Barnett and colleagues (2013), girls who left the study were more likely to come from urban areas (p=0.023) and have lower-educated mothers (p=0.079). However, girls were not different in terms of the household composition variables of interest, thereby increasing confidence in the validity of the analytical sample. Due to small sample sizes, we report t-tests for the differences in means on the pooled sample.

The chosen dependent variable is a binary indicator for teen marriage—defined as marriage occurring before age 19.[5] The definition of marriage adopted in this study includes cohabitation, a particularly important reality in Latin American countries. We limit ourselves to this self-reported current-status variable due to incomplete retrospective data on age at marriage. Following Singh and Espinoza Revollo (2016), we focus on teenage marriage, rather than early marriage (below 18 years old) as we aim to uncover the main drivers and determinants of this event, which we believe in these contexts are not closely tied to the legal status threshold of 18 years old. Also, adopting a teen marriage definition provides a more reliable measure given the YL survey design, which collects marital status information at the time of the last survey (i.e., ages 18–19). Given the limited information available on the exact timing of marriage and the risk of recall bias that plagues variables of this kind, measuring early marriage would lead to imprecise assessments.

We draw on the household roster to construct variables on the number of siblings, together with their sex and age.[6] With these, we construct the main predictors of interest, namely a dummy for whether the YL girl has any older sisters (versus not having older sisters, i.e., she is the eldest daughter in the household), a continuous variable for the number of older sisters, and dummy variables for whether her next-youngest and next-oldest siblings are female (1 if female; 0 if male). We also build a variable for the birth interval (in months) between the YL girl and her next-youngest and next-oldest siblings. This is measured as their respective age difference in months. The relevance of these dimensions for the current analysis will become clearer in the following sections. The sex of the next-youngest sibling and the related birth interval are only available for the 919 girls who report having any younger sibling, that is 276 girls in Ethiopia (66 percent of the girls' sample in Ethiopia), 269 in India (55 percent), 143 in Peru (49 percent), and 231 in Vietnam (50 percent). Similarly, the sex of the next-oldest sibling and the related birth interval are only available for the 1,068 girls who report having any older sibling, that is 297 girls in Ethiopia (71 percent), 315 in India (65 percent), 171 in Peru (58 percent), and 285 in Vietnam (61 percent).

Additional controls include the number of older brothers, the number of younger siblings, the age of the child (in months), the age and educational attainment of the mother (results are qualitatively similar when substituting with father's characteristics), the wealth index, a dummy for urban residence (1 if urban; 0 if rural), and a dummy for whether the child was enrolled in school at age 15 (R3). Educational attainment is measured in continuous fashion as grade attained, and the wealth index—constructed combining three indices for housing quality, access to services, and consumer durables—positions YL households on a continuous 0–1 asset scale, with higher values reflecting higher household wealth. Except

5 In what follows, the term "teen marriage" refers to marriage or cohabitation occurring any time before age 19. This definition of teen marriage includes girls who got married before the age of 19 but then separated (*ever married*).

6 These are co-resident siblings, but the analysis is robust to the inclusion of siblings who have moved out before R1.

for the child's school enrollment dummy, all predictors are measured in R1 for two reasons. First, the outcomes are only available in R4, hence we make use of the longitudinal nature of the data, yet we cannot estimate fixed-effects panel models. Second, most predictors are time invariant (e.g., mother's education), or measured at a point in time in which little variation in household composition is likely to occur (e.g., sibling sex-composition).[7] Although missing values on covariates are rare—at most 5 percent of cases in some variables—whenever possible we use data from subsequent rounds to impute missing data (e.g., age of the child or education of the mother).

Last, for each YL girl we construct a variable that accounts for the permutations of older siblings by sex to more precisely capture the sex and sequencing of male and female births that occurred prior to the YL girl. For instance, a girl who reports having only one older sister is coded as "G," and a girl who reports having only two older sisters is coded as "GG." Conversely, a girl who reports having three older sisters and one older brother—where the older brother is the firstborn—is coded as "BGGG." A girl with no older siblings is coded as "N."

Analysis

Our analytical approach proceeds as follows. First, we model the probability of being married (including cohabitation) using logistic regression as follows:

$$logit(Y_i) = \alpha + \beta sisters_i + \gamma x_i \tag{1}$$

where Y_i is a dummy variable that takes the value of 1 if girl i has ever been married and takes the value of 0 if the girl has never been married. As the YL data come from nonrandomly selected sites within nonrandomly selected countries, we deem it more appropriate to run analyses separately by country. The term $sisters_i$ captures the association between the role of older sisters and the probability of experiencing teen marriage. We provide two specifications per outcome. In specification (1) $sisters_i$ is a dummy variable for whether the YL girl has any older sisters (1 if the girl has at least one older sister, 0 otherwise); in specification (2) $sisters_i$ is a continuous variable measuring the number of older sisters. The vector x_i includes all sociodemographic determinants other than the presence and the number of older sisters, namely the number of older brothers, the number of younger siblings, age of the child, mother's age and education, the wealth index, a dummy for urban residence, and a dummy for enrollment in school at age 15. Although in this first stage of the analysis we make no claim of causality, we use as predictors characteristics that are either time-invariant or recorded in earlier rounds of the survey. This modeling choice guards against obvious sources of reverse causality.

Second, to delve more closely into the role of gender and sibling sex-composition in shaping the probability of getting married before age 19—and provide estimates that are closer to being causal—our identification strategy takes advantage of variation in younger siblings' gender, in a spirit similar to Vogl (2013). We exploit the idea that, conditional on a girl having at least one younger sibling, the gender of her sibling may be taken as random. In a more

7 Note that the Young Lives girl is 8 in Round 1, hence variations in household size or number of siblings are less likely to occur than if the girl was a newborn. For instance, the mean number of siblings on the pooled sample increases from 2.1 to 2.5 over four rounds of data. Furthermore, for the core of the analysis we use information on the sex-composition of older siblings, which is time invariant in the absence of mortality or migration shocks. Finally, child and mother's age increase by construction over rounds.

general scenario, conditional on a girl having at least *x* younger siblings, the gender of her x^{th} younger sibling can be taken as random in the absence of sex selection. A comparison of girls with next-born sisters to those with next-born brothers thus identifies the effect of next-born sibling's gender, allowing for a more causal interpretation of the role of sibling structures on teen marriage. As before, we model for each country the probability of getting married by age 19 using logistic regression as follows:

$$logit\ (Y_i) = \alpha + \beta sex\_next\_youngest_i + \gamma x_i \tag{2}$$

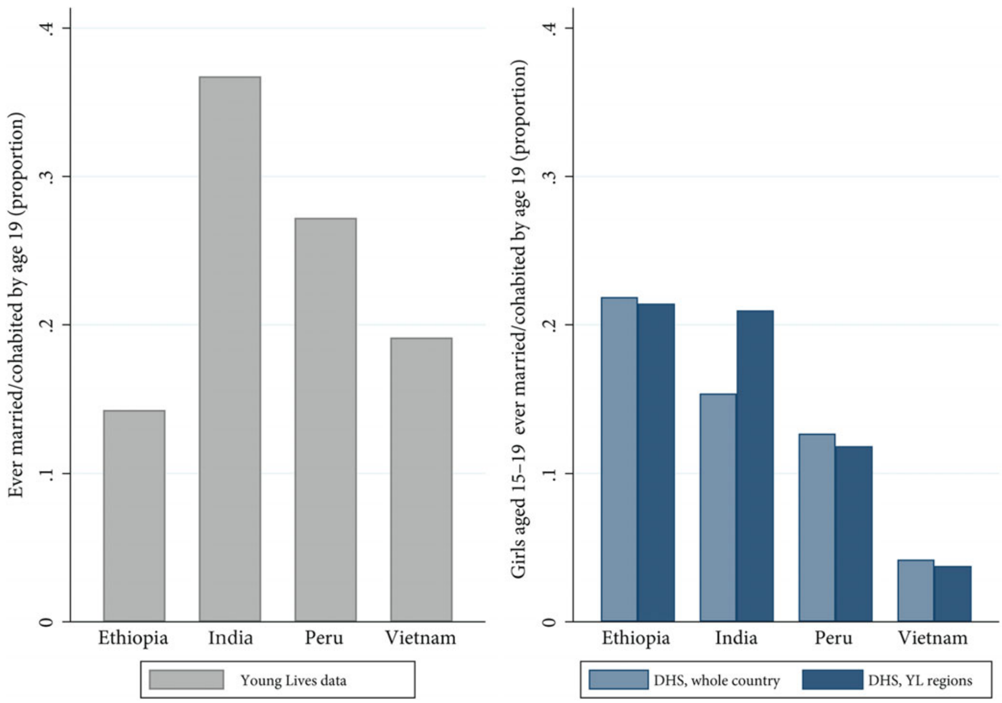
where the term $sex\_next\_youngest_i$ varies between 0 for a next-youngest brother and 1 for a next-youngest sister.[8] We provide, as before, two specifications per outcome, where (1) controls for the number of older sisters and the number of older brothers, while (2) replaces these two controls with dummies for the exact permutation of older siblings by sex (e.g., B, G, BB, BG, BGB) in an effort to capture not only the overall number of older brothers and sisters, but also the exact sex-sequencing.[9] This is crucial to account for parental preferences for a specific offspring sex-composition, and to partly address endogeneity concerns related to son preference and sex selection. As a matter of fact, while the outcome of a given birth is random in ideal circumstances, it may be correlated with pre-birth characteristics. This threat to identification is mostly due to sex-selective abortion and sex-related investments, which are prevalent in some LMICs, particularly in South Asia (Arnold, Kishor, and Ray 2002; Das Gupta et al. 2003; Bhalotra and Cochrane 2010). The likelihood of sex selection declines in the number of older brothers due to a demand for sons, and it increases in the birth interval as longer birth intervals allow for more terminated pregnancies between births (Pörtner 2015).

Besides controlling for the exact permutation of older siblings by sex in specification (2) of Equation 2, we complement our core results with ancillary analyses that examine whether son preference, sex selection, and sex-related investments are issues of concern. We test for the presence of son preference and sex-selective abortion by implementing two different strategies. First, following Seid and Gurmu (2015) we draw on the whole sample—boys and girls—to check whether the birth intervals with the next-youngest and next-oldest siblings differ based on the proportion of boys in the household. The idea is that if parents selectively abort female fetuses, then the proportion of boys in the household is endogenous. If it is the case that parents abort female fetuses, birth spacing is expected to be higher for families that have a higher proportion of boys, as the higher proportion of boys is partly driven by sex-selective abortion and longer birth intervals allow for more terminated pregnancies between births. Second, switching back to the sample of girls who have at least one younger sibling, we run

8 We could have conducted an analogous analysis using as predictor the sex of the next-oldest sibling, yet we favored analyses based on the sex of the next-youngest sibling in that endogenous fertility is more likely to confound comparisons based on the sex-composition of older siblings (Vogl 2013). Results with this other predictor are available upon request.

9 Whenever the Young Lives girl reports more than four older siblings, we truncate the permutations of older siblings by sex to the first four births if the sex-composition of these births is mixed. For instance, a girl with "GGBBG" and another girl with "GGBBGGGBG" are assigned the same coding "GGBB." In so doing, we are assuming that parental preferences for offspring sex-composition in these two scenarios are similar. This assumption is reasonable and permits the reduction of the number of fixed-effects from 98 to 31 configurations. Also, as this specification is estimated on the sample restricted to girls who have at least one younger sibling, the number of observations is reduced from 1,666 to 919. We run the same analyses keeping the overall sample of 1,666 girls and recoding the sex of the next-youngest sibling variable into 0 (male), 1 (female), and 2 (no younger siblings), hence using this variable as a categorical one. Results are fully in line and therefore not reported (available upon request).

FIGURE 1 Prevalence of teen marriage in the Young Lives sample of the present study (left) and the latest Demographic and Health Survey (right)



NOTES: Data in the left panel come from the Young Lives study (analytical sample of the present study). Data in the right panel come from the latest Demographic and Health Survey (DHS) available for each country, namely Ethiopia 2016, India 2015–16, Peru 2012, and Vietnam 2004, and include both girls married and living with a partner. Children in the Young Lives study were selected from 20 sentinel sites defined specifically in each country. The 20 sentinel sites are located in targeted regions in each country. The regions are: Amhara, Oromia, SNNPR, Tigray, and Addis Ababa in Ethiopia; Andhra Pradesh and Telangana in India; Amazonas, Ancash, Apurimac, Arequipa, Ayacucho, Cajamarca, Huanuco, Junin, La Libertad, Lima, Piura, Puno, San Martin, and Tumbes in Peru; North-East, Red River Delta, City, South Central Coast, and Mekong Delta in Vietnam.

linear probability models (LPM) of the next-youngest sibling's sex on the birth interval, the number of older sisters and older brothers (replaced in specification [2] by the exact permutations of older siblings by sex), and some child and maternal characteristics. The idea is that if the number and/or sex-composition of older siblings, together with the length of the birth interval with the next-youngest sibling, and parental characteristics more generally significantly predict the probability of a female birth, then the sex of the next-youngest sibling might not be randomly determined.

Last, we test (indirectly) for differential infant and child mortality by gender by assessing whether there are systematic gender differentials in child anthropometrics and parental investments using data from the YL younger cohort.

RESULTS

Descriptive Statistics

Figure 1 (left panel) shows the prevalence of teen marriage for girls in the YL sample. India stands out as the country with the highest proportion of girls married before age 19, around

0.37. Peru, Vietnam, and Ethiopia follow with shares around 0.27, 0.19, and 0.14, respectively. With reference to these estimates, it is important to note that while the inclusion of cohabitation is negligible in India and Vietnam, it increases the prevalence of teen marriage from 0.11 to 0.14 in Ethiopia, and from 0.07 to 0.27 in Peru. A comparison with the incidence of teen marriage among girls aged 15–19 using the latest round of DHS data for each country (Figure 1, right panel) shows remarkable discrepancies, stressing again the context-specificity of the YL sample. Nationally representative estimates suggest that the share of girls aged 15–19 who are married by age 19 is around 0.22 in Ethiopia (2016), 0.15 in India (2015–16), 0.13 in Peru (2012), and 0.04 in Vietnam (2004). Appendix Table A2 provides additional details on the characteristics of girls' marriage, and shows that in the YL sample the prevalence of arranged marriage is striking in Ethiopia and India, where parents were solely responsible for choosing their daughters' grooms in 65.3 and 43.0 percent of instances, respectively. Vietnam follows with a percentage of 13.6. Data on who chose the girl's partner are not available for Peru, yet the high share of girls who report having known their partner for longer than a year (85.7 percent) suggests that arranged marriage might be less prevalent in this context.

Table 2 provides descriptive statistics on the girls' sample (N = 1,666). The data show that the mean birth interval between the YL girl and her next-youngest sibling is lowest in India (32.4 months) and highest in Vietnam (48.3 months), while the share of next-youngest siblings who are female is rather homogeneous across countries. Consistent with the larger mean household sizes observed in sub-Saharan Africa, the number of siblings is higher in Ethiopia, followed in turn by India, Peru, and Vietnam. Conversely, while Ethiopia stands out for the highest mean number of older sisters and brothers, the remaining countries do not follow any specific ordering. All children were around 8 years old (95–96 months) when they were surveyed in Round 1, hence there is neither within-country nor cross-country variation in the age of the child. There is little variation in mother' age too, except for India, where mothers are on average four years younger. Mean educational attainment of the mother shows remarkable variability across countries, with Ethiopia and India averaging 2.7 grades, and Peru and Vietnam approaching 6.7 grades completed. The majority of girls live in rural areas in Ethiopia, India, and Vietnam, while 74 percent of them live in urban areas in Peru (note that the sample in Peru is overwhelmingly urban by design). Moreover, while 91–93 percent of girls are enrolled in school at age 15 in Ethiopia and Peru, this percentage declines to 80 and 73 percent in Vietnam and India, respectively. Last, at the bottom of Table 2 we report the four most common configurations of older siblings observed in each country, from the first most common (left) to the fourth most common (right). In all countries, the most common configuration is one in which the YL girl reports having no older siblings, followed by one older sister in Ethiopia (G), and one older brother in India, Peru, and Vietnam (B). Due to the largest mean household size and the highest number of older siblings documented above, the most complex configurations of older siblings by sex are observed in Ethiopia.

Socio-Demographic Determinants of Teen Marriage, Sibling Sex-Composition, and Sister Effects

Table 3 provides estimates (odds ratios) from logistic regressions predicting the probability of teen marriage as a function of the presence of older sisters (1) and the number of older sisters

TABLE 2 Descriptive statistics on girls' sample (N=1,666), pooled and by subregion in country

	Ethiopia (N = 420)		India (N = 487)		Peru (N = 294)		Vietnam (N = 465)	
	Mean (SD)	Obs.	Mean (SD)	Obs.	Mean (SD)	Obs.	Mean (SD)	Obs.
Outcome								
Married/cohabited by age 19	0.143 (0.350)	420	0.368 (0.483)	487	0.272 (0.446)	294	0.191 (0.394)	465
Predictors								
Sex of next-youngest sibling (1 if female)	0.514 (0.501)	276	0.517 (0.501)	269	0.531 (0.501)	143	0.459 (0.499)	231
Birth interval with *next-youngest* sibling (months)	41.49 (18.70)	276	32.37 (15.92)	269	41.94 (20.16)	143	48.33 (22.55)	231
Sex of next-oldest sibling (1 if female)	0.545 (0.499)	297	0.492 (0.501)	315	0.427 (0.496)	171	0.484 (0.501)	285
Birth interval with *next-oldest* sibling (months)	39.95 (28.77)	297	40.40 (33.11)	315	38.11 (31.92)	171	43.41 (26.26)	285
Presence of older sisters (R=No older sisters)	0.555 (0.498)	420	0.374 (0.484)	487	0.364 (0.482)	294	0.389 (0.488)	465
Number of older sisters	0.976 (1.141)	420	0.505 (0.772)	487	0.541 (0.849)	294	0.535 (0.774)	465
Number of older brothers	0.969 (1.157)	420	0.511 (0.705)	487	0.595 (0.884)	294	0.527 (0.760)	465
Number of younger siblings	1.067 (0.987)	420	0.766 (0.828)	487	0.653 (0.785)	294	0.619 (0.730)	465
Number of siblings	3.012 (2.082)	420	1.803 (1.123)	487	1.799 (1.472)	294	1.684 (1.190)	465
Age (months)	95.10 (3.549)	420	96.38 (3.836)	487	95.59 (3.855)	294	96.24 (3.675)	465
Mother's age (years)	34.41 (7.584)	420	30.61 (6.178)	487	34.06 (6.755)	294	34.68 (6.048)	465
Mother's education (grade attained)	2.656 (4.110)	420	2.748 (4.189)	487	6.632 (4.263)	294	6.817 (3.728)	465
Urban residence (R=Rural)	0.371 (0.484)	420	0.230 (0.421)	487	0.741 (0.439)	294	0.176 (0.382)	465
Wealth index	0.221 (0.164)	420	0.405 (0.205)	487	0.471 (0.229)	294	0.438 (0.192)	465
Enrolled at age 15	0.912 (0.284)	420	0.733 (0.443)	487	0.932 (0.252)	294	0.796 (0.404)	465
Permutations of older siblings by sex:								
Four most common configurations	N - G - B - BB		N - B - G - GB		N - B - G - GB		N - B - G - GG	
Most complex configuration(s)	BBBGBGBB - BBGBGGGB		BBGGGG		BBGGBGG		BBBGB - GBBGB - GGBGB	

NOTES: Reports, from left to right, the sex composition of older siblings. For instance, BGGG means that the oldest sibling (i.e., the firstborn) is a boy, followed by three girls. Therefore, the YL girl has three older sisters and one older brother, distributed that way. "N" refers to the configuration in which the YL girl has no older siblings.
SD = Standard deviations. Obs. = Number of observations. R = Reference category.

in the household (2), as of Equation 1. Results show that the presence and number of older sisters are associated with a 30–50 percent lower likelihood of teen marriage in Ethiopia, India, and Vietnam, while there is no statistically significant association in Peru. Estimated odds ratios are highest in Ethiopia and India, and lowest in Vietnam. The two specifications deliver similar findings, yet focusing on the latter (number of sisters) delivers more precise estimates. Slight differences emerge in Vietnam, where the number of older sisters is significantly associated with a lower likelihood of teen marriage, yet the mere presence of older sisters is not.

Interestingly, the number of older brothers and the number of younger siblings are not significantly predictive of teen marriage. In terms of socioeconomic characteristics, both mother's education and the wealth index are negatively associated with the outcomes, yet coefficients are only significant for wealth in Peru and Vietnam, suggesting that teen marriage

TABLE 3 Presence and number of older sisters and teen marriage, logit estimates by subregion in country (Equation 1)

	Ethiopia		India		Peru		Vietnam	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Presence of older sisters (R=No)	0.536^{+}		0.528*		1.161		0.684	
	(0.182)		(0.136)		(0.381)		(0.235)	
Number of older sisters		0.689*		0.643**		0.846		0.697^{+}
		(0.106)		(0.109)		(0.160)		(0.145)
Number of older brothers	0.835	0.823	1.016	1.004	1.133	1.112	1.421	1.407
	(0.125)	(0.121)	(0.175)	(0.173)	(0.200)	(0.194)	(0.307)	(0.306)
Number of younger siblings	0.979	0.975	0.844	0.843	0.999	0.972	0.991	0.991
	(0.154)	(0.156)	(0.121)	(0.121)	(0.199)	(0.195)	(0.212)	(0.212)
Age (months)	1.052	1.052	1.013	1.013	1.028	1.029	1.001	1.003
	(0.042)	(0.042)	(0.030)	(0.030)	(0.042)	(0.041)	(0.040)	(0.040)
Mother's age	1.053*	1.057*	0.976	0.979	0.954^{+}	0.966	0.935*	0.941*
	(0.024)	(0.025)	(0.026)	(0.027)	(0.026)	(0.025)	(0.029)	(0.029)
Mother's education	0.952	0.944	0.959	0.960	0.985	0.984	0.960	0.959
	(0.034)	(0.034)	(0.036)	(0.036)	(0.036)	(0.036)	(0.046)	(0.046)
Wealth index	0.314	0.362	0.755	0.690	0.200*	0.193*	0.037**	0.033***
	(0.436)	(0.507)	(0.567)	(0.525)	(0.159)	(0.153)	(0.037)	(0.034)
Urban residence (R=Rural)	0.460	0.448	0.453*	0.466*	1.624	1.551	1.199	1.200
	(0.222)	(0.219)	(0.166)	(0.171)	(0.667)	(0.625)	(0.733)	(0.743)
Enrolled in school at age 15	0.144***	0.148***	0.109***	0.111***	0.169**	0.144***	0.119***	0.113***
	(0.057)	(0.059)	(0.029)	(0.029)	(0.092)	(0.076)	(0.036)	(0.035)
Constant	0.003	0.003	3.381	3.191	0.920	0.798	0.783	0.672
	(0.012)	(0.011)	(9.682)	(9.205)	(3.552)	(3.055)	(3.581)	(3.586)
Observations	420	420	487	487	294	294	465	465

NOTES: Robust standard errors are in parentheses. Odds ratios reported. Model (1) includes as main predictor a dummy for whether the Young Lives girl has any older sisters; model (2) replaces this predictor with a continuous variable for the number of older sisters the girl reports.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$.
R = Reference category.

in these two countries might retain a stronger socioeconomic gradient. Enrollment in school at age 15 emerges as the strongest predictor of teen marriage, with similar magnitudes across specifications and outcomes. Specifically, being enrolled in school at age 15 is associated with 85–90 percent lower odds of experiencing teen marriage. Also, it is important to note that most socioeconomic controls—namely mother's education, wealth, and household location of residence—lose predictive power once the enrollment variable is accounted for, suggesting that, especially in Ethiopia and India, socioeconomic status matters for teen marriage to the extent that it makes it more likely for girls to be in school (i.e., the association between sibling composition and teen marriage flows through the schooling channel).

Note that for this and subsequent specifications we test the robustness of the findings using household composition variables (number of older and younger siblings, sex of siblings, etc.) as measured in later rounds. Results are aligned and available upon request. Overall—and consistently with Vogl (2013), Singh and Espinoza Revollo (2016), and Singh and Vennam (2016)—this analysis suggests that there is something inherent in having older sisters—rather than older brothers or younger siblings—that correlates with better adolescent outcomes. Appendix Figure A1 (Panels A1 and A2) provides estimates from pooled analyses with country fixed-effects and country-sister interactions (linear combinations with point estimates by country). Results are aligned and even more statistically significant—mainly due to bigger sample size and higher statistical power.

Table 4 provides estimates (odds ratios) from logistic regressions predicting the probability of teen marriage as a function of the sex of the next-youngest sibling (1) controlling for the number of older sisters and brothers, and (2) replacing these controls with permutation

TABLE 4 Sex of the next-youngest sibling and teen marriage, logit estimates by subregion in country (Equation 2)

	Ethiopia		India		Peru		Vietnam	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Sex of next-youngest sibling (1 if female)	0.489^{+}	0.438^{+}	0.864	0.855	0.965	1.185	1.152	1.195
	(0.195)	(0.198)	(0.263)	(0.263)	(0.401)	(0.512)	(0.522)	(0.541)
Birth interval with next-youngest sibling (months)	0.978^{+}	0.976^{+}	0.995	0.995	0.979^{+}	0.975*	1.013	1.013
	(0.012)	(0.013)	(0.009)	(0.009)	(0.011)	(0.011)	(0.011)	(0.012)
Number of older sisters	0.565**		0.753		0.763		0.509^{+}	
	(0.122)		(0.158)		(0.237)		(0.194)	
Number of older brothers	0.797		1.119		0.956		1.009	
	(0.137)		(0.387)		(0.240)		(0.391)	
Age (months)	1.049	1.036	0.997	1.001	0.980	0.969	1.051	1.070
	(0.051)	(0.060)	(0.039)	(0.039)	(0.055)	(0.059)	(0.071)	(0.079)
Mother's age	1.084**	1.106**	0.979	0.972	0.966	0.952	0.962	0.912
	(0.028)	(0.035)	(0.030)	(0.034)	(0.042)	(0.048)	(0.055)	(0.064)
Mother's education	0.922^{+}	0.895*	0.968	0.965	0.936	0.947	0.892^{+}	0.934
	(0.040)	(0.040)	(0.052)	(0.054)	(0.052)	(0.060)	(0.060)	(0.064)
Wealth index	1.002	1.158	0.928	1.193	0.322	0.484	0.022**	0.014**
	(1.848)	(2.487)	(0.949)	(1.239)	(0.384)	(0.613)	(0.029)	(0.021)
Urban residence (R=Rural)	0.339	0.302	0.309*	0.272*	1.045	0.844	0.168	0.155
	(0.268)	(0.265)	(0.151)	(0.138)	(0.572)	(0.486)	(0.289)	(0.326)
Enrolled in school at age 15	0.151***	0.177**	0.115***	0.105***	0.088*	0.059^{+}	0.065***	0.057***
	(0.071)	(0.094)	(0.042)	(0.040)	(0.087)	(0.095)	(0.033)	(0.029)
Constant	0.005	0.012	0.134	0.073	0.988	1.634	0.237	0.430
	(0.025)	(0.070)	(0.457)	(0.258)	(0.451)	(1.153)	(1.645)	(3.254)
Permutations of older siblings by sex	No	Yes	No	Yes	No	Yes	No	Yes
Observations	276	276	269	269	143	143	231	231

NOTES: Robust standard errors are in parentheses. Odds ratios reported. Model (1) includes as main predictor the sex of the next-youngest sibling, controlling for the number of older sisters and brothers; model (2) replaces these latter controls with dummies for the exact permutations of older siblings by sex.
***Significant at $p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{+}p < 0.1$.
R = Reference category.

dummies of older siblings by sex, as of Equation 2. In three out of the four countries, namely India, Peru, and Vietnam, there is no effect of sex of next-youngest sibling on teen marriage, suggesting there is no evidence that girls whose next-youngest sibling is a girl are differentially exposed to the risk of marrying before age 19 relative to girls whose next-youngest sibling is a boy. The effect is instead negative and statistically significant ($p < 0.1$) in Ethiopia, where a girl whose next-youngest sibling is a girl is about 50 percent less likely to experience teen marriage relative to a girl whose next-youngest sibling is a boy. The number of older sisters emerges as a significant negative predictor of teen marriage in Ethiopia and Vietnam, while the coefficients for India and Peru are negative and nonsignificant. In line with Table 3, the number of older brothers does not emerge as having predictive power. Appendix Figure A1 (Panels B1 and B2) provides estimates from pooled analyses with country fixed-effects and country-sex interactions (linear combinations with point estimates by country reported). Results confirm that Ethiopia is the only country in which having a girl as next-youngest sibling significantly (and negatively) affects the likelihood of experiencing teen marriage.

Son Preference and Sex-Selective Abortion

As described in the Methods section, for estimates in Table 4 to be credible (in a causal sense) we provide evidence that sex-selective abortion is not an issue of concern in our sample using two strategies, implemented in Panel A and B of Table 5, respectively. Panel A compares birth spacing by proportion of boys in the households and shows that there are no statistically

TABLE 5 Birth intervals (in months) by proportion of boys in the household (Panel A) and predictors of next-youngest sisters, LPM estimates by subregion in country (Panel B)

	Birth intervals (in months) by proportion of boys in the household							
	Ethiopia		India		Peru		Vietnam	
Panel A	**<50%**	**≥50%**	**<50%**	**≥50%**	**<50%**	**≥50%**	**<50%**	**≥50%**
Birth interval with next-youngest sibling (mean)	40.57	40.76	33.45	32.85	42.76	41.83	45.83	45.19
(SE)	(1.090)	(0.889)	(1.057)	(0.940)	(1.892)	(1.219)	(1.655)	(1.341)
Observations	252	433	228	296	109	252	172	267
p-value	0.893		0.674		0.676		0.765	
Birth interval with next-oldest sibling (mean)	39.41	41.31	36.18	39.64	40.69	35.84	41.13	43.69
(SE)	(1.513)	(1.384)	(1.778)	(1.505)	(2.892)	(1.820)	(1.604)	(1.302)
Observations	280	456	236	422	134	287	227	386
p-value	0.373		0.152		0.145		0.223	

	Sex of next-youngest sibling (female=1)							
	Ethiopia		India		Peru		Vietnam	
Panel B	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Birth interval with next-youngest sibling (months)	−0.000	−0.001	0.001	0.002	0.003	0.002	0.001	−0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Number of older sisters	−0.036		−0.139***		−0.022		−0.011	
	(0.030)		(0.038)		(0.057)		(0.051)	
Number of older brothers	−0.013		−0.017		−0.015		0.021	
	(0.031)		(0.065)		(0.056)		(0.064)	
Age (months)	−0.000	−0.002	0.008	0.009	0.009	0.014	−0.003	−0.005
	(0.009)	(0.009)	(0.008)	(0.008)	(0.010)	(0.011)	(0.009)	(0.010)
Mother's age	−0.003	−0.001	0.017*	0.017*	0.003	0.002	−0.007	−0.010
	(0.005)	(0.005)	(0.007)	(0.007)	(0.009)	(0.010)	(0.009)	(0.011)
Mother's education	0.007	0.006	−0.011	−0.010	−0.014	−0.016	0.004	0.005
	(0.008)	(0.009)	(0.008)	(0.008)	(0.012)	(0.013)	(0.010)	(0.011)
Urban residence (R=Rural)	0.010	0.003	0.012	0.013	0.009	0.024	0.059	0.074
	(0.076)	(0.080)	(0.077)	(0.080)	(0.104)	(0.113)	(0.109)	(0.116)
Constant	0.675	0.753	−0.685	−0.893	−0.472	−0.837	0.912	1.196
	(0.832)	(0.900)	(0.774)	(0.795)	(1.020)	(1.119)	(0.912)	(1.020)
Permutations of older siblings by sex	No	Yes	No	Yes	No	Yes	No	Yes
Joint F-test (*p-value*)	0.656	0.974	0.003	0.044	0.684	0.487	0.960	0.927
Observations	276	276	269	269	143	143	231	231

NOTES: Robust standard errors are in parentheses. In Panel A, the proportion of boys in the household is computed as the ratio between male siblings (including the YL child if he is a boy) over the sum of male and female siblings (the latter including the YL child if she is a girl). The variable is then dichotomized to equal 1 if the proportion is greater or equal to 0.50.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$.
LPM = Linear probability model. SE = Standard errors. R = Reference category. YL = Young Lives.

significant differences in the average length of the birth interval by proportion of boys in the household. Although averages are more balanced when using the birth interval with the next-youngest sibling, the higher birth intervals observed in Ethiopia, India, and Vietnam when the proportion of boys equals or exceeds 0.50 using the birth interval with the next-oldest sibling are not significantly higher.

Panel B reports results of a linear probability model predicting the sex of the next-youngest sibling as a function of the birth interval and household characteristics. Results reveal little reason to believe that sex selection will bias the results in Ethiopia, Peru, and Vietnam. As for India, the nonsignificant coefficient on the birth interval is reassuring, yet the negative and significant coefficient on the number of older sisters suggests that one additional older sister is associated with a 14-percentage-point reduction in the probability of a female birth. Additionally, the joint F-test on India suggests that all variables together are significant predictors of the sex of the next-youngest sibling ($p = 0.003$ and $p = 0.044$). Evidence from both panels in Table 5 hence suggests that sex-selective abortion is not an issue of concern in Ethiopia, Peru, and Vietnam, while it cannot be completely ruled out in the Indian context, although quantitatively small.

Differential Infant and Child Mortality by Gender

If mortality patterns systematically vary across gender, the observed gender mix in the household not only reflects parents' effort to achieve their desired gender mix, but also differential mortality rates. There is widespread literature about sex-related investments in children's health and nutrition that might imply differential mortality and thus—in a longitudinal context—not survival until the subsequent survey wave (Rosenzweig and Schultz 1982; Das Gupta 1987; Behrman 1988). Since information on mortality in the YL sample reports missing data, in Appendix Table A3 we show that there are no systematic gender differentials—or that patterns are similar across countries—in child anthropometrics and parental investments using data from the YL yonger cohort (R1–R3), thereby suggesting no evidence of a female disadvantage.[10] Birth weight is about 100–200 grams lower for girls in every country, in line with the literature (Van Vilet, Liu, and Kramer 2009), while prevalence and duration of breastfeeding are equal for male and female births (breastfeeding was still occurring at the time of the survey, so the duration measure is not representative of terminal breastfeeding). Similarly, body mass index (BMI) and weight-for-age (z-score) show no evidence of discriminatory investments favoring boys.[11]

SUMMARY AND DISCUSSION

The purpose of this study was to contribute knowledge on the determinants of teen marriage across geographically selected areas of four LMICs, with a key focus on gender and sibling sex-composition. Using data from the Young Lives study of childhood poverty tracking a cohort of children from the ages of 8–19 in Ethiopia, India, Peru, and Vietnam, we provided a comparative overview of the prevalence of the phenomenon and sought a better understanding of how the family's influence over children's life-course decisions creates tradeoffs among siblings in resource-deprived contexts and/or in settings characterized by rooted customs and strong social norms surrounding the order and timing of marriage. We tested hypotheses relating to the availability of *economic resources* within the household and *cultural norms* surrounding the order and timing of marriage.

10 We still attempted to retrieve some information on child mortality looking at children from the household roster (below age 8, 5, and 1) who die between rounds. Although the absolute numbers are too small to allow conclusive statements, there is no evidence of higher mortality for girls. If anything, the data suggest that more boys than girls die between rounds, at least in Ethiopia and India.

11 The literature on the topic is mixed and somewhat aligns with our findings. For instance, using Young Lives data Dercon and Singh (2013) find limited evidence of boys doing better than girls across nutritional indicators. Actually, where significant differences in these indicators exist, they are more likely to favor girls. From a review of more than 50 datasets from sub-Saharan Africa, Svedberg (1990) also finds no evidence that girls are at a disadvantage to boys in terms of child nutrition. Similarly, drawing information from 306 surveys on child nutrition, Marcoux (2002) reports that results from 227 of these display no evidence of any sex differentials across stunting, wasting, and underweight. This is not to say that gender biases do not exist across other types of indicators or at different (likely, later) ages. For instance, Dercon and Singh (2013) document a pro-boy bias in cognitive achievement in Ethiopia and India that is not apparent at an early age, but is most pronounced by the age of 12 and 15. Aurino (2017) also documents widening gaps at later ages.

We found that teen marriage in the YL sample is prevalent across all four countries. For instance, 37 percent of girls are married by the age of 19 in India and 27 percent are married (including cohabiting) in Peru. Moreover, we found that household characteristics—mainly, sibship characteristics—are important determinants of teen marriage in three out of the four countries, where evidence is suggestive of sister effects. In Ethiopia, India, and Vietnam the presence and number of older sisters in the household are associated with a 30-to-50-percent lower likelihood of teen marriage, while the association is null in Peru. Also, we show that having a girl as next-youngest sibling does not significantly affect girls' likelihood of experiencing teen marriage, except in Ethiopia where the estimated association is negative. Our results combined support for the idea that—at least in India and Vietnam—older sisters tend to delay the marriage of younger sisters, but younger sisters do not prompt earlier marriages for older sisters. On a theoretical side, our findings conform better to theories of family-level resource constraints associated with the costs of marriage for daughters, whereby parents feel compelled to marry their older daughters first but not necessarily to marry all their daughters by a certain age. Conversely, the sibling rivalry framework does not hold in the YL sample, not even in countries where the prevalence of arranged marriage is high, such as Ethiopia and India.

These findings enrich and complement existing scholarship on the role of gender and sibling sex-composition on early-adulthood outcomes. First, research on the issue is not extensive, particularly in LMICs. Second, related research is either concerned with outcomes other than teen marriage or focused on a single country. By adopting a comparative perspective, we have in no way claimed that the four countries of interest are similar, nor set the expectation that the hypothesis tested would hold across all contexts. Quite the contrary, we set out this investigation intrigued by the idea of documenting the heterogeneity in the role played by older sisters across contexts. Still, we found a good degree of cross-country homogeneity in the negative association between older sisters and teen marriage. This is particularly the case for Ethiopia, India, and Vietnam, the countries in the sample that are closest in terms of cultural norms, customs and traditions, while more dissimilarities emerge for Peru, the setting that departs the most in terms of the nature of marriage, the influence of parental control, and the prevalence (rather, absence) of arranged marriage.

The case of Ethiopia deserves special consideration as this is the only country in which we observe a negative association between presence and number of older sisters and teen marriage, alongside a negative (yet weak) association between having a sister as next-youngest sibling and teen marriage. This negative sign contradicts even further a sibling rivalry scenario in which younger sisters hasten the marriage of their older sisters, aligning with the mixed evidence on siblings' rivalry and later-life outcomes documented in Africa (Garg and Morduch 1998; Vogl 2013). Evidence from Ethiopia is more consistent with a scenario in which sisters—regardless of whether they are younger or older—are beneficial for the outcomes of children in the household and are "protective" of their female siblings (Parish and Willis 1993; Kaestner 1997). In economies that have a pro-male bias, resource constraint hypotheses might suggest that when households face constraints in the resources available for children, rivalries are set in motion that yield gains to having relatively more sisters than brothers (Morduch 2000).[12] As the literature is not conclusive on whether African countries effectively exhibit a pro-male bias (Svedberg 1990; Klasen 1996; Marcoux 2002), more research is needed to untangle this finding. An alternative hypothesis relates to the financial incentives tied to the practice of bride price. For instance, parents may feel pressured to marry their older daughter early, to obtain the resources associated with her bride price. These resources can then be recycled as part of the bride price they themselves will have to pay when their son gets married. In such a scenario, having a second daughter would not exert this type of financial pressure.

The nonsignificant coefficient on the sex of the next-youngest sibling in India stands at odds with Vogl's (2013) support for the sibling rivalry framework. Vogl found girls with next-youngest sisters in Bangladesh, India, Nepal, and Pakistan to be about 3 percentage points more likely to leave their natal homes—a proxy for marriage—than their counterparts with next-youngest brothers. Several factors may lie behind this discrepancy, likely related to the YL sampling design, the sample size, and the chosen outcomes. As a matter of fact, the YL study oversamples poor areas, hence the data cannot be compared with DHS data used by Vogl. Moreover, while Vogl focused on parental co-residence and age at marriage, due to data restrictions we chose as outcomes the probability of being married by age 19. It would be desirable to run parallel analyses using alternative variables such as the age at first marriage, together with measures of spousal quality, yet the comparative nature of the work prevents us from doing so. New YL data from upcoming rounds will make some of these additions possible.

This study has other limitations that lay the ground for subsequent research. First, due again to the YL sampling design, the prevalence figures presented in this study are not in line with country-level statistics on the prevalence of teen marriage—though they are consistent with official YL reports and studies (Favara, Lavado, and Sanchez 2016; Roest 2016; Singh and Espinoza Revollo 2016; Singh and Vennam 2016). These discrepancies need to be kept in mind when thinking about generalizability of results. Second, sample sizes are quite modest, especially for the next-youngest sibling analyses, which are conditioned upon having at least one younger sibling. Third, a methodological limitation has to do with the fact that the causal specification that relies on variation in younger siblings' sex (Equation 2) may reflect a negative (positive) effect of a younger sister on teen marriage, a positive (negative) effect of a younger brother, or some combination of the two. Twins data would permit investigating this possibility further, yet YL data were not designed to include twins (as only one child per household was selected). Future research should pick up on this important point. Fourth, evidence of sex-selection in the Indian sample, although quantitatively small, may raise some concerns on the reliability of the estimates. Alternative strategies should be considered to reduce this potential bias. Last, we acknowledge that our work leaves aside important factors such as religion and caste, polygamy, or access to modern contraception. Yet comparative research always entails trade-offs between comparability and level of detail. In

12 To provide further support to this hypothesis, we run a logistic regression replacing the sister-related predictor of interest with a dummy for whether the girl lives with only brothers (dummy =1 if the girl lives with only brothers; 0 if she lives with only sisters, or with a mix of brothers and sisters). Point estimates reported in Appendix Figure A2 show that Ethiopia is the only country in which there is a positive and statistically significant association between living with only brothers and teen marriage. In Ethiopia, a girl living with only brothers is about twice as likely to be married by age 19 relative to a girl living with only sisters, or with both brothers and sisters, all else being equal.

this work, we have prioritized the former component, highlighting the value of a rich—and quite underused—longitudinal dataset for answering new questions on sibship structures and adolescent well-being. Country-specific studies might be better suited to provide additional contextual details.

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APPENDIX

TABLE A1 Attrition analysis

	Present in R1 and R4 (N = 1,666)	Dropping out between R1 and R4 (N = 168)	Difference	P-value
Sex of next-youngest sibling (1 if female)	0.504	0.478	0.026	0.129
Birth interval with *next-youngest* sibling (months)	40.61	37.26	3.352	0.144
Sex of next-oldest sibling (1 if female)	0.494	0.519	−0.025	0.629
Birth interval with *next-oldest* sibling (months)	40.71	42.31	−1.600	0.608
Presence of older sisters (R=No older sisters)	0.422	0.458	−0.036	0.364
Number of older sisters	0.639	0.631	0.008	0.917
Number of older brothers	0.646	0.744	−0.098	0.187
Number of younger siblings	0.781	0.774	0.007	0.919
Number of siblings	2.074	2.149	−0.075	0.567
Age (months)	95.88	95.87	0.012	0.968
Mother's age	33.31	33.30	0.009	0.987
Mother's education	4.546	3.905	0.641^{+}	0.079
Urban residence (R=Rural)	0.341	0.429	-0.089^{*}	0.023
Wealth index	0.380	0.358	0.022	0.219

***Significant at $p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{+}p < 0.1$.
R = Reference category.

TABLE A2 Characteristics of girls' marriage, by subregion in country

	Ethiopia (%)	India (%)	Peru (%)	Vietnam (%)
How long had you known your spouse/partner before marrying him?				
On wedding day only	18.4	43.6	—	—
Less than one year	44.9	9.9	—	52.3
More than one year	34.7	20.9	85.7	47.7
Since childhood	2.0	25.6	14.3	—
Total	*100.0*	*100.0*	*100.0*	*100.0*
Who chose your spouse/partner?				
Child himself/herself	30.6	9.9	na	79.6
Child and parents/relatives together	4.1	47.1	na	6.8
Parents/relatives alone	65.3	43.0	na	13.6
Total	*100.0*	*100.0*	na	*100.0*

— = Not applicable. na = Not Available.

TABLE A3 Child characteristics and parental investments by sex of the child (YL younger cohort), by subregion in country

			Ethiopia		India		Peru		Vietnam	
Younger cohort	Round	Age	Male	Female	Male	Female	Male	Female	Male	Female
Birth weight (grams)	R1	1	3,263	3,009	2,792	2,730	3,235	3,165	3,147	3,050
Breastfeeding (any)	R1	1	0.983	0.981	0.973	0.974	0.995	0.988	0.987	0.994
Breastfeeding (months)	R1	1	17.24	17.29	16.90	16.86	16.97	16.98	17.06	17.18
Diarrhea (previous 24 hours)	R1	1	0.255	0.244	0.093	0.095	na	na	0.063	0.058
Body Mass Index (BMI)	R1	1	15.99	15.61	15.47	15.08	17.96	17.76	16.28	15.84
	R2	5	14.70	14.34	13.93	13.76	16.53	16.28	15.16	14.79
	R3	8	14.24	13.86	13.98	13.87	17.04	16.67	15.30	14.82
Weight-for-age (z-score)	R1	1	−1.579	−1.279	−1.639	−1.441	−0.288	−0.107	−1.032	−0.890
	R2	5	−1.327	−1.396	−1.896	−1.832	−0.461	−0.615	−0.997	−1.130
	R3	8	−1.678	−1.596	−1.958	−1.767	−0.308	−0.396	−1.117	−1.152

na = Not Available.

FIGURE A1 Association between presence and number of older sisters and teen marriage (top) and sex of the next-youngest sibling and teen marriage (bottom), pooled logit estimates

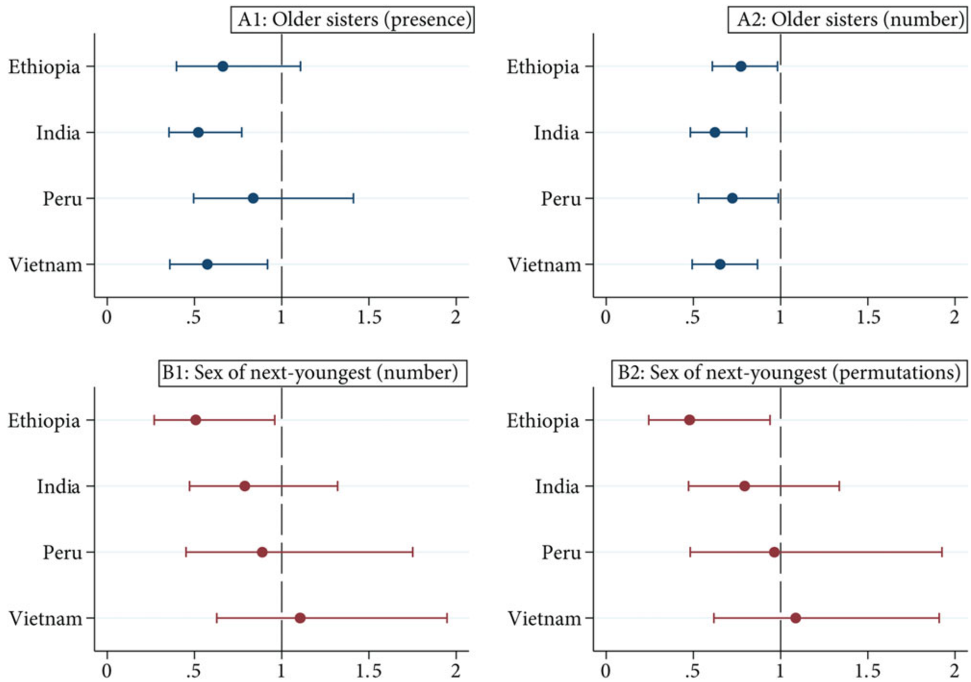

FIGURE A2 Association between living with only brothers (versus living with only sisters or with both brothers and sisters) and teen marriage, pooled logit estimates