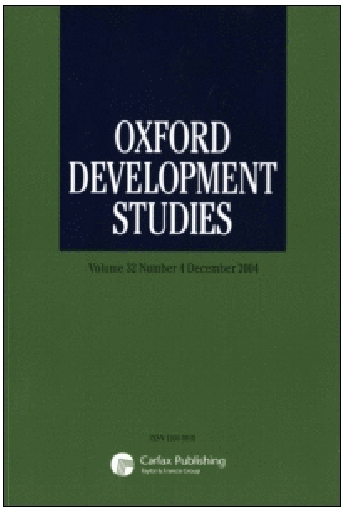


**Oxford Development Studies**
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713439972

# Household Expenditure Patterns and Gender Bias: Evidence from Selected Indian States

Geoffrey Lancaster[a]; Pushkar Maitra[b]; Ranjan Ray[a]
[a] School of Economics, University of Tasmania, Hobart, Tasmania, Australia [b] Department of Economics, Monash University, Clayton Campus, VIC, Australia

**To cite this Article** Lancaster, Geoffrey , Maitra, Pushkar and Ray, Ranjan(2008) 'Household Expenditure Patterns and Gender Bias: Evidence from Selected Indian States', Oxford Development Studies, 36: 2, 133 — 157
**To link to this Article: DOI:** 10.1080/13600810802037803
**URL:** http://dx.doi.org/10.1080/13600810802037803

*Oxford Development Studies,*
*Vol. 36, No. 2, June 2008*

Routledge
Taylor & Francis Group

# Household Expenditure Patterns and Gender Bias: Evidence from Selected Indian States

GEOFFREY LANCASTER, PUSHKAR MAITRA & RANJAN RAY

ABSTRACT *This paper uses Indian data to investigate the existence and nature of gender bias in the intra-household allocation of expenditure. An extended version of the collective household model is estimated where the welfare weights, i.e. the bargaining power of the adult decision-makers, are simultaneously determined with the household's expenditure outcomes. Significant gender bias is detected in some items, most notably in education, and it is found that the bias is considerably stronger in the more economically backward regions of the country. It is also found that the results of the test of gender bias vary sharply between households at different levels of adult literacy. This is particularly true of household spending on education. The gender bias in the case of this item is, generally, more likely to prevail in households with low levels of adult educational attainment than in more literate households. This result is of considerable policy importance given the strong role that education plays in human capital formation.*



## 1. Introduction

The issue of gender bias against girls in the distribution of resources within the household has been a topic of much research in recent years (see, e.g. Deaton, 1989; Pitt *et al.*, 1990; Ahmad & Morduch, 1993; Haddad & Reardon, 1993; Bhalotra & Attfield, 1998; Gibson & Rozelle, 2004; Gong *et al.*, 2005; Kingdon, 2005).[1] This issue, which is revisited in this paper, is of particular importance in the context of developing countries because, if true, then gender bias in the intra-household allocation of resources could explain what Drèze & Sen (1989) refer to as the phenomenon of "missing women" in South Asia.

The difficulty of observing the inner workings of the household, typically because of the lack of adequate data, means that one is usually restricted to examining this issue using

Geoffrey Lancaster, Deceased. At the time of his demise, he was employed at the School of Economics, University of Tasmania, GPO Box 252-85, Hobart, Tasmania, 7001, Australia. Pushkar Maitra (corresponding author), Department of Economics, Monash University, Clayton Campus, VIC 3800, Australia. Email: pushkar.Maitra@Buseco.monash.edu.au. Ranjan Ray, School of Economics, University of Tasmania, GPO Box 252-85, Hobart, Tasmania, 7001, Australia. Email: Ranjan.Ray@utas.edu.au

Pushkar Maitra and Ranjan Ray acknowledge funding provided by an Australian Research Council Discovery Grant. Geoffrey Lancaster and Ranjan Ray received funding provided by an Australian Research Council Large Grant. We would like to thank Gary Deng for his excellent and painstaking research assistance, David Stifel, Geeta Gandhi Kingdon, Brett Inder, two anonymous referees, seminar participants at the University of Sydney and Purdue University and participants at the Econometric Society Australasian Meeting, the Australian Conference of Economists, the NEUDC Conference, the Empirical Development Economics Workshop at Monash University and the European Society of Population Economics Annual Conference for their comments on earlier versions of the paper. The usual caveat applies.

ISSN 1360-0818 print/ISSN 1469-9966 online/08/020133-25

DOI: 10.1080/13600810802037803

externally observable outcomes such as health, education and expenditure. A common approach has been to examine how household expenditure on a particular good changes with the gender composition of the household (Deaton, 1989, 1997). This is commonly referred to as the Engel Curve approach. The methodology usually adopted in testing for gender bias is based on a quantification of the differential between the reduction of the consumption of "adult goods" associated with the *ceteris paribus* addition of a boy and a girl child to the household. If this differential is statistically significant, then gender bias is said to exist, with the sign of the differential indicating the direction of the bias. The validity of this procedure relies, however, on the strong assumption of demographic separability between "adult goods" and other items underlying the restrictive Rothbarth model (see Myles, 1995). This general test has been modified to test for the statistical significance of the gender differential between the marginal impact of a boy and that of a girl child on the expenditure share of an item in the household budget. Stated differently, if one replaces a girl in a certain age group with a boy in that same age group, holding everything else constant, then the extent to which the expenditure share of an item changes gives us a measure of gender bias in the case of the expenditure allocation of that item.

The methodology, though quite simple and easy to understand, is not free of problems. First, this may also reflect the fact that "children of one gender may have different expenditure needs than children of the other gender". Moreover, "a positive change in one expenditure share may be counterbalanced with a negative change in another expenditure share". This suggests that the budget share-based methodology for detecting gender bias implies that a pro-male gender bias in the case of one item will be counterbalanced by pro-female gender bias in the case of another item or groups of items, even though some of the latter biases may not be statistically significant.

Second, most of the investigations based on the Engel Curve approach have failed to detect systematic evidence of gender bias even in societies where gender discrimination is known to exist, as reflected, for example, in differential mortality rates between boys and girls.[2] Deaton (1989) calls this a *puzzle*. Udry (1997) and Rose (1999) argue that this might be due to sample truncation: girls have been so discriminated against that they have died, and are missing from the sample. Ahmad & Morduch (1993) argue that, even if allocations are equal, girls might still be at a disadvantage because their needs might be higher. Kingdon (2005) argues that the problem arises because aggregation of bias at the enrolment decision stage with that at the decision on expenditure, conditional on enrolment, might give us an incorrect picture. If, for example, most of the bias exists at the enrolment stage, but it is conditional on enrolment that parents do not discriminate (or might even over-compensate to pay more for travel and clothing of girls), the aggregation of the two decisions might lead to non-detection of bias, even if significant bias exists.

In this paper, using the Engel Curve approach, the issue of gender bias in expenditure patterns is revisited. In particular, the following questions are examined in the context of India. First, what is the link between economic development and gender bias? Second, given that the decision to educate children can be viewed as an inter-generational investment decision, what do these results imply regarding inter-generational transmission of human capital?

Evidence was found of gender bias in education spending in some areas in India, typically the backward ones, though not in others. The results of the test of gender bias were also found to vary sharply between households at different levels of adult literacy. This is particularly true of household spending on education. The gender bias in the case of this item is, generally, more likely to prevail in households with low levels of adult educational attainment than in more literate households. Not only is this result of considerable policy importance, given the strong role that this item plays in human capital formation, but it also suggests another possible reason for previous failures to detect gender bias, namely, the overlooking of possible interaction between the adults' literacy levels and the gender issue.

## 2. Estimation Methodology, Data and Descriptive Statistics

In this paper, the collective household model (Bourguignon *et al.*, 1993; Browning & Chiappori, 1998) is adopted and extended not only by relaxing the conventional assumption of income pooling between the household income earners in achieving the expenditure outcomes, but also by relaxing a potentially limiting characteristic of such models (see Basu, 2006), namely, that the welfare weight assigned to each income earner is exogenous to the household decision-making process. Consider a household with two members: a man ($m$) and a woman ($f$). Assume that utility depends on consumption ($x$) and leisure ($l$). The household's utility function is assumed to be the weighted sum of the utilities of the two individuals in the household and the household maximizes this weighted sum of utilities subject to the full income constraint. Following Basu (2006), a framework is applied in which the welfare weight of the adult male *vis-à-vis* the adult female income earner, namely, the bargaining power variable, is jointly determined with the household's expenditure outcomes. There is a fairly large literature in sociology and anthropology that argues that the male's share of household earnings is a good measure of his bargaining power within the household (see Blumberg & Coleman, 1989; Desai & Jain, 1994; Riley, 1997).

Let $\theta$ denote the income share of male member $m$ and $(1-\theta)$ denote the share of female member $f$, i.e. income shares depend on the welfare weights of the different members of the household.[3] Let us also assume that utility is separable over consumption and leisure. This gives us individual budget shares, $b_i^g$; $g = 1,\mathrm{K},G$; $i = m, f$, which depend on the individual income shares $\theta\mu$ and $(1-\theta)\mu$, where $\mu$ denotes the permanent income of the household. Very few surveys collect data on gender-specific expenditure on specific commodities, hence $b_m^g$ and $b_f^g$ are typically not observed. Assume that the household level budget share of good $g(b^g)$ is the $\theta$ weighted average of the budget share of that good for the spouses $(m, f)$, i.e. $b^g = \theta b_m^g + (1-\theta)b_f^g$. Including standard demographic variables (household size and composition variables) as additional controls, the estimating equation can be written as follows:[4]

$$b^g = \alpha_0^g + \alpha_1^g\theta + \beta_m^g\theta^2\mu + \beta_f^g(1-\theta)^2\mu + \gamma^g\log(n) + \sum_{i=m,f}\sum_{k=1}^{K}\varphi_{ki}^g\left(\frac{n_{ki}}{n}\right) + \varepsilon^g; \qquad (1)$$

$$g = 1, \mathrm{K}, G.$$

Equation (1) is estimated as a system of equations. $n$ denotes household size and $n_{ki}$ denotes the number of individuals in the age category $k$ and gender $i$. If household size and expenditures are sufficient to explain demand, then the coefficients $\varphi$ will all be zero. However, in general, household composition will matter and the coefficients $\varphi_{ki}$ measure the effect of changing household composition (in proportion terms) on budget shares. A test of the statistical significance of the estimated difference $(\hat{\varphi}_{km}^g - \hat{\varphi}_{kf}^g)$ constitutes a test of gender bias in the age group $k$ in the expenditure allocation of item $g$. In other words, the null hypothesis, $\varphi^g_{km} = \varphi^g_{kf}$ maintains that there is no gender bias in the case of age group $k$ and item $g$. In this paper, the following age groups were chosen: 0–5 years, 6–10 years, 11–16 years, 17–60 years and 61 years and above. Females in the age group 61 years and above were chosen as the omitted category in equation system (1). If it is the case that the coefficients for boys and girls are different (at any particular age group $k$), then it can be concluded that, everything else being constant, expenditure on a particular commodity depends on the gender composition of children. The choice of the age groups 6–10 years and 11–16 years is justified by the fact that in India, whereas the former includes children enrolled in the primary school (grades I–V), the latter includes children enrolled in the middle and high school.

A significant feature of our estimation methodology is that the male welfare weight ($\theta$), which is a determinant of budget shares (see Equation (1)), is jointly estimated with household expenditure and the budget shares, $b^g$. $\theta$, which denotes the male income earner's bargaining power within the household, could be correlated with the unobserved determinants of budget shares, i.e. $\theta$ is potentially endogenous in the budget share equations.

Per capita household expenditure is used as a proxy for household permanent income. Household expenditure is easier to measure compared with household income and is measured with less error. Moreover, household expenditure is a better proxy than current income because, although income might be subject to transitory fluctuations, households use a variety of mechanisms to smooth consumption over time. However, household expenditure is also likely to be correlated with unobserved determinants of the household budget shares, and failure to account for this potential endogeneity could result in inconsistent estimates.

Our empirical analysis is based on the three-stage least squares (3SLS) estimation of the following system of equations:

$$\theta = \theta(\mathbf{X}_1) + v_1 \tag{2a}$$

$$EXP = EXP(\mathbf{X}_2) + v_2 \tag{2b}$$

$$b^g = b^g(\theta, EXP, \mathbf{X}_3) + v^g; \quad g = 1, ..., G, \tag{2c}$$

where $EXP$ is per capita household expenditure, $\mathbf{X}_1, \mathbf{X}_2, \mathbf{X}_3$ are the vectors of exogenous determinants in the three equations, and the other variables are as defined earlier.

Two different data sets are used in the estimation. The first is the Uttar Pradesh and Bihar "Survey of Living Conditions" (henceforth referred to as the SLC data set), which is a two-part study of rural poverty carried out in 1997–98 in South and Eastern Uttar Pradesh and North and Central Bihar. The data set used is from the quantitative component of the study, which draws on data collected from household and community surveys modelled after the World Bank's Living Standard Measurement Surveys (LSMS). The data were collected between December 1997 and March 1998 from 120 villages drawn from a sample of 25 districts in the states of Uttar Pradesh and Bihar. A total of 2250 households were interviewed for this survey. Information was collected on household demographics, economic activities, housing, education, health, marriage and maternity history expenditures, and so on.[5] In this paper, wage earnings is used as the measure of bargaining power, and the theoretical framework used to justify the estimation methodology (Basu, 2006) applies only when there are separately assignable wage income flows to at least one of the two spouses. Note also that, in the developing country context as in this paper, it is not surprising that households that have non-zero wage income with separately assigned wage income flows to at least one of the two spouses constitute 50–60% of all households.

The second data set used here is that on household expenditure collected in the fiftieth round (1993/94) of the National Sample Survey (NSS). The NSS, because of its wider coverage involving all regions/states in India, has been used extensively. In the fiftieth round, 71 385 rural households in over 6000 villages were interviewed all over India. This analysis is restricted to the data from three states: Bihar, Kerala and Maharashtra. The choice of these three states was guided by the significant socio-economic disparities between them. Data on the Human Development Index, provided by the Indian Planning Commission,[6] show that Kerala was ranked first in 1981, 1991 and 2001 among the 15 major states in India. Datt & Ravallion (2002) showed that over the period 1960–2000, while Kerala had the highest rate of poverty reduction, Bihar's performance was much less impressive and lagged behind most of the other states. The choice of Maharashtra is due to the fact that, on the criterion of the Human Development Index, it falls somewhere in between the extremes of Bihar and Kerala. The use of the NSS data also allows us to examine whether there are rural–urban disparities in the principal results. Essentially, the use of the NSS data set helps us answer the following questions:

(1) Is gender bias pervasive in all parts of India or is it specific to certain regions?
(2) What is the link between economic development and gender bias?
(3) Given that the decision to educate children can be viewed as an inter-generational investment decision, what do these results imply regarding inter-generational transmission of human capital? Is it the case that parents who are not educated themselves might be less aware of the potential benefits of increased educational attainment of their children?

The budget share equations were estimated on a nine-item disaggregation of household expenditure: food, tobacco, alcohol, energy/fuel and light, transport, medical expenses, clothing, education and other expenditure. The last category (other expenditure) serves as the omitted category in all the regressions that follow. The sample means, on these data sets, of the principal variables of interest are presented in Table 1. The backwardness of rural Bihar and the relative affluence of urban Maharashtra are evident from the high and low budget share of food recorded by these regions, respectively. Another feature worth noting is the striking disparity between the educational attainment of men and women, with Kerala being the significant exception. The high literacy levels of both men and women in Kerala have made this state stand out from the rest of the country in the context of human development. The heterogeneity between the three states, reflected in the summary means presented in Table 1, justifies the selection of Bihar, Kerala and Maharashtra for this study.

## 3. Results on SLC Data

The regression results from the 3SLS estimation of the 10-equation system (Equations (2a–c)) on the SLC data set, along with the $\chi^2$ tests for equality of gender effects, are presented in Table 2. The coefficient estimates for male bargaining power ($\theta$), measured by the male share of earnings within the household (Equation (2a)), and per capita

**Table 1.** Selected sample means

| Variable | SLC Bihar—UP | NSS Kerala (rural) | NSS Kerala (urban) | NSS Bihar (rural) | NSS Bihar (urban) | NSS Maharashtra (rural) | NSS Maharashtra (urban) |
|---|---|---|---|---|---|---|---|
| Sample size | 1273 | 1321 | 983 | 2824 | 983 | 2131 | 3058 |
| Per capita monthly expenditure (Rs) | 356.63 | 407.03 | 627.83 | 208.53 | 442.65 | 283.59 | 616.97 |
| Educational attainment of most educated male in the household | 6.31 | 6.36 | 6.97 | 4.29 | 6.93 | 5.17 | 7.55 |
| Educational attainment of most educated female in the household | 2.81 | 6.65 | 6.96 | 2.07 | 3.93 | 3.37 | 5.90 |
| Household size | 6.55 | 5.00 | 5.10 | 5.20 | 5.60 | 5.10 | 4.90 |
| Budget share of: | | | | | | | |
| Food | 0.66 | 0.67 | 0.64 | 0.72 | 0.65 | 0.62 | 0.58 |
| Tobacco | 0.02 | 0.03 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 |
| Alcohol | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Energy/fuel and light | 0.03 | 0.07 | 0.07 | 0.09 | 0.07 | 0.08 | 0.07 |
| Transport | 0.02 | 0.07 | 0.08 | 0.08 | 0.09 | 0.011 | 0.09 |
| Medical items | 0.06 | 0.02 | 0.03 | 0.01 | 0.03 | 0.01 | 0.03 |
| Clothing | 0.09 | 0.05 | 0.05 | 0.03 | 0.02 | 0.5 | 0.04 |
| Education | 0.02 | 0.04 | 0.05 | 0.01 | 0.03 | 0.03 | 0.05 |
| Other items | 0.09 | 0.03 | 0.05 | 0.04 | 0.08 | 0.06 | 0.11 |

**Table 2.** 3SLS estimates of budget shares—SLC data

| | Food | Tobacco | Alcohol | Energy | Transport | Medical | Clothing | Education |
|---|---|---|---|---|---|---|---|---|
| Males aged 0–5 | 0.0088 | 0.0134 | 0.0064 | 0.0091 | 0.0352*** | −0.0686** | 0.0310** | −0.0211** |
| | (0.0396) | (0.0084) | (0.0104) | (0.0105) | (0.0134) | (0.0276) | (0.0147) | (0.0107) |
| Females aged 0–5 | −0.0073 | 0.0115 | 0.0116 | 0.0196* | 0.0391*** | −0.0505* | 0.0083 | −0.0074 |
| | (0.0417) | (0.0088) | (0.0109) | (0.0110) | (0.0141) | (0.0290) | (0.0155) | (0.0112) |
| Males aged 6–10 | 0.0308 | −0.0042 | 0.0013 | 0.0179* | 0.0185 | −0.0500* | 0.0103 | 0.0340*** |
| | (0.0400) | (0.0085) | (0.0105) | (0.0106) | (0.0135) | (0.0279) | (0.0148) | (0.0108) |
| Females aged 6–10 | 0.0455 | 0.0038 | 0.0054 | 0.0145 | 0.0077 | −0.0558** | −0.0086 | 0.0198* |
| | (0.0416) | (0.0088) | (0.0109) | (0.0110) | (0.0140) | (0.0290) | (0.0154) | (0.0112) |
| Males aged 11–16 | −0.0450 | 0.0044 | −0.0047 | 0.0011 | 0.0138 | −0.0888*** | 0.0291* | 0.1056*** |
| | (0.0417) | (0.0088) | (0.0109) | (0.0110) | (0.0141) | (0.0290) | (0.0155) | (0.0112) |
| Females aged 11–16 | 0.0202 | −0.0004 | 0.0042 | 0.0147 | 0.0267* | −0.1202*** | 0.0199 | 0.0394*** |
| | (0.0442) | (0.0094) | (0.0116) | (0.0117) | (0.0149) | (0.0308) | (0.0164) | (0.0119) |
| Males aged 17–60 | 0.0308 | 0.0120 | −0.0032 | 0.0196** | 0.0150 | −0.0743*** | 0.0365*** | 0.0208** |
| | (0.0374) | (0.0079) | (0.0098) | (0.0099) | (0.0126) | (0.0261) | (0.0139) | (0.0101) |
| Females aged 17–60 | 0.0200 | −0.0026 | −0.0063 | 0.0200** | 0.0314*** | −0.0436* | 0.0252** | −0.0089 |
| | (0.0351) | (0.0075) | (0.0092) | (0.0093) | (0.0119) | (0.0245) | (0.0130) | (0.0095) |
| Males aged 61 and higher | 0.0578 | 0.0140 | −0.0107 | 0.0090 | 0.0231 | −0.0560* | 0.0321* | 0.0064 |
| | (0.0478) | (0.0101) | (0.0125) | (0.0126) | (0.0161) | (0.0333) | (0.0177) | (0.0129) |
| *$\chi$2 test for equality by gender* | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.25 | 0.07 | 0.37 | 1.52 | 0.13 | 0.64 | 3.59* | 2.46 |
| Age 6–10 ($\chi^2(1)$) | 0.18 | 1.16 | 0.20 | 0.14 | 0.84 | 0.06 | 2.13 | 2.26 |
| Age 11–16 ($\chi^2(1)$) | 2.86 | 0.35 | 0.79 | 1.77 | 0.98 | 1.36 | 0.41 | 40.46*** |
| Age 17–60 ($\chi^2(1)$) | 0.14 | 5.49** | 0.16 | 0.00 | 2.72 | 2.26 | 1.07 | 14.06*** |
| All children ($\chi^2(3)$) | 3.25 | 1.61 | 1.34 | 3.44 | 1.99 | 2.05 | 6.14 | 44.71*** |

Other explanatory variables included are: $\theta$, $\theta(\theta$* Per Capita Expenditure), $(1-\theta)((1-\theta)$*Per Capita Expenditure), log family size and a constant term.
Omitted category: other expenditures. Standard errors in parentheses.
Significance: *10%; **5%; ***1%.

household expenditure (Equation (2b)) are not presented, but the interested reader should look at Lancaster *et al.* (2006) for these estimates. Using the Breusch-Pagan test, the null hypothesis of diagonal covariance matrix of the errors is rejected ($\chi^2(45) = 1038.763$; $p$-value $= 0.0000$). The corresponding ordinary least squares estimates are available on request.[7]

Consistent with much of the previous literature, there is generally an absence of gender bias, as seen from the failure of the $\chi^2$ values to reject the hypothesis of gender equality in most of the items. However, a significant exception occurs in the case of the allocation of spending on education between boys and girls in the age group 11–16 years. In addition, the joint hypothesis of no gender bias among all children aged 0–16 years yields a $\chi^2$ statistic that is highly statistically significant. Inspection of the coefficient estimates shows that, holding household size constant, a *ceteris paribus* unit increase in the proportion of boys in the age group 11–16 years has a significantly positive impact on the budget share of education, with a magnitude (0.1060), which is nearly three times that of girls (0.0394) in the same age group.

There are different ways of interpreting these results. Our results are indicative of active gender differentiation against girls, especially in the children's age group for middle and high schooling—parents are unwilling to spend as much on educating girls as they are on boys. Of course, there could be alternative explanations. For example, the statistically significant gender effect might simply represent a rational choice on the part of the parents to invest in the education of boys compared with girls (the income-maximizing hypothesis). The reduced form equations are the same in both these models and existing data do not allow us to discriminate between the two hypotheses. Yet another explanation could be because of supply-side conditions. Kingdon (2005) argues that in India most secondary schools are single-sex schools and it is likely that there are more secondary schools for boys than girls. Additionally, there might be social taboos or difficulties associated with sending girls to non-local secondary school. If so, higher household education expenditure on boys may be because there are no nearby secondary schools for girls, rather than due to pro-male discrimination.

The $\chi^2$statistic for testing the equality of gender effects for working age males and females in the household (individuals aged 17–60) is also computed. The null hypothesis that the gender composition of working age adults does not have a statistically significant effect on expenditure cannot be rejected for most commodities—the exceptions are tobacco and education. The coefficient estimates imply that, holding household size constant, while a unit increase in the number of working age adult males significantly increases the budget share of education by 2.08 percentage points, a unit increase in the number of working age adult females has no statistically significant impact on the budget share of education.

The results, which are quite different from those that have been obtained previously using data from India, lead to two obvious questions. First, how general is the result? The SLC data were collected from Bihar and Uttar Pradesh, two of the most socio-economically backward states in the country. It is worth examining whether gender bias of this kind is related to the socio-economic status not only of the household, but also of the community. Second, given that the decision to educate children can be viewed as an inter-generational investment decision, what do these results imply regarding inter-generational transmission of human capital? Is it the case that parents who are not educated themselves might be less aware of the potential benefits of increased educational attainment of their children? To examine the first issue (Section 4), the analysis is repeated using the NSS data set from three states in India chosen to cover the broad spectrum of the different levels of socio-economic development of the different regions of India. To analyse the second issue (Section 5), the analysis is repeated, but this time the sample is stratified by the level of adult literacy within the household.

## 4. Results on NSS Data

Tables 3–5 present the corresponding results using the NSS data sets of Kerala, Bihar and Maharashtra, separately for the rural and urban samples. Again using the Breusch-Pagan test, the null hypothesis of diagonal covariance matrix of the errors is rejected. The interested reader is referred to Lancaster *et al.* (2006) for the full set of estimates. In each of the tables, 'Table a' presents the results for the rural sample and 'Table b' the results for the urban sample. The $\chi^2$ test statistics provide the item-wise tests for the differential gender effects. The results vary across the different regions and do not lend themselves to easy generalization. The gender bias in expenditure allocation is more prevalent in the adult age group, 17–60 years, compared with children (0–16 years). The NSS results contain evidence of strong gender disparities in expenditure allocation between adults, for example, clothing and education in urban Kerala,[8] food in urban Maharashtra and tobacco, alcohol, fuel and light in rural Bihar. The coefficient estimates for urban Maharashtra show that whereas a *ceteris paribus* increase in the proportion of male adults leads to a strong and statistically significant increase in the budget share of food, in female adults it leads to a statistically significant decline, thus providing a strong example of pro-male gender bias in food spending in urban Maharashtra. This contrasts with previous failures to detect gender bias in food consumption in Maharashtra (Subramanian & Deaton, 1991) and in the other states of Western India (Subramanian, 1995).

The general absence of gender bias in expenditure allocation in the case of children, especially young children, which is apparent from these results, is consistent with the previous evidence in the literature. However, educational spending in rural Bihar provides a significant exception in registering strong gender bias, particularly for children in the age group 11–16 years. These results corroborate those obtained using the SLC data set from Bihar and Uttar Pradesh. The coefficient estimates show that the demographic impact of a unit increase in the proportion of boys aged 11–16 years on educational spending (0.035) is significantly higher than that of girls in the same age group (0.020), providing strong evidence of gender disparity in educational expenditure in favour of the former. A similar gender disparity in favour of boys' education, though of weaker statistical significance, exists in rural Bihar in the case of younger children aged 6–10 years.

The other result that is worth noting is that in rural Kerala, *ceteris paribus*, a unit increase in the proportion of boys and girls in the age group 11–16 years (holding household size constant) has very similar effects on the budget share of education in the household. The coefficient estimates are 0.051 and 0.059, respectively. Although the difference estimate is not statistically significant, it is interesting that in rural Kerala parental preferences on the education of their children are not skewed in favour of boys, unlike in most other states of India.

## 5. Does the Literacy Level of the Household Matter?

The results presented in the previous two sections raise the issue of their robustness to the introduction of additional socio-economic determinants in the estimating equations and

**Table 3a.** 3SLS estimates of budget share equations—NSS Kerala: rural sample

| | Food | Tobacco | Alcohol | Fuel and light | Clothing | Education | Medicine | Transport |
|---|---|---|---|---|---|---|---|---|
| Males aged 0–5 | 0.0288 | −0.0221** | 0.0055 | −0.0371*** | 0.0343*** | −0.0157** | −0.0153 | 0.0212** |
| | (0.0254) | (0.0090) | (0.0090) | (0.0078) | (0.0113) | (0.0076) | (0.0193) | (0.0105) |
| Females aged 0–5 | −0.0069 | −0.0179** | 0.0056 | −0.0345*** | 0.0433*** | −0.0194** | −0.0073 | 0.0271** |
| | (0.0264) | (0.0093) | (0.0094) | (0.0081) | (0.0118) | (0.0079) | (0.0201) | (0.0109) |
| Males aged 6–10 | −0.0072 | −0.0158* | 0.0067 | −0.0274*** | 0.0385*** | 0.0291*** | −0.0549*** | 0.0066 |
| | (0.0243) | (0.0086) | (0.0086) | (0.0075) | (0.0109) | (0.0073) | (0.0185) | (0.0101) |
| Females aged 6–10 | −0.0112 | −0.0209** | 0.0130 | −0.0398*** | 0.0575*** | 0.0325*** | −0.0356** | 0.0158 |
| | (0.0247) | (0.0087) | (0.0088) | (0.0076) | (0.0110) | (0.0074) | (0.0187) | (0.0102) |
| Males aged 11–16 | 0.0079 | −0.0136* | 0.0115 | −0.0382*** | 0.0294*** | 0.0505*** | −0.0617*** | 0.0039 |
| | (0.0232) | (0.0082) | (0.0082) | (0.0071) | (0.0104) | (0.0069) | (0.0176) | (0.0096) |
| Females aged 11–16 | −0.0261 | −0.0236*** | 0.0088 | −0.0244*** | 0.0343*** | 0.0590*** | −0.0587*** | 0.0177* |
| | (0.0229) | (0.0081) | (0.0081) | (0.0070) | (0.0102) | (0.0069) | (0.0174) | (0.0095) |
| Males aged 17–60 | 0.0258 | −0.0025 | 0.0136** | −0.0548*** | 0.0142* | 0.0165*** | −0.0340** | 0.0270*** |
| | (0.0176) | (0.0062) | (0.0063) | (0.0054) | (0.0079) | (0.0053) | (0.0134) | (0.0073) |
| Females aged 17–60 | 0.0023 | −0.0185*** | 0.0007 | −0.0282*** | 0.0345*** | 0.0085* | −0.0106 | 0.0104 |
| | (0.0167) | (0.0059) | (0.0059) | (0.0051) | (0.0075) | (0.0050) | (0.0127) | (0.0069) |
| Males aged 61 and higher | −0.0306 | −0.0005 | 0.0126 | −0.0520*** | 0.0059 | 0.0027 | 0.0259 | 0.0218** |
| | (0.0256) | (0.0090) | (0.0091) | (0.0079) | (0.0114) | (0.0077) | (0.0194) | (0.0106) |
| *χ2 test for equality by gender* | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 1.52 | 0.17 | 0.00 | 0.08 | 0.49 | 0.19 | 0.13 | 0.24 |
| Age 6–10 ($\chi^2(1)$) | 0.02 | 0.28 | 0.42 | 2.18 | 2.39 | 0.17 | 0.86 | 0.66 |
| Age 11–16 ($\chi^2(1)$) | 1.81 | 1.25 | 0.09 | 3.11 | 0.19 | 1.26 | 0.02 | 1.74 |
| Age 17–60 ($\chi^2(1)$) | 2.57 | 9.48*** | 6.14** | 34.93*** | 9.54*** | 3.32* | 4.40** | 7.44** |
| All children ($\chi^2(3)$) | 3.36 | 1.65 | 0.53 | 5.62 | 2.99 | 1.58 | 1.00 | 2.56 |

Other explanatory variables included are: $\theta$, $\theta$($\theta$*Per Capita Expenditure), $(1 - \theta)$($(1 - \theta)$*Per Capita Expenditure), log family size and a constant term.
Omitted category: other expenditures.
Standard errors in parentheses. Significance: *10%; **5%; ***1%.

**Table 3b.** 3SLS estimates of budget share equations—NSS Kerala: urban sample

| | Food | Tobacco | Alcohol | Fuel and light | Clothing | Education | Medicine | Transport |
|---|---|---|---|---|---|---|---|---|
| Males aged 0–5 | −0.0288 | 0.0098 | 0.0092 | −0.0332*** | 0.0208 | −0.0267** | 0.0202 | 0.0034 |
| | (0.0328) | (0.0090) | (0.0111) | (0.0104) | (0.0167) | (0.0116) | (0.0226) | (0.0163) |
| Females aged 0–5 | −0.0018 | 0.0191** | 0.0133 | −0.0389*** | 0.0421** | −0.0181 | −0.0175 | −0.0046 |
| | (0.0336) | (0.0092) | (0.0114) | (0.0106) | (0.0171) | (0.0119) | (0.0231) | (0.0167) |
| Males aged 6–10 | −0.0786** | 0.0112 | 0.0134 | −0.0217* | 0.0401** | 0.0279** | −0.0341 | 0.0384** |
| | (0.0365) | (0.0100) | (0.0124) | (0.0115) | (0.0185) | (0.0129) | (0.0251) | (0.0182) |
| Females aged 6–10 | −0.0941** | 0.0068 | 0.0111 | −0.0324*** | 0.0528*** | 0.0235* | −0.0413 | 0.0280 |
| | (0.0373) | (0.0103) | (0.0127) | (0.0118) | (0.0190) | (0.0132) | (0.0257) | (0.0186) |
| Males aged 11–16 | −0.0674** | 0.0028 | 0.0160 | −0.0406*** | 0.0440*** | 0.0564*** | −0.0242 | 0.0157 |
| | (0.0289) | (0.0079) | (0.0098) | (0.0091) | (0.0147) | (0.0102) | (0.0199) | (0.0144) |
| Females aged 11–16 | −0.0338 | −0.0012 | 0.0122 | −0.0187** | 0.0600*** | 0.0407*** | −0.0670*** | 0.0005 |
| | (0.0287) | (0.0079) | (0.0097) | (0.0091) | (0.0146) | (0.0101) | (0.0197) | (0.0143) |
| Males aged 17–60 | −0.0038 | 0.0207*** | 0.0210*** | −0.0563*** | 0.0221** | −0.0005 | −0.0225* | 0.0342*** |
| | (0.0199) | (0.0055) | (0.0067) | (0.0063) | (0.0101) | (0.0070) | (0.0137) | (0.0099) |
| Females aged 17–60 | −0.0695*** | −0.0069 | 0.0066 | −0.0294*** | 0.0670*** | 0.0261*** | −0.0119 | 0.0040 |
| | (0.0201) | (0.0055) | (0.0068) | (0.0064) | (0.0102) | (0.0071) | (0.0139) | (0.0100) |
| Males aged 61 and higher | −0.0361 | 0.0234** | 0.0159 | −0.0194* | −0.0108 | −0.0099 | 0.0422* | −0.0046 |
| | (0.0329) | (0.0090) | (0.0112) | (0.0104) | (0.0167) | (0.0116) | (0.0226) | (0.0164) |
| *$\chi$2 test for equality by gender* | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.49 | 0.77 | 0.10 | 0.22 | 1.18 | 0.39 | 2.01 | 0.17 |
| Age 6–10 ($\chi^2(1)$) | 0.11 | 0.12 | 0.02 | 0.54 | 0.30 | 0.07 | 0.05 | 0.21 |
| Age 11–16 ($\chi^2(1)$) | 1.11 | 0.21 | 0.12 | 4.69** | 0.97 | 1.92 | 3.80** | 0.91 |
| Age 17–60 ($\chi^2(1)$) | 19.27*** | 45.21*** | 8.01*** | 32.50*** | 35.03*** | 25.49*** | 1.07 | 16.46*** |
| All children ($\chi^2(3)$) | 1.70 | 1.08 | 0.24 | 5.50 | 2.46 | 2.39 | 5.86 | 1.29 |

Other explanatory variables included are: $\theta$, $\theta$($\theta$*Per Capita Expenditure), (1 − $\theta$)((1 − $\theta$)*Per Capita Expenditure), log family size and a constant term.
Omitted category: other expenditures.
Standard errors in parentheses. Significance: *10%; **5%; ***1%.

**Table 4a.** 3SLS estimates of budget share equations—NSS Bihar: rural sample

| | Food | Tobacco | Alcohol | Fuel and light | Clothing | Education | Medicine | Transport |
|---|---|---|---|---|---|---|---|---|
| Males aged 0–5 | −0.0092 | 0.0040 | 0.0067* | −0.0015 | −0.0009 | −0.0078** | −0.0040 | 0.0074* |
| | (0.0183) | (0.0034) | (0.0036) | (0.0079) | (0.0078) | (0.0038) | (0.0111) | (0.0045) |
| Females aged 0–5 | 0.0047 | 0.0023 | 0.0088** | −0.0071 | −0.0078 | −0.0046 | −0.0026 | 0.0086** |
| | (0.0184) | (0.0034) | (0.0036) | (0.0079) | (0.0079) | (0.0039) | (0.0112) | (0.0045) |
| Males aged 6–10 | 0.0070 | 0.0040 | 0.0048 | 0.0034 | −0.0105 | 0.0198*** | −0.0228** | 0.0042 |
| | (0.0184) | (0.0034) | (0.0036) | (0.0079) | (0.0079) | (0.0039) | (0.0111) | (0.0045) |
| Females aged 6–10 | 0.0034 | 0.0042 | 0.0058 | 0.0028 | −0.0125 | 0.0126*** | −0.0150 | 0.0092** |
| | (0.0194) | (0.0036) | (0.0038) | (0.0083) | (0.0083) | (0.0041) | (0.0117) | (0.0047) |
| Males aged 11–16 | −0.0183 | −0.0030 | 0.0038 | −0.0048 | −0.0043 | 0.0354*** | −0.0291** | 0.0072 |
| | (0.0189) | (0.0035) | (0.0037) | (0.0081) | (0.0081) | (0.0040) | (0.0114) | (0.0046) |
| Females aged 11–16 | 0.0021 | −0.0036 | 0.0013 | −0.0054 | −0.0003 | 0.0196*** | −0.0191 | 0.0050 |
| | (0.0200) | (0.0037) | (0.0039) | (0.0086) | (0.0086) | (0.0042) | (0.0121) | (0.0049) |
| Males aged 17–60 | −0.0039 | 0.0200*** | 0.0119*** | −0.0219*** | 0.0048 | 0.0049 | −0.0367*** | 0.0095** |
| | (0.0163) | (0.0030) | (0.0032) | (0.0070) | (0.0070) | (0.0034) | (0.0099) | (0.0040) |
| Females aged 17–60 | 0.0081 | 0.0024 | 0.0015 | 0.0087 | 0.0064 | −0.0010 | −0.0190** | 0.0025 |
| | (0.0161) | (0.0030) | (0.0032) | (0.0069) | (0.0069) | (0.0034) | (0.0098) | (0.0039) |
| Males aged 61 and higher | 0.0104 | 0.0218*** | 0.0127*** | −0.0156 | 0.0089 | −0.0018 | −0.0400*** | 0.0069 |
| | (0.0221) | (0.0041) | (0.0043) | (0.0095) | (0.0095) | (0.0047) | (0.0134) | (0.0054) |
| *χ2 test for equality by gender* | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 1.10 | 0.50 | 0.66 | 0.97 | 1.48 | 1.35 | 0.03 | 0.15 |
| Age 6–10 ($\chi^2(1)$) | 0.06 | 0.00 | 0.13 | 0.01 | 0.10 | 5.38** | 0.75 | 1.88 |
| Age 11–16 ($\chi^2(1)$) | 1.59 | 0.03 | 0.64 | 0.01 | 0.34 | 21.39*** | 1.04 | 0.32 |
| Age 17–60 ($\chi^2(1)$) | 1.64 | 106.41*** | 32.41*** | 58.58*** | 0.16 | 9.00*** | 9.82*** | 9.30*** |
| All children ($\chi^2(3)$) | 2.72 | 0.53 | 1.43 | 0.98 | 1.91 | 28.46*** | 1.83 | 2.32 |

Other explanatory variables included are: $\theta$, $\theta$($\theta$*Per Capita Expenditure), $(1-\theta)((1-\theta)$*Per Capita Expenditure), log family size and a constant term.
Omitted category: other expenditures.
Standard errors in parentheses. Significance: *10%; **5%; ***1%.

**Table 4b.** 3SLS estimates of budget share equations—NSS Bihar: urban sample

| | Food | Tobacco | Alcohol | Fuel and light | Clothing | Education | Medicine | Transport |
|---|---|---|---|---|---|---|---|---|
| Males aged 0–5 | 0.0075 | 0.0154** | 0.0076 | −0.0349*** | −0.0075 | −0.0100 | −0.0353** | 0.0104 |
| | (0.0359) | (0.0079) | (0.0063) | (0.0125) | (0.0136) | (0.0150) | (0.0180) | (0.0121) |
| Females aged 0–5 | 0.0008 | 0.0095 | 0.0082 | −0.0446*** | −0.0162 | −0.0059 | −0.0157 | 0.0210* |
| | (0.0361) | (0.0080) | (0.0063) | (0.0125) | (0.0137) | (0.0151) | (0.0181) | (0.0122) |
| Males aged 6–10 | −0.0270 | 0.0136 | 0.0049 | −0.0507*** | −0.0227 | 0.04164*** | −0.0341* | 0.0252** |
| | (0.0380) | (0.0084) | (0.0067) | (0.0132) | (0.0145) | (0.0159) | (0.0191) | (0.0128) |
| Females aged 6–10 | −0.0420 | 0.0045 | 0.0070 | −0.0675*** | −0.0003 | 0.0453*** | −0.0555*** | 0.0382*** |
| | (0.0400) | (0.0088) | (0.0070) | (0.0139) | (0.0152) | (0.0167) | (0.0201) | (0.0135) |
| Males aged 11–16 | −0.0707** | 0.0044 | 0.0040 | −0.0526*** | 0.0019 | 0.0770*** | −0.0455*** | 0.0067 |
| | (0.0326) | (0.0072) | (0.0057) | (0.0113) | (0.0124) | (0.0136) | (0.0164) | (0.0110) |
| Females aged 11–16 | −0.0853** | 0.0055 | 0.0029 | −0.0525*** | 0.0187 | 0.0728*** | −0.0557*** | 0.0228* |
| | (0.0366) | (0.0081) | (0.0064) | (0.0127) | (0.0139) | (0.0153) | (0.0184) | (0.0124) |
| Males aged 17–60 | −0.0199 | 0.0171*** | 0.0045 | −0.0619*** | 0.0132 | 0.0247** | −0.0491*** | 0.0123 |
| | (0.0280) | (0.0062) | (0.0049) | (0.0097) | (0.0107) | (0.0117) | (0.0141) | (0.0095) |
| Females aged 17–60 | −0.0523* | −0.0020 | 0.0023 | −0.0216** | 0.0172 | 0.0040 | −0.0357** | 0.0169* |
| | (0.0293) | (0.0065) | (0.0051) | (0.0102) | (0.0111) | (0.0122) | (0.0147) | (0.0099) |
| Males aged 61 and higher | −0.0228 | 0.0082 | 0.0084 | −0.0325** | 0.0143 | −0.0088 | −0.0261 | 0.0135 |
| | (0.0405) | (0.0090) | (0.0071) | (0.0141) | (0.0154) | (0.0169) | (0.0203) | (0.0137) |
| *$\chi 2$ test for equality by gender* | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.05 | 0.70 | 0.01 | 0.78 | 0.53 | 0.10 | 1.52 | 0.99 |
| Age 6–10 ($\chi^2(1)$) | 0.15 | 1.17 | 0.10 | 1.58 | 2.36 | 0.05 | 1.23 | 1.00 |
| Age 11–16 ($\chi^2(1)$) | 0.27 | 0.03 | 0.05 | 0.00 | 2.39 | 0.12 | 0.51 | 2.81* |
| Age 17–60 ($\chi^2(1)$) | 4.73** | 33.50*** | 0.74 | 60.35*** | 0.52 | 11.01*** | 3.22* | 0.84 |
| All children ($\chi^2(3)$) | 0.46 | 1.90 | 0.16 | 2.35 | 5.34 | 0.27 | 3.30 | 4.75 |

Other explanatory variables included are: $\theta$, $\theta(\theta$*Per Capita Expenditure), $(1-\theta)((1-\theta)$*Per Capita Expenditure), log family size and a constant term.
Omitted category: other expenditures.
Standard errors in parentheses. Significance: *10%; **5%; ***1%.

**Table 5a.** 3SLS estimates of budget share equations—NSS Maharashtra: rural sample

| | Food | Tobacco | Alcohol | Fuel and light | Clothing | Education | Medicine | Transport |
|---|---|---|---|---|---|---|---|---|
| Males aged 0–5 | 0.0007 | −0.0106** | 0.0030 | −0.0106 | −0.0122 | −0.0114*** | −0.0187 | 0.0146* |
| | (0.0199) | (0.0047) | (0.0036) | (0.0066) | (0.0100) | (0.0036) | (0.0146) | (0.0082) |
| Females aged 0–5 | 0.0277 | −0.0009 | 0.0066* | −0.0118* | −0.0087 | −0.0114*** | −0.0425*** | 0.0190** |
| | (0.0200) | (0.0047) | (0.0036) | (0.0067) | (0.0101) | (0.0036) | (0.0147) | (0.0083) |
| Males aged 6–10 | 0.0261 | −0.0003 | 0.0112*** | −0.0038 | −0.0153 | 0.0135*** | −0.0636*** | 0.0078 |
| | (0.0202) | (0.0048) | (0.0036) | (0.0067) | (0.0102) | (0.0036) | (0.0149) | (0.0083) |
| Females aged 6–10 | 0.0409** | −0.0015 | 0.0154*** | −0.0125* | −0.0299*** | 0.0164*** | −0.0707*** | 0.0156* |
| | (0.0208) | (0.0049) | (0.0037) | (0.0069) | (0.0105) | (0.0037) | (0.0153) | (0.0086) |
| Males aged 11–16 | −0.0297 | −0.0021 | 0.0067** | −0.0179*** | 0.0025 | 0.0354*** | −0.0479*** | 0.0074 |
| | (0.0188) | (0.0045) | (0.0034) | (0.0063) | (0.0095) | (0.0034) | (0.0138) | (0.0078) |
| Females aged 11–16 | 0.0238 | −0.0076 | 0.0005 | −0.0120* | −0.0112 | 0.0330*** | −0.0676*** | 0.0154* |
| | (0.0205) | (0.0049) | (0.0037) | (0.0068) | (0.0103) | (0.0037) | (0.0151) | (0.0084) |
| Males aged 17–60 | 0.0089 | 0.0041 | 0.0087*** | −0.0257*** | 0.0116 | 0.0058** | −0.0725*** | 0.0230*** |
| | (0.0143) | (0.0034) | (0.0026) | (0.0048) | (0.0072) | (0.0026) | (0.0105) | (0.0059) |
| Females aged 17–60 | 0.0313** | −0.0035 | 0.0014 | 0.0029 | 0.0049 | −0.0013 | −0.0459*** | 0.0026 |
| | (0.0136) | (0.0032) | (0.0024) | (0.0045) | (0.0069) | (0.0024) | (0.0100) | (0.0056) |
| Males aged 61 and higher | −0.0037 | 0.0265*** | 0.0074** | −0.0059 | −0.0038 | −0.0043 | −0.0364** | 0.0035 |
| | (0.0207) | (0.0049) | (0.0037) | (0.0069) | (0.0104) | (0.0037) | (0.0152) | (0.0085) |
| *χ2 test for equality by gender* | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 1.64 | 3.79** | 0.90 | 0.03 | 0.11 | 0.00 | 2.35 | 0.26 |
| Age 6–10 ($\chi^2(1)$) | 0.42 | 0.05 | 1.06 | 1.31 | 1.62 | 0.53 | 0.18 | 0.69 |
| Age 11–16 ($\chi^2(1)$) | 6.38** | 1.23 | 2.64 | 0.70 | 1.62 | 0.40 | 1.60 | 0.84 |
| Age 17–60 ($\chi^2(1)$) | 3.15* | 6.55** | 10.51*** | 46.31*** | 1.10 | 9.82*** | 8.24*** | 15.47*** |
| All children ($\chi^2(3)$) | 8.44** | 5.03 | 4.58 | 2.06 | 3.31 | 0.95 | 4.14 | 1.76 |

Other explanatory variables included are: $\theta$, $\theta$($\theta$*Per Capita Expenditure), $(1-\theta)((1-\theta)$*Per Capita Expenditure), log family size and a constant term.
Omitted category: other expenditures.
Standard errors in parentheses. Significance: *10%; **5%; ***1%.

**Table 5b.** 3SLS estimates of budget share equations—NSS Maharashtra: urban sample

| | Food | Tobacco | Alcohol | Fuel and light | Clothing | Education | Medicine | Transport |
|---|---|---|---|---|---|---|---|---|
| Males aged 0–5 | 0.0258 | 0.0155*** | 0.0073* | −0.0471*** | −0.0111 | −0.0179** | −0.0148 | 0.0158 |
| | (0.0194) | (0.0046) | (0.0040) | (0.0059) | (0.0085) | (0.0083) | (0.0113) | (0.0097) |
| Females aged 0–5 | 0.0139 | 0.0103** | 0.0191*** | −0.0403*** | −0.0133 | −0.0223*** | −0.0258** | 0.0174* |
| | (0.0197) | (0.0047) | (0.0040) | (0.0060) | (0.0087) | (0.0085) | (0.0115) | (0.0099) |
| Males aged 6–10 | −0.0018 | 0.0006 | 0.0053 | −0.0448*** | −0.0061 | 0.0504*** | −0.0454*** | 0.0184* |
| | (0.0214) | (0.0051) | (0.0044) | (0.0065) | (0.0094) | (0.0092) | (0.0124) | (0.0107) |
| Females aged 6–10 | 0.0420* | 0.0143** | 0.0093** | −0.0452*** | −0.0043 | 0.0326*** | −0.0671*** | 0.0129 |
| | (0.0235) | (0.0056) | (0.0048) | (0.0071) | (0.0103) | (0.0101) | (0.0137) | (0.0117) |
| Males aged 11–16 | 0.0222 | 0.0109** | 0.0041 | −0.0376*** | −0.0049 | 0.0563*** | −0.0562*** | 0.0029 |
| | (0.0180) | (0.0043) | (0.0037) | (0.0055) | (0.0079) | (0.0077) | (0.0105) | (0.0090) |
| Females aged 11–16 | 0.0166 | 0.0077* | 0.0053 | −0.0392*** | −0.0089 | 0.0518*** | −0.0668*** | 0.0191** |
| | (0.0187) | (0.0045) | (0.0038) | (0.0057) | (0.0082) | (0.0080) | (0.0109) | (0.0093) |
| Males aged 17–60 | 0.0666*** | 0.0173*** | 0.0049* | −0.0561*** | −0.0056 | 0.0222*** | −0.0674*** | 0.0289*** |
| | (0.0134) | (0.0032) | (0.0027) | (0.0041) | (0.0059) | (0.0057) | (0.0078) | (0.0067) |
| Females aged 17–60 | −0.0315** | −0.0006 | 0.0015 | −0.0055 | 0.0079 | 0.0122** | −0.0410*** | 0.0390*** |
| | (0.0140) | (0.0034) | (0.0029) | (0.0043) | (0.0062) | (0.0060) | (0.0082) | (0.0070) |
| Males aged 61 and higher | 0.0054 | 0.0126** | 0.0052 | −0.0190*** | −0.0261*** | −0.0010 | 0.0186 | 0.0310*** |
| | (0.0206) | (0.0049) | (0.0042) | (0.0063) | (0.0091) | (0.0088) | (0.0120) | (0.0103) |
| *χ2 test for equality by gender* | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.32 | 1.03 | 7.38** | 1.12 | 0.06 | 0.23 | 0.79 | 0.02 |
| Age 6–10 ($\chi^2(1)$) | 2.74 | 4.68** | 0.55 | 0.00 | 0.02 | 2.48 | 1.98 | 0.17 |
| Age 11–16 ($\chi^2(1)$) | 0.09 | 0.50 | 0.10 | 0.08 | 0.23 | 0.31 | 0.92 | 2.87* |
| Age 17–60 ($\chi^2(1)$) | 122.01*** | 71.14*** | 3.52* | 352.41*** | 12.01*** | 6.81** | 26.16*** | 5.10** |
| All children ($\chi^2(3)$) | 3.19 | 6.34 | 7.98** | 1.21 | 0.31 | 2.94 | 3.56 | 3.12 |

Other explanatory variables included are: $\theta$, $\theta$($\theta$*Per Capita Expenditure), (1 − $\theta$)((1 − $\theta$)*Per Capita Expenditure), log family size and a constant term.
Omitted category: other expenditures.
Standard errors in parentheses. Significance: *10%; **5%; ***1%.

**Table 6.** Variation of gender bias with literacy level of household—NSS: rural areas

| | Food | | | Tobacco | | | Alcohol | | |
|---|---|---|---|---|---|---|---|---|---|
| | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate |
| *Kerala* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.74 | 9.66*** | 0.39 | 2.02 | 2.75 | 0.04 | 0.91 | 0.06 | 2.22 |
| Age 6–10 ($\chi^2(1)$) | 0.10 | 0.53 | 0.46 | 0.02 | 0.13 | 0.13 | 2.39 | 0.11 | 0.57 |
| Age 11–16 ($\chi^2(1)$) | 1.53 | 1.38 | 6.24** | 0.01 | 4.51** | 0.90 | 2.06 | 0.45 | 0.00 |
| Age 17–60 ($\chi^2(1)$) | 1.95 | 1.90 | 0.02 | 8.26*** | 2.06 | 0.19 | 16.59*** | 3.17* | 0.17 |
| All children ($\chi^2(3)$) | 2.33 | 11.43*** | 7.14* | 2.06 | 7.38* | 1.06 | 5.24 | 0.60 | 2.77 |
| *Bihar* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 4.14* | 3.78* | 2.14 | 2.27 | 0.93 | 0.41 | 0.35 | 9.35*** | 0.01 |
| Age 6–10 ($\chi^2(1)$) | 0.00 | 0.23 | 2.23 | 0.44 | 0.49 | 0.03 | 0.40 | 2.29 | 0.60 |
| Age 11–16 ($\chi^2(1)$) | 0.41 | 6.43** | 1.68 | 0.00 | 0.01 | 0.07 | 0.36 | 0.36 | 0.27 |
| Age 17–60 ($\chi^2(1)$) | 1.38 | 3.43* | 0.75 | 136.48*** | 1.66 | 1.47 | 35.33*** | 2.93* | 4.92*** |
| All children ($\chi^2(3)$) | 4.51 | 10.55** | 6.19 | 2.73 | 1.46 | 0.52 | 1.10 | 11.83*** | 0.88 |
| *Maharashtra* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.46 | 2.71* | 0.13 | 0.33 | 1.28 | 0.89 | 0.57 | 0.19 | 0.00 |
| Age 6–10 ($\chi^2(1)$) | 0.41 | 0.84 | 0.9 | 0.16 | 0.26 | 0.00 | 0.06 | 0.51 | 0.79 |
| Age 11–16 ($\chi^2(1)$) | 0.73 | 3.94** | 0.44 | 0.07 | 0.00 | 3.11* | 1.81 | 0.02 | 1.63 |
| Age 17–60 ($\chi^2(1)$) | 1.13 | 8.47*** | 1.65 | 4.46 | 1.71 | 11.95*** | 0.14 | 2.03 | 2.05 |
| All children ($\chi^2(3)$) | 1.66 | 7.23* | 1.37 | 0.57 | 1.57 | 4.10 | 2.55 | 0.70 | 2.24 |

Significance: *10%; **5%; ***1%.

**Table 6.** *Continued*

| | Fuel and light | | | Clothing | | | Education | | |
|---|---|---|---|---|---|---|---|---|---|
| | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate |
| *Kerala* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.51 | 0.03 | 0.49 | 4.44** | 0.89 | 0.66 | 0.02 | 0.03 | 0.09 |
| Age 6–10 ($\chi^2(1)$) | 3.59* | 0.04 | 0.06 | 2.86* | 0.03 | 0.09 | 0.01 | 1.77 | 0.08 |
| Age 11–16 ($\chi^2(1)$) | 1.31 | 0.04 | 0.07 | 1.66 | 0.62 | 0.08 | 0.00 | 0.09 | 0.72 |
| Age 17–60 ($\chi^2(1)$) | 8.62*** | 2.26 | 7.22*** | 0.55 | 0.10 | 0.74 | 0.09 | 0.01 | 0.60 |
| All children ($\chi^2(3)$) | 5.33 | 0.11 | 0.61 | 8.95** | 1.52 | 0.83 | 0.04 | 1.91 | 0.90 |
| *Bihar* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 2.25 | 0.68 | 0.11 | 0.02 | 1.41 | 2.79* | 0.01 | 2.06 | 0.2 |
| Age 6–10 ($\chi^2(1)$) | 0.26 | 0.13 | 0.10 | 1.21 | 6.52** | 0.15 | 8.07*** | 7.47*** | 0.02 |
| Age 11–16 ($\chi^2(1)$) | 0.63 | 3.41* | 3.26* | 0.07 | 0 | 2.56 | 46.48*** | 13.3*** | 0.08 |
| Age 17–60 ($\chi^2(1)$) | 22.81*** | 0.49 | 0.28 | 3.58* | 0.39 | 0.03 | 9.24*** | 0.44 | 5.85** |
| All children ($\chi^2(3)$) | 3.15 | 4.25** | 3.49* | 1.29 | 7.78* | 5.56 | 55.12*** | 22.88*** | 0.29 |
| *Maharashtra* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.42 | 0.39 | 0.67 | 1.51 | 0.01 | 0.00 | 0.07 | 1.22 | 0.14 |
| Age 6–10 ($\chi^2(1)$) | 2.10 | 0.58 | 0.07 | 0.62 | 1.54 | 0.29 | 0.19 | 0.38 | 0.26 |
| Age 11–16 ($\chi^2(1)$) | 3.76* | 0.04 | 0.00 | 0.07 | 1.16 | 0.83 | 0.53 | 2.72* | 0.64 |
| Age 17–60 ($\chi^2(1)$) | 1.63 | 18.25*** | 4.87** | 2.77* | 4.04** | 1.89 | 0.15 | 0.95 | 0.68 |
| All children ($\chi^2(3)$) | 6.46* | 1.05 | 0.75 | 2.27 | 2.59 | 1.04 | 0.78 | 4.41 | 0.99 |

Significance: *10%; **5%; ***1%.

**Table 6.** *Continued*

| | Medicine | | | Transport | | | Other expenditure | | |
|---|---|---|---|---|---|---|---|---|---|
| | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate |
| *Kerala* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.64 | 4.36 | 0.40 | 0.32 | 0.36 | 1.24 | 0.02 | 0.09 | 2.56 |
| Age 6–10 ($\chi^2(1)$) | 0.31 | 2.29 | 0.41 | 0.42 | 1.19 | 0.06 | 0.85 | 1.59 | 6.17** |
| Age 11–16 ($\chi^2(1)$) | 0.16 | 0.15 | 2.58 | 0.26 | 0.20 | 0.28 | 0.17 | 0.65 | 0.40 |
| Age 17–60 ($\chi^2(1)$) | 1.66 | 5.70** | 0.07 | 0.00 | 3.34* | 1.07 | 0.09 | 1.04 | 1.60 |
| All children ($\chi^2(3)$) | 1.14 | 6.69* | 3.41 | 1.01 | 1.74 | 1.58 | 1.02 | 2.41 | 8.88** |
| *Bihar* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.02 | 0.75 | 0.06 | 0.43 | 0.01 | 0.01 | 3.04* | 1.83 | 2.87* |
| Age 6–10 ($\chi^2(1)$) | 0.15 | 0.56 | 0.88 | 0.98 | 0.31 | 1.43 | 0.22 | 0.21 | 0.46 |
| Age 11–16 ($\chi^2(1)$) | 0.02 | 0.06 | 9.25*** | 0.67 | 0.12 | 0.02 | 0.03 | 4.28** | 0.65 |
| Age 17–60 ($\chi^2(1)$) | 0.21 | 7.14*** | 6.81*** | 0.00 | 0.01 | 0.16 | 7.46*** | 0.69 | 6.00** |
| All children ($\chi^2(3)$) | 0.19 | 1.34 | 10.26** | 2.07 | 0.43 | 1.45 | 3.28 | 6.36* | 4.01 |
| *Maharashtra* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.16 | 0.89 | 1.10 | 0.07 | 2.20 | 0.24 | 0.07 | 5.25** | 0.44 |
| Age 6–10 ($\chi^2(1)$) | 0.77 | 1.38 | 0.94 | 0.07 | 1.62 | 0.09 | 0.69 | 0.02 | 0.02 |
| Age 11–16 ($\chi^2(1)$) | 0.76 | 0.03 | 0.01 | 1.41 | 1.87 | 0.02 | 1.87 | 0.02 | 5.24** |
| Age 17–60 ($\chi^2(1)$) | 1.74 | 4.67** | 0.21 | 0.46 | 3.96** | 0.23 | 1.25 | 2.00 | 0.11 |
| All children ($\chi^2(3)$) | 1.73 | 2.23 | 2.04 | 1.51 | 5.43 | 0.34 | 2.66 | 5.30 | 5.70 |

Significance: *10%; **5%; ***1%.

**Table 7.** Variation of gender bias with literacy level of household—NSS: urban areas

| | Food | | | Tobacco | | | Alcohol | | |
|---|---|---|---|---|---|---|---|---|---|
| | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate |
| *Kerala* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 1.09 | 0.26 | 1.19 | 0.00 | 0.06 | 1.18 | 0.30 | 0.01 | 0.17 |
| Age 6–10 ($\chi^2(1)$) | 1.47 | 0.00 | 0.97 | 0.44 | 0.20 | 0.73 | 0.14 | 0.00 | 0.03 |
| Age 11–16 ($\chi^2(1)$) | 0.11 | 1.13 | 0.00 | 0.06 | 0.15 | 0.57 | 0.05 | 0.60 | 0.39 |
| Age 17–60 ($\chi^2(1)$) | 7.59*** | 2.24 | 26.21*** | 0.23 | 6.96*** | 26.13*** | 2.36 | 0.07 | 9.40*** |
| All children ($\chi^2(3)$) | 2.53 | 1.38 | 2.06 | 0.53 | 0.42 | 2.38 | 0.49 | 0.61 | 0.61 |
| *Bihar* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.31 | 0.00 | 0.83 | 0.13 | 0.03 | 1.59 | 0.14 | 0.54 | 3.51* |
| Age 6–10 ($\chi^2(1)$) | 0.44 | 0.79 | 1.86 | 1.39 | 0.13 | 1.29 | 1.36 | 0.56 | 2.01 |
| Age 11–16 ($\chi^2(1)$) | 0.94 | 0.01 | 1.44 | 0.54 | 0.59 | 0.01 | 0.27 | 0.62 | 1.60 |
| Age 17–60 ($\chi^2(1)$) | 1.99 | 12.71*** | 12.39*** | 41.96*** | 6.30** | 4.02** | 1.27 | 1.25 | 0.20 |
| All children ($\chi^2(3)$) | 1.68 | 0.80 | 4.00 | 2.08 | 0.76 | 2.74 | 1.72 | 1.70 | 6.80* |
| *Maharashtra* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.45 | 0.02 | 0.17 | 2.86* | 0.40 | 0.00 | 0.89 | 4.65** | 1.13 |
| Age 6–10 ($\chi^2(1)$) | 0.02 | 0.70 | 2.13 | 0.26 | 3.35* | 0.53 | 1.43 | 0.05 | 0.05 |
| Age 11–16 ($\chi^2(1)$) | 0.76 | 0.71 | 0.37 | 0.01 | 0.01 | 0.56 | 0.18 | 1.34 | 0.06 |
| Age 17–60 ($\chi^2(1)$) | 59.58*** | 102.12*** | 42.77*** | 46.12*** | 11.76*** | 12.40*** | 0.56 | 3.41* | 7.01*** |
| All children ($\chi^2(3)$) | 1.21 | 1.39 | 2.73 | 3.12 | 3.80 | 1.14 | 2.53 | 5.92 | 1.24 |

Significance: *10%; **5%; ***1%.

**Table 7.** *Continued*

| | Fuel and light | | | Clothing | | | Education | | |
|---|---|---|---|---|---|---|---|---|---|
| | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate |
| *Kerala* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 1.82 | 0.02 | 0.60 | 2.68 | 0.04 | 0.81 | 0.20 | 1.36 | 0.07 |
| Age 6–10 ($\chi^2(1)$) | 0.75 | 1.33 | 0.00 | 0.92 | 0.05 | 1.02 | 0.03 | 1.31 | 1.98 |
| Age 11–16 ($\chi^2(1)$) | 6.12** | 1.27 | 0.04 | 0.64 | 0.38 | 3.11 | 0.11 | 2.39 | 1.33 |
| Age 17–60 ($\chi^2(1)$) | 4.76** | 23.66*** | 54.07*** | 5.39** | 0.17 | 31.21*** | 3.16* | 17.72*** | 7.06*** |
| All children ($\chi^2(3)$) | 8.41** | 2.58 | 0.64 | 4.05 | 0.47 | 5.09 | 0.34 | 5.04 | 3.44 |
| *Bihar* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.09 | 0.25 | 1.40 | 1.26 | 0.29 | 0.69 | 0.67 | 0.83 | 0.03 |
| Age 6–10 ($\chi^2(1)$) | 0.96 | 0.11 | 0.03 | 0.11 | 0.98 | 3.16* | 2.21 | 3.41* | 0.06 |
| Age 11–16 ($\chi^2(1)$) | 0.08 | 0.42 | 0.20 | 0.04 | 0.23 | 3.36* | 0.54 | 1.52 | 0.02 |
| Age 17–60 ($\chi^2(1)$) | 4.19 | 19.16*** | 24.67*** | 12.85*** | 3.57* | 0.43 | 12.26*** | 0.00 | 3.50* |
| All children ($\chi^2(3)$) | 1.10 | 0.78 | 1.59 | 1.35 | 1.50 | 7.51* | 3.64 | 5.74 | 0.12 |
| *Maharashtra* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.09 | 0.37 | 0.30 | 6.92*** | 0.38 | 2.36 | 2.67 | 0.45 | 1.92 |
| Age 6–10 ($\chi^2(1)$) | 1.18 | 0.14 | 0.87 | 1.19 | 0.49 | 2.03 | 0.21 | 1.09 | 0.85 |
| Age 11–16 ($\chi^2(1)$) | 0.00 | 0.01 | 0.54 | 0.02 | 0.43 | 0.00 | 0.03 | 2.20 | 0.05 |
| Age 17–60 ($\chi^2(1)$) | 53.72*** | 76.93*** | 102.11*** | 9.56*** | 2.37 | 2.59 | 19.22*** | 14.49*** | 28.24*** |
| All children ($\chi^2(3)$) | 1.27 | 0.53 | 1.66 | 8.10** | 1.24 | 4.45 | 2.91 | 3.70 | 2.83 |

Significance: *10%; **5%; ***1%.

**Table 7.** *Continued*

| | Medicine | | | Transport | | | Other expenditure | | |
|---|---|---|---|---|---|---|---|---|---|
| | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate | Illiterate | Moderately literate | Highly literate |
| *Kerala* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.00 | 1.90 | 0.90 | 0.39 | 0.02 | 0.03 | 0.85 | 0.32 | 2.78* |
| Age 6–10 ($\chi^2(1)$) | 0.01 | 0.03 | 0.01 | 0.08 | 2.49 | 0.22 | 1.65 | 2.09 | 2.13 |
| Age 11–16 ($\chi^2(1)$) | 1.60 | 0.49 | 3.11 | 0.18 | 0.60 | 2.03 | 0.77 | 0.39 | 4.41** |
| Age 17–60 ($\chi^2(1)$) | 2.34 | 1.02 | 0.06 | 2.36 | 9.83*** | 0.50 | 0.42 | 2.83* | 5.87** |
| All children ($\chi^2(3)$) | 1.60 | 2.41 | 4.05** | 0.63 | 3.16 | 2.27 | 3.04 | 2.78 | 9.06** |
| *Bihar* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 1.60 | 0.50 | 2.73* | 0.21 | 0.12 | 1.01 | 4.99** | 1.01 | 0.29 |
| Age 6–10 ($\chi^2(1)$) | 0.01 | 0.16 | 2.01 | 0.00 | 0.01 | 1.92 | 0.09 | 0.23 | 1.79 |
| Age 11–16 ($\chi^2(1)$) | 0.00 | 0.12 | 1.06 | 0.66 | 0.12 | 2.76* | 2.55 | 0.70 | 0.31 |
| Age 17–60 ($\chi^2(1)$) | 0.16 | 4.25** | 0.19 | 12.06*** | 0.73 | 15.79*** | 0.01 | 2.52 | 7.15*** |
| All children ($\chi^2(3)$) | 1.60 | 0.78 | 6.18 | 0.85 | 0.24 | 5.55 | 7.45 | 1.96 | 2.32 |
| *Maharashtra* | | | | | | | | | |
| Age 0–5 ($\chi^2(1)$) | 0.06 | 0.20 | 0.11 | 0.99 | 0.02 | 0.04 | 2.19 | 0.00 | 0.21 |
| Age 6–10 ($\chi^2(1)$) | 0.01 | 0.24 | 3.48* | 0.16 | 1.73 | 1.92 | 0.07 | 1.83 | 0.10 |
| Age 11–16 ($\chi^2(1)$) | 0.67 | 0.42 | 0.04 | 2.36 | 0.00 | 1.97 | 1.72 | 0.07 | 0.27 |
| Age 17–60 ($\chi^2(1)$) | 0.61 | 15.21*** | 9.55*** | 8.17*** | 5.49** | 14.49*** | 6.86*** | 13.19*** | 10.98*** |
| All children ($\chi^2(3)$) | 0.75 | 0.82 | 3.61 | 3.45 | 1.76 | 4.10 | 4.01 | 1.88 | 0.58 |

Significance: *10%; **5%; ***1%.

to disaggregation between the different household types. For example, does the evidence suggesting strong gender bias against girl children in the allocation of educational spending in rural Bihar, but not elsewhere, simply reflect the socio-economic backwardness of this region? More generally, is the regional pattern of the results of the item-wise tests of gender bias robust to the introduction of adult educational variables that control for the level of parental literacy in the household?

To examine this issue, Equations (2a–c) were re-estimated, but this time stratifying the sample on the basis of the literacy level of the most educated male member of the household. Three different literacy levels were considered: (i) "illiterate household", where the most educated adult male cannot read or write; (ii) "moderately literate" household, where the most educated adult male has completed primary school; and (iii) "highly literate" household, where the most educated adult male has completed middle school. The results for the $\chi^2$ tests for gender difference are presented in Tables 6 and 7 for the rural and urban samples, respectively.[9] In general, the $\chi^2$ values tend to fall, quite sharply in some cases, as we move from illiterate or moderately literate households to the highly literate ones. In other words, gender disparity in the allocation of spending between boys and girls is more likely to prevail at the lower rather than the higher levels of adult literacy. Of particular interest is the result that gender bias against girls in educational spending in the backward regions of Bihar weakens or disappears with the increasing literacy of the decision-makers in the household.

The interaction between gender bias and adult literacy suggests a vicious inter-generational cycle that keeps the girl child in a state of permanent educational backwardness. Low adult educational attainment contributes to gender bias against girls in the sphere of education, who, when they become adults and decision-makers, contribute to further gender bias because of their lack of literacy and awareness.

## 6. Conclusion

This analysis of gender bias in household expenditure patterns in India was undertaken against a background of previous failures to detect much evidence of gender disparity in household spending on aggregate data. The authors assumed a collective household framework and, following Basu (2006), the welfare weights assigned to the intra-household decision-makers were endogenously and simultaneously determined with the household's spending outcomes. Evidence was found of gender bias in the adults' consumption of several items. More significantly, the test results on gender bias point to education, especially of children, as an item that has witnessed significant gender disparity in household spending in several parts of India. The results are consistent with those of Kingdon (2005). The results also reveal sharp regional differences in the nature and existence of gender bias, and between the various age groups.

Evidence of the significant gender bias in education expenditure, especially in the backward areas of rural India, raises some important policy issues. Education and investment in human capital are universally recognized as essential components of economic development in any country. Education endows individuals with the means to enhance their skills, knowledge, health and productivity and also enhances the economy's ability to develop and adopt new technology for the purpose of economic and social development. Given these benefits from education, increasing levels of education is an important objective for policy-makers everywhere. The results presented in this paper confirm the existence of gender bias in educational spending in favour of boys in the socially and economically backward areas of India.

The fact that in rural Kerala the difference estimate is actually negative (i.e. parents prefer to spend more on educating daughters than sons in the age group 10–16 years) is interesting. This is, possibly, due to the fact that in Kerala, unlike in the rest of India, the society is matrilineal and inheritance flows from mother to daughter (as opposed to father to son in the rest of India). This could, to some extent, explain why parents are willing to invest in educating girls.[10] If one also considers the increased male occupational mobility (and out-migration) that has actually shifted the balance of responsibility (and in consequence the balance of power within the household) towards women, then the absence of gender bias against girls in Kerala is merely a reflection of this shift in the balance of power (see Kodoth, 2004). Our results imply that this structure of the society has very different implications for parental investment in human capital for their children. The results obtained in this paper imply that societal norms and cultures have a very important role to play in defining parental preferences.

Additionally, evidence was found of significant inter-generational transmission of educational gender bias. Although the regional patterns of the tests of gender bias are robust to the educational attainment of the household (measured by the educational attainment of the most educated male member of the household), the results are indicative of significant intra-regional variation between households with different levels of educational attainment. The observation that in the backward areas of Eastern India the gender bias in favour of boys in educational spending exists in the illiterate households but weakens or disappears in the more literate ones suggests a vicious cycle that keeps the girl child in the former households in a state of perpetual educational backwardness and illiteracy. However, it also suggests a way forward, namely, by mounting a campaign of literacy and social awareness aimed at the adult decision-makers in the household. As shown by the results for Kerala, which is the most literate state in India, such a campaign works quite well in protecting and promoting the welfare of the girl child.

The results of this paper on Indian data warn against making any generalized statement about the existence and nature of gender bias in the country as a whole. There are sharp regional variations reflecting differences in social and economic factors that need to be recognized in policy formulation.



## Notes

1. Udry (1997) and Duflo (2005) present useful summaries of the literature.
2. For example, Subramanian & Deaton (1991), using data from Maharashtra in India, found that basic foodstuffs were either gender neutral or pro-female. One could argue that Maharashtra is not the ideal state in India to examine this issue, and northern states such as Rajasthan, Haryana and Punjab, given their highly skewed sex ratios, are possibly better laboratories. However, Subramanian (1995) failed to find any evidence of gender bias in these three states. Similarly, Ahmad &d Morduch (1993) and Bhalotra & Attfield (1998) failed to find evidence of differential treatment of boys and girls in Bangladesh and Pakistan, respectively, even though the relevant surveys found significantly biased sex ratios in favour of boys. Alternative measures consistently support the hypothesis that boys get preferential treatment over girls. Khanna *et al.* (2003), using data from India, found that in poor neighbourhoods in New Delhi, girls are more than twice as likely to die of diahorrea compared with boys. Rose (1999) found that in times of drought when families cannot feed everyone, they disproportionately sacrifice the welfare of girls. Chaudhuri & Roy (2006), using data from Uttar Pradesh and Bihar, found that at the individual level, parents exhibit gender bias while educating their

children. Kingdon (2005) found that, while individual-level data exhibit gender bias, aggregate (household-level) data fail to pick up any evidence of gender bias in educational expenditure. With respect to data from other countries, Gibson & Rozelle (2004), using data from Papua New Guinea, and Gong *et al.* (2005), using data from rural China, did find significant gender composition effects in expenditure patterns.

[3] Alternatively, assume that the welfare weights are determined by the income shares of the two members of the household.

[4] See Lancaster *et al.* (2003) for details on the derivation of Equation (1).

[5] This data set is available from the World Bank at http://www.worldbank.org/lsms/country/india/upbhhome.html.

[6] http://planningcommission.nic.in/.

[7] Note also that the issue of identification and the instruments chosen were discussed in detail in Lancaster *et al.* (2006). They are not discussed here.

[8] Inspection of the coefficient estimates for urban Kerala shows that the gender bias in these items (clothing, education) is in favour of female adults (aged 17–60 years) in this most literate part of India.

[9] In this case, attention is restricted to the NSS data. The actual coefficient estimates are available on request.

[10] The result that parents discriminate less against girls in matrilineal societies is neither new nor surprising, and is consistent across different parts of the world. For example, Gibson & Rozelle (2004), using data from Papua New Guinea, found that bias against girls is lower in regions of the country that practise matrilineal descent.



## References


Ahmad, A. & Morduch, J. (1993) Identifying sex bias in the allocation of household resources: evidence from linked household surveys from Bangladesh, Mimeo, Harvard University.

Basu, K. (2006) Gender and say: a model of household behaviour with endogenously determined balance of power, *Economic Journal*, 116, pp. 558–580.

Bhalotra, S. & Attfield, C. (1998) Intra-household resource allocation in rural Pakistan: a semiparametric analysis, *Journal of Applied Econometrics*, 13, pp. 463–480.

Blumberg, R. & Coleman, M. (1989) A theoretical look at the gender balance of power in the American couple, *Journal of Family Issues*, 10, pp. 225–250.

Bourguignon, F., Browning, M., Chiappori, P. A. & Lechene, V. (1993) Intra-household allocation of consumption: some evidence on French data, *Annales d'Economie et de Statistique*, 29, pp. 137–156.

Browning, M. & Chiappori, P. A. (1998) Efficient intra-household allocations: a general characterisation and empirical tests, *Econometrica*, 66, pp. 1241–1278.

Chaudhuri, K. & Roy, S. (2006) Do parents spread educational expenditure evenly across the two genders? Evidence from two North Indian states, *Economic and Political Weekly*, 41, pp. 5276–5282.

Datt, G. & Ravallion, M. (2002) Is India's economic growth leaving the poor behind?, *Journal of Economic Perspectives*, 16, pp. 89–108.

Deaton, A. (1989) Looking for boy–girl discrimination in household expenditure data, *World Bank Economic Review*, 3, pp. 1–15.

Deaton, A. (1997) *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy* (Washington, DC: The World Bank).

Desai, S. & Jain, D. (1994) Maternal employment and family dynamics: the social context of women's work in rural South India, *Population and Development Review*, 20, pp. 115–136.

Drèze, J. & Sen, A. (1989) *Hunger and Public Action* (Oxford: Oxford University Press).

Duflo, E. (2005) *Gender Equality in Development* (Mimeo: MIT).

Gibson, J. & Rozelle, S. (2004) Is it better to be a boy? A disaggregated outlay equivalent analysis of gender bias in Papua New Guinea, *Journal of Development Studies*, 40, pp. 115–136.

Gong, X., Soest, A. V. & Zhang, P. (2005) Sexual bias and household consumption, a semiparametric analysis of Engel curves in rural China, *Journal of Applied Econometrics*, 20, pp. 509–527.

Haddad, L. & Reardon, T. (1993) Gender bias in the allocation of resource within households in Burkina Faso: a disaggregated outlay equivalent analysis, *Journal of Development Studies*, 29, pp. 260–276.

Khanna, R., Kumar, A., Vaghela, J. F. & Puliyel, J. M. (2003) Community based retrospective study of sex in infant mortality in India, *British Journal of Medicine*, 327, pp. 126–129.

Kingdon, G. G. (2005) Where has all the bias gone? Detecting gender bias in the intra-household allocation of educational expenditure, *Economic Development and Cultural Change*, 53, pp. 409–452.

Kodoth, P. (2004) Gender, property rights and responsibility for farming in Kerala, *Economic and Political Weekly*, 29, pp. 1911–1920.

Lancaster, G., Maitra, P. & Ray, R. (2003) *Endogenous Power, Household Expenditure Patterns and Gender Bias: Evidence from India*, Department of Economics, Monash University, Working Paper No. 20–03.

Lancaster, G., Maitra, P. & Ray, R. (2006) Endogenous intra-household balance of power and its impact on expenditure patterns: evidence from India, *Economica*, 73, pp. 435–460.

Myles, G. (1995) *Public Economics* (Cambridge: Cambridge University Press).

Pitt, M., Rosenzweig, M. R. & Hassan, M. N. (1990) Productivity, health and inequality in the intra-household distribution of food in low-income countries, *American Economic Review*, 80, pp. 1139–1156.

Riley, N. (1997) Gender, power and population change, *Population Bulletin*, 52, pp. 1–46.

Rose, E. (1999) Consumption smoothing and excess female mortality in rural India, *The Review of Economics and Statistics*, 81, pp. 41–49.

Subramanian, S. (1995) Gender Discrimination in Intra-Household Allocation in India, Mimeo, Department of Economics, Cornell University.

Subramanian, S. & Deaton, A. (1991) Gender effects in Indian consumption patterns, *Sarvekshana*, 14, pp. 1–12.

Udry, C. (1997) Recent advances in empirical microeconomic research in poor countries: an annotated bibliography, *Journal of Economic Education*, 28, pp. 58–75.