HOUSEHOLD EQUIVALENCE SCALES, POVERTY AND INEQUALITY IN INDONESIA: THREE ESSAYS

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ABSTRACT

This study addresses the issue of differences in resource requirements for adults and children in analyzing poverty and income inequality. Sensitivity of poverty and inequality measures for two different equivalence scales are discussed using Indonesian socio-economic survey.

Essay one, "Estimation of Equivalence Scales for Indonesia," presents estimates for the two most widely used scales — Engel and Rothbarth — by urban/rural residence and sex of children. We found that scale values are higher in rural areas implying that rural parents have to forego a larger proportion of their resources for nurturing a child compared to their urban counterparts. But the absolute cost is larger in urban areas because of higher total household expenditures. The estimates also provide evidence of economies of scale in consumption. Like previous studies, we also found a large difference between the Engel and Rothbarth scales.

Essay two, "Aspects of Poverty in Indonesia: A Decomposition Analysis," analyses the incidence of poverty and contribution to total poverty from different demographic and socio-economic groups using a decomposable poverty index. Three different poverty thresholds — per-capita, Engel scale-adjusted, and Rothbarth scale-adjusted — were used to take into account the effect of family size in poverty. We found that poverty measurement is

sensitive to the choice of scaling parameter. The per-capita threshold and the Engel scale-adjusted threshold provide similar results whereas the Rothbarth scale-adjusted threshold is in conformity with other two thresholds only when the decomposition is based on the education of the household head.

The third and final essay, "Aspects of Inequality in Indonesia: A Decomposition Analysis," endeavors to assess the impact of 'within-group' and 'between-group' inequalities on inequality in total household expenditure using two different decomposable inequality indices. The main conclusion is that the 'between-group' inequality accounts for little of the inequality observed in Indonesia with most inequality stemming from 'within-group' differences. As in the poverty exercise, the use of Rothbarth scale gives different results.

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Chapter 1. INTRODUCTION

1.1 Background

The use of household equivalence scales in the analysis of poverty and inequality is very common. These scales are typically used to adjust the differences in household composition. A large number of scales are being used in different countries[1], but there seems to be no consensus on the choice of a particular scale. The conclusion regarding the extent of poverty and inequality is very sensitive to the chosen scale. Buhmann, Rainwater, Schmaus, and Smeeding (1988) have demonstrated that choice of equivalence scale affects absolute and relative poverty and inequality, and therefore the rankings. Coulter, Cowell, and Jenkins (1992) argue that one cannot simply compute inequality and poverty measures for two extreme equivalence scales and assume that intermediate scales will lead to intermediate inequality and poverty estimates (p. 1081). Hence, they suggest to use a wide range of equivalence scales in order to arrive at a defensive conclusion.

In Indonesia, despite a large literature on poverty and inequality

[1]Buhmann, Rainwater, Schmaus, and Smeeding (1988) provide 34 equivalence scales used in European countries and the United States.

measurement, studies designed to analyze the sensitivity of poverty and inequality measures for varying equivalence scales are unavailable. The available estimates of poverty and inequality are based on per-capita income / expenditure. The World Bank Country Study (1990) mentions the need for such an exercise, but adheres to the practice of using consumption per-capita. This methodology ignores the differences in resource requirements of an adult compared to a child because each member of the household is assigned the same amount of resources. Hence, a large household having many children is most likely to be in poverty and facing higher inequality compared to a small household having few children when no allowance is made for differential resource requirements. This study endeavors to analyze the poverty and inequality in Indonesia using estimated adult equivalence scales.

1.2 Objectives of the Study

The principal objective of this study is to analyze the sensitivity of poverty and inequality measures when different scales are used to adjust the resource requirements for adults and children. To accomplish this, the following tasks are performed:

1. Estimation of Engel and Rothbarth equivalence scales,
2. Estimation and decomposition of poverty incidence, and
3. Estimation and decomposition of inequality.

1.3 Organization of the Study

This study is composed of three essays. The first essay (Chapter 2) presents the estimation of Engel and Rothbarth equivalence scales for Indonesia. The estimation has been carried out using 1987 Indonesian Socio-economic Survey (SUSENAS).

The second essay (Chapter 3) analyzes the differences in poverty estimates when different scaling parameters are used to adjust for family composition. The official poverty threshold of Indonesia has been revised using the estimated equivalence scales to study the sensitivity of poverty incidence and contribution to total poverty from different demographic and socio-economic groups using a decomposable poverty index.

The third and final essay (Chapter 4) provides the analysis of inequality in consumption expenditures using scale-adjusted expenditure series. The impact of 'within group' and 'between group' inequalities in the total inequality is analyzed using a decomposable inequality index.

Chapter 2. ESSAY ONE

Estimation of Adult Equivalence Scales for Indonesia

2.1 Introduction

Adult equivalence scales measure the relative cost of households of different size and composition. They are the deflators by which the budgets of different household types can be converted to a "need-corrected" basis for making welfare comparisons across households. An equivalence scale purports to account for the differences in the needs of household members as well as the economies of scale in consumption. A straightforward comparison of incomes and expenditures between households is inappropriate, as needs vary depending on the age and sex composition of the household. For example, a child may not consume the same amount as an adult and females may need fewer resources than males. Furthermore, there may be economies of scale in consumption in the household as some goods are shared by almost all members of the household (such as lighting, TV, etc.); households may experience increasing returns in household production of goods and services; and larger households may benefit from bulk purchases. Hence, an adjustment is inevitable to make meaningful comparisons across heterogeneous households.

Household equivalence scales are used for various purposes such as measuring the direct cost (expenditure) of a child, estimating the extent of poverty and income inequality, and devising welfare and tax policies. The use of household income is a poor indicator of household welfare because it makes larger households appear to be better off than they actually are. The use of per capita income or expenditure is also flawed because it ignores the economies of scale in consumption (i.e., the marginal cost of an extra person may change as family size changes) and overcorrects for household size. Hence, a larger household will always seem worse off than a smaller household since no allowance is made for the differences in the needs of children and adults. The scale-corrected income or expenditure will provide a true picture of household economic status. Equivalence scales also enable us to calculate the resources needed by a family with children to attain the same welfare enjoyed by a family without children. In other words, the direct expenditure incurred on a child can be calculated with the use of such scales.

This study endeavors to calculate the adult equivalence scales for Indonesia using the 1987 SUSENAS (Socio-Economic Survey). The calculated scales are then used in estimating the direct cost of children, defining a new poverty threshold, and analyzing inequality in the chapters that follow.

2.2 Adult Equivalence Scales: A Review

Adult equivalence scales are a sophisticated way of head counting when comparing the living standards of families of different sizes and compositions (Deaton and Muellbauer, 1980). These scales have been estimated mostly from the consumption behavior of households of different sizes and compositions. The derivation of equivalence scales is mostly based on observed consumption behavior. Suppose that parental welfare is given by a utility function u:

$$u = v(q, a) \qquad (1)$$

where v is utility, q the vector of commodities consumed by the household and 'a' is a vector of demographic variables such as number of children, numbers of males, and so on. The utility function is assumed to be continuous, increasing, and quasi-concave in consumption, q. The household is assumed to have total income y and face exogenous prices p. Given that total expenditures X_i cannot exceed household income y, the household has the following budget constraint:

$$p.q = \sum_{i=1}^{i} p_i q_i \leq y \qquad (2)$$

The household maximizes the utility function subject to this constraint yielding

Marshallian demand functions for each good, of which are functions of p, x_i and a_i. The maximized utility function can be represented by the indirect utility function:

$$u_i = v(p, a_i, x_i) \qquad (3)$$

which is non-increasing in p, increasing in x_i, and homogeneous of degree zero in p and x_i.

Associated with the utility function is a cost function that gives the minimum level of expenditure x, required to attain utility level u at given prices p and demographic characteristics a:

$$c(u, p, a) = x \qquad (4)$$

Then we can select a reference price vector p^0 and a reference utility level u^0 and divide the cost function of any household "h" by the cost function of reference household "0", in order to derive the equivalence scale:

$$m(a^h, a^0; u, p) = \frac{c(u, p, a^h)}{c(u, p, a^0)} \qquad (5)$$

This ratio measures the relative cost of reaching the same welfare level at the same prices for a household with characteristics a^h vis-a-vis the reference household.

There are different models proposed for the estimation of equivalence scales based on different assumptions about how the non-income characteristics "a" affect demands and about the extent to which their impact is similar to that of price changes. Two of the simplest and widely used models are those of Engel (1895) and Rothbarth (1943).

2.2.1 Engel's Method

The pioneering work in this area was carried out by Engel (1895). He opined that the share of food could be used as an indication of welfare because poorer households spend a higher share of income on food in comparison to richer households. Hence, a comparison of their money incomes at the same food share yields an index of the cost of maintaining the larger relative to the smaller family, and this is the equivalence scale. According to Engel's model, the cost function of any household "h" with demographic characteristics a^h is the product of two terms:

$$c(u,p,a^h) = m(a^h).c(u,p) \qquad \textbf{(6)}$$

where c(u,p) is the cost function of the reference household (assumed to equal one adult) and $m(a^h)$ is the number of equivalent adults in household "h". This assumption of separability of the cost function implies that differences in non-income characteristics are equivalent to equi-proportionate differences in each of the prices and so an additional child, for example, corresponds to an increase in total cost. For the reference household $m(a^0) = 1$. Then:

$$u^h = u(q^h, a^h) = u(q^h / m(a^h)) \qquad (7)$$

and the per-equivalent adult - demand function becomes

$$\frac{q_i^h}{m(a^h)} = f_i\,(x^h / m(a^h), p) \qquad (8)$$

If it can be assumed that the same price vector exists for all households and that both households h and the reference household have the same budgets share w_i, then they should be at the same welfare level. Therefore:

$$\frac{x^h}{m(a^h)} = \frac{x^0}{m(a^0)} = m(a^h) = \frac{x^h}{x^0} \qquad (9)$$

where $m(a^h)$ is the equivalence scale. The scale rate varies with u, unless preferences are homothetic.

This approach has been criticized on the ground that the needs of children relative to adults and the economies of scale in consumption are not the same for every commodity. Deaton and Muellbauer have argued that this method generally overstates the true cost of a child:

> Suppose that the true child costs were known and that a young couple were perfectly compensated for the expenses associated with their newborn child. As a first approximation, we should expect the adult's consumption pattern to be more or less what it was before. However, the household contains a new largely food consuming individual. Hence, although

> fully compensated, the household has a higher food share than before the arrival of the child. Restoration of the food share to its original level would require overcompensation, and this is what the Engel procedure does (Deaton and Muellbauer, 1986,6).

Gronau (1988) and Tsakloglou (1991) share this view point.

2.2.2 Rothbarth's Method

Rothbarth (1943) distinguishes adult goods (q_A) from other goods that are consumed only by children or are jointly consumed (q_B). He then goes on to argue that expenditure on purely adult goods correctly indicates welfare. At a given level of total expenditure on all goods, a childless couple is expected to spend more on adult goods-- have a higher standard of living-- than a couple having children. Two households will be said to be equally well off if they spent the same amount on adult goods. In notational terms, the cost function for couples having children consists of two terms-- the first being the cost incurred on adults and the second term the cost of children:

$$c(u,p,a^h) = \alpha(u,p_A,a_A) + \beta(u,p_B,a_B) \qquad \textbf{(10)}$$

Thus, the equivalence scale for couples with children is:

$$m(a^h) = \frac{\alpha+\beta}{\alpha} \qquad \textbf{(11)}$$

But such an approach poses the problem of identifying the purely adult goods, on the one hand, and forces one to assume that: (1) children neither affect adult leisure nor the cost of adult goods, and (2) parents do not derive utility from their children, on the other hand. Gronau (1988), however, attempts to take care of the problem by assuming the separability of welfare that adults derive from their own consumption and welfare they derive from their children's consumption. He then argues that when "welfare is the utility parents derive from their own consumption," the Rothbarth method is the only feasible and theoretically justifiable method for estimating equivalence scales. Deaton, Ruiz-Castillo, and Thomas (1989) provide a methodology for selecting adult goods proposing the notion of "demographic separability", that certain classes of goods (adult goods) have little or no relationship to the numbers and ages of children. However, the existence of "demographic separability" is a necessary but not a sufficient condition for the validity of Rothbarth's model (Deaton, Ruiz-Castillo, and Thomas 1989; Blackorby and Donaldson 1991).

There are other methods found in the literature such as the Prais-Houthakker method (1955), originally suggested by Sydenstricker and King (1921), Barten (1964), Pollak and Wales (1981), and Gorman (1976). The Prais and Houthakker formulation tries to remedy some of the shortcomings of the Engel model such as non-publicness of consumption and non-differentiation of economies of scale across different goods. Their model incorporates commodity-specific scales. Hence, the demand per commodity-specific scale of each good is linked to the overall resources of the household.

Barten's model challenges the Rothbarth method's assumption that the presence of children or other demographic variables does not affect relative prices. According to Barten's model, the advent of an additional child not only necessitates more food, but also increases the equivalent price of food relative to other goods such as housing. Thus, some substitution of housing for food is inevitable. Gorman's model is an extension of the Barten model in which an increase in household size not only changes the relative prices but also increases the fixed cost associated with the size. Muellbauer (1977), using grouped data, showed that the Barten model has its own shortcomings. Furthermore, if only a cross-section of households is available, then neither the Barten nor the Prais-Houthakker model scales can be identified. Table 2.1 provides a brief survey of the models discussed above.

2.2.3 Critique

Pollak and Wales (1979) opined that the usual practice of basing welfare comparisons on equivalence scales estimated from observed differences in the consumption patterns of households with different numbers of children (conditional preference) is illegitimate. They suggest that the scales required for comparing welfare levels can be obtained by analyzing responses to direct questions about preferences or hypothetical choices (unconditional

Table 2.1

A Survey of Equivalence Scales

Demand relations	Utility (u) and Cost Functions (x)
	Engel (1895)
$e_i/m_0 = g_i(x/m_0)$	$u = U(q_1/m_0(u),....q_n/m_0(u),$
at constant prices and m_0 depends on x as well as on a.	$x = m_0(u).\ c(u,p),$
	Rothbarth (1943)
$e_i/m_0 = g_i(x/m_0)$	$u = U[V^A(q_A,a_A),V^B(q_B,a_B)],$
at constant prices and m_0 depends on x as well as on a.	$x = \alpha(u,p_A,a_A)+\beta(u,p_B,a_B),$
	Prais-Houthakker (1955)
$e_i/m_i = g_i(x/m_0),$ $m_0 = m_0(m_1,m_2,....m_n,x)$	$u = \min[q_i/m_i\alpha_i(u)],$ $x = \sum p_i m_i \beta_i(u),$
at constant prices.	where $\beta_i(u) = g_i(x/m_0).$
	Barten (1964)
$q_i/m_i = D_i(p_1m_1/x,..,p_nm_n/x)$	$u = U(q_1/m_1,....,q_n/m_n),$ $x = c(u,p_1m_1,...,p_nm_n).$
	Gorman (1976)
$qi/m_i = D_i(p_1m_1/x,..,p_nm_n/x)$	$u = U(q1/m_1,....,q_n/m_n),$ $x = \sum p_i\alpha_i(a) + c(u,p_1m_1,...,p_nm_n)$

Source: Muellbauer (1977), p. 463

preference). Accepting their line of reasoning, Gronau (1988) also views the methods based on the use of household expenditure data as meaningless for welfare comparisons because they cannot separate needs from wants. Blundell and Lewbel (1990), however, recommend using demand data for recovering the available information. They show that given the true values of equivalence scales in one price regime, Marshallian demands can be used to recover the true values of all equivalence scales in all other price regimes. Thus the assertions made by Pollak and Wales and Gronau seem too critical, as the demand data are capable of providing some important information which is helpful for deriving cost measures.

Another criticism leveled against the use of equivalence scales is that many different cost functions and hence many different equivalence scales may be recovered from the same expenditure data set. Suppose preferences are in fact described by the utility function $\mathbf{F[U(q_i,a_i),a_i]}$ where F is increasing in U. The cost function $\mathbf{C^F(u,p,a_i)}$ corresponding to preferences F will imply the same demands as cost function $\mathbf{C(u,p,a_i)}$ corresponding to preferences U. Blackorby and Donaldson (1988), Lewbel (1989), and Blundell and Lewbel (1990) focus on the extent to which intuitively attractive assumptions about equivalence scales narrow the range of possible specifications for preferences summarized by F. They assume scales to be independent of the reference utility level (IB). The assumption of IB is equivalent to assuming a single specification for F and consequently a unique set of equivalence scales. IB scales arise when the cost function can be written as:

$$C(u,p,a_i) = C^{*}(u,p) . C^{**}(p,a_i) \qquad \textbf{(12)}$$

and hence equivalence scales take the form:

$$m_i = \frac{C^{**}(p,a_i)}{C^{**}(p,a_r)} \qquad \textbf{(13)}$$

Despite having an attractive empirical appeal, this property has not been yet rigorously tested empirically. Its theoretical proof depends to a large degree on the additional assumption of homothetic preferences, which, in turn, has been empirically rejected.

2.3 The Model

The model followed in this chapter is based on the standard consumer expenditure system augmented with social and demographic variables. These variables are modelled as exogenous "shifts" in consumer choice. Let u represent the parental utility, or alternatively adult utility, which is given by:

$$u = u(q,a,z) \qquad \textbf{(14)}$$

where parental utility depends on the consumption of goods and services q, (in our case food or adult goods), the demographic characteristics of the household, a, (e.g., age-sex composition and family size), and other social, demographic and geographic characteristics, z, (e.g., education of household head, regional location, age of household head).

The budget constraint of the household is given by:

$$p.q = \sum_{i=1}^{i} p_i q_i \leq y \qquad (15)$$

From the maximization results we obtain the indirect utility function:

$$v(p,y,a,z) \equiv \max_q [u(q,a,z) : p.q \leq y,\ q \geq 0] \qquad (16)$$

Applying the logarithmic form of Roy's identity to the indirect utility function, we get the following expenditure share function:

$$w_i(p,y,a,z) = -\frac{\dfrac{\partial ln v(p,y,a,z)}{\partial ln p_i}}{\dfrac{\partial ln v(p,y,a,z)}{\partial ln y}} \qquad (17)$$

In the above formulation, for any given good the constraint $q_j \geq 0$ may be binding. In other words, households are not allowed to have consumed negative quantities.

The selection of econometric model has been determined by the availability of data and the objective of the study. Avariant of Working's (1943) model is adopted following Leser (1963), Deaton (1982), Deaton and

Case (1987), Deaton and Muellbauer (1986), and Deaton, Ruiz-Castillo and Thomas (1989) have employed varying forms of Working's basic model. The study uses the following specification:

$$w_i = \alpha_i + \beta_i \ln(\frac{X}{N}) + \eta_i \ln N + \sum_{j=1}^{j-1} \gamma_{ij}(\frac{N_j}{N}) + \delta_i Z + u \qquad (18)$$

where:

w_i = share of expenditure (on food/adult goods)

X/N = per-capita household expenditure

N = number of household members

N_j/N = proportion of household members in different age categories, and

Z = other socio-demographic factors.

In the above formulation, the logarithm of per-capita expenditures has been introduced to capture the effect of expenditures on the share devoted to a particular good. The logarithm of household size and the proportion of household members in different age categories have been included to study the effects of household composition on share. The sign pattern of coefficient for family size shows how demand patterns change with household scale. Having selected the functional form and the variables to be used in the estimation, the next step is to devise the estimating strategy for the share equation. For the food share equation, Ordinary Least Squares estimation is used. For the adult goods share equation, however, this method would result in biased and inconsistent estimates of coefficients (Tobin, 1958) because many households report zero expenditure on adult goods. Problems with models involving zero expenditures have been dealt by Deaton and Irish (1984), Kay, Keen, and Morris (1984), Keen (1986), and Heien and Wessells (1990). For this study, however, we use a method similar to the one used by Gronau (1974) and Lewis (1974) for analyzing labor market behavior. Chung and Goldberger (1984), Greene (1981), and Olsen (1980) have also used varying forms of such method. For this study, the following two-part model with selectivity has been used.

1. A probit regression is run that determines the probability that a given household will consume the adult good. The inverse Mills ratio for each household is computed from the regression estimates.

2. In the second step, the inverse Mills ratio is included in the estimating equation as an instrument to capture unobserved factors affecting the preference.

The estimates from this method are compared with those obtained from Ordinary Least Squares estimation. After the estimation of each model, the Engel food equivalence scale and Rothbarth Adult goods equivalence scales are calculated.

2.3.1 Engel Equivalence Scales

Suppose X^0 is the expense of a reference household, 2-adult aged 25-64 having no children, and X^h the expenses of a household having the same characteristics but with a child. Equating the food shares of the two households we obtain:

$$\alpha + \beta \ln(\frac{X^h}{N^h}) + \eta \ln N^h + \sum_{j=1}^{j-1} \gamma_{ij} \frac{N_j^h}{N} = \alpha + \beta \ln(\frac{X^0}{N^0}) + \eta \ln N^0 + \sum_{j=1}^{j-1} \gamma_{ij} \frac{N_j^0}{N} \qquad (19)$$

Solving for X^h/X^0, we obtain:

$$\frac{X^h}{X^0} = \frac{N^h}{N^0} \exp[-\frac{\eta}{\beta} \ln(\frac{N^h}{N^0}) - \sum \frac{\gamma_{ij}}{\beta}(N_j^h - N_j^0)] \qquad (20)$$

This will be evaluated for varying values of the number of children (C) and household size. The scale will be calculated as follows:

$$m(a^h) = (\frac{X^h}{X^0}) * (\frac{2}{C}) \qquad (21)$$

2.3.2 Rothbarth Equivalence Scales

From the estimates obtained, the calculation of equivalence scales involves the following steps.

(i) Calculation of estimated adult share for a reference household of two adults, setting all the control variables equal to the sample mean,

(ii) Calculation of total expenditure (X^0) by the reference household using the following formula:

$$X^0 = 2 * e^{\text{Mean of (LNPCE)}}$$

(iii) Calculation of expenses on adult goods ($X_A{}^0$) by the reference household. This is done by multiplying the results obtained in the previous two steps.

(iv) Calculation of total expenditures necessary to maintain $X_A{}^0$ with the variations in household size. In order to obtain these estimates we have to perform numerical procedure because a unique root cannot be obtained from the functional form presented above. The normalized equation can be written as follows[1] :

$$\hat{X}_A^0 X^{-1} - \hat{\beta} \ln X - [\hat{\alpha} + (\hat{\eta} - \hat{\beta}) \ln N + \sum_{j=1}^{j-1} \hat{\Upsilon}_{ij} \frac{N_j}{N}] = 0 \qquad \textbf{(22)}$$

The above expression will be evaluated for different values of N and N_i using a numerical approximation method.[2]

$$m(a^h) = (\frac{X^h}{X^0}) * (\frac{2}{C}) \qquad \textbf{(23)}$$

(v) Finally, the equivalence scale, $m(a^h)$, will be calculated as follows:where X^h

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[1] This normalized equation is from Bauer and Mason (1992).

[2]This has been done using Mathcad 4.0.

is the expenditure of the household in question, X^0 is the expenditure of the reference household, and C is the number of children. The difference between X^h and X^0 gives the cost of the child. In the above formula, 2 refers to the number of members in the reference household.

2.4 Data

The data used in this study are taken from the 1987 National Socio-economic Survey (SUSENAS) of Indonesia carried out by Indonesian Central Bureau of Statistics. Since 1981 SUSENAS has been conducted at three-year intervals. The 1987 SUSENAS includes information on 51,225 households consisting of 245,407 individuals. The survey was conducted throughout Indonesia using a multistage sampling design that differentiated between rural and urban areas. At the final sampling stage, households were selected from the chosen primary sampling unit in a systematic fashion. The Survey covers both urban and rural areas of all 27 provinces and records expenditure data for 15 major food categories and 6 major non-food categories. Besides these, information on education , income, and health was also collected.

SUSENAS is the best available data set for studying consumer behavior in Indonesia because of its detailed coverage of various food and non-food categories. Nevertheless, SUSENAS has some shortcomings. Evidence from the national accounts suggests that SUSENAS underestimates private consumption and that the discrepancy is widening over time. In 1969, the SUSENAS data amounted to over 80 percent of the estimate of household consumption expenditures contained in the national accounts; by 1980 this had dropped to 57 percent, although in 1987 the ratio had recovered to 62.5 percent (Booth, 1993). The possible sources of such discrepancies, to mention a few, are the following (World Bank, 1990):

1. SUSENAS does not adequately record the services and transfers provided by the government to the households;
2. SUSENAS may be underestimating the consumption expenditure by richer households; and
3. The own-produced consumption component may be underestimated.

For the estimation of adult equivalence scales, some exclusions were made from the total sample. Single-person households and households of unrelated individuals were excluded from the sample because of the differences between the consumption behaviors of such households and the households having children and made up of related individuals. We also excluded households which did not have any member aged 25-64 years, was headed by a member less than 15 years old, or did not report the age of either the head or the spouse of head. Thus, the final sample excluded 10.7 percent of the total sample. For the purpose of estimation, we recalculated the food expenditure, adult expenditure[3], and total expenditure from the sample rather than taking the reported values. This was done because of both the definitional differences[4] and the discrepancy between the calculated total expenditure and the one reported in SUSENAS[5]. Furthermore, 27 provinces have been categorized under four regions on the basis of geographical proximity.[6] The four regions and the provinces associated with them are as follows,

Region 1	Region 2	Region 3	Region 4
Aceh	Bali	East Kalimantan	Maluku
Riau	East Java	West Kalimantan	East Timor
Jambi	West Java	South Kalimantan	Irian Jaya
Lampung	Central Java	Central Kalimantan	East Nusa Tenggara
Bengkulu	DKI Jakarta	North Sulawesi	West Nusa Tenggara
West Sumatera	D.I. Yogyakarta	South Sulawesi	
North Sumatera		Central Sulawesi	
South Sumatera		South-East Sulawesi	

Tables 2.2 and 2.3 provide the definitions, means, and standard deviations of the variables used in this study.

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[3]Adult expenditure is the expenditure incurred on alcohol, tobacco, and betel-nut. The methodology adopted for the selection of adult goods is explained in Appendix 1.

[4]SUSENAS includes alcohol, tobacco, and betel-nut (adult goods in our terminology) in the food expenditure.

[5]This problem was discovered by van de Walle (1988). He found that the calculated total expenditure using the method followed in SUSENAS is greater than the reported total expenditure.

[6]The government of Indonesia and Demographic and Health Surveys conducted by the Indonesia Central Bureau of Statistics, the National Family Planning Coordinating Board and the Ministry of Health use three groupings: Java and Bali, Outer Islands I, and Outer Islands II.

Table 2.2

Definition of Variables Used in Estimations

Variable	Definition
WF	Share of food in total household expenditure
WA	Share of adult goods in total household expenditure
LNPCE	Natural log of par-capita monthly expenditure
LNSIZE	Natural log of household size
PC0-6	Proportion of children aged 0-6
PC7-15	Proportion of children aged 7-15
PM0-6	Proportion of male children aged 0-6
PM7-15	Proportion of male children aged 7-15
PF0-6	Proportion of female children aged 0-6
PF7-15	Proportion of female children aged 7-15
PM16-24	Proportion of male members aged 16-24
PM65UP	Proportion of male members aged 65 and above
PF16-24	Proportion of female members aged 16-24
PF65UP	Proportion of female members aged 65 and above
FHEAD	Head is female (Dummy variable=1)
HDAGE	Age of household head
HDAGESQ	Age of household head squared
SAGE	Age of head's spouse
SAGESQ	Age of head's spouse squared
REG2	Resident of region 2 (Dummy variable=1)
REG3	Resident of region 3 (Dummy variable=1)
REG4	Resident of region 4 (Dummy variable=1)
HPRIM	Head has primary schooling (Dummy variable=1)
HSEC	Head has secondary schooling (Dummy variable=1)
HHIGH	Head has higher education (Dummy variable=1)
SPRIM	Spouse has primary schooling (Dummy variable=1)
SSEC	Spouse has secondary education (Dummy variable=1)
SHIGH	Spouse has higher education (Dummy variable=1)
AGRI	Agricultural occupation (Dummy variable=1)
IND	Employed in industries (Dummy variable=1)
TRADE	Engaged in trade (Dummy variable=1)
SERVICE	Employed in service sector (Dummy variable=1)
EARNER	Number of wage/salary earners in household
OWNFOOD	Share of self-produced food

Table 2.3

Means and Standard Deviations of the Variables Used in Estimations

Variable	Total		Urban		Rural	
	Mean	S.D.	Mean	S.D	Mean	S.D.
WF	0.6401	0.1403	0.5514	0.1333	0.6794	0.1245
WA	0.0535	0.0490	0.0508	0.0509	0.0547	0.0481
LNPCE	9.9130	0.5777	10.3090	0.5726	9.7378	0.4860
LNSIZE	1.5366	0.4287	1.5906	0.4377	1.5128	0.4225
PC0-6	0.1708	0.1793	0.1637	0.1792	0.1740	0.1792
PC7-15	0.2099	0.1953	0.1967	0.1935	0.2157	0.1958
PM0-6	0.0880	0.1324	0.0853	0.1308	0.0892	0.1331
PM7-15	0.1086	0.1428	0.1016	0.1378	0.1117	0.1449
PF0-6	0.0828	0.1293	0.0784	0.1263	0.0848	0.1305
PF7-15	0.1013	0.1374	0.0951	0.1323	0.1040	0.1395
PM16-24	0.0675	0.1236	0.0827	0.1334	0.0607	0.1184
PF16-24	0.0163	0.1345	0.0128	0.1424	0.0179	0.1302
PM65UP	0.0861	0.0694	0.1030	0.0596	0.0787	0.0733
PF65UP	0.0123	0.0551	0.0113	0.0523	0.0127	0.0563
FHEAD	0.0951	0.2934	0.0950	0.2933	0.0951	0.2934
HDAGE	43.0830	12.5100	42.6870	12.2630	43.2580	12.6140
HDAGESQ	2012.6000	1184.7000	1972.5000	1153.5000	2030.4000	1197.9000
SAGE	37.9670	11.9920	37.6890	11.8660	38.0900	12.0460
SAGESQ	1585.3000	1017.4000	1561.2000	1007.3000	1595.9000	1021.6000
REG2	0.3886	0.4874	0.4326	0.4955	0.3691	0.4826
REG3	0.1905	0.3927	0.1784	0.3829	0.1959	0.3969
REG4	0.1770	0.3817	0.1675	0.3734	0.1813	0.3852
HPRIM	0.5573	0.4967	0.4219	0.4939	0.6172	0.4861
HSEC	0.2233	0.4165	0.4096	0.4918	0.1409	0.3479
HHIGH	0.0338	0.1808	0.0879	0.2832	0.0099	0.0990
SPRIM	0.5459	0.4979	0.4854	0.4998	0.5727	0.4947
SSEC	0.1668	0.3728	0.3431	0.4748	0.0888	0.2844
SHIGH	0.0128	0.1125	0.0342	0.1817	0.0034	0.0580
AGRI	0.4995	0.5000	0.0711	0.2570	0.6891	0.4629
IND	0.0538	0.2257	0.0871	0.2819	0.0391	0.1939
TRADE	0.1304	0.3368	0.2328	0.4226	0.0851	0.2791
SERVICE	0.1692	0.3749	0.3283	0.4696	0.0988	0.2984
EARNER	0.6671	0.8218	0.8835	0.8356	0.5713	0.7971
OWNFOOD	0.1391	0.2039	0.0136	0.0664	0.1946	0.2191
URBAN	0.3068	0.4612				
SAMPLE	45,753		14,036		31,717	

2.5 Empirical Results

Empirical results are presented separately for Engel and Rothbarth scales. The estimation has been done separately for total, urban, and rural areas because of the behavioral differences anticipated due to location. One econometric issue, which is still unresolved, is the issue related to the consideration of sample design in the estimation process. The question is whether or not to use inverse probability weights in the estimation. The multistage sampling design of SUSENAS may provide non-independent error terms across households leading to an inefficient, yet consistent, estimates. Holt and Scott (1981), Scott and Holt (1982), and DuMouchel and Duncan (1983) have all dealt with this issue . However, the empirical results from these studies point that the empirical inferences will not be significantly affected by leaving aside the sample design issue. For this study, we do not consider this issue.

2.5.1 Engel Food Share Method

The Ordinary Least Squares estimates of the food share equation are presented in Tables 2.4 and 2.5. In Table 2.4 the estimates for the total sample are reported. Table 2.5 provides the estimates for urban and rural samples. All estimated equations had heteroskedastic residuals resulting in

Table 2.4

Results from Engel Food Share Method
(Total Sample)

Variable	Coefficient	Standard Error+
CONSTANT	1.98400*	0.01593
LNPCE	-0.12577*	0.00139
LNSIZE	-0.03168*	0.00192
PC06	0.03197*	0.00510
PC715	0.03130*	0.00443
PM1624	-0.01199**	0.00540
PM65UP	0.01270	0.00922
PF1624	-0.00425	0.00474
PF65UP	-0.02324**	0.01032
FHEAD	0.00479**	0.00206
HDAGE	0.00036	0.00041
HDAGESQ	-1.90E-5	4.18E-5
SAGE	-0.00015	0.00041
SAGESQ	-3.70E-5	4.57E-5
REG2	-0.07598*	0.00129
REG3	-0.02187*	0.00154
REG4	-0.04895*	0.00164
HPRIM	-0.00842*	0.00165
HSEC	-0.01894*	0.00228
HHIGH	-0.02441*	0.00395
SPRIM	-0.00471*	0.00146
SSEC	-0.01654*	0.00227
SHIGH	-0.01996*	0.00558
AGRI	0.02212*	0.00173
IND	0.00395	0.00243
TRADE	-0.00108	0.00189
SERVICE	-0.00116	0.00182
EARNER	0.00131	0.00067
OWNFOOD	-0.03183*	0.00314
URBAN	-0.03119*	0.00143
Adj. R^2		0.4492
F ratio	1287.8540	
Sample Size	45,753	

+ Corrected for Heteroskedasticity.
* Significant at 1% ** Significant at 5%

Table 2.5

Results from Engel Food Share Method

Variable	Urban		Rural	
	Coefficient	Standard Error+	Coefficient	Standard Error+
CONSTANT	2.06620*	0.02374	1.93290*	0.02180
LNPCE	- 0.13670*	0.00194	- 0.12065*	0.00194
LNSIZE	- 0.04468*	0.00326	- 0.02314*	0.00242
PC0-6	0.03407*	0.00880	0.02377*	0.00626
PC7-15	0.02738*	0.00768	0.02687*	0.00546
PM16-24	- 0.02235**	0.00899	- 0.00901	0.00674
PM65UP	0.01902	0.01909	0.01022	0.01048
PF16-24	- 0.00473	0.00796	- 0.00584	0.00587
PF65UP	- 0.02321	0.01960	- 0.02730**	0.01216
FHEAD	- 0.00034	0.00354	0.00830*	0.00252
HDAGE	0.00242*	0.00071	- 0.00048	0.00048
HDAGESQ	- 0.00002*	7.41E-5	6.98E-5	4.88E-5
SAGE	- 0.00251*	0.00073	0.00076	0.00048
SAGESQ	0.00002*	8.15E-5	- 0.00001*	5.32E-5
REG2	- 0.05159*	0.00228	- 0.08627*	0.00159
REG3	- 0.00771**	0.00290	- 0.02706*	0.00181
REG4	- 0.03891*	0.00291	- 0.05124*	0.00199
HPRIM	- 0.00362	0.00402	- 0.00920*	0.00180
HSEC	- 0.01371*	0.00464	- 0.02026*	0.00277
HHIGH	- 0.01250**	0.00593	- 0.04268*	0.00734
SPRIM	- 0.00316	0.00323	- 0.00513*	0.00163
SSEC	- 0.01291*	0.00395	- 0.01763*	0.00305
SHIGH	- 0.01619**	0.00689	- 0.02771**	0.01197
AGRI	0.02177*	0.00421	0.01867*	0.00223
IND	0.00059	0.00327	0.00177	0.00361
TRADE	0.00081	0.00247	- 0.00244	0.00292
SERVICE	0.00056	0.00234	- 0.00550	0.00292
EARNER	0.00419*	0.00119	0.00148	0.00081
OWNFOOD	- 0.00163	0.01478	- 0.03302*	0.00325
Adjusted R^2	0.4148		0.2956	
F Ratio	356.3095		476.3148	
Sample Size	14,036		31,717	

+ Corrected for Heteroskedasticity.

* Significant at 1%   ** Significant at 5% .

inefficient, yet unbiased and consistent parameter estimates. Hence, a method suggested by White (1980) has been used to correct the standard errors for the presence of heteroskedasticity.

For all the estimates the coefficient of per capita expenditure is negative and statistically significant, implying that food share declines as per capita income (expenditure) grows -- a validation of Engel's law. The effect, however, is higher in urban areas. Log family size also has a negative and statistically significant effect on food share. The negative coefficient implies the existence of economies of scale in the consumption of food. The effect of household composition (represented by the proportion of members in a particular age group to household size) declines with age for the total and urban samples but for the rural sample the effect is highest for the age group 7-15. The coefficients for two child categories (PC06 and PC715) are positive and significant. Hence, if the per capita expenditures are held constant, the addition of any children will lead to reallocation of expenditure towards food. However, the negativity of other compositional variables does not imply that the household will demand less food as members in that group increase. For example, an additional member, say in age group 16-24, will lead to a decline in per capita expenditure thereby raising the food share because of the inverse relationship between food share and per capita expenditure. Hence, the positive effect on food share operating through the income terms will offset the negative effect of demographic terms (Deaton, Ruiz-Castillo, and Thomas, 1989).

The food equivalence scales calculated from the estimated models are given in tables 2.6 and 2.7. The reference household is a 2-adult household aged 25-64 years. The scales are calculated at the mean of per capita expenditure. The estimated scales suggest that children aged 0-6 and 7-15 cost about 0.95 and 0.94 of an adult respectively when the whole sample is taken into consideration. But the estimation done by splitting the sample into urban and rural areas gives a different picture. In urban areas children aged 0-6 and 7-15 cost 0.86 and 0.81 of an adult, whereas in rural areas these values are 0.96 and 0.99. The estimates provide the evidence of economies of scale in child consumption. In urban areas the scale for children aged 0-6 declines from 0.86 for one child to 0.81 for two children. In rural areas it declines from 0.96 to 0.93 . These scales seem very high compared to the scales found in other ASEAN countries. However, they are lower than the scales estimated by Deaton and Muellbauer (1986) for children aged greater than 5 years old using 1978 SUSENAS. Their estimates based on total sample are as follows,

Child's Age	With 1 Child	With 2 Children
0-5	0.90	0.86
> 5	1.16	1.22

Tsakloglou (1991) also found these scales to be on the higher side for Greece.

Table 2.6

Engel's Adult Equivalence Scales
(Total Sample)

Children Aged 0-6	Children Aged 7-15				
	0	1	2	3	4
0		0.94 (0.0243)	0.90 (0.0223)	0.87 (0.0210)	0.84 (0.0201)
1	0.95 (0.0295)	0.90 (0.0214)	0.87 (0.0193)	0.84 (0.0186)	0.82 (0.0183)
2	0.91 (0.0270)	0.87 (0.0219)	0.85 (0.0194)	0.82 (0.0184)	0.80 (0.0180)
3	0.87 (0.0252)	0.85 (0.0224)	0.82 (0.0200)	0.80 (0.0188)	0.78 (0.0183)
4	0.85 (0.0239)	0.82 (0.0227)	0.80 (0.0205)	0.78 (0.0194)	0.77 (0.0188)

Figures within parentheses are standard errors.

Table 2.7

Engel's Adult Equivalence Scales
(Urban / Rural)

Children Aged 0-6	Children Aged 7-15				
	0	1	2	3	4
			Urban		
0		0.81 (0.0323)	0.76 (0.0289)	0.73 (0.0270)	0.70 (0.0259)
1	0.86 (0.0149)	0.78 (0.0295)	0.74 (0.0257)	0.71 (0.0245)	0.68 (0.0242)
2	0.81 (0.0372)	0.75 (0.0315)	0.72 (0.0270)	0.69 (0.0252)	0.66 (0.0246)
3	0.77 (0.0341)	0.73 (0.0327)	0.70 (0.0285)	0.67 (0.0266)	0.65 (0.0257)
4	0.74 (0.0320)	0.70 (0.0334)	0.68 (0.0298)	0.65 (0.0279)	0.63 (0.0269)
			Rural		
0		0.99 (0.0328)	0.96 (0.0307)	0.93 (0.0292)	0.91 (0.0283)
1	0.96 (0.0380)	0.94 (0.0285)	0.92 (0.0265)	0.90 (0.0258)	0.89 (0.0255)
2	0.93 (0.0353)	0.91 (0.0290)	0.90 (0.0263)	0.88 (0.0252)	0.87 (0.0249)
3	0.91 (0.0334)	0.89 (0.0296)	0.88 (0.0268)	0.86 (0.0256)	0.85 (0.0250)
4	0.89 (0.0320)	0.87 (0.0300)	0.86 (0.0274)	0.85 (0.0262)	0.83 (0.0250)

Figures within parentheses are standard errors.

From tables 2.6 and 2.7 we observe that for total and urban samples children aged 0-6 cost more than children aged 7-15 but for the rural samplewe get the opposite result. But the differences in scales between the two groups of children are not statistically significant (Table 2.8). The difference between the urban and rural child, however, is mostly significant ang large (Table 2.9). From this table we see that the relative cost of rural children is higher than urban children. This may be the result of imputed values for the home/self produced food items. About 20 percent of food consumption in rural areas consist of home/self produced goods which are not purchased in the market. In other words, non-monetary consumption assumes a significant proportion of food consumption of rural households. The reported food expenditure -- the imputed values, therefore, may be an over-estimation of true consumption because there exists a large differential in production and consumption quantities due to wastage and other factors. The differential in scales between the urban and rural children, however, is much more pronounced for older children[7]. This may also indicate the importance of older children in household chores, agriculture, taking care of older siblings and other activities in rural areas.

Tables 2.10 provides the scale estimates for male and female children for the total sample. The estimates for urban and rural samples are given in tables 2.11 and 2.12. In the total and urban samples, the cost of a female

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[7]Differences in scales are significant at 1 % level of significance.

Table 2.8

Difference in Engel Scales between Children aged 0-6 and 7-15

Number of Children in each Age Group	Difference in Scales	Standard Error	Significance Level
	Total		
1	0.00526	0.02982	0.8600
2	0.00510	0.02893	0.8601
3	0.00494	0.02805	0.8601
4	0.00480	0.02725	0.8601
	Urban		
1	0.04626	0.0472	0.3267
2	0.04371	0.0447	0.3278
3	0.04156	0.0425	0.3285
4	0.03975	0.0407	0.3291
	Rural		
1	-0.02550	0.0379	0.5010
2	-0.02499	0.0371	0.5007
3	-0.02445	0.0363	0.5005
4	-0.02394	0.0355	0.5003

Table 2.9

Difference in Engel Scales between Urban and Rural Child

Number of Children in each Age Group	Difference in Scales	Standard Error	Significance Level
	Children Aged 0-6		
1	-0.10865	0.0677	0.1084
2	-0.12612**	0.0654	0.0538
3	-0.13890**	0.0635	0.0287
4	-0.14874**	0.0620	0.0163
	Children Aged 7-15		
1	- 0.18019*	0.0570	0.0016
2	- 0.19461*	0.0549	0.0004
3	- 0.20470*	0.0532	0.0001
4	- 0.21223*	0.0519	0.0000

* Significant at 1 % level of significance.
** Significant at 5 % level of significance.

Table 2.10

Engel's Adult Equivalence Scales: Male / Female
(Total Sample)

Children Aged 0-6	Children Aged 7-15				
	0	1	2	3	4
			Male		
0		0.92 (0.0289)	0.88 (0.0265)	0.85 (0.0248)	0.82 (0.0236)
1	0.95 (0.0347)	0.89 (0.2400)	0.86 (0.0217)	0.83 (0.0209)	0.81 (0.0205)
2	0.90 (0.0318)	0.86 (0.0251)	0.83 (0.0217)	0.81 (0.0203)	0.79 (0.0197)
3	0.87 (0.0296)	0.84 (0.0259)	0.81 (0.0225)	0.79 (0.0208)	0.77 (0.0200)
4	0.84 (0.0280)	0.82 (0.0264)	0.80 (0.0233)	0.78 (0.0215)	0.76 (0.0205)
			Female		
0		0.97 (0.0316)	0.92 (0.0291)	0.89 (0.0273)	0.86 (0.0260)
1	0.95 (0.0355)	0.92 (0.0252)	0.89 (0.0232)	0.86 (0.0224)	0.84 (0.0220)
2	0.91 (0.0326)	0.88 (0.0260)	0.86 (0.0227)	0.83 (0.0214)	0.82 (0.0209)
3	0.88 (0.0304)	0.85 (0.0267)	0.83 (0.0233)	0.81 (0.0217)	0.80 (0.0208)
4	0.85 (0.0287)	0.83 (0.0271)	0.81 (0.0240)	0.79 (0.0222)	0.78 (0.0213)

Table 2.11

Engel's Adult Equivalence Scales: Male / Female
(Urban)

Children Aged 0-6	Children Aged 7-15				
	0	1	2	3	4
			Male		
0		0.77 (0.0380)	0.73 (0.0336)	0.69 (0.0310)	0.67 (0.0293)
1	0.82 (0.0473)	0.75 (0.0325)	0.71 (0.0278)	0.68 (0.0263)	0.65 (0.0258)
2	0.78 (0.0418)	0.72 (0.0356)	0.69 (0.0295)	0.66 (0.0270)	0.64 (0.0259)
3	0.74 (0.0380)	0.70 (0.0375)	0.67 (0.0316)	0.64 (0.0287)	0.62 (0.0273)
4	0.71 (0.0353)	0.68 (0.0386)	0.65 (0.0334)	0.63 (0.0304)	0.61 (0.0288)
			Female		
0		0.85 (0.0443)	0.80 (0.0395)	0.76 (0.0362)	0.73 (0.0339)
1	0.89 (0.0535)	0.82 (0.0362)	0.77 (0.0316)	0.74 (0.0299)	0.71 (0.0290)
2	0.84 (0.0477)	0.79 (0.0387)	0.75 (0.0323)	0.72 (0.0296)	0.69 (0.0284)
3	0.80 (0.0435)	0.76 (0.0403)	0.72 (0.0341)	0.70 (0.0309)	0.68 (0.0292)
4	0.77 (0.0404)	0.73 (0.0413)	0.70 (0.0356)	0.68 (0.0324)	0.66 (0.0305)

Figures within parentheses are standard errors.

Table 2.12

Engel's Adult Equivalence Scales: Male / Female
(Rural)

Children Aged 0-6	Children Aged 7-15				
	0	1	2	3	4
			Male		
0		0.98 (0.0389)	0.94 (0.0365)	0.92 (0.0348)	0.90 (0.0335)
1	0.97 (0.0453)	0.94 (0.0324)	0.92 (0.0302)	0.90 (0.0295)	0.88 (0.0292)
2	0.94 (0.0424)	0.92 (0.0335)	0.90 (0.0298)	0.88 (0.0284)	0.86 (0.0279)
3	0.92 (0.0402)	0.90 (0.0344)	0.88 (0.0306)	0.86 (0.0287)	0.85 (0.0279)
4	0.90 (0.0384)	0.88 (0.0351)	0.86 (0.0314)	0.85 (0.0294)	0.83 (0.0284)
			Female		
0		1.00 (0.0415)	0.97 (0.0391)	0.95 (0.0373)	0.92 (0.0359)
1	0.95 (0.0444)	0.95 (0.0329)	0.93 (0.0312)	0.91 (0.0307)	0.89 (0.0305)
2	0.92 (0.0414)	0.91 (0.0336)	0.90 (0.0303)	0.89 (0.0291)	0.87 (0.0287)
3	0.90 (0.0392)	0.89 (0.0345)	0.88 (0.0308)	0.86 (0.0291)	0.85 (0.0284)
4	0.87 (0.0375)	0.87 (0.0351)	0.86 (0.0316)	0.85 (0.0297)	0.84 (0.0288)

Figures within parentheses are standard errors.

child is higher than the cost of a male child. A male child aged 0-6 living in an urban area costs about 0.82 of an adult but a female child of the same age also living inan urban area costs about 0.89. The results are different for rural areas, amale child aged 0-6 cost about 0.97 but a female of the same group cost about 0.95. For age group 7-15, however, the cost is higher for female children. But the difference in scales between children aged 0-6 and 7-15 for both sexes and all sample groupings are not statistically significant (Tables 2.13 and 2.14). The differences in scales between male and female children are also not statistically significant (Tables 2.15 and 2.16). This may indicate the absence of gender discrimination in household expenses. A definitive conclusion can not be made, however, in the absence of information about intra-family distribution of resources.

The test of difference between urban and rural children by sex provides different results for younger and older and children. The difference in scales for male children is mostly significant for both age groups. But the difference for female children is statistically significant only for older children (Table 2.17). The higher scales for rural male children, especially in 7-15 age group, provides some evidence of the importance of this age group in family labor allocation.

Table 2.13

Difference in Engel Scales between Male Children aged 0-6 and 7-15

Number of Children in each Age Group	Difference in Scales	Standard Error	Significance Level
	Total		
1	0.02324	0.03948	0.5561
2	0.02249	0.03824	0.5564
3	0.02178	0.03704	0.5562
4	0.02113	0.03596	0.5568
	Urban		
1	0.05137	0.0625	0.4114
2	0.04826	0.0589	0.4125
3	0.04572	0.0559	0.4133
4	0.04362	0.0534	0.4139
	Rural		
1	-0.00045	0.0501	0.9928
2	-0.00044	0.0491	0.9928
3	-0.00043	0.0480	0.9928
4	-0.00042	0.0470	0.9928

Table 2.14

Difference in Engel Scales between Female Children aged 0-6 and 7-15

Number of Children in each Age Group	Difference in Scales	Standard Error	Significance Level
	Total		
1	-0.01497	0.0416	0.7191
2	-0.01455	0.0404	0.7190
3	-0.01412	0.0392	0.7189
4	-0.01373	0.0381	0.7188
	Urban		
1	0.03904	0.0666	0.5574
2	0.03713	0.0634	0.5580
3	0.03544	0.0606	0.5585
4	0.03398	0.0581	0.5588
	Rural		
1	-0.05245	0.0527	0.3197
2	-0.05141	0.0516	0.3192
3	-0.05031	0.0505	0.3189
4	-0.04927	0.0494	0.3185

Table 2.15

Difference in Engel Scales between Male and Female Children
(Children Aged 0-6)

Number of Children in Age Group 0-6	Difference in Scales	Standard Error	Significance Level
	Total		
1	-0.00568	0.0400	0.8872
2	-0.00551	0.0388	0.8872
3	-0.00534	0.0377	0.8872
4	-0.00519	0.0366	0.8872
	Urban		
1	-0.06361	0.0674	0.3454
2	-0.06037	0.0639	0.3448
3	-0.05754	0.0608	0.3442
4	-0.05512	0.0582	0.3435
	Rural		
1	0.02287	0.0492	0.6417
2	0.02237	0.0481	0.6418
3	0.02186	0.0470	0.6419
4	0.02138	0.0460	0.6419

Table 2.16

Difference in Engel Scales between Male and Female Children
(Children Aged 7-15)

Number of Children in Age Group 7-15	Difference in Scales	Standard Error	Significance Level
	Total		
1	-0.04388	0.0388	0.2574
2	-0.04255	0.0376	0.2572
3	-0.04124	0.0364	0.2569
4	-0.04005	0.0353	0.2566
	Urban		
1	-0.07594	0.0654	0.2452
2	-0.07149	0.0614	0.2443
3	-0.06782	0.0581	0.2434
4	-0.06476	0.0554	0.2425
	Rural		
1	-0.02912	0.0478	0.5424
2	-0.02860	0.0469	0.5423
3	-0.02802	0.0460	0.5422
4	-0.02747	0.0451	0.5421

Table 2.17

Difference in Engel Scales between Urban and Rural Children by Sex

Number of Children in Age Group 0-6	Difference in Scales	Standard Error	Significance Level
	Male		
1	-0.15036**	0.0802	0.0607
2	-0.16596**	0.0775	0.0323
3	-0.17709**	0.0753	0.0187
4	-0.18552*	0.0734	0.0115
	Female		
1	-0.06429	0.0804	0.4241
2	-0.08361	0.0782	0.2848
3	-0.09806	0.0761	0.1978
4	-0.10936	0.0744	0.1416
Number of Children in Age Group 7-15	**Difference in Scales**	**Standard Error**	**Significance Level**
	Male		
1	-0.20229*	0.0701	0.0039
2	-0.21475*	0.0674	0.0014
3	-0.22333*	0.0653	0.0006
4	-0.22964*	0.0636	0.0003
	Female		
1	-0.15532**	0.0714	0.0295
2	-0.17171*	0.0693	0.0132
3	-0.18338*	0.0675	0.0066
4	-0.19220*	0.0660	0.0036

* Significant at 1 % level of significance.
** Significant at 5 % level of significance.

2.5.2 Rothbarth's Method

The estimated adult goods share equations for total, urban, and rural areas are given in tables 2.18, 2.19 and 2.20. The estimates are provided forboth the Ordinary Least Squares method and the 2-step method. The estimated coefficients from the two methods are comparable because the second step of the 2-step estimation is also Ordinary Least Squares. As in the food share method, the standard errors have been corrected for heteroskedasticity. It can be seen from the estimates that children reduce the expenses going to adult goods. The coefficients are both negative and significant implying that in order to make allowance for child needs parents have to curtail expenses going to adult only goods. In absolute terms the coefficient for children aged 7-15 is higher than for children aged 0-6. The share devoted to adult goods declines with the family size. The per capita expenditure exerts an upward effect in the share in the total and rural sample and negative effect in urban sample which means that the expenses on these items are expenditure elastic for total and rural samples.

The estimated Rothbarth scales are given in Table 2.21. The estimates from the 2-step model have been used in the calculation of scales. These estimates suggest that, on the average, a child aged 0-6 costs about 0.18 of an adult for the total sample and 0.15 and 0.20 in urban and rural areas. A child aged 7-15 needs about 0.27 of an adult's expenses for the total sample

Table 2.18

Results from Adult Goods Share Method
(Total Sample)

Variable	OLS		2-STEP	
	Coefficient	Standard Error+	Coefficient	Standard Error+
Constant	0.08556*	0.00621	0.11983*	0.00526
LNPCE	0.00345*	0.00051	0.00169*	0.00044
LNSIZE	-0.00047	0.00089	-0.00432*	0.00077
PC06	-0.02607*	0.00244	-0.02908*	0.00208
PC715	-0.03630*	0.00208	-0.04121*	0.00179
PM1624	-0.00291	0.00267	-0.00276	0.00228
PM65UP	-0.01848*	0.00421	-0.02068*	0.00366
PF1624	-0.02612*	0.00227	-0.02850*	0.00191
PF65UP	-0.02731*	0.00455	-0.03398*	0.00397
FHEAD	-0.02429*	0.00091	-0.02169*	0.00075
HDAGE	0.00034	0.00019	0.00014	0.00016
HDAGESQ	-5.89E-5*	1.92E-5	-4.02E-5**	1.64E-5
SAGE	-0.00156*	0.00019	-0.00164*	0.00016
SAGESQ	0.00002*	2.07E-5	0.00002*	1.77E-5
REG2	-0.01440*	0.00060	-0.01680*	0.00051
REG3	-0.00706*	0.00074	-0.00481*	0.00062
REG4	-0.01455*	0.00069	-0.01693*	0.00061
HPRIM	-0.00063	0.00073	0.00006	0.00066
HSEC	-0.00386*	0.00104	-0.00194**	0.00089
HHIGH	-0.01814*	0.00172	-0.01860*	0.00135
SPRIM	-0.00186*	0.00066	-0.00170*	0.00058
SSEC	-0.00946*	0.00102	-0.00955*	0.00084
SHIGH	-0.01619*	0.00230	-0.01819*	0.00177
AGRI	-0.00509*	0.00080	-0.00846*	0.00067
IND	-0.00069	0.00118	-0.00150	0.00096
TRADE	-0.00206**	0.00090	-0.00247*	0.00073
SERVICE	-0.00176**	0.00089	-0.00097	0.00072
EARNER	0.00015*	0.00030	0.00010	0.00026
URBAN	-0.00323*	0.00067	-0.00185*	0.00054
Lambda			0.03801*	0.00019
Adj. R^2		0.0703		0.0928
F ratio		124.5678		130.2757

+ Corrected for Heteroskedasticity.
* Significant at 1% ** Significant at 5%

Table 2.19

Results from Adult Goods Share Method
(Urban Sample)

Variable	OLS		2-STEP	
	Coefficient	Standard Error+	Coefficient	Standard Error+
CONSTANT	0.16362*	0.01096	0.26396*	0.01468
LNPCE	-0.00316*	0.00082	-0.01013*	0.00109
LNSIZE	-0.00610*	0.00154	-0.01668*	0.00199
PC0-6	-0.02193*	0.00453	-0.02299*	0.00606
PC7-15	-0.03233*	0.00375	-0.03613*	0.00496
PM16-24	-0.00778	0.00460	-0.01036	0.00590
PM65UP	-0.03081*	0.00949	-0.03045**	0.01187
PF16-24	-0.03222*	0.00401	-0.03217*	0.00532
PF65UP	-0.02775*	0.00960	-0.04013*	0.01191
FHEAD	-0.02884*	0.00161	-0.01543*	0.00236
HDAGE	0.00042	0.00036	-5.50E-5	0.00047
HDAGESQ	-8.31E-5**	3.70E-5	3.96E-5	4.75E-5
SAGE	-0.00161*	0.00034	-0.00145*	0.00045
SAGESQ	0.00002*	3.79E-5	0.00001*	4.97E-5
REG2	-0.01080*	0.00111	-0.01261*	0.00143
REG3	-0.00702**	0.00139	-0.00145	0.00188
REG4	0.01322*	0.00135	-0.01608*	0.00163
HPRIM	-0.00402	0.00214	-0.00225	0.00275
HSEC	-0.00751*	0.00242	-0.00256	0.00310
HHIGH	-0.02067*	0.00287	-0.01429*	0.00361
SPRIM	-0.00344**	0.00167	-0.00115	0.00211
SSEC	-0.01123*	0.00196	-0.00837*	0.00247
SHIGH	-0.01575*	0.00297	-0.01411*	0.00379
AGRI	-0.00524*	0.00173	-0.01206*	0.00213
IND	-0.00053	0.00162	-0.00137	0.00210
TRADE	-0.00250**	0.00119	-0.00177	0.00153
SERVICE	-0.00322*	0.00114	-0.00118	0.00143
EARNER	0.00251*	0.00060	0.00224*	0.00071
Labmda			0.02296*	0.00088
Adjusted R^2	0.0911		0.1216	
F Ratio	53.0864		50.1146	

+ Corrected for Heteroskedasticity.
* Significant at 1% ** Significant at 5% .

Table 2.20

Results from Adult Goods Share Method
(Rural Sample)

Variable	OLS		2-STEP	
	Coefficient	Standard Error+	Coefficient	Standard Error+
CONSTANT	0.03699*	0.00783	0.08982*	0.00793
LNPCE	0.00757*	0.00067	0.00490*	0.00067
LNSIZE	0.00392*	0.00111	-0.00301*	0.00110
PC0-6	-0.03098*	0.00290	-0.02956*	0.00287
PC7-15	-0.04076*	0.00253	-0.03892*	0.00251
PM16-24	-0.00199	0.00328	-0.00015	0.00324
PM65UP	-0.01576*	0.00468	-0.01559*	0.00467
PF16-24	-0.02317*	0.00275	-0.02192*	0.00273
PF65UP	-0.02986*	0.00510	-0.03667*	0.00516
FHEAD	-0.02120*	0.00111	-0.00870*	0.00113
HDAGE	0.00037	0.00022	-0.00003	0.00022
HDAGESQ	-5.46E-5**	2025E-5	-1.54E-5	2.22E-5
SAGE	-0.00157*	0.00023	-0.00154*	0.00022
SAGESQ	0.00002*	2.47E-5	0.00002*	2.47E-5
REG2	-0.01493*	0.00073	-0.01515*	0.00071
REG3	-0.00668**	0.00087	-0.00083	0.00086
REG4	-0.01355*	0.00081	-0.01487*	0.00080
HPRIM	0.00019	0.00077	0.00120	0.00076
HSEC	-0.00299**	0.00124	0.00160	0.00121
HHIGH	-0.01495*	0.00351	-0.00554	0.00350
SPRIM	-0.00134	0.00071	-0.00069	0.00069
SSEC	-0.00740*	0.00135	-0.00446*	0.00133
SHIGH	-0.01894*	0.00550	-0.01172**	0.00569
AGRI	-0.00456*	0.00106	-0.01051*	0.00105
IND	-0.00294	0.00174	-0.00382**	0.00171
TRADE	-0.00105	0.00139	-0.00207	0.00137
SERVICE	-0.00207	0.00143	0.00030	0.00142
EARNER	-0.00048	0.00034	-0.00081**	0.00033
Labmda			0.01206*	0.00044
Adjusted R^2	0.0681		0.0873	
F Ratio	86.8544		92.3249	

+ Corrected for Heteroskedasticity.
* Significant at 1% ** Significant at 5% .

Table 2.21

Rothbarth's Adult Equivalence Scales

Children Aged 0-6	Children Aged 7-15				
	0	1	2	3	4
			Total		
0		0.27	0.22	0.19	0.17
1	0.18	0.19	0.17	0.15	0.14
2	0.16	0.15	0.14	0.13	0.12
3	0.13	0.12	0.12	0.11	0.11
4	0.11	0.11	0.11	0.10	0.10
			Urban		
0		0.24	0.19	0.16	0.15
1	0.15	0.16	0.14	0.13	0.12
2	0.13	0.13	0.12	0.11	0.11
3	0.11	0.11	0.10	0.10	0.09
4	0.10	0.09	0.09	0.09	0.08
			Rural		
0		0.26	0.21	0.18	0.16
1	0.20	0.19	0.16	0.15	0.14
2	0.16	0.15	0.14	0.13	0.12
3	0.14	0.13	0.13	0.11	0.11
4	0.12	0.12	0.11	0.10	0.10

and 0.24 and 0.26 in urban and rural areas respectively. Furthermore, a child aged 0-6 living in an urban area needs 0.15 of an adult, but when an additional child of the same age group is added the average cost drops to 0.13 of an adult. In rural areas, the cost drops from 0.20 to 0.16. The larger decline in rural areas may be due to: (a) the economies of scale in consumption, and (b) the scarcity of resources to support a second child.

From the values reported above we see that the Rothbarth scales are much smaller than the Engel scales, as was found by Deaton and others. If the presence of children increases the relative price of goods shared with children and decreases the relative price of adult goods[8], then the advent of a new child will lead to an increase in the consumption of adult goods, assuming that they are normal goods. Therefore, compensating the household to maintain its expenses on adult goods to the level before the arrival of the child will be smaller in amount. The scales will be biased downwards because of such under-compensation.

The calculation done by sexes (Table 2.22) shows higher scale values for females in both age categories only in rural sample. For the urban sample, a female child aged 0-6 cost less than a male child but there is no difference in 7-15 age group. But we can not say whether the difference we discussed is significant or not as standard errors could not be calculated. If the results from the food share model provide any indication, there is no discrimination between

[8]This has been explained in detail by Barten (1964).

Table 2.22

Rothbarth's Adult Equivalence Scales by Sex

Children Aged 0-6	Children Aged 7-15				
	0	1	2	3	4
		Total: Male			
0		0.26	0.21	0.18	0.16
1	0.20	0.18	0.16	0.15	0.14
2	0.16	0.15	0.14	0.13	0.12
3	0.14	0.13	0.12	0.11	0.11
4	0.12	0.11	0.11	0.10	0.10
		Total: Female			
0		0.28	0.22	0.20	0.17
1	0.18	0.19	0.17	0.16	0.14
2	0.15	0.15	0.14	0.13	0.12
3	0.13	0.12	0.12	0.12	0.11
4	0.11	0.11	0.11	0.10	0.10
		Urban: Male			
0		0.24	0.19	0.16	0.15
1	0.17	0.17	0.15	0.14	0.13
2	0.15	0.14	0.13	0.12	0.11
3	0.13	0.12	0.11	0.11	0.10
4	0.11	0.11	0.10	0.09	0.09
		Urban: Female			
0		0.24	0.19	0.16	0.15
1	0.13	0.15	0.14	0.13	0.12
2	0.11	0.11	0.11	0.11	0.10
3	0.09	0.09	0.09	0.09	0.09
4	0.08	0.08	0.08	0.08	0.08
		Rural: Male			
0		0.25	0.20	0.17	0.15
1	0.20	0.18	0.16	0.15	0.13
2	0.16	0.15	0.14	0.13	0.12
3	0.14	0.13	0.12	0.11	0.10
4	0.12	0.12	0.11	0.10	0.10
		Rural: Female			
0		0.27	0.22	0.19	0.17
1	0.21	0.19	0.18	0.16	0.14
2	0.17	0.16	0.15	0.14	0.13
3	0.14	0.14	0.13	0.12	0.11
4	0.12	0.12	0.11	0.11	0.10

male and female children because the differences in scale values are minimal. Hence, from both the Engel scales and the Rothbarth scales we observe no sign of discrimination against female children in Indonesia. Nevertheless, we can not be absolutely certain about the discrimination issue without knowing the allocation within the household. The SUSENAS data do not permit such analysis because individual consumption figures are not reported.

2.6 Costs of Children

We have estimated the average and marginal cost of children based on calculated scales. These costs are, however, only the direct monetary costs which do not include psychic and other intangible costs discussed in the fertility literature. In Table 2.23, we presented average and marginal cost as a proportion of the cost of an adult aged 25-64. From this we notice that both the average and marginal costs decline with the increase in number of children with one exception; in the urban sample the marginal cost of the fourth child aged 7-15 is higher than that of the third child. We also notice that marginal cost is lower than average cost for all sample categories. The costs of children in Rupiah are reported in Table 2.24. We see that the cost figures for the urban sample is higher than for the rural sample despite having lower scales. This is because of the higher total expenditure in urban sample.

The cost figures based on two methods differ not only in levels but also

Table 2.23

Cost of Children Based on Two Methods
(As a proportion of the cost of an adult)

	Engel		Rothbarth	
	Average	Marginal	Average	Marginal
	Total			
1 Child 0-6	0.95	-	0.18	-
2 Children 0-6	0.91	0.87	0.16	0.14
3 Children 0-6	0.87	0.81	0.13	0.08
4 Children 0-6	0.85	0.77	0.11	0.06
1 Child 7-15	0.94	-	0.27	-
2 Children 7-15	0.90	0.86	0.22	0.17
3 Children 7-15	0.87	0.80	0.19	0.14
4 Children 7-15	0.84	0.76	0.17	0.10
	Urban			
1 Child 0-6	0.86	-	0.15	-
2 Children 0-6	0.81	0.76	0.13	0.11
3 Children 0-6	0.77	0.69	0.11	0.07
4 Children 0-6	0.74	0.64	0.10	0.05
1 Child 7-15	0.81	-	0.24	-
2 Children 7-15	0.76	0.72	0.19	0.15
3 Children 7-15	0.73	0.65	0.16	0.10
4 Children 7-15	0.70	0.61	0.15	0.11
	Rural			
1 Child 0-6	0.96	-	0.20	-
2 Children 0-6	0.93	0.90	0.16	0.13
3 Children 0-6	0.91	0.86	0.14	0.09
4 Children 0-6	0.89	0.82	0.12	0.07
1 Child 7-15	0.99	-	0.26	-
2 Children 7-15	0.96	0.93	0.21	0.16
3 Children 7-15	0.93	0.88	0.18	0.14
4 Children 7-15	0.91	0.84	0.16	0.10

Table 2.24

Cost of Children Based on Two Methods
(in Rupiah)

	Engel		Rothbarth	
	Average	Marginal	Average	Marginal
Total				
1 Child 0-6	19182	-	3634	-
2 Children 0-6	18374	17566	3231	2827
3 Children 0-6	17566	16355	2625	1615
4 Children 0-6	17162	15547	2221	1211
1 Child 7-15	18980	-	5452	-
2 Children 7-15	18172	17364	4442	3432
3 Children 7-15	17566	16153	3836	2827
4 Children 7-15	16961	15345	3432	2019
Urban				
1 Child 0-6	25801	-	4500	-
2 Children 0-6	24301	22801	3900	3300
3 Children 0-6	23101	20701	3300	2100
4 Children 0-6	22201	19201	3000	1500
1 Child 7-15	24301	-	7200	-
2 Children 7-15	22801	21601	5700	4500
3 Children 7-15	21901	19501	4800	3000
4 Children 7-15	21001	18301	4500	3300
Rural				
1 Child 0-6	16268	-	3389	-
2 Children 0-6	15760	15252	2711	2203
3 Children 0-6	15421	14574	2372	1525
4 Children 0-6	15082	13896	2034	1186
1 Child 7-15	16777	-	4406	-
2 Children 7-15	16268	15760	3559	2711
3 Children 7-15	15760	14913	3050	2372
4 Children 7-15	15421	14235	2711	1695

in terms of movement from one demographic category to the other. The percentage decline in the average and the marginal costs calculated using Rothbarth scales is much larger than the decline in costs based on Engel scales. The percentage decline in marginal costs, in particular, is much more pronounced. For example, in urban sample, the average cost of 3 children aged 0-6, calculated using Engel scales, is 5 percent less than the average cost of two children, but this figure rises to 15 percent when we consider costs based on Rothbarth scales. The corresponding figures for marginal costs are, however, 9 and 36 percents respectively. The graphical presentation of average and marginal costs of children aged 0-6 and 7-15 from two methods is provided in figures 2.1 and 2.2 respectively.

2.7 Conclusion

In this chapter we have presented two simple estimates of equivalence scales for Indonesia using the 1987 SUSENAS. The estimates differ substantially across models. Engel scales are 6-9 times higher than Rothbarth scales as found in other major studies. We also found that the relative cost is higher in rural areas and that females cost more than males in relative terms. But the differences between male and female were found to be statistically insignificant. The absolute cost is, however, higher in urban areas because of higher total household expenditures.

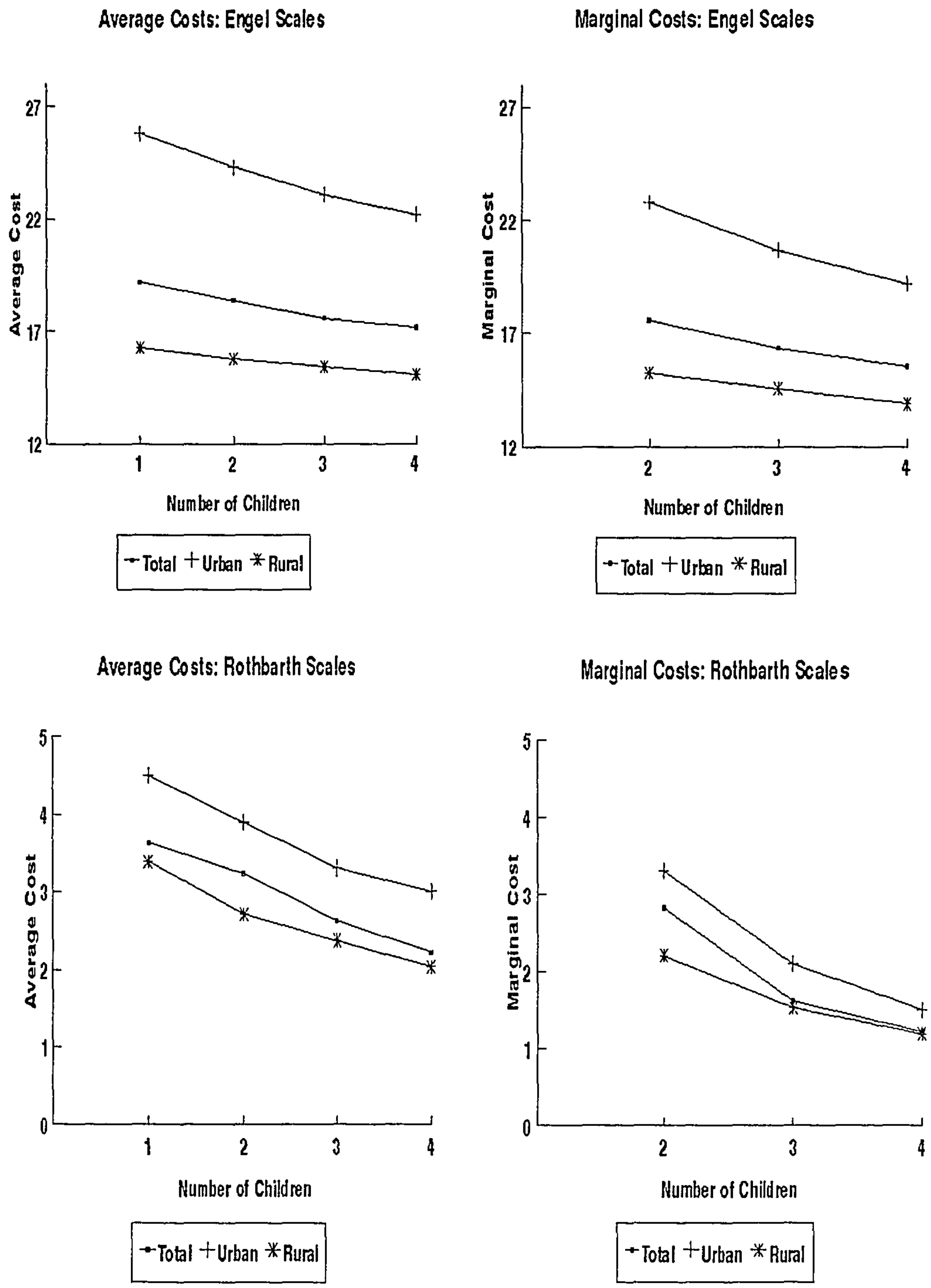

Figure 2.1 Average and Marginal Costs for Children Aged 0-6 (in thousands)

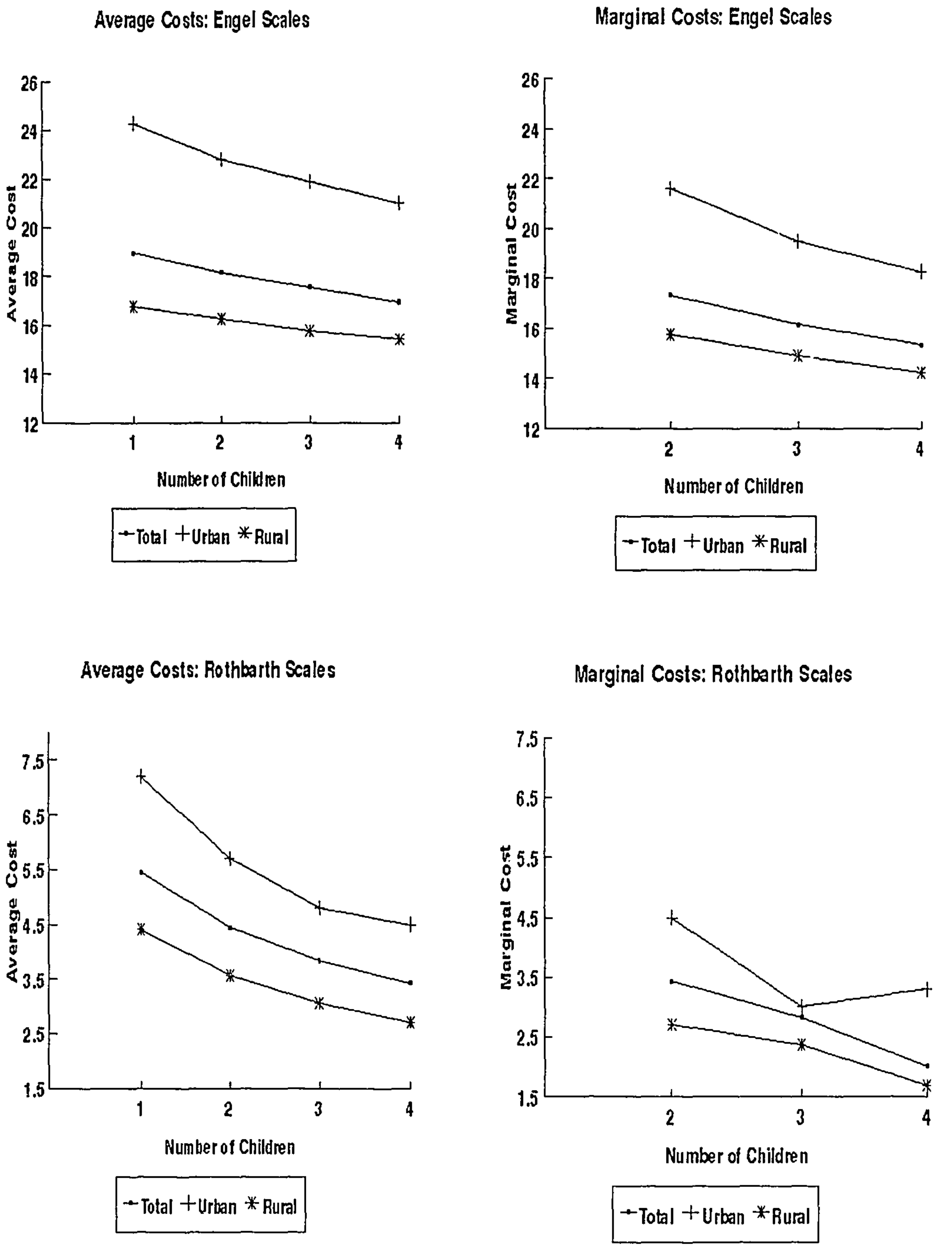

Figure 2.2 Average and Marginal Costs for Children Aged 7-15 (in thousands)

The estimates also provide evidence of economies of scale in consumption. However, the continual occurrences of economies may point toward some other associated factors. One of them may be the lack of resources to support an additional member in the family. An increase in non-income generating member, a child, reduces the per capita expenditure as children increase the amount spent on food. In the absence of additional resources the households are prone to spend less on everything. Hence, the decline in scale may be the result of resource deprivation than economies of scale.

There is a large difference between Engel and Rothbarth scales. This result, however, did not come as a surprise because Deaton and Muellbauer (1986), using 1978 SUSENAS, also came up with such differences.[9] We also come to accept their conclusion that Engel scales overstates the cost of children.

The use of these scales in estimating the cost and poverty is important as well as cumbersome. The most difficult issue is, which scales -- Engel vs. Rothbarth -- to choose for the analysis. The magnitude of differences between two scales is large enough to provide two different estimates of cost, as we saw in tables 2.21 and 2.22, and the poverty line. Deaton and Muellbauer, however, are inclined to rule out the use of Engel scales.

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[9]Their definition of adult goods, however, included all the nonfood items. Their Rothbarth scales are based on OLS estimates.

> We can construct no plausible defense for the belief that the food share correctly indicates welfare between households of different size, and we do not believe that credence should be given to estimates based on that belief (p. 741).

But for this study we shall be using both scales in defining the poverty threshold and in analyzing the demographic profile of the poor. Use of Engel scales, despite being on shaky theoretical ground, will, at least, provide an indication of food poverty. Rothbarth scales are not also fullproof. The definition of adult goods may itself be questioned even though it satisfies the Deaton et. al criterion. For example, there is a strong social taboo against alcohol consumption in a Muslim society and tobacco and betel nut can start young in rural areas. Furthermore, the two critical assumptions of Rothbarth method, namely (1) children neither affect adult leisure nor the cost of adult goods, and (2) parents do not derive utility from their children, are very restrictive. Hence, instead of defending one method over the other, both scales will be used in subsequent analysis, because our objective is to study the sensitivity of results for different scaling parameters.

Chapter 3. ESSAY TWO

Poverty in Indonesia: A Decomposition Analysis

3.1 Introduction

Indonesia has experienced a substantial reduction in poverty over the last 25 years. When the New Order Government came to power in the mid-1960s, the economy was in considerable disrepair. Indonesia was one of the poorest countries in the world with per-capita GNP only at US$50 in 1967, roughly one half of the level of India, Bangladesh, and Nigeria. It is estimated that almost 60 percent of the population or nearly 70 million people were living in absolute poverty in 1970 (World Bank, 1990). The incidence of poverty declined to 28.6 percent in 1980 to 21.6 percent in 1984. It is estimated that in 1987 the percentage of poor living below the poverty line was only 17.4 – 20.1 urban and 16.4 rural. However, these official estimates of poverty are based on a per-capita estimation methodology which does not adequately take into account the differential requirements of an adult compared to a child. It assigns equal weights to all members of the household. A scaling procedure is needed to adjust this differential in order to measure the incidence of poverty more accurately.

Household equivalence scales, usually Engel and Rothbarth scales, are used for adjusting the household income or expenditure for differences in household composition. The use of these scales is itself controversial. However, they allow one to capture the variation in household consumption patterns. In Indonesia, use of estimated scales in studying poverty is rare, as most studies used per-capita income / expenditure to identify the poor. This study endeavors to close this gap in the analysis of Indonesian poverty.

The principal objective of this essay is to analyze the differences in poverty estimates when different scaling parameters are used to adjust for family composition. The official poverty threshold of Indonesia has been revised using the estimated equivalence scales – Engel and Rothbarth – to study the incidence of poverty and contribution to total poverty from different demographic and socio-economic groups using a decomposable poverty index.

All these exercises have been done for separate urban and rural samples using three different poverty thresholds – Official (BPS), Engel scale adjusted (ESA), and Rothbarth scale adjusted (RSA).

3.2 The Measurement of Poverty: A Review

The publication of Sen's (1976) seminal work on poverty heralded the proliferation of theoretical literature on poverty. Sen argued that the measurement of poverty involves identifying the poor in a population and estimating an index to summarize the overall poverty. He introduced the notion of relative deprivation, the distribution of income among the poor, in the calculation of the poverty index. Prior to his publication, poverty was measured by considering only the number of poor, the head-count measure, and the average deprivation of the poor, the poverty gap.

There are basically two approaches to the construction of a poverty index - axiomatic and welfare. The axiomatic approach specifies certain axioms that a poverty index should satisfy and evaluates various indices in terms of their capability to satisfy these axioms. The welfare approach, on the other hand, introduces a social evaluation function and builds up the indices by measuring the loss of welfare as a result of the existence of poverty. However, the distinction is not always clear. It can be said that those who introduce discretionary parameters requiring some explicit criterion for the social evaluation of poverty are following both approaches. The theoretical contributions made by Sen (1976), Takayama (1979), and Thon (1979) fall under the axiomatic approach, whereas those made by Blackorby and Donaldson (1980), Clark, Hemming and Ulph (1981), Hagennars (1986), Vaughan (1987) and Pyatt (1987) fall under the welfare approach. Kakwani (1980) and Foster, Greer and Thorbecke (1984) follow a blended approach.

The poverty axioms most widely used are the following.

1. *Focus*: Poverty index should be based only on the income of the poor.

2. *Monotonicity*: An increase (decrease) in the income of a poor individual must decrease (increase) the index.

3. *Transfer*: A regressive transfer from one poor person to another poor person which leaves both of them under the poverty threshold should increase the index.

4. *Population Symmetry*: If two or more identical populations are pooled, the index should not change.

5. *Symmetry*: A rearrangement of income within a distribution should not affect the index.

6. *Mean Independence*: If income of the population and the poverty line change by the same proportion, the index should remain the same.

7. *Additively Decomposable*: If a population can be subdivided into m mutually exclusive and collectively exhaustive groups, then the index should be a weighted sum of the m group indices.

Suppose n is the size of population, z is the poverty threshold, m is the number of poor who have income/ expenditure less than z, and μ^p is the mean income/expenditure of the poor. The two commonly used measures of poverty – the Head Count index (HCI), the proportion of the population who are poor, and the Poverty Gap Index (PGI), the mean income/expenditure shortfall of the poor expressed as a proportion of the poverty line – can be defined as follows:

$$HCI = \frac{m}{n} \qquad (1)$$

and

$$PGI = 1 - \frac{\mu^p}{z} \qquad (2)$$

The HCI is based entirely on the numbers of poor and is insensitive to changes below the poverty line whereas the PGI takes into account the depth of poverty for the poor. The HCI violates the monotonicity and transfer axioms because any decrease in the income of the poor which does not change m would not affect the value of HCI. Similarly, PGI violates the transfer axiom because any mean-preserving redistribution of income among the poor would not alter PGI.

In order to address these problems Sen (1976) introduced a poverty index, S, defined as:

$$S = H[PGI + (1-PGI)*G^p] \qquad (3)$$

where G^p is the Gini coefficient derived from the incomes of the poor. This index satisfies the transfer axiom but the index is not additively decomposable.

Foster, Greer and Thorbecke (1984) introduced an index which is additively decomposable, thus permitting an analysis of subgroup poverty and their contribution to total poverty. Their index, P_α, can be written as follows,

$$P_\alpha(y;z) = \frac{1}{nz^\alpha} \sum_{i=1}^{m} [z-y_i]^\alpha \qquad (4)$$

where $\alpha \geq 0$ is a parameter measuring poverty aversion and y is the income / expenditure vector.

When $\alpha = 0$, P_α = HCI and when $\alpha = 1$, P_α = PGI. The higher the value of α, the greater the weights assigned to poor households in calculating the index. For very large values of α, the index becomes Rawlsian insofar as all weight is assigned to the very poorest household. P_α satisfies the axioms mentioned above.

Now suppose the population is divided into m mutually exclusive and collectively exhaustive subgroups, indexed by m = 1, 2, ...,M, with ordered income/expenditure vectors y^j and population sizes n_j. For any income / expenditure vector broken down into subgroup income / expenditure vectors y^1, y^2, ..., y^m,

$$P_\alpha(y; z) = \sum_{j=1}^{J} \frac{n_j}{n} P_\alpha(y^j; z) \qquad (5)$$

where,

$$P_\alpha(y^j;z) = \frac{1}{n_j z^\alpha} \sum_{i=1}^{M_j} (z-y_{ij})^\alpha \qquad (6)$$

and y_{ij} is the ith poor in the Jth subgroup.

Thus, the total poverty index, P_α, is additively decomposable with population share (n_j/n) weights. This will allow us to identify the most vulnerable subgroup and their contribution to total poverty. The percentage contribution of group j to total poverty can be calculated as follows,

$$\frac{100 * [\,(n_j / n) \; * \; P_\alpha(y^j;\, z, \alpha)\,]}{P_\alpha(y;\, z, \alpha)} \qquad (7)$$

3.3 A Review of the Literature on Poverty Measurement in Indonesia

In Indonesia different approaches to estimating the incidence of poverty have been put forward by the Indonesian government, the World Bank, and academicians. Almost all of the proposed measures use the calorie sufficiency approach in one form or other and use SUSENAS data for the analysis. But each approach has its own way of arriving at the total expenditure needed to attain the pre-determined calorie level.

The official estimates of poverty and the poverty line are performed by the Indonesian Central Bureau of Statistics (BPS). The official measure (BPS) is based on a minimum daily caloric intake (2,100 calories) and an allowance for other non-food basic necessities such as housing, fuel, light, water, clothing, footwear, headwear, transportation, and other goods and services. An expenditure level necessary to reach the minimum daily caloric intake is estimated to calculate the food component of the poverty line. The total poverty line is estimated by inflating the food component by the percentage of expenditure on non-food items. This approach involves calculating different poverty thresholds for urban and rural areas separately. The food expenditure component of BPS poverty line is based on implicit cost of calories which does not account for the quality differentials in the consumption basket of the urban and rural poor. This may have led to the huge differential observed between the urban and the rural poverty thresholds. Ravallion (1992) argues that the observed differential in thresholds is far in excess of any reasonable estimates of the cost of living differential.

Another poverty measure used in Indonesia is the one proposed by Sajogyo (1975,1985). This measure is based on the price of rice and implies that poverty can be well understood by expressing households' expenditure or income in terms of rice purchasing power because for most rural Indonesians, rice is still the major staple – its sufficiency means better living conditions and a higher level of welfare. Four categories of households were identified based on per capita annual rice equivalent expenditures (REE):

Household Type	Annual Per-capita REE	
	Rural	Urban
Very Poor	< 240 kg.	< 480 kg.
Poor	< 320 kg.	< 480 kg.
Almost self-sufficient	< 480 kg.	< 720 kg.
Self-sufficient	> 480 kg.	> 720 kg.

The urban poverty line was estimated by inflating the rural line by 50 percent without any justification for such a practice. The major problem in the Sajogyo method lies in its sole reliance on rice and the rice price, as even the poorest of the poor households consume other food stuffs. Furthermore, in Indonesia as the prices of non-rice items have tended to move upwards more rapidly than rice prices in the last 15 years, it is obvious that a poverty line based exclusively on rice is a very inadequate indicator of the total basic needs purchasing power of the incomes accruing to the poorer sections of the population and will overstate improvements in the living standards of the poor (Booth, 1993).

A method widely used in the World Bank publications is due to V.V.B. Rao and is reported in the World Bank (1990) study on poverty in Indonesia. Like the BPS method this method is also based on the concept of calorie sufficiency. The methodology is as follows,

1. Estimation of 'basic food expenditure' by valuing 16 kg. of rice at implicit SUSENAS price. The 16 kg. cut-off point was used on the assumption that rice provides about 90 percent of the needed 2,150 calories..
2. The value obtained in step 1 is multiplied by 1.25 to allow for other food expenditures.
3. The value of step 2 is divided by the share of food expenditures in the total expenditures of the expenditure group whose total food expenditure was closest to step 2.

The methodology was applied separately for urban and rural Java and outer islands, and a weighted average was applied to obtain total poverty. The estimated poverty threshold depends to a large extent on the price of rice as well as the adjustment for non-rice food expenditures and non-food expenditures. Hence, this method is also prone to the same deficiencies as the BPS and Sajogyo methods.

Esmara (1986) defined the poverty threshold based on per capita expenditures on a package of basic needs which included cereals and tubers, nuts, fish, meat, vegetables, fruit, clothing, housing, education, and health. This method permits the basic needs to change over time not by measuring the expenditure on a fixed bundle of needs but by estimating the expenses on changing basic necessities. However, the serious problem with this approach is its inability to take into consideration quality and quantity differences over time and also between geographical locations. For example, a rural household in most circumstances spends less on health and education than its urban counterpart because the cost may be lower or the services offered may be of lower quality. Thus, a rural household may fall below the poverty line not because he is spending less than a urban household spending the same amount of resources but because its expenditure falls short of the rural standard.

Ravallion and Bidani (1994) have proposed a modified cost of basic needs (CBN) approach in contrast to the food energy intake approach followed by BPS. Two refinements, claimed by the authors, from past CBN are,

(i) An adjustment of the food component needed to achieve stipulated energy requirements according to the observed diets of the poor.

(ii) A method of setting non-food basic needs consistent with the consumption behavior of those who can just afford their basic food needs.

This method also suffers from all the problems of arbitrariness in setting food energy requirements and the problems associated with calorie intake approaches.

From the review of various approaches of defining the poverty threshold in Indonesia, we find that none of the methods explicitly takes into account the differential requirements of a child compared to an adult. None of the methods adjusts for family-size economies, as all of these thresholds are based on per-capita measures. The per-capita approach of defining poverty does not, however, make allowance for size economies which may be present in a household, as some goods and services are public goods within the household. In this study, I attempt to revise the official per-capita threshold using the equivalence scales presented in the previous chapter.

3.4 Measurement Issues

Any serious attempt to measure the poverty incidence involves various issues which have to be settled. The first and the foremost is the choice of an appropriate poverty line and a summary measure, the poverty index, to measure the incidence of poverty. The selection of a poverty line has to be done with great caution because of the possible reclassification of the poor due to the change in poverty threshold. The choice of an income unit – household vs. individual – is another issue which has to be dealt with. Since most of the surveys do not report detailed individual level income and expenditures, the analysis has to done at the household level. An individual level analysis can also be performed with the assumption of equal sharing within the household. However, this assumption is subject to many criticisms (Sen, 1984).

Choice of an appropriate definition of resource – income vs. expenditure – in defining the poverty threshold is another issue. It has been widely reported that household expenditures better approximate welfare than household income. Consumption theory suggests that long-run welfare is determined by the level of life-cycle or permanent income (Friedman, 1956). Current consumption is believed to be a better proxy for permanent income than current income. Hence, the analysis of poverty should be done using consumption expenditures.

Choice of an appropriate equivalence scale is another central issue in poverty analysis. Many studies just ignore this issue by presenting the analysis either based on per-capita expenditure or based on total expenditures. Adjustment with equivalence scales is desirable to make allowance for the size and composition of the household. Much has already been said on this issue in the first chapter. The objective here is to discuss the difficulty in choosing between the two most commonly used scales – Engel and Rothbarth. Since we already know (from Chapter Two) that the values of these two scales are quite different, the adherence to one scale may result in either under-reporting or over-reporting of poverty, depending on the scale being used.

From this discussion we see that the measurement of poverty involves various issues to be resolved which may, in turn, introduce arbitrary elements into the analysis. This study is no exception. We use the official (per-capita) threshold published by BPS and adjust it to a per-adult-equivalent threshold. Household expenditure per adult equivalent is the definition of resources by which poor households are identified. The analysis of poverty is conducted using official threshold (BPS) and thresholds adjusted using Engel and Rothbarth scales (ESA and RSA respectively). The primary objective of this study is not to develop an entirely new poverty threshold but to explain the demographic profile of poverty when official thresholds are subjected to adjustment using the calculated scales. The objective is to see whether three different thresholds profile the same subgroup as poor within the population using the decomposition technique proposed by Foster, Greer and Thorbecke (1984). The analysis is performed separately for urban and rural samples, the usual practice in Indonesia.

3.5 Adult Equivalence Scales and Poverty

Official estimates of poverty do not take into account the differential requirements of children compared to an adult. For this study, an adjustment is applied using the calculated equivalence scales to convert the per-capita threshold to an adult equivalent threshold. The steps involved are the following:

1. A reference household of 5 members is selected. This number is equal to the average household size obtained from the 1987 SUSENAS data set used for the analysis. The reference household is made up of two adults (aged 16 and over) and 2 children (one aged 0-6 and other aged 7-15). The adult equivalents for this household are calculated using the scales presented in the previous chapter. We use both the Engel and Rothbarth scales in calculating the adult equivalents for urban and rural households.
2. The current per-capita threshold will be converted to adult equivalent thresholds. Household poverty thresholds are obtained by multiplying adult equivalent threshold by adult equivalents.

In calculating adult equivalents we assign each adult a value of 1 and each children aged 0-6 and 7-15 their respective scale values. From Chapter Two, for a household having two children – one aged 0-6 and the other aged 7-15 – the Engel scales are 0.78 and 0.94 for urban and rural areas, respectively. The Rothbarth scales are equal to 0.16 and 0.19. Hence, a 5-

member urban household has 4.56 and 3.32 adult equivalents according to the Engel and Rothbarth scales, respectively. The corresponding numbers for rural areas are 4.88 and 3.38, respectively[1]. These estimated adult equivalents are used to adjust the per-capita threshold. The scaling factor is obtained by dividing the number of household members by the adult equivalents. The values obtained are follows,

Scale	Urban	Rural
Engel	1.09649	1.02459
Rothbarth	1.50602	1.47929

The per-capita official threshold (BPS) and the per-adult equivalent thresholds (ESA and RSA thresholds) for urban and rural households are reported below.

Threshold	Rupiah per-month	
	Urban	Rural
BPS	17,381	10,294
ESA	19,058	10,547
RSA	26,176	15,228

A household is deemed poor if its per-capita / per adult equivalent expenditure is below the threshold given above.

[1]The calculation is done by the following method:

(Number of adults + 2 * scale values)

3.6 Measurement and Decomposition of Poverty

Before presenting the estimates of poverty indices and the decomposition analysis, we summarize the percentages of households in different demographic and socio-economic groups in Table 3.1. The discussion has been restricted to five groups because these are the categories utilized in the decomposition analysis. For both the urban and rural areas, a male-headed household is the norm, as more than 90 percent of households have male heads. Rural households have older and less educated heads compared to urban households. The Service sector is the main source of income in urban areas, whereas agriculture is the main source of rural income source.

The estimates of HCI, PGI and FGT[2] indices are presented in Table 3.2. Using the BPS threshold we find that 16.3 percent of urban and 13.9 percent of rural households are living below the poverty line. When the ESA threshold is used, the percentages of poor for urban and rural areas increase to 17.3 and 14.6 respectively. The HCI for urban areas remains the same when the RSA threshold is used, and the increment in the rural index is negligible (0.1).

The poverty gap indices are higher in both urban and rural areas for RSA thresholds. BPS threshold gives the lowest gap index. The differences in

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[2]For α=2, FGT_2, and for α=4, FGT_4. However, subsequent analysis will be done only with FGT_2 because this index is superior to both HCI and PGI as it considers the distribution among the poor.

Table 3.1

Household Descriptive Statistics

Characteristics	Percentage of Households	
	Urban	Rural
	Sex of head	
Male	90.5	90.5
Female	9.5	9.5
	Age of Head (Years)	
Less than 35	30.4	28.4
35 - 44	27.8	27.6
45 - 54	23.0	23.1
55 - 64	13.4	14.7
65^+	5.4	6.2
	Education of Head	
No Schooling	8.1	23.2
Primary	42.2	61.7
Secondary	41.0	14.1
High	8.8	1.0
	Main Source of Income	
Agriculture	7.1	68.9
Industry	8.7	3.9
Trade	23.3	8.5
Service	32.8	9.9
Other	28.1	8.8

Table 3.2

Poverty Measures and Their Standard Errors

Poverty Measures	Poverty Lines		
	BPS	ESA	RSA
	Urban		
Head Count Index	16.3 (0.31)	17.3 (0.32)	17.3 (0.32)
Poverty Gap Index	3.4 (0.08)	3.6 (0.08)	3.9 (0.09)
FGT_2 Index	1.1 (0.03)	1.1 (0.04)	1.3 (0.04)
FGT_4 Index	0.2 (0.01)	0.2 (0.01)	0.2 (0.01)
	Rural		
Head Count Index	13.9 (0.19)	14.6 (0.20)	14.7 (0.20)
Poverty Gap Index	2.3 (0.04)	2.5 (0.04)	2.7 (0.05)
FGT_2 Index	0.6 (0.01)	0.6 (0.02)	0.7 (0.02)
FGT_4 Index	0.1 (0.003)	0.1 (0.003)	0.1 (0.004)

Figures in parentheses are standard errors. The standard errors for Head Count Index (HCI), Poverty Gap Index(PGI), and FGT indices are given by the following (Kakwani, 1993),

$$SE(HCI) = \sqrt{\frac{HCI(1-HCI)}{N}} \; ; \quad SE(PGI) = \sqrt{\frac{FGT_2 - PGI^2}{N}}$$

$$SE(FGT_2) = \sqrt{\frac{FGT_4 - FGT_2^2}{N}} \; ; \quad SE(FGT_4) = \sqrt{\frac{FGT_8 - FGT_4^2}{N}}$$

where N is the number of observations.

indices do not seem very large, as the increment is by 0.2 from one threshold to the other threshold. The FGT_2 index is higher for the RSA threshold in both urban and rural areas but the FGT_4 indices remain the same for all thresholds.

All the poverty indices are statistically significant at the 5 percent level. This implies that non-zero poverty exists in both urban and rural Indonesia. Measures of poverty incidence are sensitive to the choice of scale. RSA gives a higher incidence of poverty followed by the ESA and the BPS. This dependence of poverty measurement on the scale being used signals that it may not be appropriate to analyze poverty using a single poverty threshold. The controversy surrounding the selection of an appropriate poverty threshold is unresolvable. Hence, for this study, all three poverty lines will be used to analyze the effect on relative ranking of a subgroup on the total poverty due to differing scales.

For this study, five factors – sex of head, age of head, education of head, and main source of household income – have been chosen for decomposition analysis. The results for each group are presented below.

3.6.1 Poverty Decomposition by the Sex of Household Head

In recent years concern has grown about the feminization of poverty (Anand 1977; Bane 1986; Fishlow 1972; Fuschs 1986; Hagenaars 1986). Here we study that proposition for Indonesia. In Indonesia more than 90 percent of households are headed by males in both the urban and rural areas[3]. We find that in both urban and rural Indonesia, poverty incidence is higher for female-headed households for all three poverty lines (Table 3.3). The indices for female-headed households are the highest for the RSA poverty threshold followed by the ESA and the BPS. However, from table 3.3, we see that for both urban and rural samples, male-headed households contribute more towards overall poverty, the share being more than 80 percent.

The test for poverty differences[4] between male-headed and female-headed households (Table 3.4) finds that for urban sample the differences are statistically significant only when the poverty line chosen is the RSA. For the rural sample, the differences are also statistically significant for ESA poverty line. Hence, for Indonesia the conclusion about the feminization of poverty differs depending on the chosen poverty threshold.

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[3]However, by social convention a woman is seldom recognized as the head of a household in Indonesia if there is an adult male in the household. Also, male household heads constitute a larger proportion of the 'circular' migrants to urban areas and therefore, may be absent from the household for long period. For these reasons, more rural households may be *de facto* headed by women than indicated by the SUSENAS survey (World Bank, 1990).

[4]The test statistic for poverty differences, η, is given by the following.

$$\eta = \frac{\hat{p}_1 - \hat{p}_2}{SE(\hat{p}_1 - \hat{p}_2)} \ ; \quad where, \quad SE(\hat{p}_1 - \hat{p}_2) = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Here, p_1 and p_2 are two poverty indices and σ_1^2 and σ_2^2 are the variances of p_1 and p_2 respectively. This statistic follows the asymptotic normal distribution with zero mean and unit variance. η can be used to test the null hypothesis that the differences in poverty indices are not statistically significant. The critical value of the distribution for η at 5 percent level of significance is 1.96.

Table 3.3

Poverty Decomposition by the Sex of Household Head

Poverty Line	Poverty Index		Percentage Contribution	
	Male	Female	Male	Female
		Urban		
BPS	1.1 (0.04)	1.2 (1.12)	89.5	10.5
ESA	1.1 (0.04)	1.3 (0.12)	88.9	11.1
RSA	1.2 (0.04)	2.2 (0.17)	84.3	15.7
		Rural		
BPS	0.6 (0.02)	0.7 (0.05)	89.0	11.0
ESA	0.6 (0.02)	0.8 (0.06)	88.9	11.1
RSA	0.7 (0.02)	1.3 (0.08)	83.9	16.1

Table 3.4

Test of Differences in FGT Indices between Male and Female Headed Households

Poverty Line	Urban	Rural
BPS	-1.1	-1.9
ESA	-1.7	-2.1*
RSA	-5.5*	-7.1*

* statistically significant at 5% level.

3.6.2 Poverty Decomposition by the Age of Household Head

Age of the individual heading a household has an important bearing on the welfare of the household. It has been found that income of a household rises and falls over the life of the head. Income reaches its peak at age 45-54 and declines sharply after age 65 and over (Kuznets 1974). From labor economics, we know that this is the outcome of enhanced experience and skill because of the longer exposure to the labor market. The poverty decomposition by the age of household head (Table 3.5) shows that the incidence of poverty differs depending on the chosen poverty threshold. In urban Indonesia, heads 55-64 years old are the poorest according to BPS whereas RSA finds 65 years and older heads the poorest. ESA, on the other hand, find heads aged 55-64 and 65 and over equally poor. In rural Indonesia the pattern is different. Here, BPS finds heads 35-44 and 45-54 equally poor, ESA finds 35-44 the poorest, and RSA, like in urban area, finds the oldest group the poorest group.

Table 3.6 reports the percentage contribution by different age groups to total poverty. We see that even though the older age groups are poorer, the higher contribution to total poverty comes from somewhat younger age groups. The most striking case being the result for RSA poverty threshold – heads aged 65 and over were the poorest but they contributed less than 15 percent to total poverty. The largest contributors to total poverty were the heads aged 35-54 in both the urban and rural areas. In urban areas, both ESA and RSA found heads 45-54 years contributing the largest whereas BPS indicated heads 35-44 years the leader. In rural areas, heads in the age group 35-44 years contributed the biggest proportion when the poverty thresholds were BPS and ESA, whereas heads in age group 45-54 were the leader when RSA was the chosen poverty threshold.

Figure 3.1 depicts the relationship between poverty and the age of household head in both urban and rural areas. We notice the marked differences between RSA and BPS or ESA. RSA consistently finds the monotonic relationship between age and poverty. The patterns for BPS and ESA are almost identical.

The test of differences in poverty among different age groups (Table 3.7) shows that results vary depending on the poverty threshold and age pair chosen. The poverty incidence for a household whose head is younger than

Table 3.5

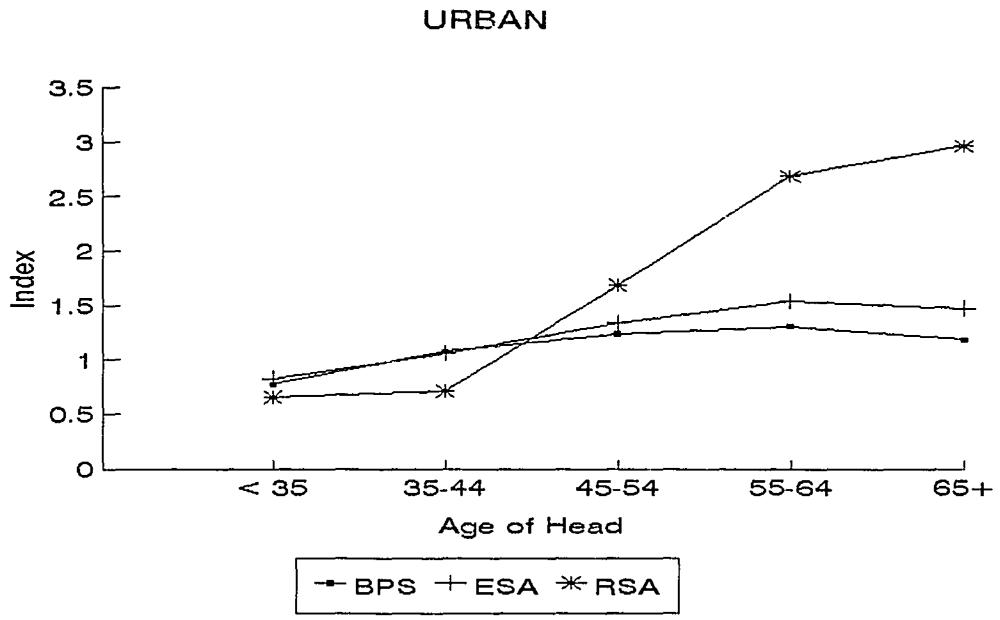
Poverty Decomposition by Age of Household Head

Age Group	Urban			Rural		
	BPS	ESA	RSA	BPS	ESA	RSA
< 35	0.8 (0.05)	0.8 (0.05)	0.7 (0.05)	0.5 (0.03)	0.6 (0.03)	0.5 (0.03)
35 - 44	1.1 (0.06)	1.1 (0.06)	0.7 (0.05)	0.7 (0.03)	0.8 (0.03)	0.5 (0.03)
45 - 54	1.2 (0.08)	1.3 (0.08)	1.7 (0.10)	0.7 (0.03)	0.7 (0.03)	0.9 (0.04)
55 - 64	1.3 (0.10)	1.5 (0.11)	2.7 (0.16)	0.5 (0.04)	0.5 (0.04)	1.2 (0.06)
65^{+}	1.2 (0.15)	1.5 (0.17)	3.0 (0.25)	0.6 (0.06)	0.6 (0.06)	1.7 (0.11)

Table 3.6

Percentage Contribution to Total Poverty by Age Group

Age Group	Poverty Line		
	BPS	ESA	RSA
		Urban	
< 35	22.4	22.0	15.3
35 - 44	28.3	25.9	15.2
45 - 54	26.8	27.0	29.7
55 - 64	16.5	18.1	27.6
65^{+}	6.1	7.0	12.3
		Rural	
< 35	24.5	24.0	17.5
35 - 44	32.1	31.8	17.4
45 - 54	25.6	25.9	28.2
55 - 64	12.0	12.3	23.2
65^{+}	5.8	6.0	13.8



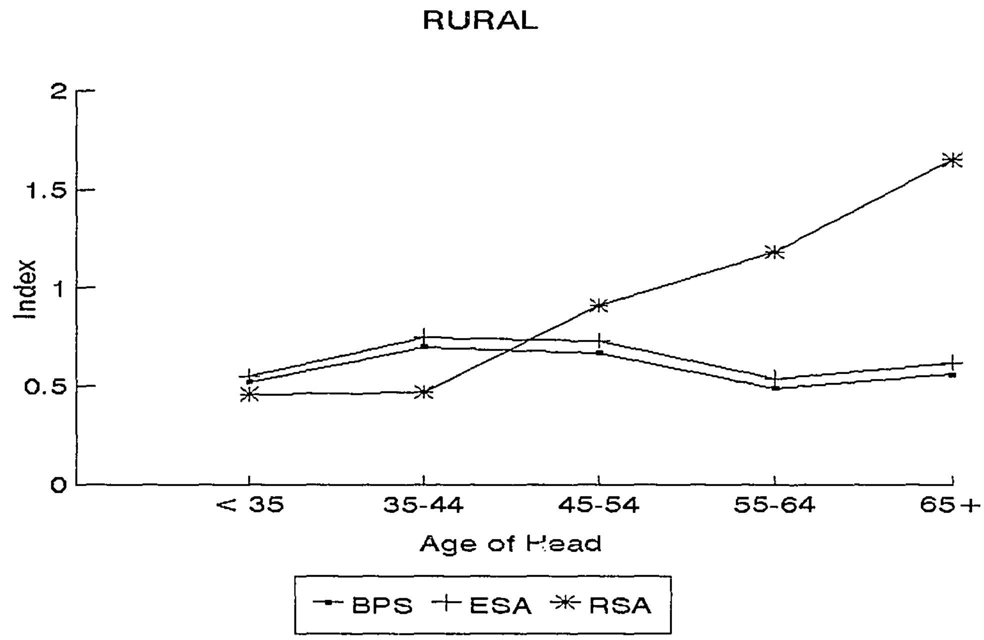


Figure 3.1: Poverty and Age of Household Head

Table 3.7

Test of Differences in FGT Indices Among Different Age Groups

Poverty Lines	Differences between < 35 &				Differences between 35-44 &			Differences between 45-54 &		Differences between 55-64 &
	35-44	45-54	55-64	65^+	45-54	55-64	65^+	55-64	65^+	65^+
					Urban					
BPS	-3.6*	-4.9*	-4.6*	-2.6*	-1.6	-1.9	-0.7	-0.5	0.3	0.6
ESA	-2.9*	-5.3*	-5.7*	-3.7*	-2.7*	-3.7*	-2.3*	-1.4	-0.8	0.3
RSA	-0.8	-9.6*	-12.5*	-9.1*	-9.0*	-12.1*	-8.9*	-5.5*	-4.8*	-0.9
					Rural					
BPS	-4.6*	-3.6*	0.6	-0.7	0.7	4.5*	2.2*	3.7*	1.6	-1.1
ESA	-4.9*	-4.3*	0.1	-1.2	0.4	4.2*	1.8	3.7*	1.5	-1.1
RSA	-0.3	-9.6*	-11.5*	-10.9*	-9.3*	-11.3*	-10.8*	-3.9*	-6.6*	-4.0*

35 years is significantly different from a household with a head older than 35 years, except for the difference with age group 35-44 when RSA is the poverty threshold. The differences between older age groups are mostly insignificant. We find that the RSA threshold gives a larger number of statistically significant poverty differences among age groups.

In summary, the incidence of poverty varies depending on the threshold. The RSA poverty line finds greater number of elderly as poor and continual increase in poverty incidence as age progresses. The conclusion that the under-65 group contributes more to poverty is robust to the choice of threshold.

3.6.3 Poverty Decomposition by Education of Household Head

In Indonesia 8 percent of urban household heads and 23 percent of rural household heads have no schooling. The majority of heads have only a primary education – 42 percent in urban and 62 percent in rural areas. Schooling has an important effect on the earnings potential of household heads and thus may affect the welfare of the household. Hence, an analysis of poverty based on educational status of the head is conducted.

For all three poverty lines household heads with no schooling have a higher and statistically significant incidence of poverty (Table 3.8). Poverty incidence declines monotonically with the level of education. The effect of education is more pronounced in rural areas. Poverty incidence for heads having high level of education is statistically insignificant in rural Indonesia for the RSA poverty line. The contribution to total poverty, however, is the highest from the households heads having primary level education (Table 3.9) in both urban and rural areas for the BPS and ESA poverty lines. For the RSA poverty threshold, however, heads having no-schooling contribute the largest in rural areas. One striking difference observed between urban and rural results is in the household whose heads have a secondary education. In urban areas, this group contributes between 12 - 16 percent to overall poverty, whereas in rural areas the contribution falls to 3 - 4 percent. In rural Indonesia, household heads having no schooling contribute a much larger share to overall poverty incidence than their urban counterparts. This may be due to the differences in the educational and employment status of urban and rural labor forces, urban labor force being more educated and facing higher unemployment. Figure 3.2 depicts the relationship between education level and poverty incidence. We observe the steep decline in poverty from no-schooling to primary level schooling. The slope of the curve continually flattens after primary schooling.

In both urban and rural Indonesia, the test of poverty differences between the households, based on the level of schooling achieved, are statistically significant for all pairs of education categories. The coefficients are smaller for the differences between secondary and high education categories.

Table 3.8

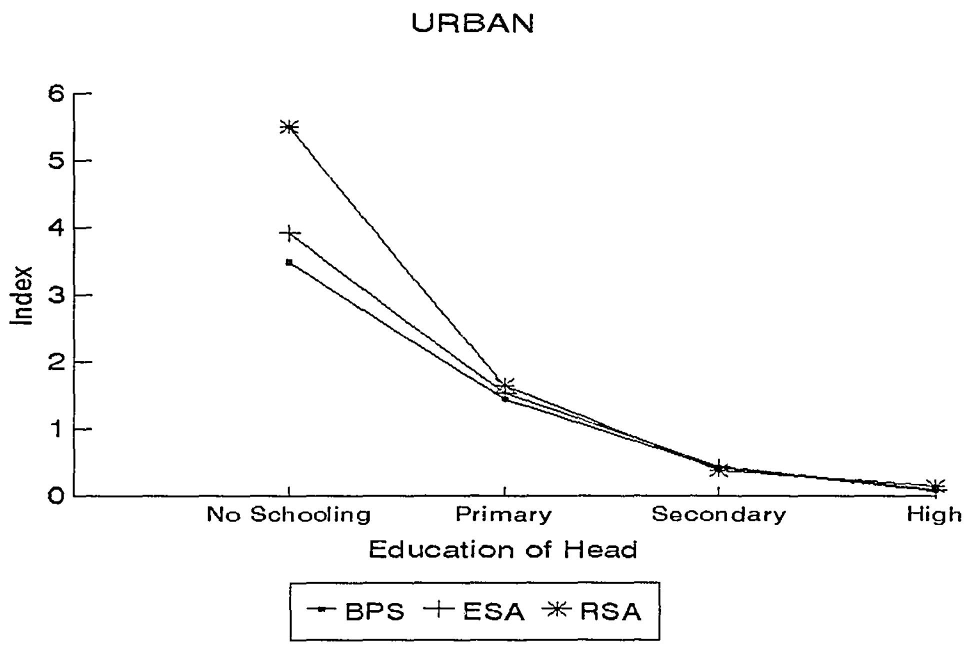
Poverty Decomposition by Education of Household Head

Education	Urban			Rural		
	BPS	ESA	RSA	BPS	ESA	RSA
No-Schooling	3.5 (0.21)	3.9 (0.22)	5.5 (0.28)	1.0 (0.04)	1.1 (0.04)	1.6 (0.05)
Primary	1.4 (0.06)	1.5 (0.06)	1.6 (0.07)	0.6 (0.02)	0.6 (0.02)	0.6 (0.02)
Secondary	0.4 (0.03)	0.43 (0.03)	0.4 (0.03)	0.2 (0.02)	0.2 (0.02)	0.1 (0.02)
High	0.1 (0.02)	0.08 (0.02)	0.1 (0.04)	0.01 (0.003)	0.01 (0.004)	0.03 (0.02)

Table 3.9

Percentage Contribution to Total Poverty by Head's Education

Source	Poverty Line		
	BPS	ESA	RSA
		Urban	
No-Schooling	26.6	27.8	34.2
Primary	56.9	56.3	53.1
Secondary	16.1	15.5	12.0
High	0.6	0.6	0.9
		Rural	
No-Schooling	39.2	39.5	50.6
Primary	56.5	56.4	46.8
Secondary	4.2	4.1	2.5
High	0.1	0.0	0.1



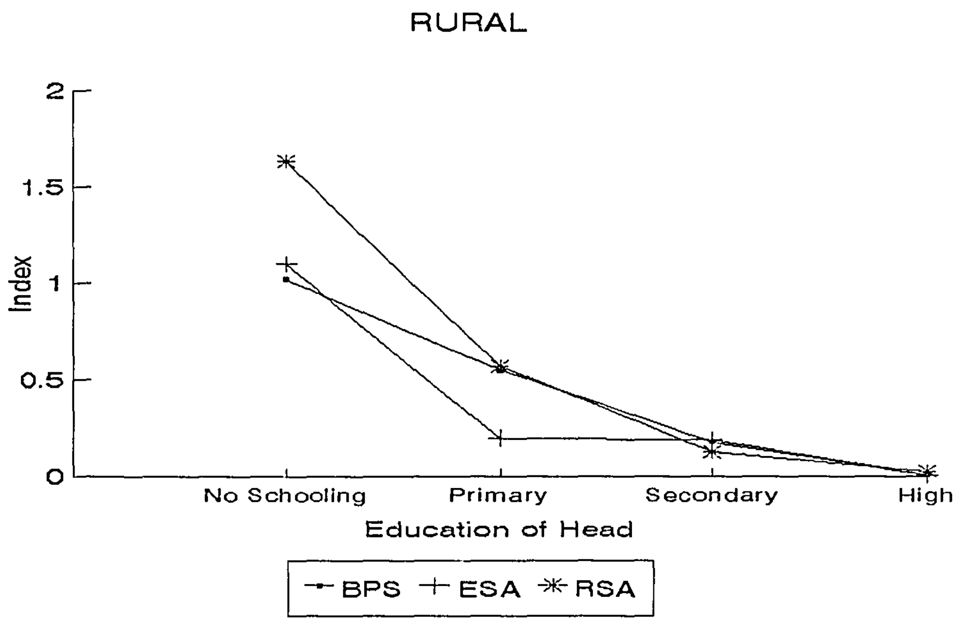


Figure 3.2: Poverty and Education of Household Head

Table 3.10

Test of Differences in FGT Indices by Head's Education

Poverty Line	Differences between No-schooling &			Differences between Primary &		Differences between Secondary &
	Primary	Secondary	High	Secondary	High	High
			Urban			
BPS	9.3*	14.2*	15.9*	15.1*	21.7*	9.3*
ESA	10.3*	15.4*	17.0*	15.9*	22.2*	9.0*
RSA	13.7*	18.5*	19.3*	17.3*	19.8*	5.1*
			Rural			
BPS	10.8*	18.9*	25.5*	14.0*	30.6*	8.5*
ESA	20.0*	19.7*	26.3*	14.3*	9.9*	8.7*
RSA	18.5*	26.2*	27.9*	17.1*	20.4*	4.1*

To summarize, education is a major factor in explaining the poverty in Indonesia – particularly in rural Indonesia. For all three poverty lines, the incidence of poverty declines with the education of household head. Here too, the poverty line obtained by using the Rothbarth scales gives the higher incidence of poverty. However, all three thresholds point that the biggest decline in poverty occurs from no-schooling to primary education. This may indicate the significance of education in alleviating the poverty.

3.6.4 Poverty Decomposition by the Source of Income

Table 3.11 presents the results of decomposition by the main source of household income. The incidence of poverty is the highest for the agricultural households and the lowest for service income recipients according to all three poverty thresholds. In urban Indonesia, the incidence of poverty from one category to another varies more than its rural counterpart. Almost 90 percent of the total poverty in rural areas comes from the agricultural sector whereas in urban areas the contribution is spread across various categories. In both urban and rural areas, industry sector contributes the least to total poverty (Table 3.12).

The test of poverty differences between agriculture and other four categories are statistically significant in both the urban and rural Indonesia. In urban areas, the differences between industry and trade and between industry

Table 3.11

Poverty Decomposition by Main Source of Household Income

Source of Income	Urban			Rural		
	BPS	ESA	RSA	BPS	ESA	RSA
Agriculture	4.1 (0.26)	4.4 (0.26)	5.0 (0.29)	0.8 (0.02)	0.8 (0.02)	1.0 (0.02)
Industry	1.2 (0.12)	1.3 (0.12)	1.4 (0.13)	0.3 (0.05)	0.3 (0.05)	0.4 (0.06)
Trade	0.8 (0.06)	0.8 (0.06)	1.1 (0.07)	0.2 (0.03)	0.2 (0.03)	0.3 (0.03)
Service	0.6 (0.04)	0.7 (0.04)	0.8 (0.05)	0.2 (0.02)	0.2 (0.02)	0.2 (0.03)
Other	1.0 (0.06)	1.1 (0.06)	1.2 (0.07)	0.2 (0.03)	0.3 (0.03)	0.4 (0.04)

Table 3.12

Percentage Contribution to Total Poverty by Main Source of Income

Source of Income	Poverty Line		
	BPS	ESA	RSA
		Urban	
Agriculture	27.5	27.6	27.1
Industry	10.0	10.0	9.5
Trade	17.0	17.1	18.8
Service	19.1	19.2	19.5
Other	26.4	26.2	25.1
		Rural	
Agriculture	89.0	88.9	87.7
Industry	1.9	2.0	2.2
Trade	2.9	2.9	2.9
Service	2.8	2.8	2.8
Other	3.5	3.5	4.4

and service pairs are statistically significant, whereas the difference between industry and the other sector is not significant in both the urban and rural areas. The difference between trade and service is significant in urban areas but insignificant in rural areas. In both urban and rural areas, the results from the BPS, ESA, and RSA poverty lines are very similar. For urban areas, the outcome is different in one instance and for rural areas in three instances. In summary, the use of three different poverty thresholds does not result in dramatic differences in the incidence of poverty for urban and rural Indonesia. Figure 3.3 supports this argument.

To summarize the results of decomposition analysis presented in previous pages, Table 3.14 presents the poverty rankings based on three different thresholds. We notice that except for the age of the head, rankings are similar from all three thresholds. For the age categories, the rankings differ based on the poverty line used. In urban areas, BPS and ESA find heads aged 55-64 years the poorest whereas RSA finds heads 65 and older the poorest. In rural areas, the result is much more dramatic. Heads aged 35-44 are the poorest according to BPS and ESA, but they rank fourth when RSA is the chosen threshold. As in urban areas, RSA finds heads 65 and older the poorest.

Table 3.13

Test of Differences in FGT Indices by Main Source of Income

Poverty Lines	Differences between Agriculture &				Differences between Industry &			Differences between Trade &		Differences between Service &
	Industry	Trade	Service	Other	Trade	Service	Other	Service	Other	Other
					Urban					
BPS	10.2*	12.7*	13.4*	11.8*	3.5*	4.9*	1.7	2.2*	-2.7*	-5.2*
ESA	10.7*	13.3*	14.1*	12.4*	3.5*	5.0*	1.8	2.3*	-2.6*	-5.2*
RSA	11.3*	13.4*	14.5*	13.0*	2.4*	4.4*	1.7	3.1*	-1.2	-4.5*
					Rural					
BPS	8.8*	17.5*	19.6*	15.3*	1.7	2.4*	1.1	1.0	-0.9	-1.8
ESA	9.0*	17.9*	20.2*	15.8*	1.8	2.5*	1.2	1.1	-0.9	-1.9
RSA	8.3*	18.4*	19.2*	13.0*	2.5*	3.1*	0.7	1.0	-2.4*	-3.3*

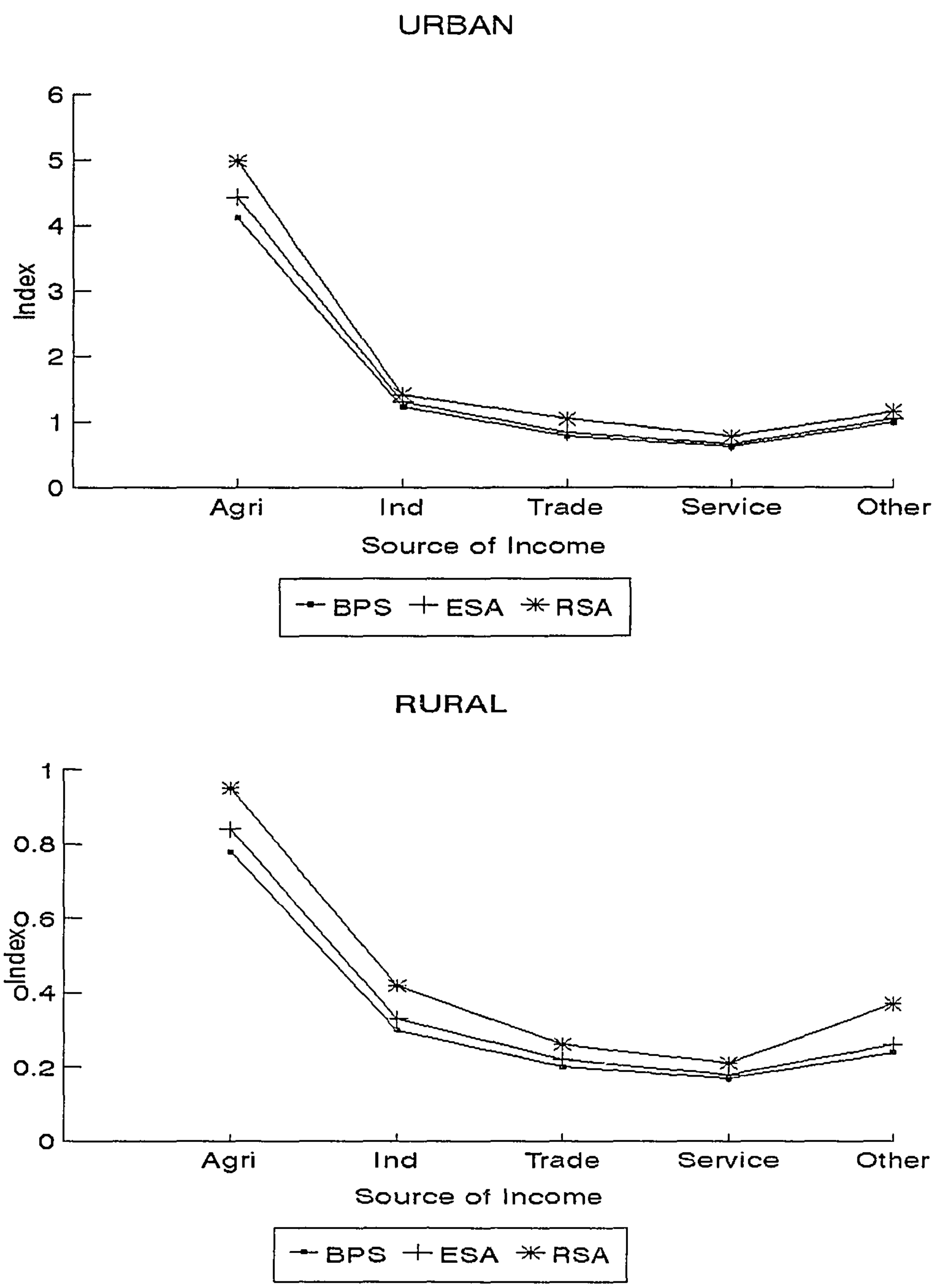


Figure 3.3: Poverty and Source of Income

Table 3.14

Poverty Rankings Based on FGT Index

Characteristics	Urban			Rural		
	BPS	ESA	RSA	BPS	ESA	RSA
			Sex of Head			
Male	2	2	2	2	2	2
Female	1	1	1	1	1	1
			Age of Head (Years)			
Less than 35	5	5	5	4	4	5
35-44	4	4	4	1	1	4
45-54	2	3	3	2	2	3
55-64	1	1	2	5	5	2
65 and over	3	2	1	3	3	1
			Education of Head			
No Schooling	1	1	1	1	1	1
Primary	2	2	2	2	2	2
Secondary	3	3	3	3	3	3
High	4	4	4	4	4	4
			Source of Income			
Agriculture	1	1	1	1	1	1
Industry	2	2	2	2	2	2
Trade	4	4	4	4	4	4
Service	5	5	5	5	5	5
Other	3	3	3	3	3	3

Note: Rank 1 means the poorest.

The probability of being poor[5] for different categories is presented in Table 3.15. We find that the probability of being poor is the highest for female heads, heads having no-schooling, and the agricultural households. These results are consistent for all three poverty thresholds. Probabilities differ for the age category based on the chosen poverty threshold. In both the urban and rural areas, heads younger than 35 years old have the highest probability of being poor according to BPS and ESA poverty lines whereas heads 65 and

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[5]This is based on the following Logit regression:

$$f(p_i) = \log\left[\frac{p_i}{1-p_i}\right] = \sum_k \beta_k X_{ik}$$

where,

p_i = likelihood that household i is poor. $p_i = p(Y_i = 1/ x_i)$, where Y_i is the poverty status of the household i. Y_i=1 if the household is poor, and zero if the household is not poor;

X_k = k-th explanatory variables of the likelihood of poverty of household i; and

β_k = parameter estimates for X_k.

Probabilities of poverty are estimated using the following;

$$\hat{P}_i = \frac{\exp\left[\sum_k X^0_{ik}\,\hat{\beta}_k\right]}{1+\exp\left[\sum_k X^0_{ik}\,\hat{\beta}_k\right]}$$

where,

p_i = the estimated probability that household i is poor,

X_{ik} = the observed value of the k-th explanatory variable of the probability of poverty of household i, and

β_k = the estimate of k-th explanatory variable.

Table 3.15

Probability of Being Poor (%)

Characteristics	Urban			Rural		
	BPS	ESA	RSA	BPS	ESA	RSA
			Sex of Head			
Male	11.0	12.3	12.3	9.0	9.6	9.3
Female	11.1	12.7	12.3	13.9	14.7	12.9
			Age of Head (Years)			
Less than 35	12.9	14.4	11.6	11.6	12.2	9.7
35-44	10.8	12.0	11.9	9.5	10.2	9.3
45-54	9.8	10.9	12.5	8.3	9.0	9.4
55-64	9.8	11.0	13.5	7.7	8.5	9.8
65^{+}	11.0	12.8	15.3	7.8	8.6	10.9
			Education of Head			
No Schooling	41.8	43.8	40.7	16.2	17.3	16.2
Primary	19.3	21.1	21.2	9.4	10.1	9.7
Secondary	6.4	7.3	7.2	4.2	4.4	4.3
High	1.6	1.9	2.4	0.8	1.2	1.2
			Source of Income			
Agriculture	27.1	30.0	29.5	12.4	13.2	12.6
Industry	12.2	13.7	13.7	6.7	7.2	6.7
Trade	8.8	10.0	9.8	4.2	4.6	4.9
Service	10.2	11.3	11.5	4.6	5.0	4.3
Other	11.0	12.3	12.2	5.2	5.9	5.9

Based on Logit Regression.

over have the highest probability of being in poverty according to RSA threshold.

3.7 Conclusion

This study measures Indonesian poverty using the official and the scale-adjusted poverty thresholds. The scale-adjusted thresholds are the Engel and Rothbarth scales adjusted. All three thresholds have been used to study the differences in poverty incidence, if any, for Indonesia. The FGT poverty index has been used to estimate the poverty incidence.

For both urban and rural Indonesia, the poverty incidence depended to a large extent on the chosen threshold. However, the differences between the Engel scale-adjusted and the official thresholds are not large. This may be due to the high Engel scale values used to adjust the presence of children in the household. The Rothbarth scale-adjusted threshold, in most cases, gave a higher incidence of poverty. This may be due to the very small scaling values.

This study has used a decomposable poverty index to study the contribution of different demographic groups in total poverty. The decomposition has been performed based on the sex, age, education, and source of main income of the household head. Age has been categorized under 5 groups – less than 35 years, 35-44 years, 45-54 years, 55-64 years, and 65 years and older. Education has been grouped under four categories –

no schooling, primary, secondary, and high. Source of income has been grouped under 5 categories – agriculture, industry, trade, service, and other. A test, proposed by Kakwani (1993), has been also performed to study the statistical significance of poverty differences between two sub-groups within a group.

Poverty decomposition by the sex of household head found female-headed households to have a higher incidence of poverty. However, the male-headed households contribute a huge proportion (more than 80 percent) to overall poverty. In urban Indonesia, the statistical significance of poverty differences between the male-headed and the female-headed households is observed only when the RSA poverty line is the preferred choice. For the rural areas, the differences are significant even for the BPS and ESA poverty lines.

Poverty incidence by age categories depends on the poverty line chosen. According to the BPS and ESA poverty lines, household heads aged 55-64 are the poorest whereas according to RSA poverty line 65 years and older heads are the poorest. For rural Indonesia, the results for RSA threshold are similar to their urban counterparts, but for BPS and ESA poverty lines heads aged 35-44 are the poorest. The decomposition analysis conducted by partitioning the educational level of the heads gave similar results for all three poverty lines: households headed by uneducated individuals are the poorest. But, the households headed by primary school graduates contribute the largest proportion to overall poverty, except for the rural Indonesia when the RSA poverty line is chosen. The poverty differences between different household categories are statistically significant, with few exceptions. Households who derive their largest income from agriculture are the poorest and contribute largest proportion to overall poverty.

The official and the Engel scale-adjusted poverty thresholds provided similar qualitative results even though the levels were different – the latter giving higher values than the former. The tests conducted to examine the statistical significance of poverty differences also provided similar results for these two poverty lines. The Rothbarth scale-adjusted threshold is in conformity with the other two thresholds only when the decomposition is conducted based on the education of the household head. The results are different in all other instances.

This study provides further support to the notion that the poverty measurement is sensitive to the choice of scale. We found that in some instances, the results were quite different depending on the poverty threshold chosen. Hence, we can conclude by saying that the analysis of poverty incidence needs to be done based on a wide-range of poverty definitions in order to study the sensitivity of results for the definition chosen.

Chapter 4: ESSAY THREE

Inequality in Indonesia: A Decomposition Analysis

4.1 Introduction

This chapter considers the issues associated with the estimation and decomposition of income inequality. In Indonesia many studies have been done to analyze the distribution of income[1] but only a few have tackled the decomposition analysis. A decomposition analysis is necessary to understand the source and nature of inequality and to devise policies for addressing the distributional issues. Almost all studies of Indonesian income distribution have concluded that inequality has declined over the course of years. But, only a study done more than a decade ago (Hughes and Islam 1981) uses the decomposition analysis. Their analysis was, however, limited to comparing Java with the outer islands.

The analysis of inequality has been done based either on per-capita series or total series of income and expenditure. None of the studies has adjusted the income/expenditure series for differential resource requirements arising from age-sex composition of households. This study endeavors to

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[1]For example, Booth (1992), Asra (1989), Islam and Khan (1986), Hughes and Islam (1981), Booth and Sundrum (1981), Arief (1980), and Perena and Budianti (1977) to mention a few.

assess the impact of 'within group' and 'between group' inequalities in the total inequality using a decomposition analysis, which is consistent with the theoretical literature of decomposition propounded by Bourguignon (1979) and Shorrocks (1980, 1984). This analysis is an addition to Indonesian studies on income inequality because it uses micro data and adjusts the data with estimated equivalence scales. The use of micro data permits several mutually exclusive partitions of population, and the use of equivalence scales adjusts the differences in needs of household members.

4.2 Measures of Income Inequality: A Review

The literature on measuring income inequality is voluminous. The most widely used measure of inequality is the Lorenz curve which provides a visual representation of inequality. It gives the relation between the percentage of income recipients and the percentage of income they earn. The following Fig. 4.1 is an example of the Lorenz curve. In this figure the 45 degree line is the line of equality implying that the percentage of households and the percentage of income accruing to them are same. For example, 5 percent of households will have exactly 5 percent of total income and so on. The area under A gives the amount of inequality, the maximum being (A+B).

The most widely used inequality index, derived from the Lorenz curve, is the Gini coefficient. It measures the area between the Lorenz curve and the 45

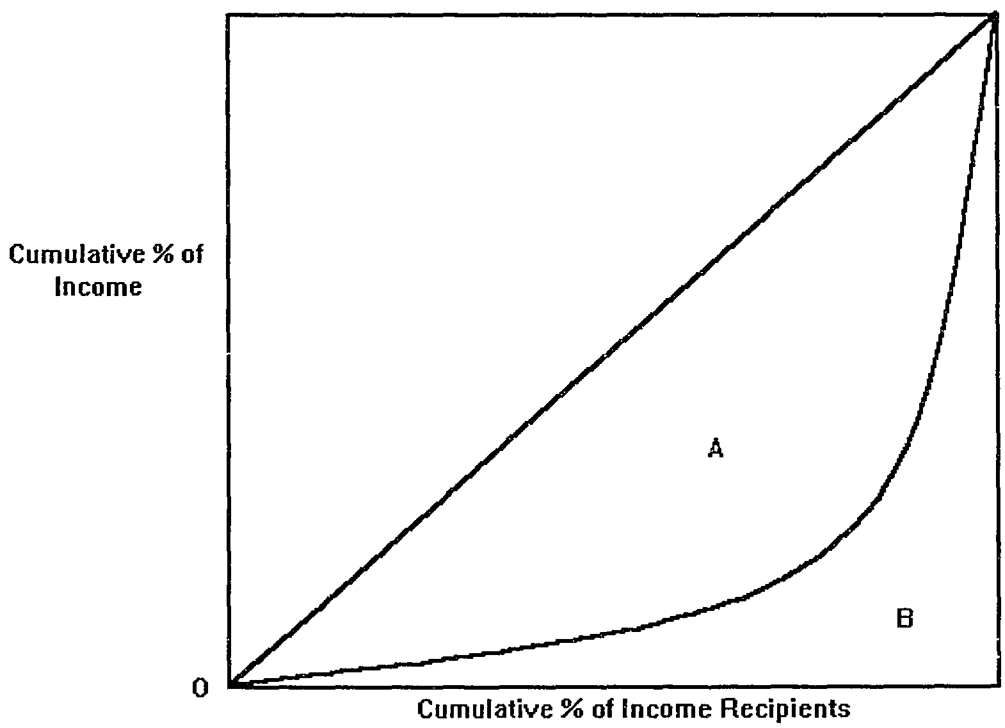

Figure 4.1 The Lorenz Curve

degree line as a fraction of the total area under the 45 degree line. The Gini coefficient is equal to the ratio of area A to area A+B. The Gini index (G) is defined as follows:

$$G = \frac{1}{2\mu} \int_0^\infty \int_0^\infty |X-Y| \, f(x) \, f(y) \, dx \, dy$$

where μ is the population mean and X and Y are income. Hence, G is the mean absolute difference between all income-receiving units divided by twice its mean. Atkinson (1970) has criticized the Gini index by arguing that if Lorenz curves do intersect, one can always find a social welfare function that will rank the distributions in a reverse order to the one given by the Gini index. Newbery (1970) strengthened Atkinson's criticism of the Gini index by proving that there exists no additive social welfare function that ranks income distributions in the same order as the Gini index. Das Gupta, Sen, and Starrett (1973) and Rothchild and Stiglitz (1973) demonstrated that there exists no strictly quasi-concave welfare function that would give the same ranking of the distributions as the Gini index would give. The Gini index has also been criticized on the grounds that it tends to attach more weight to income transfers that occur around the middle income classes.

The other widely used measures of inequality are relative mean deviation (RMD), coefficient of variation (CV), Atkinson Index (AI), and two inequality measures (T and L) proposed by Theil (1967) which are based on the notion of entropy[2] in information theory. The definition of each follows:

$$RMD = \frac{1}{2\mu}\int_0^{\infty} |X-\mu| \ f(x)\ dx$$

$$CV = \frac{\sigma}{2\mu}$$

$$AI = 1 - \frac{1}{\mu}\ [m_{1-\epsilon}]^{\frac{1}{1-\epsilon}} \qquad \epsilon \neq 1$$

$$T = \int_0^{\infty} \frac{X}{\mu} \log\ (\frac{X}{\mu})\ \ f(x)\ dx$$

$$L = \int_0^{\infty} \log\ (\frac{\mu}{X})\ \ f(x)\ d(x)$$

The inequality indices are judged on the basis of various axioms. The most widely used axioms are the following:

1. *Mean Independence*: The value of the index remains the same when the incomes are all multiplied by the same positive factor. This characteristic is also known as "Income Homogeneity" and "Scale Invariance."

2. *Population Symmetry*: The index does not change due to an equal increase or decrease in the population across all income levels.

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[2]The fundamental idea of information entropy is that occurrences which differ greatly from what was expected should receive more weight than events which conform with prior expectations. The entropy index gauges the expected information content from the various outcomes, with the weights depending on the likelihood of each outcome(Fields 1979).

3. *Pigou-Dalton Principle of Transfers*: The transfer of resources from a richer person to a poorer person which does not make the latter richer than the former reduces the index. In other words, a mean-preserving transfer from richer to poorer reduces inequality.

4. *Decomposability*: An inequality index is decomposable on the basis of population subgroups and income subgroups.

All these measures have two properties in common: the mean independence property and population symmetry property. However, not all measures satisfy the Pigou-Dalton principle of transfer. The Gini coefficient, the coefficient of variation and Theil's index satisfy this property (Shorrocks, 1980). The Relative mean deviation measure fails this property because a transfer from poor to rich may leave inequality unchanged rather than increased (Cowell, 1977).

Inequality indices can be differentiated on the basis of the weights they attach to income transfer from rich to poor. The Gini coefficient attaches more weight to income transfers that occur around the middle-income classes, while the relative mean deviation is unaffected by income transfers between people on the same side of the mean. The Coefficient of variation is very effective in reflecting inequality among high incomes, but is less effective at capturing inequality anywhere else in the distribution (Cowell, 1977; Shorrocks, 1980). Theil's index attaches equal weight to transfers at the lower and upper end (Shorrocks, 1980).

Shorrocks and Foster (1987) argued that the Pigou-Dalton principle has limited capability in the comparison of inequality because it does not permit the ranking of a pair of distributions if both progressive and regressive transfers are needed to convert one distribution into the other. They argue for the inclusion of a transfer sensitivity property as an extension of the Pigou-Dalton principle. Shorrocks and Foster propose a new definition based on the notion of favorable composite transfers, which combines a regressive transfer with a progressive transfer at a lower income level. Transfer sensitivity is satisfied by the Theil index, but not by the coefficient of variation and the Gini coefficient.

4.2.1 Decomposition of Inequality

The axiom of decomposability mentioned above permits an inequality index to be decomposed over population subgroups or sources. An inequality index is said to be additively decomposable over subgroups of population if total inequality can be expressed as a weighted sum of the inequality existing within the subgroups and of the inequality between the subgroups (Shorrocks, 1980,1984). When the index is additively decomposable over population subgroups, it satisfies the constraint,

$$I(X) = I(X_1, X_2, \ldots\ldots, X_n) = \sum_{i=1}^{n} w_i \, I(X_i) + B$$

where $x_1, \ldots\ldots, x_n$ represent any partition of the distribution X into N subgroups. The first term on the right is the 'within group' inequality and the second term, B, the between group inequality. Such a decomposition will be either "weak" or "strong".

The weakly additive decomposition assigns income share as the weight for 'within group' component, whereas the strictly additive decomposition assigns population share as the weight. If the index is only weakly additively decomposable then the elimination of inequalities 'between groups' affects the value of the 'within group' component, whereas if it is strictly additively decomposable then the elimination does not affect the 'within group' component. This happens because after the elimination of 'between group' inequalities the weights used in the 'within group' component of weakly additively decomposable indices (income shares) change, whereas those used in the strictly additively decomposable indices (population shares) do not change.

An inequality index is "source decomposable" if it can be expressed as the weighted sum of inequality by all the sources. However, since activities which influence a particular source of income are likely to have an impact on other activities from which total income is comprised, any inequality measure which is source decomposable must address covariance among the income sources (Adams and Alderman 1992).

4.3 Methodology

This study uses 1987 SUSENAS data for the decomposition analysis. For this study I use consumption expenditure instead of income for the analysis of inequality. This step has been taken because expenditure data are considered more reliable than income data[3]. Furthermore, current consumption is considered to be a better approximation to life-cycle income than current income and, thus, a better measure of welfare (Sen, 1976; Deaton, 1980). Per-capita consumption expenditure (PCE), Engel scale-adjusted expenditure (ESAE), and Rothbarth scale-adjusted expenditure (RSAE) will be used for the measurement and decomposition of inequality.

For this study, I use Theil's entropy measure, T, of inequality for the decomposition analysis. This measure is additively decomposable and also satisfies other axioms of inequality index. The choice was also motivated by the apparent shortcomings of Gini index, the logarithmic variance, and the relative mean deviation measures of inequality. Cowell (1988) shows that for these three measures, it is possible that inequality in every group goes up while overall inequality goes down. Furthermore, the L measure cannot be computed for distributions with zero expenditures.

If the population is grouped into j mutually exclusive and exhaustive groups, T can be written as follows,

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[3]Essay 1 discusses data issues in detail.

$$T = \sum_j \frac{\mu_j n_j}{\mu n} T_j + \frac{1}{n} [\sum_j n_j (\frac{\mu_j}{\mu}) \log (\frac{\mu_j}{\mu})]$$

where μ_j, n_j, and T_j are the values of μ, n, and T for the group j respectively. In the above partitioned equations, the first term on the right-hand side is the 'within group' inequality and the second term is the 'between group' inequality. Here, we see that T is weakly additively separable because it uses income shares as the weight for the within group component.

Aggregate inequality will be decomposed based on the sex, age, education and province of residence of household head. The decomposition analysis has been done separately for urban and rural areas.

4.4 Measurement and Decomposition of Inequality

Before proceeding to the decomposition analysis based on different demographic characteristics, Table 4.1 has been produced to report various inequality indices computed for urban and rural Indonesia. The indices are provided for all three expenditure definitions. We see that RSAE in most cases gives lower inequality followed by ESAE and PCE. The values obtained for PCE and ESAE are, however, almost similar. Inequality in rural areas is lower than in urban areas according to all the reported indices. Asra (1989), Booth (1992), and others have also found higher inequality in urban areas

Table 4.1

Inequality Measures For Different Expenditure Definitions

Inequality Measures	Urban			Rural		
	PCE	ESAE	RSAE	PCE	ESAE	RSAE
Gini	0.337	0.332	0.328	0.355	0.354	0.352
RMD	0.240	0.236	0.233	0.206	0.205	0.202
CV	0.520	0.524	0.533	0.438	0.436	0.412
Theil 'T'	0.224	0.219	0.212	0.175	0.175	0.168
Theil 'L'	0.187	0.182	0.178	0.140	0.139	0.137
Atkinson						
ϵ=1.5	0.233	0.227	0.225	0.178	0.177	0.177
ϵ=2.0	0.287	0.280	0.279	0.219	0.218	0.219
ϵ=2.5	0.334	0.326	0.328	0.256	0.255	0.258

using the Gini coefficient and per-capita expenditure series[4]. This may be due to lower average expenditure for rural areas compared to urban average expenditures and also higher consumption share (23.4 percent in contrast to 20.5 for urban) for the poorest 40 percent households. The higher inequality in urban areas may also be the outcome of the labor market segmentation into formal and informal sectors and higher representation of high-paid military personnel.

The decomposition of inequality based on sex, age, education, and province of residence of the household head are presented in the subsequent pages for urban and rural areas.

4.4.1 Decomposition by the Sex of Head

Decomposition of total inequality by the sex of the head gives different results for urban and rural areas. In urban Indonesia female-headed households have higher inequality compared to male-headed households for all three expenditure categories. PCE indicates higher inequality than RSAE and ESAE. In rural areas, male-headed households have greater inequality for PCE and ESAE definitions. RSAE finds no difference in the inequality between

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[4]Jain (1975), Anand (1983), Glewwe (1986), and Mishra and Parikh (1992) have found similar results for other developing countries.

Table 4.2

Inequality Decomposition by the Sex of Head

	Population Share	Group mean Expenditure			Theil's 'T' Indices		
		PCE	ESAE	RSAE	PCE	ESAE	RSAE
			Urban				
Male	0.905	36191.21	38390.03	52607.36	0.222	0.217	0.210
Female	0.095	36124.48	37696.54	47100.73	0.242	0.235	0.237
Within-Groups Inequality					0.224 (100.0)	0.219 (100.0)	0.212 (100.0)
Between-Groups Inequality					2e-07 (0)	1e-05 (0)	0.0005 (0)
			Rural				
Male	0.905	19555.61	19728.47	28777.00	0.177	0.176	0.167
Female	0.095	18888.90	18994.32	26506.39	0.156	0.156	0.167
Within-Groups Inequality					0.175 (100.0)	0.174 (99.4)	0.167 (99.4)
Between-Groups Inequality					5e-05 (0)	7e-05 (0.6)	0.0008 (0.6)

Figures in parentheses indicate percentage contributions to total inequality.

male-headed and female-headed households. This phenomenon in rural areas may be due to the non-recognition of de facto female heads as household heads due to social conventions as mentioned in Chapter III.

The decomposition by sexes points to the non-importance of gender of head in inequality for both urban and rural areas as implied by the negligible contribution of between group inequality to overall inequality. The inequality seems to be the result of only 'within group' inequality. This may be the outcome of same level of mean expenditures for two sub-groups. In both the urban and rural areas, mean expenditures are higher for male-headed households.

4.4.2 Decomposition by the Age of Head

Many studies have found the inverse U-shaped relationship between the household income / expenditure and the age of household head (Paglin 1975; Cowell 1984). In Indonesia, such a relationship is observable only for rural household heads. For both urban and rural Indonesia, the RSAE definition of expenditure gives lower inequality followed by ESAE and PCE definitions. In urban Indonesia, younger heads have the highest inequality and the heads aged 45-54 years the least inequality. But, in rural areas 45-54 years head has the highest inequality. The contribution of between group inequality in urban areas is higher when RSAE expenditure is considered. For rural areas,

Table 4.3

Inequality Decomposition by the Age of Head

	Population Share	Group mean Expenditure			Theil's 'T' Indices		
		PCE	ESAE	RSAE	PCE	ESAE	RSAE
			Urban				
< 35	0.304	37103.50	39282.07	55501.59	0.254	0.250	0.232
35-44	0.278	35913.73	38928.71	58679.06	0.206	0.200	0.189
45-54	0.230	35466.76	37430.67	47834.11	0.201	0.195	0.187
55-64	0.134	36073.02	37127.56	42366.54	0.229	0.222	0.207
65^{+}	0.054	35736.94	36576.95	41016.30	0.229	0.221	0.200
Within-Groups Inequality					0.224 (100.0)	0.218 (99.5)	0.205 (96.7)
Between-Groups Inequality					1E-04 (0)	3E-04 (0.5)	0.007 (0.3)
			Rural				
< 35	0.284	20210.74	20464.92	30801.45	0.165	0.164	0.153
35-44	0.276	18836.61	19032.13	30921.81	0.175	0.175	0.168
45-54	0.231	19047.14	19158.63	26886.72	0.201	0.200	0.182
55-64	0.147	19926.22	19998.17	24626.53	0.164	0.163	0.145
65^{+}	0.062	19755.88	19819.74	23335.53	0.153	0.152	0.156
Within-Groups Inequality					0.175 (100.0)	0.174 (99.4)	0.163 (97.0)
Between-Groups Inequality					5E-04 (0)	5E-04 (0.6)	0.005 (3.0)

Figures in parentheses indicate percentage contributions to total inequality.

PCE also gives a higher value. However, the contribution of 'between-group' inequality to overall inequality is quite small indicating the non-significance of the age factor in explaining the inequality in Indonesia. Tsakloglou (1993) also found unimportant role of 'between group' inequality in total inequality for Greece. For both the urban and rural samples, all three expenditure definitions gave roughly the same results.

4.4.3 Decomposition by the Education of Head

In urban Indonesia, the highest inequality is prevalent in the households headed by secondary school graduates. The 'between-group' inequality contribution ranges from 13.8 percent to 16.2 percent. The difference in the group mean expenditure is also noticeable – it rises with the educational level. In rural Indonesia, inequality is the highest for the high education group followed by the secondary education group. In contrast to the urban area, inequality in the households whose heads have no-schooling is higher than those headed by a primary school graduate. The contribution of 'between-group' inequality, however, is smaller, 11.4 percent to 14.9 percent. The higher 'between group' inequality has been also found by Tsakloglou (1992) and Glewwe (1986) for Greece and Sri Lanka, respectively.

Table 4.4

Inequality Decomposition by the Education of Head

	Population Share	Group mean Expenditure			Theil's 'T' Indices		
		PCE	ESAE	RSAE	PCE	ESAE	RSAE
			Urban				
None	0.081	23587.32	24573.90	30329.00	0.151	0.145	0.140
Primary	0.422	29482.72	31163.97	42083.38	0.166	0.158	0.149
Secondary	0.410	40680.80	43257.85	60005.10	0.220	0.216	0.208
High	0.088	58948.97	62302.93	83113.30	0.187	0.179	0.162
Within-Groups Inequality					0.193 (86.2)	0.187 (85.4)	0.178 (84.0)
Between-Groups Inequality					0.031 (13.8)	0.032 (14.6)	0.034 (16.0)
			Rural				
None	0.232	16470.24	16565.84	22212.67	0.138	0.137	0.129
Primary	0.617	18507.42	18672.51	27481.88	0.130	0.129	0.118
Secondary	0.141	26911.23	27182.47	40998.36	0.238	0.237	0.212
High	0.010	46115.51	46534.86	67602.45	0.274	0.273	0.262
Within-Groups Inequality					0.156 (89.1)	0.155 (88.6)	0.142 (84.5)
Between-Groups Inequality					0.019 (10.9)	0.020 (11.4)	0.025 (15.5)

Figures in parentheses indicate percentage contributions to total inequality.

4.4.4 Decomposition by the Province of Residence

In urban Indonesia, East Kalimantan has the highest and Jambi the least inequality. This conclusion is invariant to the definition of expenditure. In rural Indonesia, Bali has the highest and Bengkulu has the lowest inequality. The value of inequality indices and the relative ranking of provinces change little in rural sample compared to their urban counterparts. The choice of expenditure categories plays smaller role in rural areas. The contribution of between group inequality in total inequality in rural areas are 93.1, 92.6, and 91.3 percentages for PCE, ESAE, and RSAE respectively. In urban Indonesia, these perentages are 91.1, 90.9, and 90.6. Like before, here too, contribution of within-group inequality to total inequality is smaller in magnitude.

4.5 Conclusion

This study has examined inequality in the consumption distribution in Indonesia using the 1987 SUSENAS data. Theil's decomposable inequality index (T) has been used for partitioning the inequality based on different characteristics in order to analyze the 'within-group' and 'between-group' components of inequality.

The main conclusion derived from the decomposition analysis is that the between group inequality does not account for much of the inequality observed

Table 4.5A

Inequality Decomposition by Province: Urban

	Population Share	Group mean Expenditure			Theil's 'T' Indices		
		PCE	ESAE	RSAE	PCE	ESAE	RSAE
Aceh	0.022	38538.11	40861.79	55948.71	0.185	0.178	0.173
N. Sumatra	0.048	35901.88	38149.39	53390.44	0.162	0.155	0.146
W. Sumatra	0.023	39509.37	41900.29	57717.94	0.180	0.174	0.169
Riau	0.031	37538.70	40063.30	57538.13	0.127	0.122	0.128
Jambi	0.017	30299.61	32252.70	45013.74	0.081	0.076	0.082
S. Sumatra	0.045	32142.78	34173.47	47764.57	0.162	0.155	0.148
Bengkulu	0.011	32157.61	34048.68	46744.89	0.101	0.095	0.089
Lampung	0.025	33622.50	35875.68	51082.88	0.182	0.176	0.183
Jakarta	0.132	49698.06	52375.68	69372.83	0.164	0.157	0.143
W. Java	0.086	31176.11	33038.51	45002.28	0.183	0.176	0.159
C. Java	0.081	27215.69	28681.47	37906.76	0.210	0.201	0.182
Yogyakarta	0.024	29130.16	30543.01	38714.93	0.183	0.181	0.190
E. Java	0.086	31848.83	33511.49	43567.84	0.235	0.230	0.226
Bali	0.023	34046.72	35774.92	46199.73	0.191	0.182	0.162
W. Nusa Teng	0.021	25402.12	26909.22	36523.44	0.381	0.364	0.307
E. Nusa Teng	0.099	37511.64	39879.18	54930.90	0.245	0.241	0.242
W. Kalimantan	0.031	35079.64	37246.82	51011.68	0.156	0.152	0.147
C. Kalimantan	0.012	34262.01	36675.93	53017.60	0.126	0.117	0.099
S. Kalimantan	0.029	39161.27	41478.89	56217.78	0.179	0.171	0.161
E. Kalimantan	0.015	60368.10	64634.99	90999.03	0.916	0.942	0.986
N. Sulawesi	0.026	39287.96	41340.15	54155.24	0.201	0.192	0.173
C. Sulawesi	0.012	32021.50	34005.89	46289.97	0.109	0.105	0.103
S. Sulawesi	0.044	27479.31	29046.43	39396.40	0.206	0.197	0.181
S.E. Sulawesi	0.010	30568.37	33004.53	49108.06	0.141	0.140	0.150
Maluku	0.011	39338.42	42246.54	61371.65	0.143	0.140	0.159
Irian Jaya	0.037	44105.47	46907.64	65773.04	0.163	0.157	0.150
Within-Groups Inequality					0.204 (91.1)	0.199 (90.9)	0.192 (90.6)
Between-Groups Inequality					0.020 (8.9)	0.020 (9.1)	0.020 (9.4)

Figures in parentheses denote percentage contributions to total inequality.

Table 4.5B

Inequality Decomposition by Province: Rural

	Population Share	Group mean Expenditure			Theil's 'T' Indices		
		PCE	ESAE	RSAE	PCE	ESAE	RSAE
Aceh	0.036	22270.80	22466.50	33349.83	0.116	0.115	0.111
N. Sumatra	0.043	20764.30	20972.13	32349.86	0.131	0.130	0.121
W. Sumatra	0.037	24929.02	25143.88	37026.56	0.141	0.140	0.145
Riau	0.025	22427.19	22632.56	33765.38	0.083	0.082	0.076
Jambi	0.019	22356.49	22567.76	33432.95	0.095	0.094	0.084
S. Sumatra	0.040	21959.19	22180.79	34114.68	0.120	0.120	0.122
Bengkulu	0.012	20792.00	20991.76	32353.71	0.063	0.063	0.067
Lampung	0.041	19485.25	19675.54	29652.81	0.180	0.179	0.174
W. Java	0.095	20812.36	20984.95	30137.24	0.143	0.142	0.134
C. Java	0.098	16233.63	16359.76	23064.85	0.138	0.138	0.140
Yogyakarta	0.033	20518.22	20643.82	27430.23	0.242	0.241	0.215
E. Java	0.112	16988.70	17111.26	23331.35	0.214	0.214	0.212
Bali	0.031	22916.83	23066.41	31275.60	0.375	0.373	0.320
W. Nusa Teng	0.034	16523.87	16685.80	25671.57	0.257	0.256	0.279
E. Nusa Teng	0.108	16724.67	16878.33	24944.64	0.157	0.156	0.159
E. Timor	0.008	16663.26	16820.46	24184.72	0.105	0.104	0.089
W. Kalimantan	0.039	18122.18	18291.93	27158.38	0.084	0.083	0.083
C. Kalimantan	0.013	19463.58	19658.43	29966.68	0.074	0.074	0.073
S. Kalimantan	0.030	22891.52	23071.56	32907.69	0.142	0.142	0.134
E. Kalimantan	0.018	27610.84	27855.52	40597.90	0.168	0.167	0.155
N. Sulawesi	0.025	27089.19	27267.97	37482.81	0.275	0.273	0.219
C. Sulawesi	0.013	20575.96	20767.00	31020.63	0.202	0.201	0.178
S. Sulawesi	0.045	16157.15	16291.13	23986.70	0.110	0.109	0.106
S.E. Sulawesi	0.013	14382.35	14531.16	22512.08	0.126	0.125	0.128
Maluku	0.010	18866.55	19036.41	27795.04	0.158	0.157	0.150
Irian Jaya	0.021	18648.51	18836.21	28237.03	0.179	0.178	0.183
Within-Groups Inequality					0.163 (93.1)	0.162 (92.6)	0.154 (91.7)
Between-Groups Inequality					0.012 (6.9)	0.013 (7.4)	0.014 (8.3)

Figures in parentheses denote percentage contributions to total inequality.

in Indonesia. The highest between group inequality was observed when the decomposition was done based on education of head and province of residence. The contribution of inequality between male-headed and female-headed households to total inequality was quite insignificant. Likewise, decomposition based on age of the household gave very low 'between group' component.

The decomposition analysis based on the Rothbarth scale-adjusted expenditure series (RSAE) gave different results than those based on Engel scale adjusted (ESAE) and per-capita series (PCE). This may be due to the lower values obtained for Rothbarth scales which makes smaller adjustment for the presence of children. However, the composition of inequality is the same. This implies that the use of different scales may result in different inequality indices but that the structure of inequality remains the same. This has been substantiated by the information presented in Table 4.6 which lists the inequality rankings for all three expenditure categories. The rank correlation coefficients (Table 4.7) are, however, very high indicating the similarity of qualitative results for all three expenditure definitions. The graphical presentation of decompositions based on age of head and education of head (Figures 4.2 and 4.3) also support this assertion as we observe no noticiablely large change in the movement from one subgroup to the other.

For this study, decomposition based on the source of income was not conducted, as many households received income from different sources. Work

Table 4.6

Inequality Rankings Based on Theil's 'T' Measure

Characteristics	Urban			Rural		
	PCE	ESAE	RSAE	PCE	ESAE	RSAE
		Sex of Head				
Male	2	2	2	1	1	1
Female	1	1	1	2	2	2
		Age of Head (Years)				
Less than 35	1	1	1	3	3	4
35-44	4	4	4	2	2	2
45-54	5	5	5	1	1	1
55-64	3	2	2	4	4	5
65 and over	2	3	3	5	5	3
		Education of Head				
None	4	4	4	3	3	3
Primary	3	3	3	4	4	4
Secondary	1	1	1	2	2	2
High	2	2	2	1	1	1
		Province of Residence				
Aceh	9	10	9	19	19	19
N. Sumatra	18	17	20	16	16	18
W. Sumatra	13	13	11	14	14	12
Riau	22	22	22	24	24	24
Jambi	26	26	26	22	22	22
S. Sumatra	17	18	18	18	18	17
Bengkulu	25	25	25	26	26	26
Lampung	12	11	6	7	7	8
Jakarta	15	16	21	-	-	-
W. Java	10	12	14	12	12	14
C. Java	5	5	7	15	15	13
Yogyakarta	11	9	5	4	4	4
E. Java	4	4	4	5	5	5
Bali	8	8	12	1	1	1
W. Nusa Tenggara	2	2	2	3	3	2
E. Nusa Tenggara	3	3	3	11	11	9
E. Timor	-	-	-	21	21	21
W. Kalimantan	19	19	19	23	23	23
C. Kalimantan	23	24	24	25	25	25
S. Kalimantan	14	13	13	13	13	15
E. Kalimantan	1	1	1	9	9	10
N. Sulawesi	7	10	10	2	2	3
C. Sulawesi	24	23	23	6	6	7
S. Sulawesi	6	8	8	20	20	20
S.E. Sulawesi	21	17	17	17	17	16
Maluku	20	15	15	10	10	11
Irian Jaya	16	16	16	8	8	6

Note: Rank 1 means the highest inequality.

Table 4.7

Rank Correlation Coefficients

	Urban			Rural		
	PCE	ESAE	RSAE	PCE	ESAE	RSAE
			Sex of Head			
PCE	-	1.0	1.0	-	1.0	1.0
ESAE	1.0	-	1.0	1.0	-	1.0
			Age of Head			
PCE	-	0.9	0.9	-	1.0	0.7
ESAE	0.9	-	1.0	1.0	-	0.7
			Education of Head			
PCE	-	1.0	1.0	-	1.0	1.0
ESAE	1.0	-	1.0	1.0	-	1.0
			Province of Residence			
PCE	-	1.0	0.93	-	1.0	0.99
ESAE	1.0	-	0.94	1.0	-	0.99

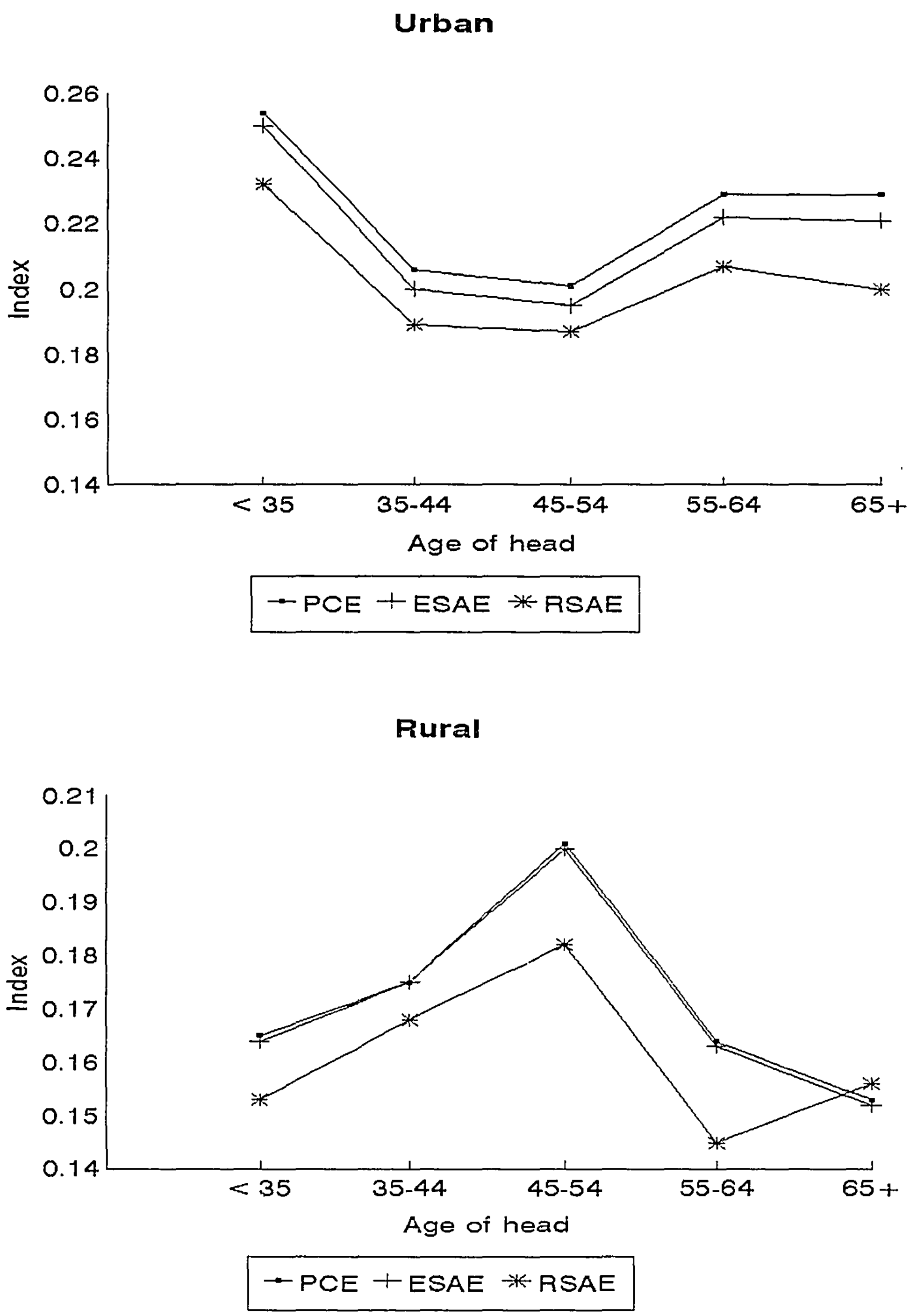
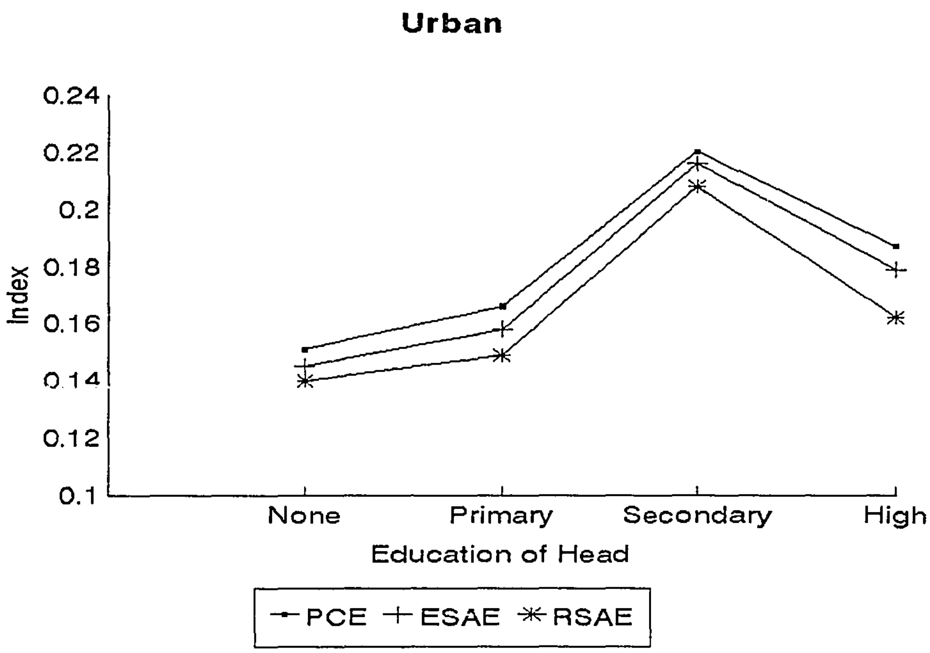


Figure 4.2: Inequality and Age of Head



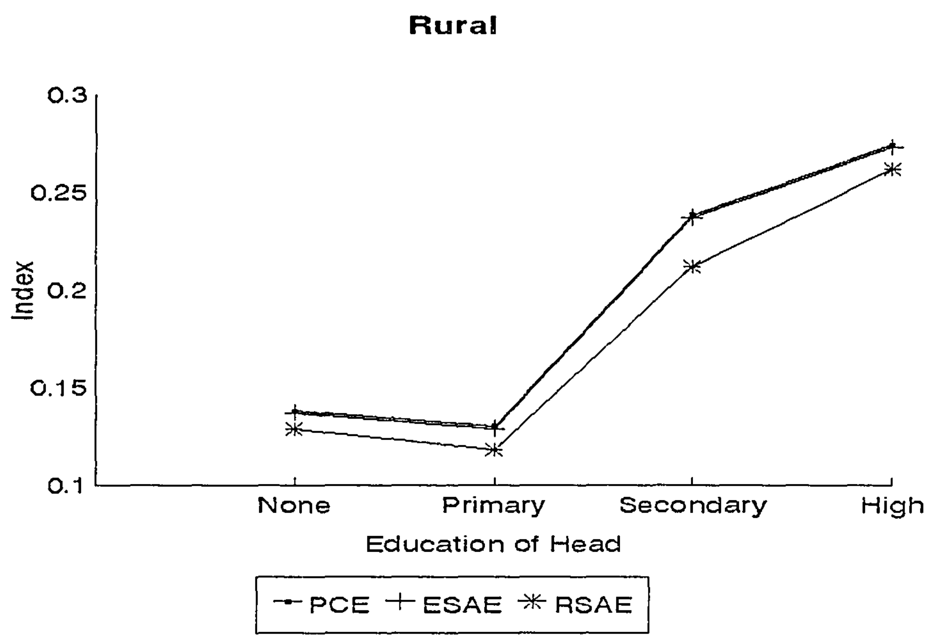


Figure 4.3: Inequality and Education of Head

on SUSENAS has found that the household's stated principal source of income may not necessarily be the sector from which the household derived its largest source of income (ILO 1989). Furthermore, no analysis was done to examine the changes over time. Future work should attempt to accomplish this task.

Many studies have found that inequality indices are different for income and expenditure data (Cutler and Katz 1992; Glewwe 1986). For Indonesia too, income data indicates higher inequality compared to expenditure data. Booth (1992) argues that this could reflect either understatement of consumption expenditures or higher savings. However, a comparative analysis using both the income and expenditure data can throw some light on the nature of inequality for different population sub-groups even though expenditure is the preferred choice.

APPENDIX

Methodology for the Selection of Adult Goods

In order to select the adult goods for estimating the Rothbarth model, we have identified alcohol,tobacco and betel-nut, adult clothing, entertainment, personal care, prepared food, and transport and communications as potential adult goods. Then, the following simple linear model was adopted to regress the expenses on particular good on total expenditure on adult goods, demographic variables and other control variables.

$$p_i q_i = \alpha + \beta_{1i} X_A + \beta_{2i} C_{0\text{-}6} + \beta_{3i} C_{7\text{-}15} + \gamma_i Z$$

where,

$p_i q_i$ = expenditure on a good

X_A = expenses on adult goods

$C_{0\text{-}6}$ = number of children aged 0-6

$C_{7\text{-}15}$ = number of children aged 7-15

Z = other control variables

Since $X_A = \sum_i p_i q_i$, it is likely that X_A will not be independent of error terms for each commodity. So the above equation has been estimated using Instrumental variables with total expenditure as the instrument for the expenditure on adult goods. In order to restrict the marginal propensity to spend on adult goods out of X_A equal to one, the restriction $\sum_i \beta_{1i} = 1$ was imposed across equations. After the estimation F-test was done to test the hypothesis that the demographic variables are jointly significant. From the results, only alcohol,tobacco and betel-nut qualified as the possible adult good category. The F statistics are presented in appendix A.

In order to cross-check these results we also calculated the Outlay equivalent ratios[1]. A negative ratio for adult demographic group implies that good does not belong to adult category and vice versa. From the results p[resented in Appendix B we see that only tobacco, betel-nut and alcohol qualify as adult good because the ratio is positive for age group 25-64, our reference group.

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[1]These ratios give the effect of an additional person of type r on the demand for good i, measured as the amount of additional outlay that would have been necessary to produce the same effect on demand, that additional outlay expressed as a fraction of total household expenditure per household member (Deaton, Ruiz-Castillo and Thomas, 1989).

Appendix A

F-test for the Exclusion of Child Category

Commodity	F-ratio	Probability
Adult Clothing	72.3161	0.0001
Tobacco and Betel Nut*	2.4453	0.0867
Entertainment	255.6115	0.0001
Personal Care	46.8493	0.0001
Prepared Food	25.8443	0.0001
Transport and Communications	74.4202	0.0001

* also includes Alcohol.

Appendix B

Outlay Equivalent Ratios

Commodity	C0-6	C7-15	N16-24	N25-64	N65UP
Adult Clothing	-0.4925	-0.5502	-0.1198	-0.2313	-0.2092
Tobacco, and Betel Nut*	-0.3460	-0.5705	-0.1154	0.2174	-0.1981
Entertainment	-0.1751	-0.3872	-0.4939	-0.4797	-0.3083
Personal Care	-0.1475	-0.0606	0.2500	-0.0227	-0.1090
Prepared Food	-0.0800	-0.0451	-0.2409	-0.3659	-0.4457
Transport and Communications	-0.3500	-0.3655	-0.1096	-0.0921	-0.1902

* also includes Alcohol

REFERENCES

Adams, R. and H. Alderman. 1992. Sources of Income Inequality in Rural Pakistan: A Decomposition Analysis. Oxford Bulletin of Economics and Statistics, 54: 591-608.

Anand, S. 1977. Aspects of Poverty in Indonesia. Review of Income and Wealth, 23: 1-16.

Arief, S. 1980. Who Benefits from Economic Growth? The Indonesia Experience. The South East Asian Economic Review, 1: 1-12.

Asra, A. 1989. Inequality Trends in Indonesia, 1969-1981: A Re-examination. Bulletin of Indonesian Economic Studies, 25: 100-110.

Atkinson, A. 1970. On the Measurement of Inequality. Journal of Economic Theory, 2: 244-263.

Bane, M. 1986. Household Composition and Poverty, in Danziger, S. and D. Weinberg eds. Fighting Poverty, pp. 209-231, Harvard University Press.

Barten, A. 1964. "Family Composition, Prices, and Expenditure patterns", in P. Hart et al., Econometric Analysis for National Economic Planning. 16th Symposium of the Colston Society, Butterworth, London.

Bauer, J. and A. Mason. 1993. "Equivalence Scales, Costs of Children, and Poverty in the Philippines and Thailand" in Cynthia B. Lloyd ed. Fertility, Family Size, and Structure: Consequences for Families and Children. New York, The Population Council.

Blackorby, C. and D. Donaldson. 1992. "Measuring the Costs of Children: A Theoretical Framework". A paper prepared for and presented at a conference on 'Measurement and Household Welfare', sponsored by the Institute for Fiscal Studies in May, 1991.

Blackorby, C. and D. Donaldson. 1988. "Adult equivalence scales and the Economic Implementation of Interpersonal Comparisons of Well-Being". University of British Columbia Discussion Paper 88-27, revised 1989.

Blackorby, C. and D. Donaldson. 1980. Ethical Indices for the Measurement of Poverty. Econometrica, 48: 1053-60.

Blundell, R. and A. Lewbel. 1991. "The Information Content of Equivalence Scales". Journal of Econometrics, 50: 49-68.

Booth, A. 1993. Counting the Poor in Indonesia. Bulletin of Indonesian Economic Studies, 29: 53-83.

Booth, A. 1992. Income Distribution and Poverty, in Anne Booth (ed.), The Oil Boom and after: Indonesian Economic Policy and Performance in the Soeharto Era, Oxford University Press, Singapore.

Booth, A. and R. Sundrum. 1981. Income Distribution, in Anne Booth and Peter McCawley (eds.), The Indonesian Economy During the Suharto Era, Oxford University Press, Kuala Lumpur.

Bourguignon, F. 1979. Decomposable Income Inequality Measures. Econometrica, 4: 901-920.

Buhmann, B., L. Rainwater, G. Schmaus, and T. Smeeding. 1988. Equivalence Scales, Well-being, Inequality, and Poverty: Sensitivity estimates Across Ten Countries Using the Luxembourg Income Study (LIS) Database. The Review of Income and Wealth, 34: 115-142.

Chung, C. and A. Goldberger. 1984. Proportional Projections in Limited Dependent Variable Models. Econometrica, 52: 531-534.

Clark, S., R. Hemming and D. Ulph. 1981. On Indices for the Measurement of Poverty. The Economic Journal, 91: 515-526.

Coulter, A., F. Cowell, and S. Jenkins. 1992. Equivalence Scale Relativities and the Extent of Inequality and Poverty. The Economic Journal, 102: 1067-1082.

Cowell, F. 1988. Inequality Decomposition: Three Bad Measures. Bulletin of Economic Research, 40: 309-312.

Cowell, F. 1980. On the Structure of Additive Inequality Measures. Review of Economic Studies, 47: 521-531.

Cowell, F.A. 1977. Measuring Inequality. Philip Allon, Oxford.

Cutler, D. and L. Katz. 1992. Rising Inequality? Changes in the Distribution of Income and Consumption in the 1980s. NBER Working Paper No. 3964, Cambridge.

Dasgupta, P., A. Sen and D. Starrett. 1973. Notes on the Measurement of Inequality. Journal of Economic Theory, 6:180-87.

Deaton, A. 1982. Inequality and Needs: Some Experimental Results for Sri Lanka. Population and Development Review, 8: 35-49.

Deaton, A. 1980. Measurement of Welfare: Theory and Practical Guidelines, World Bank Living Standards Measurement Study Working Paper no. 7, World Bank, Washington D.C.

Deaton, A. and A. Case. 1988. "Analysis of Household Expenditures". Living Standards Measurement Study Working Paper no. 28, The World Bank, Washington D.C.

Deaton, A. and J. Muellbauer. 1980. Economics and Consumer Behavior. New York: Cambridge University press.

Deaton, A. and J. Muellbauer. 1986. On Measuring Child Costs: With Application to Poor Countries. Journal of Political Economy, 94: 720-44.

Deaton, A., J. Ruiz-castillo and D. Thomas. 1989. The Influence of Household Composition on Household Expenditure Patterns: Theory and Spanish Evidence. Journal of Political Economy, 97: 179-200.

Deaton, A. and M. Irish. 1984. Statistical Models for Zero Expenditures in Households Budgets. Journal of Public Economics, 23: 59-80.

DuMouchel, W. and G. Duncan. 1983. Using Sample Survey Weights in Multiple Regression Analyses of Stratified Samples. Journal of American Statistical Association, 78: 535-543.

Engel, E. 1895. "Die Lebenskosten Belgischer Arbeiter-Familien Fruher und Jetzt". International Statistical Institute Bulletin, 9: 1-74.

Esmara, H. 1986. Perencanaan dan Pembangunan di Indonesia. Gramedia, Jakarta.

Fields, G. 1979. Decomposing LDC Inequality. Oxford Economic Papers, 31: 437-459.

Fishlow, A. 1972. Brazilian Size Distribution of Income, American Economic Review, 62: 391-402.

Foster, J., J. Greer and E. Thorbecke. 1984. A Class of Decomposable Poverty Measures. Econometrica, 52: 761-67.

Friedman, M. 1957. A Theory of the Consumption Function. Princeton, NJ: Princeton University Press (for NBER).

Fuschs, V. 1986. The Feminization of Poverty, NBER Working Paper No. 1934.

Glewwe, P. 1986. The Distribution of Income in Sri Lanka in 1969-70 and 1980-81: A Decomposition Analysis. Journal of Development Economics, 24: 255-274.

Gorman, W. 1976. "Tricks with Utility Functions". in M. Artis and A. Nobay eds., Essays in Economic Analysis, The Proceedings of the AUTE Sheffield 1975, Cambridge University Press, Cambridge.

Greene, W. 1981. On the Asymptotic Bias of the Ordinary Least Squares Estimator of the Tobit Model. Econometrica, 49: 505-514.

Gronau, R. 1991. The Intra-family Allocation of Goods- How to Separate Adult from the Child. Journal of Labor Economics, 9: 207-35.

Gronau, R. 1988. Consumption Technology and the Intra-family Distribution of Resources: Adult Equivalence Scales Re- Examined. Journal of Political Economy, 96: 1183-205.

Gronau, R. 1974. Wage Comparisons: A Selectivity Bias. Journal of Political Economy, 82: 1119-1144.

Hagenaars, A. 1986. The Perception of Poverty, North Holland.

Heien, D. and C. Wessells. 1990. Demand Systems Estimation with Microdata: A Censored Regression Approach. Journal of Business and Economic Statistics, 8: 365-71.

Holt, D. and A. Scott. 1981. Regression Analysis using Survey Data. The Statistician, 30: 169-178.

Hughes, G. and I. Islam. 1981. Inequality in Indonesia: A Decomposition Analysis. Bulletin of Indonesian Economic Studies, 17: 42-71.

ILO, 1989. Prospects for Labor Absorption in Agriculture in Repelita V.

Islam, I. and H. Khan. 1986. Spatial Patterns of Inequality and Poverty in Indonesia. Bulletin of Indonesian economic Studies. 22: 80-102.

Jain, S. 1975. Size Distribution of Income: A Compilation of Data. Johns Hopkins University Press, Baltimore.

Kakwani, N. 1993. Statistical Inference in the Measurement of Poverty. Review of Economics and Statistics, 75: 632-39.

Kakwani, N. 1986. Analyzing Redistribution Policies: A Study using Australian Data, New York, Cambridge University Press.

Kakwani, N. 1980. On a Class of Poverty Measures, Econometrica, 48: 437-446.

Kay, J., M. Keen and C. Morris. 1984. Estimating Consumption from Expenditure data. Journal of Public Economics, 23: 169-82.

Keen, M. 1986. Zero Expenditures and the Estimation of Engel Curves. Journal of Applied Econometrics, 1: 277-86.

Kuznets, S. 1974. Demographic Aspects of the Distribution of Incomes among Families: Recent Trends in the United States, in W. Sellekaerts (ed.), Econometrics and Economic Theory: Essays in Honor of Jan Tinbergen, London: MacMillan Press Ltd., PP. 223-245.

Lazear, E. and R. Michael. 1988. Allocation of Income Within the Household. Chicago, University of Chicago press.

Leser, C. 1963. "Forms of Engel Functions". Econometrica, 31: 694-703.

Lewbel, A. 1989. "Household Equivalence Scales and Welfare Comparisons". Journal of Public Economics, 39: 377-91.

Lewis, H. 1974. Comments on Selectivity Biases on Wage Comparisons. Journal of Political Economy, 82: 1145-56.

Lipton, M. 1983. Poverty, Undernutrition and Hunger. World Bank Staff Working Paper No. 597.

Mishra, P. and A. Parikh. 1992. Household Consumer Expenditure Inequalities in India: A Decomposition Analysis. Review of Income and Wealth, 38: 225-236.

Muellbauer, J. 1977. "Testing the Barten Model of Household Composition Effects and the Cost of Children". The Economic Journal, 87: 460-87.

Newbery, D. 1970. A Theorem on the Measurement of Inequality. Journal of Economic Theory, 2: 264-266.

Olsen, R. 1980. Approximating a Truncated Normal Regression with the Method of Moments. Econometrica, 48: 1099-1105.

Paglin, M. 1975. The Measurement and Trend of Inequality: A Basic Revision. American Economic Review, 65: 598-609.

Pashardes, P. 1991. Contemporaneous and Intertemporal Child Costs: Equivalent Expenditure vs. Equivalent Income Scales. Journal of Public Economics, 45: 191-213.

Pollak, R. and T. Wales. 1979. Welfare Comparisons and Equivalence Scales. American Economic Review, 69: 216- 21.

Prais, S. and H. Houthakker. 1955. The Analysis of Family Budgets. Cambridge University Press, Cambridge.

Pyatt, G. 1987. Measuring Welfare, Poverty and Inequality. The Economic Journal, 97: 459-67.

Perena, L. and S. Budianti. 1977. Economic Growth and the Distribution of Income in Indonesia, 1970-1976. BPS, Jakarta.

Ravallion, M. 1992. Poverty Comparisons: A Guide to Concepts and Methods. Living Standards Measurement Study Working Paper No. 88. The World Bank.

Ravallion, M. and B. Bidani. 1994. How Robust is a Poverty Profile. The World Bank Economic Review, 8: 75-102.

Rothbarth, E. 1943. Note on a Method of Determining Equivalent Income for Families of Different Composition, app. 4 in War-time Pattern of Saving and Spending, by Charles Madge, Occasional paper no. 4, Cambridge. Cambridge University press.

Rothchild, M. and J. Stiglitz. 1970. Some Further Results on the Measurement of Inequality. Journal of Economic Theory, 6: 188-204.

Sajogyo. 1975. Usaha Perbaikan Gizi Keluarga, (ANP Evaluation Study 1973), Institut Pertanian Bogor, Bogor.

Sajogyo and G. Wiradi. 1985. Rural Poverty and Efforts for its Alleviation in Indonesia, WCARRD Follow-up Program In-depth Studies, Series No. 18, FAO, Rome.

Scott, A. and L. Holt. 1982. The Effect of Two Stage Sampling on Ordinary Least Squares Methods. Journal of the American Statistical Association, 77: 848-54.

Sen, A. 1984. Resources, Values and Development, Oxford: Basil Blackwell.

Sen, A. 1976. Poverty: An Ordinal Approach to Measurement. Econometrica, 44: 219-231.

Shorrocks, A. 1980. The Class of Additively Decomposable Inequality Measures. Econometrica, 48: 613-625.

Shorrocks, A. 1984. Inequality Decomposition by Population Subgroups. Econometrica, 52: 1369-1385.

Shorrocks, A. and J. Foster. 1987. Transfer Sensitive Inequality Measures. The Review of Economic Studies, 54: 485-497.

Sydenstricker, E. and W. King. 1921. "The Measurement of relative Economic Status of families". Quarterly Publication of the American Statistical Association, 17: 842-57.

Takayama, N. 1979. Poverty, Income Inequality, and their Measures: Professor Sen's Axiomatic Approach Reconsidered. Econometrica, 47: 747-759.

Theil, H. 1967. Economics and Consumer Theory. Amsterdam, North Holland.

Thon, D. 1979. On Measuring Poverty. The Review of Income and Wealth, 25: 429-439.

Tobin, J. 1958. "Estimation of Relationships for Limited Dependent Variables". Econometrica, 26: 24-36.

Tsakloglou, P. 1993. Aspects of Inequality in Greece: Measurement, Decomposition and Intertemporal Change, 1974, 1982. Journal of Development Economics, 40: 53-74.

Tsakloglou, P. 1991. Estimation and Comparison of Two Simple Models of Equivalence Scales for the Cost of Children. The Economic Journal, 101: 343-57.

Van de walle, D. 1988. On the Use of the SUSENAS for Modelling Consumer Behavior. Bulletin of Indonesian Economic Studies, 24: 107-22.

Vaughan, R. 1987. Welfare Approaches to the Measurement of Poverty. The Economic Journal, (supplement), 97: 160-70.

White, H. 1980. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity". Econometrica, 48: 817-38.

Working, H. 1943. "Statistical laws of Family Expenditures". Journal of American Statistical Association, 38: 43-56.

World Bank. 1990. Indonesia: Strategy for Sustained Reduction in Poverty. Washington, D.C.