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Gender Bias in Education: the Role of Inter-household Externality, Dowry and Other Social Institutions

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By

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Abstract

We analyze gender bias in school enrollment by developing a two-period model where women become part of extended families of their in-laws. Each family decides how many children are sent to school and thus become skilled. Gender bias occurs due to failure of the families to internalize inter-household externalities. 'Groom-price' dowry worsens the situation. Under 'bride-price' dowry, bias exists if and only if the skill premium in the labor market is bigger than that in the marriage market. A specific discriminatory 'food-for-education' policy is shown to reduce bias, but increase total enrollment. Finally, using cross-country data, we test some of the predictions of our theoretical analysis.

JEL Classification: H52, O10, O16.
Keywords: education, child labor, skill, gender bias, dowry

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1 Introduction

Gender inequality — whether in education or in wages, in health or in occupations, outside the home or within the household, in rich or in poor countries — is well documented. This bias against women is much more pervasive in the developing world. For example, in South and South-East Asia the proportion of young men alive is much higher than young women resulting in as many as 80 million 'missing' young women (Drèze and Sen, 1989; Bardhan and Klasen, 1999). The most common explanation for such gender gap is summarized by Rosenzweig and Shultz (1982) as parents allocating a larger share of the family's resources to children who have potential for being more economically productive as adults. To this if we include a socially persistent backdrop of wage discrimination in the labor market, loss of earnings from daughters following their marriage, and some proportion of unexplained parental discrimination (Gandhi-Kingdon, 2002), sons emerge as the more preferred gender, hence the bias.

The two most compelling areas of bias against females in developing countries are in the labor market and in education. In this paper our focus is the gender gap in education in developing countries within the context of certain prevailing social norms. In order to sharpen focus we shall assume away other possible forms of bias such as that in the labor market and in intra-household distribution of nutrients. We model parents' behavior in making decisions about educating their male and female children, the alternative to education being working as child labor.[1] In constructing our model we consider an extended family where the entire household behaves as a single unitary agent as in Becker (1981). In such a family married sons live with parents and contribute economically towards the family's budget. Similarly, once a daughter is married, all her assets become part of her in-law's family (Sharma, 1993). This assumption implies a reliance on sons' and daughters-in-law's incomes by families and non-reliance on the income potential of an adult daughter.

We construct a two-period model and begin with a benchmark case in which a certain proportion of male and a certain proportion of female children are sent to school by parents while the rest work. It assumes that education leads to higher income for the individual.[2] The extra income of an educated male child accrues to the family and that of the educated female child (who is married at the end of period 1) goes to her in-law's family. We assume that a family does not internalize the externalities of daughters-in-law's education as such investments are made by the latter's families. It is found that because of the above-mentioned lack of coordination between the families, parents send a larger proportion of sons to school compared to daughters. In other words, the fact that married daughters become part of in-laws' families is not by itself a reason for bias against women as for each daughter 'lost' a

[1]Our contribution can also be seen as a contribution, and providing a gender dimension, to the fast emerging literature on child labor. Some theoretical contributions on the economics of child labor are Basu and Van (1998), Basu (2000), Baland and Robinson (2000), Dessy (2000), Jafarey and Lahiri (2000, 2002), Ranjan (1999), and Gupta (2000). Econometric studies include Cockburn (2000), Emerson and D'Souza (2000), Ravallion and Woodon (2000), Ray (2000), and Maitra and Ray (2002). For two extensive surveys of the literature see Basu (1999) and Jafarey and Lahiri (2001).

[2]See Glewwe (2002) for an extensive survey on the socioeconomic effects of education in developing countries.

family 'gains' a daughter-in-law. It is the interaction between this social institution and the lack of coordination between families that, according to our analysis, causes discrimination.

Having set up our basic model of gender bias, we then consider two simple extensions of this model by introducing dowry.[3] The first extension involves a situation where a more educated groom demands a higher dowry regardless of the education level of the bride. In the second case a bride's education level helps to lower dowry payment, regardless of the education of the groom.

We call first case of dowry a 'groom-price' dowry since the dowry being paid is groom specific. It is similar to what Sheel (1999) describes as a higher dowry being correlated with the higher socioeconomic status of the groom's family. It should be noted that in equilibrium the net dowry payment is zero as we assume that each family has the same number of grooms and brides and the equilibrium is symmetric: dowry payments for daughters cancel out with dowry receipts for sons. However, because of the lack of coordination mentioned above, the rates of dowry payments do affect the marginal conditions and therefore the education levels of both male and female children. As groom price for educated males increases or the groom price of uneducated males decreases, a larger proportion of male children are educated and fewer female children are educated, *i.e.*, groom-price dowry contribute towards more bias against daughters.

In the second case, the dowry is bride-specific and we call this 'bride-price' dowry. A woman's education can be viewed as an asset she brings into the family and several studies supports the hypothesis that educated women have more bargaining power in a family's decision making process (Shultz, 1999; Quisumbing and Maluccio, 2000; Quisumbing and Briere, 2000; Basu, 2001). Most of these studies have looked at how a woman's assets at the time of marriage adds to her bargaining position in the family. We extend this to a woman's education adding to her bargaining position at the time of marriage itself.[4,5]

In this case we find that dowry can lead to lower bias against daughters than in the benchmark case, provided the skill premium in the marriage market is larger than that in the labor market. It should be noted that in either of the two scenarios, it is the skill premium in the marriage market — i.e., the difference between dowry levels for skilled and unskilled bridegroom (for the case of groom-price dowry) or bride (for the case of bride-price dowry) — that affects school enrollment rates. If skill-premium in the marriage market is absent, the level of dowry payments would have no effect in our framework as in equilibrium net dowry payments is zero: dowry payments for daughters cancel out with dowry receipts for sons.

Finally, we examine how a food-for-education subsidy program can be used to reduce

[3]Dowry is a common socio-cultural practice in many developing countries which, according to Rao (1993) and Anderson (2003), has been rising in much of South Asia over the past decade.

[4]It is to be noted that, in our framework, for both 'groom-price' and 'bride-price' dowry, it is the bride's family that pays dowry to the groom's family. In the literature sometimes bride-price dowry is taken to mean a situation where the groom's family pays dowry to the bride's family.

[5]There is some evidence that rich households in Pakistan tend to educate their daughters purely for marriage purposes rather than for labor market reasons, as female education is often found to be negatively correlated with female workforce participation (see, for example, Ilahi and Jafarey (1996)).

bias against daughters, but not at the cost of reducing total school enrollment.[6] We find that due to the substitutability between boys and girls, any subsidy for boys alone results in the reduction of the proportion of girls being sent to school and *vice versa*. Thus, an effort to increase the education of one gender, can result in a reduction in total enrollment. In order to address this problem, we conduct a policy experiment and suggest a particular policy reform which would reduce an existing bias without reducing total enrollment.

The lay out of the paper is as follows. The following section sets up the basic model. Three subsections analyze in turn a benchmark model with no dowry and two extensions involving two types of dowry mentioned above. The analysis of the food-for-subsidy policy is taken up in section 3. In section 4, some of the predictions of our theoretical model is tested using cross-country data. Finally, some concluding remarks are made in section 4.

2 The Theoretical Framework

We consider a society with a two-period horizon, indexed by $t = 1, 2$ respectively. The economy produces a single good per period. Goods are labelled 1 and 2 respectively, depending on the period of production. The production technology is linear in effective units of labor and normalized such that one effective unit of labor produces one unit of output per period.

The society has a number of identical households each headed by a single parent and has N number of boys and N number of girls. Children are endowed at birth with a low skill level, ϕ^u. But unlike their parents, children can increase their skill level to ϕ by undertaking full-time schooling in the first period.

For each poor child not educated, its family receives a wage income of ϕ^u units of output per period. For each child who undertakes schooling, the family foregoes the child's wage in the first period but receives a higher wage, ϕ in the second period.

Each parent's preferences are represented by a utility function over the two consumption goods and a measure of the educational level of children.

$$v = w(c_1, c_2) + Ng(e_m) + Ng(e_f), \tag{1}$$

where v is utility, c_i is consumption of good i $(i = 1, 2)$, and e_m and e_f are the proportion of boys and girls respectively who receive schooling at $t = 1$. The functions w and g are increasing and concave in their respective arguments. $g(\cdot)$ can be interpreted as capturing the subjective preference that parents have for schooling over child labor.[7] There is considerable anecdotal evidence to suggest not only that most parents derive some form of disutility from subjecting their children to labor, but also that they get positive utility from educating them

[6] Ravallion and Wodon (2000) evaluate the food-for-subsidy program in Bangladesh. Jafarey and Lahiri (2000) compare this policy with an alternative policy, *viz.*, investment in education quality, in the presence of credit market distortions.

[7] In principle the g-function could be gender specific characterizing an inherent bias against young girls in the society. However, since the purpose of this paper is to explain gender bias via economic and social channels, we assume the functions to be the same.

instead, even when the pecuniary returns to education by themselves might not warrant this choice.[8] A similar subjective preference is implicit in Basu and Van (1998).

Dowry, and therefore marriage, plays an important role in our analysis. We assume that all young men and women get married at the beginning of period 2 to people from outside the family. The daughters leave home to live with their in-laws and the daughters-in-law move in with the husbands' families. Therefore, each family continue to have N young men and the same number of young women. However, there is an important difference between the two genders in this respect. Since for the daughters-in-law, investment in education are made by other families, a family has no control over how many educated and how many uneducated daughters-in-law it can have. We assume that educated men get married to educated women, if possible, and if the number of educated men in the society is more than that of women, some men are left with no option but to marry uneducated women. In other words, there is positive correlation between education of brides and grooms. But exactly how many educated daughters-in-law a family gets depends on how many educated girls there are outside the family, and importantly the family has no control over this number. In the process of the marriage, the bride's family has to pay a dowry to the bridegroom's family. We shall describe later on how education affects the level of dowry.

Consumption is assumed to be non-rivalrous within households, allowing us to abstract from intra-household distributional issues.[9] This completes the description of households. We now proceed to the basic decision making problem facing them. For expositional simplicity, we shall assume that there are only two families in the society.

Each household's inter-temporal budget constraint can be expressed as:

$$\begin{aligned} Pc_1 + \frac{Pc_2}{r} &= \phi^u + N(1-e_m)\phi^u + \frac{\phi^u}{r} + Ne_m\frac{\phi}{r} + N(1-e_m)\frac{\phi^u}{r} + N(s_m e_m + s_f e_f) \\ &\quad + \left[N(1-e_f)\phi^u + Ne_f^*\frac{\phi}{r} + N(1-e_f^*)\frac{\phi^u}{r}\right] + \frac{D}{r} = Y \text{ (say)}, \end{aligned} \tag{2}$$

where r is the market interest factor (one plus the interest rate), P is the price of the consumption good per period and D is the net dowry income. e_f^* represents the proportion of educated women in the other family. s_f and s_m respectively are the subsidies that the family receives for sending each girl and boy to school.

The first and the second term on the right hand side of (2) are the period 1 income of the parent and boys respectively. The next term is the present value of parent's income in period 2. The fourth and the fifth terms are respectively the present values of second-period incomes of the skilled and unskilled young men. The sixth terms is the subsidy payment the family receives for sending their children to school. The expressions inside the square bracket are the period 1 and discounted present value of period 2 income by young women: period 1 income are due to daughters, but period 2 income are due to daughters-in-law.

[8]A recent survey conducted in villages of six northern provinces of India, found that economic motives are not the only reasons why poor families want their children to go to school (see The Probe Team (1999, chs. 2 and 3)).

[9]For reasons mentioned in footnote 7, we abstract away from intra-household distribution in nutrients.

The household's problem consists of choosing c_i, $i = 1, 2$, and e_j, $j = m, f$, in order to maximize (1) subject to (2), and to the constraint, $e_j \in [0, 1]$, $(j = m,\ f)$. We shall consider this problem in two stages. In the first stage, the family makes consumption decisions for given levels e_m and e_f. This problem gives us an indirect utility function $V(P, P/r, Y)$, and therefore:

$$v = V(P, \frac{P}{r}, Y) + Ng(e_m) + Ng(e_f), \tag{3}$$

where income Y is defined in (2).

In the second stage, each family maximizes its utility level, given in (3) with respect to e_m and e_f, taking the educational decisions of other families, e_m^* and e_f^* as given. Since formalizing this problem requires specification of the net dowry income D, we consider this in the following three subsection, starting with the benchmark case where no dowry is paid.

2.1 No dowry: the benchmark case

We consider this case of no dowry for two reasons. First, this will be used for comparison purposes. Second, we want to highlight the fact that in our framework gender bias can occur even in the absence of dowry.

From (2) and (3), we find the first order conditions for e_m and e_f as

$$\begin{aligned} \frac{\partial v}{\partial e_m} &= V_3 N\left[-\phi^u + s_m + \frac{\phi - \phi^u}{r}\right] + Ng'(e_m) = 0, && (4) \\ \frac{\partial v}{\partial e_f} &= V_3 N(s_f - \phi^u) + Ng'(e_f) = 0. && (5) \end{aligned}$$

Equations (4) and (5) can be simplified as:

$$\begin{aligned} \frac{g'(\bar{e}_m)}{\bar{V}_3} + s_m + \frac{\phi - \phi^u}{r} &= \phi^u, && (6) \\ \frac{g'(\bar{e}_f)}{\bar{V}_3} + s_f &= \phi^u, && (7) \end{aligned}$$

where $\bar{e}_m$ and $\bar{e}_f$ are respectively the equilibrium values of e_m and e_f in this equilibrium and $\bar{V}_3$ is the value of the marginal utility of income evaluated at the present equilibrium.

The marginal benefit of an extra boy in education is represented by the left-hand side of (6): an increase in e_m leads to a marginal pecuniary gain $(\phi - \phi^u)$ units of second-period income (the so-called skill premium in the labor market), plus a marginal utility increase of $g'(e_m)$, which has a pecuniary value of $g'(\bar{e}_m)/\bar{V}_3$. The term on the right-hand side represents the marginal cost, *i.e.* the loss of ϕ^u units of first-period income.[10] Since

[10] An interior choice of e_m also reflects negative discounted pecuniary returns (net of opportunity cost) to education of boys for the representative household. This in turn reflects a low level of value added by schooling, $(\phi - \phi^u)$. In this situation, the subjective parental preference for education plays a crucial role

for girls, the second-period income is due to daughters-in-law and the decision to educate the latter or not is made by other families without any coordination with future husbands' families, the marginal benefit of educating a girl is lower than that of educating a boy, and the difference is given by the skill premium in the labor market. It therefore follows that the equilibrium value of e_m must be higher than that of e_f.[11] Formally,

Proposition 1 *In the absence of dowry and any differential policy intervention, more boys than girls go to school.*

To summarize the results of this section, it should be noted that fewer girls than boys receive education for two reasons. First, daughters after marriage become part of the extended family of their husbands. Second, the return to investment on a daughter's education goes to her husband's families and the families do not coordinate their actions. Thus it is the interplay of a particular type of social institution and a failure to internalize inter-family externalities which results in a gender bias against girls as far as school enrollment is concerned.

2.2 Groom-price of dowry

In this subsection we assume that there is a groom price for dowry, *i.e.*, a groom commands a dowry and the amount depends on whether he is educated or not. Denoting by D_s^g and D_u^g respectively the amount of dowry that an educated and an uneducated bridegroom receives, the net amount of dowry received by the family is

$$D = [Ne_m D_s^g + N(1-e_m)D_u^g] - [Ne_m^* D_s^g + N(1-e_m^*)D_u^g] \,. \tag{8}$$

The term inside the first square bracket on the right hand side of (8) is the amount of dowry received by the bridegrooms and that inside the second square bracket is the amount of dowry paid out for the brides. Since skill level of the husbands of the family's daughters are decided outside the family, the family cannot affect the amount paid out by its choice of education variables.

The first order condition for e_m and e_f in this case are

$$\frac{g'(\tilde{e}_m)}{\tilde{V}_3} + s_m + \frac{\phi - \phi^u}{r} + \frac{D_s^g - D_u^g}{r} = \phi^u, \tag{9}$$

$$\frac{g'(\tilde{e}_f)}{\tilde{V}_3} + s_f = \phi^u, \tag{10}$$

where $\tilde{e}_m$ and $\tilde{e}_f$ are respectively the equilibrium values of e_m and e_f in this equilibrium and $\tilde{V}_3$ is the value of the marginal utility of income evaluated at the present equilibrium.

in determining a positive value for e_m. Such a situation is consistent both with evidence on the quality of primary schooling available to poor households in developing countries and on the subjective parental attitudes toward education amongst such households (see The Probe Team (1999)).

[11] More rigorously speaking, with $s_f = s_m$, subtracting (7) from (6), we get $g'(\bar{e}_m) - g'(\bar{e}_f) = \bar{V}_3[\phi^u - \phi]/r < 0$. Since $g'' < 0$ it then follows that $\bar{e}_m > \bar{e}_f$.

Note that the dowries have no direct effect on the marginal conditions for $\tilde{e}_f$ as the total payments of dowries in the present case depends on how many skilled grooms there are outside the family which depends on decisions by other families. Comparing (9) and (10) with (6) and (7), we find that the presence of dowry only raises the marginal benefit of sending a boy to school (by the skill premium for the grooms in the marriage market $(D_s^g - D_u^g)/r$) and therefore there is bias against girls in the present case as well, *i.e.*, $\tilde{e}_m > \tilde{e}_f$. Next we want to examine if the presence of dowry increases the bias against young girls. We do so, *inter alia*, in the following subsection.

2.2.1 Comparative statics

In this subsection we shall examine how the equilibrium values of $\tilde{e}_m$ and $\tilde{e}_f$ change when some of the exogenous parameters of the model are altered. In particular, note that in our symmetric equilibrium, *i.e.*, $e_m = e_m^*$ and $e_f = e_f^*$, the equilibrium values of net dowry income given by (8) is zero and therefore $\bar{e}_m$ and $\bar{e}_f$ are equal respectively to $\tilde{e}_m$ and $\tilde{e}_f$ when the latter are evaluated at $D_s^g - D_u^g = 0$. Therefore, if we show that $d\tilde{e}_m/dD_s^g > 0$, $d\tilde{e}_m/dD_u^g < 0$, $d\tilde{e}_f/dD_s^g < 0$ and $d\tilde{e}_f/dD_u^g > 0$, it will follow that $\tilde{e}_m > \bar{e}_m$ and $\tilde{e}_f < \bar{e}_f$. In the following analysis we shall prove that this is indeed the case.

Totally differentiating (2), (9) and (10), we get

$$\begin{aligned}
\frac{1}{N} \cdot dY &= -\theta_1 d\tilde{e}_m - \theta_2 d\tilde{e}_f + e_m ds_m + e_f ds_f - \frac{Y_2}{r^2 N} dr + \frac{\tilde{e}_m + \tilde{e}_f}{r} d\phi, &(11)\\
\frac{g''(\tilde{e}_m)}{\tilde{V}_3} \cdot d\tilde{e}_m &= \frac{g'(\tilde{e}_m)\tilde{V}_{33}}{\left(\tilde{V}_3\right)^2} dY - ds_m - \frac{dD_s^g - dD_u^g}{r} + \theta_3 dr - \frac{1}{r} d\phi, &(12)\\
\frac{g''(\tilde{e}_f)}{\tilde{V}_3} \cdot d\tilde{e}_f &= \frac{g'(\tilde{e}_f)\tilde{V}_{33}}{\left(\tilde{V}_3\right)^2} dY - \frac{g'(\tilde{e}_f)\tilde{V}_{32} P}{\left(\tilde{V}_3 r\right)^2} dr - ds_f, &(13)
\end{aligned}$$

where

$$\begin{aligned}
Y_2 &= \phi^u + N e_m \phi + N e_f^* \phi + N(1 - e_m)\phi^u + N(1 - e_f^*)\phi^u + D,\\
\theta_1 &= \phi^u - \frac{\phi - \phi^u}{r} - s_m,\\
\theta_2 &= \phi^u - \frac{\phi - \phi^u}{r} - s_f,\\
\theta_3 &= \frac{D_s^g - D_u^g + \phi - \phi^u}{r^2} - \frac{g'(\tilde{e}_m)\tilde{V}_{32} P}{\left(\tilde{V}_3 r\right)^2}.
\end{aligned}$$

Note that in view of (9) and (10), $\theta_1 > 0,\ \theta_2 > 0$. Furthermore, a sufficient condition for $\theta_3 > 0$ is that $V_{32} < 0$, an assumption that we shall make henceforth.[12]

[12]If the utility function $w(c_1,\ c_2)$ (see (1)) is homogeneous of degree 1 in c_1 and c_2, V_{32} is indeed negative.

From (11) we see that an increase in either e_m or e_f reduces total income (discounted over two periods), increases in the subsidy rates and skilled wage rate raise income, and an increase in the discount (interest) rate reduces income. The latter two effects are straightforward to explain. The first effects are due to the fact in our education equilibria (equations (6), (7), (9) and (10)), we have negative discounted pecuniary returns to education (see footnote 10).

An increase in total income Y raises both $\tilde{e}_m$ and $\tilde{e}_f$ as can be seen from the first terms on the right and sides of (12) and (13). These are due to pure income effects: an increase in Y reduces the marginal utility of income V_3 and therefore increases the dollar value of non-pecuniary returns to education (first terms on the left hand sides of (9) and (10)). The effect of the subsidy rate s_m (s_f) has the direct effect of increasing the marginal benefit of educating a boy (girl) and thus its effect on $\tilde{e}_m$ ($\tilde{e}_f$) is positive. Similarly, an increase in D_s^g (or a decrease in D_u^g) raises the marginal benefit of education a boy and thus $\tilde{e}_m$. This however has no direct effect on $\tilde{e}_f$ for reasons mentioned after (10). An increase in r increases V_3 since $V_{32} < 0$ and thus unambiguously reduces the equilibrium value of $\tilde{e}_f$. There is an additional negative effect of an increase in r on $\tilde{e}_m$ via the reduction in the present value of marginal benefits $(D_s^g - D_u^g + \phi - \phi^u)/r$. Finally, an increase in skilled wage rate ϕ has no direct effect on e_f as the families do not internalize the contributions of skilled daughters-in-law, but raises e_m.

Substituting (11) into (12) and (13) we obtain

$$\begin{aligned}
\alpha_1 d\tilde{e}_m + \alpha_2 d\tilde{e}_f &= \beta_1 ds_m + \beta_2 ds_f + \beta_3 dr + \frac{1}{r} dD_u^g - \frac{1}{r} dD_s^g \\
&\quad + \left[\frac{\alpha_2(\tilde{e}_m + \tilde{e}_f)}{\theta_2 r} - \frac{1}{r} \right] d\phi, \qquad (14) \\
\alpha_3 d\tilde{e}_m + \alpha_4 d\tilde{e}_f &= \beta_4 ds_m + \beta_5 ds_f + \beta_6 dr + \frac{\alpha_3(\tilde{e}_m + \tilde{e}_f)}{\theta_1 r} d\phi, \qquad (15)
\end{aligned}$$

where

$$\begin{aligned}
\alpha_1 &= \frac{g''(\tilde{e}_m)}{\tilde{V}_3} + \theta_1 \frac{g'(\tilde{e}_m) N \tilde{V}_{33}}{\left(\tilde{V}_3\right)^2} < 0, \qquad & \alpha_2 &= \theta_2 \frac{g'(\tilde{e}_m) \tilde{V}_{33} N}{\left(\tilde{V}_3\right)^2} < 0 \\
\alpha_3 &= \theta_1 \frac{g'(\tilde{e}_f) \tilde{V}_{33} N}{\left(\tilde{V}_3\right)^2} < 0, \qquad & \alpha_4 &= \frac{g''(\tilde{e}_f)}{\tilde{V}_3} + \theta_2 \frac{g'(\tilde{e}_f) \tilde{V}_{33} N}{\left(\tilde{V}_3\right)^2} < 0, \\
\beta_1 &= \frac{g'(\tilde{e}_m) \tilde{V}_{33} N \tilde{e}_m}{\left(\tilde{V}_3\right)^2} - 1 < 0, \qquad & \beta_2 &= -\frac{g'(\tilde{e}_m) \tilde{V}_{33} N \tilde{e}_f}{\left(\tilde{V}_3\right)^2} > 0, \\
\beta_3 &= \theta_3 - \frac{g'(\tilde{e}_m) \tilde{V}_{33} Y_2}{\left(\tilde{V}_3 r\right)^2} > 0, \qquad & \beta_4 &= -\frac{g'(\tilde{e}_f) \tilde{V}_{33} N \tilde{e}_m}{\left(\tilde{V}_3\right)^2} > 0, \\
\beta_5 &= \frac{g'(\tilde{e}_f) \tilde{V}_{33} N \tilde{e}_f}{\left(\tilde{V}_3\right)^2} - 1 < 0, \qquad & \beta_6 &= -\frac{g'(\tilde{e}_f)}{\left(\tilde{V}_3 r\right)^2} \cdot \left(\tilde{V}_{32} P + \tilde{V}_{33} Y_2 \right) > 0.
\end{aligned}$$

Solving (14) and (15) simultaneously, we obtain

$$\frac{d\tilde{e}_m}{ds_m} = \frac{\beta_1\alpha_4 - \alpha_2\beta_4}{\Delta} > 0, \qquad \frac{d\tilde{e}_f}{ds_m} = \frac{\alpha_1\beta_4 - \alpha_3\beta_1}{\Delta} < 0,$$

$$\frac{d\tilde{e}_m}{ds_f} = \frac{\beta_2\alpha_4 - \alpha_2\beta_5}{\Delta} < 0, \qquad \frac{d\tilde{e}_f}{ds_f} = \frac{\alpha_1\beta_5 - \alpha_3\beta_2}{\Delta} > 0,$$

$$\frac{d\tilde{e}_f}{dr} = \frac{\alpha_1\beta_6 - \alpha_3\beta_3}{\Delta} = \frac{g''(\tilde{e}_m)\beta_6}{\tilde{V}_3\Delta} - \frac{(D_s^g - D_u^g + \phi - \phi^u)\theta_1 g'(\tilde{e}_f)\tilde{V}_{33}N}{r\left(\tilde{V}_3\right)^2},$$

$$\frac{d\tilde{e}_m}{dr} = \frac{\beta_3\alpha_4 - \alpha_2\beta_6}{\Delta} = \frac{(D_s^g - D_u^g + \phi - \phi^u)\alpha_4}{r} + \frac{g'(\tilde{e}_m)g''(\tilde{e}_f)\beta_6}{g'(\tilde{e}_f)\tilde{V}_3} < 0,$$

$$\frac{d\tilde{e}_m}{dD_u^g} = \frac{\alpha_4}{r\Delta} < 0, \qquad \frac{d\tilde{e}_f}{dD_u^g} = \frac{-\alpha_3}{r\Delta} > 0, \tag{16}$$

$$\frac{d\tilde{e}_m}{dD_s^g} = \frac{-\alpha_4}{r\Delta} > 0, \qquad \frac{d\tilde{e}_f}{dD_s^g} = \frac{\alpha_3}{r\Delta} < 0, \tag{17}$$

$$\frac{d\tilde{e}_m}{d\phi} = \frac{-\alpha_4\theta_2 + \alpha_2 g''(\tilde{e}_f)(\tilde{e}_m + \tilde{e}_f)}{r\theta_2\Delta} > 0, \qquad \frac{d\tilde{e}_f}{d\phi} = \frac{\alpha_3\theta_1 + \alpha_3 g''(\tilde{e}_m)(\tilde{e}_m + \tilde{e}_f)}{r\theta_1\Delta}, \tag{18}$$

where $\Delta = \alpha_1\alpha_4 - \alpha_2\alpha_3 > 0$ from the second order condition.

As one would expect we find that a subsidy to children of a particular gender increases their school enrollment rate, but reduces that of children of the opposite gender. This cross effect occurs via changes in the marginal utility of income V_3. An increase in s_m, for example, reduces income Y and thus increases V_3 which in turn reduces the marginal non-pecuniary benefit of sending a girl to school. For the same cross-effect we find that whereas an increase in r unambiguously reduces $\tilde{e}_m$, its effect on $\tilde{e}_f$ is ambiguous.

An increase in r, for a given value of $\tilde{e}_m$ increases V_3 and therefore reduces $\tilde{e}_f$. But the cross-effect via changes in $\tilde{e}_m$ increases $\tilde{e}_f$. The asymmetry in the effects on $\tilde{e}_m$ and $\tilde{e}_f$ is due to the fact that skill premium in labor as well as in marriage market (which directly depend on the interest factor) affect the marginal condition for $\tilde{e}_m$, but not that for $\tilde{e}_f$. However, the effect of a change in r on the total enrollment rate is unambiguous when $s_m = s_f$. In particular, with $s_m = s_f$,

$$\frac{d(\tilde{e}_m + \tilde{e}_f)}{dr} = \frac{g''(\tilde{e}_m)\beta_6}{\tilde{V}_3} + \frac{g'(\tilde{e}_m)g''(\tilde{e}_f)\beta_6}{g'(\tilde{e}_f)\tilde{V}_3} + \frac{(D_s^g - D_u^g + \phi - \phi^u)g''(\tilde{e}_f)}{r\tilde{V}_3} < 0.$$

An increase in ϕ unambiguously increases $\tilde{e}_m$, but has two opposing effects on $\tilde{e}_f$. A higher skilled wage raises the marginal pecuniary benefit of educating a boy.[13] This is the direct positive effect. An increase in ϕ also increases family income which reduces the marginal utility of income and thus raises the 'dollar' value of marginal non-pecuniary

[13] One can also carry out a comparative static exercise with respect to unskilled wage rate ϕ^u. The direct effect of an increase in ϕ^u will reduce both e_m and e_f by increasing the opportunity cost of education. But an increase in ϕ^u will increase income and this will increase both e_m and e_f. So the net effect on both is ambiguous and will depend on the relative magnitude of income effect *vis-a-vis* the price (opportunity cost) effect. This exercise is left out for the sake of brevity.

benefit of educating a boy (the first term in (9)). Thus the effect of an increase in ϕ on $\tilde{e}_m$ is unambiguously positive. As for the effect on $\tilde{e}_f$, the direct effect is absent. The second positive effect via changes in income is present; but there is an additional negative effect which appears because of the perfect substitutability of boys' and girls' income, i.e., the direct benefit of educating a boy mentioned above reduces the need to educate a girl. Thus the net effect of ϕ on $\tilde{e}_f$ is ambiguous. However, we are able to say a little bit more the effect of ϕ on the ratio $\tilde{e}_m/\tilde{e}_f$. When $s_m = s_f$, $\theta_1 = \theta_2 > 0$ and so from (18) we get

$$\begin{aligned} \frac{d\left(\frac{\tilde{e}_m}{\tilde{e}_f}\right)}{d\phi} &= \frac{\tilde{e}_m}{\tilde{e}_f}\left\{\frac{1}{\tilde{e}_m}\cdot\frac{d\tilde{e}_m}{d\phi} - \frac{1}{\tilde{e}_f}\cdot\frac{d\tilde{e}_f}{d\phi}\right\} \\ &= \frac{\tilde{e}_m}{\tilde{e}_f}\cdot\frac{-\theta_1\left(\frac{\alpha_4}{\tilde{e}_m}+\frac{\alpha_3}{\tilde{e}_f}\right)+\frac{\tilde{V}_{33}N(\tilde{e}_m+\tilde{e}_f)g'(\tilde{e}_m)g'(\tilde{e}_f)}{\tilde{e}_m\tilde{e}_f(\tilde{V}_3)^3}\cdot\left[\frac{g''(\tilde{e}_f)\tilde{e}_f}{g'(\tilde{e}_f)}-\frac{g''(\tilde{e}_m)\tilde{e}_m}{g'(\tilde{e}_m)}\right]}{r\theta_1\Delta}. \end{aligned} \tag{19}$$

From the above equation we can conclude that if the sub-utility function $g(\cdot)$ is of the constant relative risk aversion (CRRA) type, i.e., if $g''(e)e/g'(e)$ is constant for all e, then the term within the square bracket on the right hand side of (19) is zero and therefore $d(\tilde{e}_m/\tilde{e}_f)/d\phi > 0$. In other words, when the sub-utility function g is of the CRRA type, an increase in skilled wage rate makes bias against girls worse.

As for the effects of dowry, from (16) and (17), we find that an increase in the skill premium for the groom in the marriage market, $D_s^g - D_u^g$, raises $\tilde{e}_m$, but reduces $\tilde{e}_f$. The latter effect is due to the indirect effect via changes in $\tilde{e}_m$ explained above. This confirms the assertion made in the paragraph just before subsection 2.2.1. Thus we have the following proposition.

Proposition 2 *The presence of groom-price dowry increases school enrollment of boys and reduces that of girls, as compared to the case where there is no dowry.*

Having analyzed the case of groom-price dowry, we now move to the case of bride-price dowry in the following subsection.

2.3 Bride-price of dowry

In this subsection we assume that there is a bride price for dowry, *i.e.*, the dowry is bride specific and the amount depends on whether she is educated or not. Denoting by D_s^b and D_u^b respectively the amount of dowry that an educated and an uneducated bride pays, the net amount of dowry received by the family is

$$D = \left[Ne_f^* D_s^b + N(1-e_f^*)D_u^b\right] - \left[Ne_f D_s^b + N(1-e_f)D_u^b\right]. \tag{20}$$

The term inside the first square bracket on the right hand side of (8) is the amount of dowry received by the bridegrooms and the that inside the second square bracket is the amount of dowry paid out for the brides. Since skill level of the daughters-in-law are decided outside the family, the family cannot affect the amount of dowry received by its choice of education variables.

The first order condition for e_m and e_f in this case are

$$\begin{aligned} \frac{g'(\hat{e}_m)}{\hat{V}_3} + s_m + \frac{\phi - \phi^u}{r} &= \phi^u, \quad (21) \\ \frac{g'(\hat{e}_f)}{\hat{V}_3} + s_f + \frac{D_u^b - D_s^b}{r} &= \phi^u, \quad (22) \end{aligned}$$

where $\hat{e}_m$ and $\hat{e}_f$ are respectively the equilibrium values of e_m and e_f in this equilibrium and $\hat{V}_3$ is the value of the marginal utility of income evaluated at the present equilibrium.

Note that, as opposed to the case of groom-price dowry, the skill premium in the marriage market now applies to the marginal condition for e_f and not that for e_m. It can be easily verified, following the proof given in footnote 11, that when $s_m = s_f$, $\hat{e}_m > \hat{e}_f$ if and only if $\phi - \phi^u > D_u^b - D_s^b$, *i.e.*, if and only if the skill premium for boys in the labor market is larger than the skill premium for brides in the marriage market. Formally,

Proposition 3 *In the presence of bride-price of dowry, bias against girls in school enrollment exists if and only if the skill premium for boys in the labor market is larger than the skill premium for brides in the marriage market.*

As in the previous subsection, we now want to examine if bride-price of dowry increases bias against girls as compared to the case where there is no dowry. For this, we first of all resort to a number of comparative static exercises in the following subsection.

2.3.1 Comparative statics

Parallel to (14) and (15) in this case,[14] we find

$$\begin{aligned} \alpha_1 d\hat{e}_m + \alpha_2 d\hat{e}_f &= \beta_1 ds_m + \beta_2 ds_f + \beta_7 dr, \quad (23) \\ \alpha_3 d\hat{e}_m + \alpha_4 \hat{d}e_f &= \beta_4 ds_m + \beta_5 ds_f + \beta_8 dr - \frac{1}{r} dD_u^b + \frac{1}{r} dD_s^b, \quad (24) \end{aligned}$$

where α_i $(i = 1, \cdots, 4)$, β_1, β_2, β_4, β_5 are defined after (15) and

$$\begin{aligned} \beta_7 &= -\frac{g'(\hat{e}_m)}{\left(\hat{V}_3 r\right)^2} \cdot \left(\hat{V}_{32} P + \hat{V}_{33} Y_2\right) + \frac{\phi - \phi^u}{r^2} > 0, \\ \beta_8 &= -\frac{g'(\hat{e}_f)}{\left(\hat{V}_3 r\right)^2} \cdot \left(\hat{V}_{32} P + \hat{V}_{33} Y_2\right) + \frac{D_u^b - D_s^b}{r^2} > 0. \end{aligned}$$

[14] We do not consider the effect of changes in ϕ in this case as they are exactly the same as in the case of groom-price dowry.

Solving (23) and (24) simultaneously we obtain

$$\frac{d\hat{e}_m}{dr} = \frac{\beta_7\alpha_4 - \beta_8\alpha_2}{\Delta} = \frac{\beta_7 g''(\hat{e}_f)}{\hat{V}_3\Delta} + \frac{\theta_2 g'(\hat{e}_f)\hat{V}_{33}N(\phi^u - s_m)}{\left(\hat{V}_3\right)^2 r\Delta} - \frac{\theta_2 g'(\hat{e}_m)\hat{V}_{33}N(\phi^u - s_f)}{\left(\hat{V}_3\right)^2 r\Delta}, \quad (25)$$

$$\frac{d\hat{e}_f}{dr} = \frac{\alpha_1\beta_8 - \alpha_3\beta_7}{\Delta} = \frac{\beta_8 g''(\hat{e}_m)}{\hat{V}_3\Delta} + \frac{\theta_1 g'(\hat{e}_m)\hat{V}_{33}N(\phi^u - s_f)}{\left(\hat{V}_3\right)^2 r\Delta} - \frac{\theta_1 g'(\hat{e}_f)\hat{V}_{33}N(\phi^u - s_m)}{\left(\hat{V}_3\right)^2 r\Delta}, \quad (26)$$

$$\frac{d\hat{e}_m}{dD_u^b} = \frac{\alpha_2}{r\Delta} < 0, \qquad \frac{d\hat{e}_f}{dD_u^b} = \frac{-\alpha_1}{r\Delta} > 0, \quad (27)$$

$$\frac{d\hat{e}_m}{dD_s^b} = \frac{-\alpha_2}{r\Delta} > 0, \qquad \frac{d\hat{e}_f}{dD_s^b} = \frac{\alpha_1}{r\Delta} < 0. \quad (28)$$

From (25) and (26), we observe that the effect of a change in r on both $\hat{e}_m$ and $\hat{e}_f$ are ambiguous because in the present case a change in the discount rate has direct effect on the marginal conditions for both variables. However, when $s_m = s_f$, we get the following results.

From (25) we find that when $s_m = s_f = s$

$$\frac{d\hat{e}_m}{dr} = \frac{\beta_7 g''(\hat{e}_f)}{\hat{V}_3\Delta} + \frac{\theta_2\hat{V}_{33}N(\phi^u - s)(g'(\hat{e}_f) - g'(\hat{e}_m))}{\Delta r(\hat{V}_3)^2}. \quad (29)$$

Since $g'' < 0$ and $V_{33} < 0$, it follows from the above equation that if $\hat{e}_m > \hat{e}_f$, we must have $d\hat{e}_m/dr < 0$.

Similarly, from (26) we find that when $s_m = s_f = s$

$$\frac{d\hat{e}_f}{dr} = \frac{\beta_8 g''(\hat{e}_m)}{\hat{V}_3\Delta} + \frac{\theta_1\hat{V}_{33}N(\phi^u - s)(g'(\hat{e}_m) - g'(\hat{e}_f))}{\Delta r(\hat{V}_3)^2}. \quad (30)$$

Once again, since $g'' < 0$ and $V_{33} < 0$, it follows from the above equation that if $\hat{e}_f > \hat{e}_m$, we must have $d\hat{e}_f/dr < 0$. That is, an increase in r decreases school enrollment rate of the 'favored' gender.

As for the effect of r on total enrollment, summing over (29) and (30), we get

$$\frac{d(\hat{e}_m + \hat{e}_f)}{dr} = \frac{\beta_8 g''(\hat{e}_m)}{\hat{V}_3\Delta} + \frac{\beta_7 g''(\hat{e}_f)}{\hat{V}_3\Delta} < 0.$$

Finally, turning to the effects of dowry, from (27) and (28), it is clear that an increase in skill premium for brides in the marriage market, $D_u^b - D_s^b$, unambiguously increases $\hat{e}_f$

and unambiguously decreases $\hat{e}_m$. The intuitions are similar to the ones given in subsection 2.2.1. This result is summarized in the following proposition.

Proposition 4 *The presence of bride-price dowry increases school enrollment of girls and reduces that of boys, as compared to the case where there is no dowry.*

It should be noted that in the case of either groom-price dowry or bride-price dowry, it is the skill premium in the marriage market — i.e., $D_s^g - D_u^g$ (for the case of groom-price dowry) or $D_u^b - D_s^b$ (for the case of bride-price dowry) — that affects school enrollment rates. If skill-premium in the marriage market is absent, the level of dowry rates will not affect the marginal conditions (see (9) and (22)) and will have no income effect as in equilibrium net dowry payment is zero, i.e., dowry payments for daughters cancel out with dowry receipts for sons (see (8) and (20)).

This completes our analysis of the the different equilibria that we presented and the comparative static exercises. In the next section we shall focus of the policy variables s_m and s_f.

3 A policy experiment

A measure to increase school enrollment that is actually being applied is a program — being tested in countries like Brazil, Mexico and Bangladesh by the World Bank — which pays families to send their children to school. This program, also known as Bolsa Escola in Brazil and PROGRESA in Mexico, gives poor families a means-tested income subsidy, typically in the form of food rations, for sending their children to school on a full time basis. In this section we want to examine if an introduction of a certain amount of discrimination in the application of this program can reduce bias in school enrollment without lowering total enrollment.[15] In particular, we consider a reform of the program which changes the levels of subsidies according to the following formula

$$ds_m = \frac{\lambda}{e_m}, \quad ds_f = \frac{\lambda}{e_f}, \tag{31}$$

where λ is a positive constant.[16] That is, the children of a particular gender that has a lower school enrollment rate receives a higher subsidy than the other children.

Taking the expressions for β_i, $(i = 1, 2, 3, 4)$ as defined after (15) and using (31), we get

$$\beta_1 ds_m + \beta_2 ds_f = -\frac{\lambda}{e_m}, \tag{32}$$

$$\beta_4 ds_m + \beta_5 ds_f = -\frac{\lambda}{e_f}. \tag{33}$$

[15]Note that since we do not change any of the dowry parameters or the interest rate, the following analysis can be applied to any of the three equilibria that we have described in this paper.

[16]If the total funds available for the program is limited, λ can be adjusted to meet the budget constraint.

Setting the $s_m = s_f$ and substituting (32) and (33) into (14) and (15) we obtain

$$\frac{e_m e_f \Delta}{\lambda}\, de_m = -\frac{g''(e_f)e_f}{V_3} + \frac{\theta_2 V_{33} N[g'(e_m)e_m - g'(e_f)e_f]}{(V_3)^2}, \tag{34}$$

$$\frac{e_m e_f \Delta}{\lambda}\, de_f = -\frac{g''(e_m)e_m}{V_3} + \frac{\theta_1 V_{33} N[g'(e_f)e_f - g'(e_m)e_m]}{(V_3)^2}, \tag{35}$$

$$\frac{e_m e_f \Delta}{\lambda}\, d(e_m + e_f) = -\frac{g''(e_f)e_f}{V_3} - \frac{g''(e_m)e_m}{V_3} > 0. \tag{36}$$

If $g'(e) + eg''(e) > 0$ for all $0 \leq e \leq 1$, *i.e.*, if $eg'(e)$ is an increasing function of e, it follows from (34) and (35) that $de_f > 0$ if $e_m > e_f$ and $de_m > 0$ if $e_f > e_m$. In other words, the policy experiment that we consider in this section will result in a higher enrollment of girls in the cases of no dowry and groom-price dowry and also in the case of bride-price dowry if skill premium in the labor market in higher than the skill premium for brides in the marriage market.[17] When skill premium in the labor market is lower than the skill premium for brides in the marriage market (for the case of bride-price dowry), more girls than boys go to school and our suggested reform will increase enrollment of boys. Interestingly, it also follows from (36) that in all the cases our reform will result in an increase in total enrollment.

4 An Empirical Test

The purpose of this section is to test empirically some of the predictions of our theoretical analysis using cross-country data. It may be recalled that in our analysis we focused on the inability of the families to coordinate their actions and thus to internalize inter-family externalities, and a particular type of social institution, viz., an extended family system where married women becomes part of the extended family of the in-laws, as two important reasons for the existence of gender bias in school enrollments. We also found that a particular type of dowry, viz., groom-price dowry, makes the scales tilt even further against women.

In order to test this basic premise, we conduct a very simple empirical exercise using cross-country data from the World Bank and the UNDP. We keep the exercise simple for practical reasons. First, some of our key variables are difficult to quantify. For example, ability or inability to coordinate actions is a point in hand. It is also difficult to compile data on social institutions including the extent of dowry. Second, the amount of missing observations also renders some of the variables such as school enrollment rates and manufacturing wage rates unusable. Given these limitations, we are forced make use of proxies for many of the variables.

As for the dependent variable, we use the ratio of male to female literacy rates for youth between ages 15 and 24 (called LITERACY below) as a proxy for bias against girls in school enrollment. Direct data on primary school enrollment is available, but it is not used for a number of reasons. First, as mentioned above, there are large number of missing

[17]Note that in these three cases, fewer girls than boys go to school.

observations in this series. Second, the standard deviation of primary enrollment is rather low in the sample: the median primary enrollment rate is 98%. Finally, since marriage is at the heart of our analysis, the age group 15-24 seems more appropriate to consider. In any case, one would expect that a higher school enrollment should translate into a higher literacy rate. As for the ease (or the difficulty) in coordination, we use two proxies: total land area and total number of poor people in the country. Given a population, the larger the geographic size of the country the more difficult for the families to coordinate their actions as families are more spread out. Similarly, given the size of a country, the lower the population size the more difficult it is to coordinate actions as once again people would be more spread out. Since gender bias is more significant among the poor, we consider only that part of the population living in poverty, i.e., total number of poor people in the country, as another proxy for ease in coordination.[18] These two variables are transformed into their natural logs and are called LAND and POOR respectively. Finding a proxy for skill-premium in the marriage market (i.e., in dowry) is more difficult. Since it is widely thought that dowry exists in its most oppressive form in South and South-East Asia (see, for example, Epstein, 1973 and Rao, 1993), we use a South and South-East Asia dummy as a proxy for this variable and call it SASIA.

As it is explained in the introduction, although we focus on the above variables for our theoretical analysis, there are other important determinants of gender bias. Two such factors are the overall level of (socioeconomic) development in a country and relative labor market participation rates for the two genders (see, for example, Kynch and Sen, 1983). We include the Human Development Index (HDI) as produced by the UNDP to represent the overall state of development of a country and female to male labor force participation ratio (LABOR) as an additional control variable.

We utilize a simple OLS framework for our regressions using the World Bank's World development Indicators, 2001 for all variables except HDI which is from the 2000 Human Development Report of the UNDP. We do not include the high income countries and have a total of 97 countries in our sample, although because of missing observations the actual sample size is somewhat lower. All results are corrected for White heteroscedasticity-consistent Standard errors and covariance. We present below two OLS estimated equations; the second one having an additional explanatory variable in LABOR.

[18]In some cases, a higher population may make it more difficult to coordinate actions. Thus, the effect of this variable can go either way. However, we believe that it is the density aspect of population which is more important than the size aspect.

$$
\begin{array}{lllllllllll}
\text{Literacy} & = & 0.83 & + & 0.06\ \text{Land} & - & 0.08\ \text{Poor} & - & 0.78\ \text{HDI} & + & 0.24\ \text{SASIA} \\
 & & (5.97) & & (2.24) & & (-2.49) & & (-3.76) & & (2.67)
\end{array}
$$

$R^2 = 0.37$ Sample=57 F-Stat=7.59

$$
\begin{array}{lllllllllll}
\text{Literacy} & = & 0.74 & + & 0.06\ \text{Land} & - & 0.07\ \text{Poor} & - & 0.83\ \text{HDI} & + & 0.23\ \text{SASIA} \\
 & & (4.72) & & (2.19) & & (-2.34) & & (-3.92) & & (2.62) \\
 & & & - & 0.13\ \text{Labor} & & & & & & \\
 & & & & (-1.22) & & & & & &
\end{array}
$$

$R^2 = 0.38$ Sample=56 F-Stat=6.10

(t-Statistics are in parenthesis)

Given the discussions above, we should expect LAND and SASIA to be positively, and POOR, HDI and LABOR to be negatively, related to LITERACY, and that is exactly what we find. Furthermore, all but the coefficient for LABOR are statistically significant at the confidence level of 5% or less.[19]

We realize that this is a very simplistic exercise and that our results are tentative at best given our liberal use of proxies. However, we checked for the robustness of these results by interchanging the dependent variable with adult male-female literacy ratio and the results remain essentially unchanged and, replacing HDI by GDP per capita also does not change the results much except lowering the significance level a little. Therefore, it can be said that these results are suggestive and provide some support to our theoretical analysis.

5 Conclusion

Discrimination in general, and discrimination against girls and women in particular, come in different shapes and sizes. Many aspects of the bias against girls have been discussed in the literature and many different explanations provided. In this paper we focus on discrimination against girls in school enrollment and explain such phenomenon in terms of interactions between a number specific types of social institutions. In particular, we consider the institution of an extended family system in which married women become part of their in-laws' families. To be more specific, we develop a two-period model in which a family decides at the beginning of period 1 how many of the children should go to school. If the children go to school they become skilled and earn a higher wage in period 2. Whereas educated boys earn a higher income for the family, educated girls do so for their in-laws' families. If the families coordinate their action and take into account the contributions of educated daughters-in-laws' contributions to family income, there would be no bias against girls in school enrollments in our framework. However, the lack of such coordinations results in discrimination against girls in our benchmark model.

[19] In some societies, young girls are educated so that good husbands can be found for them and not for labor market reasons (see footnote 5). This is possibly a reason why the coefficient for LABOR is not significant.

Having established the above-mentioned mechanism which puts young girls at a disadvantage, we then introduce another social institution, *viz.*, dowry, and examine if it aggravates the situation. We find that under groom-price dowry, *i.e.*, when the amount of dowry depends on the education level of the groom, it indeed increases the level of discrimination. Under bride-price dowry, there is still discrimination if and only if skill premium in the labor market is larger than that in the marriage market.

Having characterized the equilibrium under different forms of dowry, we consider a policy experiment in which subsidies are provided to a family if it sends its children to school and the level of subsidy depends on the gender of the child that goes to school. We suggest a particular scheme for such a policy that will reduce the bias and increase total enrollment at the same time.

Finally, using cross-country data, we empirically test some of the predictions of our theoretical analysis. Although such tests should be treated with caution, it provides some evidence to suggest that inabilities of the families to internalize inter-family externalities and dowry are to some extent responsible for the bias against girls in school enrollments.

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