The missing link between parents' preferences and daughters' survival: the moderator effect of societal discrimination

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Abstract

The premature mortality of female children is an alarming demographic outcome in many countries of the world. The most popular explanation for this phenomenon is the prevalence of son preference. However, empirical findings indicate that the assumption of a positive relationship between wanted daughters and female children's survival is not found in every scenario, and it does not have a clear explanation in the literature. To fill this gap, we present a simple model that provides insights into how the positive marginal effect of wanted daughters on their survival might decrease with higher societal discrimination against young females. The model draws on the emerging literature that examines the erosion of cognitive and noncognitive skills that result from poverty and discrimination. Our theoretical findings are tested for the case of India, using the third round of the National Family Health Survey, with zero-inflated Poisson models. Our estimates provide support for the interaction of parents' preferences and societal discrimination against female children. In particular, we show that the statistical significance of the marginal effect of wanted daughters on their survival disappears in contexts of high societal discrimination against female children. Our study contributes to the literature by questioning the commonly held assumption of additive separability between the effect of family and societal characteristics. One central implication is that the alleviation of poverty alone might fail to automatically reduce sex-based discriminatory practices, and that multidimensional interventions are required that target the individual and society.

Keywords: Psychology of discrimination, children survival, gender, India.

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1. Introduction

Millions of women are missing because of discriminatory practices carried out all over the world (Anderson & Ray, 2010; Sen, 1992). An alarming type of discrimination is intrahousehold discrimination against female children (Lin, Liu, & Qian, 2014; Mangyo, 2008; Oster, 2009a; Qian, 2008; Rohlfs, Reed, & Yamada, 2010; Rosenzweig & Schultz, 1982).

The most popular explanation for the intrahousehold discrimination against young females is the prevalence of son preference (Lin et al., 2014; Pande, 2003). It is argued that son preference results in a biased allocation of the scarce time, energy and resources needed to fight against the avoidable morbidity and premature mortality of female children. However, recent empirical findings indicate that the positive relationship between son preference and female child deprivation is not so straightforward. In India, for instance, a decline in the number of unwanted girls across all socioeconomic groups (Retherford & Roy, 2003) has failed to be associated with a decrease in the mortality of young females (Mukherjee, 2013). Another troublesome finding results from examining the effect of sex-selective abortions on young girls' survival. Sex-selective abortions, which reduce the number of unwanted girls, as well as the number of girls that are raised in large families and in poor conditions, are expected to improve the health conditions and survival of young girls (Lin et al., 2014). However, in many scenarios, this relationship fails to arise (Nandi, 2014; Shepherd, 2008). Nandi (2014) finds, for instance, that a reduction in sex-

selective abortions, as result of the ban on prenatal sex diagnostics, and which would have increased the number of unwanted girls, had no impact on the mortality of young girls in Maharashtra (India).

Although important steps have been taken to better understand the complex relationship between preferences and discrimination against young females (Rohlfs et al., 2010), to our knowledge, no study has yet provided a comprehensive explanation of why, contrary to what was expected, the positive relationship between the number of wanted female children and their survival is not found in every scenario. The reason why previous works provide an unsatisfactory explanation of this phenomenon could rest on the lack of comprehensive theoretical analysis of the particularities of human behavior under circumstances of societal discrimination and poverty (Appadurai, 2004; Ray, 2006). In particular, further analysis should be conducted on the role played by societal discrimination on the relationship between parents' preferences and child survival.

To overcome this shortcoming, we incorporate recent insights from the psychology of poverty and discrimination literature (Dercon & Singh, 2012; Haushofer & Fehr, 2014; Pasquier-Doumer & Risso-Brandon, 2015; World Bank, 2015) on the study of intrahousehold discrimination. Poverty, stigma and discrimination undermine cognitive and noncognitive performance, and limit a person's aspirations (Ghosal, Jana, Mani, Mitra, & Roy, 2013; Hoff & Pandey, 2006). The analysis of the person's own aspirations and the aspirations for others is very important if inter and intra-generational poverty and discriminatory trap wants to be understood and overcome. For instance, in a study carried out in Ethiopia, India, Peru, and Vietnam, Dercon and Singh (2013) found a robust

relationship between parents' aspirations for the future of their children and the children's own aspirations and achievements.

Bringing these findings into our study, we argue that the overwhelming discrimination against young females might erode parents' aspirations for the survival of their daughters, making them more likely to overlook health risks for their female children. Moreover, the poor performance of parents in the context of overwhelming societal discrimination against females might be reinforced by the human tendency to act in accordance with observed behavior (Kahneman, 2003). Parents exposed to sex-based discriminatory practices in their community might be prone to undertake prevalent discriminatory practices. Indeed, the propensity to replicate observed behavior is one of the main mechanisms that contributes to perpetuate discriminatory practices, even when the basis for discrimination has been removed from society (World Bank, 2015). In our context, parents who want boys and girls equally might still overlook the health of their daughters, because they take for granted the discriminatory practices of their community. We bring these insights into a simplified model of family decisions, and show how societal discrimination might moderate the relationship between the number of wanted girls and female child survival. Specifically, our model points to a decrease in the positive marginal effect of wanted female children on their survival, where there is greater societal discrimination against young females. The examination of this marginal effect sheds light on the particularities of the relationship between parents' (cognitive and noncognitive) performance and the characteristics of the society, which in turn, we argue, are crucial for gaining a better understanding of the fundamentals of a sex-based discriminatory trap.

To validate our theoretical approach, an empirical analysis is carried out for the case of India, using the National Family Health Survey (2005–2006). Our estimates show that, holding constant other socioeconomic and cultural factors, having wanted daughters increases their survival. However, an interplay exists between the number of wanted daughters and societal discrimination against female children, so that the positive effect of wanted daughters on their survival is reduced with societal discrimination against female children. Indeed, the statistical significance of wanted daughters disappears in contexts of extremely high societal discrimination against female children. The results are robust to changes in specification, sample, year and variable definitions.

The paper is structured as follows. Section 2 provides the theoretical background of the paper. In Section 3, we present the data and methods. The empirical results are displayed in Section 4, and conclusions are given in Section 5.

2. A psychology of discrimination perspective

A great deal of research has been conducted to examine both the effect of parents' son preferences and the effect of (sex- based) discriminatory institutions on the survival of children. On the one hand, parents might bear son preferences and allocate survival resources unequally between sons and daughters (Qian, 2008; Rohlfs et al., 2010; Rosenzweig & Schultz, 1982). On the other hand, discriminatory institutions might limit what parents can do to fight for the survival of their female children (Branisa, Klasen, & Ziegler, 2013; Luke & Munshi, 2007), for example, through the characteristics of the social actors involved in the care of their children, such as physicians who could also bear son preferences (Patel, Badhoniya, Mamtani, & Kulkarni, 2013). However, less attention (if any) has been paid in this field to examine the effects of the interaction between

individuals' preferences and their discriminatory socioeconomic and cultural context, to explain observed behavioral patterns in a society.

Laboratory and field experiments carried out in different cultural environments demonstrate how discrimination and stigma foster negative psychological dispositions, and contribute to the erosion of cognitive and noncognitive skills of underprivileged individuals, which undermines the person's potential. Hoff and Pandey (2006) show how the public revelation of the young boys' social identity (the caste) in rural north India affected the cognitive task performance and ability to respond to economic opportunities of low-caste children. These authors found that as social identity was made public, the negative thoughts of underprivileged people increased, eroding their confidence, learning and trust in their own success. Ghosal et al. (2013) showed how the enhancement of psychological characteristics, such as the self-esteem of sex workers in Kolkata (India)— while keeping invariant the amount of material resources that they were entitled to— made them more proactive, as shown by their savings choices and health-seeking behavior. Cohen, Garcia, Apfel and Master (2006) reduced the racial achievement gap (40 percent) of African-American students in a suburban school in the United States, as the experimenters enhanced the students' sense of personal adequacy (see also Cohen, Garcia, Purdie-Aughns, Apfel, & Brzustoski 2009).

The psychological mechanisms through which discrimination undermines the performance of underprivileged population are multifaceted. The pressure of dealing with poverty (Mani, Mullainathan, Shafir, & Zhao, 2013) and discrimination (Cohen et al., 2006, 2009; Hoff & Pandey, 2006) could overwhelm the human cognitive system based on reasoning and judgment, leading to low performance by the underprivileged. Discrimination might

also erode the person's noncognitive skills. Authors such as Appadurai (2004) or Ray (2006) identify a phenomenon called "the aspirations failure"; the gap between the person's current aspirations and their own potential. The rise of a gap in aspirations with discrimination makes it possible that noncognitive skills contribute to the exacerbation of chronic deprivation (Ghosal et al., 2013). Going further in this direction, Dalton, Ghosal and Mani (2015) examine how the inability of human beings to internalize the long-term consequences of their actions (e.g., the long-term returns of effort) might be one of the main origins of aspiration failure, and the low effort levels undertaken by the underprivileged population.

Attention is redirected by the psychologist Kahneman (2003) to the structure of the human mind. He supports the idea that the cognitive system, based on reasoning and judgment, coexists with another (automatic) system, comprising thoughts that come spontaneously to the person's mind. The salience of the automatic cognitive system, which prioritizes shared understandings of a community (mental models), would contribute to the perpetuation of poverty and inequality (World Bank, 2015). By acknowledging that discriminatory environments might foster parents' internal constraints (e.g., aspiration failure for their daughters), or cause them to behave in accordance with shared (sex-based) discriminatory mental models, thus compromising the effort that parents devote to fight against the premature mortality of their daughters, we move to a framework that helps us to understand why the marginal effect of being wanted and surviving might fail to be constant across levels of societal discrimination against young females. We present a simplified model that sheds light on this relationship.

Holding constant other socioeconomic and cultural factors (including the level of discrimination in society), let us represent the relationship between the level in which parents want female children, denoted by $w \in [0,1]$, and their success in avoiding premature mortality of their daughters by function $f(w)$, defined in $(0,1]$, and satisfying $f(0) = \epsilon$, $f(1) = 1$ and $f'(w) > 0$, where $\epsilon > 0$ is arbitrarily low. The outcomes of this function can be read as the percentage of success in avoiding the premature mortality of female children.

Let now assume that societal discrimination against young girls (mediated by aspiration failure on daughters' survival, and the propensity to act in accordance with observed behavior) affects parents' performance. Then, for a given level of discrimination, the relationship between wanting female children and the success in avoiding the premature mortality of daughters would be represented by function $\bar{f}: [0,1] \rightarrow [0,1)$, such that $\bar{f}(w) = f(w) - \epsilon$. Generalizing the problem for a continuous range of societal discrimination against female children, we obtain the next result:

Proposition 1. *Let* $d \in [0,1]$ *represent the level of societal discrimination against female children in a given society. The relationship between the level in which parents want female children (w), and their success in avoiding the premature mortality of their daughters, can be represented by a function* $g: [0,1]^2 \rightarrow [0,1]$*, such that* $g(w,d)$ *is increasing in w (*$\frac{\partial g(w,d)}{\partial w} > 0$*), decreasing in d (*$\frac{\partial g(w,d)}{\partial d} < 0$*), and has a negative cross-partial derivative (*$\frac{\partial^2 g(w,d)}{\partial w \partial d} < 0$*).*

Proposition 1 means that holding constant other socioeconomic and cultural factors, the positive marginal effect of having wanted daughters on the parents' success in avoiding the premature mortality of their female children decreases with societal discrimination against

female children. In other words, the model shows how the optimal use of their scarce time, energy and resources could reduce the number of female deaths within the household. As a result, wanted daughters in the context of overwhelming discrimination would be neglected to a similar extent as unwanted girls are discriminated against. Figure 1 illustrates this theoretical result. The Section 3 empirically examines the validity of Proposition 1.

(FIGURE 1 HERE)

3. Data and methods

This section tests our theoretical findings for the case of India. This country is an adequate case study in our context, as shown by the historical preference for male children there (Bharati, Shome, Pal, Chaudhury, & Bharati, 2011; Clark, 2000; Sen, 1992). The analysis is based on household-level information obtained from the National Family Health Survey, complemented by information from other sources, such as the 2001 Census of India, and the Full Realization Rate (FRRR) of female children at state level, developed by Chaudhuri (2013).

The high quality of the National Family Health Survey, which is the product of the most extensive demographic survey at both state and national levels, is widely acknowledged. The information compiled there is based on questionnaires from the Demographic and Health Surveys, which were modified appropriately to capture the Indian setting (Visaria & Irudaya-Rajan, 1999). It should be noted that, among the various sources that could account for the variables in this study, the National Family Health Survey best meets the requirements of our theoretical approach. This survey gathers information on family decisions, with an emphasis on children's health and survival. Moreover, it provides

separate information for the estimation of how welcome a girl is within the family, as well as on gender bias in mortality, which is lacking in other datasets (e.g., Indian Census; see Echavarri & Ezcurra, 2010). In addition, it is worth mentioning that most of the empirical research on discrimination against young females in India is based on this dataset, facilitating the comparability of outcomes.

The National Family Health Survey has been conducted three times since its inception in 1992–93. The last survey covers the period 2005–2006, and includes interviews with 124,385 women aged between 15 and 49 years, who are, or have been married. Following the standard procedure in household-level analysis, the target group is limited to mothers for whom childbearing is finished (Clark, 2000), which comprises 64,545 females, who account for a total of 211,004 births. Our sample is constrained to 43,576 females, who account for a total of 141,917 births, because our measure of societal discrimination against female children is not defined for all of the states in India. We conduct a robustness analysis employing other measures of societal discrimination against women that are defined for all the states included in the National Family Health Survey in Section 4.2.

Table 1 presents the summary statistics of the variables used in this study. The households report, on average, 0.08 daughters who died before their first birthday. However, mortality is concentrated in 6.98 percent of the households, some of which reported as many as 5 female infant deaths. We also find evidence that some girls in our sample are unwanted. Approximately one-half (47.08 percent) of the families have an excess of female births, whose number varies between 1 and 9, and the average family has approximately 1 (0.80) unwanted daughter. As far as family size and composition is concerned, on average, women in the sample have three children (3.26), with a high probability that they have

more male than female births (the average proportion of sons is 0.55). On average, 0.1 of their sons died before their first birthday. Regarding the socioeconomic characteristics of mothers in the sample, over 40 percent of them have no education (42.45), almost half live in urban areas (46.55). The majority are Hindu (80.74). The average durables owned by families are 1.96 out of 6. Regarding health indicators at state level, on average, over two-thirds (66.98) of female children were not breastfed for at least twelve months after their birth, and did not receive all the basic vaccinations. However, these figures vary largely across the 14 states in the sample (from numbers below 50 percent in Kerala, Maharashtra, Punjab and Tamil Nadu, to levels that surpass 80 percent in Bihar, Rajasthan and Uttar Pradesh).

Before continuing, it is worthwhile justifying the choice of the household as the unit of analysis. Our choice is based on the finest disaggregation level at which the moderator effect of social norms on parents' behavior can be adequately evaluated using our dataset. To this end, we require a reliable measure of the level to which daughters are wanted. In the National Family Health Survey, women fail to report individual information on wanting children. Instead, they are asked about their ideal family gender-composition. One might estimate if a particular child is wanted or not by the assumption that, for each sex, parents want their children until they meet their fertility ideals, after which all others are unwanted. We do not follow this direction for several reasons. First, the estimation procedure implies a dichotomous division between wanted and unwanted children, which is far from the reality. Second, the procedure impedes accounting for the overall intensity of preferences. Finally, household-level estimates, which allow accounting for the intensity of son preference, are adequate to examine if societal discrimination against young females

moderates the relationship between mothers' preferences and their (household aggregate) performance.

(TABLE 1 HERE)

3.1.Variables and Measurement

Mortality of daughters. With regard to measuring the parents' performance on avoiding deprivation, mortality provides a better measure than food intake (Sen, 1984). Using cohort 0–1 as the focus of the analysis (Bhalotra, 2010; Nandi, 2014; Rohlfs et al., 2010; Shepherd, 2008), our dependent variable is defined by the number of daughters that die up to that age. The focus on the mortality of girls avoids over/underestimations due to biological differences in mortality of male and female children (for a deep analysis of the female biological advantage, see Drevenstedt, Crimmins, Vasunilashorn, &Finch, 2008, or Seifarth, McGowan, & Milne, 2012), or due to intentional and unintentional underreporting of female births and deaths (Clark, 2000; Das Gupta, Chung, & Shuzhuo, 2009), while raising the need to control for parents' ability to avoid infant mortality. Section 4.2 discusses the robustness of this definition by employing cohort 0–5 (Bhattacharya, 2006; Murthi, Guio, & Drèze, 1995) and 0–10 in the analysis.

Unwanted daughters. To measure the extent to which mothers have unwanted daughters, we calculate the difference between the actual and the ideal number of daughters, and truncate it at zero. At this point, it should not be overlooked that this measure is based on stated information, opening up the possibility that people adapt their preferences in light of their actual family sex-composition. Despite this possibility, evidence shows that people fail to completely adjust ideal and actual numbers (Clark, 2000).

Societal discrimination against young females. Female status can be operationalized by measuring the capacity of females in a given society to achieve a full bundle of elementary rights. By doing so, one overcomes the problem associated with the potential trade-off between elementary human rights (Echavarri & Permanyer, 2008). In this spirit, Chaudhuri (2013) recently proposed a measure of societal status of females, based on the extent to which their human rights are fulfilled or violated in a given society. This measure is called the Full Rights Realization Rate (FRRR), and this is calculated for four life stages of females (infancy/childhood; early adolescence; late adolescence; and early adulthood), using the three waves of the National Family Heath Surveys of India. In particular, the infancy/childhood FRRR is given by the percentage of female children (aged 0–5) that fulfills the right to health. A child fulfills the right to health when she achieves both the right to breastfeed and the right to vaccination. The right to breastfeed is fulfilled when the child is put to the breast within the first 24 hours of birth and for 12 months (or the child's age if they are younger than twelve months). The right to vaccination is fulfilled if the child is given the full basic vaccinations, following the guidelines of the World Health Organization. We use the percentage of young females in the state whose right to health is violated, to operationalize the societal discrimination against young females. Measures of female deprivation have been considered adequate to capture discriminatory outcomes (Branisa et al., 2012). Endorsing Chaudhuri's procedure, our measure is given by 1-infancy/childhood FRRR. At this point, it is worth recalling that Chaudhuri's index is computed for a subsample of Indian states (see Chaudhuri, 2013:69). Thus, to test against the possibility that our analysis suffers from sample bias, in section 4.2., we replicate the study, using alternative measures of societal discrimination against females that focus on

women, which in turn cover all states in the National Family Health Survey (see the robustness analysis in section 4.2.).

Control variables. When studying female child deprivation, we should not forget that the survival of children in India depends strongly on factors such as socioeconomic characteristics and residence facilities (Drèze & Sen, 2002; Luke & Munshi, 2007). Accordingly, we study the effect of individual characteristics, such as age, education, family size, socioeconomic status, caste, religion, residence and geographic region. In this regard, females with no schooling (Bhalotra, 2010; Kravdal, 2004; Nandi, 2014), born in larger family sizes, who live in rural areas and in states located in north-northwest India appear to have less ability to fight against infant mortality (Bhattacharya, 2006; Murthi et al., 1995; Pande, 2003; see also Nandi, 2014, for evidence on the negative relationship between family size and child mortality). The ownership of durables is used as a proxy for family socioeconomic status, as it is associated with long-term household wealth. The ownership of durables is associated with the increased health of children (Pande, 2003), and reduced mortality (Shepherd, 2008), although investments in sons' and daughters' health may be unequal (Oster, 2009a).

Less agreement exists, however, regarding the sign and significance of caste (Hoff & Pandey, 2006; Luke & Munshi, 2007), and religion (Dharmalingam & Morgan, 2004; Mukherjee, 2013). Findings from earlier studies support the presence of egalitarian traditions among scheduled tribes (Mitra, 2008), and egalitarian health investments among scheduled castes (Luke & Munshi, 2007). Nevertheless, these groups are found to suffer a higher incidence of childhood mortality (Mukherjee 2013; Murthi et al., 1995), which could reflect unequal access to survival resources throughout the country (Hoff & Pandey,

2006; Luke & Munshi, 2007). In a similar vein of discussion, while the prevalence of son preference appears to vary little by religion (Clark, 2000), differences in socioeconomic characteristics across religious groups might affect the outcomes (Dharmalingam & Morgan, 2004; Drèze & Murthi, 2001).

Furthermore, we control for other discriminatory practices, such as base neglect in the household, or the practice of prenatal discrimination (e.g. sex-selective abortions). On the one hand, we operationalize the base neglect in the household by the number of sons who died before age one. In contexts in which boys are preferred over girls, neglect might also affect male children, the nature of discrimination being different by sex (Pande, 2003). Thus, we expect that higher base levels of child neglect are associated with increased numbers of female child deaths. On the other hand, we capture the effect of prenatal discrimination by controlling for the proportion of sons within the household. The family composition of those couples that undertook sex-selective abortions would be characterized by a high proportion of sons. If a trade-off between prenatal and postnatal discriminatory practices existed, we should find that a greater proportion of sons is associated with a reduced mortality of young females (Lin et al., 2014).

Finally, taking into account that our dependent variable is the number of children that die before their first birthday, for comparative purposes, we control for the possibility that child-rearing up to that age is still unfinished. To this end, we include the number of children aged less than one in the household. We expect to find a negative relationship between the number of children under one and the number of daughters who died before their first birthday.

3.2. **Econometric Model**

The choice of the empirical model rests on the nature of our dependent variable, which we have defined as the number of daughters who died before their first birthday. Apart from its discrete nature, it is worth noting that the domain of this variable lies within the set of nonnegative integers with cardinal values. In contrast to the classical linear model, these features can be captured by a standard Poisson model. However, as mentioned above, in 93.02 percent of the households in our sample, there are no daughters who died before age one. Moreover, there are two different data-generating processes that seem to explain the zero outcomes: families whose daughters fail to be at risk of infant mortality; and families that are at risk, but manage to avoid infant mortality. In contrast with the Hurdle model (extension of Poisson to account for differences between zero and nonzero outcomes), Lambert's (1992) Zero-Inflated Poisson (ZIP) considers that the large number of zeros might result from the confluence of two data-generating processes (Hu & Jefferson, 2009). The specification for the probability of zero outcomes in our base empirical model includes education. Robustness checks on the specification for zero outcomes are performed in section 4.2.

Before continuing, it is worth recalling that we use negative definitions for success and wanting female children. Thus, according to Proposition 1, we expect that the marginal effect of unwanted daughters on the expected number of daughter deaths satisfies the following properties: $\frac{\partial \mathrm{E[m|uw,d,X]}}{\partial \mathrm{uw}} > 0$, $\frac{\partial E[m|uw,d,X]}{\partial d} > 0$ and $\frac{\partial^2 E[m|uw,d,X]}{\partial uw \partial d} < 0$, where m denotes mortality, *uw* unwanted girls, *d* is the societal discrimination against female children, and *X* is a vector of control variables. Section 4 presents our estimates.

4. Results

The main results of our empirical study are shown in Table 2. The first section of the table provides the marginal effects on the predicted number of daughter deaths, at the mean of the regressors, and the standard errors in parentheses. The second section of this table displays the cross-partial derivative with respect to the number of unwanted daughters and societal discrimination against young females. The third section of Table 2 examines our empirical model. In particular, we include Vuong's test of the Zero-Inflated Poisson model versus the standard Poisson model (Vuong, 1989), which appears to confirm that the Zero-Inflated Poisson model provides a more satisfactory description of the data. Moreover, the measures of goodness-of-fit that are employed to compare nested specifications included in Table 2 (Akaike and Schwartz information criteria) reveal that the inclusion of parents' ability to avoid infant mortality, and other socioeconomic variables, provides increased explanatory power, which confirms that it is the preferred specification in this context.

(TABLE 2 HERE)

Focusing on our base specification (column 3 of Table 2), the estimates support the fact that, holding constant other socioeconomic and cultural factors, and given the mean societal discrimination against female children (0.67), an increase in the number of unwanted daughters is associated with a 0.004 increase in the expected number of daughters' deaths ($p < 0.001$). Regarding the effect of societal discrimination against young girls, holding constant other socioeconomic and cultural factors, and given the mean number of unwanted daughters within the household (0.80), our estimates support that increases in societal discrimination are associated with 0.045 increases in the expected number of daughters' deaths ($p< 0.001$).

Moreover, our estimates lend support to the idea that an interaction exists between parents' preferences and societal discrimination against young females. The estimate of the cross-partial derivative with respect to unwanted daughters and societal discrimination against female children is -0.022 ($p<0.001$). Specifically, the interplay between our key variables leads us to reveal the next outcome: holding constant other socioeconomic and cultural factors, the marginal effect of having unwanted daughters on the expected number of young female deaths decreases with higher societal discrimination against young females (see Figure 2). In egalitarian contexts (first row of the attached table to Figure 2), an increase in the number of wanted (unwanted) daughters is associated with 0.009 increase in the survival (mortality) of young females ($p<0.001$). However, as societal discrimination increases, the effect of parents' preferences would decrease up to disappear. According to our estimates, for levels of societal discrimination equal to or greater than eighty percent, the marginal effect of wanted (unwanted) daughters on survival (mortality) is not statistically significant (see the last three rows of the Table in Figure 2). These empirical findings are compatible with our theoretical analysis, supporting the idea that discriminatory environments against young females might raise parents' internal constraints (e.g., aspiration failure for the future of their daughters), and/or cause parents to act automatically, in accordance with sex-based discriminatory mental models, compromising the effort undertaken to fight for the survival of their daughters.

(FIGURE 2 HERE)

4.1. Marginal Effects of Additional Explanatory Variables

Table 2 also provides information on the marginal effects of the remaining explanatory variables, with regard to explaining female mortality in childhood. Focusing on results related to our base specification (the third column of Table 2), the marginal effects calculated at the mean of the regressors indicate the following relationships: the predicted number of daughters' deaths is 0.006 lower for women with schooling, than for those with no schooling ($p < 0.005$). This negative relationship between education and child mortality agrees with findings of the earlier literature (Bhalotra, 2010; Bhattacharya, 2006; Kravdal, 2004; Murthi et al., 1995; Shepherd, 2008). In a similar vein, our estimates confirm that a larger family size is associated with greater mortality (Pande, 2003). We find that each increase in family size is associated with a 0.016 increase in the expected number of daughters' deaths ($p < 0.001$). As expected, we find that the expected number of daughters' deaths is lower (0.011 fewer deaths) in households that have not finished their child-rearing ($p<0.001$). Regarding the base level of discrimination within the household, we find that each increase in sons' deaths is associated with 0.005 more daughters' deaths ($p < 0.001$). Moreover, a greater amount of durables is associated with 0.003 fewer daughters' deaths ($p<0.001$), which supports the idea that household socioeconomic status helps parents to fight against the avoidable mortality of children (Oster, 2009a; Pande, 2003; Shepherd, 2008).

Concerning religion, the estimates suggest that the mortality of young females is greater among Hindus than among other religions. However, the estimates only point to the statistical significance ($p< 0.001$) of differences in the predicted mortality rates of Muslims (0.014 fewer deaths). Still, we acknowledge the importance of conducting qualitative studies, to arrive at a deeper understanding of how mortality varies by religion (Pande,

2003). Individual characteristics such as age and caste are not statistically significant ($p>0.01$), but the estimates suggest that mothers who belong to scheduled castes and tribes have more daughter deaths, supporting the idea that discrimination against scheduled castes and tribes (leading to unequal access to survival resources) persists throughout the country (Hoff & Pandey, 2006; Luke & Munshi, 2007; Mitra, 2008; Mukherjee, 2013).

When we control for family size, the base of household mortality and the proportion of sons, the place of residence is weakly or not statistically significant. In any event, the predicted mortality of daughters is lower for urban households than for their rural counterparts ($p>0.01$), and lower for families who live in states located in southern India than it is for families living in northwest India ($p<0.01$), which agrees with previous findings in the literature (Mukherjee, 2013; Murthi et al., 1995).

Finally, our estimates support the finding that a greater proportion of sons in the household is associated with fewer daughters deaths (0.064 less deaths), and the effect is statistically significant ($p<0.001$). This finding is compatible with the idea that a trade-off exists between prenatal and postnatal discriminatory practices (Lin et al., 2014), which might lead to a change in the trend of postnatal discrimination over time (Diamond-Smith & Bishai, 2015).

4.2. Robustness Checks

This section examines the extent to which the analysis is robust to variable definitions, the sample, year and choice of specification.

The role of age cohort in daughters' mortality. The factors that help us to understand an excess of female mortality are likely to vary by children's age (Anderson & Ray, 2010). Table 3 in the Appendix estimates the mortality of girls for larger age cohorts. Column 1 presents the marginal effects of our central variables on the predicted number of daughters who died before age 5 years. Column 2 presents the effects for daughters who died before age 10 years. The estimates show that our results are robust to changes in age cohort. Indeed, there is no change in the statistical significance of our central variables ($p<0.001$), and neither is there any variation on the size of the marginal effect of unwanted daughters on their mortality (0.004 more daughter deaths). The size of the marginal effects of societal discrimination increases slightly, as does the size of the interplay between wanted daughters and societal discrimination against female children.

Societal-discrimination measures. This subsection examines whether our main results are robust to alternative operationalization of sex-based discrimination. It is worth mentioning that the overall discrimination against females, in economics, is measured traditionally by the labor status of women. However, in some cases, greater female labor participation might fail to reflect greater female status, especially if (as is largely the case in India) they have no control over the outcomes of their work, or if their contribution to household income is undervalued (Mukherjee, 2013; Srinivasan, 2005). Bearing this limitation in mind, Drèze and Sen (2002) support the idea that a comprehensive understanding of the societal discrimination against women should not only account for women's actions, but also for their capacity to act otherwise (e.g., without husbands' permission). Endorsing Drèze and Sen's (2002) proposal, discrimination regarding the capacity of wives to decide private aspects of their lives is measured by the percentage of married women aged 15–49 years, who need permission to go to the market alone.

Bearing this in mind, we examine the effect of societal discrimination against women, using both measures of discrimination: the percentage of women that need permission to go to market alone (female freedom to act differently); and the percentage of women who do not participate in labor markets (female labor status). In particular, columns 1 and 2 of Table 4 in the Appendix operationalize the societal discrimination against females by female freedom to act differently. Columns 3 and 4 of this same table operationalize the societal discrimination against females by female labor status (Mukherjee, 2013). For this purpose, the National Family Health Survey (round 3) is merged with information from the 2001 Census , which makes it possible to calculate the work-participation rate of women (this information is available from the Government of India (see http://censusindia.gov.in/2011-common/censusdataonline.html).

By focusing on overall discrimination, an extended sample can be employed (remember that societal discrimination against young females is available for 14 states in India). Thus, columns 1 and 3 are based on an extended sample of 64,545 women, and the data lend support to the idea that an interplay exists between mothers' preferences and societal discrimination against females ($p<0.001$). Columns 2 and 4 replicate the analysis for our subsample of 43,576 women. By doing so, we observe that similar results would have been obtained by focusing on the extended sample.

The role played by district level characteristics and survey year. The capacity of couples to fight against child mortality is strongly related to access to district facilities, such as health services (Oster, 2009a). In this regard, it is worth mentioning that the National Family Health Survey (round 3) fails to provide district identification. Hence, the

effect of access to health services is examined by using the second round of this dataset, and outcomes are displayed in Table 5 in the Appendix. The marginal effect of wanted daughters on female children mortality does not vary in size and significance with the inclusion of access to health facilities and survey year. Moreover, the interplay between unwanted daughters and societal discrimination against female children is robust to the control for health facilities and survey year ($p<0.001$). However, neither societal discrimination against female children nor the access to health facilities are statistically significant ($p>0.01$), making it necessary to research further the relationship between the guarantee of female children's right to health and access to health facilities (Oster, 2009a; Patel et al., 2013).

Fertility and base level of family neglect. Fertility and our measure of base neglect in the household (i.e., the number of sons that died before their first birthday) might introduce multicollinearity, affecting the observed significance of our estimates. However, the omission of these variables might involve overestimation of our central variables. Table 6 in the Appendix presents estimates of when fertility and sons' deaths are omitted. The estimates show that, as expected, the effect of wanted girls and discrimination increases with the omission of family size and sons' deaths, as they are positively correlated variables. To test the stability of our base-model estimates, we estimate our model using Poisson regression and Zero-inflated regression that differ from our base model on the zero-outcome specifications (see Table 7 in the Appendix). The marginal effects and standard errors in all of the regressions are nearly the same.

The zero-outcome specification. Table 7 in the Appendix shows that the estimates of our central variables are robust to changes in the specification for zero outcomes. Our baseline

model is the one that, according to both Akaike and Schwartz criteria, has greater explanatory power than models with alternative specifications for the zero outcome.

5. Discussion and conclusion

In line with previous literature, our findings show that, controlling for other socioeconomic and cultural factors that might explain female children's survival, the expected number of daughters' deaths increases with societal discrimination against female children, and with the number of unwanted daughters within the family. Our findings also show the existence of an interaction between parents' preferences and their (sex-based) discriminatory socioeconomic and cultural context, which constitutes the contribution of this work to the understanding of female child mortality. In other words, our results show that neither the socio-economic context, nor the parents, but the interaction of parents' preferences and their socio-economic context would explain the bias in female children's survival. Specifically, our estimates point to a decrease in the positive marginal effect of having wanted (unwanted) daughters on the survival (mortality) of their female children, with societal discrimination against young females. Indeed, this marginal effect loses its statistical significance for levels of societal discrimination equal to or greater than eighty percent.

Thus, our estimates support the argument that discrimination would raise a gap between parents' current success to fight against the premature mortality of their female children, and their own potential to do so, taking into account their preferences and their socioeconomic and cultural context, and this gap increases with societal discrimination against young females. Our results are in line with the growing literature on development that emphasizes that "decision-making is the product of an interaction between mind and

context'" (World Bank, 2015:2). Social influences can shape women's opportunities and achievements through human disposition or propensities, without presupposing, necessarily, "a conscious aiming at ends or an express mastery of the operations necessary to attain them and, being all this, collectively orchestrated without being the product of the orchestrating action of a conductor" (Bourdieu, 1990:72).

The psychologist Kahneman describes the social influences on behavior as the salience of a cognitive system that gives priority to "what [people] happen to see at a given moment" (Kahneman, 2003: 1469). Kahneman supports the idea that the architecture of the human mind can be characterized by the coexistence of two cognitive systems: one based on reasoning and judgment; and the other on effortless associative thinking. This means that people would be attracted by shared understandings and behavioral practices of their community, because they come quickly to their mind. Thus, in contexts of overwhelming discrimination against young girls, widespread sex-based discriminatory behavior and understandings would cause parents to be prone to neglect wanted and unwanted daughters. The combination of automatic and social thinking, and the presence of shared discriminatory mental models would therefore lead to the perpetuation of discrimination in a given society (World Bank, 2015).

The cognitive system based on reasoning, combined with common behavioral bias, would also favor the perpetuation of discrimination. In a recent study, Dalton et al. (2015) examined how the failure to internalize the long-term returns of current decisions implies lower aspirations and achievements for people suffering from discrimination and poverty (compared with their own potential). In contexts of prevalent discrimination against young girls, the aspirations for daughters' survival might be seriously reduced. A particular

person might value boys and girls equally, but they would hardly find the courage (or awareness) required to go against well-established behavioral patterns in their society (Echavarri & Ezcurra, 2010). Under these circumstances, one would observe that parents fail to engage in effort levels that would avoid the premature mortality of their wanted and unwanted daughters. The influence of social and psychological factors on people's minds yields the possibility that unwanted girls, raised in egalitarian environments, survive more than wanted girls in nonegalitarian environments, holding constant the economic constraints on parents' opportunities. Therefore, even though the material payoffs of allocating survival resources against girls decrease when daughters are wanted—and as a result, self-interested conscious practices against them decrease (Lin et al., 2014)—a couple that forms part of, and conforms to a society characterized by high societal discrimination against young females might still discriminate against wanted daughters. The findings of Maertens (2013) in the rural Indian context shed light on this point. The author shows how increments in perceived returns to higher education may not be enough to increase education investments in girls, due to the marital norms regarding the age of marriage, and the social perception of female incorporation into the job market.

The present paper contributes to the literature on female child deprivation by demonstrating the need to remove the commonly held assumption of additive separability, between the effect of intrahousehold and societal factors on female children deprivation. The interaction of individual and societal characteristics might constitute a trap that perpetuates gender discrimination, thus contributing to the exacerbation of discrimination for current, but also for future generations, "in ways that make the effects of past discrimination persist over time" (Hoff & Pandey, 2006: 206).

The analysis of the interplay between individual dispositions and social conditions allows us to show how the constraints associated with female discrimination could extend beyond material deprivation, and other external constraints. One central implication is that the alleviation of poverty alone might fail to automatically reduce parents' sex-based discriminatory practices. Interventions that impact parents' mode of thinking and deciding are therefore necessary (Kahneman, 2003), which affect the shared mental models of their community (Jensen & Oster, 2009), or that raise the aspirations of the underprivileged population (Ghosal et al., 2013). Multidimensional and innovative interventions are adequate for this end. One example of how affecting mental models might lead to the diffusion of gender-egalitarian practices in a community is provided by Jensen and Oster (2009). The authors find that the introduction of cable television contributed to the increase of women's status in rural India (lower acceptability of domestic violence and of son preference; increases in women's autonomy and reduction in fertility). A great reduction in the expected amount of female mortality would result from simultaneously targeting parents' material constraints, and the internal effects of evolving in discriminatory environments; for example, modifying the sex-based discriminatory mental models of parents by causing them to be in contact with egalitarian realities.

While further research is needed, the central point is that public policies that act only on individual economic budget constraints, assuming only payoff-oriented behavior, and using only monetary incentives, could fail to reduce the expected number of young female deaths. Note that in underprivileged environments, even the diffusion of education might contribute to the diffusion of discrimination against unborn females (Echavarri & Ezcurra, 2010). This important problem could be overcome if complementary measures, affecting shared mental models or raising aspirations for the future of daughters, were implemented

along with economic incentives. Further study of human psychology mechanisms are required, to better understand how a person translates discrimination at societal level into a poor alignment of their wants and actions. Future work in this field, on the evolutionary and iterative dynamics of discrimination at societal or community level and individual or family level, would be helpful in shedding light on the persistence of discrimination, and in identifying adequate combinations of public policies.

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(TABLES AND FIGURES TO BE INSERTED IN THE TEXT)

Table 1: Variable definitions and summary statistics, India 2005–2006.

Variable name	Definition	Min	Max	Mean	Std. Dev.
Household					
Mortality of daughters	Daughters who died before their first birthday	0	5	0.08	(0.32)
Mortality of sons	Sons who died before their first birthday	0	7	0.10	(0.36)
Unwanted daughters	Total daughters born minus ideal number of daughters	0	9	0.80	(1.10)
Age	Mothers' current age	15	49	34.48	(7.57)
Family size	Total number of children born	1	16	3.26	(1.72)
Children under one	Number of live children aged twelve months or less	0	3	0.08	(0.27)
Durables	Ownership of durables	0	6	1.97	(1.53)
Proportion of sons	Total sons born divided by total children born	0	1	0.55	(0.30)
Education	Dummy = 1 for mother that has no schooling			42.45	
Scheduled caste	Dummy = 1 for mother that belongs to a scheduled caste			19.10	
Scheduled tribe	Dummy = 1 for mother that belongs to a scheduled tribe			5.79	
Hindu	(Reference group) mother that is Hindu			80.74	
Muslim	Dummy = 1 for mother that is Muslim			11.91	
Christian	Dummy = 1 for mother that is Christian			2.26	
Sikh	Dummy = 1 for mother that is Sikh			3.13	
Religion other	Dummy = 1 for mother that is not Hindu, Muslim, Christian or Sikh			1.96	
Urban	Dummy = 1 for mother that lives in urban area			46.55	
Northwest	(Reference group) mother that lives in Gujarat, Haryana, Himachal Pradesh, Punjab and Rajasthan.			17.63	
East	Mother that lives in Assam, Bihar, Orissa and West Bengal.			18.72	
South	Dummy = 1 for mother that lives in Andhra Pradesh, Karnataka, Kerala and Tamil Nadu			29.39	
Central	Dummy = 1 for mother that lives in Madhya Pradesh, Maharashtra and Uttar Pradesh.			34.26	
District					
Health facilities	Percentage of villages in the district with health facility in the village.	0	1	15.93	(21.89)
State					
Societal discrimination against female children	Percentage of female children that fails to be breastfed for twelve months from birth, and to be vaccinated.	45	90	66.98	(14.55)
Female freedom to act otherwise	Percentage of women in the state that need permission to go to market alone	13.2	69.96	44.29	(13.15)
Female labor status	Percentage of women who do not participate in labor markets	64.9	84.60	73.73	(7.08)

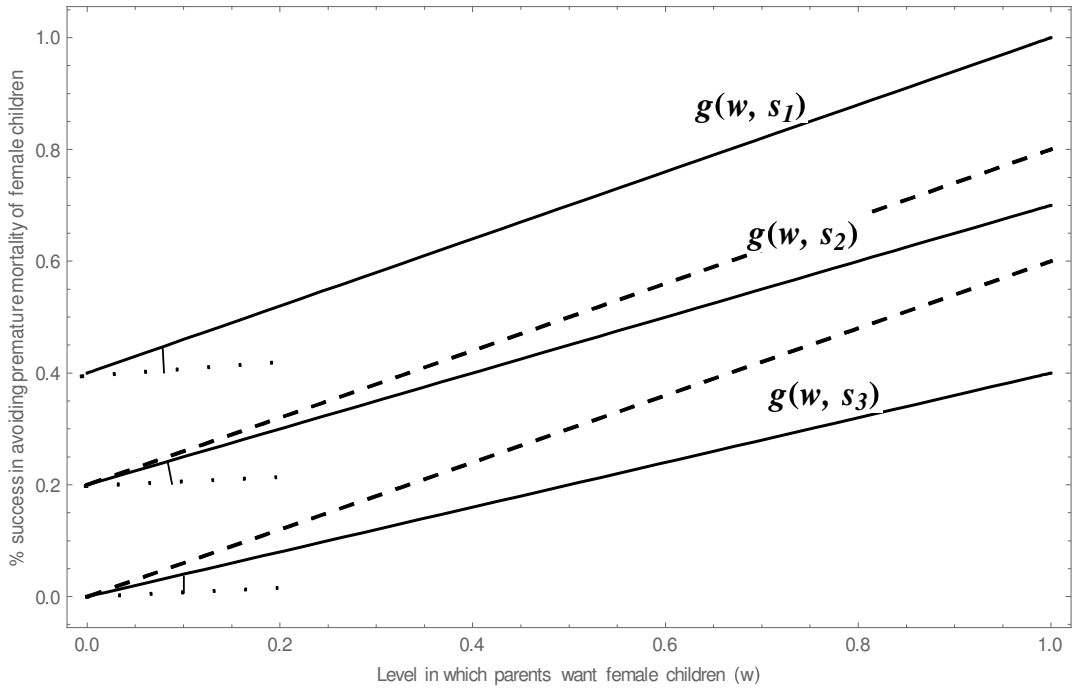
Sources: Societal discrimination against female children' variable is obtained from Chaudhuri (2013), which is calculated from the National Family Health Survey (round 1); health facilities are calculated from the National Health Survey (round 2); female labor status is calculated from Census 2001; and the remaining variables are calculated from the National Family Health Survey (round 3).

Table 2: Zero-Inflated Poisson regression of female-children mortality.
Sample of mothers aged 15–49, India 2005–2006.

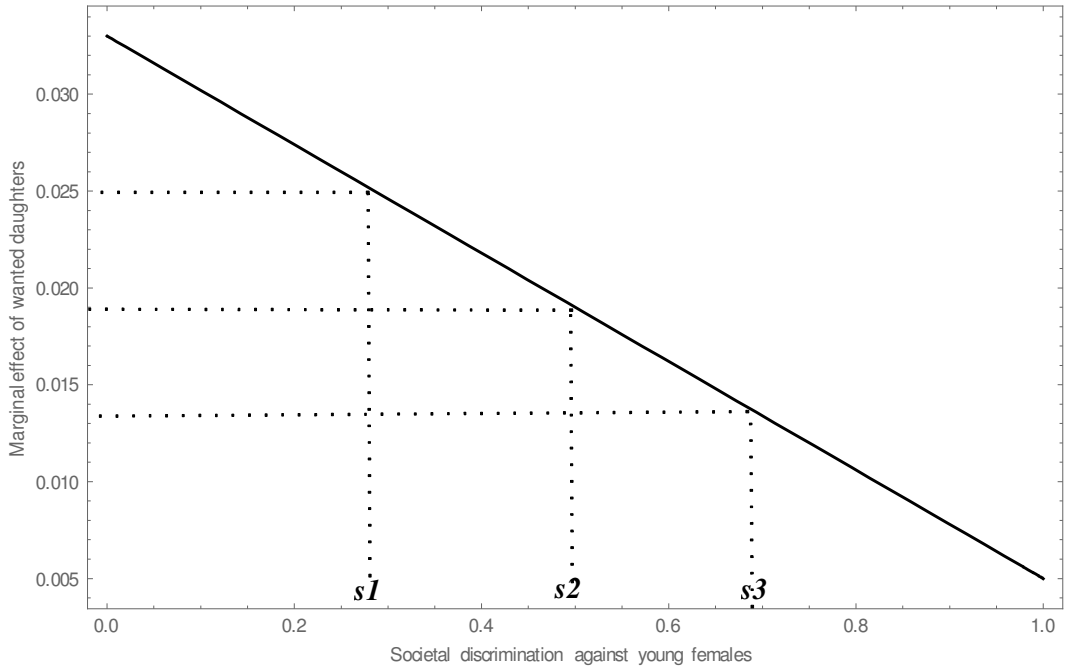
	Dependent variable: number of daughters who died before age 1					
Regressors:	(1)		(2)		(3)	
Unwanted daughters (UD)	0.031***	(0.001)	0.027***	(0.001)	0.004***	(0.001)
Societal discrimination (D)	0.128***	(0.009)	0.100***	(0.009)	0.045***	(0.008)
Mother's age: (<20)						
20–24			0.036	(0.033)	0.015	(0.022)
25–29			0.055	(0.035)	0.017	(0.023)
30–34			0.074	(0.040)	0.020	(0.022)
35–39			0.079	(0.042)	0.016	(0.021)
40–44			0.098	(0.050)	0.015	(0.021)
45–49			0.121	(0.060)	0.019	(0.023)
Education: (School)						
No school			0.018***	(0.002)	0.006**	(0.002)
Family size					0.016***	(0.001)
Children under one					-0.011***	(0.003)
Sons' deaths					0.005***	(0.001)
Proportion of sons					-0.064***	(0.004)
Durables			-0.006***	(0.001)	-0.003***	(0.001)
Caste: (Other)						
Scheduled caste			0.006*	(0.002)	0.001	(0.002)
Scheduled tribe			0.008	(0.004)	0.002	(0.003)
Religion: (Hindu)						
Muslim			-0.007*	(0.002)	-0.014***	(0.002)
Christian			-0.011	(0.007)	-0.010	(0.006)
Sikh			-0.009	(0.006)	-0.005	(0.005)
Other			-0.017**	(0.006)	-0.014*	(0.005)
Residence: (Rural)						
Urban	-0.002***	(0.002)	-0.010***	(0.002)	-0.004	(0.002)
Geographic region: (Northwest)						
East	-0.06	(0.003)	-0.004	(0.003)	0.001	(0.002)
South	-0.012***	(0.003)	-0.013***	(0.003)	-0.007*	(0.003)
Central	0.004	(0.003)	0.006	(0.003)	0.002	(0.002)
Cross-partial derivative with respect to UD and D	-0.027***	(0.003)	-0.025***	(0.003)	-0.022***	(0.003)
LR Chi-Square (df)	3,690.10(7)***		3,172.98(21)***		4,149.30(25)***	
Vuong	3.78***		4.09***		3.32***	
AIC	21,388.33		21,040.24		20,071.92	
BIC	21,466.47		21,248.62		20,315.02	
Observations	43,576		43,576		43,576	

Notes: In this table, the dependent variable is the number of daughters who died before age one. Columns present the marginal effects on the predicted number of deaths at the mean of the regressors. The infinite-difference method is used to compute the marginal effect of binary regressors. Standard errors for marginal effects are in parentheses. The cross-partial derivative of the expected number of daughters' deaths, with respect to unwanted daughters and societal deprivation against young females at the mean of the regressors, is presented in the second section of the table. The estimation employs the Zero-Inflated Poisson model. The specification for the probability of zero outcomes includes education in columns two and three. The likelihood ratio (LR) Chi-Square test compares the model specified in the corresponding column with the unconditional model. The p-value associated with this test informs if, as a whole, the model is statistically significant. The Vuong (1989) test compares the Zero-Inflated Poisson model versus the standard Poisson model: large positive (negative) values favor the Zero-Inflated Poisson (standard Poisson) model, while absolute values below 2 do not favor any model. Akaike information criterion (AIC) based on the likelihood framework, and Schwartz information criterion (BIC) based on the Bayesian framework compare nested models; lower values imply an increased explanatory power. * $p < .01$; ** $p < .005$; *** $p < .001$.

FIGURE 1.

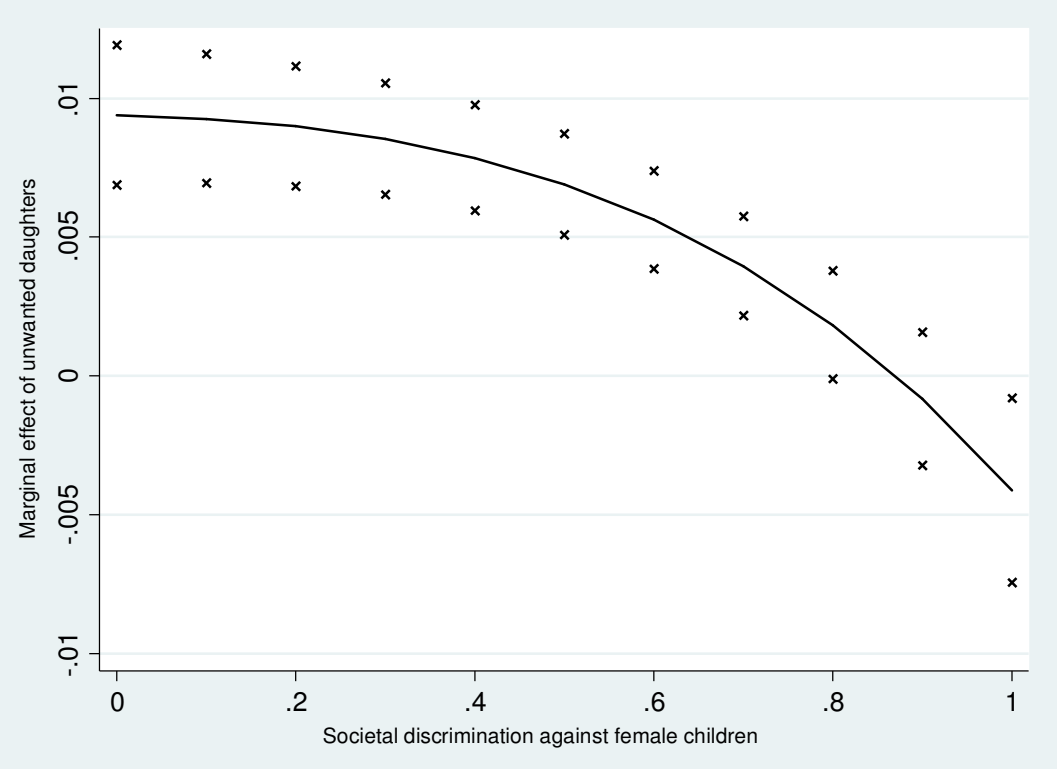


(a) Figure represents the relationship between the level in which parents want female children and percentage of success in avoiding premature mortality of daughters for three different levels of societal discrimination, $s_1 < s_2 < s_3$. Solid lines represent parents' success, while dashed lines represent the potential success of parents.



(b) Figure represents the relationship between societal discrimination against young females and marginal effect of wanted daughters on parents' success in avoiding premature mortality of daughters.

FIGURE 2.



Societal discrimination against female children	Marginal effect of unwanted daughters	95% Conf. Interval	
0	0.0094***	0.0069	0.0119
0.1	0.0093***	0.0069	0.0116
0.2	0.0090***	0.0068	0.0111
0.3	0.0085***	0.0065	0.0105
0.4	0.0080***	0.0059	0.0097
0.5	0.0069***	0.0051	0.0087
0.6	0.0056***	0.0038	0.0074
0.7	0.0040***	0.0022	0.0057
0.8	0.0018	-0.0001	0.0038
0.9	-0.0008	-0.0032	0.0016
10	-0.0041	-0.0074	-0.0008

Notes: The marginal effects of unwanted daughters refer to the marginal effects of unwanted daughters on the expected number of daughters' deaths, and are calculated using the post-estimation results related to our baseline specification (see column 3 in Table 2), at the level of societal discrimination against female children specified in the horizontal axe in this figure/column 1 in this table, and the mean of the remaining regressors. * p < .01; ** p < .005; *** p < .001.

Appendix

Table 3: Robustness Analysis (I): Mortality of daughters using cohorts 0–5 and 0–10 as the focus of the analysis. Sample of mothers aged 15–49, India 2005–2006.

	Dependent variable: Number of daughters who died before age 5	Dependent variable: Number of daughters who died before age 10
Regressors:		
Unwanted daughters (UD)	0.004*** (0.001)	0.004*** (0.001)
Societal discrimination (D)	0.056** (0.009)	0.061*** (0.009)
Cross-partial derivative derivative with UD and D	-0.024*** (0.003)	-0.025*** (0.003)
Control variables	Yes	Yes
LR Chi-Square (df)	6,098.15 (25)***	6,457.79 (25)***
Vuong	2.49*	2.41*
Observations:	43,576	43,576

Notes: The columns present the marginal effects on the predicted number of deaths at the mean of the regressors. Standard errors for marginal effects are in parentheses. The estimation uses the Zero-Inflated Poisson model. The specification for the probability of zero outcomes includes education. The likelihood ratio (LR) Chi-Square test compares the model specified in the corresponding column with the unconditional model. The p-value associated with this test informs whether, as a whole, the model is statistically significant. The Vuong (1989) test compares the Zero-Inflated Poisson model with the standard Poisson model: large positive (negative) values favor the Zero-Inflated Poisson (standard Poisson) model, while absolute values below 2 do not favor any model.
* $p < .01$; ** $p < .005$; *** $p < .001$.

Table 4: Robustness Analysis (II): Measures of societal discrimination against females. Sample of mothers aged 15–49, India 2005–2006.

	Dependent variable: number of daughters who died before age 1			
	(1)	(2)	(3)	(4)
Regressors:				
Unwanted daughters (UD)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
Female freedom to act otherwise (FF)	0.035*** (0.006)	0.019*** (0.009)		
Female labor status (LS)			0.022 (0.009)	-0.006 (0.015)
Cross-partial derivative derivative with UD and FF or LS	-0.009** (0.003)	-0.016*** (0.004)	-0.011** (0.004)	-0.019** (0.005)
Control variables	Yes	Yes	Yes	Yes
LR Chi-Square	5,602.81(25)***	4,107.10(25)***	5,576.21(25)***	4,110.92(25)***
Vuong	3.42***	3.25***	3.52***	3.27***
Observations:	64,545	43,576	64,545	43,576

Notes: The dependent variable is the number of daughters who died before age one. Discrimination that women suffer is included in all columns of this table, which is measured by the percentage of women in the state that need permission to go to market alone in columns 1 and 2, while it is measured by the percentage of women that fail to participate in labor markets in the state in columns 3 and 4. The columns present the marginal effects on the predicted number of deaths at the mean of the regressors. Standard errors for marginal effects are in parentheses. The cross-partial derivative of the expected number of daughters' deaths with respect to an excess of female births, and societal discrimination at the mean of the regressors, is presented in the second section of the table. The estimation employs the Zero-Inflated Poisson model. The specification for the probability of zero outcomes includes education. The likelihood ratio (LR) Chi-Square test compares the model specified in the corresponding column with the unconditional model. The p-value associated with this test informs whether, as a whole, the model is statistically significant. The Vuong (1989) test compares the Zero-Inflated Poisson model with the standard Poisson model: large positive (negative) values favor the Zero-Inflated Poisson (standard Poisson) model, while absolute values below 2 do not favor any model.
* $p < .01$; ** $p < .005$; *** $p < .001$.

Table 5: Robustness Analysis (III): Role of district health facilities and survey year.

Sample of mothers aged 15–49, India 1998–1999.

	Dependent variable: number of daughters who died before age 1			
	(1)		(2)	
Regressors:				
Unwanted daughters (UD)	0.004***	(0.001)	0.004**	(0.001)
Societal discrimination (D)	0.032**	(0.010)	0.016	(0.011)
District health facilities			-0.021	(0.006)
Cross-partial derivative derivative with respect to UD and D	-0.024***	(0.004)	-0.055***	(0.004)
Control variables	Yes		Yes	
LR Chi-Square	4,685.06(25)***		4,466.87(26)***	
Vuong	2.08		2.00	
AIC	22,372.48		21,489.25	
BIC	22,612.79		21,735.81	
Observations:	39,437		39,437	

Notes: The dependent variable is the number of daughters who died before age one. District health facilities variable is the percentage of villages in the district with their own health facility. The columns present the marginal effects on the predicted number of deaths at the mean of the regressors. Standard errors for marginal effects are in parentheses. The cross-partial derivative of the expected number of daughters' deaths with respect to an excess of female births, and societal discrimination against young females at the mean of the regressors, is presented in the second section of the table. The estimation uses the Zero-Inflated Poisson model. The specification for the probability of zero outcomes includes education. The likelihood ratio (LR) Chi-Square test compares the model specified in the corresponding column with the unconditional model. The p-value associated with this test informs whether, as a whole, the model is statistically significant. The Vuong (1989) test compares the Zero-Inflated Poisson model with the standard Poisson model: large positive (negative) values favor the Zero-Inflated Poisson (standard Poisson) model, while absolute values below 2 do not favor any model. Akaike information criterion (AIC) based on the likelihood framework, and Schwartz information criterion (BIC) based on the Bayesian framework compare nested models; lower values imply an increased explanatory power.
* $p < .01$; ** $p < .005$; *** $p < .001$.

Table 6: Robustness Analysis (IV): Role of family size and base neglect.

Sample of mothers aged 15–49, India 2005–2006.

	Dependent variable: number of daughters who died before age 1		
	(1)	(2)	(3)
Regressors:			
Unwanted daughters (UD)	0.004*** (0.001)	0.023*** (0.001)	0.026*** (0.001)
Societal discrimination (D)	0.043*** (0.008)	0.090*** (0.009)	0.100*** (0.009)
Cross-partial derivative derivative with UD and D	-0.023*** (0.003)	-0.022*** (0.003)	-0.011** (0.004)
Control variables	Except sons deaths	Except family size	Except son deaths and family size
LR Chi-Square	4,130.70 (24)***	3,473.97 (24)***	3,176.72 (23)***
Vuong	3.52***	3.72***	4.15***
AIC	20,088.52	20,745.25	21,040.5
BIC	20,322.94	20,979.67	21,266.24
Observations:	43,576	43,576	43,576

Notes: The dependent variable is the number of daughters who died before age one. The columns present the marginal effects on the predicted number of deaths at the mean of the regressors. Standard errors for marginal effects are in parentheses. The cross-partial derivative of the expected number of daughters' deaths with respect to an excess of female births, and societal discrimination against young females at the mean of the regressors, is presented in the second section of the table. The estimation employs the Zero-Inflated Poisson model. The specification for the probability of zero outcomes includes education. The likelihood ratio (LR) Chi-Square test compares the model specified in the corresponding column with the unconditional model. The p-value associated with this test informs whether, as a whole, the model is statistically significant. The Vuong (1989) test compares the Zero-Inflated Poisson model with the standard Poisson model: large positive (negative) values favor the Zero-Inflated Poisson (standard Poisson) model, while absolute values below 2 do not favor any model. Akaike information criterion (AIC) based on the likelihood framework, and Schwartz information criterion (BIC) based on the Bayesian framework compare nested models; lower values imply an increased explanatory power.
* $p < .01$; ** $p < .005$; *** $p < .001$.

Table 7: Robustness Analysis (V): Role of Zero-Inflated Poisson model.

Sample of mothers aged 15–49, India 2005–2006.

	Dependent variable: number of daughters who died before age 1				
	(1)	(2)	(3)	(4)	(5)
Regressors:					
Unwanted daughters (UD)	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Societal discrimination (D)	0.044***	0.046***	0.047***	0.047***	0.049***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Cross-partial derivative derivative with UD and D	-0.018***	-0.023***	-0.022***	-0.021***	-0.021***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Control variables	Yes	Yes	Yes	Yes	Yes
Zero outcomes specification:					
Education: (School)					
No school	No	Yes	Yes	Yes	Yes
Residence: (Rural)					
Urban	No	Yes	Yes	Yes	Yes
Geo. region: (Northwest)					
East	No	No	Yes	Yes	Yes
South	No	No	Yes	Yes	Yes
Central	No	No	Yes	Yes	Yes
Durables	No	No	No	Yes	Yes
Caste: (Other)					
Scheduled caste	No	No	No	No	Yes
Scheduled tribe	No	No	No	No	Yes
Vuong		3.59***	4.29***	4.48***	4.60***
AIC	20,135.25	20,066.68	20,046.13	20,044.34	20,042.73
BIC	20,360.99	20,318.47	20,323.96	20,330.86	20,346.61
Observations:	43,576	43,576	43,576	43,576	43,576

Notes: The dependent variable is the number of daughters who died before their first birthday. The columns present the marginal effects on the predicted number of deaths at the mean of the regressors. Standard errors for marginal effects are in parentheses. The cross-partial derivative of the expected number of daughters' deaths, with respect to excess of female births and societal discrimination against young females at the mean of the regressors, is presented in the second section of the table. Except in column 1 (standard Poisson regression), the estimation employs the Zero-Inflated Poisson model. Akaike information criterion (AIC) based on the likelihood framework, and Schwartz information criterion (BIC) based on the Bayesian framework compare nested models; lower values imply an increased explanatory power. * $p < .01$; ** $p < .005$; *** $p < .001$.