Preference Based Vrs. Market Based Discrimination: Implications for Gender Differentials in Child Labor and Schooling

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Abstract

This paper studies the effects of *son-preference by parents* and *earnings function bias* on child labor and schooling in a model in which parents are altruistic. It finds that son-preference leads to gender differential in child labor with female children working more than male children. But, it does not lead to gender differential in schooling, except when the bequest constraints are binding. On the other hand, the earnings function bias results in gender differential in both child labor and schooling. Dowry and marriage expenses can lead to inefficiently low level of schooling and high level of child labor. Son-preference magnifies gender differential in child labor and schooling in the presence of dowry and marriage expenses.

Keywords: son-preference, earnings function bias, schooling, child labor, dowry, marriage expenses

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1 Introduction

Empirical evidence suggests that son-preference (parental gender bias in favor of sons) is wide-spread in many regions of the world, particularly in Asia and the Middle-East (Boserup 1970, Williamson 1976, Behrman 1988). In recent years, especially due to the spread of sex-selection techniques, a large literature has emerged which studies the socio-economic determinants and consequences of this bias. Previous works on son-preference have studied its effects on fertility and sex-ratio (Ben-Porath and Welch 1976), excess mortality among female infants (Sen 1990), and differential access to health (Chen et. al. 1982), nutrition (Behrman 1988) and education (Behrman, Pollak, and Taubman 1986, Davis and Zhang 1995, Alderman and King 1998, Orazem and King 2007).

Empirical evidence also suggests that both incidence and the intensity of child labor is higher for female children than male children. For example, Edmonds and Pavcnik (2005) using UNICEF MICS (Multiple Indicator Cluster Survey) data find that the incidence of child labor among female children (72.1 percent) is much higher compared to male children (64.8 percent). They also find that female children are more likely to work long hours than male children.

In this paper, I develop a model to study the effects of two types of gender biases: *the son-preference by parents* and *the earnings function bias towards male* on child labor and schooling. The earning function bias towards male is widely prevalent in both developing and developed countries (e.g. Oaxaca 1973, Meng 1998, Weichselbaumer and Winter-Ebmer R. 2005).

In the model, there are two periods. A family consists of parents and two children – one male and one female. Parents are altruistic. Their utility depends not only on their own consumption, but also on the utility enjoyed by their children. The utility of children depends on their consumption and leisure. Children are endowed with one unit of time in the first period, which can be allocated among three activities: labor, schooling, and leisure. A higher level of schooling reduces leisure in the first period, but leads to higher earnings next period. While parents care about both children, they may put more weight on the utility of their male children.

I distinguish between two cases: *a pure son-preference case* and *a pure earnings function bias towards male case*. In the pure son-preference case, I assume that parents put more weight on the utility of male children, but the earnings functions are identical for both male and female adults. In the pure

earnings function bias towards male case, parents care equally about both male and female children, but male adults have a superior earnings function.

In the model, I derive the following main results. Firstly, in the case of son-preference, when parents can give bequests, both male and female children receive an equal amount of schooling, but female children work more than male children. In the case of earnings function bias, not only male children work less, but also receive more schooling than female children. Secondly, when the bequest constraints are binding, son-preference leads to gender differential in schooling with female children receiving less schooling than male children. However, the binding bequest constraints reduce gender inequality in schooling in the case of earnings function bias. Thirdly, dowry and marriage expenses can result in inefficiently low level of schooling and aggravate gender differential in schooling and child labor in the case of son-preference.

This paper most directly relates to Horowitz and Wang (2004) who analyze the effects of the earnings function bias on child labor and schooling. They do not analyze the effects of son-preference. In addition, in their model there is no labor-leisure choice and parents face a direct trade-off between schooling and child labor. The separation between schooling and child labor is more in accord with the large empirical literature which suggests that there is no direct trade-off between schooling and child labor (e.g. Ravallion and Wodon 2000, Bhalotra 2003, de Janvry et. al. 2006, Edmonds 2007).

The remainder of this paper is structured as follows. Section 2 presents the model. Section 3 analyzes the equilibrium outcomes. Section 4 concludes the paper.

2 Model

There are two periods, $t = 1, 2$. The economy consists of a large number of households and firms. Each household consists of parents and two children: one male (m) and one female (f). Parents and children live for both periods. Parents and firms discount future at the rate normalized to one. Parents are endowed with A units of labor in each period. Throughout the paper, I measure labor in efficiency units.

Firms are owned by other types of agents, who live for two periods and do not have children. Firms produce goods using labor. They hire labor in a competitive labor market. Assume that firms have linear technology.

Linear technology and the competitive labor market imply that wages (or the marginal product of labor) per efficiency unit of labor are constant. I normalize wages per efficiency unit to one.

In both periods, parents supply their labor inelastically. In the first period, children are endowed with one unit of time, which can be used for work, schooling, and leisure. Schooling in the first period increases the human capital or the earnings of children next period.

Let l^m and l^f be the labor supplied by male and female children respectively. The earnings (human capital) function of the ith child is given by, $h^i(s^i)$ for $i = m, f$, where s^i is the time spent in schooling. The earnings function is an increasing and concave function of s^i and $h^i(0) > 0$.

Parents are altruistic. Parental utility depends not only on their own consumption but also on the utility of children. Though parents care about both male and female children, they may prefer male children over female children. The parental utility function is given by

$$W^p = U(c_1^p) + U(c_2^p) + \delta^m W^m + \delta^f W^f \tag{2.1}$$

where function $U()$ is the period utility function and W^m and W^f are the utility functions of male and female child respectively defined below. $U()$ is a twice continuously differentiable, strictly increasing, and concave function of consumption. c_t^p is the consumption of parents in period $t = 1, 2$. Parameters $0 < \delta^i < 1$ for $i = m, f$ measure the degree of parental altruism.

The utility of children depends on their leisure in the first period and consumption in the second period. Let $V(l^i + \mu s^i)$ be the disutility incurred from the loss of leisure due to child labor and schooling by the ith child in the first period, where $\mu > 0$. μ determines the disutility incurred from schooling relative to child labor and allows for the possibility that the disutility from schooling and child labor can be different. $V()$ is assumed to be a twice continuously differentiable, strictly increasing, and convex function. The utility function of the ith child is as follows:

$$W^i = U(c^i) - V(l^i + \mu s^i), \text{ for } i = m, f \tag{2.2}$$

where c^i is the consumption of the ith child in the second period.

Parents choose child labor, time spent in schooling, and bequests for children and their own consumption and savings. I normalize the rate of return on savings to one. Parents give bequests, $b^i \geq 0$ for $i = m, f$, to their children in the second period.

Let k be the savings in the first period. The budget constraints faced by parents and children are

$$c_1^p + k = A + l^m + l^f; \tag{2.3}$$

$$c_2^p + b^m + b^f = A + k \ \& \tag{2.4}$$

$$c^i = b^i + h^i(s^i), \text{ for } i = m, f. \tag{2.5}$$

I distinguish between two cases: *the pure son-preference case* and *the pure earnings function bias towards male case*. In the *pure son-preference case*, I assume that parents care more about the welfare of male children than female children, $\delta^m > \delta^f$, but the earnings functions are identical, $h^m() \equiv h^f() \equiv h()$. In the *pure earnings function bias towards male case*, I assume that there is no son-preference, $\delta^m \equiv \delta^f \equiv \delta$, but the earnings functions are heterogeneous $h^m(s^m) \neq h^f(s^f)$. This is the case which is similar to one analyzed by Horowitz and Wang (2004). In particular, I assume that male children have a superior earnings function. For any $s^m = s^f$, $h^m(s^m) > h^f(s^f)$ and $h_s^m(s^m) > h_s^f(s^f)$.[1] Thus male children have a higher total as well as marginal return from the time spent in schooling.

3 Equilibrium

The parental optimization problem is

$$\max_{c_1^p, c_2^p, l^m, l^f, s^m, s^f, b^m, b^f, k} \sum_{t=1}^{2} U(c_t^p) + \sum_{i=m,f} \delta^i [U(c^i) - V(l^i + \mu s^i)]$$

subject to the budget constraints 2.3-2.5. In the rest of the paper, I assume an interior solution for child labor and schooling, i.e. $0 < l^m, l^f, s^m, s^f < 1$. The first order conditions associated with the optimal choices are

$$l^i : \ U_c(c_1^p) = \delta^i V_l(l^i + \mu s^i), \text{ for } i = m, f; \tag{3.1}$$

$$s^i : \ U_c(c^i) h_s^i(s^i) = V_s(l^i + \mu s^i), \text{ for } i = m, f; \tag{3.2}$$

[1] Throughout the paper, for any function $F(x)$, $F_x(x)$ and $F_{xx}(x)$ denote the first and the second derivatives respectively.

$$b^i: \ U_c(c_2^p) = \delta^i U_c(c^i), \ \text{if } b^i > 0, \ \text{for } i = m, f; \tag{3.3}$$

$$b^i: \ U_c(c_2^p) > \delta^i U_c(c^i), \ \text{if } b^i = 0, \ \text{for } i = m, f \ \& \tag{3.4}$$

$$k: \ U_c(c_1^p) = U_c(c_2^p). \tag{3.5}$$

(3.1) equates the marginal benefit of child labor with its marginal cost. One additional unit of child labor increases parental utility by $U_c(c_1^p)$ in the first period, but reduces it by $\delta^i V_l(l^i + \mu s^i)$ in the same period.

Similarly, (3.2) equates the marginal cost of the time spent in schooling to its marginal benefit. An increase in the time spent in schooling increases the earnings of the ith child next period by $h_s^i(s^i)$. But it reduces the utility of the ith child by $V_s(l^i + \mu s^i)$ in the first period.

(3.3) equates the marginal cost of giving bequest to the ith child with its marginal benefit. An additional unit of bequest reduces the utility of parents by $U_c(c_2^p)$ in the second period. At the same time, it increases the utility of parents by $\delta^i U_c(c^i)$ in the second period. If the marginal cost of bequest to the ith child exceeds the marginal benefit, then parents will not give any bequest to the ith child. (3.4) characterizes this condition. This case can arise when parental income is low and/or they put small weight on the utility of their children.

(3.5) equates the marginal cost of savings with its marginal benefit. The marginal cost of savings is the loss in the utility by having to consume one unit less in the first period. One unit of savings increases income by one unit next period, the value of which is $U_c(c_2^p)$.

(3.1) implies that

$$\delta^m V_l(l^m + \mu s^m) = \delta^f V_l(l^f + \mu s^f). \tag{3.6}$$

Lemma 1: Son-Preference ($\delta^m > \delta^f$) leads to male children having lower disutility from schooling and child labor than female children and

$$l^m + \mu s^m < l^f + \mu s^f. \tag{3.7}$$

In the absence of son-preference, both male and female children have the same level of disutilty from schooling and child labor and $l^m + \mu s^m = l^f + \mu s^f$.

Lemma 1 shows that differences in the earnings functions do not lead to gender differential in the disutility from schooling and child labor, but son-preference does. The reason is that in the case of son-preference, parents would like to provide higher utility to male children compared to female children. On the other hand, in the absence of son-preference, parents would like to provide same utility level to both types of children. Parents use leisure of children as one of the instruments to achieve their desired outcome.

Since, $V_s(l^i + \mu s^i) = \mu V_l(l^i + \mu s^i)$, (3.1) and (3.2) imply that

$$\delta^m U_c(c^m) h_s^m(s^m) = \delta^f U_c(c^f) h_s^f(s^f). \tag{3.8}$$

(3.8) shows that parents choose time spent in schooling such that it equalizes the marginal utility of schooling of two children.

Next, I characterize levels of child labor, time spent in schooling, consumption of children, and bequest pattern under different conditions. I begin with the case in which bequests are interior ($b^m, b^f > 0$). I call this case **unconstrained equilibrium**.

3.1 Unconstrained Equilibrium

Equations (3.2), (3.3), (3.5), and (3.8) imply that

$$h_s^m(s^m) = h_s^f(s^f) = 1. \tag{3.9}$$

(3.9) has two parts. Firstly, the marginal rate of return from schooling is equal for both children. Secondly, the marginal rate of return from schooling equals the rate of return on savings. (3.9) also characterizes efficient level of the time spent in schooling.

In the model, bequests play a dual role. Firstly, by using bequests parents can achieve their desired level of distribution of consumption between children. This allows parents to delink their choice of time spent in schooling from the distribution of consumption between children. Secondly, bequests allow savings and the time spent in schooling to become perfect substitutes in financing consumption of children. Parents can increase consumption of their children in two ways. They can increase their time spent in schooling. Alternatively, they can give larger bequests, which would require more savings by parents.

Pure Son-Preference

Equation (3.9) implies that $s^m = s^f$. Thus, son-preference does not lead to gender differentiation in earnings and schooling. However, from (3.7) it follows that $l^m < l^f$. Also (2.5) and (3.3) imply that $c^f < c^m$ and $b^f < b^m$. Female children work more as child labor, have lower consumption, and receive smaller bequest. Parents are able to provide higher consumption to male children by giving them larger bequest. Higher consumption and leisure of male children imply that they have higher utility than female children.

Pure Earnings Function Bias Towards Male

From (2.5), (3.3), (3.9), and Lemma 1, it follows that $s^m > s^f$, $l^m < l^f$, $b^m < b^f$ and $c^m = c^f$. Male children spend more time in schooling and work less as child labor and receive smaller bequest than female children. But both male and female children have the same amount of consumption and utility. By providing higher amount of bequests to female children, parents are able to equalize consumption and utility of both types of children. These results are similar to ones derived in Horowitz and Wang (2004).

Proposition 1: Unconstrained Equilibrium ($b^m, b^f > 0$):

(i) *Pure Son-Preference*: The time spent is schooling is same for both male and female children, $s^m = s^f$. But male children have higher utility and consumption, $c^m > c^f$, receive larger bequest, $b^m > b^f$, and work less as child labor, $l^m < l^f$.

(ii) *Pure Earnings Function Bias Towards Male*: Both male and female children have the same level of utility and consumption $c^m = c^f$. But male children spend more time in schooling, $s^m > s^f$, work less as child labor, $l^m < l^f$, and receive smaller bequest, $b^m < b^f$.

(iii) The time spent in schooling for both male and female children is at efficient level regardless of the form of gender bias.

Next, I analyze the equilibrium in which bequests are at the corner.

3.2 Constrained Equilibrium

When parents cannot give bequests to one or both children, then parents loose a set of instruments which can be used to achieve their desired distribution of consumption between children. In addition, savings and the time

spent in schooling are no longer perfect substitutes for a child who does not receive bequests. The result is that $h_s^m(s^m) \neq h_s^f(s^f)$ and $h_s^i(s^i) > 1$ for the child who does not receive bequests.

Pure Son-Preference

I first consider the case in which the bequest constraint is binding for female children, $b^m > 0,\ b^f = 0$. This case can arise, if the earnings of parents are low and parents put a smaller weight on the welfare of female children relative to male children. In this case, one can easily show that

$$h_s(s^f) > h_s(s^m) = 1. \tag{3.10}$$

(3.10) shows that $s^m > s^f$. In addition, s^m continues to be at efficient level, but s^f is inefficiently low. Given that $b^m > 0$ & $b^f = 0$, (2.5) and (3.10) imply that $c^m > c^f$. Also, from Lemma 1 it follows that $l^f > l^m$ and female children work relatively more than male children compared to the unconstrained case.

Next, I consider the case in which the bequest constraints are binding for both male and female children, $b^m,\ b^f = 0$. This case can arise, if either the earnings of parents is low or parents put relatively less weight on the welfare of children. In this case, the first order conditions imply that

$$h_s(s^m)\ \&\ h_s(s^f) > 1. \tag{3.11}$$

Thus, for both male and female children, the time spent in schooling is inefficiently low. Given $b^m,\ b^f = 0$, (2.5) implies that $c^i = h(s^i)$ for $i = m, f$. Then, (3.1), (3.7), and (3.8) imply that $c^m > c^f$, $s^m > s^f$ and $l^m < l^f$. Male children have higher consumption and time spent in schooling and work less as child labor compared to female children.

Finally, in this model one cannot have $b^f > b^m = 0$. The proof is straightforward. $b^m = 0$ and $b^f > 0$ are possible only when $c^m > c^f$. In this case, then $h_s(s^m) > 1$ and $h_s(s^f) = 1$. Thus, $s^f > s^m$. But then it would imply that $c^m < c^f$, which is a contradiction.

Pure Earnings Function Bias Towards Male

In this case, unlike the son-preference case, it can be easily shown that if the bequest constraint binds for only one type of children it must bind for male children. It cannot happen that $b^m > 0$ & $b^f = 0$.

Next, I consider the case in which $b^m = 0$ & $b^f > 0$. In this case, (3.3) and (3.4) imply that that $c^m > c^f$. It also follows that

$$h_s^f(s^f) = 1 < h_s^m(s^m). \tag{3.12}$$

(3.12) shows that the time spent in schooling for female children is at efficient level, but the time spent in schooling for male children is inefficiently low.

(3.12) also shows that the binding bequest constraint leads to a more egalitarian distribution of human capital compared to the efficient level. The issue that whether children with superior earnings function can have a lower time spent on schooling, $s^m < s^f$, and in particular whether they can have lower human capital, $h^m(s^m) < h^f(s^f)$, has been an important issue in the literature (Horowitz and Wang 2004). The first case ($s^m < s^f$) is known as the *reverse specialization* and the second case ($h^m(s^m) < h^f(s^f)$) is known as the *absolute reverse specialization.*

(3.12) shows that male children who have superior earnings function can have higher or lower time spent in schooling than female children (i.e. there can be reverse specialization). But since, $c^m > c^f$, there cannot be absolute reverse specialization. Male children must have higher human capital. From Lemma 1 it follows that $l^m \lessgtr l^f$.

Next I consider the case, when both bequest constraints are binding, $b^m = b^f = 0$. In this case, the first order conditions imply that

$$h_s^m(s^m) \;\&\; h_s^f(s^f) > 1. \tag{3.13}$$

Thus, the time spent in schooling for both male and female children is inefficiently low.

Using (2.5) and (3.8), one can easily show that when both bequest constraints are binding, one can have $s^m \gtreqless s^f$ and $l^m \gtreqless l^f$. There can be reverse specialization similar to the case discussed above. However, there cannot be absolute reverse specialization. Male children have higher consumption and human capital.

Proposition 2: The constrained equilibrium:

(i) *Pure Son-Preference Case*: If the bequest constraint are binding for one or both type of children, then the time spent in schooling for female children is lower than for male children, $s^f < s^m$, they consume less, $c^f < c^m$, and work more as child labor, $l^f > l^m$.

(ii) *Pure Earnings Function Bias Towards Male*: The binding bequest constraints lead to a more egalitarian distribution of the time spent in schooling

compared to efficient level. Female children may have a higher or lower time spent in schooling and the level of child labor compared to male children. However, they consume less than male children, $c^f < c^m$.

(iii) The time spent in schooling is inefficiently low for children whose bequest constraints are binding regardless of the source of gender bias.

The above analysis shows that in the presence of binding bequest constraints, son-preference aggravates the gender inequality in the human capital investment, while the earnings function bias reduces it. This implies that in poorer societies with son-preference, we should expect greater gender inequality in the human capital investment. The reason is that in the case of son-preference parents in order to provide a higher utility level to male children relative to female children under-invest more in the human capital of female children. In the case of pure earnings function bias, since parents would like to provide equal level of utility to both male and female children, the investment in the human capital is more equal.

3.3 Dowry and Marriage Expenses

In many societies, dowries are widely prevalent. In this section, I analyze the effects of dowries on the time spent in schooling and child labor. For concreteness assume that parents pay a dowry, M, for the female child in the second period.

Suppose that $b^f \geq M > 0$, but the lower bound for b^m continues to be zero. I only consider the case in which $b^f = M$. In this case, it is easy to show that $h_s^f(s^f) > 1$. If $b^m > 0$ then $h_s^m(s^m) = 1$. Male children will have higher time spent in schooling and lower level of child labor.

Note that in no dowry situation, for any $0 < b^f \leq M$, the time spent in schooling for female children will be at efficient level. Thus, the social norm of dowry is more likely to lead to inefficiently low level of human capital investment for female children among poor households. In addition, Lemma 1 implies that female children will be working more as child labor relative to the efficient level. In that sense, they will be partly financing their dowry.

Regarding the interaction between gender biases and dowry, the results summarized in Proposition 2 apply. With dowry, female children will have less human capital investment, less consumption, and will work more than male children in the case of son-preference. However, in the case of earnings

function bias, female children may have more or less human capital investment than male children. Similarly, they can work more or less as child labor compared to male children. This suggests that son-preference interacting with institutions like dowry can aggravate the gender differential in the human capital investment.

In many societies, marriage is an important social event and households have to incur significant amount of marriage expenditure. For concreteness, suppose that parents have to incur cost M for marrying the female child and this cost does not augment her income. The marriage cost has the effect of reducing the parental income in the second period. This case can be analyzed by replacing A by $A - M$ in the second period budget constraint of parents (2.4).

As the net second period income of parents falls, using (3.1) and (3.5) it is straightforward to show that the marginal benefit from child labor increases and thus parents would choose a higher level of child labor for both children. Parents use child labor to partly finance marriage expenses. This happens regardless of whether the bequest constraints are binding or not. Interestingly, the effect of dowry on child labor of male children may be different from the effect of marriage expenses. As discussed earlier, dowry is more likely to increase child labor of female children, but marriage expenses, even though they are incurred just for marrying female child, are likely to increase child labor for both male and female children.

Regarding human capital investment, they remain at efficient level as long as the bequest constraints are not binding. However, with marriage expenses the bequest constraints are more likely to be binding. In that case, the results summarized in Proposition 2 and discussed above apply.

4 Conclusion

In this paper, I analyzed the effects of son-preference and the earnings function bias towards male on gender differentials in child labor and schooling. I find that the effects of gender bias depend on both its form as well as economic conditions of parents. In the case of son-preference, when parents are relatively better-off and can give bequests, both male and female children receive an equal amount of schooling. However, female children work more than male children. In the case of an earnings function bias, not only do male children receive more schooling than female children, but also work less. The

allocations are efficient.

When parents are so poor that they cannot give bequests, child labor is inefficiently high and schooling is inefficiently low for children who do not receive bequests. Son-preference interacting with poverty can lead to less investment in the human capital of female children relative to male children. Social norms such as dowry and marriage expenses can lead to inefficiently low level of human capital investment and high level of child labor. Son-preference interacting with dowry and marriage expenses can aggravate gender differential in the human capital investment.

The study has a number of policy implications. One of the goals of the Millennial Development Goals (MDGs) is to achieve gender equality and empower women. The analysis suggests that providing support to poor households (e.g. old-age pension), particularly in the societies with son-preference, can go a long way to realize this goal. Labor market policies which aim at eliminating discrimination against women in the labor market and public campaign against son-preference are likely to reduce child labor and increase schooling of female children. Finally, public campaign to reduce marriage and dowry expenses in poor societies has a role to play in reducing child labor and increasing schooling particularly for female children.

The paper finds that when parents cannot give bequests, the human capital investment is inefficiently low and child labor is inefficiently high. This raises the issue whether reverse transfers by children to parents in the second period can lead to efficient level of human capital investment and child labor. Baland and Robinson (2000) in their model with *households with one child* show that reverse transfers result in efficient allocations. However, in the current model households have *multiple children* and parents can receive transfers from one or more children. In this set-up, parental welfare becomes a public good for children. This may lead to *the free rider problem* and reverse transfers may not result in the efficient allocations. This raises the issue of what policies can be adopted to restore efficiency. The other issue is how different types of gender biases interact with reverse transfers. These issues are currently under investigation in a separate paper.

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