ESSAYS IN THE ECONOMICS OF CHILD-BRIDE MARRIAGE AND THE
ECONOMICS OF GOVERNANCE

by

Paola A. Suarez
A Dissertation
Submitted to the
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of
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The Requirements for the Degree
of
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DEDICATION

I dedicate this dissertation to my loving family.

To my father and mother, Eduardo and Maria Suarez, who have done everything to make my life better in every way, including leaving everything behind in Bolivia to give more opportunities to me and my sister in the United States.

To my sister, Claudia Suarez, for knowing me inside out and unconditionally loving, accepting, and supporting me my entire life.

To Douglas Bruce Rogers, whose life and love inspire and encourage me every day.

To Robert and Theresa Rogers, and Gabrielle Rogers-Nieman, for being the purest and brightest light in my life, especially at times of darkness.

I thank each of you for everything. I love you all with my entire heart.

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ABSTRACT

ESSAYS IN THE ECONOMICS OF CHILD-BRIDE MARRIAGE AND THE ECONOMICS OF GOVERNANCE

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This dissertation consists of three chapters.[1] The first two chapters explore the economics of child-bride marriage. The third chapter provides an economic analysis of magna carta. Chapter one develops and empirically evaluates an economic theory of the market for child brides—females who begin marital cohabitation before menarche. The theory is grounded in son preference—the preference for male over female children commonly found in developing countries. Son preference generates a supply of child brides when son-preferring couples produce unwanted daughters in their attempt to produce sons and seek to dispose of such daughters via the marriage market. Son preference also generates a demand for child brides when adult males are induced to search for spouses in younger

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[1] Chapter one was coauthored with Peter T. Leeson. It was published at the *Journal of Economic Behavior and Organization*: https://www.sciencedirect.com/science/article/pii/S0167268117302755.
Chapter two was published at the *European Journal of Law and Economics*: https://link.springer.com/article/10.1007/s10657-017-9562-7.
Chapter three was coauthored with Peter T. Leeson. It was published at the *International Review of Law and Economics*: https://www.sciencedirect.com/science/article/abs/pii/S0144818816300175.

cohorts in the face of an imbalanced sex ratio in the marriage market, caused by differential investments in sons versus daughters by son-preferring couples that encourage the survival of more males than females to puberty. Evidence from India supports the theory's predictions: stronger son preference is associated with the birth of more unwanted daughters, younger postpubescent-female age at marriage, and a higher incidence of prepubescent brides. Moreover, son preference has a stronger positive association with prepubescent brides where poverty is more extreme; prepubescent brides have lower quality husbands than postpubescent brides; and stronger son preference is associated with a higher ratio of traditional-marriage-aged males to females.

Chapter two investigates the effects of policies aimed at raising female marriage age for women in developing countries where parents strongly prefer sons to daughters. I find that raising female marriage age in such countries may have the unintended consequence of increasing the prevalence of female infanticide and sex-selective abortion. Where parents strongly prefer sons to daughters, some parents seek to dispose of their unwanted daughters through child-bride marriage, female infanticide, or sex-selective abortion. By raising the cost of child-bride marriage relative to infanticide or abortion, policies that raise female marriage age may induce such parents to substitute the latter disposal methods for the former. I evaluate one such policy in Haryana, India and find empirical support for this prediction. My analysis suggests that from the perspective of female welfare, child-bride marriage may be a second-best institution, or constrained optimum, in developing countries that exhibit strong son preference.

Chapter three analyzes Magna Carta using the economic approach to self-enforcing constitutions. Reissued, but not original, Magna Carta satisfied each of the conditions necessary for constitutional self-enforcement of the charter according to that approach, and thus an effectively constrained government. This analysis illuminates the original charter's failure to constrain government and its subsequent success in doing so. This analysis also furnishes supportive evidence for the economic approach to self-enforcing constitutions.

1. CHILD BRIDES

This paper develops and empirically tests a theory of the market for "child brides"—prepubescent girls whose parents marry them to adult men. We argue that parental preference for sons over daughters creates a supply of, and demand for, prepubescent brides in impoverished societies. Evidence from India, one of the most son-preferring and child-bride populous nations in the world, supports our theory's predictions: stronger son preference is associated with the birth of more unwanted daughters, younger postpubescent-female age at marriage, and a higher incidence of prepubescent brides. Moreover, son preference has a stronger positive association with prepubescent brides where poverty is more extreme; prepubescent brides have lower quality husbands than postpubescent brides; and stronger son preference is associated with a higher ratio of traditional-marriage-aged males to females.

1. Introduction

In the developing world, millions of girls become wives before reaching puberty—married, by their parents, to husbands who reached puberty long ago.[2] The marriage of young postpubescent women is unsurprising where poverty, and thus short

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[2] Since very few datasets contain information on ever-married women's ages at menarche, only a very crude estimate of the number of child brides globally is possible. Still, using DHS (1990-1999) data for all countries for which they are available in the 1990s, and relying on the most recent data for countries that were surveyed multiple times, c.1995, approximately 28.4 million females who had ever married did so by age 12. This is a conservative estimate, as average at menarche globally is 13.5 years (Palmert and Boepple 2001).

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life expectancy, encourages unions that extend females' effective reproductive window. But the marriage of prepubescent girls, who are biologically incapable of reproduction and often years from becoming otherwise, presents a puzzle. What explains the surprising and, for most Westerners, disturbing institution of "child brides" in the developing world? Why are many parents in developing countries willing to marry their prepubescent daughters to adult men? And why are many adult men in the same countries willing to take prepubescent girls as wives?

To shed light on these questions, we develop and empirically test a theory of the market for child brides. Our theory is grounded in son preference: parental taste for sons over daughters, common in developing countries. In trying to produce sons, son-preferring couples sometimes produce daughters. To afford the sons they want, some of these couples must dispose of their unwanted daughters, one way of which is to marry them off prematurely, creating a supply of prepubescent brides.

Son-preferring couples invest fewer resources in the care of their young daughters than their young sons, so more males survive to traditional marriage age than females. To find brides in the face of this sex ratio imbalance, some traditional-marriage-aged men must reach into younger female cohorts, requiring them where that imbalance is severe to reach into prepubescent cohorts, creating a demand for prepubescent brides.

To test our theory, we investigate the relationship between son preference and child brides in India, one of the most son-preferring and child-bride populous nations in the world. The results support our theory's predictions: stronger son preference is associated with the birth of more unwanted daughters, younger postpubescent-female age

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at marriage, and a higher incidence of prepubescent brides. Moreover, son preference has a stronger positive association with prepubescent brides where poverty is more extreme; prepubescent brides have lower quality husbands than postpubescent brides; and stronger son preference is associated with a higher ratio of traditional-marriage-aged males to females.

Outside of economics, a literature on early marriage considers possible contributors to young postpubescent-female marriage. These include poverty; low female education; low female labor-force participation; low female exposure to mass media; risk of sexual violence against females; and "culture," such as religion and the custom of dowry (see, for instance, Savitridina 1997; Islam and Ahmed 1998; Nour 2006, 2009; Roy 2008; Kamal 2011; Bhanji and Punjani 2014; Kamal and Hassan 2015; Kamal et al. 2015). Each of these factors may also contribute to the distinctive practice of prepubescent female marriage. Indeed, in our theory, poverty plays a critical role in contributing to child brides, since only impoverished son-preferring parents must dispose of their unwanted daughters to afford the sons they seek. Further, while our empirical analysis considers many of the above factors, it does not consider dowries, and it does not identify causal effects. Our study provides only suggestive evidence for the theory we develop and cannot rule out other possible explanations for child brides.

Even so, by themselves at least, the above factors seem to leave much of the child bride phenomenon unexplained. For example, while a dearth of school or work opportunities for females could motivate parents to offer their daughters for marriage early, perhaps even before puberty, it is unclear why such a dearth would motivate adult

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men to take prepubescent girls as wives. With the possible exception of Judaism, no religion—including Hinduism—prescribes a minimum age at marriage younger than puberty, and Judaism is virtually nonexistent in developing countries, such as India, where prepubescent brides are prevalent (Sarkar 2013). Dowries may incentivize early female marriage when they are lower for younger brides, but dowries are not a universal feature of prepubescent female marriage, and in India, they are not significantly lower for younger brides (Dalmia and Lawrence 2005). Similarly, although risk of sexual violence could encourage parents to marry off their daughters sooner, in India, where the average prepubescent bride marries at age 12, more than 80 percent of female victims of sexual assault are victimized after age 12 (NFHS-3 2007).

Our paper contributes to the literature on the economics of marriage, pioneered by Gary Becker (1973, 1974) and extended in a variety of directions by others (see, for instance, Posner 1980; Cohen 1987; Becker and Murphy 1988; Allen 1990; Brinig 1990, 2007; Allen and Lu 2017; Leeson and Pierson 2016; Grossbard 2015, 2016). It does so by analyzing an enormous but hitherto neglected marriage market: the market for prepubescent brides. Of special relevance is work that studies marriage timing and spousal age differences. Such work suggests, for instance, that where males earn more than females or have longer reproductive windows, females will marry at younger ages than males (see, for instance, Bergstrom and Bagnoli 1993; Bergstrom and Schoeni 1996; Siow 1998; Hamilton and Siow 2007; Coles and Francesconi 2011; Díaz-Giménez and Giolito 2013). It also finds, for example, that where traditional-marriage-aged males are more numerous than traditional-marriage-aged females, females marry at younger ages

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than males, and spousal age differences are larger (see, for instance, Becker 1973, 1974, 1991; South and Trent 1988; Brainerd 2007; Abramitzky, Delavande, and Vasconcelos 2011; Anukriti 2013). Our analysis of prepubescent brides in India, where labor market opportunities for females are scant and traditional-marriage-age sex ratios are skewed toward males, is complementary to and supports these findings.

Other aspects of our analysis, however, provide new wrinkles to the literature on marriage timing and spousal age gaps. For example, existing research typically predicts that younger brides will attract higher quality husbands since younger females tend to be more fit/beautiful/fecund, and fitness/beauty/fecundity is assumed to decay monotonically with age (see, for instance, Bergstrom and Bagnoli 1993; Siow 1998; Coles and Francesconi 2011). In contrast, our theory predicts that exceptionally young brides—those who are prepubescent—will attract lower quality husbands, and evidence from India suggests they do. This is not inconsistent with high quality males pairing with high quality females, since, as we discuss below, prepubescent brides tend to be lower quality. However, it does suggest that instead of assuming that females' marriage-market value declines monotonically as their age rises, it may be more appropriate to assume that below some female-age threshold—perhaps puberty—their marriage-market value increases as their age rises, declining as females get older only past that point.

2. Child Brides and Son Preference in India

2.1. Indian Child Brides

Despite laws that mandate marriage-age minimums, prepubescent female marriage is widespread in the developing world. Child brides inhabit South Asia, Sub-

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Saharan Africa, South America, and North Africa, but they are most numerous in one country in particular: India. Since 1978, it has been illegal for females in India to marry before age 18. Still, in that country, where the average age at menarche is 13.7 years, in 1993, an estimated 10.6 million females who had ever married did so by age 12—more than 37 percent of the world's population of such females.[3]

Marriage in India is typically arranged by a couple's parents, who share similar socioeconomic backgrounds. In the majority of cases, the bride, regardless of age, moves in with her husband immediately, usually into his parents' household. However, a minority of marriages in India follow a different process whereby the bride moves in with her husband, and thus begins actual marriage, only several years after the marriage ceremony, which merely weds the couple ritually. In our data, the marriages of approximately 28 percent of postpubescent brides and 37 percent of prepubescent brides followed this two-stage process.

Some females who marry in two stages have not yet reached puberty at the time of the first stage and begin the second stage once they do. Our study does not consider them child brides, since their actual marriages do not begin until after they have reached puberty. We count as child brides only females who were prepubescent at the time they began cohabiting with their husbands, whether their marriages involved two stages or not.

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[3] In the world's second-most child-bride populous nation—Bangladesh—in 1993, an estimated 5.1 million females who had ever married did so by age 12. We calculate the estimate for India using data from NFHS-1 (1995) on the percentage of ever-married females and their ages at marriage in in 1992-1993, and data on India's female population in 1991 from the Census of India (1991). We calculate the estimate for Bangladesh using data from DHS-Bangladesh (1994) on the percentage of ever-married females and their ages at marriage in Bangladesh in 1993-1994, and data on Bangladesh's female population in 1993 from the World Bank's (2014a) Gender Statistics. We calculate India's global share of ever-married women who married by age 12 by dividing the estimate for India, provided above, by the estimate for the world, provided in fn. 1.

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Girls who grow up in extreme poverty and suffer chronic illness or malnutrition often take longer to mature sexually (see, for instance, Kulin et al. 1982; Bhakhri et al. 2010; Soliman, De Sanctis, and Elalaily 2014). As we discuss below, child brides disproportionately hail from the most socioeconomically disadvantaged families in India, which raises a question: Are these brides truly *child* brides or simply brides who marry at the same age as other females but happen to reach puberty later?

They are truly child brides. Appendix A presents the distribution of age at menarche and age at first marriage for pre- and postpubescent brides by Indian state and age cohort. In every state, and for every cohort, prepubescent brides reach puberty at an older age than postpubescent brides but nevertheless get married at a younger age. Average age at menarche among prepubescent brides is 14.3 years—about half a year older than for postpubescent brides, whose average age at menarche is 13.7 years. Yet, average age at marriage among prepubescent brides is only 12.4 years—more than four years younger than for postpubescent brides, whose average age at marriage is 16.8 years.

The grooms of both pre- and postpubescent brides in India are adults, men well past puberty. However, the age difference between spouses in child bride marriages is larger.[4] Whereas the average child bride's husband is 19.3 years old at marriage, nearly seven years older than his prepubescent wife, the average postpubescent bride's husband is 23.1 years old at marriage, approximately six years older than his postpubescent wife.[5]

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[4] For the average male, puberty is reached at approximately 14 years (Palmert and Boepple 2001).
[5] NFHS-1 (1995) does not ask husbands' age at marriage directly. To determine it here, we use information on husbands' ages at the time of the survey and the number of years since ever-married women's first marriages. We consider only the husbands of currently married women who have been married once, since it is not possible with this information to determine age at marriage for husbands who are married to women who are separated from their husbands, have been married more than once, are widowed, or are

Appendix A presents information on the distribution of child brides by Indian state (and age cohort). Prepubescent brides are most common in the northern and central regions of the country and less common in the south and northeast. In the northern state of Rajasthan, for example, in 1993, more than 17 percent of women who had ever married did so before puberty; in the southern state of Tamil Nadu, less than 0.5 percent did so.

This distribution corresponds to India's socioeconomic geography, which displays more underdevelopment in the north. Thus, unsurprisingly, prepubescent brides tend to be considerably poorer, less educated, and more likely to inhabit (hence to hail from) rural areas than postpubescent brides. For example, 57.4 percent of prepubescent brides reside in households that occupy the bottom two wealth quintiles in India, compared to only 37.2 percent of postpubescent brides. Average years of schooling among prepubescent brides is just 0.83 years, compared to 3.1 years for postpubescent brides. And more than 85 percent of prepubescent brides reside in rural areas, whereas 73 percent of postpubescent brides do so.

Further, prepubescent brides are more likely to belong to socioeconomically disadvantaged, or "scheduled," castes and tribes. More than 17 percent are members of a scheduled caste and nearly 11 percent are members of a scheduled tribe, compared to approximately 12 percent and 9 percent, respectively, for postpubescent brides. Religiously, however, pre- and postpubescent brides in India are similar. In both groups,

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divorced. We exclude husbands whose calculated age at marriage indicates respondent misreporting and/or NFHS-1 miscoding (e.g., husbands with negative ages at marriage).

Hinduism is by far the dominant religion—85 and 82 percent, respectively—with Islam making up most of the remainder.

2.2. Indian Son Preference

Like child brides, son preference is widespread in the developing world—and especially notable in India (Williamson 1976; Cleland, Verrall, and Vaessen 1983; Arnold 1997). In 1993, the average ever-married woman in India expressed an ideal child bundle consisting of 1.56 sons and 1.05 daughters, an ideal son/daughter ratio of 1.48.[6] In the second and third most son-preferring nations in the world, Pakistan and Bangladesh, the average ever-married woman's ideal son/daughter ratios were 1.44 and 1.27, respectively (Arnold 1997: 9).[7] Also like child brides, son preference in India is most pronounced in the north and least pronounced in the south. In the northern state of Rajasthan, for example, in 1993, the average ever-married woman's ideal son/daughter ratio was nearly 1.7; in the southern state of Tamil Nadu, it was just 1.15.

The origins of son preference in India are debated (see, for instance, Rosenzweig and Schultz 1982; Arnold 1997; Mutharayappa et al. 1997; Das Gupta et al. 2003; Pande and Malhotra 2006; Pande and Astone 2007; Chakraborty and Kim 2010; Vanneman, Desai, and Vikram 2012; Gupta 2014; Mitra 2014; Klaus and Tipandjan

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[6] This ratio does not include children in ever-married women's ideal child bundles toward whose sex they are indifferent; however, the son preference measure our empirical analysis uses, described below, does include them.

[7] China, which is also well known for strong son preference, was not included among the countries surveyed by the DHS between 1990 and 1995 and thus is not included in the countries compared in Arnold (1997).

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2015).[8] However, the gender-biased outcomes of that preference are not. As a large literature documents, these outcomes include excess young-female mortality—the result of parents underinvesting in their young daughters' healthcare and wellbeing (see, for instance, Das Gupta 1987; Arnold 1997; Rose 1999; Pande and Malholtra 2006; Tarozzi and Mahajan 2007; Oster 2009; Jayachandran and Kuziemko 2011; Barcellos et al. 2012; Bharadwaj and Lakdawala 2013); sex-selective abortion—to prevent the birth of daughters; and in rare cases, female infanticide—to terminate daughters after they are born (see, for example, Miller 1987; Das Gupta and Bhat 1997; Arnold, Choe, and Roy 1998; Sudah and Rajan 1999; Sekher and Hatti 2005; Arnold and Parasuraman 2009). Still another gender-biased outcome of son preference in India, however, has gone unnoticed: prepubescent female marriage.

3. A Theory of the Market for Child Brides, with Special Reference to India

3.1. Supply

Consider a society of child-seeking, son-preferring couples, all of whom are poor but some of whom are poorer than others. To simplify our discussion, suppose that each couple's ideal child bundle consists of a single son of a given quality and that a couple's child-bundle utility decreases monotonically in reductions in that quality. Suppose also that the financial cost of giving birth to and subsequently supporting a child of a given quality is positive and the same regardless of its sex.[9]

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[8] Much of this literature suggests that, rather than being an intrinsic preference, son preference is driven at least in part by economic factors, for example the custom of dowry, which reduces the desirability of daughters relative to sons.

[9] In fact, because of the custom of dowry, in India, the cost of raising daughters may be higher than the cost of raising sons (of a given quality). Since assuming as much would only strengthen the effects of son preference that our theory identifies—daughters, in this case, being even more undesirable relative to

When fetal-sexing technology is available, a couple can use sex-selective abortion to achieve its ideal bundle by preventing the birth of unwanted daughters it conceives.[10] Today, three such technologies are available in India: amniocentesis, introduced in the 1970s; chorionic villus sampling, introduced in the 1980s; and ultrasound, the most popular method, also introduced in the 1980s (Arnold, Kishor, and Roy 2002; Retherford and Roy 2003: 14; Bhakat 2013: 1827). Access to this technology, however, did not grow rapidly until the mid-1990s (Khanna 1997; Bhalotra and Cochrane 2010; Akbulut-Yuksel and Rosenblum 2012). Before then, sex-selective abortion was not widely available in India.

To reflect this fact, suppose that sex-selective abortion is also unavailable in the society in question. Pregnancy therefore produces a son approximately half the time. In that event, a couple achieves its ideal child bundle and stops attempting to conceive. But in the near-equally likely event that pregnancy produces an unwanted daughter, the couple faces a choice: raise the daughter to young adulthood, when she would traditionally leave home, or dispose of her before that.

Both options are costly. Although the couple does not want the daughter, disposing of her is emotionally painful; no parents, even strongly son-preferring ones, are untroubled by discarding a young child. Raising the daughter, however, uses resources, which the couple cannot devote to raising a future son. If the couple is wealthy enough, it may still be able to achieve its ideal child bundle even if it raises the daughter to young

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sons—to simplify the discussion that follows, we assume that the cost of raising a child of either sex is the same.

[10] Although abortion has been legal in India since 1971, sex-selective abortion has not. In 1976, India's government banned sex-determination tests in public facilities, and in 1994, it banned them in all facilities, public and private, nationwide. Despite this, today, sex-selective abortion is practiced.

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adulthood. But if the couple is sufficiently poor, doing so will preclude it in the future from being able to afford any son at all. The poorer the couple is, the more costly it therefore finds raising the daughter; hence, the more likely it is to dispose of her instead.

One way to do that is to kill her—overt daughter termination or, closely related, abandonment (Saravanan 2002). In India, reliance on female infanticide to dispose of unwanted daughters has been documented as far back as the late eighteenth century (Wilson 1855; Cave Browne 1857). No data exist on the extent of female infanticide in contemporary India, but killing one's daughter (or abandoning her) is surely the least appealing means of disposing of her and thus considered only as a last resort (Das Gupta and Bhat 1997: 314). We therefore assume that the psychic cost of killing/abandoning their unwanted daughters is prohibitive for at least some couples who choose daughter disposal.

Yet, these couples can dispose of their daughters before they reach adulthood in only one other way: by finding parties who are willing to take in prepubescent girls. Perhaps the most obvious, and from a couple's perspective, desirable, means of doing that is adoption—finding another couple that will take its prepubescent daughter as that couple's own. But in a society populated by son-preferring couples, couples do not want even their own daughters, let alone those of others.[11] They must therefore find parties who will take in their prepubescent daughters in a different role. As we explain below, these parties are adult men, who are willing to take prepubescent girls as wives. Thus,

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[11] Consider, for instance, the experience of China, where son preference is strong and, in the 1980s and 1990s, it was discovered that orphanages and abandoned-baby havens (so-called "baby hatches") were overflowing with girls—disposed of by their parents and unwanted by other couples (see, for example, Thurston 1996; Johnson 1993; Russell 2007; Hui and Blanchard 2014). In India, too, girls appear more likely to be abandoned in orphanages than boys (Howard 2012).

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parents who seek to dispose of their unwanted daughters but are unwilling to murder/abandon them supply their prepubescent girls on the marriage market as brides.

3.2. Demand

Demand for child brides is also driven by son preference. Son-preferring couples invest fewer resources in the care of their young daughters than their young sons, so more males survive to puberty than females. Assuming a constant rate of population growth, the result is a larger number of traditional-marriage-aged males than females.[12]

To find brides in the face of this sex ratio imbalance, some traditional-marriage-aged men must reach into younger female cohorts. The stronger son preference is, the more severe the resulting imbalance; hence, the younger the female cohorts are into which such men must reach. If son preference is sufficiently strong, and thus the imbalance is sufficiently severe, some men will be forced to reach into prepubescent cohorts to find brides. When wife-seeking males are heterogeneous in quality, these men will be those who would make lower quality husbands—men whose inferior socioeconomic status prevents them from competing successfully for the limited number of traditional-marriage-aged females available, who are taken by higher quality potential husbands.

How young the prepubescent-female cohorts are into which lower quality men must reach to find brides is determined by the same forces that determine how young the postpubescent-female cohorts are into which men more generally must reach to find brides: the strength of son preference and the severity of the traditional-marriage-age sex

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[12] From 1960 to 1999, India's population grew at an average rate of 2.1 percent per year; from 1999 to 2014, at an average rate of 1.4 percent per year (World Bank 2014b).

ratio imbalance this preference generates. Even in India, son preference is only strong enough to create a demand for brides who about eight years old at the youngest (NFHS-1 1995). Thus, while couples who seek to dispose of their unwanted daughters would like to do so as soon as possible to maximally conserve the resources available to them for future sons, they are constrained in their ability to marry off their daughters at increasingly early ages by wife-seeking men's willingness to take increasingly young females as brides. Son preference, as observed in India and elsewhere in the developing world, therefore generates marriage markets that contain prepubescent brides who are children but not toddlers or infants.

Our theory yields several testable predictions: stronger son preference should be associated with the birth of more unwanted daughters, younger postpubescent-female age at marriage, and a higher incidence of prepubescent brides. Additionally, son preference should have a stronger positive association with prepubescent brides where poverty is more extreme; prepubescent brides should have lower quality husbands than postpubescent brides; and stronger son preference should be associated with a higher ratio of traditional-marriage-aged males to females.

4. Data

4.1. Data Description

To test these predictions, we use data from the 1992-1993 National Family Health Survey of India (NFHS-1 1995). The NFHS is nationally representative and asks nearly 90,000 ever-married women, ages 13-49, and the heads of their households about their marriages, ages at menarche, child-gender preferences, fertility, knowledge and practice

of family planning, and household demographics and composition.[13] For our purpose, these data have two critical advantages: they consist of women born and interviewed before sex-selective abortion became widely available in India, and they allow both son preference and prepubescent brides to be measured directly.[14]

We exploit the fact that survey respondents inhabit different parts of India and vary widely by age to create a panel with which to investigate our theory. The cross-sectional dimension divides respondents and their household members into 25 states.[15] The temporal dimension divides them into six age groups, consisting of four- or five-year cohorts: ages 23-26, 27-30, 31-34, 35-39, 40-44, and 45-49.[16] The resulting panel consists of 150 state-cohort observations and allows us to estimate the key relationships our theory predicts using state- and cohort-fixed effects, which help account for unobserved cultural differences relating to son preference or marriage practices between people in different states and between older people and younger ones.

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[13] The state of Sikkim and the union territories of Andaman and Nicobar Islands, Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Lakshadweep, and Pondicherry were not surveyed by NFHS-1. The National Capital Territory of Delhi, which attained statehood in 1992, was included among the 25 states surveyed by NFHS-1.

[14] The youngest ever-married women surveyed by NFHS-1 were born in 1980; the youngest ever-married women included in our empirical analysis were born in 1970.

[15] In 1991, 27.4 percent of people in India were within-country migrants—people living outside the communities in which they were born. Forty-five percent of such people who migrated between 1981 and 1991, nearly all of whom were female, did so for reasons related to marriage; namely, their husbands (more precisely, their husbands' parents) resided in different communities from those in which they were born (Census of India 2001). The vast majority of within-country migration was between subdistricts or districts within the same state. In contrast, in 1991, less than 12 percent of India's within-country migrants had migrated outside their states of birth (Census of India 2001). This suggests that, geographically, the boundaries of an individual Indian marriage market extend across subdistricts and districts but are contained within a single state.

[16] More than 97 percent of ever-married women in our data married by age 23; thus, beginning the youngest cohort here ensures that women in our sample cohorts are representative of ever-married women in each cohort in general and not merely in our sample due to early selection into marriage.

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4.2. Variables

The NFHS asks ever-married women without living children, "If you could choose exactly the number of children to have in your whole life, how many would that be?" and asks those with living children, "If you could go back to the time you did not have any children and choose exactly the number of children to have in your whole life, how many would that be?" It then asks both sets of women, "How many of these children would you like to be boys, how many would you like to be girls, and for how many would it not matter?" Our son preference variable uses responses to this third question to measure women's average number of ideal sons per ideal daughter, treating each child in a woman's ideal bundle whose sex she indicates "does not matter" as equal to 0.5 ideal sons and 0.5 ideal daughters.

Our unwanted daughters variable uses the responses of women in completed families[17] to the above question, which asks their ideal number of daughters, and their responses to a question that asks the total number of daughters they have actually birthed to measure women's average number of undesired daughters (actual – ideal) per desired daughter, again treating each child in their ideal bundles toward whose sex they are indifferent as 0.5 ideal sons and 0.5 ideal daughters.[18]

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[17] A family is completed if its wife wishes to have no more children or if its wife or husband is sterilized (Clark 2000). The fraction of women in each cohort in our sample who have completed families is as follows: age 23-26: 43.5 percent; age 27-30: 65.8 percent; age 31-34: 78.9 percent; age 35-39: 83.5 percent; age 40-44: 83.8 percent; age 45-49: 76.6 percent. We also create a version of our unwanted daughters variable for women who are menopausal/infecund or have been sterilized and find similar results.

[18] An unavoidable limitation of relying on responses to survey questions about realized and ideal fertility, as we do, is that respondents' realized fertility may influence their answers to questions about ideal fertility. There is, unfortunately, no way to ascertain the extent of such influence or to address it if it exists.

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Our postpubescent-female age at marriage variable uses ever-married women's responses to questions that ask their age at menarche and their age when they began cohabiting with their first husband to measure the average age at first marital cohabitation of females who began marital cohabitation after reaching puberty.[19] Our child brides variable uses the same responses to measure the percentage of females who began marital cohabitation before reaching puberty.

We also use the NFHS data to create a variety of control variables, including many of the factors suggested as contributors to young postpubescent-female marriage. These are: average wealth (measured using a DHS-defined index described in Appendix B); average years of female schooling; the percentage of females who earn money from employment; the percentage of females who are regularly exposed to mass media; the percentage of individuals living in rural areas; and the percentage of Hindus, Muslims, Christians, and Sikhs. Additionally, we create control variables for: ideal fertility—the average number of children in ever-married women's ideal bundles; the percentage of ever-married women who know of at least one contraceptive method; the percentage of individuals who belong to a scheduled caste; the percentage of individuals who belong to a scheduled tribe; ever-married women's average age at menarche; and the percentage of ever-married women who had two-stage marriages.

Finally, we create a control variable for sex ratio at birth, which measures the number of males per 100 females born to ever-married women. In the unlikely event that

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[19] For 1,605 ever-married females (of the 89,777 surveyed), NFHS-1 misreports age at first marriage. Our data correct this error following the DHS-indicated remedy. See: http://userforum.dhsprogram.com/index.php?t=msg&th=328&start=0&S=28ff9fb93e90bc4e4480bf877d7db968.

any women in our sample had access to sex-selective abortion, our sex ratio at birth variable will account for this. Provided that women who have resorted to female infanticide do not report the births of infant daughters they have killed, our sex ratio at birth variable will also account for that practice.[20] Appendix B compiles definitions and sources for all our variables; Table 1 presents summary statistics.

Although the NFHS data have critical advantages for testing our theory, they are not perfect. Ideally, for each state-cohort, they would furnish information on each individual couple's son preference and its births of unwanted daughters, its married daughters' ages at marriage, and whether any of its daughters were married before reaching puberty. Instead, as described above, for each state-cohort, the NFHS data furnish information on average son preference, average births of unwanted daughters, average age at marriage, and prepubescent bride incidence among ever-married females.

5. Empirical Analysis

5.1. Evidence for the Son Preference Theory of Child Brides at a Glance

Figures 1-3 depict the relationships between son preference and unwanted daughters, postpubescent-female age at marriage, and child brides, respectively, in the raw data. As our theory predicts, stronger son preference is associated with the birth of more unwanted daughters, younger postpubescent-female age at marriage, and a higher incidence of child brides.

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[20] However, if women are likely to report the births of their infant daughters who they have killed, for instance because pregnancies and births are observable in the community, or because the interview may have been conducted within earshot of others, and thus an untruthful answer is difficult to hide, controlling for sex ratio at birth will not account for female infanticide.

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Below, we investigate these relationships econometrically. However, it is important to keep in mind that our analysis does not identify causal effects and cannot rule out other possible explanations for child brides. Our estimates may be affected by endogeneity or reflect spurious correlation; they provide only suggestive evidence for the son-preference theory of prepubescent female marriage.

5.2. Primary Results

Table 2 investigates the relationship between son preference and unwanted daughters. Unless otherwise noted, all results here and in the tables that follow are estimated using OLS with state- and cohort-fixed effects and calculate robust standard errors clustered at the state level. Column 1 includes no controls. Column 2 controls for ideal fertility, sex ratio at birth, and includes two-way fixed effects. Column 3 adds demographic controls for wealth, female education, and percent rural. Column 4 adds "modernity" controls: female labor-force participation, female media exposure, and female contraceptive knowledge. Column 5 adds "cultural" controls: caste, tribe, and religious composition. Finally, in column 6, we re-estimate the specification in column 5, which uses our full battery of controls, but without wealth and female education, which may be endogenous.

Stronger son preference is associated with the birth of more unwanted daughters. Depending upon the column one considers, moving from an ideal child bundle consisting of one son and one daughter to an ideal child bundle consisting of two sons and one daughter is associated with the birth of approximately 0.8 to 1.1 additional undesired daughters for every desired daughter.

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Ideal fertility, sex ratio at birth, and wealth also exhibit a consistent and significant relationship to unwanted daughters. As expected, all three are relationships negative: in state-cohorts where women desire more children and reside in wealthier households, women have fewer unwanted daughters. The coefficient on sex ratio at birth is negative but nearly zero, supporting the suggestion that reliance on sex-selective abortion and/or female infanticide in our data is rare.

Table 3 considers the relationship between son preference and postpubescent-female age at marriage. Column 1 includes no controls. Column 2 controls for age at menarche, sex ratio at birth, the percentage of two-stage marriages, and includes two-way fixed effects. Columns 3-5 add demographic, modernity, and cultural controls, respectively, and column 6 re-estimates column 5, excluding wealth and female education.

Stronger son preference is associated with younger postpubescent-female age at marriage. Moving from an ideal child bundle consisting of one son and one daughter to an ideal child bundle consisting of two sons and one daughter is associated with an approximately 2.2- to 4-year reduction in postpubescent-female age at first marriage.[21]

Predictably, older age at menarche is associated with older postpubescent-female age at marriage. Unexpectedly, a higher percentage of females with contraceptive knowledge and a higher percentage of Christians is associated with younger postpubescent-female age at marriage. The percentage of two-stage marriages is

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[21] We also check the relationship between son preference and age at first marriage for females in general— i.e., including both pre- and postpubescent brides. As expected, that relationship is also negative and stronger still.

negatively related to postpubescent-female age at marriage but rarely significant. And while wealth, female education, female labor-force participation, and female media exposure have the expected signs, they are insignificant.

Table 4 examines the relationship between son preference and child brides. All columns are the same as above. Stronger son preference is associated with a higher incidence of prepubescent brides. Moving from an ideal child bundle consisting of one son and one daughter to an ideal child bundle consisting of two sons and one daughter is associated with an approximately 14.5 to 18.9 percentage point increase in prepubescent brides.

Similar to in Table 3, sex ratio at birth, wealth, female education, female labor-force participation, and female media exposure are insignificant. Here, however, all the culture variables, including caste, tribe, and religion, are insignificant too. Besides son preference, only female contraceptive knowledge reliably exhibits a significant relationship to child brides, and consistent with Table 2, where it is associated with younger postpubescent-female age at marriage, in Table 4, it is associated with a higher incidence of prepubescent brides.

Although it is not possible to match brides to their parents in the NFHS data, bride-parent matching is possible in different data, which are from the 1999 Rural and Economic Demographic Survey (REDS 1999). With them, we can examine the relationship between an individual couple's son preference and, if the couple has a married daughter, the probability that the couple married her off before she reached puberty. The REDS data contain sociodemographic information on 7,424 household

heads, the fertility histories of their spouses, and the timing of their daughters' marriages. Matching household heads to their spouses and their married daughters yields 3,244 bride-parent pairs. Table 5 presents summary statistics.

Unlike the NFHS data, the REDS data do not contain information on women's preferred number of sons or daughters, so we must measure son preference with a proxy: the number of daughters a couple has had who have died. Also unlike the NFHS data, the REDS data do not contain information on age at menarche, so we must also measure child brides with a proxy: an indicator variable that equals one if the couple's married daughter began marital cohabitation before reaching the average age at menarche in India, i.e., by age 13, and equals zero if she did not.

Table 6 presents results, which are consistent with those in Table 4: the stronger parents' son preference is, the more likely it is that their married daughters were married before reaching the average age at menarche.

5.3. Subsidiary Results

Next, we test our theory's subsidiary predictions. Table 7 investigates how the positive relationship between son preference and child brides that we find Table in 4 may depend on the extremity of poverty. We re-estimate the most complete specification in that table using two subsamples: one consisting of only the poorest 50 percent of state-cohorts, the other of only the wealthiest 50 percent. For comparison, we also reproduce our results using the full sample. Consistent with our theory, the coefficient on son preference is largest and significant in the poorest subsample, second-largest and significant in the full sample, and small and insignificant in the wealthiest subsample.

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Table 8 examines the relationship between the child-bride status of wives and the quality of their husbands. Although the NFHS data preclude bride-parent matching, they allow us to identify husband-wife pairs. To measure a husband's quality, we use his education or membership in a scheduled caste. To measure his wife's child-bride status, we use an indicator variable that equals one if she began marital cohabitation with him before reaching puberty and zero if she did not.

Child brides are more likely than postpubescent brides to come from disadvantaged socioeconomic backgrounds, and marriages in India are endogamous—between brides and grooms from similar socioeconomic backgrounds.[22] To account for this, the regressions in Table 8 control for state-wealth-quintile fixed effects (in addition to state- and birth year-fixed effects), which use variation between husband-wife pairs within the same endogamous group. The results are consistent with our theory: even after accounting for endogamy, the husbands of child brides are both less educated and more likely to be members of a scheduled caste than the husbands of postpubescent brides.

Finally, Table 9 considers the relationship between son preference and the ratio of traditional-marriage-aged males to females. To measure this ratio, we use data from the 1991 Census of India. For each state, our variable divides the number of males age 20-25 by the number of females age 15-20 (multiplied by 100), since these age groups reflect traditional marriage age for both sexes in India (in our data, more than 51

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[22] Ninety-five percent of all marriages in India are intra-caste, and in the northern states from which most prepubescent brides hail, intra-caste marriage is nearly 100 percent (Goli, Singh, and Sekher 2013).

percent of males marry between the ages of 20 and 25, and more than 65 percent of females marry between the ages of 15 and 20).[23]

As in Tables 2-4, our son preference variable measures average son preference among ever-married females. Further, since our dependent variable here uses only one male and one female age group, it is not possible to use a state-cohort panel, precluding state- or cohort-fixed effects. Thus, even greater caution is warranted when drawing inferences from the regressions in Table 9.

Column 1 includes no controls. Column 2 controls for sex ratios at birth and birth year, the latter of which uses census data to measure the average year-of-birth of individuals in each state, included here since we cannot include cohort-fixed effects. Column 3 adds controls for wealth, female education, and percent rural. Column 4 adds controls for female labor-force participation, female media exposure, and female contraceptive knowledge. Column 5 adds controls for caste, tribe, and religious composition. And in column 6, we add region-fixed effects. Consistent with our theory, stronger son preference is associated with a higher ratio of traditional-marriage-aged males to females.

We take several steps to ensure the robustness of our primary results. First, we reexamine the relationship between son preference and child brides, investigated in Table 4, using two variables that account for sexual violence against females. One records the frequency with which ever-married females surveyed in the third wave of NFHS, NFHS-3 (2007), conducted in 2005-2006, report being forced to perform a sexual

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[23] The difference in these percentages reflects the fact that Indian males' ages at marriage are more dispersed than those of Indian females.

act.[24] NFHS-1 does not ask women about sexual violence.[25] However, NFHS-3 asks

them: "At any time in your life, as a child or as an adult, has anyone ever forced you in

any way to have sexual intercourse or perform any other sexual acts?" We use

respondents' answers to this question to measure the percentage of females who report

having been forced to perform a sexual act.[26]

Our other variable records the frequency of unmarried-female harassment.

The India Human Development Survey (IHDS-1 2007), conducted in 2005-2006, asks

ever-married women: "How frequently are unmarried girls harassed in your

village/neighborhood?" where possible responses are "rarely," "sometimes," or "often."

We use respondents' answers to this question to measure the percentage of females who

report that unmarried girls are "sometimes" or "often" harassed in their communities.[27]

Sexual violence may be endogenous to child bride incidence. Moreover,

sexual violence against females is notoriously underreported even in developed countries,

and in a country such as India, underreporting is likely to be severe. Similar to above,

special caution is therefore warranted when interpreting these results, which are reported

in Table 10. Both sexual violence variables are negatively related to child bride incidence

but are insignificant. Most important, controlling for sexual violence against females does

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[24] These respondents are a subset of all ever-married women surveyed by NFHS-3, selected for that survey's domestic-violence module.

[25] Nor does NFHS-2, conducted in 1998-1999.

[26] Our forced sexual act variable excludes respondents who indicate having been forced to perform a sexual act by their former or current husbands; however, including them does not affect our results.

[27] The data for our sexual violence variables were collected several years after the data for our NFHS-1 variables, during which time a few Indian states were divided into new states. We assign the latter states to their 1992-1993 counterparts as follows: 1992-1993 Bihar is comprised of 2005-2006 Bihar and Jharkhand; 1992-1993 Madhya Pradesh is comprised of 2005-2006 Madhya Pradesh and Chhattisgarh; and 1992-1993 Uttar Pradesh is comprised of 2005-2006 Uttar Pradesh and Uttaranchal.

not affect the relationship between son preference and child brides that we find in Table 4.

We also evaluate the robustness of each of our theory's primary predictions to three alternative ways of measuring son preference. The first measures the percentage of ever-married women whose ideal number of sons is greater than their ideal number of daughters. The second measures the percentage of such women whose ideal number of sons as a share of their total ideal number of children is greater than 50 percent. For the third, we construct a son preference index that assigns a zero to any ever-married woman whose ideal number of sons is less than her ideal number of daughters, assigns a one to any ever-married woman whose ideal number of sons equals her ideal number of daughters, and assigns a two to any ever-married woman whose ideal number of sons is greater than her ideal number of daughters. We then compute the average of this index, where a higher number means stronger son preference.

We use the most complete specification from Tables 2-4, which includes two-way fixed effects and our full battery of controls. Additionally, for each alternative son preference variable, we consider a version that treats each child in a woman's ideal bundle toward whose sex she is indifferent as 0.5 ideal sons and 0.5 ideal daughters and a version that excludes children in women's ideal bundles toward whose sex they are indifferent. Our results are nearly the same using both versions; thus, in Table 10, we report estimates for the latter only. In every case, our results for son preference are consistent with those in Tables 2-4.

As two final robustness checks, we reexamine our child bride regressions from Table 4, first, excluding observations with zero prepubescent brides, and second, excluding ever-married women whose age at menarche is three standard deviations above or below the mean. Tables 12 and 13, respectively, present results. In both cases, they are similar to when we do not exclude these data.

6. Conclusion

This paper develops an economic theory to account for the puzzling presence of millions of prepubescent brides in the developing world. According to that theory, in the absence of access to sex-selective abortion, strong son preference creates a supply of, and demand for, prepubescent brides, as some son-seeking couples who produce unwanted daughters aim to dispose of their prepubescent girls by transferring them to parties who will take them and some wife-seeking men who cannot find traditional-marriage-aged brides are willing to take prepubescent girls as wives.

Analyses of data from India, one of the most son-preferring and child-bride populous countries in the world, furnish evidence for this theory. We find that stronger son preference is associated with the birth of more unwanted daughters, younger postpubescent-female age at marriage, and a higher incidence of prepubescent brides. Additionally, we find that son preference has a stronger positive association with prepubescent brides where poverty is more extreme, that prepubescent brides have lower quality husbands than postpubescent brides, and that stronger son preference is associated with a higher ratio of traditional-marriage-aged males to females.

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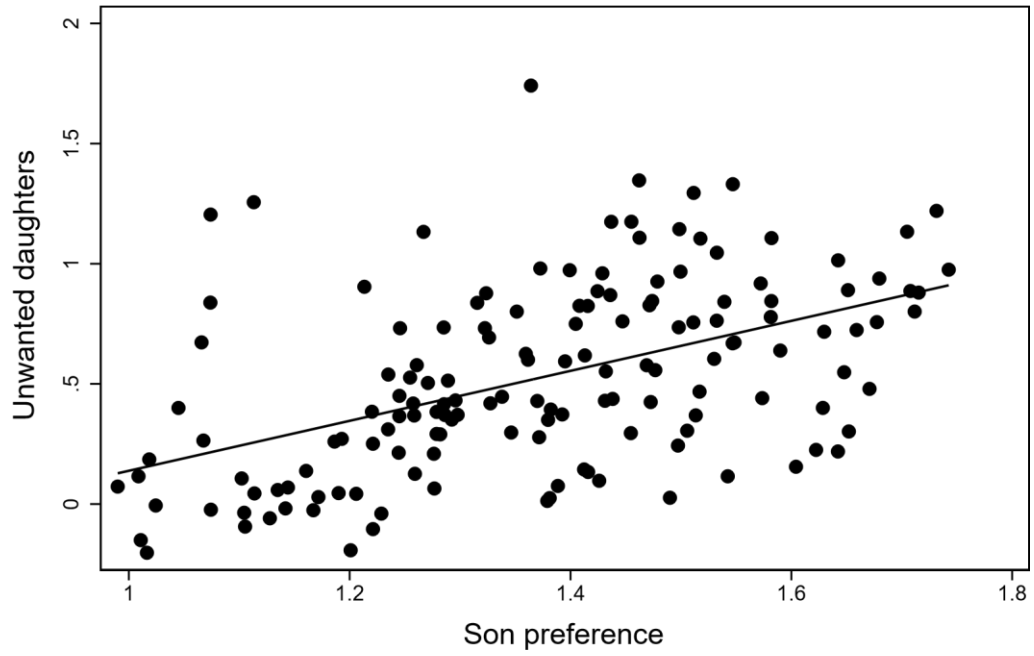
Notes: Data from NFHS-1 (1995).
Figure 1 Son Preference and Unwanted Daughters

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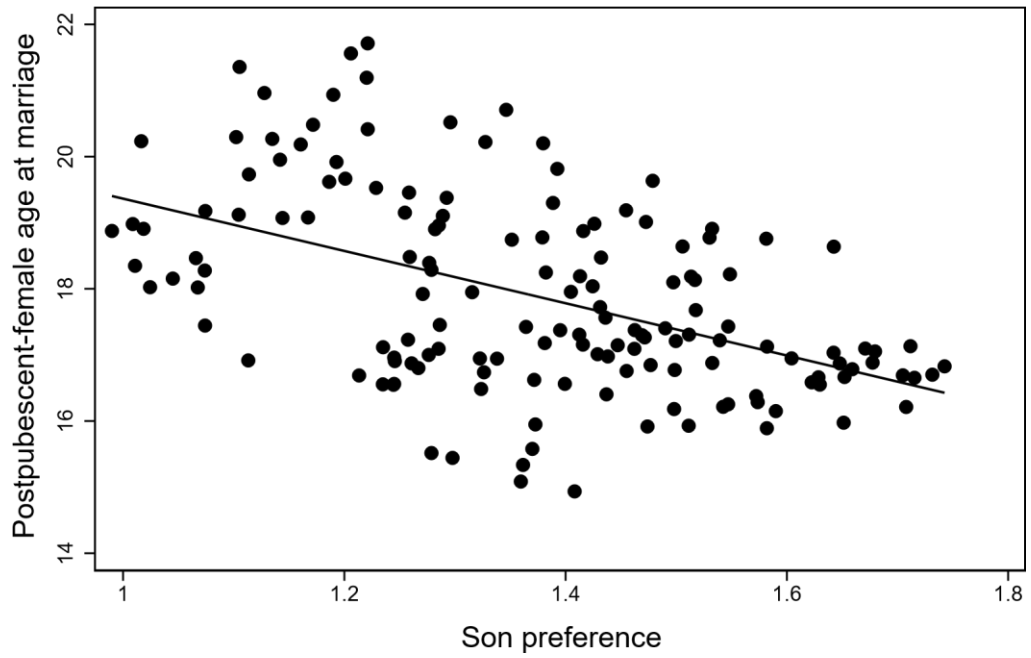
Notes: Data from NFHS-1 (1995).
Figure 2 Son Preference and Postpubescent-Female Age at Marriage
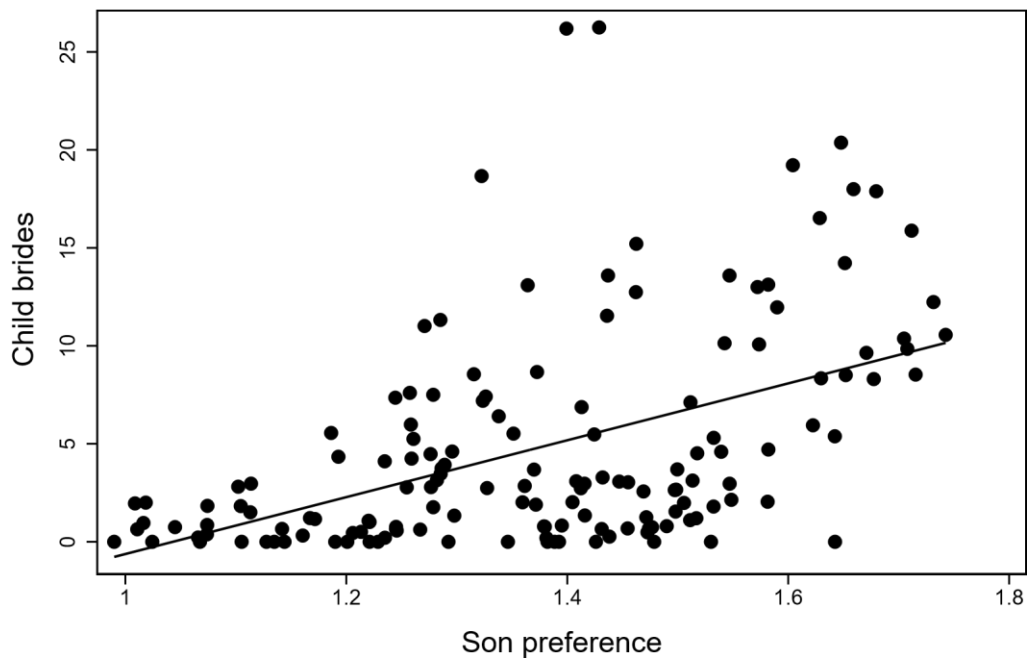
Notes: Data from NFHS-1 (1995).
Figure 3 Son Preference and Child Brides

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Table 1. Summary Statistics, NFHS Data

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Child brides (%)	150	4.787	5.528	0	26.251
Unwanted daughters	150	0.526	0.39	-0.203	1.741
Postpubescent-female age at marriage	150	17.89	1.481	14.936	21.714
Traditional-marriage-age sex ratio	24	101.747	11.494	84.418	136.46
Son preference	150	1.373	0.186	0.99	1.743
Birth year	24	1955.166	6.112	1941.119	1966.043
Ideal fertility	150	3.155	0.809	1.995	5.886
Age at menarche	150	13.86	0.539	12.743	14.994
Sex ratio at birth	150	107.795	7.216	87.586	130.453
Two-stage marriage (%)	150	16.9	20.105	0	66.169
Wealth	150	0.089	0.441	-0.532	1.614
Female education	150	3.665	1.755	0.619	8.471
Rural (%)	150	68.937	16.699	5.114	90.26
Female labor-force participation (%)	150	24.491	12.298	3.426	63.393
Female media exposure (%)	150	58.503	17.312	20.833	90.543
Female contraceptive knowledge (%)	150	93.336	12.453	31.746	100
Scheduled caste (%)	150	9.633	8.963	0	31.196
Scheduled tribe (%)	150	21.562	31.038	0	99.045
Hindu (%)	150	69.601	28.35	0.993	97.663
Muslim (%)	150	8.319	7.067	0	28.506
Christian (%)	150	15.171	28.406	0	98.421
Sikh (%)	150	3.277	11.504	0	61.813
Forced sexual act (%)	150	0.742	1.18	0	8.286
Harassment (%)	150	20.621	19.418	0	86.985
Ideal sons > Ideal daughters (%)	150	38.477	13.079	9.211	61.963
Ideal sons/Ideal children > 0.5 (%)	150	37.393	12.897	9.211	61.35

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| Son-preference index | 150 | 1.336 | 0.168 | 0.86 | 1.601 |

Notes: Traditional-marriage-age sex ratio and birth year variables are defined for states only. Summary statistics for all other variables are defined for state-cohorts. For data sources and detailed variable definitions, see Appendix B.

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Table 2. Son Preference and Unwanted Daughters

Dependent variable: Unwanted daughters	(1)	(2)	(3)	(4)	(5)	(6)
Son preference	1.040*** (0.148)	0.807*** (0.238)	1.120*** (0.288)	0.996*** (0.288)	1.016*** (0.322)	1.006*** (0.317)
Ideal fertility		-0.449*** (0.156)	-0.466*** (0.127)	-0.458*** (0.127)	-0.481*** (0.147)	-0.477*** (0.142)
Sex ratio at birth		-0.006*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)	-0.006*** (0.002)	-0.006*** (0.002)
Wealth			-1.014*** (0.245)	-0.965*** (0.274)	-0.931*** (0.273)	
Female education			0.072 (0.047)	0.063 (0.049)	0.055 (0.052)	
Rural (%)			0.008 (0.006)	0.006 (0.006)	0.005 (0.007)	0.016** (0.007)
Female labor-force participation (%)				-0.004 (0.005)	-0.002 (0.005)	-0.006 (0.006)
Female media exposure (%)				-0.008 (0.005)	-0.008 (0.005)	-0.009* (0.005)
Female contraceptive knowledge (%)				0.013 (0.008)	0.016 (0.010)	0.016 (0.011)
Scheduled caste (%)					-0.004 (0.011)	-0.000 (0.008)
Scheduled tribe (%)					0.006 (0.009)	0.015 (0.010)
Hindu (%)					0.012 (0.015)	0.021 (0.016)
Muslim (%)					0.013 (0.020)	0.027 (0.019)
Christian (%)					-0.008	-0.003

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	(1)	(2)	(3)	(4)	(5)	(6)
					(0.010)	(0.009)
Sikh (%)					0.006	0.012
					(0.020)	(0.017)
Adj. R^2	0.24	0.89	0.92	0.92	0.92	0.91
Obs.	150	150	150	150	150	150
State- and cohort-FEs?		X	X	X	X	X

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Data from NFHS-1 (1995). OLS with robust standard errors clustered by state in parentheses. Son preference is mean [ideal sons/ideal daughters]; unwanted daughters is mean [(actual daughters − ideal daughters)/ideal daughters], where each child in a woman's ideal bundle toward whose sex she is indifferent is treated as 0.5 ideal sons and 0.5 ideal daughters.

Table 3. Son Preference and Postpubescent-Female Age at Marriage

Dependent variable: Postpubescent-female age at marriage	(1)	(2)	(3)	(4)	(5)	(6)
Son preference	-3.955***	-2.502**	-2.426*	-2.244*	-2.362*	-2.540*
	(0.463)	(1.202)	(1.337)	(1.238)	(1.295)	(1.294)
Age at menarche		2.027**	1.989***	1.848***	1.827***	1.887***
		(0.749)	(0.686)	(0.513)	(0.530)	(0.568)
Sex ratio at birth		0.009	0.010*	0.007	0.009	0.008
		(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
Two-stage marriage (%)		-0.037**	-0.046**	-0.023	-0.022	-0.013
		(0.017)	(0.022)	(0.020)	(0.021)	(0.017)
Wealth			0.547	0.961	0.499	
			(1.351)	(1.127)	(1.196)	
Female education			0.143	0.123	0.150	
			(0.120)	(0.101)	(0.127)	
Rural (%)			0.005	0.018	0.016	0.008
			(0.029)	(0.026)	(0.026)	(0.018)
Female labor-force participation (%)				0.011	0.022	0.018
				(0.013)	(0.013)	(0.013)
Female media exposure (%)				0.023	0.018	0.021
				(0.015)	(0.014)	(0.015)
Female contraceptive knowledge (%)				-0.074***	-0.068***	-0.069***
				(0.019)	(0.022)	(0.023)
Scheduled caste (%)					0.010	-0.010
					(0.032)	(0.032)
Scheduled tribe (%)					-0.047	-0.052
					(0.036)	(0.036)
Hindu (%)					-0.062	-0.055
					(0.069)	(0.066)

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	(1)	(2)	(3)	(4)	(5)	(6)
Muslim (%)					-0.083 (0.075)	-0.082 (0.074)
Christian (%)					-0.090** (0.037)	-0.091** (0.033)
Sikh (%)					-0.054 (0.081)	-0.042 (0.072)
Adj. R^2	0.25	0.93	0.94	0.95	0.95	0.95
Obs.	150	150	150	150	150	150
State- and cohort-FEs?		X	X	X	X	X

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Data from NFHS-1 (1995). OLS with robust standard errors clustered by state in parentheses. Son preference is mean [ideal sons/ideal daughters], where each child in a woman's ideal bundle toward whose sex she is indifferent is treated as 0.5 ideal sons and 0.5 ideal daughters; postpubescent-female age at marriage is mean age at first marital cohabitation among females who began marital cohabitation after reaching puberty.

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Table 4. Son Preference and Child Brides

Dependent variable: Child brides (%)	(1)	(2)	(3)	(4)	(5)	(6)
Son preference	14.513*** (1.717)	18.883* (9.150)	17.329* (8.895)	17.278* (8.505)	16.814** (7.960)	16.844** (7.523)
Age at menarche		4.947 (3.273)	5.068 (3.289)	5.668* (3.137)	5.719* (3.080)	5.721* (3.148)
Sex ratio at birth		0.035 (0.047)	0.035 (0.050)	0.047 (0.052)	0.047 (0.056)	0.048 (0.050)
Two-stage marriage (%)		0.051 (0.068)	0.043 (0.108)	-0.016 (0.116)	-0.011 (0.122)	-0.011 (0.082)
Wealth			-0.532 (6.617)	-2.311 (6.485)	-1.965 (7.155)	
Female education			0.112 (1.034)	0.111 (0.965)	0.033 (1.022)	
Rural (%)			-0.118 (0.143)	-0.142 (0.134)	-0.142 (0.141)	-0.118 (0.101)
Female labor-force participation (%)				-0.035 (0.060)	-0.069 (0.092)	-0.073 (0.120)
Female media exposure (%)				-0.006 (0.059)	0.003 (0.062)	0.001 (0.065)
Female contraceptive knowledge (%)				0.190** (0.078)	0.171* (0.088)	0.169* (0.088)
Scheduled caste (%)					-0.004 (0.211)	0.010 (0.191)
Scheduled tribe (%)					0.084 (0.154)	0.103 (0.158)
Hindu (%)					0.297 (0.243)	0.311 (0.314)

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	(1)	(2)	(3)	(4)	(5)	(6)
Muslim (%)					0.178	0.202
					(0.260)	(0.290)
Christian (%)					0.263	0.271
					(0.269)	(0.297)
Sikh (%)					0.241	0.246
					(0.384)	(0.417)
Adj. R^2	0.24	0.87	0.87	0.87	0.87	0.87
Obs.	150	150	150	150	150	150
State- and cohort-FEs?	X	X	X	X	X	X

Notes: $* p < 0.1$; $** p < 0.05$; $*** p < 0.01$. Data from NFHS-1 (1995). OLS with robust standard errors clustered by state in parentheses. Son preference is mean [ideal sons/ideal daughters], where each child in a woman's ideal bundle toward whose sex she is indifferent is treated as 0.5 ideal sons and 0.5 ideal daughters. Child brides is percentage of ever-married females who began marital cohabitation before reaching puberty.

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Table 5. Summary Statistics, REDS Data

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Married daughter wed by age 13	3244	0.051	0.22	0	1
Dead daughters	3244	0.146	0.508	0	6
Dead sons	3134	0.155	0.524	0	6
Live children	3244	4.84	1.933	0	11
Daughter's birth order	3244	2.732	1.76	1	11
Daughter's birth year	3244	1971.804	6.666	1932	1997
Ln household income	3244	3.292	0.844	1.099	6.909
Husband alive	3236	0.934	0.248	0	1
Wife's education	3244	1.738	2.985	0	18
Husband's education	3244	4.193	4.368	0	25
Daughter's education	3244	4.6	4.490	0	20
Hindu	3244	0.902	0.297	0	1
Muslim	3244	0.055	0.228	0	1
Sikh	3244	0.019	0.137	0	1
Christian	3244	0.013	0.114	0	1
Buddhist	3244	0.008	0.089	0	1
Jain	3244	0.001	0.03	0	1
Upper caste	3244	0.32	0.467	0	1
Scheduled caste	3244	0.12	0.325	0	1
Scheduled tribe	3244	0.063	0.243	0	1
Other backward caste	3244	0.391	0.488	0	1

Notes: Observations are bride-parent pairs. For data sources and detailed variable definitions, see Appendix B.

Table 6. Using Bride-Parent Pairs

Dependent variable: Married daughter wed by age 13

	(1)	(2)	(3)	(4)	(5)
Dead daughters	0.038*** (0.012)	0.029** (0.010)	0.029** (0.010)	0.027** (0.011)	0.027** (0.011)
Dead sons		0.001 (0.003)	0.001 (0.003)	-0.000 (0.003)	-0.001 (0.002)
Live children		0.002 (0.003)	0.002 (0.003)	0.001 (0.003)	0.001 (0.003)
Daughter's birth order		0.000 (0.003)	0.000 (0.003)	0.001 (0.003)	0.000 (0.003)
Ln household income			-0.003 (0.005)	-0.001 (0.005)	-0.002 (0.004)
Husband alive			0.008 (0.013)	0.007 (0.014)	0.006 (0.015)
Wife's education				-0.002 (0.001)	-0.003* (0.001)
Husband's education				0.002** (0.001)	0.002* (0.001)
Daughter's education				-0.002** (0.001)	-0.003*** (0.001)
Hindu					0.082*** (0.010)
Muslim					0.048** (0.020)
Sikh					0.110*** (0.014)
Christian					0.072*** (0.018)
Buddhist					0.065*** (0.017)
Jain					0.037* (0.020)

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	(1)	(2)	(3)	(4)	(5)
Upper caste					-0.002
					(0.014)
Scheduled caste					-0.002
					(0.020)
Scheduled tribe					-0.034*
					(0.017)
Other backward caste					0.005
					(0.012)
Adj. R^2	0.01	0.16	0.16	0.17	0.17
Obs.	3,244	3,134	3,126	3,126	3,126
State- and birth year-FEs?	X	X	X	X	X

Notes: $* \ p < 0.1$; $** \ p < 0.05$; $*** \ p < 0.01$. Data from REDS (1999). Observations are bride-parent pairs. OLS with robust standard errors clustered by state in parentheses. Dead daughters is wife-reported number of dead female children in a couple's fertility history. Married daughter wed by age 13 is an indicator variable that equals one if a couple's married daughter began marital cohabitation by age 13 and zero if she did not.

Table 7. Poor and Wealthy Subsamples

Dependent variable: Child brides (%)	Full sample	Poorest 50%	Wealthiest 50%
Son preference	16.814***	28.446*	4.036
	(0.045)	(0.093)	(0.434)
Adj. R^2	0.87	0.89	0.86
Obs.	150	72	78

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Data from NFHS-1 (1995). OLS with robust standard errors clustered by state in parentheses. All columns include state- and cohort-fixed effects; age at menarche; sex ratio at birth; two-stage marriage; wealth; female education; rural; female labor-force participation; female media exposure; female contraceptive knowledge; scheduled caste; scheduled tribe; Hindu; Muslim; Christian; and Sikh. Son preference is mean [ideal sons/ideal daughters]; child brides is percentage of ever-married females who began marital cohabitation before reaching puberty.

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Table 8. Child-Bride Status and Husband Quality

Dependent variable:	Husband education	Husband scheduled caste
Child-bride status	-0.687***	0.038***
	(0.106)	(0.009)
Wealth	3.698***	-0.055***
	(0.107)	(0.008)
Rural	1.191***	-0.045***
	(0.229)	(0.010)
Scheduled caste	-1.006***	
	(0.129)	
Scheduled tribe	-1.278***	-0.141***
	(0.168)	(0.021)
Hindu	0.197*	0.002
	(0.105)	(0.024)
Muslim	-1.818***	-0.117***
	(0.382)	(0.023)
Christian	0.759**	0.041
	(0.367)	(0.057)
Sikh	-0.701**	-0.157**
	(0.281)	(0.058)
Adj. R^2	0.43	0.09
Obs.	76,716	77,078
State- and birth year-FEs?	X	X
State-wealth-quintile FEs?	X	X

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Data from NFHS-1 (1995). Observations are husband-wife pairs. OLS with robust standard errors clustered by state in parentheses. Child-bride status is an indicator variable that equals one if a wife began marital cohabitation before reaching puberty and zero if she did not. Husband education is a husband's number of completed years of schooling. Husband scheduled caste is an indicator variable that equals one if a husband is a member of a scheduled caste and zero if he does not.

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Table 9. Son Preference and Traditional-Marriage-Age Sex Ratios

Dependent variable: Traditional-marriage-age sex ratio	(1)	(2)	(3)	(4)	(5)	(6)
Son preference	27.634*** (5.879)	21.411* (10.458)	30.562*** (6.620)	29.417* (13.916)	17.718* (9.339)	22.847* (10.146)
Sex ratio at birth		0.965 (0.908)	0.182 (0.452)	-0.112 (0.380)	-0.315 (0.285)	0.072 (0.329)
Birth year		0.257 (0.299)	0.100 (0.168)	0.379 (0.313)	0.121 (0.359)	0.105 (0.138)
Wealth			7.139 (5.297)	2.572 (5.762)	4.660 (9.913)	5.723 (13.428)
Female education			-3.386 (2.343)	-2.571 (1.809)	-3.137 (2.274)	-2.660 (6.264)
Rural (%)			-0.455*** (0.129)	-0.611*** (0.111)	-0.625** (0.188)	-0.563** (0.182)
Female labor-force participation (%)				-0.171 (0.148)	-0.291** (0.111)	-0.255 (0.159)
Female media exposure (%)				-0.037 (0.198)	-0.095 (0.119)	0.013 (0.230)
Female contraceptive knowledge (%)				-0.237 (0.246)	-0.103 (0.119)	-0.124 (0.114)
Scheduled caste (%)					-0.076 (0.207)	0.104 (0.429)
Scheduled tribe (%)					0.005 (0.131)	0.105 (0.079)
Hindu (%)					-0.454** (0.158)	-0.384 (0.217)
Muslim (%)					-0.308 (0.253)	-0.075 (0.377)

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	(1)	(2)	(3)	(4)	(5)	(6)
Christian (%)					-0.501***	-0.470
					(0.119)	(0.287)
Sikh (%)					-0.377**	-0.352
					(0.150)	(0.272)
Adj. R^2	0.19	0.15	0.69	0.72	0.88	0.79
Obs.	24	24	24	24	24	24
Region-FEs?						X

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Data for traditional-marriage-age sex ratio and birth year variables from Census of India (1991). Data for all remaining variables from NFHS-1 (1995). OLS with robust standard errors (clustered by region in column 6) in parentheses. States are divided into the following regions. North: Haryana; Himachal Pradesh; Madhya Pradesh; Delhi; Punjab; Rajasthan; and Uttar Pradesh. Northeast: Arunachal Pradesh; Assam; Manipur; Meghalaya; Mizoram; Nagaland; and Tripura. East: Bihar; Orissa; and West Bengal. West: Goa; Gujarat; and Maharashtra. South: Andhra Pradesh; Karnataka; Kerala; and Tamil Nadu. Jammu was not included in the 1991 Indian Census and is therefore not included in our regressions. Son preference is mean [ideal sons/ideal daughters], where each child in a woman's ideal bundle toward whose sex she is indifferent is treated as 0.5 ideal sons and 0.5 ideal daughters. Traditional-marriage-age sex ratio is 100*(males age 20-25/females age 15-20).

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Table 10. Female Sexual Violence and Child Brides

Dependent variable: Child brides (%)	(1)	(2)	(3)
Son preference	16.814**	17.439**	17.819**
	(7.960)	(8.009)	(8.570)
Forced sexual act (%)		-0.432	
		(0.272)	
Harassment (%)			-0.024
			(0.028)
Adj. R^2	0.87	0.87	0.87
Obs.	150	150	150

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Data for forced sexual act variable from NFHS-3 (2007). Data for harassment variable from IHDS-1 (2007). Data for all remaining variables from NFHS-1 (1995). OLS with robust standard errors clustered by state in parentheses. All columns include state- and cohort-fixed effects; age at menarche; sex ratio at birth; two-stage marriage; wealth; female education; rural; female labor-force participation; female media exposure; female contraceptive knowledge; scheduled caste; scheduled tribe; Hindu; Muslim; Christian; and Sikh. Son preference is mean [ideal sons/ideal daughters], where each child in a woman's ideal bundle toward whose sex she is indifferent is treated as 0.5 ideal sons and 0.5 ideal daughters. Child brides is percentage of ever-married females who began marital cohabitation before reaching puberty. For forced sexual act and harassment variable definitions, see Appendix B.

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Table 11. Alternative Measures of Son Preference

Panel A: Unwanted Daughters

	(1)	(2)	(3)
Ideal sons > Ideal daughters (%)	0.009* (0.005)		
Ideal sons/Ideal children > 0.5 (%)		0.009* (0.005)	
Son preference index			0.873** (0.352)
Adj. R^2	0.92	0.92	0.92
Obs.	150	150	150

Panel B: Postpubescent-Female Age at Marriage

	(1)	(2)	(3)
Ideal sons > Ideal daughters (%)	-0.029** (0.014)		
Ideal sons/Ideal children > 0.5 (%)		-0.031** (0.014)	
Son preference index			-2.470* (1.208)
Adj. R^2	0.95	0.95	0.95
Obs.	150	150	150

Panel C: Child Brides

	(1)	(2)	(3)
Ideal sons > Ideal daughters (%)	0.210* (0.107)		

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Ideal sons/Ideal children > 0.5 (%)		0.217* (0.105)	
Son preference index			16.896** (7.897)
Adj. R^2	0.87	0.87	0.87
Obs.	150	150	150

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Data from NFHS-1 (1995). OLS with robust standard errors clustered by state in parentheses. All columns in all panels include state- and cohort-fixed effects; age at menarche; sex ratio at birth; two-stage marriage; wealth; female education; rural; female labor-force participation; female media exposure; female contraceptive knowledge; scheduled caste; scheduled tribe; Hindu; Muslim; Christian; Sikh. For variable definitions, see Appendix B.

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Table 12. Positive Child Brides Only

Dependent variable: Child brides (%)	(1)	(2)	(3)	(4)	(5)	(6)
Son preference	14.675***	21.997**	21.075*	21.473*	20.261*	20.609**
	(1.770)	(9.885)	(11.100)	(11.318)	(10.946)	(9.204)
Age at menarche		5.196	4.747	5.192	4.931	5.206
		(3.545)	(3.589)	(3.585)	(3.518)	(3.568)
Sex ratio at birth		0.046	0.046	0.058	0.065	0.061
		(0.056)	(0.056)	(0.0.56)	(0.0.66)	(0.0.58)
Two-stage marriage (%)		-0.011	-0.035	-0.056	-0.050	-0.041
		(0.081)	(0.130)	(0.128)	(0.131)	(0.084)
Wealth			-5.913	-5.533	-6.062	
			(8.947)	(8.457)	(9.302)	
Female education			0.224	0.175	0.047	
			(1.279)	(1.178)	(1.278)	
Rural (%)			-0.169	-0.153	-0.172	-0.083
			(0.166)	(0.146)	(0.161)	(0.116)
Female labor-force participation (%)				-0.049	-0.054	-0.067
				(0.081)	(0.104)	(0.133)
Female media exposure (%)				-0.005	0.001	-0.004
				(0.076)	(0.079)	(0.084)
Female contraceptive knowledge (%)				0.183	0.213	0.210*
				(0.110)	(0.128)	(0.122)
Scheduled caste (%)					-0.008	0.030
					(0.218)	(0.200)
Scheduled tribe (%)					0.059	0.106
					(0.181)	(0.178)
Hindu (%)					0.217	0.312
					(0.356)	(0.403)
Muslim (%)					0.071	0.188

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	(1)	(2)	(3)	(4)	(5)	(6)
					(0.414)	(0.396)
Christian (%)					-0.039	0.029
					(0.502)	(0.461)
Sikh (%)					0.457	0.491
					(0.473)	(0.519)
Adj. R^2	0.23	0.87	0.86	0.86	0.86	0.86
Obs.	130	130	130	130	130	130
State- and cohort-FEs?		X	X	X	X	X

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Data from NFHS-1 (1995). OLS with robust standard errors clustered by state in parentheses. Son preference is mean [ideal sons/ideal daughters], where each child in a woman's ideal bundle toward whose sex she is indifferent is treated as 0.5 ideal sons and 0.5 ideal daughters. Child brides is percentage of ever-married females who began marital cohabitation before reaching puberty.

Table 13. Dropping Age-at-Menarche Outliers

Dependent variable: Child brides (%)	(1)	(2)	(3)	(4)	(5)	(6)
Son preference	14.155***	17.756*	16.414*	16.320*	15.988*	16.027**
	(1.694)	(8.922)	(8.710)	(8.340)	(7.772)	(7.308)
Age at menarche		4.350	4.449	4.977	5.034	5.030
		(3.235)	(3.258)	(3.176)	(3.145)	(3.201)
Sex ratio at birth		0.037	0.037	0.048	0.048	0.049
		(0.047)	(0.050)	(0.052)	(0.056)	(0.050)
Two-stage marriage (%)		0.055	0.047	-0.010	-0.005	-0.005
		(0.065)	(0.106)	(0.115)	(0.122)	(0.081)
Wealth			-0.478	-1.983	-1.608	
			(6.542)	(6.464)	(7.083)	
Female education			0.112	0.078	0.014	
			(1.039)	(0.976)	(1.026)	
Rural (%)			-0.103	-0.121	-0.120	-0.101
			(0.137)	(0.129)	(0.137)	(0.099)
Female labor-force participation (%)				-0.044	-0.068	-0.071
				(0.059)	(0.090)	(0.119)
Female media exposure (%)				-0.002	0.005	0.002
				(0.057)	(0.060)	(0.064)
Female contraceptive knowledge (%)				0.173**	0.159*	0.158*
				(0.076)	(0.085)	(0.085)
Scheduled caste (%)					0.005	0.018
					(0.218)	(0.199)
Scheduled tribe (%)					0.068	0.083
					(0.151)	(0.158)
Hindu (%)					0.264	0.274
					(0.238)	(0.311)
Muslim (%)					0.172	0.192

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					(0.252)	(0.282)
Christian (%)					0.207	0.214
					(0.266)	(0.295)
Sikh (%)					0.199	0.202
					(0.368)	(0.404)
Adj. R^2	0.23	0.87	0.87	0.86	0.86	0.87
Obs.	150	150	150	150	150	150
State- and cohort-FEs?	X	X	X	X	X	X

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Data from NFHS-1 (1995). OLS regression with robust standard errors clustered by state in parentheses. Son preference is [ideal sons/ideal daughters], where each child in a woman's ideal bundle toward whose sex she is indifferent is treated as 0.5 ideal sons and 0.5 ideal daughters. Child brides is percentage of ever-married females who began marital cohabitation before reaching puberty, excluding those whose reported age at menarche is three standard deviations above or below the mean.

2. CHILD-BRIDE MARRIAGE AND FEMALE WELFARE

"Child-bride marriage"—the marriage of prepubescent girls to adult men—has well-known nefarious consequences for females in developing countries where such marriage is often practiced. To improve these outcomes, developing-world governments have adopted several policies aimed at raising female marriage age. This paper investigates the effects of these policies for females in developing countries where parents strongly prefer sons to daughters. I find that raising female marriage age in such countries may have the unintended consequence of increasing the prevalence of female infanticide and sex-selective abortion. Where parents strongly prefer sons to daughters, some parents seek to dispose of their unwanted daughters through child-bride marriage, female infanticide, or sex-selective abortion. By raising the cost of child-bride marriage relative to infanticide or abortion, policies that raise female marriage age induce such parents to substitute the latter disposal methods for the former. I evaluate one such policy in Haryana, India and find empirical support for this prediction. My analysis suggests that from the perspective of female welfare, child-bride marriage may be a second-best institution, or constrained optimum, in developing countries that exhibit strong son preference.

1. Introduction

720 million women currently alive worldwide were married by age 18. In the developing world, one in three girls is expected to become such a bride, and in South

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Asia and Sub-Saharan Africa in particular, this figure is closer to one in two (UNICEF 2014: 89).[28] Tens of millions of these brides are not merely young. They are prepubescent—girls whose parents marry them to adult males before menarche. These prepubescent brides, often called "child brides," are most commonly found in developing countries where parents exhibit strong son preference—the preference for male over female offspring.

The poor socio-economic outcomes for females who marry young are well-known. Women who marry as adolescents or younger typically attain less education, are less likely to participate in the labor force, face higher risk of death at childbirth, are more likely to experience domestic violence, and have less autonomy within the household. Likewise, these women's children tend to be less educated and suffer poorer health (see, for instance, Hirschman and Rindfuss 1982; Hirschman 1985; Savitridina 1997; Choe, Thapa, and Achmad 2001; Jensen and Thornton 2003; Billari and Philipov 2004; UNICEF 2005; Ababa 2006; Field and Ambrus 2008; Roy 2008; Subramanian 2008; Raj et al. 2009; Kamal 2011, 2012; Speizer and Pearson 2011; Bajracharya and Amin 2012; Abalos 2014; Bhanji and Punjani 2014; Borkotoky and Unisa 2015; Chari et al. 2015). To improve these outcomes, at the international community's urging, developing-world governments have adopted three central policies aimed at raising female marriage age: minimum marriage-age laws, conditional-cash transfers, and educational programs.

This paper investigates the effects of these policies for females in developing countries where parents exhibit strong son preference. I find that raising female marriage

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[28] Data on the percent of girls who become young brides—females aged 20-24 married by age 18—refer to the most recent year available during the period 2005-2013 (UNICEF 2014).

age in such countries may have the unintended consequence of increasing the prevalence of female infanticide and sex-selective abortion. Where parents strongly prefer sons to daughters, some parents seek to dispose of their unwanted daughters through child-bride marriage, female infanticide, or sex-selective abortion. By raising the cost of child-bride marriage relative to infanticide or abortion, policies that raise female marriage age induce such parents to substitute the latter disposal methods for the former. I evaluate one such policy in Haryana, India and find empirical support for this prediction. As tragic as child-bride marriage may be for girls, for at least some females the relevant alternative is not post-pubescent marriage, but infanticide or abortion. My analysis thus suggests that from the perspective of female welfare, child-bride marriage may be a second-best institution, or constrained optimum, in developing countries that exhibit strong son preference.

My paper contributes to the literature that evaluates the effects of policy efforts to raise female marriage age in developing countries. This literature examines whether these policies successfully raise female marriage age under the presumption that doing so unambiguously improves female welfare (see, for instance, Erulkar and Muthengi 2009; Sinha and Yoong 2009; Malhotra et al. 2011; Sekher 2012; Kim et al. 2013; Nanda, Datta, and Das 2014; Nanda et al. 2014; Maswikwa et al. 2015; Nanda et al. 2015). My analysis contributes to this research by demonstrating that successfully raising female marriage age does not unequivocally improve female welfare. In developing countries that exhibit strong son preference, raising female marriage age may result in negative consequences for females, namely infanticide and abortion.

My paper also contributes to the literature that examines the effect of early female marriage on females' socio-economic outcomes. This literature finds that such marriage has a negative effect on numerous such outcomes (in addition to the papers cited above, see, for instance, Singh and Samara 1996; Islam and Ahmed 1998; Bruce 2003; Clark 2004; Garenne 2004; Ikamari 2005; Mensch, Singh, and Casterline 2005; Nour 2006, 2009; Buttenheim and Nobles 2009; Gyimah 2009; Sarkar 2009; Santhya et al. 2010; Smith, Stone, and Kahando 2012; Sabbe et al. 2013; Sekhri and Debnath 2014; Kamal and Hassan 2015; Kamal et al. 2015). My paper contributes to this research by identifying and examining a hitherto overlooked channel through which older female marriage age may in fact lead to *worse* outcomes for females rather than better: son preference. The results of my analysis thus suggest the importance of caution for policymakers who seek to improve outcomes for females in the developing world by raising female marriage age.

More broadly, my paper contributes to the literature focused on the rational-choice treatment of institutions pertaining to female welfare in developing countries. This literature has examined, for instance, female genital mutilation and dowry killings (see, for example, Coyne and Mathers 2011; Coyne and Coyne 2014; Bloch and Rao 2002). My paper contributes to this research by using rational choice to investigate the consequences of policy efforts to reduce child-bride marriage incidence in the developing world.

2. Child Brides in the Developing World

A child bride is a prepubescent female whose parents marry her to an adult man and who begins marital cohabitation with her groom before menarche. A child-bride marriage is thus a genuine cohabitational marriage between a prepubescent female and a post-pubescent male.

Child-bride marriage incidence varies substantially throughout the developing world. To measure it across countries, I use data from the Demographic and Health Surveys on the percentage of ever-married females who married by age 12 (DHS 1990-1999).[29] Average age at menarche globally is 13.5 years (see, for instance, Palmert and Boepple 2001). The overwhelming majority of ever-married females who married by age 12 were therefore likely prepubescent at the time of their marriages.[30]

Figure 4 depicts child-bride marriage incidence across developing countries. This map highlights that incidence's substantial variation, ranging from zero percent in Kyrgyz Republic, to 4.9 percent in Pakistan, and nearly 30 percent in Bangladesh. Child brides are especially concentrated in South Asia and Sub-Saharan Africa. For instance, in South Asia 6.1 percent of ever-married females married by age 12, whereas in Latin America only 1.6 percent of ever-married females did so.

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[29] I use Demographic and Health Surveys for all 50 countries surveyed between 1990 and 1999, relying on the most recent survey for countries surveyed multiple times during this period. These data are also used below to compare women who marry by age 12 with those who marry later, and in Section 3 to measure son preference across developing countries. I obtain similar patterns using the countries surveyed between 2000 and 2009 (DHS 2000-2009).

[30] To the best of my knowledge, there exist no data that allow me to precisely identify prepubescent brides—females whose age at menarche strictly exceeds their age at marital cohabitation—for as large a cross-section of countries as this conservative married-by-12 proxy. Data from India's National Family Health Survey 1992-1993, however, where such data are available, results in similar patterns as those discussed below when comparing prepubescent and post-pubescent Indian brides (see NFHS-1 1995, and also Leeson and Suarez 2016).

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Child brides marry significantly earlier than their postpubescent counterparts, yet both marry adult postpubescent males. Among females in the developing world who marry by age 12, average marriage age is 11.5 years, whereas among females who marry later it is 18.2 years. Despite this difference, however, both females who marry by age 12 and those who marry later marry similarly aged adult males who are well past puberty: males who are, on average, 21.6 years old and 25 years old, respectively.[31]

Child-bride marriage is vastly more common in more impoverished parts of the developing world. Consider Figure 5, which depicts the relationship between child-bride marriage incidence and real GDP per capita across countries. The relationship is clearly negative: child-bride marriage incidence tends to be higher where per-capita national income is lower. Furthermore, within countries, child brides are heavily concentrated in the poorest households. Figure 6 depicts child-bride incidence in the poorest and richest households by wealth quintiles in each country. In 80 percent of countries, child-bride incidence is higher in the poorest quintile, and in 62 percent of countries, it is at least twice as high in the poorest relative to the richest households.

Child brides tend to be less educated and are more likely to inhabit rural areas than post-pubescent brides. In developing countries, females who marry by age 12 attain on average 1.3 years of education, whereas females who marry later attain on average 4.4 years of education. Similarly, nearly 82 percent of females who marry by age 12 reside in rural areas, whereas only 63 percent of females who marry later do so.

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[31] The average male reaches puberty at approximately 14 years old (Palmert and Boepple 2001).

In addition to being poorer and less educated, child brides experience a wide range of other inferior socio-economic outcomes. For instance, 26 percent of females who marry by age 12 show signs of wasting and 43 percent show signs of stunting. In contrast, less than 17 percent of females who marry later show signs of wasting, and less than 36 percent show signs of stunting.[32] Child brides are thus more likely to suffer moderate to severe malnutrition.

Child brides' children also experience poorer health outcomes. For example, children born to females who marry by age 12 are less likely to be vaccinated against tuberculosis, measles, DTP, and polio, with only 66, 46, 43, and 13 percent receiving such vaccines, respectively. In contrast, among children born to females who marry later, 77, 58, 57, and 21 percent, respectively, receive such vaccines. Similarly, 13 percent of children born to females who marry by age 12 show signs of wasting and 47 percent show signs of stunting. Among children born to females who marry later, in contrast, only 8 percent show signs of wasting and 34 percent show signs of stunting.

Child brides also exhibit less autonomy in their households. For instance, 10 percent of females who marry by age 12 have no say over their own health care or how the money that they or their husbands earn is spent. In contrast, only 4 percent of females who marry later have no say over such matters. Similarly, 10 percent of females who marry by age 12 have no say in decisions regarding large household purchases, purchases

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[32] The World Health Organization defines wasting as a weight-for-height index that is two or more standard deviations below the reference median population. It similarly defines stunting as a height-for-age index that is two or more standard deviations below the reference median population. For more information, visit: www.who.int/nutrition/topics/moderate_malnutrition/en/

for daily needs, or visits to family or relatives. In contrast, only 4 percent of females who marry later have no say over such matters.

Additionally, child brides are more likely to experience domestic violence. 35 percent of females who marry by age 12 report moderate to severe physical abuse by their husbands. Such abuse ranges from being slapped or punched to being attacked with a knife, gun, or other weapon. In contrast, 27 percent of females who marry later report such physical violence. Child brides are also more likely to experience sexual abuse by their husbands. Among females who marry by age 12, 11 percent report forced intercourse or other sexual acts by their husbands, compared to 9 percent of females who marry later.[33]

3. Understanding the Reason for Child-Bride Marriage

To investigate the potential effects of policy efforts aimed at raising female marriage age on females in developing countries that exhibit son preference, it is necessary to first understand the cause of child-bride marriage. For this purpose, I draw on Leeson and Suarez (2016), who identify the source of the supply and demand for child brides in developing nations: son preference.

Son preference is the preference for male over female offspring by a child-seeking couple. A son-preferring couple demands a higher quantity of sons than daughters, higher-quality sons than daughters, or some combination of both. In developing countries that exhibit strong son preference, parents' preference for male over female offspring is

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[33] Questions regarding female autonomy were only available for one country between 1990 and 1999 (Zimbabwe), and those regarding domestic violence were not asked until 2000. Such figures thus correspond to the 2000-2009 period.

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widespread and deep-rooted. Although the reason for son preference is disputed, the fact that in many developing countries parents are son-preferring is not (see, for instance, Williamson 1976; Cleland, Verrall, and Vaessen 1983; Arnold 1997).[34] For instance, in the developing world the average ever-married female's stated preferences for her ideal number and sex composition of children imply an ideal child bundle that consists of 1.62 sons and 1.46 daughters, or an ideal son/daughter ratio of 1.11.[35]

Son preference in the developing world is also evident in parents' systematic underinvestment in their daughters' care in favor of care for their sons. For example, son-preferring parents underfeed their daughters from infancy through childhood, frequently forgo medical care and treatments for their daughters ranging from prenatal care to vaccinations, and generally devote less time, attention, and resources to their daughters, contributing ultimately to excess female infant and child mortality in the developing world (see, for instance, Das Gupta 1987; Pitt and Rosenzweig 1990; Arnold 1997; Pande and Malholtra 2006; Tarozzi and Mahajan 2007; Oster 2009; Jayachandran and Kuziemko 2011; Barcellos et al. 2012; Bharadwaj and Lakdawala 2013).

Like child-bride marriage incidence, the strength of son preference varies substantially throughout the developing world. Figure 7 depicts the average ever-married female's ideal son/daughter ratio across countries. This ratio ranges from only 0.77 in the

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[34] Son preference has been attributed to, for example, kinship systems, land holdings, agricultural activity, religion, and ability to care for parents in old age (see, for instance, Rosenzweig and Schultz 1982; Mutharayappa et al. 1997; Das Gupta et al. 2003; Pande and Malhotra 2006; Arnold 2007; Chung and Das Gupta 2007; Pande and Astone 2007; Chakraborty and Kim 2010; Arokiasami and Goli 2012; Vanneman, Desai, and Vikram 2012; Alesina et al. 2013; Gupta 2014; Jain 2014; Mitra 2014; Klaus and Tipandjan 2015; and Xue 2015).

[35] This ratio excludes children in ever-married females' ideal child bundle whose sex "does not matter." Nearly 80 percent of ever-married females' ideal child bundles contain zero such children.

Dominican Republic, to 1.22 in Bangladesh, and 1.54 in Nepal. South Asian countries in particular tend to be strongly son preferring. While in Latin America the average ever-married female's ideal son/daughter ratio is only 0.97, in South Asia it is 1.40.

Unsurprisingly given the patterns in Figures 4 and 7, child-bride marriage incidence is positively related to son preference across countries. Figure 8 depicts this relationship: where son preference is stronger, child-bride incidence is higher. This is consistent with the theory that both a supply and demand for child brides in developing nations arise from son preference.

The logic behind that theory is straightforward. Son-preferring couples seek to produce some ideal number of sons of a given quality. When fetal-sexing technology is available, such couples can attain their ideal sex composition of children and thus their ideal number of sons via sex-selective abortion. Couples who are willing to incur the psychic and resource costs associated with sex-selective abortion can dispose of unwanted daughters by preventing those daughters' birth. This allows them to conserve on resources available for investment in sons.[36]

In the absence of such technology, however, or if they are unable or unwilling to incur the costs of sex-selective abortion, son-preferring couples attempting to produce sons will sometimes produce unwanted daughters. To conserve on the resources available for their desired sons, these couples must minimize the cost of maintaining their unwanted daughters in their households by disposing of those daughters after they are

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[36] See Becker (1960, 1992) and Becker and Lewis (1973) on the quantity-quality tradeoff faced by parents in their demand for children.

born. These couples have two alternative means of such disposal: infanticide or transferring their unwanted daughters to third parties.

Infanticide avoids the cost of maintaining an unwanted daughter. However, it is also exceptionally psychically costly. At least some couples may therefore seek to dispose of their unwanted daughters by attempting to transfer them to third parties who are willing to accept them. In a son-preferring society where other couples also desire sons and have unwanted daughters they seek to dispose of themselves, finding another couple willing to adopt one's unwanted daughter is unlikely.[37] Finding an adult male who is willing to take one's unwanted daughter as a wife, however, is not.

The reason for this is simple. Son-preferring parents systematically underinvest in their daughters' care in favor of their sons. In doing so, they induce disproportionately greater female infant and child deaths, promoting the survival of relatively more males than females to puberty in son-preferring societies. These differential male-female survival rates produce an imbalanced sex ratio manifesting in a shortage of traditional marriage-aged (i.e. post-pubescent) females. In order to find wives, some adult males are consequently forced to search for brides in younger female cohorts. If the resulting shortage of traditional marriage-aged females is severe enough, these males are willing to take son-preferring couples' unwanted, prepubescent daughters as brides. The more severe this shortage is, the younger the child brides these males are willing to take.

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[37] Anecdotal evidence from China and India, two of the most son-preferring nations in the world, suggests that girls are more likely to be abandoned in orphanages than boys, and that other couples are unwilling to adopt these daughters as their own (see, for example, Thurston 1996; Johnson 1993; Russell 2007; Hui and Blanchard 2014).

Child-bride marriage therefore serves a simple yet crucial function in developing countries that exhibit strong son preference: it allows son-preferring couples who are unable or unwilling to dispose of their unwanted daughters via infanticide or abortion to do so via the marriage market, and allows adult males who are unable to find brides among traditional marriage-aged (i.e. post-pubescent) females to nevertheless find wives.

4. Analyzing Policy Efforts to Raise Female Marriage Age in Developing Countries that Exhibit Son Preference

At the urging of the international community, developing-world governments have devoted considerable effort to raising female marriage age with the goal of improving females' poor socio-economic outcomes attendant to child-bride marriage. Those efforts are reflected by three central policies that aim to raise female marriage age in particular: minimum marriage-age laws, conditional-cash transfers, and educational programs. The first sets a minimum age at which someone may legally enter a marital union. The second policy provides a monetary or in-kind reward to a couple if their daughter reaches a pre-determined age as a single female or to a young female herself if she remains unmarried by this age. The third educates parents, young females, and/or young adult males about the poor socio-economic outcomes for females linked to early female marriage.

The United Nations (UN), for instance, adopted in 1962 the Convention on Consent to Marriage, Minimum Age for Marriage, and Registration of Marriages (Marriage Convention). The Marriage Convention was the first attempt to address early marriage via international law. It called on states to establish a legal minimum marriage

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age of 15 years or older. In 1979 the UN adopted the Convention for the Elimination of All Forms of Discrimination Against Women (CEDAW). The CEDAW explicitly classified early female marriage as a women's rights violation, declared all child marriages illegal, and called on states to increase the legal minimum marriage age to at least 18 years.[38]

Prior to the CEDAW, less than 10 percent of countries globally had a minimum female marriage age of 18 or older (Kim et al. 2013: 4). By 2007, however, nearly half of all countries had adopted this standard, and as of 2013 it extended to over 80 percent of countries worldwide (Kim et al. 2013: 4; UNSD 2013). Enforcement of such laws by local authorities in developing countries has typically been weak, especially in rural areas. The international community thus continues to call on developing-world governments to encourage stricter enforcement.

In 1994, the government of the Indian state of Haryana launched the first large-scale conditional-cash transfer program, "Our Daughter, Our Wealth" (Apni Beti Apna Dhan) with the purpose of raising female marriage age. This program incentivized the delay of female marriage by compensating parents upon their daughter's eighteenth birthday if she remained unmarried. In Ethiopia the Berhane Hewan project, conducted in 2004-2006, created social support networks for adolescent girls with the aim of promoting female education and reducing early marriage prevalence. And in Bangladesh, the Save the Children's Kishoree Kontha program has since 2007 educated tens of

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[38] For an excellent account of international law's treatment of early marriage and its evolution, see Kim et al. (2013).

thousands of adolescent girls in basic and financial literacy and reproductive health, and regularly provided them with in-kind incentives as long as they remain unmarried.[39]

Non-profit organizations in India, such as Landesa and the MAMTA Health Institute for Mother and Child, have also conducted educational programs to inform adolescent females of the poor socio-economic outcomes for females who marry young and the benefits of investing in education and labor-market skills (see, for instance, Landesa 2013; MAMTA 2013). And the International Center for Research on Women (ICRW) has embarked on several research and educational projects that target raising female marriage age in numerous developing countries, including Bangladesh, Egypt, Ethiopia, India, Malawi, Mozambique, Nepal, Senegal, Zambia, and Zimbabwe.[40]

Analyzing the effects of these policies on females in developing countries that exhibit son preference is straightforward in light of the theory of child-bride marriage discussed above. That theory highlights a son-preferring couple's tradeoffs as it seeks to get closer to its ideal child bundle by disposing of unwanted daughters produced in the couple's attempts to produce sons. When fetal-sexing technology is available, a couple that is able and willing to incur the cost of sex-selective abortion may dispose of its unwanted daughters before birth. In the absence of such technology, however, or if the

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[39] Among more unusual efforts to reduce early female marriage, Central Malawi's Dedza District Senior Chief, Theresa Kachindamoto, annulled over 850 child marriages in the last three years because her sub-chiefs continued to approve marriages involving females younger than the legal minimum marriage-age of 18. She then sent hundreds of these former young brides back to school, often subsidizing their school fees with her personal income or by finding other willing sponsors (see, for example, Grossman 2016; McNeish 2016).

[40] For more information on ICRW's, MAMTA Health Institute for Mother and Child's, and Landesa's projects, visit:
http://www.icrw.org/where-we-work?region=All&country=All&work=5&status=All, http://mamta-himc.org/know-us/, and http://www.landesa.org/what-we-do/india/, respectively.

couple is unable or unwilling to incur this cost, it must choose between infanticide—
which economizes on unwanted-daughter maintenance costs but inflicts exceptionally
high psychic costs—or child-bride marriage—which economizes on the psychic cost of
unwanted daughter disposal but involves higher unwanted-daughter maintenance costs.

In view of this, policies that successfully raise female marriage age are notable
not only for what they do, but also for what they do not do. What these policies do *not* do
is address the underlying cause of child-bride marriage—son preference—and thus the
reason some parents resort to marrying their prepubescent daughters in the first place—to
dispose of them when they do not want them. What these policies do accomplish is to
increase son-preferring couples' cost of disposing of their unwanted daughters via child
marriage. As I consider below, however, given what these policies do not do,
accomplishing the latter, it turns out, may have unintended and, from the perspective of
female welfare, at least not obviously desirable effects.

First, consider the ways in which the foregoing policies aimed at raising female
marriage age may raise parents' cost of resorting to child-bride marriage. Minimum
marriage-age laws do so by declaring child-bride marriage illegal and punishing parents
who resort to it, typically with a fine. Of course the cost of child-bride marriage only rises
in this case if there is a positive probability that at least some parents who resort to it will
be detected. If this is not true, minimum marriage-age laws are powerless to affect female
marriage age and thus useless as a policy for this purpose.

Conditional-cash transfer programs (CCTs) may increase parents' cost of
resorting to child-bride marriage through two channels. Which channel operates depends

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on the identity of the conditional reward's recipient. CCTs that reward young females for remaining unmarried before a stipulated age increase parents' cost of resorting to child-bride marriage via the same channel that educational programs that inform such females do. If young females are the recipients of such reward, or of education about the poor socio-economic outcomes for females who marry young, and this makes them more likely to resist their parents' efforts to marry them off before puberty, it may become more difficult for their parents to do so, raising parents' cost of resorting to child-bride marriage. Even if females cannot prevent being married off before puberty, they may be able to resist their parents' efforts in other ways. For example, females who receive a reward for remaining unmarried, or who are educated about the female outcomes attendant to early marriage, and whose parents marry them off before puberty may attempt to run away from their husbands' households or be less inclined to care for their husbands. This would increase males' cost of accepting prepubescent brides, making it more difficult for parents seeking to dispose of their unwanted, prepubescent daughters to find men willing to take them as wives.

CCTs that reward young females' parents also raise parents' cost of resorting to child-bride marriage by making it more difficult for them to find adult males willing to take their unwanted, prepubescent daughters as wives. By inducing marginal couples who otherwise expect to marry their daughters slightly earlier than the age stipulated by the CCT to delay their daughters' marriages, these programs raise the "typical" female

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marriage age, as they are designed to do.[41] In doing so, however, they reduce the demand for prepubescent brides since fewer males are forced to reach into prepubescent female cohorts in search of brides when their search begins among older females and more males can find traditional marriage-aged (i.e., post-pubescent) brides.

Additionally, when the "typical" female marriage age rises, those males who are forced to reach into prepubescent female cohorts in search of brides will only be willing to take relatively older prepubescent females as wives, since the shortage of post-pubescent females is less severe. This, in turn, requires parents who seek to dispose of their unwanted daughters via child-bride marriage to maintain such daughters longer before they are able to dispose of them, thus raising parents' cost of resorting to child-bride marriage. To the extent that minimum marriage-age laws and educational programs also induce marginal couples to delay their daughters' marriage, they also increase parents' cost of resorting to child-bride marriage via the foregoing channel.

Educational programs that inform their participants about the poor socio-economic outcomes for females who marry young may also increase parents' cost of resorting to child-bride marriage through several channels. Here, the operative channel depends on the identity of the person who receives this education. If parents are the recipients of such education, these programs may increase parents' psychic cost of disposing their unwanted daughters via child-bride marriage. If young females are the recipients of such education, these programs may increase parents' cost of resorting to

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[41] On the positive effect of some such CCTs on average female age at marriage see, for instance, Erulkar and Muthengi (2009), Nanda et al. (2014), and Nanda et al. (2015).

child-bride marriage via the same channel that CCTs that reward young females do, discussed above.

If instead adult males are the recipients of education about the poor socio-economic outcomes for females who marry young, males may become less willing to take young girls as wives. Such may be the case if these outcomes render young brides potentially inferior spouses, as might particularly be the case for the poor outcomes experienced by young brides' children (see, for example, Chari et al. 2015). Wife-seeking males educated about these facts are likely to be less keen to marry young girls, making it more difficult for parents who wish to dispose of their unwanted, prepubescent daughters via child-bride marriage to do so.

Although minimum marriage-age laws, CCTs, and educational programs as those just examined raise parents' cost of disposing of their unwanted daughters via child-bride marriage in the ways considered above, they do not affect parents' cost of disposing of unwanted daughters through the other means available to them for this purpose: female infanticide and sex-selective abortion. Policies aimed at raising female marriage age, therefore, raise the cost of child-bride marriage relative to these substitute means of unwanted-daughter disposal. This, of course, is likely to induce substitution of such means: some parents who formerly would have disposed of their unwanted daughters via child-bride marriage will now do so via infanticide or abortion. These policies are consequently likely to have the unintended effect of increasing the prevalence of female infanticide and sex-selective abortion, which would typically be regarded as rather undesirable outcomes for females.

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The reason for this unintended effect lies both in what polices that raise female marriage age in son-preferring developing countries do and do not do. As noted above, these policies do not address the underlying cause of child-bride marriage in such countries: son preference, which is ultimately responsible for parents' demand for unwanted-daughter disposal. Given that son preference, and thus the demand for such disposal, is unaffected, what these policies do accomplish is to raise the relative cost of resorting to child-bride marriage as a means of unwanted-daughter disposal, leading parents to satisfy that demand through the now relatively cheaper means of infanticide and abortion.

Among the policies adopted by developing-world governments to raise female marriage age, CCTs come closest to potentially addressing the demand for unwanted daughter-disposal in son-preferring developing countries. In principle, at least, CCTs are capable of raising the cost of such disposal in general rather than through child-bride marriage alone. By offering parents a sufficiently large reward for delaying their daughters' marriage until a certain age, CCTs could potentially incentivize son-preferring parents to not dispose of their unwanted daughters at all, or at least until the cash-transfer is realized. In practice this is unlikely. The cash-transfer sum required to induce such parents to forego unwanted-daughter disposal would need to be at least as large as such parents' cost of maintaining an unwanted daughter until traditional marriage age. Under existing CCT programs, the cash rewards available to parents who delay their daughters' marriage until traditional marriage age are not this large.

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India's largest CCT, for example, consisted of the government purchasing a bond of 2,500 Indian Rupees upon an eligible girl's birth. Conditional on their daughter remaining unmarried, on her eighteenth birthday her parents could redeem this bond for 25,000 Rupees—the equivalent of approximately 455 USD in 2012, when the first beneficiaries' daughters turned 18 (Nanda et al. 2014: 2). The *Economic Times* (2011) recently estimated the cost of raising a child through age 21 for upper middle-class Indian parents to be 90,000 USD. This of course is a gross overestimate for the typical Indian family: 46 percent of such costs were estimated to come from education (including college), and about 12 percent from entertainment. Even excluding such costs, however, and including the remaining costs only through age 16, one arrives at a cost of raising a child in India of 24,000 USD. If the typical Indian family must spend even one-tenth as much to raise a daughter, the largest conditional-cash transfer program in India would not provide son-preferring parents anywhere near sufficient compensation for the costs of raising an unwanted daughter.[42]

5. Testable Predictions and Data

The foregoing analysis of the effects of policies aimed at raising female marriage age on females in developing countries that exhibit son preference yields one key testable prediction. By increasing son-preferring parents' cost of disposing of unwanted daughters

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[42] Other smaller-scale programs in India have rewards ranging from 9,000 to 100,000 Indian Rupees (Sekher 2012: 15). The largest of these would still be insufficient to cover the estimated costs above. In other countries, CCTs similarly typically provide insufficiently-large rewards. For example, in Ethiopia, the Berhane Hewan project provided parents with a goat upon their daughter's "graduation" from the program if she had remained unmarried throughout the two-year period. At the time of graduation, a goat was worth about 20 USD (Erulkar and Muthengi 2009: 8). Additionally, girls who stayed or returned to school received about 4 USD worth of school materials, and those who asked about family planning had the cost of their clinic card (2 USD) covered by the project. In 1994 in Bangladesh, the government launched a scholarship program whereby girls in 7th and 8th grade received a monthly stipend of about 1 to 2 USD if they remained in school and unmarried (Amin 1998: 9; Arends-Kuenning and Amin 2000: 6).

via child-bride marriage, policies such as minimum marriage-age laws, conditional-cash transfers, and educational programs may induce such parents to substitute alternative means for this purpose, thus potentially increasing the prevalence of female infanticide and sex-selective abortion.

Empirically evaluating the effect of such policies requires some measure of the prevalence of female infanticide and sex-selective abortion. Although reliable data on such outcomes is nearly impossible to obtain, data on the sex ratio at birth is not. The sex ratio at birth captures the extent to which couples practice sex-selective abortion as well as female infanticide—provided that couples who resort to female infanticide do not report the births of infant daughters they have killed—as deviations from the natural sex ratio at birth.

Evaluating the effect of minimum marriage-age laws on the sex ratio at birth requires data not only on such laws' existence, but their enforcement. As discussed above, minimum marriage-age laws potentially increase parents' cost of resorting to child-bride marriage relative to infanticide or abortion only to the extent that they are enforced. To the best of my knowledge such data do not exist, making such an analysis unfeasible.

Evaluating the effect of educational programs on the sex ratio at birth requires data on the extent to which the education provided to recipients is in fact new as well as a reliable way to define and identify those who are treated. The former is not typically or consistently recorded by the organizers of such programs, and the latter is problematic because even if reliable data on attendees of an educational program existed, the extent to

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which they communicate such education with their households, social networks, and communities does not. This makes it difficult to distinguish between program participants and non-participants, which precludes an evaluation of the effect of an educational program on participants' sex ratio at birth.

Of the main policies aimed at raising female marriage age in developing countries, therefore, conditional-cash transfer programs are most suitable for evaluating the effect of such policies on the sex ratio at birth and thus the prevalence of female infanticide and sex-selective abortion. To do so, I focus on the first large-scale conditional-cash transfer program in Haryana, India: "Our Daughter, Our Wealth" (Apni Beti Apna Dhan or ABAD). The scheme for this program, discussed above, consisted of providing eligible parents with a monetary reward conditional on their eligible daughter reaching her eighteenth birthday as a single female. Its large coverage permits a greater number of observations in control and treatment groups and its duration allows me to explore ABAD's short and medium-term effects on the sex ratio at birth.

Although data specifically for this purpose were not formally collected, it is possible to explore the effects of ABAD on the sex ratio at birth in Haryana, India by constructing a program-eligibility proxy—that is, an intent-to-treat rather than treatment measure. The National Family Health Survey (NFHS-1 1995; NFHS-2 2000; NFHS-3 2007) is a nationally representative survey which collects all information necessary for this purpose and spans the appropriate time period. Each wave covers females of reproductive age (13-49 for NFHS-1 and 15-49 for NFHS-2 and NFHS-3) and contains

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information on basic household and demographic characteristics, a complete birth history, and fertility preferences.

6. Empirical Analysis

6.1. Variables and Empirical Strategy

Using all three waves of NFHS, I employ a difference-in-difference approach to examine ABAD's short and medium-term effects on females' sex ratio at birth in Haryana. NFHS-1 was conducted in 1993 in Haryana, and so may be regarded as the baseline survey for the pre-treatment period since ABAD was implemented simultaneously in all districts in October 1994. NFHS-2 was conducted in 1998-1999 and may be regarded as the short-term follow-up survey in the post-treatment period, and NFHS-3, conducted in 2006 in Haryana, as the medium-term follow-up survey in the post-treatment period.

For each female, I define the sex ratio at birth as total male births divided by total female births. I compare the difference between eligible and non-eligible females' sex ratio at birth before ABAD's implementation to the difference between eligible and non-eligible females' sex ratio at birth 4-5 years and 12 years after ABAD's implementation. This approach allows me to control for common additive time trends and permanent differences between eligible and non-eligible females as well as relevant household and individual-level characteristics. The estimated effect of ABAD on females' sex ratio at birth thus serves as a proxy for the effect of ABAD on the prevalence of female infanticide and sex-selective abortion. If son preference, and thus the demand for

unwanted daughter disposal, is strong enough in Haryana, ABAD's impact can potentially be positive.

To be eligible for ABAD, a couple had to satisfy poverty and fertility criteria. The former required the couple to be below the poverty line or belong to a disadvantaged caste ("scheduled caste" or "other backward caste"), provided that members of such castes were not government employees or income tax payees—i.e. among the wealthiest 1 to 4 percent of the national population (Banerjee and Piketty 2006). The latter required the couple to give birth to a daughter within the first three births in the family after ABAD's implementation date of October 1994.

Based on each of these eligibility criteria, I construct an ABAD-eligibility proxy for all females in the three rounds of NFHS with sufficient information to do so.[43] To approximate the poverty eligibility criterion I use the wealth index constructed by NFHS—a composite measure of a household's cumulative living standard based on household ownership of assets—since no explicit measure of income or poverty is collected. I sort females according to the wealth index within urban and rural sectors and define as poor the population-weighted proportion of the sample that falls below the percentile thresholds indicated by the poverty headcount ratio. I use official poverty headcount ratios for Haryana computed by India's National Planning Commission. These ratios are as follows: 28 and 16.4 percent for the rural and urban sectors in 1993-1994, 8.3 and 10 percent for the rural and urban sectors in 1999-2000, and 13.6 and 15.1 percent for the rural and urban sectors in 2004-2005 (Government of India Planning

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[43] A similar proxy is constructed by Sinha and Yoong (2009).

Commission 2014: 25-27). Additionally, I define as poor all females who belong to a scheduled caste or other backward caste, unless their household wealth index is in the wealthiest 4 percent of the population-weighted distribution.

To approximate the fertility eligibility criterion I use females' birth histories and define as (potentially) eligible all females with two or fewer live children as of ABAD's implementation date of October 1994, and as non-eligible all females with three or more children as of that date. Thus, I define as (potentially) eligible all females who may still have given birth to a daughter within the first three births in their family after ABAD's implementation—and thus may have subsequently become eligible—and as non-eligible all females who could no longer have given birth to a daughter within the first three births in the family—and thus could not become eligible after ABAD's implementation.

For females interviewed after ABAD's implementation, i.e. all females in NFHS-2 and NFHS-3, this measure is determined by the sum of all births up to October 1994 conditional on the child being alive at the time of the interview or reported as having died after October 1994. For females interviewed before ABAD's implementation, i.e. all females in NFHS-1, I approximate this measure by the sum of all surviving children at the time of the interview in 1993 plus one for females who report a current pregnancy at that time. The ABAD-eligibility proxy is thus equal to one for females who satisfy both the poverty and eligibility criteria approximations, and zero otherwise.

Then, for female i in each NFHS wave t, I use ordinary least squares to estimate a linear specification for the sex ratio at birth, SRB_{it}, where

$$SRB_{it} = \alpha_i + \beta_1 ABAD_i T_{t=2} + \beta_2 ABAD_i T_{t=3} + \beta_3 ABAD_i + \beta_4 T_{t=2} + \beta_5 T_{t=3} + X_i'\alpha + \varepsilon_i$$

where $ABAD_i$ is the ABAD-eligibility proxy and T_t are indicators for each survey wave. X is a vector of household and individual level characteristics, including the household wealth index, an indicator for rural residence, years of education, and indicators for scheduled caste/scheduled tribe membership and religious affiliation. With this approach, β_1 and β_2 are the estimates of ABAD's short and medium-term effects, respectively. Table 14 presents summary statistics by survey wave for all the variables used in this analysis.

6.2. Results

Table 15 presents the main results of this empirical analysis. Unless otherwise noted, all regressions include NFHS sample weights. Column 1 contains the most stripped-down specification which includes no controls. Column 2 adds demographic controls for wealth, rural residence, education and birth year fixed effects. Column 3 adds cultural controls for scheduled caste and scheduled tribe membership and religious affiliation.

Consistent with the prediction that policies aimed at raising female marriage age in son-preferring societies may result in higher prevalence of sex-selective abortion and female infanticide, the estimated effect of ABAD on females' sex ratio at birth is positive and significant. Compared to the period before ABAD's implementation, the difference between eligible and non-eligible females' sex ratio at birth increases by 0.227 males per

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female 4 to 5 years after ABAD's implementation and by 0.434 males per female 12 years after ABAD's implementation (based on column 3 estimates).[44]

Table 16 presents additional results that contribute to the robustness of the main results. First, to account for permanent differences across districts within Haryana that may be related to ABAD-eligibility and/or implementation, column 1 includes district fixed effects in addition to the demographic and cultural controls from column 3 in table 2. Unfortunately, this specification does not allow for an estimate of ABAD's medium-term effect on females' sex ratio at birth because confidentiality requirements for HIV testing in NFHS-3 render such information unavailable. Thus, the sample contains only NFHS-1 and NFHS-2 females. Consistent with the main results, ABAD's impact on females' sex ratio at birth is positive and significant when controlling for time-invariant differences across districts within Haryana. Compared to the period before ABAD's implementation, the difference between eligible and non-eligible females' sex ratio at birth increases by 0.256 males per female 4 to 5 years after ABAD's implementation.

The extent to which policies aimed at raising female marriage age may result in higher prevalence of female infanticide and sex-selective abortion in son-preferring societies depends on son-preferring parents' demand for unwanted daughter disposal, and, therefore, on the degree of son preference. In particular, the stronger a couple's son

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[44] Using a similar approach, Sinha and Yoong (2009) find a positive and significant impact of ABAD on the ratio of living female children to living male children. By evaluating ABAD's effect on the female/male ratio of living children, Sinha and Yoong's analysis precludes finding ABAD's potential effect on unborn or unreported children killed in infancy (i.e. sex-selective abortion and infanticide). Their results are thus consistent with mine since, conditional on being born, a daughter is more likely to be desired rather than unwanted, especially when ABAD leads son-preferring parents to substitute abortion and infanticide as means of unwanted daughter disposal. Thus, all else equal, we would expect ABAD to promote the survival of living female children relative to living male children while simultaneously inducing a higher prevalence of female infanticide and sex-selective abortion.

preference is, the greater is their demand for unwanted daughter disposal. The effect of such policies on the prevalence of female infanticide and sex-selective abortion, therefore, would be larger among relatively more son-preferring couples.

To explore this empirically, I create a son preference index equal to zero if a female's ideal number of daughters equals or exceeds her ideal number of sons, and equal to one if a female's ideal number of sons strictly exceeds her ideal number of daughters. I evaluate the effect of ABAD on females' sex ratio at birth within each of these subsamples in columns 2 to 5, where columns 2 and 3 include district fixed effects and columns 4 and 5 do not (but include all waves of NFHS). Column 2 includes only relatively less son-preferring females (son preference index equals zero) and column 3 includes only relatively more son-preferring females (son preference index equals one).

Consistent with the analysis underlying the main results, columns 2 and 3 show that the magnitude of ABAD's positive impact in the short-term on females' sex ratio at birth is over four times larger among relatively more son-preferring females than less son-preferring females. Columns 4 and 5 similarly show that ABAD's impact in the medium-term on females' sex ratio at birth is over twice as large among relatively more son-preferring females than less son-preferring females. This suggests, as predicted by the analysis in this paper, that the extent to which ABAD induces son-preferring couples to substitute female infanticide and sex-selective abortion as means of unwanted daughter disposal increases with the degree of son preference.

7. Concluding Remarks

The marriage of a twelve-year old girl to an adult male is tragic. It is the startling frequency of this tragedy in the developing world that motivates the international community's campaign to "end child marriage."[45] Unfortunately, the unquestionable tragedy of child-bride marriage is not sufficient to declare even successful policy efforts to raise female marriage age in the developing world unambiguously welfare improving for females.

Although such efforts may improve some outcomes for females—such as health and education—in developing countries that exhibit strong son preference, they may worsen others—namely, by increasing the prevalence of female infanticide and sex-selective abortion. To the extent that policymakers are indeed concerned with improving female welfare in the developing world, a more cautious approach to policies aimed at raising female marriage age, or at least one that is cognizant of the underlying cause of child-bride marriage in the first place, is warranted. For this purpose, perhaps the sobering possibility that child-bride marriage may reflect a second-best institution, or constrained optimum, in son-preferring developing countries demands serious consideration.[46] Perhaps in such societies policymakers could devote more effort to addressing son preference itself rather than its symptoms. This, too, however, requires

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[45] See, for instance, the cover and back photographs of the UNFPA's report *Marrying Too Young: End Child Marriage* (2012), and the photographs exhibited at http://tooyoungtowed.org/. By "child marriage," the international community typically refers to marital unions involving at least one party under the age of 18.

[46] See, for instance, Leeson and Williamson (2009) on the theory of second best. For examples of institutional second-bests, see Coyne (2006), Leeson (2007; 2014), Leeson and Coyne (2012), and Leeson, Boettke, and Lemke (2014).

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caution. Although the consequences of son preference are well-known, its causes remain disputed.

My investigation of the effect of policies aimed at raising female marriage age on females in the developing world leads to several conclusions. First, my analysis suggests that if the goal is to improve female welfare, policies that may be desirable in a developing country that does not exhibit strong son preference may be considerably less desirable in one that does. In Latin America, for instance, where son preference is weak or non-existent, minimum marriage-age laws, conditional-cash transfers, and educational programs that inform about the negative outcomes for females who marry young may have the desired effect of improving female welfare. In South Asia, in contrast, where son preference is very strong, such policies may have unintended consequences for female welfare by raising the relative cost of child-bride marriage as a means of unwanted-daughter disposal and inducing son-preferring parents to dispose of their unwanted daughters via infanticide or abortion instead.

Second, my analysis highlights the potential difficulty of using policies to independently address any single poor socio-economic outcome for females in countries that exhibit strong son preference. In such countries, studies suggest that son preference is an important determinant of many poor socio-economic outcomes for females (see, for instance, Das Gupta 1987; Miller 1987; Arnold 1997; Das Gupta and Bhat 1997; Arnold, Choe, and Roy 1998; Sudah and Rajan 1999; Sekher and Hatti 2005; Pande and Malholtra 2006; Tarozzi and Mahajan 2007; Arnold and Parasuraman 2009). It is also certainly possible, and indeed likely, that some such outcomes reinforce or give rise to

son preference itself.[47] Such may be the case, for instance, when sons rather than daughters are expected to care for parents in old age and females' expected market earnings are lower than that of males (see, for example, Mutharayappa et al. 1997; Das Gupta et al. 2003; Pande and Malhotra 2006; Chung and Das Gupta 2007; Pande and Astone 2007; Mitra 2014; Klaus and Tipandjan 2015). Similarly, where females have few labor market opportunities and are thus unable to independently support themselves, parents may be more likely to view daughters as a greater economic responsibility than sons. Nonetheless, to the extent that son preference remains a significant determinant of poor socio-economic outcomes for females, addressing any one of them without consideration to the rest is likely to result in unintended consequences, as son-preferring parents adjust their efforts to get closer to their ideal child bundles in unforeseen, and perhaps undesirable, ways.

Such parents' substitution of infanticide and abortion for child-bride marriage to dispose of their unwanted daughters is but one example of such a response. To see another, consider, for instance, the tradeoff between prenatal and post-natal investments in children and son-preferring parents' systematic underinvestment in their daughters' care in favor of care for their sons, which results in excess female infant and child mortality.[48] Suppose that in an effort to improve the latter outcomes, policy "balanced" son-preferring parents' post-natal investments in their sons and daughters. A potential unintended consequence of this policy may be even greater prenatal investments in sons

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[47] I thank an anonymous reviewer for highlighting the two-way causal relationship between son preference and female outcomes, particularly labor market outcomes.
[48] On the tradeoff between pre- and post-natal sex-selection, see Lin, Liu and Qian (2014).

versus daughters, as son-preferring parents adjusted their behavior to get closer to their ideal child bundles in light of the new constraints imposed by this policy.

Finally, my analysis illuminates why governments in son-preferring developing countries have been unsuccessful at strictly enforcing minimum marriage-age laws, particularly by local authorities in rural areas. As documented above, child brides are more common in impoverished and rural areas. Given these laws' effect on the relative cost of child-bride marriage and the crucial function such marriage plays in son-preferring societies—both in permitting son-preferring parents to dispose of their unwanted daughters and in enabling adult males, despite the shortage of traditional marriage-aged females, to nevertheless find wives—it is unsurprising that in areas where inhabitants resort to this institution more frequently authorities would be less willing to enforce such laws.
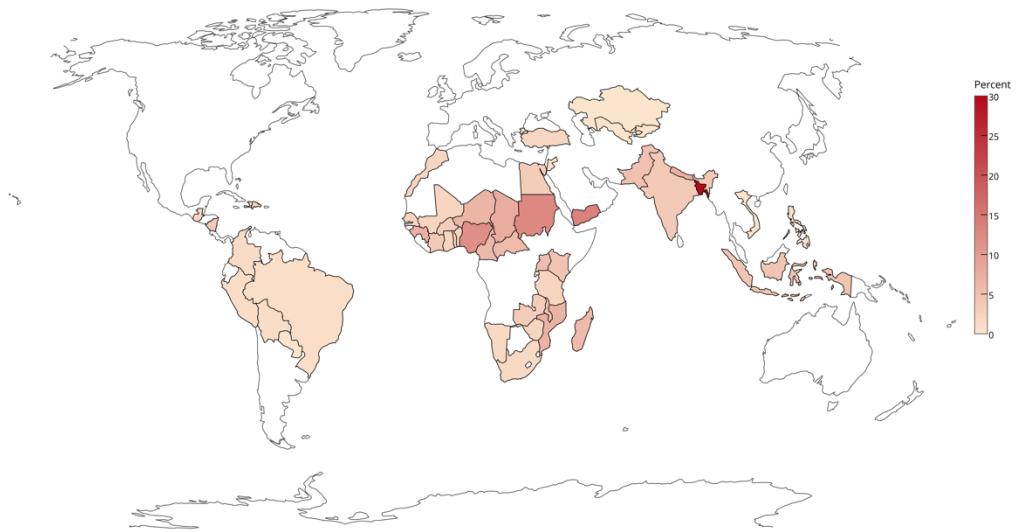
Notes: Data from Demographic and Health Surveys (1990-1999). I use the most recent survey for countries surveyed multiple times during this period. Child-bride marriage incidence is measured as the percentage of ever-married females who married by age 12. The countries surveyed during this period are: Benin, Burkina Faso, Bangladesh, Bolivia, Brazil, Central African Republic, Cote d'Ivoire, Cameroon, Colombia, Comoros, Dominican Republic, Egypt, Ghana, Guinea, Guatemala, Haiti, Indonesia, India, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Morocco, Madagascar, Mali, Mozambique, Malawi, Namibia, Niger, Nigeria, Nicaragua, Nepal, Pakistan, Peru, Philippines, Paraguay, Rwanda, Sudan, Senegal, Chad, Togo, Turkey, Tanzania, Uganda, Uzbekistan, Vietnam, Yemen, South Africa, Zambia, Zimbabwe.

Figure 4 Child-bride incidence in the developing world
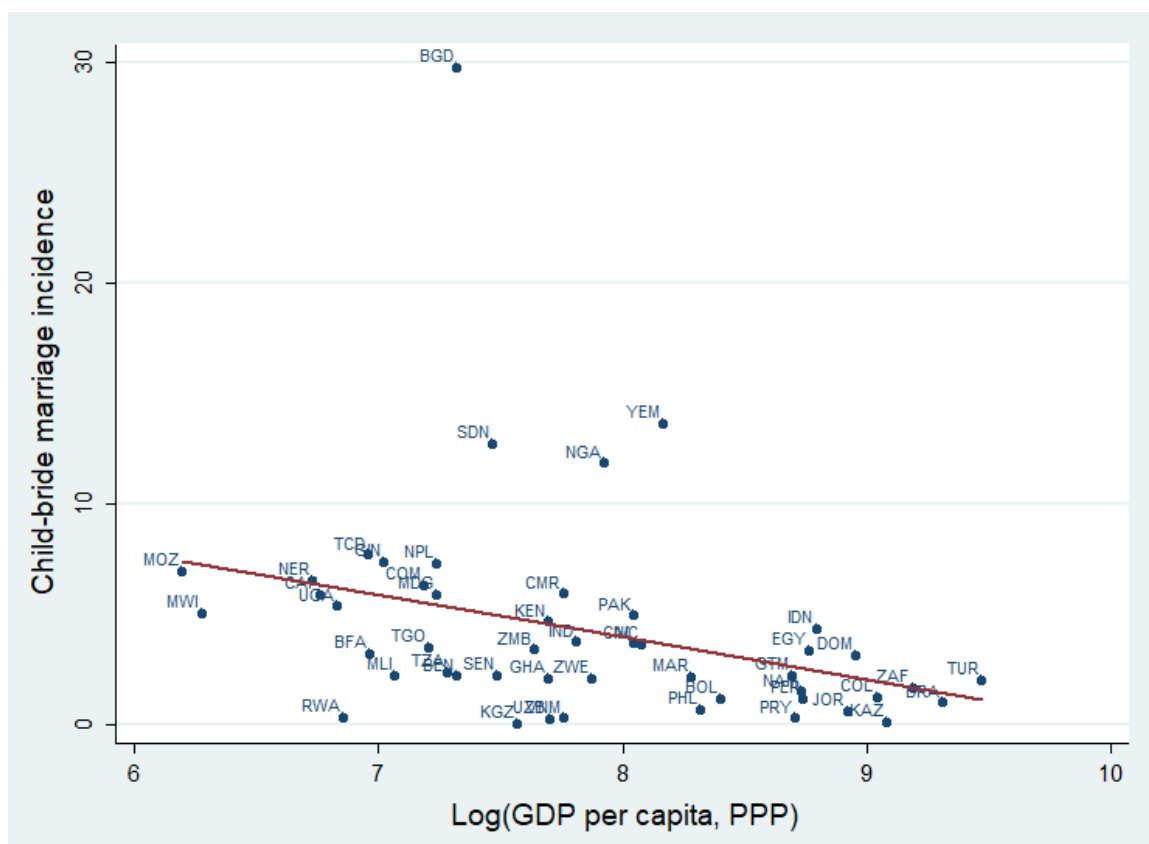
Notes: Child-bride marriage incidence is from Demographic and Health Surveys (1990-1999) and GDP per capital (PPP) is from World Bank's (2015) World Development Indicators. Coeff. = -1.904 and t-stat = -3.62. Excluding Bangladesh: coeff. = -1.501 and t-stat = -4.76.

Figure 5. Child-bride marriage incidence and per capita income
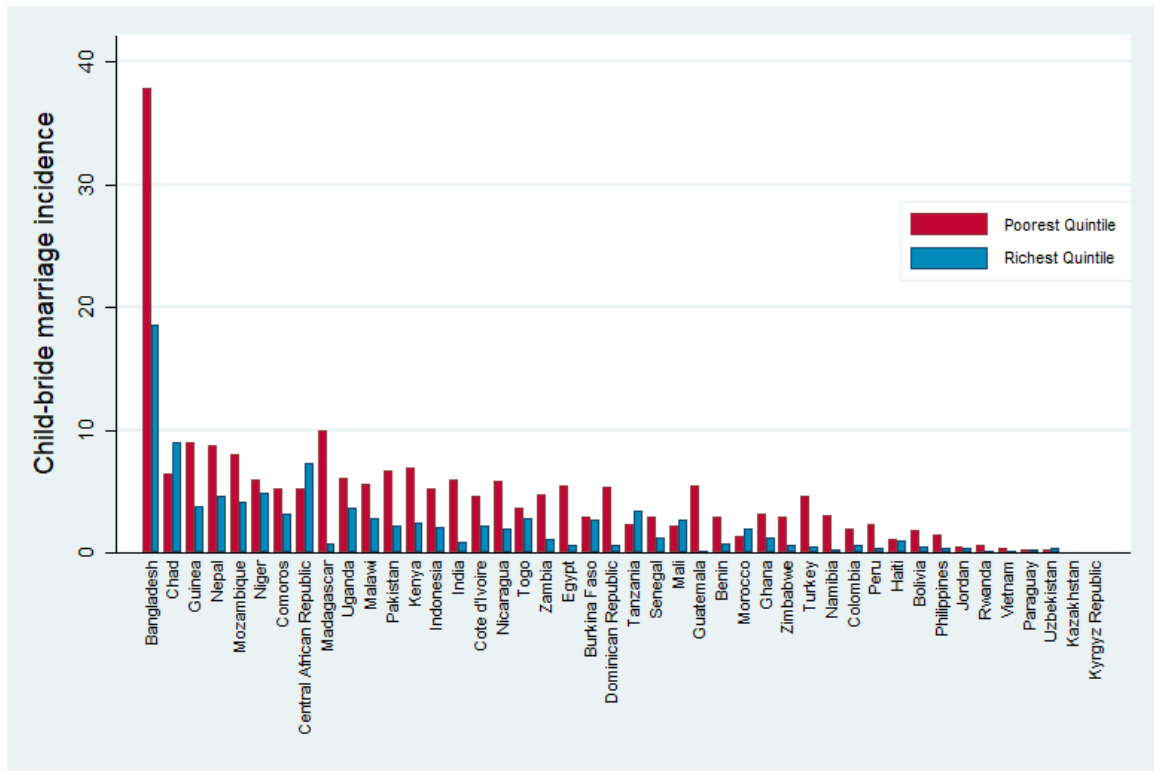
Notes: Data from Demographic and Health Surveys (1990-1999). Wealth quintiles defined from the DHS Wealth Index.

Figure 6. Child-bride marriage incidence in poorest vs. richest quintiles

Notes: Data from Demographic and Health Surveys (1990-1999). Son preference is measured as
the average ever-married female's ideal son/daughter ratio.

Figure 7. Son preference in the developing world
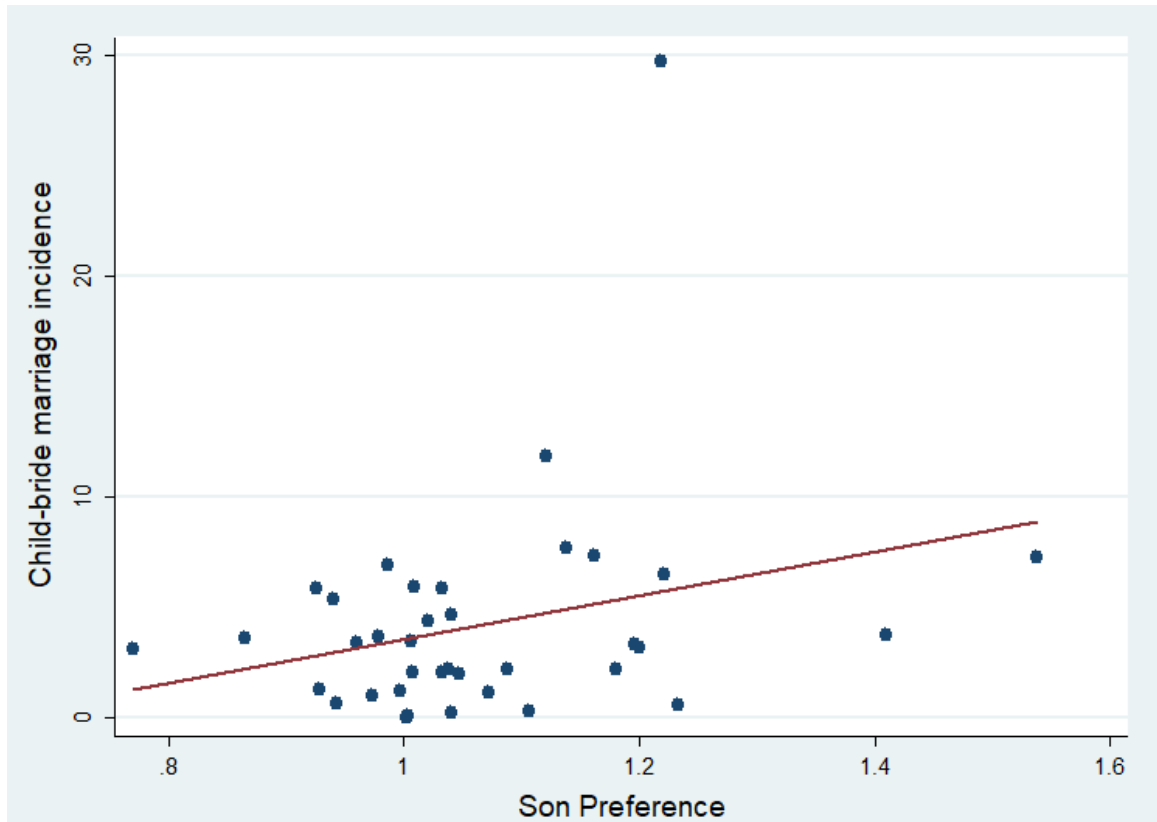
Notes: Data from Demographic and Health Surveys (1990-1999). Coeff. = 9.845 and t-stat = 1.67. Excluding Bangladesh: coeff. = 4.624 and t-stat = 2.02

Figure 8. Child-bride marriage incidence and son preference

Table 14. Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
NFHS-1					
Sex ratio at birth	2065	1.124	1.023	0	7
ABAD	2846	0.168	0.374	0	1
Ideal son/daughter ratio	2557	1.450	0.596	0	5
Son preference index	2731	1.444	0.509	0	2
Son preference index=1 (%)	2731	0.451	0.498	0	1
Age	2846	29.827	8.615	13	49
Wealth index	2846	0.336	0.849	-1.266	2.785
Rural (%)	2846	0.737	0.440	0	1
Education	2826	3.017	4.402	0	20
Scheduled caste (%)	2846	0.262	0.440	0	1
Scheduled tribe (%)	2846	0.001	0.028	0	1
Hindu (%)	2846	0.893	0.309	0	1
Muslim (%)	2846	0.038	0.190	0	1
Christian (%)	2846	0.001	0.023	0	1
Sikh (%)	2846	0.066	0.249	0	1
NFHS-2					
Sex ratio at birth	2064	1.112	0.970	0	7
ABAD	2908	0.243	0.429	0	1
Ideal son/daughter ratio	2616	1.355	0.583	0	5
Son preference index	2837	1.370	0.493	0	2
Son preference index=1 (%)	2837	0.375	0.484	0	1
Age	2908	31.556	8.578	15	49
Wealth index	2908	0.495	0.912	-1.277	2.661
Rural (%)	2908	0.712	0.453	0	1
Education	2907	3.960	4.966	0	19
Scheduled caste (%)	2908	0.422	0.494	0	1

	N	Mean	SD	Min	Max
Scheduled tribe (%)	2908	0.001	0.026	0	1
Hindu (%)	2905	0.892	0.311	0	1
Muslim (%)	2905	0.041	0.198	0	1
Christian (%)	2905	0.001	0.038	0	1
Sikh (%)	2905	0.066	0.248	0	1
NFHS-3					
Sex ratio at birth	1593	1.031	0.846	0	6
ABAD	2790	0.285	0.452	0	1
Ideal son/daughter ratio	2296	1.192	0.504	0	8
Son preference index	2454	1.208	0.435	0	2
Son preference index=1 (%)	2454	0.220	0.414	0	1
Age	2790	28.996	9.439	15	49
Wealth index	2790	0.262	0.893	-1.640	2.181
Rural (%)	2790	0.697	0.460	0	1
Education	2790	5.684	5.161	0	20
Scheduled caste (%)	2790	0.468	0.499	0	1
Scheduled tribe (%)	2790	0.002	0.042	0	1
Hindu (%)	2790	0.889	0.314	0	1
Muslim (%)	2790	0.054	0.226	0	1
Christian (%)	2790	0.001	0.026	0	1
Sikh (%)	2790	0.056	0.229	0	1

Notes: Data are taken from NFHS-1 (1995), NFHS-2 (2000), and NFHS-3 (2007).

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Table 15. ABAD's Effect on Females' Sex Ratio at Birth: Main Results

Dependent variable:	Sex ratio at birth		
	(1)	(2)	(3)
ABAD*NFHS-2	0.277***	0.238***	0.227***
	(0.076)	(0.073)	(0.074)
ABAD*NFHS-3	0.494***	0.457***	0.434***
	(0.075)	(0.074)	(0.075)
ABAD	-0.516***	-0.381***	-0.397***
	(0.061)	(0.061)	(0.062)
NFHS-2	-0.009	0.129***	0.122***
	(0.035)	(0.035)	(0.035)
NFHS-3	-0.140***	0.196***	0.194***
	(0.036)	(0.038)	(0.038)
Wealth index		-0.068***	-0.054**
		(0.021)	(0.021)
Rural		-0.020	-0.008
		(0.033)	(0.033)
Education		-0.020***	-0.018***
		(0.003)	(0.003)
Scheduled caste			0.059*
			(0.034)
Scheduled tribe			-0.113
			(0.363)
Hindu			-0.307
			(0.334)
Muslim			-0.199
			(0.341)
Christian			-0.740*
			(0.425)
Sikh			-0.462
			(0.337)
R^2/Adjusted R^2	0.02	0.10	0.10
N	5,722	5,705	5,705
Birth year fixed effects		X	X

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Notes: Data are taken from NFHS-1 (1995), NFHS-2 (2000), and NFHS-3 (2007). OLS with robust standard errors in parentheses. Sex ratio at birth is each female's total male births divided by total female births. ABAD is an indicator variable for program eligibility. NFHS-2 and NFHS-3 are indicator variables for waves 2 and 3 of the survey, respectively. Adjusted-R squared reported whenever birth year fixed effects are included.

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Table 16. ABAD's Effect on Females' Sex Ratio at Birth: Additional Results

Dependent variable: Sex ratio at birth	(1)	(2) Less son-preferring	(3) More son-preferring	(4) Less son-preferring	(5) More son-preferring
ABAD*NFHS-2	0.256**	0.084	0.480***	0.099	0.441***
	(0.088)	(0.116)	(0.137)	(0.104)	(0.110)
ABAD*NFHS-3				0.333***	0.700***
				(0.103)	(0.127)
ABAD	-0.342***	-0.366***	-0.349***	-0.436***	-0.388***
	(0.055)	(0.097)	(0.093)	(0.093)	(0.085)
NFHS-2	0.173***	0.212***	0.104***	0.139***	0.103*
	(0.036)	(0.052)	(0.034)	(0.043)	(0.058)
NFHS-3				0.230***	0.171**
				(0.045)	(0.077)
Wealth index	-0.046*	-0.027	-0.046	-0.062**	-0.016
	(0.025)	(0.031)	(0.042)	(0.025)	(0.039)
Rural	0.027	0.029	-0.022	-0.006	-0.067
	(0.028)	(0.035)	(0.060)	(0.038)	(0.063)
Education	-0.020***	-0.024***	0.004	-0.018***	-0.006
	(0.004)	(0.005)	(0.008)	(0.004)	(0.007)
Scheduled caste	0.038	0.178***	-0.105	0.170***	-0.107**
	(0.048)	(0.040)	(0.077)	(0.045)	(0.053)
Scheduled tribe	-0.710***	-0.626***	-1.087***	-0.042	-0.078
	(0.043)	(0.081)	(0.148)	(0.457)	(0.639)
Hindu	-0.268	-0.348	-0.037	-0.363	-0.217*
	(0.282)	(0.304)	(0.154)	(0.362)	(0.124)
Muslim	-0.168	-0.397	0.219	-0.371	0.102
	(0.299)	(0.311)	(0.191)	(0.371)	(0.162)
Christian	-0.675**	-0.728		-0.704	
	(0.309)	(0.295)		(0.457)	
Sikh	-0.397	-0.489*	-0.119	-0.498	-0.410***
	(0.267)	(0.274)	(0.173)	(0.366)	(0.152)
*Adjusted R*²	0.11	0.13	0.10	0.11	0.09
N	4,112	2,394	1,718	3,607	2,098
Birth year fixed effects	X	X	X	X	X
District fixed effects	X	X	X	X	X

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Notes: Data are taken from NFHS-1 (1995), NFHS-2 (2000), and NFHS-3 (2007). OLS with robust standard errors in parentheses clustered by district whenever

district fixed effects are included. Sex ratio at birth is each female's total male births divided by total female births. ABAD is an indicator variable for program eligibility. NFHS-2 and NFHS-3 are indicator variables for waves 2 and 3 of the survey, respectively. Sample in columns 1-3 contains only females from NFHS-1 and NFHS-2. Christian indicator omitted in samples with no Christians.

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3. AN ECONOMIC ANALYSIS OF MAGNA CARTA

This paper uses the economic approach to self-enforcing constitutions to analyze Magna Carta and uses Magna Carta to evaluate the economic approach to self-enforcing constitutions. We find that Magna Carta in its reissued, but not original, incarnation satisfied each of the conditions necessary for constitutional self-enforcement according to that approach and thus effectively constrained government. Our analysis illuminates Magna Carta's initial failure to constrain government, helps explain its ultimate success in doing so, and furnishes supportive evidence for the economic approach to self-enforcing constitutions.

1. Introduction

England's Magna Carta established a foundation of constitutionally constrained government that remains standing 800 years later. According to the most popular explanation this success, Magna Carta succeeded in constraining government because it coincided with a long period of English government by council (see, for instance, Maddicott 2010). Between 1189 and 1199, under Richard I, who spent much of his reign abroad on crusade or in captivity, and then again after 1216, under Henry III, who did not reach the age of majority until 1227, England was ruled largely by the consent and consensus of nobles, clerics, and courtiers rather than by a king. By the time of Magna Carta (1215-1225), England therefore had significant experience under conciliar

government, magnates were accustomed to participating regularly in the kingdom's governance, and citizens were ready to defend their right to do so.

There is, however, an important problem with this explanation for Magna Carta's success in constraining government: in its original incarnation, Magna Carta abysmally failed to do so. Only 90 days after the Charter of 1215 was solemnized, King John had brushed aside its limits on his authority and England descended again into civil war. It was not Magna Carta in general that succeeded in constraining government, but rather reissued Magna Carta, culminating in the Charter of 1225.

This paper develops an alternative explanation for Magna Carta's (eventual) success in constraining government grounded in economic analysis. We use the economic approach to self-enforcing constitutions to analyze Magna Carta and use Magna Carta to evaluate the economic approach to self-enforcing constitutions. This approach highlights that in order to be enforced at all, constitutions must be self-enforcing, and considers the conditions under which this may be possible (see, for instance, Hardin 1989; Ordeshook 1992; Chen and Ordeshook 1994; Weingast 1995, 1997, 2004; de Figueiredo and Weingast 2005; de Figueiredo, McFaul, and Weingast 2007; Leeson 2011; Mittal and Weingast 2013).

Although the economic approach to self-enforcing constitutions is not homogenous, it broadly suggests the necessity of satisfying three conditions to render a constitution self-enforcing and thus the governmental constraints it promises effective. To be self-enforcing, constitutions must: (1) publicly establish sufficiently clear limits on rulers' authority; (2) reflect mutually beneficial exchanges between rulers and the citizens

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who contract them; and (3) inclusively advance the interests of the citizenry's politically important groups. We elaborate the logic underlying these conditions and ask whether they were satisfied by Magna Carta.

Existing work in the literature on self-enforcing political institutions has analyzed such institutions in the context of, for example, England's Revolution Settlement, the Articles of Confederation, the United States Constitution, the Missouri Compromise, political arrangements in medieval Genoa, and those in contemporary China, Spain, and Russia (see, for instance, North and Weingast 1989; Weingast 1995, 1997, 2004; Greif 1998; de Figueiredo and Weingast 2005; de Figueiredo, McFaul, and Weingast 2007; Mittal and Weingast 2013). No work, however, has used the economic approach to self-enforcing constitutions to analyze Magna Carta. Our paper contributes to this literature by doing so.

The results of our analysis suggest that in its original incarnation, Magna Carta failed to satisfy the conditions necessary for constitutional self-enforcement and thus effective governmental constraints, but that in its reissued form, Magna Carta satisfied each of them. Magna Carta is a complex document with many facets whose history reflects numerous political, economic, legal, religious, and social factors. We do not claim to offer a "complete" picture of Magna Carta or to address all its nuances, nor do we pretend to capture the panoply of forces that contributed to the durability of the governmental constraints Magna Carta established in England. Rather, we provide a single, hitherto neglected, window through which to view and understand Magna Carta's success in this regard. The view through this window helps illuminate Magna Carta's

initial failure to constrain government, helps explain its ultimate success in doing so, and furnishes supportive evidence for the economic approach to self-enforcing constitutions.

2. The Problem of Ruler Promises

Promises rulers make to their citizens to limit their authority are plagued by a simple but critical problem: enforcement. Such promises, which for our purposes may be styled as "contracts" between rulers and citizens, differ from contracts between private citizens in that they cannot be reliably enforced in the typical fashion of the latter—i.e., by a third party with final enforcement authority (Acemoglu 2003). The reason for this is straightforward. Rulers, whose governments are the regular agency of such enforcement for contracts between private citizens, will not enforce contracts between themselves and citizens against themselves when it is in their interest to violate those contracts, which is precisely when enforcement is required. This ruler promise-enforcement problem threatens to render ruler promises to limit their authority non-binding and thus to prevent governmental constraints from being effective.

There is a potential solution to this enforcement problem: promises may be self-enforcing. Self-enforcing contracts do not require the threat of third-party intervention to be enforced. A large literature identifies a variety of mechanisms that may render contracts self-enforcing (see, for instance, Leeson 2007a, 2007b, 2008, 2009, 2013, 2014a, 2014b; Leeson and Suarez 2015).

Foremost among these mechanisms is the "discipline of continuous dealings." If parties to a contract interact indefinitely, the threat of being punished by one's

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counterparty via his refusal to interact with one in the future can induce a party who is contemplating breaking his promise to uphold his promise instead. Under this threat, breaking one's promise today means foregoing the present discounted value of indefinite interactions with his counterparty in the future. Thus, if parties do not discount the future too steeply, upholding one's promise may be more profitable than breaking it.

The discipline of continuous dealings works well for enforcing promises between private citizens (see, for instance, Stringham 2015). However, it is largely ineffective for the purpose of enforcing promises made by rulers to their citizens. The logic underlying the mechanism described above assumes that both parties to a contract can freely exit relations with the other. If one party cannot do so, his counterparty needn't fear the threat of being terminated from future interactions if he breaks his promise, since for the former, refusing future interactions is not an option.

In the context of promises made by private citizens to one another, the mutual free-exit assumption is usually satisfied. In the context of promises made by rulers to citizens, it usually is not. Most citizens cannot credibly threaten to terminate dealings with a promise-violating ruler, since international migration is costly, and historically, many citizens were not internationally mobile at all.

The discipline of continuous dealings' inability to reliably enforce ruler promises is not unique. Nearly all other such mechanisms of self-enforcement identified in the literature suffer related problems (see, for instance, Leeson 2014b). There is, however, an important exception: the threat of coordinated citizen rebellion. Although rulers typically wield more coercive power than any single citizen or group of citizens, collectively,

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citizens may wield more coercive power than rulers. Popular revolutions thus have the potential to depose unpopular rulers, such as those who break their promises to limit their authority. If citizens can credibly threaten to jointly revolt when their ruler breaks his promise, this threat may be sufficient to induce their ruler to uphold his promise instead.

The credibility of such a threat, however, faces a crucial obstacle: collective action. To see this clearly, consider a ruler that has promised his citizens to respect their property rights. For the moment, suppose that keeping his promise serves the ruler's long-run interest by, for instance, incentivizing his citizens to be more productive, but that the ruler's short-run interests are best served by violating his promise, for instance by expropriating his citizens' wealth. If the ruler is impatient, he will be tempted to break his promise to his citizens.

If an insufficient number of groups of citizens rebel against the ruler when he breaks his promise, the ruler is likely to overcome them, squelching the revolt and punishing the rebels. Only if enough groups of citizens rebel together is victory over the ruler likely. The willingness of any given group of citizens to rebel thus hinges on each group's expectation about how other groups of citizens will respond to the ruler breaking his promise. Unless a sufficient number of groups of citizens each expects the others to rebel if the ruler breaks his promise, no group rebels, and, with knowledge that the threat of coordinated citizen rebellion is not credible, an impatient ruler is led to do just that.

There is no inherent reason for groups of citizens to share such an expectation, and two important reasons they probably will not. Different groups of citizens are likely to have different understandings about which specific constraints on the ruler's authority

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are implied by his promise to protect their property rights, and some citizens may not be aware of the ruler's promise at all. If an insufficient number of groups of citizens share a common understanding about whether, in taking some particular action, the ruler has violated his promise, or are even aware of his promise, there can be no shared expectation among them that a sufficient number of such groups will rebel against the ruler in response to a potential breach of his promise.

Heterogeneity of citizen interests presents a related problem. Suppose citizens do in fact share a common understanding about which specific constraints on the ruler's authority are implied by his promise to protect their property rights and that all citizens are aware of this promise. It may nevertheless be true that only some groups of citizens' interests are advanced by those constraints, while the interests of others are not, or are even harmed by them. In this case, if the ruler breaks his promise, groups of citizens whose interests are not advanced by the constraints the ruler's promise entails will be unwilling to rebel along with groups of citizens whose interests are advanced by them. This, too, prevents a shared expectation that a sufficient number of groups of citizens will rebel against the ruler if he fails to keep his word. Without such an expectation, coordinated, and thus potentially successful, rebellion is not possible, preventing the ruler's promise from being self-enforcing.

The collective-action problem of coordinating citizen rebellion is not the only obstacle to rendering rulers' promises to limit their authority self-enforcing. Above we assumed that a ruler's promise to limit his authority is harmful to his interest in the short run, but beneficial to his interest in the long run. However, if even the long-run interest of

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the ruler is not served by his promise to limit his authority, it is unlikely that he will be willing to uphold his promise even if the threat of coordinated citizen rebellion is credible and thus he expects probable deposition if he breaks his word. Such may be the case if, for example, a ruler's promise strips him of sufficient authority to render him under its terms a ruler in name only, or if it prevents him from being a ruler long enough to reap any long-term benefits from constraining his authority. Promises that restrict a ruler's authority too severely reduce his expected payoff of upholding them and retaining his position below that of breaking them and risking probable deposition.

Given that no ruler would voluntarily choose to make promises that restrict his authority to this extent in the first place, it may seem peculiar to consider such a possibility an obstacle to rendering ruler promises self-enforcing. However, when citizens have overcome the collective-action problem of coordinated rebellion considered above, they wield significant, and often superior, coercive power, making citizen coercion, or "extortion," of rulers possible. Under citizen compulsion a ruler may be willing to make promises to limit his authority that do not serve even his long-term interest, if only to live to "rule another day" for the opportunity to clash with his rebelling citizens on terms relatively more favorable (though in absolute terms, still unfavorable) to his victory.

A final problem of rendering ruler promises self-enforcing relates to heterogeneous understandings about the particular limits on the ruler's authority his promise implies, not among citizens, but between citizens and ruler. If a ruler and his citizens differ in such understandings, the ruler may inadvertently break his word, or at least is likely to find himself at odds with his citizens regarding whether he has broken

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his word or not. If the ruler and his citizens can come to a common understanding of what the ruler's promise entails, this problem may be averted. If they cannot, however, the result will be warfare or the ruler simply following his will. Such may be the case if, for example, the interpretation citizens insist on yields the ruler a lower expected payoff than hazarding a coordinated citizen rebellion in the event that citizens have overcome the collective-action problem such rebellion confronts, or merely a lower expected payoff than following his will in the event they have not. In either case the ruler's promise will not be self-enforcing and thus will fail to constrain government.

3. The Economic Approach to Self-Enforcing Constitutions

The economic approach to self-enforcing constitutions suggests the conditions that ruler promises to limit their authority must satisfy to be self-enforcing and thus to effectively constrain government (see, in particular, Mittal and Weingast 2013; see also, for instance, de Figueiredo and Weingast 2005; de Figueiredo, McFaul, and Weingast 2007; Weingast 1995, 1997, 2004). A "constitution" for our purposes refers to any agreement between political rulers and their citizens containing promises relating to, and with the purpose of circumscribing, the former's governance authority—i.e., establishing governmental constraints. The conditions the economic approach identifies as necessary for constitutional self-enforcement are threefold.

The first is the clear-and-public condition: to be self-enforcing, a constitution must publicly establish sufficiently clear limits on government's authority.[49] The clear-

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[49] Given the cost of (constitutional) contracting, which is increasing in efforts to render contractual terms clearer, perfectly clear limits on government's authority are not possible. Some degree of vagueness is therefore unavoidable, which is why we refer to "sufficiently clear" limits on government's authority—

and-public condition ensures that rulers' constitutional violations are common knowledge among citizens. Self-enforcing constitutions generate such knowledge in two ways. First, they identify specifically which relevant actions are or are not prohibited or permitted to rulers. When such promises are specific, it is less likely that different groups of citizens will have different understandings about when an enforcement response is or is not warranted, facilitating coordinated rebellion in the event of constitutional violation. Second, self-enforcing constitutions render the specific limits on ruler authority they prescribe parts of public agreements. The public status of self-enforcing constitutions permits the entire citizenry's awareness of the ruler's particular promises, again facilitating coordinated rebellion in the event of constitutional violation. Equally important, the clear-and-public condition ensures that rulers share citizens' understanding about which governmental behaviors qualify as constitutional violations and which do not. This prevents interpretive disagreements that may lead to ruler-citizen conflict, or otherwise lead rulers to violate their constitutional promises as understood by citizens.

The second condition necessary for constitutional self-enforcement is the mutual-benefits condition: to be self-enforcing, a constitution must reflect mutually beneficial exchanges between rulers and the citizens who contract them. The mutual-benefits condition ensures that both parties to constitutional agreement expect to benefit from that agreement's terms. When constitutions reflect mutually beneficial exchanges, the groups of citizens who contract them value what they receive from constitutional creation— specific governmental constraints—more than what they give up in exchange for those

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limits clear enough to create common knowledge among citizens, and among citizens and ruler, about when the ruler has broken or kept his promise.

constraints—agreement to permit the ruler to retain his position so long as he does not violate their agreement. Likewise, rulers value what they receive from constitutional creation—the ability to retain their position provided that they do not violate the agreement—more than what they give up in exchange for that ability—specific types of authority. Such mutual benefits are crucial, since, if one or both parties does not believe it benefits on net from the agreement, the agreement cannot be self-enforcing. If the groups of citizens who contract the agreement do not believe it benefits them on net, the constitution needn't prevent them from rebelling even when the ruler upholds it. And if the ruler does not believe the agreement benefits him on net, he may be willing to accept the risk of deposition rather than abide by the constitution.

The final condition necessary for constitutional self-enforcement is the inclusivity condition: to be self-enforcing, a constitution must inclusively advance the interests of the citizenry's politically important groups. The inclusivity condition ensures that it is in the interest of each of the groups of citizens whose participation in rebellion is required to potentially overcome the ruler to rebel when the ruler violates the constitution if they expect the other groups of such citizens to do so. When the groups of citizens who contract a constitution with the ruler include each of the groups of citizens whose participation is needed for potentially successful rebellion, the inclusivity condition is satisfied, *ipso facto*, when the mutual-benefits condition is satisfied. Since the mutual-benefits condition requires that the groups of citizens who forge constitutional agreement with the ruler benefit on net from that agreement, if those groups include all whose participation is required for potentially successful rebellion, it is in the interest of each of

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the those groups to participate in rebellion when the ruler violates the constitution provided that each expects the others to do so as well.

It remains possible, however, and indeed is likely, that not all groups of citizens whose participation in rebellion is required for potential success will in fact be party to constitutional creation. When this is the case, to enable potentially successful rebellion in the event of ruler transgression, the constitution must contain provisions that advance the interests of such groups that are not party to its creation. If the constitution is not inclusive in this manner, the group or groups of citizens whose participation is required for potentially successful rebellion, but whose interests the constitution does not advance, cannot be relied on to rebel in conjunction with the groups of citizens whose interests the constitution does advance when the ruler violates the constitution. In contrast, if the constitution inclusively advances the interests of all groups of citizens whose participation is required for potentially successful rebellion, then all such groups of citizens will find it in their interest to rebel when the ruler violates the constitution provided that each expects the others to do so as well.

A constitution that satisfies the foregoing three conditions consists of ruler promises that overcome each of the problems of ruler-promise enforcement discussed above and thus may effectively constrain government: such a constitution is self-enforcing. A self-enforcing constitution serves the long-run interest of the ruler such that he would rather respect the limits on his authority it promises than risk deposition if citizens can credibly threaten to jointly rebel against him when he violates it. Equally critical, such a constitution coordinates citizen rebellion in the event that the ruler violates

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those limits, enabling them to credibly threaten joint rebellion, and thus to probabilistically depose the ruler. A self-enforcing constitution facilitates this coordination by (1) creating common knowledge among groups of citizens about when the ruler has violated the constitution, (2) rendering it in the interest of each group of citizens whose participation in rebellion is required for potential success to see the constitution enforced, and, through accomplishing both of the former, (3) creating a shared expectation among those groups that the others will rebel if the ruler violates the constitution, which in turn makes it rational for each such group to itself rebel in this event.

In a similar manner, a constitution that satisfies the foregoing three conditions creates common knowledge among groups of citizens about when the ruler complies with the constitution, and, when these conditions are satisfied, no group of citizens has an interest in deposing a ruler who does so. The ruler under a self-enforcing constitution consequently expects coordinated citizen rebellion and thus probable deposition if he violates the constitution, and expects no citizen rebellion and thus to retain his position if he upholds the constitution, leading him, as long as he wishes to retain his position, to respect the governmental constraints the constitution promises.

4. Magna Carta: A Self-Enforcing Constitution?

The sequence of events that directly precipitated Magna Carta are well known. Between 1199 and 1216, England was ruled by King John Lackland. Largely to finance two failed wars with France—one that resulted in England's loss of Normandy in 1204, and another that resulted in its loss of Flanders in 1214—John levied heavy taxes on his

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barons, who saw little value in the king's foreign expeditions and to which they had not consented. "Unjust" taxation was not the barons' only complaint against the king, however. They objected also to what they considered his abuse of the court system, legal punishments, property seizures, forest administration, and a host of other royal policies, each employed by John also to assist in raising royal revenues, which unduly deprived the barons of what they viewed as their ancient rights and liberties.

In 1215 the barons rebelled. They renounced fealty to the king and seized control of London, where they found ready urban allies in their grievances against John. The result of this revolt was a meeting at Runnymede where John was compelled to accept a charter—the original Magna Carta—promising to redress the barons' grievances and to limit his authority accordingly.

The Charter of 1215 contained 63 chapters that addressed these limits, ranging from the king's power to raise taxes and administer justice, to his power to compel the building of bridges and forcibly remarry widows. Among them featured several "special" clauses, which, as we discuss below, in time would prove critically important to 1215 Charter's fate. Two such clauses required the king to restore to his citizens any property he had unjustly seized from them (chapters 52 and 55). Another established a court of 25 barons to arbitrate disputes between the king and his subjects arising from the restoration of seized property, whose members were to be selected by the barons themselves, and, in an unprecedented move, empowered the baronial court to distrain the king's property in the event of his failure to uphold the Charter's terms (chapter 61). In exchange for the

1215 Charter, the barons agreed to renew their pledges of homage and fealty to the king, lay down their arms, and return London to royal control.

4.1. The Charter of 1215

The Magna Carta of 1215 was a failure. Almost immediately the governmental constraints it promised proved ineffective. Just three months after Runnymede, the barons were accusing John of violating his promises under the new agreement, and the king and his subjects had resumed war.[50]

The economic approach to self-enforcing constitutions suggests that this failure reflected the 1215 Charter's failure to satisfy at least one of the three conditions necessary for constitutional self-enforcement. An examination of that Charter's features supports this suggestion. Although the 1215 Charter satisfied the inclusivity condition, it failed to satisfy both the clear-and-public and mutual-benefits conditions.

Magna Carta—from its first incarnation to its last—protected the rights and liberties of a remarkably inclusive segment of England's medieval citizenry. This degree of inclusivity stands in contrast to a charter that could have protected the rights and liberties of only a small segment of the citizenry, for instance nobles alone, which

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[50] The original incarnation of Magna Carta was not the only early thirteenth-century English royal charter that failed to be self-enforcing. In 1201 John confirmed a charter (originally created by Henry I) granting England's small but economically important Jewish community rights and liberties, including the right to hold land of the king, to own moveable property, and the liberty to inhabit and move freely about the kingdom: the so-called "Charter of the Jews of England." However, in 1290 Edward I broke this charter's promise and expelled the Jews from England. The economic approach to self-enforcing constitutions suggests the reason the Jewish charter was not self-enforcing: it did not satisfy the inclusivity condition, benefiting only one small group of citizens—England's Jews. Edward I was therefore not only able to break the promises the charter contained, he was in fact asked to do so by baronial interests in exchange for the latter's consent to a new royal tax (peculiarly testifying to the reissued Magna Carta's successful self-enforcement, which we discuss below). See, for instance, Prestwich (1997).

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Holt (1992), for example, suggests was the case among charters granted by medieval kings to their subjects in many places in continental Europe.

"This comprehensive quality of Magna Carta was revealed in many different ways" (Holt 1992: 276). For instance, while contracted chiefly by England's barons, the limits on royal authority the Charter of 1215 promised advanced the interests of each of England's politically important citizen groups—those whose participation in rebellion, should it come to that, would facilitate rebellious success: the barons, the clergy, the knights, and the towns. Chapter 21 of the Charter, for example, promised that "Earls and barons shall be fined only by their equals, and in proportion to the gravity of their offence," benefiting barons. Chapter 1 promised "that the English Church shall be free, and shall have its rights undiminished, and its liberties unimpaired," benefiting clergy. Chapter 2 promised to limit the maximum "inheritance tax" (feudal relief) owed by a knight's heir to the king upon a knight's death, benefiting knights. And chapter 13 promised that "The city of London shall enjoy all its ancient liberties and free customs, both by land and by water," benefiting towns.

Still more inclusively, Magna Carta explicitly promised to protect and advance the interests of, as chapter 1 of the 1215 Charter put it, "all free men of our kingdom." And many of the Charter's provisions stood to benefit this broad class of citizens rather than any one group of citizens in particular. Chapter 9, for instance, promised to limit the king's power to seize land in payment for monies owed him. Chapter 20 promised to limit the king's power to fine free men. Chapter 28 promised to limit the king's power to take citizens' moveable goods without compensation. Chapter 36 promised to limit the

king's power to charge for writs of inquisition of life or limbs. Chapter 38 promised to limit the king's power to try persons solely on the unsupported word of a royal official. And chapter 39 promised to limit the king's power to imprison or seize the property of free men without due process.

Some provisions in the 1215 Charter went further yet in advancing the interests of a broad base of England's citizenry. Chapter 20, for example, promised limits on the king's power to fine villeins, and chapter 60 encouraged "all men of our kingdom, whether clergy or laymen," to respect all Charter-promised protections and liberties "in their relations with their own men." As Holt (1992: 278) points out, "Magna Carta then assumed legal parity among all free men to an exceptional degree . . . . The documents of 1215 assumed that the liberties at issue were to be held by a community, not by a series of individuals of this or that status, but by the realm."

As evidenced by the success of the revolt against John in 1215 that led to the Charter of the same year, the collective-action difficulties of coordinating citizen rebellion had, at least at this point in time, been overcome by the rebels and thus did not present an obstacle to overwhelming the king.[51] The revolting barons calculated correctly in 1215 that their joint rebellion would, perhaps with support from townsmen in London, be sufficient to corner John. At the same time, the extensive inclusivity of the 1215 Charter suggests that the barons were keenly aware that the potential success of future citizen rebellions, should the king fail to uphold the Charter, hinged on incentivizing the

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[51] The Charter of Liberties, granted by Henry I in 1100, may have assisted in facilitating this coordination. The governmental constraints this Charter promised, while it seems not enforced, appear to have furnished John's rebelling barons with some foundation for a shared understanding of their "ancient rights and liberties" and thus perhaps for a shared expectation of joint rebellion given the behavior of John's government.

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response of a larger number of citizen groups. This awareness is also suggested by, for example, chapter 61 of the Charter, which promises "public and free permission" to "Any man who so desires" to "take an oath to obey the commands of the twenty-five barons for the achievement of these ends, and to join with them in assailing [the king if he does not comply with the Charter] to the utmost of his power."

Thus "The barons did not talk of free men" in Magna Carta "out of loftiness of purpose, or make concessions to knights and burgesses out of generosity. They did so because the political situation required it" (Holt 1992: 295). By including provisions in the 1215 Charter that advanced the interests of England's politically important citizen groups, each of which in consequence stood to benefit from the Charter's enforcement, on this dimension at least, the barons at Runnymede maximized the potential success of future citizen rebellions against the king should he fail to comply with the Charter, and thus the credibility of the threat of coordinated rebellion as a means of enforcing Magna Carta.

Despite inclusively advancing the interests of England's most important groups of citizens, the Charter of 1215 failed to satisfy the other two conditions necessary for a self-enforcing constitution: that Charter neither publicly established sufficiently clear limits on royal authority, nor did it reflect a mutually beneficial exchange between the king and its baronial contractors.

Although many of the governmental constraints the 1215 Charter promised were sufficiently precise and detailed, other important provisions were ambiguous and uncertain. Particularly problematic in this regard were the clauses

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promising to limit the king's power over the forest—a long-standing point of contention between the king and the barons—and those relating to royal restitution of unjustly seized property. Chapter 48 of the 1215 Charter, for example, promised investigation and abolition of "All evil customs" of royal administration of forests, but, critically, failed to define which specific administration practices were "evil." More seriously still, chapters 52 and 55 of the 1215 Charter, which promised the restoration of property and money "unjustly" seized by the king, failed to define what specific features might render property and monies previously seized "unjust," referring that question instead to the Charter-created court of 25 barons, which, as we consider below, led to its own problems.

These important ambiguities in the 1215 Charter left much room—too much room—for conflicting interpretations. While, among themselves, the barons may have shared an understanding about what the 1215 Charter's ambiguous provisions promised, this understanding was most definitely not shared by the king. Such provisions' opacity permitted the barons to maintain that John had not fulfilled his promises per Magna Carta, in particular the return of unjustly seized property, and permitted John to maintain that the rebels had not fulfilled theirs, in particular the payment of baronial monies due him now that the barons were again his lieges. In large part "The Charter failed to produce lasting peace in 1215 just because" of the ambiguous provisions' "looseness of phrasing," which "hid a real and irreconcilable difference of interpretation" (Holt 1992: 7). Thus instead of creating peace, the Charter contributed to the renewal of civil war.

Though not as important as the 1215 Charter's lack of clarity at crucial junctures, the publicity of this Charter was also impaired. While the intent was for the

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Charter to be publicized throughout the kingdom by having copies sent to and publicly read in each of England's counties, distribution problems prevented the Charter from reaching more than a handful of communities. As a result, "accurate knowledge of the [1215] Charter itself" was "rare," and most Englishmen "knew very little of [its] contents" (Holt 1992: 355).

Nor did the Charter of 1215 reflect a mutually beneficial exchange between the king and the barons who contracted it. The agreement forged at Runnymede reflected an exchange—the former receiving the barons' renewed homage and the return of London to royal control in return for limits on his authority, and the latter receiving limits on the former's authority in return for renewing homage to the king and surrendering London to him—but it was not mutually beneficial. The reason for this simple enough: the terms of trade the 1215 Charter reflected were negotiated under baronial coercion, which was then holding John's capital hostage. Indeed, when Pope Innocent III annulled the Charter of 1215, he did so citing this very reason.

The result was a Charter that stood to benefit barons and other English citizens substantially, but whose only benefit for the king was immediate reprieve from baronial coercion. This is perhaps most apparent in chapter 61 of the 1215 Charter, which, as discussed above, created a court of 25 barons—selected by the rebelling barons themselves—empowered to distrain the king's property should the court find him in violation of the Charter. This clause, which effectively gave the barons final authority over the king, is not one any medieval king seeking to remain as much in anything but name would agree to voluntarily. Given this situation, "it was easy enough for John . . . to

regard the Charter as an . . . act of extortion," which is precisely what he did (Holt 1992:

236). The Charter of 1215, extracted from John under baronial compulsion, led to an

agreement whose terms were so unfavorable to the king that he was willing to risk

renewed rebellion and thus deposition rather than upholding the Charter under the

barons' terms. It is therefore hardly surprising that, following the meeting at Runnymede,

as soon as John felt strong enough, he began resisting and then refusing to comply with

the Charter.

4.2.   The Charters of 1216, 1217, and 1225

In 1216 King John died, leaving the kingdom and its ongoing rebellion to his

nine-year-old son, Henry III, whose guardianship was entrusted to William Marshal, a

prominent English knight.[52] In an attempt at conciliation, later that year, Henry, still a

child, reissued Magna Carta under the seals of Marshal and Guala Bicchieri, the papal

legate to England, but in a form that purged the Charter of several of its critically

problematic provisions. Chief among these was chapter 61, which established the

baronial court of 25, and chapters 52 and 55, which required the restoration of property

unjustly seized by John. Further efforts were now also undertaken to publicize the new

Magna Carta. "Instructions were issued on the occasion of" the 1216 Charter's reissue,

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[52] Given the common explanation for Magna Carta's success in constraining government grounded in England's experience with government by council, discussed above, one might wonder whether John's death and the entrusting of Henry III's guardianship, and thus the kingdom, to Marshal was the reason a self-enforcing charter was subsequently agreed to. The answer is no. If the reason reissued Magna Carta was enforced was that Marshal, a noble, had an interest in a charter that advanced nobles' interests against the king, one would expect a Magna Carta reissued under his guardianship to advance such interests further, or at least not to curtail them for the king's benefit. In fact, however, "Marshal's Magna Carta" did just the opposite. As we discuss below, reissued Magna Carta did away with the provisions found in the original Charter that most benefited nobles at the king's expense.

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and on its subsequent reissues discussed below, "that the Charters should be read in full county court" (Holt 1992: 400).

The rebels rejected the 1216 concession. However, in 1217, facing likely defeat by royal forces, they agreed to a slightly modified version of the 1216 Charter, offered again under seals of Marshal and the papal legate, ending the civil war. Crucially, like the 1216 issue, the 1217 Charter did not contain the problematic clauses of 1215 relating to the court of 25 barons and the restoration of property unjustly seized by Henry's father. In addition, the 1217 Charter, or rather a supplementary document created to accompany it—the so-called "Charter of the Forest"—imperfectly, but acceptably, resolved the other significant ambiguities of the 1215 version: those relating to the king's regulation of the forest. This supplementary Charter "carried the regulation of the forest law far beyond anything considered or even suggested in any of the earlier documents" (Holt 1992: 385).

Eight years later in 1225, Magna Carta was reissued a final time, and under importantly different circumstances that reflected not baronial demands amidst civil war, but a kingly request amidst domestic peace. In 1224 Louis VIII invaded England's remaining lands in France, and Henry required an army to defend them. To fund this army, Henry turned to his barons, who agreed to finance the defense if Henry would reissue Magna Carta and the Charter of the Forest under the royal seal, which Henry, now old enough to do so, did "spontaneously and of [his] own free will," as the 1225 Charter was careful to note. After 1225, Magna Carta was reconfirmed by several English kings through the reign of Edward I, but in unaltered form.

Magna Carta's reissues, culminating in the Charter of 1225, resolved the deficiencies of the 1215 Charter that prevented it from satisfying two of the three the conditions necessary for constitutional self-enforcement: the clear-and-public and mutual-benefits conditions. Like the 1215 Charter, Magna Carta's reissues inclusively advanced the interests of England's politically important citizen groups. The 1225 Charter, for instance, reiterated that it was a grant to "the archbishops, bishops, abbots, priors, earls, barons, and all of our kingdom." However, unlike the 1215 charter, Magna Carta's reissues publicly established sufficiently clear limits on royal authority and reflected a mutually beneficial exchange between the king and his subjects.

"In each case" of the Charter's evolution between 1216 and 1225, "there was a marked trend towards legal precision, towards noting exceptions, plugging holes, and covering foreseeable eventualities" (Holt 1992: 289). Most critically, Magna Carta's reissues jettisoned the troublesome retrospective property restitution clauses of the 1215 issue and resolved the ambiguous clauses regulating forest administration through the Charter of the Forest, which were largely responsible for the interpretive conflicts between the king and barons. Additionally, "every step was taken to make sure that the texts were known" (Holt 1992: 401). Thus Magna Carta's reissues were effectively publicized throughout the realm.

Equally important, unlike the Charter of 1215, which had been extracted from John coercively and provided for a court of 25 barons empowered to distrain the king, rendering it negative value to the king, the Charter of 1225 was initiated and entered freely by Henry and did away with the baronial court so detrimental to the king's interest,

reflecting a mutually beneficial exchange. The result was a self-enforcing Magna Carta—
one that satisfied not only the inclusivity condition, but also the clear-and-public and
mutual-benefits conditions—and thus a Magna Carta capable of effectively constraining
government.

5.   Conclusion

Our economic analysis of Magna Carta leads to several conclusions. First, the
economic approach to self-enforcing constitutions helps explain Magna Carta's initial
failure to constrain government. Although the Charter of 1215 satisfied the inclusivity
condition necessary for constitutional self-enforcement and thus effective governmental
constraints, that Charter failed to satisfy the two other conditions necessary for as much:
the clear-and-public condition and the mutual-benefits condition. The ambiguity of
important clauses of the 1215 Charter led almost immediately to conflicting royal and
baronial interpretations of the 1215 agreement, which ultimately contributed to the
resumption of civil war. Moreover, the fact that the 1215 Charter was extorted from John
by its contracting barons led to a Charter with negative value to the king, giving him little
reason to respect the limits on his authority the agreement promised and leading him to
violate those promises instead.

Second, and equally important, the economic approach to self-enforcing
constitutions helps explain Magna Carta's ultimate success in constraining government.
The reissued Charters of 1216, 1217, and finally 1225 incrementally addressed the
deficiencies of the original Charter by clarifying or jettisoning the interpretively
problematic clauses of the original version, as well as purging those parts most damaging

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to the king's interest, while retaining the original Charter's inclusivity. The final reissue of Magna Carta, which was voluntarily contracted by the king, thus satisfied all three conditions necessary for constitutional self-enforcement, enabling it to effectively constrain government.

Finally, our analysis of Magna Carta furnishes supportive evidence for, and suggests the usefulness of, the economic approach to self-enforcing constitutions. The failed Magna Carta of 1215, which did not durably constrain government, did not satisfy two of the three conditions suggested as necessary for constitutional self-enforcement according to the economic approach to self-enforcing constitutions. In contrast, the successful Magna Carta of 1225, which did durably constrain government, satisfied all the conditions suggested as necessary for constitutional self-enforcement according to that approach. The evidence from Magna Carta, both in 1215 and its reissued forms, is therefore consistent with, and supportive of, the implications of the economic approach to self-enforcing constitutions.

Appendix A. Distribution of Ages at Menarche and First Marriage

State	Cohort													
	23-26		27-30		31-34		35-39		40-44		45-49		All	
	CB	AB	CB	AB	CB	AB	CB	AB	CB	AB	CB	AB	CB	AB
All India	14.39	13.66	14.36	13.68	14.20	13.70	14.38	13.73	14.50	13.71	14.36	13.74	14.34	13.66
	12.41	16.96	12.50	17.19	12.36	17.24	12.36	17.10	12.31	16.85	12.20	16.76	12.37	16.84
	4.87		5.98		6.15		7.68		8.53		9.62		6.49	
Andhra Pradesh	18.09	13.18	15.00	13.11	13.20	13.15	15.93	13.19	14.71	13.19	14.67	13.27	15.12	13.14
	13.00	15.52	13.00	15.44	11.87	15.58	12.40	15.34	11.57	15.09	11.78	14.94	12.30	15.30
	1.77		1.34		3.69		2.85		2.02		3.09		2.08	
Arunachal Pradesh	15.00	12.90	14.00	12.90	14.00	12.99		13.01		13.08		13.34	14.33	12.96
	12.00	17.40	11.00	17.72	13.00	18.13		18.25		18.77		19.63	12.00	17.76
	0.80		0.65		1.20		0.00		0.00		0.00		0.42	
Assam	12.96	12.75	12.79	12.83	14.00	12.70	12.71	12.82	14.15	12.80	12.89	12.79	13.52	12.75
	11.92	16.62	11.40	17.37	12.35	17.16	11.57	17.27	12.19	16.76	11.44	16.77	12.14	16.71
	1.90		0.83		2.97		1.25		3.04		2.66		1.90	
Bihar	13.54	13.27	13.65	13.25	13.79	13.27	14.07	13.22	13.60	13.23	13.66	13.23	13.69	13.24
	11.42	16.59	11.83	16.67	11.82	16.55	11.93	16.65	11.67	16.21	11.63	15.98	11.69	16.36
	5.95		8.51		8.35		8.53		9.85		14.23		7.95	
Goa	14.00	13.64	13.50	13.81	13.00	13.70	17.50	13.74	15.23	13.65	15.20	13.66	15.22	13.69
	12.00	20.18	12.00	21.56	11.25	21.71	13.83	21.19	13.46	20.22	13.50	20.52	13.24	20.78
	0.32		0.45		1.01		1.08		2.74		4.61		1.68	
Gujarat	16.79	14.30	15.27	14.35	15.50	14.41	15.30	14.41	16.13	14.36	15.40	14.40	15.55	14.35
	14.43	18.10	13.93	18.18	14.00	18.47	13.30	17.95	14.13	18.04	13.73	17.68	13.84	17.97

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State														
Haryana	15.43 13.93	14.25 17.31	15.04 14.04	14.21 17.30	15.30 14.10	14.13 17.15	15.51 14.26	14.24 17.21	15.11 13.75	14.29 17.31	15.50 14.50	14.29 17.43	15.27 14.01	14.19 17.12
	2.73	2.64	2.57	3.13	3.08	3.29	3.70	2.02	7.12	5.48	2.96	4.52	3.34	3.29
Himachal Pradesh	16.32 14.92	14.90 18.48	15.00 18.29	14.92 13.24	15.73 14.13	14.81 17.92	16.21 13.91	14.83 17.56	15.16 13.15	14.92 17.38	15.75 12.89	14.80 17.09	15.60 13.63	14.89 17.88
	4.25		7.50		11.01		11.54		15.21		12.74		8.97	
Jammu	14.75 13.25	14.37 18.87	15.14 14.14	14.30 18.64	14.17 13.17	14.19 18.22	14.55 13.40	14.07 17.22	14.59 13.41	14.06 16.88	15.88 14.76	14.06 17.13	14.81 13.67	14.19 17.86
	1.34		1.98		2.14		4.60		5.31		4.71		2.75	
Karnataka	13.50 11.75	13.54 16.56	13.60 12.40	13.54 16.96	12.00 11.00	13.54 17.12	13.67 12.33	13.69 16.91	13.00 11.50	13.59 16.69	14.00 13.00	13.77 16.80	13.73 12.36	13.53 16.59
	0.67		0.76		0.21		0.58		0.51		0.63		0.59	
Kerala	14.30 12.90	14.25 19.12	14.95 13.26	14.26 19.73	16.67 15.07	14.38 20.30	15.62 13.90	14.30 19.92	16.34 14.34	14.51 19.62	15.79 14.13	14.47 19.46	15.73 14.03	14.31 19.48
	1.82		2.97		2.81		4.34		5.56		5.99		3.70	
Madhya Pradesh	13.97 12.12	13.62 16.22	14.10 12.15	13.69 16.29	13.91 12.09	13.69 16.15	14.41 12.43	13.71 16.25	14.51 12.31	13.55 15.89	14.15 12.04	13.75 16.38	14.19 12.22	13.63 16.09
	10.13		10.08		11.97		13.59		13.13		13.00		11.58	
Maharashtra	14.46 12.79	13.52 16.56	14.09 12.52	13.52 16.94	13.25 11.71	13.47 16.87	13.71 11.98	13.51 16.74	13.89 12.11	13.49 16.48	13.81 12.12	13.39 15.95	13.79 12.17	13.48 16.44
	4.11		6.41		5.25		7.41		7.20		8.67		5.83	
Manipur	15.00 13.44	13.55		13.48	13.46	13.41	17.00 13.48		13.46		13.41		16.00 13.48	

State	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
Meghalaya	14.00 18.78 0.79	19.30 0.00	20.71 0.00	16.00 20.20 0.77	19.82 0.00	19.38 0.00	15.00 19.50 0.25
Mizoram	16.00 15.00 13.88 18.35 0.64	13.78 18.88 0.00	13.72 18.02 0.00	15.00 12.50 13.98 19.18 1.83	14.00 12.50 13.78 18.91 2.00	13.00 12.00 14.31 20.23 0.96	14.57 12.86 13.88 18.61 0.84
Nagaland	14.69 19.67 0.00	14.79 20.41 0.00	16.00 15.00 14.91 20.48 1.16	24.00 21.00 14.91 20.94 0.00	14.89 20.96 0.00	14.96 21.36 0.00	16.00 15.00 14.82 20.44 0.12
New Delhi	14.50 13.50 13.61 19.08 1.21	13.80 19.07 0.00	14.00 12.00 13.90 18.98 1.96	15.22 13.22 14.05 19.10 0.66	13.75 19.53 0.00	13.92 20.27 0.00	18.50 15.00 13.82 19.33 0.65
Orissa	14.73 13.13 14.04 18.39 2.79	15.33 13.33 14.08 18.90 3.15	15.27 13.67 14.02 18.96 3.47	15.22 13.22 14.05 19.10 3.93	15.67 13.83 14.07 18.74 5.52	15.18 13.55 13.93 18.19 6.88	15.20 13.43 14.04 18.59 3.94
Punjab	14.00 13.00 13.28 17.18 0.20	12.00 11.00 13.33 16.98 0.27	14.29 12.72 13.33 16.85 0.74	14.85 12.54 13.23 16.18 1.54	14.75 11.75 13.18 15.93 1.11	13.98 12.98 13.26 15.92 0.68	14.83 12.78 13.26 16.54 0.64
Rajasthan	14.24 18.98 0.00	13.67 14.33 12.67 19.19 0.68	14.50 12.00 14.17 19.01 0.49	14.56 12.56 14.15 18.91 1.80	19.57 14.86 14.21 18.76 2.05	14.27 18.64 0.00	15.96 13.30 14.22 18.84 0.87
	14.82 12.75 14.28 16.95 19.22	14.92 12.82 14.14 16.66 16.52	14.83 12.78 14.17 16.87 20.37	14.78 12.71 14.19 16.78 18.00	14.93 12.81 14.05 17.13 15.88	15.33 12.91 14.26 17.05 17.89	14.88 12.83 14.16 16.70 17.40

For each state, the first row contains average age at menarche, the second contains average age at first marriage, and the third contains the percentage of child brides.

Tamil Nadu

	C1	C2	C3	C4	C5	C6	C7
Menarche (AB)	14.06	14.09	14.23	14.11	14.14	14.17	14.10
Marriage (AB)	18.02	18.16	18.46	18.28	17.44	16.92	17.77
Menarche (CB)		16.00	15.00	13.50	17.25	15.20	15.69
Marriage (CB)		13.75	9.00	12.50	15.00	14.00	13.69
% child brides	0.00	0.75	0.22	0.38	0.86	1.51	0.47

Tripura

	C1	C2	C3	C4	C5	C6	C7
Menarche (CB)	13.17	13.33	13.67	14.23	14.21	14.45	14.09
Marriage (CB)	11.83	12.33	11.67	12.46	12.57	12.91	12.55
Menarche (AB)	13.53	13.67	13.74	13.97	13.66	14.33	13.67
Marriage (AB)	17.00	17.45	19.15	17.95	16.40	17.42	17.28
% child brides	4.48	3.75	2.78	8.55	13.59	13.10	6.19

Uttar Pradesh

	C1	C2	C3	C4	C5	C6	C7
Menarche (CB)	14.51	14.78	14.65	14.75	14.62	14.69	14.65
Marriage (CB)	12.84	12.78	12.98	12.99	12.74	12.66	12.81
Menarche (AB)	13.81	13.77	13.79	13.82	13.80	13.72	13.78
Marriage (AB)	17.03	17.10	16.88	16.83	16.69	16.70	16.79
% child brides	5.39	9.64	8.31	10.56	10.37	12.24	8.49

West Bengal

	C1	C2	C3	C4	C5	C6	C7
Menarche (CB)	13.45	13.51	13.56	13.58	14.00	13.84	13.69
Marriage (CB)	11.47	11.82	11.24	11.31	11.26	11.11	11.37
Menarche (AB)	13.32	13.36	13.52	13.59	13.37	13.46	13.39
Marriage (AB)	16.55	17.23	17.09	16.95	16.56	17.01	16.60
% child brides	7.36	7.60	11.32	18.67	26.19	26.25	12.82

Notes: Data from NFHS-1 (1995). For each state, the first row contains average age at menarche, the second contains average age at first marriage, and the third contains the percentage of child brides (ever-married females who began cohabitation before reaching puberty). Columns "CB" present data for child brides; columns ("AB") present data for postpubescent brides; column "All" presents data for all ever-married females (ages 13–49).

Appendix B. Variable Descriptions

Variable	Description
Age:	
Cohort	Age group of which an individual used in our data is a member, scaled from 1 to 6 where: 1 = 23-26 years; 2 = 27-30 years; 3 = 31-34 years; 4 = 35-39 years; 5 = 40-44 years; 6 = 45-49 years. Data source: NFHS-1 (1995).
Birth year	Table 6: Bride's year-of-birth. Data source: REDS (1999). Table 8: Wife's year-of-birth. Data source: NFHS-1 (1995). Table 9: Average year-of-birth for individuals in a state. Data source: Census of India (1991).
Caste and Tribe:	
Other backward caste	Indicator variable that equals one if a bride's father belongs to other backward caste and zero if he does not. Data source: REDS (1999).
Scheduled caste	Table 6: Indicator variable that equals one if a bride's father belongs to a scheduled caste and zero if he does not. Data source: REDS (1999). Table 8: Indicator variable that equals one if an ever-married female belongs to a scheduled caste and zero if she does not. (NFHS-1 reports scheduled-caste status for household heads only. In constructing our data, we assign that status to every member of a household). Data source: NFHS - 1 (1995).
Scheduled caste (%)	Percentage of individuals in a state-cohort who belong to a scheduled caste. Data source: NFHS -1 (1995).
Scheduled tribe	Table 6: Indicator variable that equals one if a bride's father belongs to a scheduled tribe and zero if he does not. Data source: REDS (1999). Table 8: Indicator variable that equals one if an ever-married female belongs to a scheduled tribe and zero if she does not. (NFHS-1 reports scheduled-tribe status for household heads only. In constructing our data, we assign that status to every member of a household). Data source: NFHS - 1 (1995).
Scheduled tribe (%)	Percentage of individuals in a state-cohort who belong to a scheduled tribe. Data source: NFHS -1 (1995).

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Upper caste — Indicator variable that equals one if a bride's father belongs to an upper caste and zero if he does not. Data source: REDS (1999).

Demographic Characteristics:

Female education — Average years of schooling for ever-married women in a state-cohort. Data source: NFHS-1 (1995).

Daughter's education — Bride's number of years of schooling (including college). Data source: REDS (1999).

Husband alive — Indicator variable that equals one if bride's father is still alive at the time of the interview and zero if he is not. Data source: REDS (1999).

Husband's education — Number of years of schooling (including college) of a bride's father. Data source: REDS (1999).

Ln household income — Natural logarithm of a brides' parents' household income plus one (to ensure the variable is defined for all non-missing observations). Data source: REDS (1999).

Rural — Indicator variable that equals one if husband and wife live in a rural area and zero if they do not. Data source: NFHS-1 (1995).

Rural (%) — Percentage of individuals in a state-cohort who live in a rural area. Data source: NFHS-1 (1995).

Wealth — Average wealth of individuals in a state-cohort measured using the DHS-constructed "wealth index." This index is a composite measure of a household's cumulative living standard, calculated using data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities. For details on this index's construction, see: http://www.dhsprogram.com/topics/wealth-index/Index.cfm. (NFHS-1 reports a wealth-index value for households only. In constructing our data, we assign that value to every member of a household). Data source: NFHS-1 (1995).
Table 8: Husband-wife household wealth, measured using DHS-constructed wealth index, as described above. Data source: NFHS-1 (1995).

Wife's education — Number of years of schooling (including college) of a bride's mother. Data source: REDS (1999).

Fertility:

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Dead daughters	Number of dead female children in a bride's parents' fertility history, as reported by her mother. Data source: REDS (1999).
Daughter's birth order	Bride's order of birth, as reported by her mother. Data source: REDS (1999).
Dead sons	Number of dead male children in a bride's parents' fertility history, as reported by her mother. Data source: REDS (1999).
Ideal fertility	Average ideal number of children for ever-married women in a state-cohort. Data source: NFHS-1 (1995).
Live children	Number of live children in a bride parents' fertility history. Data source: REDS (1999).
Unwanted daughters	Average of actual number of daughters minus ideal number of daughters divided by ideal number of daughters ([actual daughters − ideal daughters]/ideal daughters) for ever-married women with completed families in a state-cohort, where each child in a woman's ideal bundle toward whose sex she is indifferent is treated as 0.5 ideal sons and 0.5 ideal daughters. A family is completed if its wife wishes to have no more children or if its wife or husband is sterilized. Data source: NFHS-1 (1995).
Marriage:	
Child brides (%)	Percentage of ever-married women in a state-cohort whose age at menarche was strictly greater than their age at cohabitation with their first husband. Data source: NFHS-1 (1995).
Child-bride status	Indicator variable that equals one if a wife's age at first marital cohabitation with her husband was strictly greater than her age at menarche and zero it was not. Data source: NFHS-1 (1995).
Married daughter wed by age 13	Indicator variable that equals one if a couple's married daughter began marital cohabitation by age 13 and zero if she did not.
Post-pubescent female age at first marriage	Average age at first marital cohabitation for ever-married women whose age at menarche was less than or equal to their age at cohabitation with their first husband in a state-cohort. Data source: NFHS-1 (1995).

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Variable	Description
Two-stage marriage (%)	Percentage of ever-married women in a state-cohort whose marriage followed a two-stage process separating ritual and actual marriage (the latter marked by marital cohabitation). Data source: NFHS-1 (1995).
Religion:	
Buddhist	Indicator variable that equals one if a bride's father is Buddhist and zero if he is not. Data source: REDS (1999).
Christian	Table 6: Indicator variable that equals one if a bride's father is Christian and zero if he is not. Data source: REDS (1999). Table 8: Indicator variable that equals one if husband and wife are Christian and zero if they are not. (NFHS-1 reports religious affiliation for household heads only. In constructing our data, we assign that affiliation to every member of a household). Data source: NFHS-1 (1995).
Christian (%)	Percentage of individuals in a state-cohort who are Christian. Data source: NFHS-1 (1995).
Hindu	Table 6: Indicator variable that equals one if a bride's father is Hindu and zero if he is not. Data source: REDS (1999). Table 8: Indicator variable that equals one if husband and wife are Hindu and zero if they are not. (NFHS-1 reports religious affiliation for household heads only. In constructing our data, we assign that affiliation to every member of a household). Data source: NFHS-1 (1995).
Hindu (%)	Percentage of individuals in a state-cohort who are Hindu. Data source: NFHS-1 (1995).
Jain	Indicator variable that equals one if a bride's father is Jain and zero if he is not. Data source: REDS (1999).
Muslim	Table 6: Indicator variable that equals one if a bride's father is Muslim and zero if he is not. Data source: REDS (1999). Table 8: Indicator variable that equals one if husband and wife are Muslim and zero if they are not. (NFHS-1 reports religious affiliation for household heads only. In constructing our data, we assign that affiliation to every member of a household). Data source: NFHS-1 (1995).
Muslim (%)	Percentage of individuals in a state-cohort who are Muslim. Data source: NFHS-1 (1995).

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Sikh
Table 6: Indicator variable that equals one if a bride's father is Sikh and zero if he is not. Data source: REDS (1999).
Table 8: Indicator variable that equals one if husband and wife are Sikh and zero if they are not. (NFHS-1 reports religious affiliation for household heads only. In constructing our data, we assign that affiliation to every member of a household). Data source: NFHS-1 (1995).

Sikh (%)
Percentage of individuals in a state-cohort who are Sikh. (NFHS-1 reports religious affiliation for household heads only. In constructing our data, we assign that affiliation to every member of a household). Data source: NFHS-1 (1995).

Sex Ratios:

Sex ratio at birth
Number of males born to ever-married women divided by number of females born to ever-married women, multiplied by 100, in a state-cohort. Data source: NFHS-1 (1995).

Traditional-marriage-age sex ratio
Number of males age 20-25 divided by number of females age 15-20, multiplied by 100, in a state. Data source: Census of India (1991).

Sexual Violence:

Forced sexual act (%)
Percentage of ever-married women in a state-cohort who report having been forced to perform a sexual act by someone other than their former or current husband. Data source: NFHS-3 (2007).

Harassment (%)
Percentage of ever-married women in a state-cohort who report that unmarried girls are "sometimes" or "often" harassed in their communities. Data source: IHDS-1 (2007).

Son Preference:

Ideal sons > Ideal daughters (%)
Percentage of ever-married women in a state-cohort whose ideal number of sons strictly exceeds their ideal number of daughters, where each child in a woman's ideal bundle toward whose sex she is indifferent is excluded. Data source: NFHS-1 (1995).

Ideal sons/Ideal children > 0.5 (%)
Percentage of ever-married women in a state-cohort whose ideal number of sons, excluding children in their ideal bundles toward whose sex they are indifferent, divided by their ideal number of children strictly exceeds one-half. Data source: NFHS-1 (1995).

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Son preference — Average of ideal number of sons divided by ideal number of daughters for ever-married women in a state-cohort, where each child in a woman's ideal bundle toward whose sex she is indifferent is treated as 0.5 ideal sons and 0.5 ideal daughters. Data source: NFHS-1 (1995).

Son preference index — Average of a son-preference index in each state-cohort constructed by the authors, which assigns a value of 0 to ever-married women whose ideal number of sons is strictly less than their ideal number of daughters; a value of 1 to ever-married women whose ideal number of sons is equal to their ideal number of daughters; and a value of 2 to ever-married women whose ideal number of sons is strictly greater than their ideal number of daughters, in each case excluding children in women's ideal bundles toward whose sex they are indifferent. Data source: NFHS-1 (1995).

Women's Characteristics:

Age at menarche — Average age at menarche for ever-married women in a state-cohort. Data source: NFHS-1 (1995).

Female contraceptive knowledge (%) — Percentage of ever-married women in a state-cohort who know of at least one modern or traditional contraceptive method. Data source: NFHS-1 (1995).

Female labor-force participation (%) — Percentage of ever-married women in a state-cohort who earn money from employment. Data source: NFHS-1 (1995).

Female media exposure (%) — Percentage of ever-married women in a state-cohort who are regularly exposed to mass media. A woman is considered regularly exposed to mass media if she watches television at least once per week, listens to radio at least once per week, or goes to the movie theatre at least once per month. Data source: NFHS-1 (1995).

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BIOGRAPHY

Paola A. Suarez was born in La Paz, Bolivia on March 16, 1989. She attended primary and secondary school at Colegio Santa Teresa until 2005, when she and her family moved to the United States. Paola graduated from Chantilly High School, Chantilly, VA in 2008. She then graduated *magna cum laude* from George Mason University in 2012 with a Bachelor of Science in Economics. She continued to graduate school also at George Mason University and earned her Master of Arts in Economics in 2014 and Ph.D. in Economics in 2018. During her graduate studies, Paola was a graduate research assistant and a graduate lecturer in the Department of Economics. She was also a Mercatus Center Ph.D. Fellow, an Oloffson Weaver Family Fellow, and a Humane Studies Fellow. In the last two years of her doctorate, Paola was a Visiting Ph.D. Fellow in the Department of Economics at New York University, and a Visiting Fellow at the Classical Liberal Institute at New York University's School of Law. She has presented her work at various academic conferences, and her research has been published in the *Journal of Economic Behavior and Organization*, the *European Journal of Law and Economics*, the *International Review of Law and Economics*, *Advances in Austrian Economics*, and *Conversations on Philanthropy*.