Child poverty in Vietnam: using adult equivalence scales to estimate income-poverty for different age groups

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2002

WORKING PAPER NO.6

Child Poverty in Vietnam:

Using Adult Equivalence Scales to Estimate Income-Poverty for Different Age Groups

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Young Lives
An International Study of Childhood Poverty

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1. Introduction

The design of anti-poverty strategies requires good data on the nature and causes of poverty. Yet data on income poverty are collected at the household level. Hence estimates of child poverty are based on the percentage of children living in poor households, which ignores the issue of intra-household allocation. It is commonly argued that the fact that data are collected at the household level means it is not possible to report figures relating to the number of children living in poverty.

Yet analysts using income and expenditure data routinely make adjustments to these data which implicitly tell us exactly how much of household expenditure is going on each child. These adjustments are the use of adult equivalence scales. These scales give child consumption as a proportion of that of an adult male, and hence can be used to calculate child consumption shares. Where the scales themselves are, as is often the case, derived from external data sources such as nutritional requirements, then the scales tell us nothing about consumption patterns within the households being studied. However, the scales may also be estimated econometrically, and so are indeed based on intra-household allocation patterns for the households under study. Moreover, the scales can be estimated separately for different sub-samples of the population, hence allowing estimates of child poverty rates for different groups; for example how child poverty differs between boys and girls.

Our paper begins by reviewing different approaches to estimating child expenditure, arguing that one based on equivalence scales is the only defensible approach. Part 3 explains the theory behind the two most commonly used approaches, the method of empirical estimation and how these estimates are used to calculate child poverty. Part 4 applies the method to the case of Vietnam and Part 5 concludes.

2. Child Welfare and Measurement

Much welfare measurement, including poverty analysis, requires information on the well-being of individuals. Whilst household surveys collect some individual-specific data, e.g. anthropometrics used to calculate nutritional status, income and expenditure are collected only at the household level. Although the typical household survey contains detailed information on food and non-food expenditure, all these figures are gathered with respect to the household as a whole. Hence estimates of income-poverty refer to poor households, implicitly assuming an equal distribution of resources within the household. This paper attempts to "open the black box" of household consumption and so determine consumption shares of different groups in the household, differentiated by age and gender. There are three possible ways by which we can infer child consumption from household data: (1) using per capita expenditure measurements, (2) adding up child costs, and (3) using the information contained in adult equivalence scales.

2.1 Per capita expenditure

Per capita expenditure is obtained by simply dividing total household expenditure by the number of people in the household. Much poverty analysis uses this approach. However, there are several problems in considering per capita expenditure as an indicator of child consumption. Consumption needs of children are clearly different from those of adults. Children consume considerably less than other household members do. If they did indeed receive an equal share of household resources then this measure would understate their welfare, since their needs are less. But children do not have the power to decide what and how much to consume, and there is no reason to assume that expenditure is equally distributed among household members, even if they were to have identical needs and preferences. It is very likely that the consumption share of children varies not only according to their age and gender, but also with context-specific factors. In conclusion, per capita expenditure is not suitable as a measure of child welfare.

2.2 Counting child costs

Most household surveys contain expenditure data in great detail by specific items. Some goods purchased by the household, called ‘adult goods’, are exclusively consumed by adults (alcohol and tobacco for example), while other expenditures (like education) can readily be associated with children. At first sight, it might be thought that we can obtain an estimate of child consumption by summing up all household costs that can be reasonably imputed to children and then assign to children a portion all other non-adult household expenditures by using some sensible sharing rule. Since 1960, the U.S Department of Agriculture (USDA) has provided

estimates of expenditures on children calculated in this way. These estimates are used for setting child support guidelines, foster care payments and developing educational programs. Expenditures are estimated for eight major budget categories: housing, food, transportation, child clothing, health care, childcare, education and miscellaneous. Child clothing, childcare and education are child-specific expenditure data (e.g. expenses on children dresses, school tuition, books, baby-sitting etc.). Food and health expenditures are obtained as child shares of total household expenditure on food and health, derived from estimates of USDA food plans and National Medical Expenditure Surveys of the U.S. Department of Health and Human Services. All other expenses (housing, transportation and miscellaneous) are allocated to children on a per capita basis, i.e. dividing total household expenditure by the number of family members.[1]

The main problem with this methodology is that whilst public goods are consumed jointly by household members of the household, for other non-public goods (like food for example), we do not actually know each person's consumption, which is the thing we are interested in. In the USDA estimates for 1997, expenses that are unquestionably attributable to children (clothing and education) represented only 16 per cent of total expenditure, and nearly 60 per cent of expenses were attributed to children on a per capita basis (Lino, 1998: page 29). Estimates of child consumption using this method, thus, rely largely on the per capita approach, which we have already argued is unreliable. Furthermore, it uses somewhat arbitrary shares of private consumption, with only a small share based on actual child costs. The approach should, thus, be deemed unreliable.

2.3 Equivalence scales and child costs

We mentioned above that using per capita expenditure gives a misleading picture of welfare since consumption needs vary by age and sex. This fact is widely recognised, so that much poverty analysis uses adult equivalence scales (AES) and may also adjust for economies of scale in household consumption. Adult equivalence scales give the consumption requirements of different groups as a proportion of those of an adult male. The application of these scales can make quite a difference to both the level and pattern of poverty, as we have illustrated for the case of Vietnam (White and Masset, 2002).

If these adult equivalence scales are to be believed – which presumably they are since they are routinely used to construct consumption aggregates – then they imply the consumption share of

1 See the series "Expenditure on Children by Families, Annual report" of the Centre of Nutrition, Policy and Promotion (USDA) for a detailed description of this method. Annual reports from year 1995 are currently available on the web site: htpp://www.usda.gov/cnpp/using2.htm.

different household members. Take a simple example of a household of two adults, for both of whom the AES is one, and one child with an AES of 0.4. The total number of adult equivalents in the household is 2.4, with each adult consuming 42 per cent (=1/2.4) of total household expenditure, and the child 17 per cent (=0.4/2.4). We thus propose to use these scales as a basis for estimating child consumption, or 'child costs' as they are more usually called in the literature. The next section first discusses the estimation of these scales, which is admittedly problematic, and then their use to estimate consumption shares.

3. Equivalence Scales, Economies of Scale and Child Costs

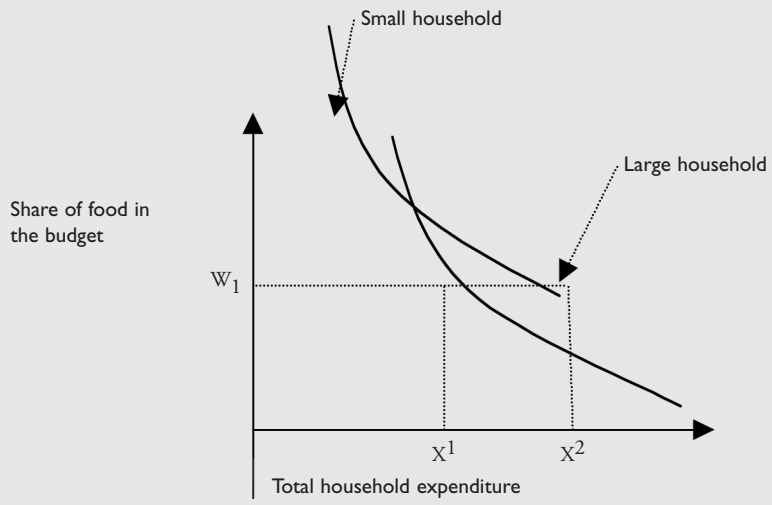
3.1 Theoretical underpinnings[2]

Several approaches to estimating equivalence scales can be found in the literature. These include the traditional Engel and Rothbarth methods, but also include demand systems analysis and subjective scales[3]. In this paper we use Engel and Rothbarth methods, both because of their relative ease of application, and because they seem to give good approximations of child costs under two different sets of assumptions.

Engel's method

Engel's method is based on the empirical observation (Engel's law) that as household expenditure increases, food consumption increases less then proportionally. Therefore, the share of food in the family budget ('food share') decreases as total household expenditure increases. The food share can thus be used as a welfare indicator. However, families of different composition have different Engel's curves. At the same level of expenditure a larger family spends a larger proportion of its budget on food. Since two households are assumed to have the same level of welfare when they devote the same share of family budget to food, the cost of a child can be calculated as the amount of expenditure necessary to maintain a household with a new born at the same level of welfare as before having the child. This cost is illustrated by the graph in figure 1.

FIGURE 1. ENGEL'S CHILD COST



2 The following two sections draw heavily on Deaton and Mulbauer (1986) and Deaton (1997). We make no claim to originality, but go into the theory and estimation procedure at some length for the sake of completeness.

3 Detailed surveys of the methods used to calculate econometric equivalence scales can be found in Van Praag and Warnaar (1997), Deaton (1997) and Deaton and Muellbauer (1986). Applications of these methods can be found in Muellbauer (1977) , Deaton and Castillo (1989), Gronau (1991) and Phipps (1998). Examples of the use of complete demand systems for the estimation of equivalence scales can be found inFerreira et al. (1999).

The Engel curve closer to the origin represents a couple without children with expenditure x^1 and food share w_1 . At the same level of household expenditure, a larger household has a larger food share. In order for the two households to have the same food share w_1 (and so the same level of welfare), expenditure of the larger households must increase from x^1 to x^2. The difference between x^1 and x^2 is Engel's child cost. Equivalence scales are usually formulated as the ratio of x^2 (expenditure of a couple with a child) to x^1 (expenditure of a childless couple). Thus, for example, a ratio of 1.3 implies an increase in total expenditure by 30 per cent for a household with a child, and the cost of the child (or child expenditure) is equivalent to 60 per cent of an adult. In this example, the child's share of total expenditure is 23 per cent (=0.6/2.6).

It has been argued that this method overstates child costs. The argument for this, formulated by Nicholson (1976), and subsequently developed by Deaton and Muellbauer (1986), is as follows. Consider a couple having a first child. Suppose that the couple is entirely compensated for the additional cost of the child. If the child expenditure is entirely financed by an external source, after the compensation the couple must be as well off as before of having a child. However, the child consumes a larger proportion of his expenditure on food than his parents do and therefore, the share of food expenditure on total expenditure increases.[4] However, according to Engel's assumption two households are equally well off only when they have the same food share in total expenditure. Engel's method will then give the household an additional compensation in order to bring the food share to the same level as before. As a consequence, Engel's compensation is overcompensation and estimates of child costs based on this method are too large. There would not be over-compensation if the amount of expenditure given to the household were spent by the child on food and non-food goods in the same proportions as the parents do. That is, Engel's method correctly estimates child cost under the additional assumption that children consume food and non-food goods in the same proportions as their parents.

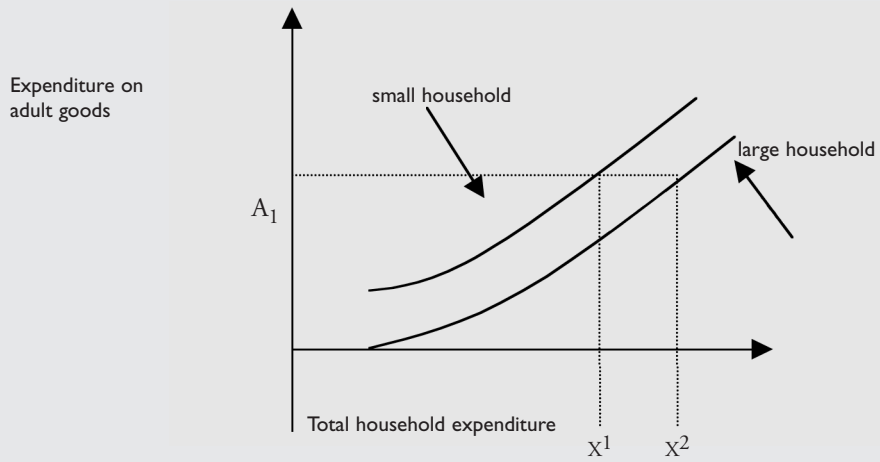
Rothbarth's method

The method elaborated by Rothbarth is similar to Engel's method, but instead of considering food consumption, it uses adult goods, i.e. those goods that are exclusively consumed by adults like alcohol and tobacco. Consumption of adult goods increases with total expenditure but, at the same level of total expenditure, larger households (i.e. those with more children) spend less on adult goods. The assumption in Rothbarth's method is that two households have the same level of welfare when they consume the same amount of adult goods. The cost of a child is

4 The assumption of a higher food share for children is a crucial step in the aregument. It seems a questionable one in developed countries, where there is a great deal of paraphernalia associated with young children (crib, cot, car seat, toys, clothes etc.) compared to their negligible food requirements, especially if being breastfed.

calculated as the reduction in total household expenditure that would produce the same reduction in consumption of adult goods produced by the additional child. This is illustrated by the graph in figure 2.

FIGURE 2. ROTHBARTH'S METHOD



The graph shows that at the same level of household expenditure x^1, the larger household has a smaller share of expenditure on adult goods. In order for the two households to have the same amount of adult goods a_1 (and so the same level of welfare), expenditure of the larger households must increase from x^1 to x^2. The difference between x^1 and x^2 is Rothbarth's child cost.

This method is likely to underestimate child costs because it does not take into account the substitution effects produced by the arrival of the child. If the decrease in consumption of adult goods is partially compensated through rearrangements in the family budget, the final reduction in the consumption of adult goods does not fully reflect the cost of the child, and the Rothbarth's compensation for child cost will be lower than it should be. If all non-food goods are considered as adult goods, then Rothbarth's method is equivalent to calculating child costs assuming that children only consume food. This requires an additional assumption that there are no substitution effects, i.e. the compensated price elasticity for food is close to zero, which is deemed reasonable in very poor settings.

3.2 Procedure for empirical estimation

In order to calculate Rothbarth's and Engel's child costs, we estimate demand equations in budget shares with a set of variables representing demographic characteristics (also known as the Working-Leser form):

$$w_i = \alpha_i + \beta_i \ln(x/n) + \eta_i \ln n + \sum_{k=1}^{K-1} \gamma_{ik} (n_k / n) + \tau_i z + u_i \quad (1)$$

where w_i is the share of food (or adult good) in total expenditure (x), n is household size, n_j is the number of people in age class j (for K age classes in total), z is a set of socio-economic variables, and u_i is the error term. Engel's compensation is obtained by equating the estimated demand equation of a childless couple to the demand equation of a couple with a child. The equation for a reference household of two adults is:

$$w^o_{food} = \alpha + \beta \ln x^0 + (\eta - \beta)\ln(2) + \gamma_a (1) \quad (2)$$

where γ_a is the coefficient for adults. The demand equation for a household with two adults and a child is:

$$w_{food} = \alpha + \beta \ln x^1 + (\eta - \beta)\ln(3) + \gamma_a (2/3) + \gamma_c (1/3) \quad (3)$$

where γ_c is the coefficient for the ratio of the child over household size. According to Engel's method the reference household of two adults (equation 2) and the households of two adults and a child (equation 3) are equally well-off when they have the same food shares. Hence we equate the right hand sides of (2) and (3) to obtain the level of expenditure necessary to compensate the larger household by solving the equation for the ratio x^1/x^0:

$$\frac{x^1}{x^0} = \exp\left(1 - \frac{\eta}{\beta}\right)\ln\left(\frac{3}{2}\right) + \frac{\gamma_a - \gamma_c}{3\beta} \quad (4)$$

The estimation of child cost through Rothbarth's method also uses the demand equation (1), where the budget share is now the expenditure of a given adult good over total expenditure. Rothbarth compensations can be calculated from equation (1) as outlay-equivalent ratio (OER), which represents the increase in total expenditure necessary to restore total expenditure on adult goods to its level prior to addition of one more child. The formula is:

$$OER_{ij} = \frac{(\eta_i - \beta_i) + \gamma_{ij} - \sum_k \gamma_{ik}(n_k / n)}{\beta_i + w_i} \tag{5}$$

where w_i (share of adult good i on total expenditure) and n_j/n (ratios of people of different age classes j on household size) are calculated at the sample mean of the data.

3.3 Obtaining child consumption from estimated equivalence scales

Child costs calculated in this way incorporate economies of scale. An additional child is to be valued less than an adult not only because she consumes less, but also because the enlarged household benefits from economies of scale. As household size increases the unit cost of shared goods (public goods within the household) decreases, thus releasing resources for the purchase of other goods. If we do not disentangle economies of scale from equivalence scales, the expenditure share of any additional household member will be underestimated. In the following example we show how equivalence scales can be calculated abstracting from economies of scale.

Underlying AES is the assumption that each person consumes a share of household consumption equal to her share of total adult equivalence. If economies of scale are included in the equivalence scale then the incremental individual bears the "cost" of these economies. Suppose the incremental cost of an additional adult is found to be 0.7, whereas without economies of scale it should be unity. Calculation of consumption shares based on this scale would give the additional adult to a one-person household a share of only 0.41 (=0.7/1.7), rather than the "correct value" of 0.5 (=1/2)[5]. Hence we must remove economies of scale from the equivalence scale. Doing so is straightforward. Since we know the equivalence scale for an adult when abstracted from economies of scale, is unity, we can work back to get the economies of scale coefficient as follows:

$$\left(\frac{2}{1}\right)^{1-\alpha} = \frac{1+0.6}{1} \tag{6}$$

5 The method assumes equal distribution between adults within the household – though in practice we should be able to estimate differential consumption for men and women.

$$\alpha = 1 - \frac{\ln(1.7)}{\ln(2)} \tag{7}$$

which yields the result α=0.23. This value means that doubling both household size and household resources gives an effective increase of 23 per cent in per capita resources or, alternatively, that doubling household size requires household expenditure to increase by only 70 per cent in order to maintain the same level of welfare. Using this value of α and the estimated AES for a child shown in table 1 we can calculate the adult equivalence scale for a child which abstracts from economies of scale (AES*):

$$(1 + AESchild)^{1-\alpha} = 1.5 \tag{8}$$

which gives adult equivalent = 0.7^{6}.

TABLE 1. EQUIVALENCE SCALES EXCLUDING ECONOMIES OF SCALE

	Combined scale	Excluding economies of scale
Reference family: one adult	1.00	1.00
Incremental cost of one adult	0.70	1.00
Incremental cost of one child	0.50	0.71

To see how we get from here to expenditure per child, we distinguish between adult (AE_A) and child (AE_C). Additional superscripts can be added to distinguish male and female, but that adds nothing to this conceptual discussion (similarly for further disaggregation of children by age, which is desirable when applying the method). These scales are rendered independent of economies of scale by the method described above, to get AE*:

$$AE_A^* = 1 \quad and \quad AE_C^* = \beta \tag{9}$$

6 Note that dividing the cost of an additional child (0.5) by the cost of an additonal adult (0.7) gives an approximation (0.71) of the true value).

There are A_i adults in household i and C_i children. Hence, total household adult equivalents for household i is:

$$AE_i^* = A_i + \beta C_i \tag{10}$$

Nominal household consumption is E_i, so real consumption per person is:

$$ep_i = \frac{E_i}{AE_i^{1-\alpha}} \tag{11}$$

where real consumption means that it is adjusted to allow for the effects of economies of scale in consumption. We introduce the concept of total real household expenditure:

$$e_i = ep_i \, AE_i^* \tag{12}$$

Real expenditure per child (ec) and per adult (ea) are calculated from their share given by the equivalence scales (AE*) as follows:

$$ec_i = \frac{\beta \, e_i}{AE_i^*} \quad and \quad ea_i = \frac{e_i}{AE_i^*} \tag{13}$$

The sum of real expenditures over the whole household comes to real household expenditure (e) not nominal (i.e. observed) expenditure (E).

In this paper, we will make use of these methods in order to estimate child poverty, analyse intra-household resources allocation of households of different characteristics and to test the presence of gender discrimination inside the household.

4. Data and Estimation

4.1 The data set and description of the data

This paper makes use of the 1992-93 and 1997-98 Vietnam Living Standard Surveys (VLSS), conducted by the Vietnam's General Statistical Office. The VLSS of 1992-93 surveyed a total of 4,800 household residing in 150 rural and urban communities (out of 10,000 in the country as a whole), and is nationally representative, since the probability of selection was set proportional to population size. The 1997-98 VLSS covered 6002 households, of which 4305 were already interviewed in the previous survey, 399 were interviewed to replace households from the 1992-92 sample that were unavailable or refused to respond, and 1298 are additional households not included in the sample of 1992-93 and not selected proportionally to population size. The final sample of 6002 over-samples specific domains (urban areas and certain regions of the country) and, therefore, the analysis of the full data set requires the use of sample weights. We use the data on expenditure and household demographics of 4799 households for VLSS 1992-93 and 5999 households for VLSS 1997-98 (some observations had to be dropped because information was incomplete). The survey recorded all household expenditure realised in the 12 months preceding the interview, including market purchases and home-produced goods. The General Statistical Office of Vietnam already operated a subdivision of expenditures in broad categories like food, non-food, education, health, housing and durables. The dataset also includes indices of price variations across time and regions for food and non-food items, which improve the comparability of expenditure between households.

The dependent variable used for the estimation of equation (1) using Engel's method is the share of food in total expenditure. Food is an aggregate of 45 products, which altogether represent on average roughly 60 per cent of total household expenditure. Food is a necessity, with expenditure elasticity of 0.8 in 1992 and 0.75 in 1998 as shown in table 2.[7]

7 Expenditure elasticities are calculated as $\varepsilon_i - 1 + \frac{\beta}{w}$ from regressions of the relevant expenditure share on total household expenditure, were w is expenditure on a given good iin share form, and β is the coeffieicnt associated to total expenditure.

TABLE 2 EXPENDITURE SHARES AND ELASTICITIES IN 1993 AND 1998

SHARE 1993	OBSERVATIONS	MEAN	ST. DEV.	EXPENDITURE ELASTICITY
Food	4799	0.61	0.15	0.80
Tobacco	3381	0.03	0.03	0.95
Alcohol	4205	0.01	0.02	0.82
Non food	4799	0.32	0.15	1.37

SHARE 1998	OBSERVATIONS	MEAN	ST. DEV.	EXPENDITURE ELASTICITY
Food share	5999	0.57	0.006	0.75
Tobacco	3886	0.04	0.001	0.88
Alcohol	5282	0.01	0.000	0.80
Non food	5999	0.37	0.005	1.30

We began by estimating the Rothbarth demand equation using different adult goods like alcoholic beverages, entertainment, personal care, adult education, tobacco etc., but finally we restricted the analysis to only those goods that gave good results, i.e. tobacco, alcoholic beverages and non-food goods. Non-food expenditure does not include expenditure on education and health, which is likely to absorb a good portion of non-food child expenditure. It seems a reasonable approximation to assume that in Vietnam, where food expenditure represents on average about 60 per cent of total expenditure, all non-food goods are adult goods after excluding health and education.

The variables on the right hand side of equation (1) include per capita expenditure, household size, demographic categories and various socio-economic characteristics of the households. Household sizes are modest in Vietnam, being on average below 5 members in both rural and urban areas (see Table 3). Extended family households, like households with three generation families or two married couples, are relatively few (Hirschmann and Vu Manh Loi, 1996). Female-headed households represent more than 25 per cent of the households surveyed and are basically a phenomenon of urban areas, where more than 40 per cent of households have a

female head. The average number of children per household is below 2 in urban areas and between 2 and 2.5 in rural areas. This small number is the result of a family planning program (also known as 'two child policy') that started to promote smaller families since 1972 (Haughton et al., 1999).

The demographic categories used in the regression consist of five age groups: from 0 to 4, 5 to 9, 10 to 14 (children), 15 to 55 (adults) and over 55 (elderly) of both sexes. The regressions also include 31 additional variables representing the educational attainment, occupation and age of the head of household, religion, ethnic group and geographical location.

TABLE 3 AVERAGE HOUSEHOLD SIZE, 1993 AND 1998

	1993	1998
All households	4.96	4.70
Rural	4.97	4.80
Urban	4.94	4.38
Male-headed	5.26	5.00
Female-headed	4.16	3.84
Kinh majority	4.85	4.58
Ethnic minorities	5.66	5.37
Educational level		
I	5.12	4.63
II	4.80	4.84
III	4.59	4.62
Expenditure quartile		
I	5.41	5.46
II	5.08	4.77
III	4.86	4.33
IV	4.50	4.05

4.2 Child costs and poverty

Table 4 presents the equivalence scales for children, on average and for three age groups, obtained by using Engel's and Rothbarth's methods. These estimates have not removed the effect of economies of scale. There is a large difference between Engel's and Rothbarth's estimations, which reflects the overestimation and underestimation of child costs produced by these methods. Child costs are considerably larger when estimated with Engel's procedure.

TABLE 4. CHILD COSTS INCLUDING ECONOMIES OF SCALE

	Engel 92	Rothbarth 92	Engel 98	Rothbarth 98
Average child	0.57	0.21	0.55	0.20
0 to 4	0.61	0.18	0.65	0.14
5 to 9	0.54	0.19	0.59	0.22
10 to 14	0.56	0.26	0.39	0.24

Table 5 shows the same child costs corrected by the presence of economies of scale. The coefficient alpha represents the increase in resources generated by increasing household size and expenditure in the same proportions. This coefficient is relatively large, indicating the presence of significant economies of size in Vietnam. According to Engel's method, a child costs almost as much as an adult, while according to the Rothbarth method it costs less than half of an adult. The Rothbarth estimates also show the expected progression in the AES for the different age groups. These costs did not change over the 5-year period considered, though Engel's estimates show a small increase.

TABLE 5. CHILD COSTS ABSTRACTING FROM ECONOMIES OF SCALE

	Engel 92	Rothbarth 92	Engel 98	Rothbarth 98
α coefficient	0.36	0.49	0.44	0.51
0 to 4	1.04	0.37	1.32	0.30
5 to 9	0.91	0.38	1.19	0.48
10 to 14	0.95	0.54	0.76	0.52
Average child	0.97	0.43	1.09	0.43

We used the estimated child costs and economies of scale of table 5 to calculate child consumption in the way described above. Consumption per child was then compared to a minimum level of expenditure on food. This minimum level was obtained by adjusting the official Vietnamese poverty line to the standard calorific requirements defined by the WHO (1985)[8]. Table 6 shows the headcount of extremely poor children in 1993 and 1998 by the two methods and the headcount obtained by comparing per capita expenditure to the child poverty line.

8 The official Vietnamese poverty line is the amount of expenditure necessary to obtain 2100 calories per day required by an average healthy person of all ages. Since calorific requirements per child amount ot 1618 calories per day, the poverty line for a child was adjusted accordingly.

TABLE 6. HEADCOUNT OF POOR CHILDREN

	Per capita measurement	Engel	Rothbarth
Food poverty 1993	20.4 %	2.1 %	10.2 %
Food poverty 1998	13.8 %	0.3 %	5.2 %

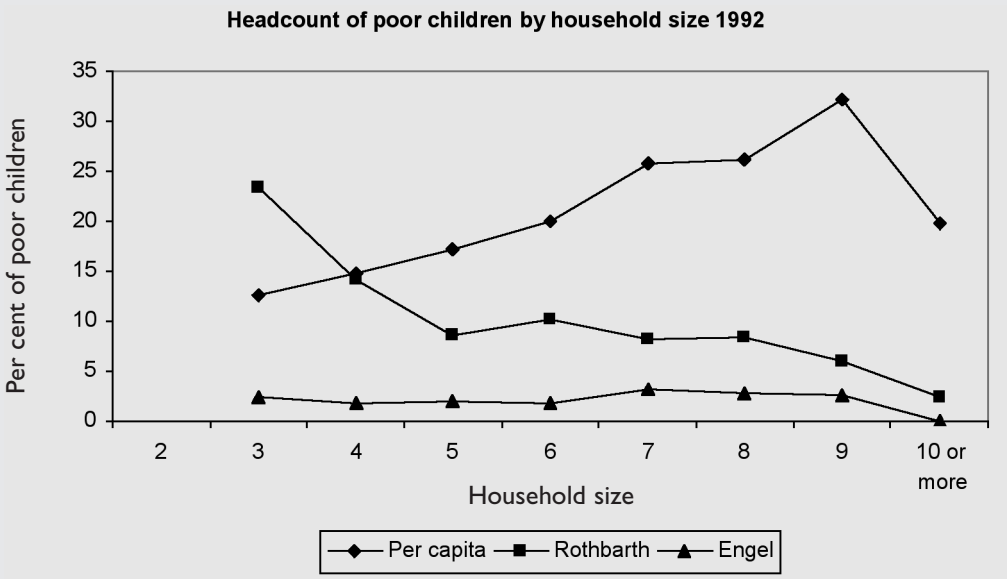
According to our estimates, the percentage number of poor children was in a range of 2 per cent and 10 per cent in 1993 and 1 per cent and 5 per cent in 1998. If Engel's and Rothbarth's estimates are to be accepted as a lower and upper limit to the 'real' cost of children (Deaton and Muellbauer 1986), then the official estimates of child poverty based on per capita expenditure are significantly overestimated (particularly when compared to the Engel estimates, but we believe those produced by Rothbarth to be more reliable).

Poverty is commonly associated with large household size in Vietnam (World Bank, 2000). However, this seems to be more a result of the method used to measure poverty than of the peculiar characteristics of larger households. Once the household expenditure data are corrected for different consumption levels of household members and economies of scale, the positive correlation between poverty and household size disappears. The graphs in Figure 3 show that children of large households are not necessarily poorer than are those of smaller ones. On the contrary, if there are large economies of scale, as it appears to be the case in Vietnam, children may be better off in large families.

4.3 Differences between household groups

In order to detect differences in child consumption between households of different categories, we ran regressions with changing slopes and intercepts for the following groups of households: rural/urban, male/female-headed, ethnic group, education and expenditure levels. Table 7 reports the results of a Wald test on the joint significance of the estimated coefficients for the various dummy variables for the different household groups.

FIGURE 3. HEADCOUNT OF POOR CHILDREN BY HOUSEHOLD SIZE, 1992 AND 1998



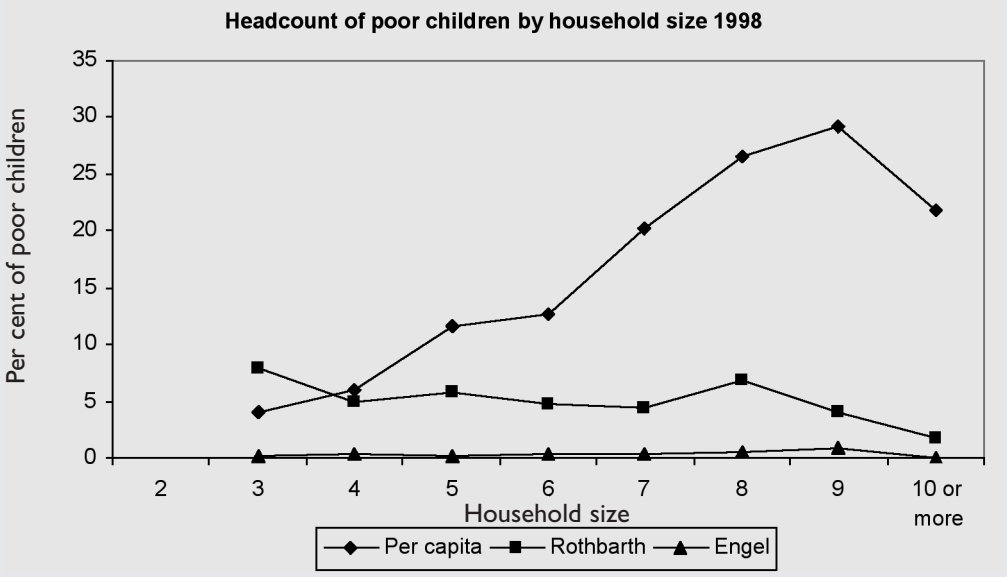


TABLE 7. TEST ON THE JOINT SIGNIFICANCE OF DEMOGRAPHIC COEFFICIENTS

Category	Engel 92	Rothbarth 92	Engel 98	Rothbarth 98
Rural/urban	1.78*	1.44	1.38	2.88***
Male/female-headed	1.71*	1.34	0.93	2.31**
Education				
Less than 5 years	0.46	1.16	1.92*	2.42**
From 5 to 10	0.48	1.25	1.42	0.81
More than 10	0.51	1.66*	0.89	1.37
Ethnicity	1.70*	0.51	0.68	1.98**
Expenditure				
I	2.58**	3.27***	0.88	2.32**
II	0.70	0.51	0.48	1.28
III	1.50	3.50***	0.86	0.81
IV			0.93	3.57***

Note: F-statistic of a Wald test is reported.

Although the test does not always recognise a significant difference in the demographic slopes, we calculated the average child costs for all groups presented above. These costs, expressed as percentages of an adult and purged of the effects of economies of scale are presented in Table 8.

TABLE 8. CHILD COSTS ABSTRACTING FROM ECONOMIES OF SCALE

Category	Engel 92	Rothbarth 92	Engel 98	Rothbarth 98
Rural	1.05	0.48	1.04	0.50
Urban	0.61	0.24	1.05	0.26
Male headed	1.05	0.48	1.05	0.44
Female headed	0.71	0.26	1.13	0.38
Education				
Less than 5 years	1.15	0.58	0.76	0.60
From 5 to 10	0.86	0.42	1.40	0.46
More than 10	0.64	0.26	1.29	0.43
Ethnicity				
Kinh majority	0.89	0.41	1.07	0.39
Other groups	1.25	0.54	1.50	0.67
Expenditure				
I	1.45	0.66	0.55	0.68
II	1.10	0.61	1.15	0.66
III	0.82	0.54	1.18	0.49
IV	0.61	0.32	1.87	0.23

According to the figures in Table 8, a larger share of household expenditure goes on children living in rural areas, in male-headed households and from ethnic groups other than the Kinh majority. The relationship between child costs and education is less clear. Child expenditure share seems to decrease with the educational level of the head of household, but the significance tests are rather low. A factor lying behind these results is perhaps income. In general, the child equivalence scale falls as we move from the poorest to richest income quartile (the partial exception being for Engel in 1998). Hence, better-off families (which are urban and male-headed) spend a lower share of their income on children – though the children may still be better off in absolute terms (which we look at below).

In order to compare children welfare across groups, we calculated child consumption for all categories, and expressed it as a multiple of the child poverty line. Table 9 shows these ratios at their mean values. A ratio below 1 would mean that, on average, children of a given household group are extremely poor. The larger the value of this ratio, the better are, on average, children's living conditions.

These results should be treated with caution, because not all the regressions on which they are based had positive significant tests (in particular those for expenditure and educational levels). However, two general observations can be made; there was a large improvement in children's living standards during the five-year period considered, which is common to all groups, and there was a reversal in the relative welfare levels of urban, female-headed and ethnic minority households during the same period.

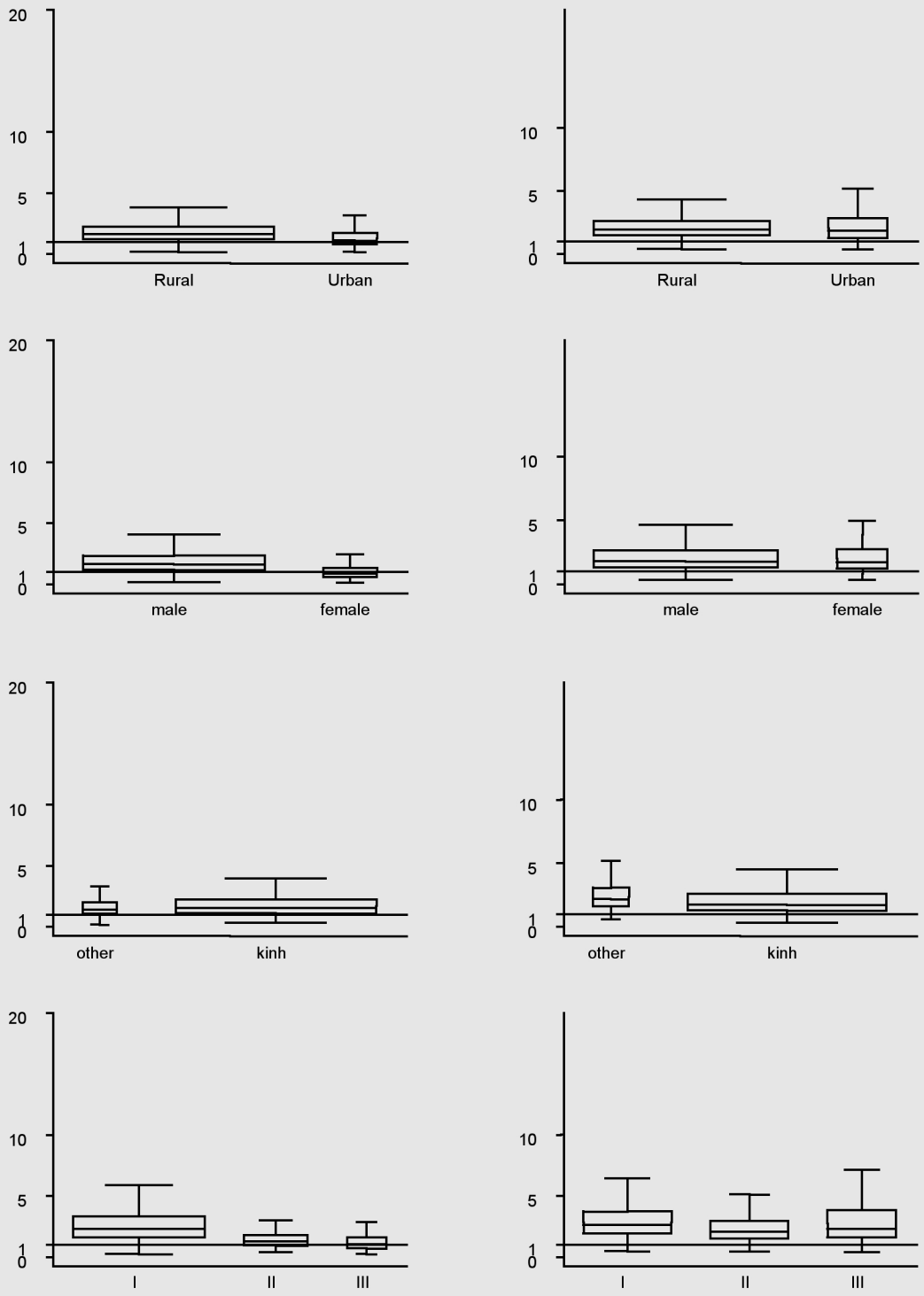
TABLE 9. CHILDREN CONSUMPTION OF DIFFERENT HOUSEHOLD GROUPS (MEAN RATIOS OVER FOOD POVERTY LINE)

Category	Engel 92	Rothbarth 92	Engel 98	Rothbarth 98
Rural	3.2	2.2	3.8	2.5
Urban	3.6	1.6	10.1	2.6
Male headed	3.7	2.3	4.9	2.4
Female headed	2.8	1.3	6.0	2.6
Education				
Less than 5 years	4.3	3.2	3.0	3.5
From 5 to 10	2.5	1.8	5.8	2.7
More than 10	3.0	1.5	8.3	3.3
Ethnicity				
Kinh majority	3.4	2.2	5.2	2.4
Other groups	3.2	2.0	5.5	3.2
Expenditure				
I	2.1	1.9	1.2	2.2
II	2.6	2.4	3.7	2.8
III	3.1	2.3	5.4	2.9
IV	6.2	3.0	23.3	2.9

It is helpful to represent these changes through the use of box plots as in Figures 4 and 5. The boxes show the ratios of child consumption over the child food poverty line for every household category. The line in the middle of the box is the median, and the box contains the observations between the 25th and 75th percentiles (interquartile range). The lines outside the box extend to the lower and upper adjacent values. All graphs illustrate the increase in the living standard of children between 1993 and 1998. During this period Vietnam has experienced a large increase in per capita income levels, which has been mainly led by a rapid growth of industry and service sectors in urban areas (IMF, 1999). Figures 4 and 5 show how this improvement in living standards has been transmitted to children. The number of children below the poverty line in urban areas has largely decreased according to Rothbarth measurements and virtually disappeared according to Engel's. The same has happened to children of female-headed households, which are mainly located in urban areas. Also noticeable is an increase in child welfare that is proportional to the educational level of the head of household. This reflects the more rapid

advances in living standards of those households that were best positioned (being more educated) to take advantage of a growing economy. A pattern of increasing levels of welfare is also shown by the breakdown in expenditure quartiles. Engel's estimates depict a substantial increase in inequality, which, however, is not confirmed by Rothbarth's estimates. Ethnic minorities represent a special case. They are the less urbanised, less educated and poorer sector of Vietnamese society. However, children from ethnic minorities have experienced a more rapid improvement in their living conditions than children from other sectors of society. A possible explanation for this is that ethnic minority households have transmitted to their children a larger portion of the increase in income than households from other groups.

FIGURE 4. CHILD CONSUMPTION IN 1992(LEFT) AND 1998 (RIGHT) AS A RATIO OF FOOD POVERTY LINE, ROTHBARTH'S METHOD



4.4 Gender discrimination

There is evidence that in countries of South Asia intra-household allocation of expenditure tends to favour boys against girls (Dasgupta, 1987; Harris, 1990). Discrimination against female children is generally attributed to cultural values and, in the case of Vietnam, many writings maintain the persistence of a Confucian culture which results in a 'son preference' (Hirschmann and Vu Manh Loi, 1996). According to these writings, fertility decisions and child treatment are strongly influenced by the desire of perpetuating the patrilineal and patriarchal structure of the household (Fairbank et al.,1973). The existing evidence on this subject asserts the influence of a preference for male children on fertility behaviour in Vietnam, which leads to large families (Haughton et al., 1999). However, significant differences between boys and girls have not been found in health indicators (World Bank, 1999) and anthropometric measurements (Haughton and Haughton, 1999).

In this section, we will try to detect differences in consumption levels of children of different sex at various ages. In order to do so, we will make use of Engel's and Rothbarth's procedures to estimate child costs, following the examples of works done by Subramanian and Deaton (1991) and Deaton (1997). Engel's and Rothbarth's procedure are based on the estimation of demand equations which include demographic characteristics. Significant differences in consumption levels of boys and girls are simply obtained by testing the difference between the coefficient estimates for boys and girls at different ages.

Table 10 shows the child costs for both sexes at various ages, in terms of adult equivalents and abstracting from economies of scale. According to these figures, Vietnamese households on average spend 30 per cent less on female children in the first age group, and 20 per cent less in the second group. Between the ages 10 and 14 expenditure is the same or higher for girls. According to WHO standards (1985), children up to the age of 9 have very similar calorific requirements, and the observed difference in expenditure cannot be justified by different food consumption needs. However, these differences were found to be statistically significant in two cases only. In 1992, girls in the 10 to 14 age group were allocated 50 per cent more expenditure than boys, and in 1998, female children in the 0 to 4 age group are found to consume 50 per cent less than male children by the Rothbarth method.

TABLE 10. EXPENDITURE ON CHILDREN BY AGE GROUP AND GENDER IN 1992 AND 1998 (EXPRESSED IN TERMS OF ADULT EQUIVALENTS).

Child age	Engel 1992		Rothbarth 1992		Engel 1998		Rothbarth 1998	
	Male	Female	Male	Female	Male	Female	Male	Female
0 – 4	1.19	0.88	0.41	0.32	1.46	1.19	0.39	0.21*
5- 9	1.07	0.76	0.45	0.31	1.29	1.09	0.48	0.48
10 - 14	0.69	1.20*	0.42	0.66**	0.82	0.70	0.51	0.53

In order to test the presence of gender discrimination in child treatment by households of different characteristics, we operated a distinction between the following categories: rural/urban, male/female-headed, ethnic group, educational and expenditure levels. The results are in tables from 11 to 14. A significant difference in the coefficients of boys and girls of the same age is indicated by a star (* is 10%, ** is 5% and *** is 1%).

After applying the disaggregation mentioned above, the already observed higher level of expenditure for female children from the oldest age group was again found significant in wealthier, urban, female-headed households (third and fourth expenditure quartiles). This difference might be related to higher expenditure on education by wealthier families in urban areas. Higher expenditure for male children in the first age group was also found to be significant in male-headed households, in the Kinh majority and in the middle expenditure and educational level.

In general, the results of the tables are in line with common expectations. There is no sign of gender discrimination in urban and female-headed households, with the exception of the already observed more favourable treatment of girls from the third age group. Rural and male-headed households are those that more prominently appear as discriminating against female children. Both Kinh and non-Kinh households show some evidence of gender discrimination. There is no clear relationship between gender discrimination and expenditure or between gender discrimination and level of education.

TABLE 11. ENGEL ESTIMATES OF CHILD COSTS AND TEST ON GENDER DISCRIMINATION 1992

	0-4		5-9		10-14	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Rural	1.34	0.98	1.35	0.78*	0.71	1.10
Urban	0.53	0.36	0.32	0.51	0.43	1.51
Male-head	1.24	1.01	1.15	0.62*	0.97	1.32
Female-head	1.01	0.37	0.70	1.07	0.17	0.93*
Education						
Less than 5	1.72	0.83*	1.28	0.89	0.75	1.41
From 5 to 10	0.96	1.08	0.94	0.94	0.42	0.81
More than 10	0.57	0.40	0.80	0.23	0.70	1.14
Ethnicity						
Kinh majority	1.04	0.86	0.96	0.66	0.77	1.05
Others	1.90	0.75*	1.57	1.33	0.27	1.71*
Expenditure						
I	1.82	1.17	1.90	1.70	0.86	1.24
II	0.94	1.32	0.81	0.65	1.04	1.85
III	1.26	0.40	0.96	0.82	0.56	0.94*
IV	0.69	0.95	0.65	-0.21	0.16	1.43

TABLE 12. ROTHBARTH'S ESTIMATES OF CHILD COSTS AND TEST ON GENDER DISCRIMINATION 1992

	0-4		5-9		10-14	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Rural	0.51	0.38	0.56	0.36	0.44	0.63
Urban	0.13	0.14	0.22	0.15	0.28	0.51*
Male-head	0.49	0.41	0.48	0.27**	0.52	0.68
Female-head	0.24	0.10	0.27	0.35	0.18	0.42*
Education						
Less than 5	0.72	0.57	0.63	0.35	0.46	0.77
From 5 to 10	0.34	0.36	0.38	0.50	0.37	0.57
More than 10	0.16	-0.02	0.30	0.05*	0.31	0.51
Ethnicity						
Kinh majority	0.37	0.30	0.41	0.31	0.43	0.62*
Others	0.74	0.41	0.64	0.34	0.31	0.78
Expenditure						
I	0.65	0.59	0.91	0.92	0.38	0.52
II	0.26	0.68	0.38	0.42	0.87	1.06
III	0.72	0.21	0.55	0.32	0.47	0.67
IV	0.25	0.15	0.39	-0.03**	0.28	0.88**

TABLE 13. ENGEL ESTIMATES OF CHILD COSTS AND TEST ON GENDER DISCRIMINATION 1998

	0-4		5-9		10-14	
	Male	Female	Male	Female	Male	Female
Rural	1.35	1.05	1.30	1.06	0.80	0.69
Urban	1.88	1.64	0.77	0.73	0.78	0.53
Male-head	1.38	0.91*	1.22	1.20	0.89	0.70
Female-head	1.21	2.03	1.30	0.66	0.69	0.87
Education						
Less than 5	1.05	0.92	1.03	0.68	0.50	0.40
From 5 to 10	1.80	1.26	1.68	1.43	1.28	0.96
More than 10	1.59	1.32	1.34	1.48	1.02	0.98
Ethnicity						
Kinh majority	1.39	1.04	1.28	1.15	0.81	0.72
Others	2.03	2.15	1.58	1.02	1.48	0.72
Expenditure						
I	0.73	0.71	0.72	0.60	0.23	0.31
II	1.43	1.20	1.56	1.01*	0.98	0.71
III	1.35	1.18	1.26	1.42	0.85	1.02
IV	4.07	1.92	1.08	1.80	1.79	0.54**

TABLE 14. ROTHBARTH'S ESTIMATES OF CHILD COSTS AND TEST ON GENDER DISCRIMINATION 1998

	0-4		5-9		10-14	
	Male	Female	Male	Female	Male	Female
Rural	0.46	0.26	0.59	0.57	0.53	0.58
Urban	0.24	0.09	0.22	0.18	0.48	0.35
Male-head	0.41	0.18**	0.49	0.51	0.52	0.55
Female-head	0.36	0.32	0.44	0.30	0.44	0.43
Education						
Less than 5	0.40	0.50	0.79	0.53	0.59	0.80
From 5 to 10	0.50	0.08**	0.56	0.54	0.55	0.53
More than 10	0.44	0.24	0.39	0.51	0.53	0.48
Ethnicity						
Kinh majority	0.37	0.16**	0.44	0.45	0.46	0.48
Others	0.52	0.63	0.69	0.62	0.86	0.73
Expenditure						
I	0.51	0.39	0.76	0.77	0.71	0.95
II	0.61	0.49	0.70	0.70	0.71	0.74
III	0.51	0.22*	0.48	0.54	0.59	0.58
IV	0.36	0.10	0.22	0.17	0.33	0.21

FIGURE 5. CHILD CONSUMPTION IN 1992 (LEFT) AND 1998 (RIGHT) AS A RATIO OF FOOD POVERTY LINE, ENGEL'S ESTIMATES

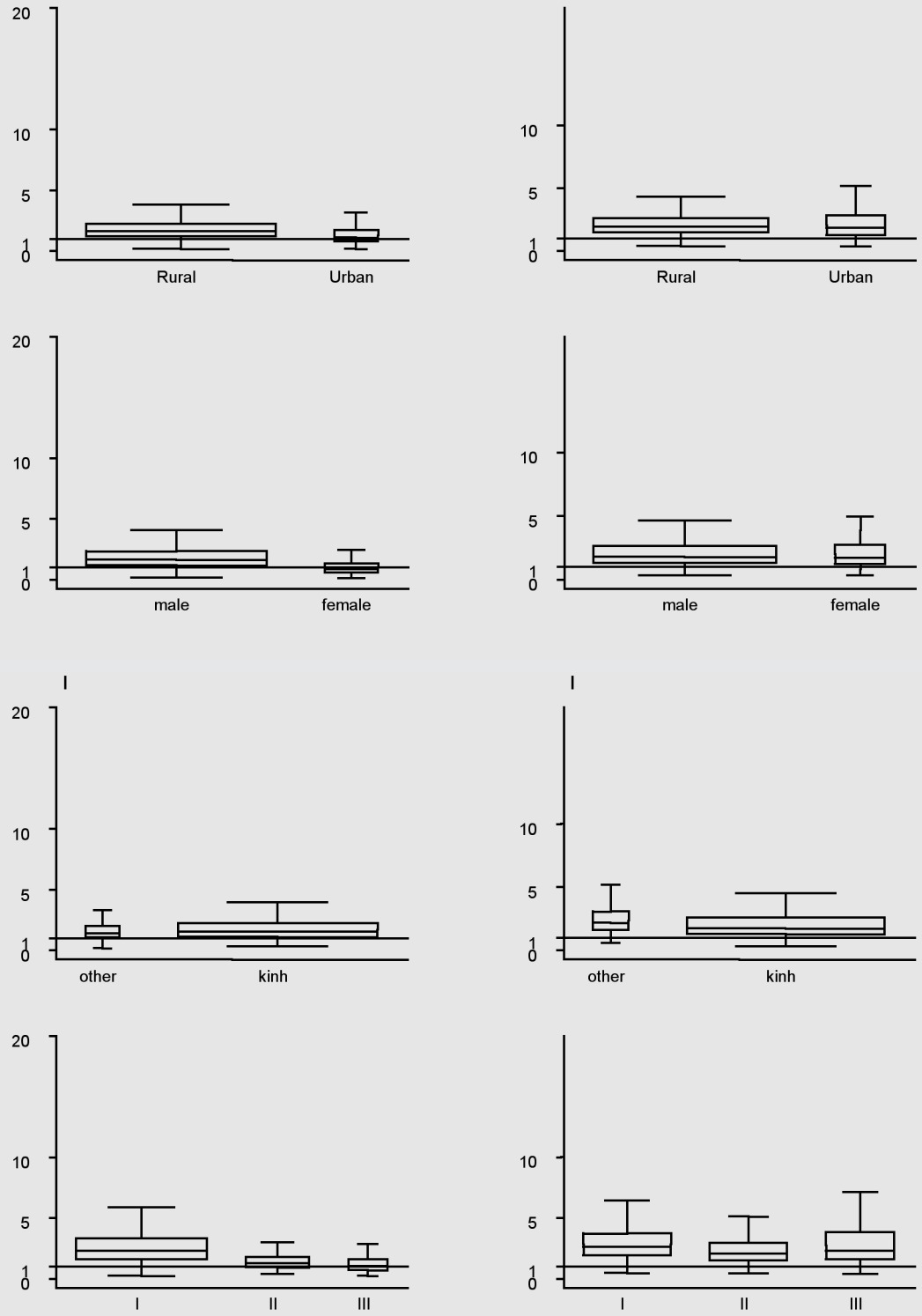
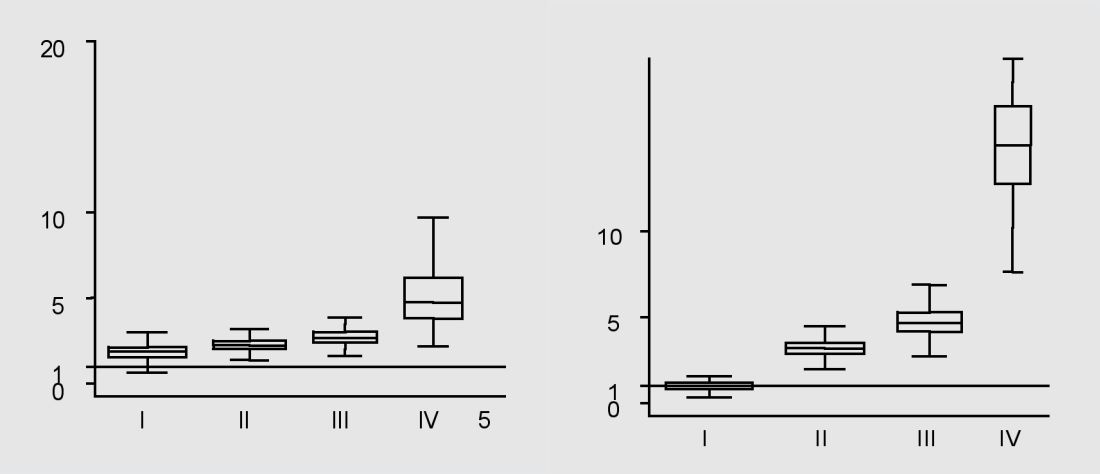


FIGURE 5. CHILD CONSUMPTION IN 1992 (LEFT) AND 1998 (RIGHT) AS A RATIO OF FOOD POVERTY LINE, ENGEL'S ESTIMATES cont..



5. Conclusions

Measurements of child poverty are commonly carried out using household expenditure data in per capita terms or adjusted by some standard parameter of economies of size. In this paper, we use adult equivalence scales and economies of scale coefficients estimated from the data to assess child poverty in Vietnam. By doing so, we show child poverty in Vietnam to be overestimated by conventional techniques.

The commonly used technique for the estimation of adult equivalence scales contains an implicit household income distribution. Therefore, we used these techniques to estimate child poverty and patterns of resource allocation for different household groups. Better-off families (which are largely urban, more educated, female-headed and from the Khin ethnic majority) spend a lower share of their income on children than other household groups, though their children are still better off in absolute terms. A comparison of the data between 1992-93 and 1997-98 also reveals that children from better-off family groups have experienced a more rapid increase in welfare levels than children from other sectors of Vietnamese society during this period.

The presence of gender discrimination in child treatment is also investigated. Rural and male-headed households are those that more prominently appear as discriminating against female children. We found no clear relationship between gender discrimination and expenditure or between gender discrimination and level of education.

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