IBGE

Brazilian Institute for Geography and Statistics

ECLAC

Economic Commission for Latin America and the Caribbean

National Statistical Institute of Portugal

Third Meeting of the Expert Group on Poverty Statistics (Rio Group)
Lisbon, 22-24 November, 1999

Equivalence Scales

A Brief Review of Concepts and Methods[1]

ECLAC

[1] This document is an abridged translation from the original in Spanish: "Escalas de Equivalencia: Breve Reseña de Conceptos y Metodos", CEPAL (1999), in press.

1. Introduction

In measuring "well-being", household income (or consumption) is usually used as a suitable indicator of the level of living. The most elementary option is to use total income, which would mean that two households with the same income have the same level of well-being, regardless of their size or other characteristics. The use of per capita income partly solves this problem, since it takes account of the number of persons in the household. However, this variable assumes that all individuals' needs are the same and that there are no economies of scale in consumption. This runs counter, for example, to the evidence that children need a smaller budget than adults to satisfy their food and clothing needs, and moreover it is not compatible with the idea that two persons living together can cover their needs in terms of heating and housing without needing to spend twice as much as a person living alone.

Equivalence scales are indexes that measure the relative cost of living of families of different sizes and compositions. They are made up of two elements: the "consumer unit equivalence", which takes account of the needs of the household members according to their characteristics, and "economies of scale", which mean that the marginal cost goes down with the addition of new members to the household.

In the literature, equivalence scales are usually classified as follows: a) "behaviour" scales, estimated on the basis of the observed expenditure of households; b) "parametric" scales, which explicitly reflect the "equivalence" and "economies of scale" elements; c) "expert" scales, which are constructed on the basis of the criteria used by researchers, and d) "subjective" scales, estimated on the basis of individuals' perceptions of their own needs. In line with this logic, the methods most frequently used to estimate equivalence scales are analysed below.

2. Equivalence scales based on observed expenditure

2.1 Theoretical framework

Following the ideas of Tsakloglou (1991), let us assume a utility function for heads of households which depends on the quantity of goods consumed in the household (**q**) and its demographic characteristics (**z**)[2]:

$$u = u(\mathbf{q}, \mathbf{z})$$

Then, we can obtain a "cost function" which indicates the minimum expenditure on goods (x) required for a household of composition **z** to reach utility level u when prices are **p**:

$$c(u, \mathbf{p}, \mathbf{z}) = x$$

The equivalence scale is obtained by dividing the cost function of household h by the cost function of the reference household, for given levels of prices (p^0) and utility (u^0):

[2] Symbols in bold-face type, such as **p** and **z**, correspond to vectors.

$$\mu^h = \frac{c\left(u^0, \mathbf{p}^0, \mathbf{z}^h\right)}{c\left(u^0, \mathbf{p}^0, \mathbf{z}^0\right)}$$

As set forth here, the equivalence scale μ cannot be estimated, because the level of utility u is not observable. However, it is possible to empirically estimate demand functions which depend on observable variables. Generally speaking, the methods for constructing equivalence scales presented in this section can be interpreted as different ways of estimating these demand functions. Expenditure on good i is given by:

$$p_i * q_i\left(x, \mathbf{p}, \mathbf{z}\right) = \frac{\partial\, c\left(v\left(x, \mathbf{p}, \mathbf{z}\right), \mathbf{p}, \mathbf{z}\right)}{\partial \ln p_i}$$

Pollak and Wales (1979) consider that this procedure is not appropriate for making welfare comparisons, because the observed demand is "conditional" on the size of the household and therefore does not reveal the household's preferences with regard to the number of members in it. According to these authors, the only valid way of making welfare comparisons is through "unconditional" preferences: that is to say, utility functions that are maximized by choosing both the quantity of goods to be consumed and the family size. Other criticisms of the welfare assumptions in the estimation of equivalence scales may be found in Fisher (1987) and Nelson (1993).

2.2 Engel method

The most frequently used method for constructing equivalence scales is that of Engel (1895). It assumes that the greater the proportion of expenditure allocated to the purchase of food, the lower the level of well-being of the household. If two households spend the same proportion of their budgets on food (i.e., they have the same level of well-being), the relation between the total expenditures of the two households will give an index of the cost of maintaining the first household compared with the second, and this index will be the equivalence scale. This is applicable not only to expenditure on food but also to spending on any good displaying the same empirical regularities ("Iso-Prop" method, Watts, 1967).

In order to construct equivalence scales by this method, we must estimate an "Engel curve" for the proportion spent on food. Let us take, for example, the following functional form:

$$w_f = \alpha + \beta \ln(x/n) + \sum_i \gamma_i n_i + \varepsilon$$

where x = total expenditure, n = total number of persons in the household, n_i = number of persons in category i (examples of categories are: children from 0 to 6 years of age, from 6 to 12, etc.), α, β and γ are parameters, ε is an error term, and $\ln(x/n)$ is the natural logarithm of per capita income.

If x^* is the expenditure that household h must make to maintain the same level of utility as the reference household (whose expenditure is x^0), and if both households devote the same proportion of their expenditure to the purchase of food, then x^* would be defined by:

$$\alpha + \beta \ln\left(x^{*}/n^{h}\right) + \sum_{i} \gamma_i n_i^{h} = \alpha + \beta \ln\left(x^{0}/n^{0}\right) + \sum_{i} \gamma_i n_i^{0}$$

Solving for the expenditure variables, we obtain the equivalence scale:[3]

$$\mu = \frac{x^{*}}{x^{0}} = \frac{n^{h}}{n^{0}} \exp \sum_{i} \left[\left(\frac{\gamma_i}{\beta} \right) \left(n_i^{0} - n_i^{h} \right) \right]$$

Nicholson (1974) shows that expenditure on food is not an appropriate indicator of well-being. His argument is as follows: Let us assume that an adult couple have just had a child and receive an income compensation which allows them to maintain their previous level of living. As the child spends most of his budget on food, the total proportion of expenditure devoted to the purchase of food will be greater than before the arrival of the child, although the family's level of living has not worsened. Consequently, Engel's method overestimates the compensation needed to maintain the family on its initial indifference curve. Such overestimation also occurs because the limited economies of scale in food consumption are not representative for other goods such as housing, etc. These observations are consistent with the findings of Tsakloglou (1991) and Deaton and Muellbauer (1986).

Although it has the great advantage of simplicity, Engel's method is rejected as a valid option for estimating equivalence scales, both because of the weakness of its theoretical bases and the implausibility of its implications, including its assumption that the relation between the needs of children and adults is the same for all goods.

2.3 Rothbart method

Instead of expenditure on food, Rothbart (1943) suggested using a group of goods consumed only by adults, termed "adult goods". The idea is that the incorporation of a child into the family involves fresh expenditure which is financed by reducing the budget for goods not consumed by children. If it is assumed that the spending on "adult goods" (such as cigarettes and liquor) reflects the well-being of the adults in a household, the equivalence scale is given by the quotient between the total expenditures of two households with different sizes whose spending on "adult goods" is the same. Using this method, it is also possible to calculate the "cost of a child": that is to say, the monetary compensation needed to permit a household to spend the same proportion of its budget on "adult goods" as it did before the incorporation of the new member. The empirical estimation of equivalence scales by this method follows the same procedure as was set forth for Engel's method, subject to prior identification of the "adult goods" to be used.

The literature comparing the Engel and Rothbart methods tends to prefer the latter. This does not mean that Rothbart's method is free from defects, however. Among such defects is the fact that this method assumes that the presence of children has an income effect only on the consumption of the parents, but this is not so when there are "family" goods (public goods in the household). Among the practical limitations, it should be noted that this method is only useful for estimating

[3] The term *exp(x)* is equivalent to e^{x}, where *e* is the base of the natural logarithm *(ln)*.

equivalence scales for children, since it requires that the additional member of the household should not consume "adult goods".

There are a number of arguments showing that the Rothbart method underestimates the equivalence scales. Thus, Gronau (1988) notes that when the parents derive utility from the consumption of their children, the marginal propensity to spend on "adult goods" is reduced by the presence of additional children. In addition, Tsakloglou (1991) mentions that some "adult goods" tend to be inelastic with respect to income, so that they do not adequately reflect the "cost" of an additional member in the household.

2.4 Prais and Houthakker (PH) method

This method –based on Sydenstricker and King (1921)– is a generalization of the preceding methods, as it estimates a system of Engel curves for each good (or group of goods) consumed in the household. The Engel curves have the following form:

$$q_i(x, \mathbf{z}) = m_i(\mathbf{z}) g_i\left(\frac{x}{m_0(\mathbf{z})}\right)$$

where $m_0(\mathbf{z})$ is interpreted as an "income scale" and $m_i(\mathbf{z})$ corresponds to "specific scales" for each good. The first function measures the relative income required by households of different compositions to attain the same level of well-being, while the second measure the relative expenditure on good *i* by the different demographic groups in the household. Thus, a household with children will have higher "specific scales" for goods such as "children's food" and "education" than a household made up only of adults; this will be reflected, in turn, in a higher "income scale".

The most obvious advantage of this method is that it does not assume that the addition of a new member to the household has the same effect on the consumption of all goods, as Engel's method does. There are certain extreme assumptions behind this method, however, such as the assumption that the crossed elasticities are zero. Moreover, Muellbauer (1974) shows that the model is under-identified and that it is not possible to estimate equivalence scales without placing restrictions on some of the specific scales. According to Deaton (1997), it could be assumed that the specific scale for "adult goods" is equal to 1, but in this sense it is open to question whether this complicated method really represents a contribution compared with a simpler methodology such as that of Rothbart.

2.5 Barten method

Like the method of Prais and Houthakker, the method by Barten (1964) proposes a system of demand equations, but unlike the methods analysed earlier this incorporates the possibility that prices may vary. As it is more general, this method embraces the three methods already analysed, subject to certain special restrictions.[4]

[4] Only if the couple is takes as the reference unit for all the methods, and not an adult or other member. Nelson (1993) notes that this assumption is open to objection, since the concept of well-being used leaves

In this method, the demand functions have the following form:

$$q_i = m_i(\mathbf{z}) * h_i\left(x, p_1 m_1(\mathbf{z}), \ldots, p_n m_n(\mathbf{z})\right)$$

where **z** is a vector of demographic characteristics vector and $m_i(\mathbf{z})$ determines the proportion of each good *i* consumed by the parents (Deaton and Muellbauer, 1986). When a new member is added to the household, the demographic characteristics can affect demand in two ways: (a) a "direct" positive effect on demand, corresponding to the increase of the factor m_i as a result of the greater "needs" caused by an additional member, and (b) an "indirect" effect due to the change in "effective" prices ($p_i m_i$) of the parents' consumption, resulting in the replacement of more expensive goods by cheaper ones. This latter effect lends greater theoretical weight to Barten's method, as it is not present in any of the earlier methods.

It should be noted that this methodology implicitly assumes that both the reference household and the household with children consume the same goods, which is not consistent with the case of a good such as diapers. This problem can be solved by using the modification suggested by Gorman (1976), who adds a number of fixed costs associated with children to Barten's cost function.

In general, Barten's method is of limited applicability, as it requires data with price variations for its estimation. With regard to the soundness of the assumptions made in this model, the empirical evidence seems to reject the independence of the $m_i(\mathbf{z})$ functions with respect to quantities, income and prices (Nelson, 1992).

3. "Parametric" scales

An option which is not based directly on observed behaviour is provided by "parametric" scales. These are scales constructed on the basis of a standard functional form, with explicit parameters that reflect the economies of scale in consumption and the different needs of the household members.

One possibility is to establish the equivalence scale entirely as a function of the economies of scale in consumption. In this case, the scale is given by n^{θ}, where *n* is the number of members in the household and θ is the parameter for economies of scale ($\theta = 0$ corresponds to absolute economies of scale; $\theta = 1$ corresponds to the absence of economies of scale). According to Buhmann and others (1988), this functional form adequately represents other scales estimated on the basis of observed expenditure, even though it does not take other demographic characteristics into account. Some studies by the Organization for Economic Cooperation and Development (OECD) and the Statistical Office of the European Community use an equivalence scale of this type, taking a value of θ equal to 0.5 (Burkhauser and others, 1996).

It is also possible to develop a parametric scale entirely as a function of the relative needs of the household members. An example of this is the OECD scale, which can be written as [1.0 + 0.7(*A*-1) + 0.5*K*]; i.e., the first adult has a value of 1.0, each additional adult is equivalent to 0.7 of the first adult, and each child under 14 is equivalent to 0.5 of the first adult. Similarly (but assuming

---

out the welfare of children.

lower equivalences) the "modified OECD" scale uses parameters corresponding to 0.5 for each additional adult and 0.3 for each child (De Vos and Zaidi, 1997).

A more "complete" parametric scale has been proposed for the construction of the United States poverty line (Citro and Michael, 1995). This scale has the form $(A + pK)^F$, where A is the number of adults in the family, K is the number of children, p is the proportion of a child's needs compared with those of an adult, and F is the economies of scale factor.

Generally speaking, the growing use of these scales is due to the ease with which they can be applied and understood. They are often criticised for the arbitrary manner in which they select parameters, although this can be corrected by choosing values that are consistent with observed behaviour.

4. "Expert" and subjective scales

4.1 "Expert" scales

An "expert scale" is one constructed on the basis of the views of expert social analysts, using different types of information and usually taking into account the specific use to be made of the scale (Buhmann and others, 1988)[5]. The "expert scale" most often cited in the economic literature is that of Orshansky, which is actually a by-product of the poverty lines for various types of United States households.

Citro and Michael (1995) mention some criticisms of this method, generally aimed at the fact that these scales depend largely on nutritional criteria. These criteria may not coincide with reality, and moreover they fail to reflect the economies of scale in the consumption of "family goods". In short, this method has gained little acceptance, and its use for the construction of equivalence scales is not usually recommended.

4.2 "Subjective" scales

As in the previous case, subjective scales are a by-product of the construction of subjective poverty lines. These are calculated on the basis of the interviewees' perception of what they consider to be the minimum income essential for survival. For this purpose, surveys usually include a "Minimum Income Question" along the following lines: "What do you consider to be the minimum amount of money needed for the survival of a family of four persons?" (Danziger and others, 1984).

The empirical evidence shows that the higher the income level of the respondent, the higher tends to be the income that he considers to be a minimum for survival. On the basis of this, it is assumed that those households which consider that this minimum income would be similar to that which they receive themselves are those that give the "true" answer, i.e., the poverty line. The equivalence

[5] Although "parametric" scales could also correspond with this definition, the information they use is not limited to that coming from "experts". Our classification is based on the way equivalence scales are constructed and not the source of the information used.

scales are obtained by dividing the subjective poverty line of a household by that of the reference household.

Although many authors acknowledge the potential of subjective information in measuring well-being, this method has not won general acceptance in the construction of equivalence scales. Its results are not usually easy to accept, as they generally involve excessive economies of scale.

5. Effects of the use of equivalence scales

A first option for evaluating the implications of the use of equivalence scales is that developed by Buhmann and others (1988). That study approximates a wide variety of equivalence scales by means of a parametric scale with a single parameter corresponding to economies of scale. The results show that the value of the parameter for "subjective" scales is usually around 0.25, that of "behaviour" scales averages 0.40, while that of "expert" scales exceeds 0.60. In short, "subjective" scales generate high values of economies of scale while "expert" scales give very small economies of scale, in line with what was noted earlier.

Coulter, Cowell and Jenkins (1992) make a theoretical analysis of the effect of using an equivalence scale on the measurement of poverty and income distribution, using a parametric scale of the same type as that of Buhmann and others (1988). These authors find that changes in the parameter of economies of scale are typically reflected as a U-shaped relation between the social indicator and the parameter in question, both for income distribution and for poverty. This means that if the value of the parameter is gradually raised from 0 to 1, first there is a reduction in the indicator (either a reduction in poverty or an improvement in income distribution), but after reaching a minimum level the indicator gradually begins to rise again.

The prediction of a U-shaped relation is compatible with the empirical findings of various studies, including those of Coulter and others (1992), Buhmann and others (1988) and Figini (1998). With regard to the magnitude of the changes in the measurement of income distribution and poverty, several studies generally concur that the aggregate measures do not display major variations as a result of changes in the equivalence scale. However, the demographic structure of households ranked by income levels may register important changes. It should be noted that these empirical observations are based on the use of relative poverty lines and refer to developed countries, so that their conclusions are not necessarily applicable to other situations or ways of measuring poverty.

6. Conclusions

The arguments set forth in this paper clearly indicate that no method is categorically superior to another. The "subjective" and "expert" methods are often rejected for not having an acceptable theoretical basis for measuring welfare. Although the methods developed by Engel and Rothbart have the advantage of being simple and easy to estimate, both of them generate biased scales. The methods of Prais and Houthakker and of Barten have more solid theoretical bases, but unfortunately their estimation is a complicated matter, they are not suitably identified, and they require very large data bases.

Among the advantages of parametric scales is their ease of construction, which makes it possible to establish a clear separation between the "needs" effect and the "economies of scale" effect. In spite

of their simplicity, they give quite acceptable approximations to the results obtained by using methods with a better theoretical base. The selection of values for the parameters could be totally arbitrary, however, unless based in some way on observed behaviour.

Generally speaking, studies which evaluate the impact of using equivalence scales on the measurements of income distribution and poverty do not find any major effects on the aggregate measurements, but such effects are observed on the demographic structure of households below the poverty line. However, these conclusions are not necessarily applicable to developing countries or those where the poverty line used is absolute.

Bibliography

Awad, Yaser; Israeli, Niri (199?): "Poverty and Income Inequality: An International Comparison, 1980s and 1990s". LIS Working Paper No. 166

Betson, David (1996): "Is Everything Relative? The Role of Equivalence Scales in Poverty Measurement (Preliminary Version)". (Mimeo)

Blundell, Richard; Lewbel, Arthur (1991): "The Information Content of Equivalence Scales". *Journal of Econometrics*, vol. 50, pp. 49-68

Bojer, Hilde (1977): "The Effect on Consumption of Household Size and Composition". *European Economic Review*, vol. 9, no. 2, pp. 169-193

Browning, Martin (1992): "Children and Household Economic Behavior". *Journal of Economic Literature*, vol. 30, no. 3, pp. 1434-1475

Buhmann, Brigitte; Rainwater, Lee; Schmaus, Günther; Smeeding, Timothy (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*, vol. 34, no. 2, pp. 115-142

Burkhauser, Richard; Smeeding, Timothy; Merz, Joachim (1996): "Relative Inequality and Poverty in Germany and the United states using Alternative Equivalence Scales". *The Review of Income and Wealth*, vol. 42, no. 4, pp. 381-400

Citro, Constance; Michaels, R. (eds.) (1995): *Measuring Poverty: A New Approach*. National Academy Press.

Conniffe, Denis (1992): "The Non-Constancy of Equivalence Scales". *The Review of Income and Wealth*. vol. 38, no. 4

Coulter, Fiona A.E.; Cowell, Frank, A.; Jenkins, Stephen P. (1992): "Equivalence Scale Relativities and the Extent of Inequality and Poverty". *The Economic Journal*, vol. 102, pp. 1067-1082

Danziger, Sheldon; van der Gaag, Jacques; Taussig, Michael; Smolensky, Eugene (1984): "The Direct Measurement of Welfare Levels: How Much Does It Cost to Make Ends Meet?". *The Review of Economics and Statistics*, vol. 46, no. 3, pp. 500-505

de Vos, Klaas; Zaidi, Asghar (1997): "Equivalence Scale Sensitivity of Poverty Statistics for the Member States of the European Community". *The Review of Income and Wealth*, vol. 43, no. 3, pp. 319-333.

Deaton, Angus (1981): "Three Essays on a Sri Lanka Household Survey". LSMS Working Paper No. 11. The World Bank. Washington D.C.

Deaton, Angus (1997): *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. World Bank. The Johns Hopkins University Press.

Deaton, Angus S.; Ruiz-Castillo, Javier; Thomas, Duncan (1989): "The Influence of Household Composition on Household Expenditure Patterns: Theory and Spanish Evidence". *Journal of Political Economy*, vol. 97, no. 1, pp. 179-203

Deaton, Angus; Muellbauer, John (1980): *Economics and Consumer Behavior*. Cambridge University Press

Deaton, Angus; Muellbauer, John (1986): "On Measuring Child Costs: With Applications to Poor Countries". *Journal of Political Economy*, vol. 94, no. 4, pp. 720-744

Deaton, Angus; Zaidi, Salman (1999): "Directrices para construir agregados de consumo a efectos del análisis del bienestar (Versión Preliminar)". In ECLAC, *3er Taller Regional: Medición del Gasto en las Encuestas de Hogares*

Duclos, Jean-Yves; Mercader-Prats, Magda (1996): "Household Needs and Poverty: With Application to Spain and the UK.". Recherche en Politique Economique, Université Laval, Département d'économique

Economic Commission for Europe (1991): "Equivalence Scales and Distribution of Household Incomes: Do Different Scales Change the Messages on Inequalities?". Central Statistical Office of Austria. Economic Commission for Europe. United Nations

Fernández, Adrian (1996): "Limitaciones del Ingreso per Cápita: Adulto Equivalencias y Economías de Escala". In *Aspectos Metodológicos sobre Medición de la Línea de Pobreza: El Caso Uruguayo*. Instituto Nacional de Estadística de Uruguay, pp. 115-130

Figini, Paolo (1998): "Inequality Measures, Equivalence Scales and Adjustment for Household Size and Composition". LIS Working Paper No. 185

Fisher, Franklin (1987): "Household Equivalence Scales and Interpersonal Comparisons". *Review of Economic Studies*, vol. 54, pp. 519-524

Gronau, Reuben (1988): "Consumption Technology and the Intrafamily Distribution of Resources: Adult Equivalence Scales Reexamined". *Journal of Political Economy*, vol. 96, no. 6, pp. 1183-1205

Grootaert, Christiaan (1982): "The Conceptual Basis of Measures of Household Welfare and their Implied Survey Data Requirements". LSMS Working Paper No. 19. The World Bank. Washington D.C.

Haque, Mohammed Ohidul (1994): "On the Measurement of Consumers' Equivalence Scales: A Review". *Indian Journal of Quantitative Economics*, vol. 9, no. 2, pp. 35-69

Kakwani, Nanak C. (1977): "On the Estimation of Consumer Unit Scales". *The Review of Economics and Statistics*, vol. 59, no. 4, pp. 507-510

Lanjouw, Peter; Milanovic, Branko; Paternostro, Stefano (1998): "Economies of Scale and Poverty: The Impact of Relative Price Shifts During Economic Transition". (Mimeo)

Lanjouw, Peter; Ravallion, Martin (1995): "Poverty and Household Size". *The Economic Journal*, vol. 105, pp. 1415-1434

Lazear, Edward; Michael, Robert (1980): "Family Size and the Distribution of Real Per Capita Income". *The American Economic Review*, vol. 70, no. 1, pp. 91-107

León, Arturo (1996): "Escalas de Equivalencia: Su Impacto en el Nivel y Distribución del Bienestar". En *Aspectos Metodológicos sobre Medición de la Línea de Pobreza: El Caso Uruguayo*. Instituto Nacional de Estadística de Uruguay. pp. 131-140

Lewbel, Arthur (1989): "Household Equivalence Scales and Welfare Comparisons". *Journal of Public Economics*, vol. 39, pp. 377-391

Lluch, Constantino (1973): "The Extended Linear Expenditure System". *European Economic Review*, vol. 4, pp. 21-32

McClements, L.D. (1977): "Equivalence Scales for Children". *Journal of Public Economics*, vol. 8, no. 2, pp. 191-210

Minujin, Alberto; Scharf, Alejandra (1989): "Adulto Equivalente e Ingreso per Cápita: Efectos Sobre la Estimación de la Pobreza". *Revista Desarrollo Económico*, vol. 29, no. 113

Morales Vergara, Julio (1972): "Unidades Equivalentes y Necesidades de Consumo en América Latina y Crítica a la Relación de Dependencia Convencional". Conferencia Regional Latinoamericana de Población. pp. 64-70

Muellbauer, John (1980): "The Estimation of the Prais-Houthakker Model of Equivalence Scales". *Econometrica*, vol. 48, pp. 153-176

Muellbauer, John (1974): "Household Composition, Engel Curves and Welfare Comparisons Between Households: A Duality Approach". *European Economic Review*, vol. 5, no. 2, pp. 103-122

Muellbauer, John (1975): "Identification and Consumer Unit Scales". *Econometrica*, vol. 43, no. 4, pp. 807-809

Nelson, Julie (1992): "Methods of Estimating Household Equivalence Scales: An Empirical Investigation". *The Review of Income and Wealth*, vol. 38, no. 3, pp. 295-310

Nelson, Julie (1993): "Household Equivalence Scales: Theory versus Policy?". *Journal of Labor Economics*, vol. 11, no. 3, pp. 471-493

Nicholson, J.L. (1976): "Appraisal of Different Methods of Estimating Equivalence Scales and Their Results". *The Review of Income and Wealth*, vol. 22, no. 1, pp. 1-11.

Phipps, Shelley; Garner, Thesia (1994): "Are Equivalence Scales the Same for the United States and Canada?". *The Review of Income and Wealth*, vol. 40, no. 1, pp. 1-18.

Pollak, Robert; Wales, Terence (1979): "Welfare Comparisons and Equivalence Scales". *American Economic Review*, vol. 69, pp. 216-221

Seneca, J.J.; Taussig, M.K. (1971): “Family Equivalence Scales and Personal Income Tax Exemptions for Children”. *Review of Economics and Statistics*, vol. 53, pp. 253-262.

Singh, Balvir; Nagar, A.L. (1973): “Determination of Consumer Unit Scales”. *Econometrica*, vol. 41, no. 2, pp. 347-355

Tsakloglou, Panos (1991): “Estimation and Comparison of Two Simple Models of Equivalence Scales for the Cost of Children”. *The Economic Journal*, vol. 101, pp. 343-357

van der Gaag, Jaques; Smolensky, Eugene (1982): “True Household Equivalence Scales and Characteristics of the Poor in the United States”. *The Review of Income and Wealth*, vol. 28, no. 1, pp. 17-28

van Praag, Bernard; Goedhart, Theo; Kapteyn, Arie (1980): “The Poverty Line - A Pilot Survey in Europe”. *The Review of Economics and Statistics*, vol. 62, no. 3, pp. 461-465

van Praag, Bernard; Hagenaars, Aldi; van Weerden, Hans (1982): “Poverty in Europe”. *The Review of Income and Wealth*, vol. 28, no. 3, pp. 345-359.