GENDER EFFECTS IN INDIAN CONSUMPTION PATTERNS

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1. *Introduction and Summary*

There is a great deal of evidence that males and females in India do not receive equal allocations of goods and services. In particular, there is an extensive literature on the excess mortality of female infants that exists in some parts of India, and that is documented, for example, in Government of India (1988). The proximate determinants of excess mortality are not fully understood, although access to hospital and medical care, as well as differential feeding patterns are obvious possibilities. If systematic patterns of discrimination exist, one would expect them to leave some traces in the household consumption patterns. And while we typically do not directly observe individual consumption levels within the household, systematic gender-based allocations should be detectable in the relationship between the gender composition of the household and its aggregate consumption pattern. One of the purposes of this paper is to look for such a relationship. If it can be found, we shall understand a good deal more about the process of discrimination. If not, it seems worth re-examining the evidenec on mortality to seek explanations that do not depend upon discrimination against women in access to goods and services.

Quite apart from trying to explain and interpret the evidence on mortality, there is a direct interest in gender discrimination for purposes of policy design. If some households allocate goods unequally, in particular if boys are favoured over girls, the state acquires a legitimate interest in affecting intrahousehold allocations. Standard welfare policies, for example food-pricing policies or food-for-work programmes, are unlikely to improve intrahousehold allocation. However, there are a number of alternatives, such as supplementary school-feeding programmes, or infant care and education programmes, that are capable of altering intrahousehold allocations, even in the presence of some offsetting behaviour by adults. Strong evidence of gender discrimination in household consumption would make such programmes seem relatively attractive.

In this paper, we follow two separate approaches. In Section 2, we examine a range of household consumption patterns using the household expenditure data from the 38th round (1983) of the National Sample Survey (NSS) from the Maharashtra state sample. Our approach is to estimate a fairly flexible model of Engel curves including detailed demographic variables, and to test for the effects of gender on the pattern of demand. As we shall see, there are substantial gender related effects in the consumption of at least some goods, although there are many cases where gender effects might have been expected but are not found. However, this sort of evidence cannot provide a convincing test for discrimination. If two households have the same total sum of money to spend, it is only the composition of demand that can vary with the gender composition of the household. If the household with more women spends less on one good, then it must spend more on something else so that we have no basis for demonstrating either discrimination or its absence.

The second part of the paper, in Section 3, tries to construct such a test, at least for children, following the general procedures discussed in Deaton (1989). If we can identify a good or a set of goods that are consumed only by adults, and not by children, the negative effect of additional children on the expenditures of these goods can be used to measure the amount that parents

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have to give up to accommodate the additional needs of their children. If these negative effects are larger for boys than for girls, we have *prima facie* evidence that parents "make more room" in their household expenditure for boys rather than girls. In the NSS data, there are few natural candidates for adult goods, but we nevertheless manage to establish some results that are, at the least, highly suggestive. In particular, more than two percent of household budgets in Maharashtra in 1983 were devoted to purchases of tobacco and *pan* with only 15% of households recording no purchases. Consumption of tobacco and *pan* is strongly associated with the presence of men, and negatively associated with the presence of children of both sexes and all ages. However, the reduction in consumption associated with an additional baby boy is many times larger than that associated with an additional baby girl. We have not been able to establish similar effects for other potential adult goods. While this negative finding should counsel caution in the interpretation of the results based on tobacco and *pan,* there are a number of good technical reasons for not expecting such clear results from the other goods, even if discrimination is present.

We note finally that the evidence presented here makes no claim to provide a comprehensive catalogue of gender patterns in household expenditure patterns. In particular, gender bias that affects the *total* of household expenditures, or household income, will not be detected in these tests. Two examples illustrate the point. Some parents may discriminate against girls by denying them access to higher education, and insisting that they contribute to the household budget by working. For such households the presence of girls in the appropriate age group will be associated with higher incomes, and higher levels of total expenditure. In the results given below, we hold total expenditure constant while looking for gender effects, so that this particular form of discrimination would not be apparent. Another example is when parents, on the birth of a daughter, embark on a saving programmes designed to endow the child with a suitable dowry upon reaching the age of marriage. Here it would be appropriate to look for effects of girls on savings behaviour, *i.e.* on total household expenditure conditional on income. The NSS does not gather data on household incomes, and the procedures of this paper, which condition on total expenditure, would not detect any gender effects on saving.

2. *Consumption patterns and gender*

2.1 *Methodology and data*

We begin by examining the role of gender in explaining household consumption patterns for a number of food and non-food goods. The methodology is straightforward; we estimate by Ordinary Least Squares a set of Engel curves containing a range of household demographic variables. The specification chosen is as follows :

$$\omega_i=\alpha_i+\beta_i \ln x+\eta_i \ln n+\sum_{j=}^{J-1}\theta_{ij}(n_j/n)+\gamma_i'z+u_i \quad (1)$$

where the dependent variable, ω_i is the share of the budget devoted to commodity i, x is total expenditure, or the budget, n is household size, n_j is the number of people in the household in the *jth* of J age/gender classes, z is a vector of other socio-demographic characteristics of the household, and u_i is the difference between ω_i and its conditional expectation The Engel curve formulation here is that first suggested by Working (1943), in which the budget share is made a linear function of logarithm of the budget, and which has proved useful in a wide range of studies. The co-efficient β_i controls the total expenditure elasticity ε_i; since $\varepsilon_i=1+\beta_i/w_i$, goods are luxuries or necessities as β_i is greater than or less than zero. Note that the budget appears in (1) in per capita form, and deviations from this simple method of allowing for household size are accommodated by the next term, which allows households scale to have a separate effect on the pattern of demand. It is important that both total expenditure and household size be allowed to have their separate effects, even if, in the data, ln x and ln n and thus ln (x/n) and ln n are correlated in the microeconomic data that we shall be using, the correlation is only -0.34, so that the inclusion of both terms, which is theoretically necessary, is unlikely to lead to any serious problem of collinearity. In a complete system of equations, in which the budget shares added to unity, the coefficients η_i would add to zero; conditional on the total budget, the scale (and other) effects can only rearrange the allocation within it.

The demographic and gender effects on the budget are captured by the ratios n_j/n. In the empirical work, we use 10 age and sex categories, the numbers of males and females in each of five age categories. 0-4 years of age, 5-9 years of age, 10-14 years, 15-54 years, and 55 and over. From these, we form *nine* ratios to place in the regression; the omitted ratio, that of the number of women who are at least 55 years old, can be inferred from the other nine ratios by subtraction from unity, and its inclusion in the regression would cause perfect collinearity. The θ_{ij} coefficients yield the effects on the budget share of increasing the ratio n_j/n while holding the total number of people and the budget constant (implicitly) by replacing women over 54 by people of type *j*. If a good is particularly associated with the presence of one demographic category, for example adult males, we should expect the associated θ-coefficient to be significantly positive. Note that the effect of adding an additional person of type *j* depends not only on the θ's, but also on the β and η coefficients, since both household size and the *per capita* budget will also be altered.

The *z* variables are designed to capture a number of other relevant household characteristics. In the results presented below, there are seven such variables. Four are dummy variables for the occupational group of the household head : (i) those with the head self-employed in non-agricultural activities, (ii) agricultural labourers (iii) non-agricultural labourers, and (iv) self-employed in agriculture, so that "other" is the fifth omitted category. An alternative would have been to use the *household* occupation codes collected by the NSS; these record the occupation from which the household receives most of its income. However, we are here mostly concerned with rural households, for the vast majority of whom the household occupation is agriculture. By contrast, the head's ocupational code distinguishes self-employed agricultural workers from agricultural labourers, and it is possible that this distinction is relevant for the head's attitudes towards allocation by gender. There are two dummies for religion, (i) Hindu, (ii) Muslim, with "other" omitted, and one dummy indicating that the household head belongs to a scheduled caste or tribe.

We focus both on the parameter estimates, and on a series of *F*-tests for equality of coefficients by gender. There are a number of ways of doing these tests, and we shall typically calculate seven different statistics. Five are for the one degree of freedom tests that, for each of the five age categories, the regression coefficients are the same. These tests allow us to conclude that there is a gender effect for or against baby girls, say, but none as between old men and women. We also compute an F-test for the hypothesis that there are no gender effects among the children, *i.e.* those aged 14 or less. This is a three degree of freedom test of the hypothesis that the first three male coefficients are (pairwise) equal to the first three female coeffcients. Finally, we compute a five degree of freedom test for the hypothesis that there is no gender difference between the two sets of coeffcients. Note that, because these tests have different degrees of freedom, it is possible for one or more of the one degree of freedom tests to indicate a gender effect, when there is no overall significant effect. Of course, this is unlikely to happen if at one (or more) of the individual *F*-tests is sufficiently large.

The data are taken from the Maharashtra state sample of the 38th round of the NSS, collected during 1983. There are 5,500 urban households and 5,630 rural households; the latter are taken from 563 villages, themselves selected from 35 strata in the 27 rural districts of the state. We shall present only the rural results in detail, with occasional brief reference to the comparable urban results.

In all the regressions reported in this paper, dummy variables are included for each of the villages. Quite apart from possible differences in tastes from village to village, there are marked differences in agroclimatic conditions within the state of Maharashtra. Village dummies allow us to control for these and any other variables that are constant within villages but differ between them, prices being perhaps the most important. Different households were also interviewed at different dates in 1983, but all households in any one village are interviewed within a few days of one another. In consequence, village level dummies also control for seasonal variations of one sort or another. In all of the regressions, tests for village dummies show very high levels of significance; indeed, without village dummies, the R^2 statistics shown in the Tables would be only about one seventh as large.

Finally, we note that the regressions are run including all (rural) households, *whether or not they purchase the good.* This is simply a matter of interpretation; equation (1) is the conditional expectation of the budget shares, including purchase and non-purchasers alike. While it can legitimately be questioned whether a linear specification is appropriate in the presence of large numbers of zeros, given that budget shares can never be negative, the inclusion of zeros means that we a re testing for the *total* influence of demographics on expenditures, including both the effects on whether to purchase at all, as well as the effects on the amount of consumption once the prior decision has been taken. This comprehensive definition seems to us to be the appropriate one. Gender effects are interesting whether they operate at the extensive margin, the intensive margin, or both.

2.2 *Results*

Table 1 lists summary statistics for nineteen budget shares and for the explanatory variables in each of the regressions. The first twelve of the commodities listed, ten foods together with educational and medical expenses. are tested for gender effects in this section. The reminder will be discussed in Section 3 below. Some 27% of the budget is devoted to cereals, with "other cereals," mainly sorghum and millet, accounting for more than half of the total. A further 6% is spent on pulses, and 24% on the other foods in the table; the ten foods listed account for over half the total budget. For foods, only meat, fish, and eggs and processed foods are not bought by a substantial fraction of households; this is not true of educational and medical expenses. Fifty-four percent of households record some expenditures on the latter, but only 11% spent anything on education. We include these two groups in the analysis because they relate to areas where it is often supposed that there is discrimination against girls. Indeed, if illness in female children is taken less seriously than illness in boys, we should expect there to be a detectable gender effect in the regressions. Educational expenses are also worth examining, although given a mostly free educational system, we would be unlikely to detect discrimination against girls that took the form of discouraging them from remaining at school as long as boys.

The results of estimating equation (1) for twelve commodities are presented in Tables 2, 3 and 4. Table 2 shows the results for cereals and pulses. Of these, wheat has an expenditure elasticity of 1.16, while the other three goods are necessities, with the coarse cereals showing the lowest elasticity of 0.35. At the same level of total expenditure, larger households tend to spend a larger share of their budgets on all three of the necessities, rice, coarse cereals, and pulses. Scheduled castes and tribes consume less wheat and more coarse cereals; much the same is true for both agricultural and non-agricultural labourers. The demographic coefficients are frequently important, note for example that in rice and coarse cerals, the coefficients tend to rise with age for both sexes, and in several cases reveal gender differences, mostly between adults rather than children. The exception is wheat, and to a lesser extent pulses, where boys up to the age of four are associated with significantly more consumption that for girls of the same age. As for adults, the coefficients associated with women are significantly *larger* than those associated with men for rice, wheat, and pulses. Households of the same size and the same budget, but with more adult women than men, consume more of these basic foodstuffs.

The next group of foods, in Table 3, consists of milk, meat, eggs, and fish, fruit and vegetables, and sugar. Milk and meat are luxuries, while fruit, vegetables, and sugar, necessities. As is to be expected, the consumption of meat is much higher among Muslim households (by nearly 4% of the budget) and those from scheduled castes and tribes (by 1.5%). At the same total budget, larger households substitute towards sugar, fruit, and vegetables, and away from milk. For these goods, there are no significant gender differences for children. Although several of the child coefficients are important, note in particular the positive effects of small children on consumption of milk, effects which are positive for both boys and girls, and do not differ significantly between them. There is no suggestion here that milk is provided more generously for boys than for girls. Among the adults, there are a number of strong gender differences, and, once again, they are in the direction of there being significantly less consumption associated with males. The effect is particularly strong for fruit and vegetables, but also important for sugar.

The last two food groups, beverages and processed food, are shown in the first two columns of Table 4. Here there are marked occupational effects, with the omitted category of "other" workers consuming a good deal less than any of the other groups. There are also strong gender effects, now in favour of males, for all groups older than ten years in the case of beverages, and for all adult males in the case of processed foods. In the case of processed foods, only adult women generate negative effects, and there is very strong negative effect of increasing household size. Processed food includes prepared foods, and foods bought away from home, and it is plausible that much of this expenditure is associated with small, largely male households, or with the absence of an adult female cook.

The last two columns of Table 4 show the results for educational expenses and for medical care. Not surprisingly, eduational expenses are quite income elastic, and presumably such expenditures are only incurred by relatively wealthy families. Even so, there is some evidene of a pro-boy gender bias for the 10-14 year old group, even though both boys and girls of this age generate additional expenditures. This finding is certainty consistent with the hypothesis that girls are differentially discouraged from higher education. Medical expenses, like educational expenses, are also a "luxury" good, with a total expenditure elasticity of 2.65, and the presence of under fives has a strong positive effect on expenditures. But there is no evidence whatever that boys are favoured over girls. Indeed, the point estimates are *all larger* for girls than boys, although the *F*-statistics are significant only for the bias in favour of *adult* women. There is nothing in these rural expenditure data to indicate that parents favour boys in the provision of medical care.

The results from the urban households are not reported in detail, but provide a broadly similar picture. The pro-female nature of expenditure on fruit and vegetables, on sugar, and on rice, wheat, and pulses, is repeated and extends also to the coarse cereals. Beverages and processed foods are again associated with the presence of males. For milk, there is now some suggestion of an effect that favours baby boys over baby girls, although, as before, there is a strong positive association with the presence of adult women. The gender differences in educational expenses do not reappear among the urban households, and there is some evidence for a pro-male effect in the 5-9 year age group in medical expenditures. However, as for rural households, the large gender effects are associated with the basic foods, and with adults, not with children.

To summarize the results of this section, we have found that gender plays a role in consumption patterns. Basic foodstuffs, rice, wheat, other cereals, pulses, milk, meat, fruit and vegetables, and sugar, are either gender neutral, or are consumed in larger quantities when there are more women in the household. For only two foodstuffs, (non-alcoholic) beverages and processed food, is there a gender effect indicating higher male consumption. For two key goods, milk and medical expenses, where we might expect to find pro-male effects consistent with the literature on excess mortality among young girls, we find either nothing, or pro-female bias, at least in the rural areas. Among urban households, there is some suggestion of pro-boy effects among medical and educational expenses. In the rural areas, there is some evidence that is consistent with an education bias operating against girls in the 10-14 year old age group. Apart from this, none of the evidence seems to provide cause for concern; it is perfectly reasonable for men and women or girls and boys to *want* different consumption bundles, and the evidence presented here seems quite consistent with such an interpretation. Of course, these results cannot provide direct evidence on discrimination, but none of the differences that might be predicted in the presence of discrimination are strongly apparent from the data.

3. *Testing for discrimination*

3.1 *Methodology*

The methods of section 2 are capable of revealing gender biases in consumption patterns, but not of revealing discrimination. Over the complete range of goods, the budget shares must add to unity, so that gender, or any other variable that affects consumption patterns, cannot affect the total, so that increases in one good must be *offset* by decreases somewhere else. For example, suppose that men got *twice* as much of everything as did women. Then households with the same budget, the same number of people, but different compositions would have identical consumption patterns at the household level, even though the intrahousehold allocations would be different. To take another example, suppose that one good, good M, is reserved for men, while all other goods, an aggregate A, say, are shared equally. Suppose that each man in the househod gets one unit of M, the rest of the budget is spent on A, to be shared equally between the sexes, and that each household has enough money to supply every man with his M, ration. The budget share of good M, ω_m is therefore n_m/x, or $(n_m/n) \div (x/n)$, whereas that of good A, is $1-n_m/x$ or $1-(1-n_f/n) \div (x/n)$, so that, conditional *per capita* household expenditure, (x/n), the share of the non-male good, A, is increasing in the ratio of females to household size. Although the effects of discrimination show up here as gender bias, the apparent pro-female bias for the A-good reflects only the adding-up properties of the budget, not the realities of allocation within the household.

A method that does detect discrimination, albeit only among children, is based on Rothbarth's (1943) procedure for measuring the cost of children, adapted as in Deaton (1989) to ask whether the "cost" of a boy is greater than that of a girl. The basic idea is to use expenditure on some "adult" good or goods, known not to be consumed by children, as an indicator of the extent to which parents give up their own consumption to provide the resources required by the child. Since children do not consume the adult good and have needs of their own but no income, economies have to be made elsewhere in the family budget. These are likely to be spread over a wide range of goods, some of which, such as foods consumed by adults, will not be detectable at the household level because the cut in adult consumption is offset by an increase in child consumption. But in adult goods, the pure effect can be isolated; indeed, and at least as a first approximation, it acts as would a cut in income. If we have several potential adult goods, the income analogy can provide a test. If the effect of a child on the good is divided by the effect of income on the good, the ratio should be common across all the adult goods.

In practice, it is useful to work, not with the regression coefficients themselves, but with the "outlay equivalent" or π-ratios, defined by

$$\pi_{ir} = \frac{\partial (p_i q_i) / \partial n_r}{\partial (p_i q_i) / \partial x} + \frac{x}{n} \qquad (2)$$

where i refers to a commodity and r to a demographic category. These ratios can usefully be calculated for all commodity-demographic pairings, and express, as a fraction of the *per capita* household budget, the increase in outlay that would produce an identical effect on good i as an additional person of type r. For adult goods, and for adult demographic categories, we should expect the ratios to be large and positive, while if i is an adult good, and r a child category, π_{ir} should be negative (an additional child as like a decrease in the budget), and should be the same for all i in the adult group. If r refers to a girl group, and s, say, a boy group, then discrimination against girls would show up in π_{is} being larger negative than π_{ir} for some or all adult goods i.

Once the regression model (1) has been estimated, the π ratios can be calculated from the formula

$$\pi_{ir} = \frac{\eta_i - \beta_i + \theta_{ir} - \sum_{1}^{9} \theta_{ij}\, n_j/n}{\beta_i + \omega_i} \qquad (3)$$

where the variables, *i.e.* the budget shares and the demographic ratios are evaluated at their means and the parameters are replaced by their estimates.

The Indian NSS is not particularly well endowed with potential adult goods. Commodities such as adult clothing, and adult shoes, which are frequently useful in this context, are not measured in the NSS. Instead, data are collected on "male" and "female" clothing, without separating adult and child uses Nevertheless, data are available on purchases of tobacco and pan, and on alcohol, both likely to be "safe" adult goods. Table 1 shows the budget shares and fractions of households not recording purchases. The usefulness of alcohol is likely to be severely limited by the few households that purchase it, only 12%, and the small share of the budget, around half of one percent. Tobacco and pan is likely to be much more useful; consumption is reported by 84% of households and the average budget share over all households is 2.27%.

There are no other goods in the NSS that can be safely be claimed as adult goods a *priori*. However, there are other categories where child consumption might be quite limited. At the beginning of the research, we identified six commodities, in addition to tobacco and pan and alcohol that might conceivably play such a role. These are (i) meat, eggs, and fish, (ii) male clothing, (iii) female clothing, (iv) leather shoes and boots, (v) amusements, (vi) personal care and toiletries. The budget shares of these commodities and the fractions not purchasing are also shown in Table 1. Note that we are not committed to these six additional goods as adult goods. We shall calculate and report outlay equivalent ratios for all eight commodities, and then test whether all or some can legitimately be regarded as adult goods.

3.1 *Results*

The expenditure elasticities, outlay equivalent ratios, and asymptotic standard errors (calculated by application of the "delta"-method) for the eight goods are listed in Table 5. A detailed examination of these estimates does nothing to increase confidence that the six doubtful commodities are indeed adult goods. While it is the case that the majority of the π-coefficients for children are negative (the first three columns on the left and right-hand sides of the table), a few are not, including those for the meat, eggs, and fish category, and some for personal care. There seems no reason to suppose that children do not get access to these goods. In contrast to the π's for children, we should expect the π's for the adult demographic categories to be positive for adult goods, at least for some of the adult categories. Apart from the clothing categories, adult males do indeed show positive outlay equivalent ratios, particularly for men between 15 and 54, and for the tobacco, alcohol, and amusements categories. Adult females, by contrast, have a positive ratio only for the personal care and toiletries categories. The ratios for both men's and women's clothing are nearly all negative, both for adults and children. These estimates are hard to rationalize, although recall from Table 1, that only 10% and 14% of households record purchases of these goods.

Formal tests support these findings. If we test the ten hypotheses that the π-ratios are equal over goods for each demographic category, we should get acceptances for child categories if these are indeed adult goods, and rejections for the adult categories. Wald tests yield statistics that are asymptotically distributed as x^2 under the null, in each case with seven degrees of freedom. The results are, for males, 0-4 group, 17.4, 5-9 group, 24.2, 10-14 group, 21.5, 15-54 group, 205.2, and 55 and over, 89.0 and for females, 0-4 group, 31.9, 5-9 group, 7.8, 10-14 group 30.6, 15-54 group 70.7, and 55 and over, 14.6. Only one of these, for females in the 5-9 group, indicates acceptance at conventional significance levels, while all others, as it to be expected from Table 5, indicate rejection.

As perhaps might have been predicted, these results show that our attempts to identify adult goods beyond alcohol, pan and tobacco have not been successful. The parameter estimates are consistent with prior supposition that at least some of these goods are consumed by children, and, for the two clothing goods, we cannot even establish any effects of adults on consumption. One possible route forward is to examine various subgroups until we find one that satisfies the test statistics, for example by combining amusements with tobacco and pan, and alcohol. However, there are a very large number of possible combinations, and it is hard to allay the suspicion that sufficient search is bound to produce some "acceptable" grouping. Instead, it seems best to admit defeat in the attempt to extend the list, and to return to the two clear adult goods. Indeed, given the very small number of households purchasing alcohol and the known understatement of this category, we focus on the results for tobacco and pan.

For this commodity, the evidence from the π-ratios in the Table is reasonably clear. Tobacco and pan consumption is associated with the presence of adult and older males, and not at all with the presence of women. Additional children of all ages and sexes act to reduce household consumption, but the only large and significant effect is for boys from 0-4, an effect that is significantly larger than the corresponding effect for girls. Since the π-ratios in Table 5 are nonlinear functions of the underlying parameters and the data, the statistical tests based on them are asymptotic, so it is worth checking this conclusion by returning to the original regression, and computing the F-tests as in Tables 2 to 4. In the regression (1) for the percentage of the budget devoted to pan and tobacco, the coefficient on boys aged 0-4 is -0.94, with a standard error of 0.36, whereas the corresponding coefficient for girls aged 0-4 is -0.15 with a standard error of 0.43. The hypothesis that the two coefficients are the same generates an F-statistic of 4.3, a test statistic that is exact, not asymptotic. These results are not replicated for the other child groups where there are no significant gender effects. Indeed, for the three groups of children taken as a whole, the F-test for gender bias has a value of 1.56, with 3 and 5049 degrees of freedom, with an associated p-value of 0.196. Furthermore, among the urban households, and although there are negative π-ratios for tobacco and pan for all three child groups, there are no significant differences between boys and girls.

The evidence for discrimination against girls is therefore confined to the youngest age group and to rural households, and the statistical significance of the finding depends on knowing in advance that this is the relevant group at which to look. This case could well be argued, and excess mortality in India relates to girls under five. In opposition, it could be argued that the finding here depends on only one good, albeit the good that is likely to be the most satisfactory detector of discrimination, and that the statistical significance of the finding is not particularly impressive, given a sample of more than five thousand households. Indeed, for many purposes, large sample testing is better approached using Bayesian criteria that balance Type I and Type II errors, and if, for example, we were to use the Schwartz (1978) criterion, discrimination would not be established unless the F-test exceeded the logarithm of the sample size, a condition that is not met in this case.

It seems best, at this point, simply to recognize that the evidence, while suggestive of discrimination against young girls in rural areas, is by no means conclusive. It is unlikely to persuade someone whose priors are strongly against the existence of such discrimination. Nevertheless the issue of great importance, and the results here are sufficiently positive to make it seems worthwhile repeating this exercise for other states for which the NSS data are available. In particular, the 1981 Census data as reported in Government of India (1988), show that excess infant mortality among females is largely a phenomenon of North India, with only very limited occurrence in Maharashtra. It would be a useful exercise to repeat the pan and tobacco regression for each of the major states (or even districts), and to test whether there is a correlation between the excess mortality data and the indirect measures of discrimination obtained by the methods of the current paper.

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TABLE 1 : SUMMARY STATISTICS

RURAL MAHARASHTRA 1983

Budget shares, proportions buying and explanatory variables

Budget shares	mean %	$p(0)$
rice	8.24	0.12
wheat	3.68	0.28
other cereals	14.97	0.13
pulses	5.97	0.01
milk	5.33	0.15
meat, eggs and fish	3.45	0.39
fruit and vegetables	7.00	0.00
sugar	4.34	0.02
beverages	2.34	0.02
processed food	1.61	0.45
education	0.48	0.89
medical expenses	4.10	0.46
pan and tobacco	2.39	0.15
alcohol	0.52	0.88
male clothing	0.83	0.90
female clothing	1.82	0.86
leather footwear	0.11	0.98
amusements	0.43	0.78
personal care	2.06	0.02

Explanatory variable	means
ln (x/n)	4.61
ln$n$	1.50
ratio of males	
0—4	0.054
5—9	0.061
10—14	0.068
15—54	0.279
0—54	0.042
ratio of females	
0—4	0.050
5—9	0.055
10—14	0.054
15—54	0.289
0—54	0.048
occupations	
1	0.075
2	0.365
3	0.047
4	0.437
hindu	0.882
muslim	0.035
scheduled caste or tribe	0.293

Note:—$p(0)$ is the proportion of households reporting zero consumption or purchase of the good. n is the number of household members, and x is total monthly household expenditure in rupees per month excluding purchases and maintenance of durable goods which comprise 2.95% of the budget at the mean, with 90% of households recording no such purchases. Occupations are as follows : (1) Self-employed in non-agriculture (2) Agricultural labourer, (3) Non-agricultural labourer, (4) Self-employed in agriculture.

TABLE 2 : REGRESSIONS FOR CEREALS AND PULSES
(all coefficients x 100)

	RICE		WHEAT		COARSE CEREALS		PULSES	
	coeff.	|t|	coeff.	|t|	coeff.	|t|	coeff	|t|
ln (*x/n*)	—2.27	(11.4)	0.60	(4.2)	—9.69	(40.6)	—1.85	(20.8)
ln *n*	—0.23	(1.4)	0.92	(7.8)	—1.18	(5.9)	—0.72	(9.8)
males								
0—4	—2.26	(2.6)	0.33	(0.5)	—4.38	(4.1)	—0.80	(2.0)
5—9	—2.33	(2.8)	0.08	(0.1)	—0.08	(0.1)	—1.09	(3.0)
10—14	—1.97	(2.5)	—0.57	(1.0)	1.48	(1.6)	—0.99	(2.8)
15—54	—1.94	(3.1)	—0.62	(1.4)	0.25	(0.3)	—1.10	(4.0)
55—	—2.90	(3.4)	—0.98	(1.6)	—1.21	(1.2)	—0.79	(2.1)
females								
0—4	—3.09	(3.5)	—1.07	(1.7)	—5.51	(5.2)	—1.33	(3.4)
5—9	—2.11	(2.4)	—0.24	(0.4)	—0.22	(0.2)	—1.49	(3.8)
10—14	—1.22	(1.4)	—0.53	(0.8)	1.50	(1.4)	—1.01	(2.6)
15—54	—0.04	(0.1)	0.67	(1.6)	1.13	(1.6)	0.44	(1.7)
occupation								
1	0.64	(1.7)	—0.42	(1.6)	2.17	(4.9)	0.63	(3.8)
2	0.26	(0.8)	—1.33	(5.8)	4.43	(11.4)	0.68	(4.7)
3	0.05	(0.1)	—0.73	(2.2)	3.83	(6.9)	0.52	(2.5)
4	1.05	(3.3)	—0.45	(2.0)	1.89	(5.0)	1.20	(8.6)
religion								
Hindu	0.22	(0.7)	—0.18	(0.8)	0.71	(1.9)	—0.06	(0.4)
Muslim	0.64	(1.3)	—0.75	(2.1)	—0.19	(0.3)	—0.04	(0.2)
Sch. caste	—0.07	(0.4)	—0.69	(4.5)	0.91	(3.5)	—0.20	(2.1)
R^2	0.86		0.40		0.72		0.57	
F-tests								
0—4	0.80		4.45		1.05		1.60	
5—9	0.06		0.25		0.02		1.00	
10—14	0.78		0.01		0.00		0.00	
15—54	12.90		11.58		1.88		42.38	
55—	11.90		2.69		1.43		4.43	
children	0.55		1.55		0.35		0.84	
all	4.57		3.52		0.79		9.25	
total expenditure elasticity	0.72		1.16		0.35		0.69	

Note : See Table 1 for variable definitions.

TABLE 3 : REGRESSIONS FOR MILK, MEAT, FRUITS, VEGETABLES AND SUGAR
(all coefficients x 100)

	MILK		MEAT, EGGS, & FISH		FRUIT & VEGETABLES		SUGAR	
	coeff	|t|	coeff	|t|	coeff	|t|	coeff	|t|
ln (x/n)	1.19	(7·6)	0.80	(6.3)	—1.57	(16.7)	—1.30	(20.2)
ln n	0.61	(4.7)	0.80	(7.6)	—0.90	(11.6)	—0.48	(8.9)
males								
0— 4	1.09	(1.6)	0.68	(1.2)	—0.29	(0.7)	—0.78	(2.7)
5— 9	0.05	(0.1)	0.72	(1.4)	—0.67	(1.7)	—0.54	(2.0)
10— 14	– 1.73	(2.8)	– 0.42	(0.9)	– 0.95	(2.6)	– 0.85	(3.3)
15—54	—0.63	(1.3)	0.75	(1.9)	—1.03	(3.5)	—0.68	(3.4)
55—	0.21	(0.3)	0.49	(0.9)	—1.73	(4.3)	0.19	(0.7)
females								
0— 4	0.76	(1.1)	0.70	(1.2)	—0.40	(0.9)	—1.04	(3.6)
5— 9	—0.17	(0.2)	0.72	(1.3)	—0.97	(2.3)	– 0.66	(2.3)
10- 14	– 0.83	(1.2)	0.39	(0.7)	—1.09	(2.6)	—0.82	(2.9)
15—54	0.08	(0.2)	0.42	(1.1)	0.53	(1.9)	0.02	(0.1)
occupation								
1	0.20	(0.7)	0.85	(3.6)	0.23	(1.3)	0.46	(3.9)
2	—0.59	(2.3)	0.83	(4.0)	—0.40	(2.6)	0.12	(1.1)
3	—0.58	(1.6)	0.51	(1.7)	—0.55	(2.5)	0.09	(0.6)
4	0.75	(3.0)	0.33	(1.6)	0.01	(0.1)	0.36	(3.6)
religion								
Hindu	—0.21	(0.9)	0.30	(1.5)	—0.07	(0.5)	0.09	(0.9)
Muslim	—0.51	(1.3)	3.83	(12.1)	—0.27	(1.1)	—0.16	(1.0)
Sch. caste	—1.30	(7.6)	1.52	(11.1)	—0.58	(5.7)	—0.39	(5.5)
R^2	0.43		0.52		0.57		0.50	
F-tests								
0— 4	0.20		0.00		0.05		0.76	
5— 9	0.10		0.00		0.51		0.16	
10—14	1.80		2.31		0.11		0.01	
15—54	2.87		1.02		38.80		16.55	
55—	0.10		0.85		18.80		0.51	
children	0.70		0.77		0.22		0.30	
all	1.05		0.80		10.17		3.90	
Total expenditure elasticity	1.22		1.23		0.78		0.70	

Note : See Table 1 for variable definitions.

TABLE 4 : REGRESSIONS, FOR BEVERAGES. PROCESSED FOOD, EDUCATION AND MEDICAL EXPENSES

(all coefficients x 100)

	BEVERAGES		PROCESSED FOOD		EDUCATION		MEDICAL EXPENSES	
	coeff	|t|	coeff	|t|	coeff	|t|	coeff	|t|
ln (x/n)	—0.5	(9.0)	0.0	(0.1)	0.3	(5.1)	6.7	(24.6)
ln n	—0.3	(7.8)	—2.5	(13.1)	0.3	(6.3)	2.5	(10.9)
males								
0—4	0.10	(0.4)	4.79	(4.6)	—0.88	(2.7)	1.98	(1.6)
5—9	—0.03	(0.1)	4.66	(4.8)	0.16	(0.5)	—0.32	(0.3)
10—14	0.27	(1.2)	5.86	(6.4)	1.38	(4.8)	—1.42	(1.3)
15—54	1.01	(5.4)	6.51	(9.0)	—0.12	(0.5)	—3.84	(4.5)
55—	1.14	(4.5)	8.03	(8.2)	—0.14	(0.4)	0.14	(0.1)
females								
0—4	0.33	(1.3)	5.78	(5.6)	—0.37	(1.1)	2.66	(2.2)
5—9	0.08	(0.3)	4.51	(4.4)	0.20	(0.6)	1.12	(0.9)
10—14	—0.38	(1.5)	4.53	(4.5)	0.82	(2.6)	—0.29	(0.2)
15—54	0.04	(0.2)	—1.70	(2.5)	—0.14	(0.6)	—1.64	(2.0)
occupation								
1	—0.44	(4.0)	—2.95	(6.8)	—0.08	(0.6)	0.43	(0.8)
2	—0.96	(9.9)	—2.81	(7.4)	—0.21	(1.7)	1.15	(2.6)
3	—0.57	(4.1)	—1.84	(3.4)	—0.03	(0.2)	0.99	(1.5)
4	—0.83	(8.8)	—2.47	(6.7)	—0.12	(1.0)	0.21	(0.5)
religion								
Hindu	—0.10	(1.0)	0.07	(0.2)	—0.02	(0.1)	—0.34	(0.8)
Muslim	0.06	(0.4	0.09	(0.1)	—0.05	(0.3)	—0.69	(1 0)
Sch. caste	—0.14	(2.1)	0.33	(1.3)	0.01	(0.1)	0.16	(0.5)
R^2	0.36		0.30		0.39		0.27	
F-tests								
0—4	0.68		0.84		2.23		0.28	
5—9	0.18		0.02		0.01		1.36	
10—14	6.55		1.79		3.22		0.93	
15—54	37.32		176.41		0.00		8.96	
55—	20.29		66.70		0.19		0.01	
children	2.46		0.88		1.82		0.85	
all	11.31		43.03		1.13		2.34	
Total expenditure elasticity	0.77		1.09		1.77		2.65	

Note : See Table 1 for variable definitions.

TABLE 5 : OUTLAY EQUIVALENT RATIOS : ADULT GOODS AND POTENTIAL ADULT GOODS

	Males					Females					Expenditure Elasticity
Adult goods	0—4	5—9	10—14	15—54	>54	0—4	5—9	10—14	15—54	>54	
Pan and tobacco	—0.42	—0.12	—0.13	0.57	0.87	—0.04	—0.01	—0.17	—0.01	0.03	0.88
Alcohol	0.02	0.11	—0.89	0.37	0.30	—0.31	—0.02	—0.76	—0.30	—0.24	1.33
Possible adult goods											
Meat, eggs and fish	0.04	0.05	—0.21	0.06	—0.00	0.04	0.05	—0.02	—0.02	—0.11	1.22
Men's clothing	—0.39	—0.48	—0.14	—0.14	0.07	—0.56	—0.23	—0.45	—0.57	—0.52	2.54
Women's clothing	—0.21	—0.37	—0.39	—0.54	—0.53	—0.31	—0.27	—0.40	—0.22	—0.20	2.83
Leather footwear	—0.60	—0.77	—0.09	0.22	—0.03	—0.69	—0.12	—0.59	—0.64	—0.40	2.37
Amusements	—0.25	—0.22	—0.46	0.97	—0.32	—0.46	—0.33	—0.35	—0.46	—0.44	1.38
Personal care and toiletries	0.00	0.02	—0.08	0.12	—0.42	0.19	—0.14	0.16	0.26	—0.13	0.72
Standard errors											
Pan and tobacco	0.13	0.12	0.11	0.09	0.14	0.13	0.13	0.13	0.08	0.11	
Alcohol	0.27	0.26	0.23	0.18	0.27	0.28	0.28	0.27	0.17	0.24	
Meat, eggs and fish	0.09	0.09	0.08	0.05	0.09	0.09	0.09	0.09	0.06	0.08	
Men's clothing	0.13	0.13	0.11	0.08	0.13	0.13	0.13	0.13	0.08	0.12	
Women's clothing	0.08	0.08	0.07	0.04	0.08	0.08	0.08	0.08	0.05	0.07	
Leather footwear	0.32	0.31	0.28	0.20	0.32	0.33	0.33	0.32	0.20	0.29	
Amusements	0.22	0.21	0.18	0.17	0.21	0.22	0.22	0.22	0.14	0.19	
Personal care and toiletries	0.10	0.10	0.09	0.06	0.10	0.11	0.11	0.10	0.07	0.09	

Note : Asymptotic standard errors for π-ratios evaluated at the means of the (transformed) data. See equation (2) in the text for the definition of the π-ratios.