Equivalence Scales Based on Revealed Preference Consumption Expenditure Microdata - The Case of West Germany

Merz, Joachim and Faik, Jürgen

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Joachim Merz and Jürgen Flaik

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ffb@uni-lueneburg.de
http://ffb.uni-lueneburg.de

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*Prof. Dr. Joachim Merz, University of Lüneburg, Department of Economics and Social Sciences, is Director of the Research Institute on Professions (Forschungsinstitut Freie Berufe), Chair 'Statistics and Professions', and Head of the Research Project 'Time Use in Employment and Household Production - Dynamic Microanalyses with Paneldata', supported by the German National Science Foundation (DFG), Hindenburgstr. 23a, W-2120 Lüneburg, Germany

Dipl.-Volkswirt Jürgen Faik, University of Frankfurt, Department of Economics, Chair of Social Policy, Prof. Dr. R. Hauser, Mertonstr. 17-25, W-6000 Frankfurt am Main, Germany

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Forschungsinstitut Freie Berufe (FFB)
Fachbereich Wirtschafts- und Sozialwissenschaften
Universität Lüneburg
Hindenburgstr. 23a
Postfach 24 40
W-2120 Lüneburg
Tel.: + 04131/714 540
Fax.: + 04131/714 565
Germany

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Summary

Equivalence scales are a prerequisite for any economic well-being comparison with measures on income distribution, inequality and poverty. This paper provides equivalence scales based on revealed preference consumption microdata for West Germany 1983. It is a part of a joint US and German research project comparing equivalence scales with consistent methods and similar microdata bases, recent income and consumption surveys of both countries. We concentrate on a single equation expenditure method with different Engel approaches as well as on a complete demand system approach.

The complete demand system approach provides true, constant utility based equivalence scales and is specified by an extended linear expenditure system (ELES). While the Engel methods traditionally focus on food expenditures, the multiple equation expenditure system takes into account a full market basket with all its interdependencies and relative prices.

Our equivalence scale study for West Germany based on actual available individual consumption expenditure data shows a variety of interesting results with regard to different goods and services baskets as well as to different household composition effects including the situation of the elderly, of the families with married couples and single mothers, and the cost of children. Our consumption results finally are compared to further consumption, expert, and subjective based equivalence scales.

JEL: I30, I32, D30, D31

Keywords: alternative equivalence scales, Germany, USA, distribution of income, inequality, poverty

Zusammenfassung

Äquivalenzskalen sind eine notwendige Voraussetzung für jeden ökonomischen Wohlfahrtsvergleich mit Informationen zur Einkommensverteilung, zur Ungleichheit und zur Armut. Das vorliegende Diskussionspapier stellt Äquivalenzskalen auf der Basis von Konsum-Mikrodaten offenbarter Präferenzen für die Bundesrepublik Deutschland 1983 vor. Es ist ein Teil eines amerikanisch-deutschen Forschungsprojektes, das Äquivalenzskalen mit konsistenten Methoden und ähnlichen Mikrodaten vergleicht, und zwar den aktuellsten verfügbaren Einkommens- und Verbrauchsstichproben beider Länder. Wir konzentrieren uns auf ein Einzelgleichungsmodell mit unterschiedlichen Engel-Ansätzen und einen kompletten nachfragetheoretisch fundierten Systemansatz.

Der Systemansatz liefert 'wahre', nutzenbasierte Äquivalenzskalen und wird durch ein erweitertes lineares Ausgabensystem (ELES) spezifiziert. Während die Engel-Verfahren traditionellerweise auf die Nahrungsmittelausgaben rekurrieren, zieht das multiple Ausgabensystem einen vollständigen Warenkorb mit all dessen Interdependenzen und relativen Preisverhältnissen in Betracht.

Unsere Äquivalenzskalen-Studie für die Bundesrepublik Deutschland auf der Basis von aktuell verfügbaren individuellen Konsumausgaben zeigt eine Vielfalt interessanter Resultate bezüglich der verschiedenen Güter-/Dienstleistungs-Körbe ebenso wie verschiedene Effekte der Haushaltsstruktur, welche die Situation der Alten, die Familien mit Ehepaaren und alleinstehenden Müttern sowie die Kinderkosten einbeziehen. Unsere Ausgaben-Resultate werden abschließend mit weiteren verbrauchs-basierten, experten-basierten und subjektiven Äquivalenzskalen verglichen.

JEL: I30, I32, D30, D31

Schlagwörter: Alternative Äquivalenzskalen, Deutschland, USA, Einkommensverteilung, Ungleichheit, Armut

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0 Introduction

Equivalence scales are a prerequisite for any economic well-being comparison with measures on income distribution, inequality and poverty. This paper provides equivalence scales based on revealed preference consumption microdata for West Germany. It is a part of a joint US and German research project comparing equivalence scales with consistent methods and similar microdata bases, recent income and consumption surveys of both countries.[1)] We concentrate on a single equation expenditure method with different Engel approaches as well as on a complete demand system approach.

The complete demand system approach provides true, constant utility based equivalence scales and is specified by an extended linear expenditure system (ELES). While the Engel methods traditionally focus on food expenditures, the multiple equation expenditure system takes into account a full market basket with all its interdependencies and relative prices. In addition and for the achieved international comparison, the economic and institutional differences of two Western countries are considered by our approach. This, in particular, is

1) National Institute on Aging Program Project No. PO1-AG09743 on 'The Well-Being of the Elderly in a Comparative Context', Project #3 'Equivalence Scales and the Cost of Disability', principal investigator Richard Burkhauser, project leader Tim Smeeding, both Syracuse University. The German copartners are Richard Hauser, University of Frankfurt, and Joachim Merz, University of Lüneburg.

important where there are large differences in the provision of merit goods, e.g. health care and education.

Further on, the estimated equivalence scales will be compared to implicit scales of official US and West Germany poverty lines and other institutional regulations for social security. For each national social policy new insights can be expected about the adequacy of household size and household composition related transfers. Moreover, comparisons of cross-national and intra-national income distributions - e.g. for different socioeconomic groups like employed or self-employed people and professionals (Freie Berufe) - are provided by a firmer methodological basis.

Our study for West Germany presents consumption expenditure needs tested and microdata based equivalence scales.

The paper is arranged as follows: Section 1 briefly embedds our approach within the general discussion of the scope and approaches of equivalence scales. Section 2 is on revealed preference consumption expenditure-based equivalence scales and specifies our Engel single equation expenditure approach and the ELES complete demand system approach. Section 3 describes the microdata base, a sample of the newest available West German Income and Consumption Survey 1983. The empirical results are discussed and compared to other scales in the literature in Section 4, followed by concluding remarks.

1 Equivalence scales: scope and approaches

Equivalence scales deflate household money income, respectively expenditures, according to the household type to 'calculate the relative amounts of money two different types of households require in order to reach the same standard of living' (Muellbauer 1977, 460). Given equal preference or utility levels u for two households and constant prices $\mathbf{p}$, an equivalence scale e of a household with composition $\mathbf{s}$ relative to that of some reference household with composition $\mathbf{s}_0$ then is defined as

$$(1) \qquad e = c(u,\mathbf{p},\mathbf{s})/c(u,\mathbf{p},\mathbf{s}_0) = y/y_0,$$

where c(.) is the cost function of reaching utility level u and y is the money income of the respective household.

Because of possible economies of scale in larger households and different individual needs of adults and children, a simple scale, given by an equal weight to each person (head counting)

providing a per capita household income, is not flexible enough to study the distribution of well-being. Therefore, more adequate person and thus household type specific weights are important for further welfare comparisons concerning inequality and the measurement of poverty.

These more flexible equivalence approaches might be divided into three general categories: expert, subjective and consumption based scales.[2] Expert based equivalence scales are defined by physiological and socio-cultural basic needs stated by some experts. Examples are 'Zentimetergewichte' (cm * kg) (Engel 1895), physiological and further basic needs (Rowntree 1901) or stated basic expenditures (Orshansky 1965). Subjective equivalence scales are based on individual surveys asking on the one hand for an overall, general necessary income of anybody and on the other hand for a respondent's own necessary income (Kapteyn and van Praag 1976, Kapteyn, Kooreman and Willemse 1988).

Consumption based equivalence scales rely on revealed preferences measuring actual consumption expenditures of different household types. Single consumption equation methods regard either absolute expenditures with specific adults' and children's goods (Rothbarth 1943) or budget shares (Engel 1857, Engel and Schwab's Law) where the income relation y/y_0 is given by identical relative expenditures.

Multiple consumption equation methods encompass several goods to capture different economies of scale in different goods (Prais and Houthakker 1955, generalizing the Engel model).[3]

The complete demand system approach relies on the theory of consumer behaviour. The cost functions are defined by microeconomic theory and its duality incorporating the household allocation problem of full market basket expenditures (Barten 1964, Gorman 1976, van der Gaag and Smolensky 1982). Recent attempts additionally regard intra-household allocation of resources via a household production approach (Gronau 1988).[4]

2 Revealed preference consumption expenditure based equivalence scales

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[2] In a recent survey on equivalence scales and their uses in inequality and poverty measurement, Coulter, Cowell and Jenkins 1992 divide the topic in 5 categories: econometric, subjective, budget standard, social assistance, and pragmatic equivalence scales. Pollak and Wales 1979 in general discuss welfare comparisons and equivalence scales. For further recent equivalence scales overviews e.g. see Klein 1986, 1990 and Bradbury 1992b.

[3] The resulting identification problem of calculating n good specific scales and one general scale out of information from n available goods is (more or less) solved by exogeneous setting one scale or by iterative solutions (Singh and Nagar 1973, McClements 1977).

[4] Seel and Hartmeier 1990 provide household production based equivalence scales on KTBL (Kuratorium für Technik und Bauwesen in der Landwirtschaft) household activity standard times.

We will concentrate on two revealed preference consumption based methods: a single equation Engel approach and a complete demand system ELES approach. As consumption expenditure based methods, both are behavioural based methods and rely on actual expenditures of different household types when computing the equivalence scale, regardless of any physiological or sociopolitical stated needs.

2.1 Single equation expenditure method: Engel approaches

The Engel (1895) approach in particular is chosen because it is used as a traditional reference in practice and thus allows us to compare our results with an used scale in the social policy discussion. Within the Engel approach, essentially, that income y of a specific household is sought, which allows it to spend the same expenditure share w as a reference household with y_0

(2) $w = v/y = v_0/y_0,$

where v denotes household (food) expenditures. The Engel-based expenditure equivalence scale then is given by

(3) $e = y/y_0 = v/v_0.$

Depending on the specification of the Engel curve $v=f(y,\mathbf{s})$ to be estimated, this scale either is independent of or dependent on the income level y.

2.2 Complete demand system method: An ELES - cost function approach

The complete demand equation approach is a general approach taking into account the overall consumption pattern of a full market basket satisfying individual needs and preferences in a closed approach.

With Lluch's (1973) Extended Linear Expenditure System (ELES) the demand system can be derived from maximization of a lifetime utility function under a lifetime wealth constraint

(Kakwani 1980).[5] Giving the same results, the two period intertemporal utility maximization problem (van der Gaag and Smolensky 1982) is

(4) $\max u = \sum_i \beta_i \log [(v_{1i}/m_i)-\gamma_i] + (1+\delta)^{-1} \sum_i \beta_i \log [(v_{2i}/m_i)-\gamma_i]$

$\text{s.t. } \sum_i v_{1i} + (1+\pi)^{-1} \sum_i v_{2i} = z \equiv \text{wealth},$

with $\sum_i \beta_i = 1$, $v_{ti}/m_i > \gamma_i$ (goods: i=1,...,n; periods: t=1,2), where v_{ti}=expenditure of good i in period t, p_{ti}=price(=1), δ=subjective utility discount factor, π=interest rate, β_i=marginal budget share, γ_i=subsistence expenditures, and commodity specific weighting factors with

(5) $m_i = 1 + \mathbf{d}_i'\mathbf{s}$

sociodemographic K-vector describing the household composition and m_1=1 if the reference household with $\mathbf{s}=\mathbf{0}$ is considered.

Constrained optimization yields the current period linear demand (expenditure) system:

reduced form

(6a) $v_i = a_i + b_i z + \mathbf{c}_i'\mathbf{s}$

structural form

(6b) $v_i = \gamma_i + \mathbf{c}_i'\mathbf{s} + \beta_i \mu (z - \sum_j \gamma_j)$ respective (i=1,...,n),

(6c) $v_i = \gamma_i m_i + b_i (z - \sum_j \gamma_j m_i)$

with $(z-\sum_j \gamma_j)$ as supernumerary income and

$a_i = \gamma_i - b_i \sum_j \gamma_j,$

$b_i = \beta_i \mu,$ where $\mu = [(1+\delta)/(2+\delta)](2+\pi)/(1+\pi)$, and

$c_{ik} = \gamma_i d_{ik} - b_i \sum_j \gamma_j d_{jk}$

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[5] The identification problem here is solved by the following Barten 1964 approach to incorporate household characteristics in a demand system (Kakwani 1977).

as the elements of the household composition coefficients vector $\mathbf{c}_i$, with goods i,j=1,...,n and household characteristics k=1,...,K.

After estimation of a_i, b_i and $\mathbf{c}_i$ with $\sum_i b_i = \sum_i \beta_i \mu = \mu \sum_i \beta_i = \mu$, the structural coefficients β_i (marginal budget share) and γ_i (subsistence expenditures) are given by

(7) $$\beta_i = b_i/\mu = b_i/\sum_i b_i$$

$$\gamma_i = a_i + b_i \sum_j \gamma_j = a_i + [b_i/(1-\mu)] \sum_j a_j.$$

The dual of the utility maximization problem with its Stone-Geary utility function yields the following cost function (Deaton and Muellbauer 1980):

(8) $$c(u,\mathbf{s}) = \sum_i \gamma_i (1+\mathbf{d}_i'\mathbf{s}) + \exp[u - \sum_i \beta_i \log b_i + \sum_i \beta_i \log (1+\mathbf{d}_i'\mathbf{s})].$$

Finally, the true, constant utility-household equivalence scale with respect to differences in family/household composition is given as in (1) by the fraction of both households' cost functions

$$e = c(u,\mathbf{s})/c(u,\mathbf{s}_0).$$

The structural influence of the household composition, given by the K-vectors $\mathbf{d}_i$ (i=1,...,n), which is important to calculate the utility level, the cost function value, and commodity specific weighting factors, can be derived via equation (7) by solving the linear equation system

(9) $$\mathbf{A}_{(nn)}\, \mathbf{d}_k = \mathbf{c}_k \quad \text{with} \quad \mathbf{d}_k = \mathbf{A}_{(nn)}^{-1}\, \mathbf{c}_k, \qquad (k=1,...,K),$$

with

$$\mathbf{A}_{(ij)} = \begin{cases} \gamma_i(1-b_i) & \text{for } i=j \\ -b_i\gamma_j & \text{else;} \end{cases}$$

and $\mathbf{d}_k=(d_{1k},...,d_{nk})'$ and now $\mathbf{c}_k=(c_{1k},...,c_{nk})'$.

Since $\mathbf{A}$ is independent of the household characteristics, the inverse of $\mathbf{A}$, $\mathbf{A}^{-1}$, has only to be computed once to calculate all K vectors $\mathbf{d}_k$ giving the household composition influence for the entire expenditure system by $\mathbf{D}_{(nK)} = (\mathbf{d}_1,...,\mathbf{d}_K)$.

3 Microdata: West German Income and Consumption Survey 1983

The newest available and extensive microdata base for research in Germany is the Income and Consumption Survey (Einkommens- und Verbrauchsstichprobe, EVS) 1983. Information about this survey with more than 44,000 households and detailed expenditure and income microdata is summarized in Table 1.

Because of privacy protection, an anonymized and reduced 96% random sample of the original EVS 1983 is available for our analysis. This sample, hereafter abbreviated by 'Sfb 3/EVS 1983' was provided by the Sonderforschungsbereich 3 (Sfb 3) 'Microanalytic Foundations of Social Policy' at the Universities of Frankfurt and Mannheim, financed by the German National Science Foundation. The opportunity to use this unique microdata base as provided by the Sfb 3, the Chair of Social Policy, Prof. Dr. R. Hauser, University of Frankfurt, as the Sfb 3 successor and the German Federal Statistical Office, Wiesbaden, is gratefully acknowledged.

The Sfb 3/EVS 1983 has these further characteristics: Individual information is restricted to households with n<7 persons. Household information consists of household characteristics, income, transfer and (limited) tax information of a variety of sources.

Consumption expenditures are aggregated into 20 categories. Additionally, sociodemographic information of each person in every household is available.

Overall, all of this information for more than 42,000 individual households serves as our microdata base.

Table 1: West German's Income and Consumption Survey (Einkommens- und Verbrauchsstichprobe, EVS) 1983

Legal basis:

Federal statistic: Bundesstatistik-Gesetz (BStatG) 14. März 1980: 1962/63, 1969, 1973, 1978, **1983**, (1988)

Sample:

Quota sample with voluntary participation (Euler 1982).

Observations: 0.2% of all private households in West Germany (ca. 50,000 households (gross)), 44,507 households finally to analyze.

Not included: households of foreigners, households in institutions, households with a monthly net household income >= 250,000 DM. Remaining households represent ca. 92% of all West German households.

Number of variables per household: 548

Questionnaires/Methods:

- First interview (**Grundinterview**) January 1983:
  Sociodemographics, durables available
- Over the year bookkeeping (**Haushaltungsbücher**):
  Monthly (for 11 months) information (**laufende Monatsanschreibungen**): one figure for an entire respective month (gathered in a 4 month booklet (Vierteljahresheft)):
  - all income figures (given scheme),
  - important expenditures (given scheme).

  One month of daily information (**Feinanschreibung**) by a stratified rotation procedure:
  daily information:
  - detailed smaller private consumption expenditures (open question)
  - food and semi-luxury expenditures (open question)
- Final interview (**Schlußinterview**) January 1984:
  Wealth (selected items) and savings

Further Information:

Euler, M. 1982, Einkommens- und Verbrauchsstichprobe (EVS) 1983, in: Wirtschaft und Statistik 6/1982, p.433-37

Statistisches Bundesamt (1984 and various years), Fachserie 15, Wirtschaftsrechnungen, Einkommens- und Verbrauchsstichproben, Heft 7, Aufgaben, Methode und Durchführung, Stuttgart und Mainz

Wirtschaft und Statistik (WiSta), various years

4 Empirical results

Let us start with a brief discussion of important variables by some descriptive measures of our above described sample. Regression and equivalence scale results then follow for different single equation Engel approaches and the complete demand system ELES - cost function approach. Then our results are compared with other commonly used scales in the literature.

4.1 Some descriptive measures

All the descriptive information is based on weighted individual data representing a total population of 23.5 million (n=42,752) households in West Germany 1983.

We regard seven aggregated consumption expenditure categories: food, clothing & shoes, housing & energy, transportation & communication, body & health care, education & entertainment, personal belongings & other goods and services, ($\sum$ = private consumption, x), household net income and a computed remainder (= household net income minus private consumption). A detailed list of all respective items of an expenditure category is given in Table 2. All further results are based on yearly data (1983).

As shown in Table 3, next to the remainder, housing & energy (19.6%) and food (18.6%) are the most important, and body & health care (3.6%) the least important expenditure categories out of a 1983 household net income of almost 40,000 DM in the average. The variance, measured by the variation coefficient, is highest within body & health care, the category with the lowest average expenditures.

Not discussing any detail of Table 3, one further important figure has to be stretched out: Since Table 3 only comprises households with respective positive values, ca. 22% [(1-33,146/42,745)*100 households] show a negative remainder indicating some dissaving processes for probably higher valued goods (durables). To capture the wide range of individual expenditure behaviour, we therefore shall regress our different Engel approaches as well as to total expenditures [=private consumption (x)] as to the respondents' household net income (y).

Table 4 presents descriptive measures for the household types we used below in our regression analyses. The breakdowns encompass singles and married couples with and without children and pure household size with its sample and population figures.

4.2 Engel approaches

To calculate Engel based consumption expenditure equivalence scales as in equation (3) given by $e = v/v_0$ four questions arise concerning the underlying Engel curve $v_i=f(y,\mathbf{s})$:

1. Which good (i), or which basket of goods?
2. Which functional form, which specification of the Engel curve $v_i=f(y,\mathbf{s})$?
3. How to incorporate household composition?
4. Which income measure?

Which good (i), or which basket of goods? Traditionally, food is the central category fulfilling the most basic needs. Since our food category comprises basic food, semi-luxury food and meals out of home, we also look for the sensitiveness of the results with basic food only. As in many equivalence scales implicitly given in Social Assistance Regulations, a basic basket of goods is considered. Thus our third category will comprise food, clothing & shoes, housing & energy and body & health care as a goods basket describing the basic standard of living expenditures in industrialized countries. In doing so, we are on the way to a full market basket approach which is considered by the subsequent ELES complete demand system.

Which functional form, which specification of the Engel curve $v_i=f(y,\boldsymbol{\alpha})$? Concerning expenditure (v_i, lhs) and the income (y, rhs) variable a multitude of specific transformations are possible within some additive specifications. Besides the simple linear approach with no further transformation (like Bojer 1977), we choose two nonlinear functional forms with 'log-log' and a 'lin-log' (share) Working-Leser (Leser 1963, Deaton and Muellbauer 1986, Tsakloglou 1991) specification, where the left hand side is the budget share ($w=v_i/y$).

How to incorporate household composition? When translating demographics into the Engel curve, we follow the Barten 1964 approach with a linear consideration of household composition dummies. This procedure here is comparable to the ELES van der Gaag and Smolensky 1982 US approach.[6)] Within this procedure either each household type of further interest might have a dummy (like a two adults, one child household) or more or less homogeneous groups (like the number of persons in age groups) form a (polytomeous) dummy variable. We follow the second more flexible approach in building different scales. Another general possibility to incorporate the

6) The FELES approach by Merz 1983a is functionalizing important ELES-parameters by sociodemographic factors.

Tab. 2

Tab. 3

Tab 4

household composition is to run separate regressions for separate subgroups given by each household type.[7)] In principle, we shall incorporate all different household types in a single comprehensive regression, because with this specification the relative importance of the household types is better comparable.

Which income measure? As mentioned above, the income regressor might be total expenditures [private consumption (x)] or some household income capturing saving and dissaving processes. Our analyses will show the results for both income measures. The question of a transitory or some permanent income to better capture the durable expenditure problem will be discussed within the complete demand system approach.

Engel regression results

In consideration of all of this, Table 5 shows the appropriate regression results for the Engel method estimating the Engel curves $v_I=f(y,\mathbf{s})$. Following our above discussed concept we run OLS-regressions specified as

$$(10) \qquad v_h = a + by_h + \mathbf{c}'\mathbf{s}_h + \varepsilon_h \qquad (h=1,...,H),$$

for all households h (h=1,...,H) with ε_h as a normal distributed error term and where expenditure v_h and income y_h are appropriately transformed. The K-vector $\mathbf{s}_h$ of household characteristics encompasses the respective number of persons in age classes (0-6 years: s_1; 7-17 years: s_2; 18-64 years: s_3; 65+ years: s_4) and two further sociodemographic variables [sex of household head (female=1, male=0): s_5; family status of household head (married=1, not married=0): s_6]. Table 5 shows the estimated coefficients a, b and $\mathbf{c}$ for basic food, food and the discussed basic basket.

First of all, there is a wide range of goodness of fit with respect to different functional forms, measured by R^2 [from 18% (share, food) to 82% ('log-log', basic basket)]. Regardless of whether private consumption (x) or household net income (y) is the 'income' regressor, there is a clear hierarchy of goodness-of-fit given a specific functional form: for all three expenditure categories the best (highest R^2) is 'log-log', next is linear, and relatively worse is share ('lin-log'). This is in some accordance to earlier results of Prais and Houthakker 1955, 106-107, where the 'log-log' specification is best for other goods than food. For food, however, they found that the semi-log specification in absolute terms was superior to other functional forms.

Private consumption fits better than household net income for all expenditure groups in the 'log-log' and linear case. In the share case this is true only for basic basket expenditures.

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7) A discussion of different specifications is found in Merz 1980, 60-62.

With regard to the age profile, measured by c_1 to c_4, basic food expenditures for all three specifications are 'monotonic' increasing in a nonlinear fashion, while food expenditures decline plausibly in the highest age class (65+ years) (linear case). Since for basic basket expenditures the picture is inverse regarding personal consumption or household net income, different saving and dissaving behaviour becomes apparent.

With regard to sex, higher expenditures are indicated for households with a female head for basic food and basic basket expenditures. The negative c_5-coefficient for food, however, might indicate more female non-market production compared to the relative greater market expenditures among males for semi-luxury goods and meals out of home. Further socio-demographic influences will be discussed among our equivalence scale results.

To compute equivalence scales according to the family/household size method (pure head counting), we additionally run separate regressions with dummies for each household size to avoid multicollinearity problems. Thus any nonlinear influence with regard to the pure household size is captured by this approach.[8)] The results are given in the Appendix by Table A1. The evident nonlinear household size influence underlines our specification, which allows for (all) varieties of revealed behaviour regardless of a specific functional form.

8) Computations with a single variable 'household size' define proportional effects, which, however, should revealed by the analyzed behaviour and not by a given functional form. Van der Gaag and Smolensky 1982, e.g., take log of family size in their overall (ELES-)regression specification.

Tab. 5

Engel equivalence scales

Table 6 shows Engel equivalence scales for different household types according to different expenditure categories, different functional forms, and different income measures based on the above regression results (Table 5).

Since all selected functional forms will yield equivalence scales independent of the reference income level, only one such Table is necessary. In particular, all equivalence scales

$$e = y/y_0 = v/v_0$$

with $v = a + by + \mathbf{c's}$ respectively $v_0 = a + by + \mathbf{c's}_0$ and a linear, 'log-log' (log of v and y) and share ($w = v/y = a + b \log y + \mathbf{c's}$) specification

$$(11) \qquad e = \begin{cases} (a + \mathbf{c's}) / (a + \mathbf{c's}_0) & \text{(linear)} \\ \exp\{(\mathbf{c's}_0 - \mathbf{c's})/(b-1)\} & \text{(log-log)} \\ \exp\{(\mathbf{c's}_0 - \mathbf{c's})/b\} & \text{(share)} \end{cases}$$

in Table 6 are based on household net income regression results (resulting in b) for a subsequent comparison with the ELES approach (private consumption based regression results are given in the Appendix, Table A2).

Tab.6

Let us begin with family/household size equivalence scales (no. 21-26). The scale differences between any two scales yield the individual household size scales. For interest and for example, concerning food expenditures Table 7 shows pure household size scales for all three functional forms.

With descending figures additional persons in a household have relatively less food expenditures indicating some economies of scale effects in larger households. A similar view to basic food and basic basket expenditure shows for basic food the highest individual weights (for all specifications) and thus the lowest economies of scale. A plausible result, since with the most basic expenditure, basic food, overall personal differences should be low.

When comparing the different functional forms, for all numbers of persons the 'log-log'-specification yields the highest weights, the share specification the relatively lowest. This picture is also given for basic food expenditures but not for the basic basket (ranking: linear, 'log-log', share). Thus, though there are functional form dependent and different weights, in general, when food, basic food, or basic basket expenditures are regarded larger households show economies of scale with decreasing individual weights.

Table 7: Household size scales for food expenditures (based on Table 6)

pure household size	functional form		
	linear	log-log	share
1	100	100	100
2	81	92	73
3	38	46	33
4	26	31	23
5	32	38	31
6	27	36	30

The above family/household size equivalence scales demonstrate the average tendency. Further socio-demographically differentiated analyses with effects like age and (the cost of) children show a different picture.

With respect to the social political discussion and our specific interest on the elderly we divide - as mentioned - the analyzed household types of Table 6 with the focus on age and children by:

- Singles; male and female, in age classes 18-64, 65+years
- Single mothers; with 1 child (in different age classes) and two children

- married couples; in different age classes, and different number of children.

Elderly adult singles have less food and basic basket equivalence scales than younger adult singles, but higher basic food weights. One reason, certainly, is the higher immobility of elderly households.

The relative low difference between the age class figures when basic basket scale values are compared to food scales seems to refer to higher body and health care expenditures of the elderly households.

Children weights are positively correlated with their age (0-6, and 7-17 years) and, as expected, are lower than the adults' equivalence scales.

With regard to sex, clear differences between female and male equivalence scales with higher female scales in all respective age classes for basic food and basic basket expenditures become apparent. However, higher male than female weights for food expenditures are evident. Some reasons for that were already discussed in the last paragraph.

When the family status is considered, basic food figures roughly show proportional, twice as high scales as for singles. However, for food and the basic basket a lower need is assigned for married couples by scales around 150.

In the social political discussion the cost of children play an important role.[9] Within the equivalence scale approach the cost of children are derived as the difference between the Engel scale values for a married couple without children and with one child (or analog for single and lone mother with one child). As Table 6 shows, there is a relatively wide range of child costs, depending on the selected Engel curve type and on the respective expenditure category (with a higher variation between the expenditure categories than between the functional forms). The cost range (line 15 minus line 13 of Table 6) for the (first) is compared to married couples both 18-16 years old as reference between 14.2% points (food; share) and 57.2% points (basic food; log-log). This highlights two problems: First, the results heavily depend on the underlying functional form and the goods basket under consideration. So, as we did, it ist very important to show the possible range of scales according to methodology reasons alone. Second, relatively low costs for younger children probably reflect one basic problem of concumption expenditure based equivalence scales in gernal: the revealed preference method - based on cross section (not on panel) data - neglects a possible changing of the household life-style

9) See Bradbury 1992a for discussion and Australian results.

(substitution effect), when e.g. a child is born. Thus any reduction of adults' expenditures in favour of the new situation is at the same time reducing the actual, revealed cost of children.

4.3 ELES complete demand system approach

The full market basket in our ELES estimates encompasses seven expenditure categories: food, clothing & shoes, housing & energy, transportation & communication, body & health care, education & entertainment, and personal belongings & other goods and services. By the Statistical Office's definition, these expenditures describe private consumption.

In the theoretical approach with equation (4), the income measure is intertemporal wealth z, incorporating saving and dissaving processes. As an available proxy, household net income (rather than total expenditures = personal consumption) is incorporated in our estimates, since any further permanent or transitory income is rather arbitrary.

ELES regression results

The ELES complete demand system reduced form coefficients [as in equation (6) respectively (10)] in Table 8 are estimated equation by equation by OLS with

$$(12) \qquad v_{ih} = a_i + b_i z_h + \mathbf{c}_i' \mathbf{s}_h + \varepsilon_i \qquad (i=1,...,n)$$

where household net income (y_h) is the proxy for intertemporal wealth (z) and ε_i is a normal distributed error term, following the Zellner 1962 seemingly unrelated regression approach.[10)]

The goodness-of-fit again measured by R^2 shows a range from 8% (body & health care) to housing & energy (46%), which is quite good for a cross section analysis. The seven categories encompass private consumption expenditures with a total marginal

[10)] The results for food therefore have to be similar to the above Engel approach. However, because the system approach requires a subsample with all categories' expenditures *and* household income > 0, the sample size and thus the estimated coefficients will differ slightly.

Tab. 8

Tab. 9

propensity to consume ($\sum_i b_i$=0.46) indicating a high remainder marginal propensity to consume. Since the remainder captures - besides saving and dissaving - a variety of other expenditures[11], and the so-called 'statistical difference' (survey errors concerning total expenditure sum minus income), a relatively high remainder value seems to be plausible.

In Table 9 the ELES structural coefficients, subsistence expenditures (γ_i), marginal budget shares ($ß_i$), and the commodity specific household composition effects [$\mathbf{D}_{(nK)}$] are given. All subsistence expenditures fulfill the positivity restriction and may be interpreted as minimum expenditures (DM/year).

The marginal budget shares assign the socalled supernumerary income (remaining income after having spent all subsistence expenditures) in some second round decision to all expenditure categories. Other goods & services including personal belongings obtain 22% of supernumerary income, followed by transportation & communication with 20%, and housing & energy with 18%. Last in line is body & health care with 7%.

The commodity specific household composition effects shall be discussed with the ELES equivalence scales in the following paragraph.

ELES equivalence scales

With respect to the ELES cost function the ELES (cross section) equivalence scale

$$e = c(u,\mathbf{s}) / c(u,\mathbf{s}_0)$$

after some rearrangements is

$$(13) \qquad e = \frac{\sum_i \gamma_i m_i + \exp [u - \sum_i \beta_i (\log b_i - \log m_i)]}{\sum_i \gamma_i + \exp [u - \sum_i \beta_i \log b_i]} \quad .$$

In contrast to the above presented Engel equivalence scales the ELES equivalence scales depend on a chosen utility level and in the sequence on a respective income level [$u \rightarrow c(u,.) \rightarrow z(u,.)$]. Thus, the empirical results in Table 10 are different according to different income levels [our choice: lower (subsistence expenditures about 16,000 to 18,000 DM), medium (arithmetic mean 22,757 DM, and median 24,941 DM), and upper level (1.5 times median = 34,136 DM)].

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11) Consisting of voluntary social security contributions, other income transfers (gifts, automobile tax, other taxes, garden rent etc.), wealth accumulation expenditures (expenditures for society building deposits, shares, savings), and mortgage payments, interests etc.; for details see Statistisches Bundesamt 1983.

Tab. 10

Despite this wide income range, however and as a main result of Table 10, the corresponding equivalence scales do not vary in a significant fashion, not showing distinct income level dependent effects.

This is in line with a result by van der Gaag and Smolensky 1982 based on the U.S. Consumer Expenditure Survey 1972/73.

Household type specific equivalence scale results shall be discussed in the next section, when we compare our results with the results given in the literature.

The commodity specific equivalence scales in the Appendix Table A5 show the sensitivity of the full market basket scales with respect to each single expenditure category. It becomes apparent, that food, clothing & shoes, housing & energy as well as body & health care have the largest variation showing a specific sensitivity regarding household composition. For single results the reader is referred to the Appendix.

As the results have shown, the revealed preference consumption based equivalence Engel and ELES scales heavily depend on sociodemographic variables like age, being a child, family status or being a lone mother. Thus, a carefully and detailed household type definition is necessary for a social political discussion regarding any welfare comparison.

In addition, as our results with different expenditure categories have shown, revealed preference consumption expenditure equivalence scales are sensitive to the underlying expenditure category, to the underlying goods and services basket.

4.4 Comparing consumption expenditure based equivalence scales to other equivalence scales

In a recent article Buhmann et al. 1988 present equivalence scales sensitivity estimates across ten countries using the Luxembourg Income Study (LIS) data base. With different methods they focus on an international comparison.

We will restrict the comparison of our results with others merely to different methods to discuss in particular differences which are more or less due to a selected method.

Out of the variety of our results we concentrate on two equivalence scales: one Engel, and one ELES based method. There are three reasons to select the linear basic basket Engel results. First, many other scales are based on goods baskets, second, many institutional equivalence scales (like the German Social Assistance implicit scale) assume constant individual weights (characteristic only for the linear Engel approach), and third, we are closer to the full basket ELES approach.

Since with the above discussion the ELES equivalence scales do not really vary according to the income level, a natural level to be taken is the arithmetic mean of the sample's household net income. Our revealed preference consumption expenditure ELES results[12)] are compared first to van der Gaag and Smolensky 1982, which use the same method with results for the U.S. Consumer Expenditure Survey 1972/73.

To compare our results with a more flexible specification of the cost function, we take into account the Blundell and Lewbel 1991 results, which are based on the Almost Ideal Demand (AID) System and pooled 1970-84 U.K. Family Expenditure Survey data.

As examples for the subjective and the expert based approach we consider the results by van Praag, Hagenaars and van Weeren 1982 for Germany, and as expert based scales the 1983 German Social Assistance Regulations implicitly used by German poverty line definitions, the OECD scale and regulations implicit in the German Social Retirement System.

A comparison in Table 11 between our computed scales in general shows higher Engel scales than the ELES scale especially when basic basket Engel values are compared to the all consumption categories ELES values.[13)] This is due to additional expenditure categories within the ELES full basket approach (with additional transportation & communication, education & entertainment, other goods & services) with higher economies of scale than any basic basket. Apart of this 'basket' effect the structure according to different household types between both scales is quite similar. So in both scales the individual weights for persons in the age class 18-64 years are higher than those for the elderly (65+ years). In addition, the revealed needs of female singles are above those of male singles. Due to the above 'basket' effect, there are also higher child costs implicit in the Engel scale when compared to the ELES scale (0-6 years: 12% Engel vs. 4% ELES; 7-17 years: 26% Engel vs. 17% ELES).

12) Based on the Functionalized Extended Linear Expenditure System FELES by Merz 1980, 1983a, Scheffter 1991 provides German 1983 FELES1 equivalence scales according to age and sex of children.

13) To compare our results with the results in particular of van der Gaag and Smolensky we recomputed our equivalence scales of Tables 6 and 10 according to the new base: male single, 18-64 years old.

Tab. 11

Remarks Tab. 11

We encompass in Table 11 all three Engel scales (basic food, food and basic basket) to show how sensitive the results are with regard to the underlying consumption categories. The results vary considerable with the largest scales for basic food for all household types. The growing differences of basic food to the other Engel scales when the household size is growing show obviously the slight possibilities of 'economies of scales' for the most basic expenditure category become obvious.

A further interesting comparison is the one between our ELES scale and the van der Gaag and Smolensky (GS) scale, because both scales are estimated on the same methodological basis. This comparison reveals that the values of our ELES scale are generally higher than the corresponding GS ELES scale. So, the estimated child costs by our scale are higher than the GS values (younger children: 4% vs. 1% GS; older children: 17% vs. 13% GS). Furthermore, the stated needs relation with respect to sex is different between both scales: In our scale the individual weights of female singles 'dominate' those of male singles in contrary to the GS scale. Naturally, the different data bases out of different countries and of different decades have to be taken into account.

To compare the Blundell and Lewbel (BL) scale, which only reflects the cost of children, with the other revealed preference consumption scales we have to assign 100% to a married couple, both 18-64 years old. As a result the BL values for children are below those for all other expenditure based scales. In addition, the BL corresponding costs of children are lower compared to institutional scales like the German Social Assistance scale or the OECD scale.

When we compare consumption expenditure based scales with subjective scales we found that the van Praag's et al. subjective family/household size scale consists of relatively low scale values, reflecting relatively high economies of scale (in a broader sense), a result, which is also confirmed by a comparison with our family/household size scales in Tables 6 and A2.

This result indicates, that subjective scales, when compared to revealed preference consumption based scales, might underreport own needs.

The comparison of expenditure based scales with expert based scales underlines the importance of the respective goods basket. All; basic food Engel scales in Germay are higher than the German Social Assistance, the OECD and the Germay Social Retirement System scales showing higher cost of living indices in all different household types than officially is respected. However, an opposite picture is given the more goods are encompassed in the basket under consideration with additional specific effects when total food expenditures (food = basic food + semi luxury goods + meals out of home) are regarded.

5 Poverty and inequality consequences

As already stated in the introduction, equivalence scales are in particular important ingrediants of social political programmes and distributional analyses. In order to deal with the latter application we selected the sociodemographically differentiated equivalence scales we have estimated as well as two German expert based scales for computing needs-adjusted inequality and poverty indices which correspond to the personal equivalent household net income distribution. Once more our data base ist the Sfb 3/EVS 1983.

All inequality measures in table 12 point out that between the estimated scales always the food/Engel scale causes the lowest inequality levels, normally followed by the two ELES scales here considered. The highest inequality levels are generated in general by the Engel scales with relatively high personal scale weights, namely the Engel scales based on the goods basket and on basic food. In analogy to the former findings the inequality levels which are produced by the two German institutional scales - the social assistant and the social retirement scale - are relatively high, too. The positive connection between high inequality levels and relatively high scale weights is insofar surprising as high personal weights theoretically - because of the positive correlation between household income and household size[14] - should lead to a more equal (equivalent) income distribution (so-called concentration effect). As a main result of table 12 reranking aspects between the equivalent personal incomes which can have an opposite inequality effect[15] play obviously an important role...

The above ranking between the scales used is *not* reproduced in the field of the poverty measures. This means that the decrease of the (equivalent) poverty line (here relatively defined as a fraction of the overall equivalent arithmetic mean income) which corresponds to higher personal scale weights[16] and generates a relatively low poverty population (at least partly) dominates the effect of a decrease of the household incomes which on the other side is ceteris paribus connected with a relatively high poverty population. Numerically the poverty population measured by the head count ratio scatters over all scales between around 3 to 4 percent at the 40 percentage mark and between around 7 to 9 percent at the 50 percentage mark. Whereas this view merely takes into account population shares, the poverty gap ratio makes it possible to deduce

14 As own computations have shown, in the Sfb 3/EVS 1983 the correlation coefficient between the unadjusted household net income and household size amounts to 0,473.

15 The inequality effects caused by concentration and reranking aspects are discussed broadly by Coulter/Cowell/Jenkins 1992.

16 For an assessment of the sensitivity of poverty indices with regard to the equivalence scales used see once more Coulter/Cowell/Jenkins 1992.

Tab.12

the money-metric difference between the poverty line and the (arithmetic) mean income of the poverty population. Depending on the equivalence scales used this relation amounts to around 17-20(21) percent both at the 40 percentage and the 50 percentage mark.

Despite the relatively narrow range of the poverty incidence even sketched our inequality/poverty results reveal a inequality/poverty sensitivity with respect to the used equivalence scales which is to some degree not neglectible. As a consequence, in empirical studies of the income distribution the investigator should keep in mind the dependence of his results with regard to the equivalence scale(s) chosen.

6 Concluding remarks

Our equivalence scale study for West Germany based on actual consumption expenditure microdata - encompassing Engel and true, constant utility based ELES approaches - shows a variety of interesting results with regard to different goods and services baskets as well as to different household composition effects including the elderly situation, family situation with married couples and single mothers, and the cost of children.

We have shown how the results are sensitive in particular to a chosen funtional specification and to the underlying expenditure category, i.e. to a goods and services basket to be chosen.

The revealed preference consumption expenditure based equivalence scales results differ from those scales which are handled within the German social political discussion and Social Assistance Regulations. Because our equivalence scales are behaviourally based and out of a broad and representative sample with more than 42,000 households, these results should be considered in the respective social political discussion.

Since it is the first comprehensive study of this kind for Germany some caveats are natural and necessary. First, a more flexible functional form of the cost function - like a nonlinear FELES (Merz 1983a), the AID system, Translog system and/or another specification - should be analyzed to be aware of the Engel and ELES restrictions.[17)] Second, as in all revealed preference analyses based on a cross section, a possibly changing individual behaviour when the household situation is changed (substitution effect, e.g. when a child is born) cannot adequately be respected. So, any other adults' behaviour and expenditure reduction e.g. in favour of children expenditures, reduces the respective scale only superficially indicating relatively low children needs. Intra-household consumption data in connection above all with panel consumption data could solve some of these problems. Last, but not least, though there

[17)] However, since the cross section case misses any price effects, the final functional form of the cost function is not very different compared to the ELES specification.

are revealed preference scales, if the available market goods do not (or are not able to) really satisfy individual needs, the derivated figures in general are misleading.

As evident, some of the above caveats are of a more general nature which are not only restrictive to our approach.

Table A1: Engel method: regression results on private consumption and household net income according to household size

Expenditure category	Engel curve type		OLS parameters a	b	c_1	c_2	c_3	c_4	c_5	R^2
basic food	linear	x	1343.695	0.050	1621.788	2653.937	3489.830	4666.838	5704.060	0.519
		y	1861.879	0.022	1879.239	3048.176	3968.945	5208.400	6246.696	0.471
	log-log	x	3.727	0.397	0.531	0.730	0.855	0.995	1.114	0.558
		y	5.383	0.225	0.600	0.831	0.972	1.123	1.242	0.515
	share	x	0.993	-0.088	0.068	0.091	0.109	0.132	0.154	0.323
		y	1.135	-0.101	0.065	0.089	0.105	0.126	0.143	0.361
food (basic food, semi-luxury, meals out of home)	linear	x	1594.930	0.132	1715.794	2474.517	3008.044	3790.846	4573.658	0.496
		y	2909.519	0.059	2359.910	3464.637	4212.110	5151.677	5926.678	0.364
	log-log	x	1.990	0.635	0.306	0.390	0.442	0.509	0.576	0.602
		y	4.176	0.407	0.388	0.515	0.588	0.666	0.733	0.487
	share	x	1.020	-0.081	0.062	0.078	0.088	0.104	0.120	0.153
		y	1.457	-0.125	0.068	0.090	0.103	0.119	0.133	0.249
basic basket (food, clothing & shoes, housing & energy, body & health care)	linear	x	4699.411	0.385	2326.107	3634.799	4885.514	6184.102	7291.576	0.750
		y	7491.227	0.215	3429.624	5430.009	7096.311	8573.301	9474.919	0.576
	log-log	x	2.683	0.680	0.128	0.180	0.226	0.269	0.306	0.819
		y	4.176	0.521	0.166	0.248	0.308	0.354	0.383	0.681
	share	x	2.474	-0.185	0.071	0.097	0.123	0.147	0.169	0.342
		y	3.304	-0.271	0.079	0.120	0.150	0.176	0.193	0.333

Remarks: (1) all parameters are significant at the 0.1% level;
(2) sample units: basic food: $n_x = 42701$, $n_y = 42694$; food: $n_x = 42720$, $n_y = 42713$; basic basket: $n_x = 42752$ $n_y = 42745$
($x > 0$, $y > 0$, *and* expenditures > 0, respectively)

Legend: a = constant; b = private consumption (household net income); c_1,.., c_5 = 2, ..., 6 persons (as 0/1 dummies); x = private consumption, y = household net income

Source: Sfb 3/EVS 1983; own computations.

Table A2: Engel equivalence scales, based on private consumption

household type	basic food			food			basic basket		
	linear	log-log	share	linear	log-log	share	linear	log-log	share
Single									
1) single (s)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2) male s	93.50	94.21	96.39	106.32	107.86	108.53	96.75	96.28	96.45
3) female s	131.11	133.09	119.27	69.74	69.61	67.58	115.57	119.91	118.90
4) male s, 18-64 years	90.79	92.77	94.84	106.47	107.64	108.11	95.67	95.26	95.28
5) female s, 18-64 years	128.40	131.06	117.36	69.89	69.46	67.32	114.50	118.64	117.47
6) male s, 65+ years	112.64	104.99	108.02	105.25	109.42	111.50	104.35	103.81	105.07
7) female s, 65+ years	150.24	148.32	133.67	68.66	70.61	69.43	123.18	129.29	129.53
Single mother, 18-64 years									
8) + 1 child (ch)	203.14	169.26	148.41	90.43	80.21	76.43	141.54	137.64	135.30
9) + 1 ch, 0-6 years	169.31	154.27	134.32	69.30	70.59	67.21	131.34	131.10	128.96
10) + 1 ch, 7-17 years	222.52	178.49	157.14	102.53	86.30	82.27	147.38	141.53	139.07
11) + 2 children	277.89	218.60	187.69	110.97	92.62	86.78	168.59	159.69	155.84
Married couples									
12) married couple(mc)	282.76	288.43	237.01	154.51	154.59	142.05	171.54	171.56	166.73
13) mc, both 18-64 years	277.34	279.70	229.47	154.81	153.97	140.97	169.38	167.94	162.73
14) mc, both 65+ years	321.03	358.23	297.69	152.36	159.08	149.93	186.74	199.44	197.88
Married couples both 18-64 years									
15) + 1 ch	352.08	361.23	290.20	175.35	177.79	160.05	196.43	194.83	187.44
16) + 1 ch, 0-6 years	318.25	329.24	262.64	154.22	156.46	140.74	186.23	185.58	178.66
17) + 1 ch, 7-17 years	371.45	380.93	307.25	187.45	191.28	172.27	202.27	200.34	192.66
18) + 2 children	426.83	466.53	366.99	195.89	205.29	181.71	223.47	226.04	215.89
19) + 3 children	501.57	602.52	464.11	216.43	237.05	206.30	250.52	262.24	248.67
20) + 4 children	576.32	778.14	586.94	236.97	273.72	234.22	277.56	304.25	286.43
Household size									
21) 1 person	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
22) 2 persons	220.70	241.21	216.50	207.58	231.36	215.89	149.50	149.38	146.46
23) 3 persons	297.51	335.50	284.24	255.15	291.46	260.24	177.35	175.71	168.77
24) 4 persons	359.72	413.16	348.06	288.60	336.04	296.90	203.96	203.10	194.03
25) 5 persons	447.31	520.94	453.47	337.68	403.24	359.22	231.59	232.36	221.47
26) 6 persons	524.51	633.88	580.58	386.76	485.07	438.81	255.16	260.62	248.59

Source: Sfb 3/EVS 1983; own computations (based on regression results of Table 5 and Table A1).

Table A3: ELES: regression results according to household size

	OLS parameters							R^2
Expenditure category	a	b	c_1	c_2	c_3	c_4	c_5	
food	2895.300	0.059	2370.402	3473.498	4221.367	5162.813	5937.595	0.365
clothing & shoes	549.485	0.044	268.335	505.348	717.076	716.480	573.637	0.275
housing & energy	3759.605	0.079	732.628	1534.393	2095.531	2710.417	3285.845	0.454
transportation & communication	536.352	0.099	826.912	1525.575	1478.343	1398.042	1109.114	0.149
body & health care	286.838	0.032	58.259*	-83.231*	62.336*	-16.408*	-322.157$^+$	0.069
education & entertainment	723.237	0.058	-84.635*	182.398	409.590	453.955	270.713*	0.189
other goods & services	616.185	0.101	306.345	-213.830$^+$	-555.749	-961.142	-1545.565	0.200

Remarks: (1) $^+$ not significant at the 0.1 % level; * not significant at the 1 % level; all other parameters are significant at the 0.1 % level;
(2) sample size: n = 42745 (net income > 0; expenditures not restricted)

Legend: a = constant; b = household net income; c_1, ..., c_5: 2,...,6 persons (as 0/1 dummies).

Source: Sfb3/EVS 1983; own computations.

Table A4: ELES subsistence expenditures, marginal budget shares and commodity specific household composition effects according to household size

		parameters					
Expenditure category	γ	β	d_1	d_2	d_3	d_4	d_5
food	3949.90	0.125	0.728	1.077	1.309	1.577	1.769
clothing & shoes	1338.21	0.094	0.482	0.813	1.066	1.131	1.014
housing & energy	5171.60	0.168	0.272	0.499	0.651	0.800	0.907
transportation & communication	2294.02	0.209	0.727	1.231	1.334	1.384	1.245
body & health care	847.37	0.067	0.385	0.391	0.669	0.649	0.277
education & entertainment	1756.33	0.123	0.233	0.539	0.762	0.853	0.739
other goods & services	2414.73	0.214	0.483	0.462	0.440	0.355	0.100

Remarks: sample size: n = 42745 (net income > 0; expenditures not restricted)

Legend: γ = subsistence expenditures (in DM); β = marginal budget share;
d_1,..., d_5 = 2, ...,6 persons

Source: own computations (based on regression results of Table A3).

Table A5: ELES: commodity-specific scales

household type	food	clothing, shoes	housing, energy	transp., communic.	body & health care	educ., entert.	other goods
Single							
1) single (s)	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2) male s	1.042	0.694	0.974	1.063	0.869	1.014	0.952
3) female s	0.801	2.464	1.122	0.697	1.625	0.934	1.228
4) male s, 18-64 years	1.060	0.800	0.980	1.129	0.839	1.051	0.973
5) female s, 18-64 years.	0.820	2.569	1.127	0.763	1.595	0.971	1.249
6) male s, 65+ years	0.909	(-0.048)	0.938	0.598	1.082	0.753	0.807
7) female s, 65+ years	0.668	1.722	1.086	0.231	1.837	0.674	1.083
Single mother, 18-64 years							
8) + 1 child (ch)	1.046	2.853	1.354	0.779	1.843	1.145	1.168
9) + 1 ch, 0-6 years	0.845	2.315	1.321	0.764	2.117	1.068	1.063
10) + 1 ch, 7-17 years	1.161	3.160	1.373	0.787	1.685	1.189	1.228
11) + 2 children	1.272	3.136	1.581	0.794	2.090	1.318	1.087
Married couples							
12) married couple (mc)	1.712	3.458	1.417	1.245	2.158	1.078	1.602
13) mc, both 18-64 years	1.750	3.669	1.428	1.377	2.098	1.152	1.644
14) mc, both 65+ years	1.447	1.973	1.345	0.314	2.583	0.556	1.311
Married couples, both 18-64 years							
15) + 1 ch	1.976	3.952	1.654	1.393	2.346	1.325	1.563
16) + 1 ch, 0-6 years	1.775	3.414	1.621	1.379	2.621	1.248	1.458
17) + 1 ch, 7-17 years	2.090	4.260	1.674	1.401	2.189	1.369	1.623
18) + 2 children	2.202	4.235	1.881	1.409	2.594	1.498	1.482
19) + 3 children	2.428	4.518	2.108	1.425	2.841	1.672	1.401
20) + 4 children	2.654	4.802	2.335	1.441	3.089	1.845	1.321
Household size							
21) 1 person	1.000	1.000	1.000	1.000	1.000	1.000	1.000
22) 2 persons	1.728	1.482	1.272	1.727	1.385	1.233	1.483
23) 3 persons	2.077	1.813	1.499	2.231	1.391	1.539	1.462
24) 4 persons	2.309	2.066	1.651	2.334	1.669	1.762	1.440
25) 5 persons	2.577	2.131	1.800	2.384	1.649	1.853	1.355
26) 6 persons	2.769	2.014	1.907	2.245	1.277	1.739	1.100

Remarks: (1) sample size n = 42745 (net income > 0; expenditures not restricted);
(2) formula of commodity-specific scales: $m_i^h = 1 + \mathbf{d}_i \,'\mathbf{s}_h - \mathbf{d}_i \,\mathbf{s}^0$

Source: Sfb 3/EVS 1983; own computations (based on regression results of Table 8).

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