Family-Type Subsistence Incomes

Christos Koulovatianos[a,*], Carsten Schröder[b,c], Ulrich Schmidt[c]

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Abstract

Different family types may have a fixed flow of consumption costs related to subsistence needs. We use a survey approach in order to identify and estimate such a fixed component of spending for different families. Our method involves making direct questions about the linkup between aggregate disposable family income and well-being for different family types. Conducting a pilot version of our survey in six countries, Germany, France, Cyprus, China, India and Botswana, we provide evidence that fixed costs of consumption are embedded in welfare evaluations of respondents. More precisely, we find that the relationship between welfare-retaining aggregate family incomes across different family types suggested by Donaldson and Pendakur (2006) and termed "Generalized Absolute Equivalence Scale Exactness" is prevalent and robust in our data. We use this relationship to identify subsistence needs of different family types and discuss potential problems and extensions.

Keywords: subsistence, equivalence scales, survey method, generalized absolute equivalence scale exactness

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[0] [a] Department of Economics, University of Vienna

[b] Department of Economics, Free University of Berlin

[c] Department of Economics, University of Kiel

* Corresponding author, Department of Economics, Univ. of Vienna, Hohenstaufengasse 9, A-1010 Vienna, Austria. E-mail: christos.koulovatianos@univie.ac.at, Tel: +43-1-427737426, Fax: +43-1-42779374.
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1. Introduction

Do observed aggregate family consumption expenditures stem solely from preferences that reflect consumer "wants" or is it that, alternatively, these expenditures contain a part that reflects family-type specific "needs?" Plausibly, in order to set up a certain household type, a minimum housing rent, maintenance flows of a minimum stock of durables, even subsistence needs, such as minimum calorie and heating needs are required. Such an aggregate component comprises a fixed consumption flow that is difficult to identify by observing consumer choices.

In recent empirical studies Donaldson and Pendakur (2004 and 2006), and Koulovatianos, Schröder and Schmidt (2005a and 2005b) examine within-household economies of scale in consumption for several family types. Household economies of scale were found to decrease as the level of material comfort of a household falls. If fixed consumption costs are present, they can provide an explanation. To cover the fixed component of consumption flows may take a large part of the disposable income of poorer households, whereas the remaining income may not be enough to contribute to the purchase of goods that contain significant sharing potential. Apart from the potential for explaining household economies of scale, the identification of fixed costs of consumption can serve the purpose of estimating family-type subsistence needs, measured in terms of income.

Family-type subsistence incomes are levels of expenditure, specific to each family type, that are just adequate to guarantee existence and sustainability of a given family type. Such subsistence incomes guarantee survival for household members, but also the borderline sustainability of the corresponding household type. In other words, for levels of material comfort greater than or equal to the level of material comfort at the family-type subsistence income, expenditure functions should be in additively-separable form: they should be the sum of the family-type subsistence income level and a term that depends on the level of material comfort.

In order to achieve the first goal, which is to identify fixed costs of consumption, a key step is to uncover the nature of expenditure functions. Yet, as expenditure functions depend on levels of material comfort, a way to convert levels of material comfort to an observable economic variable is necessary. In our survey, which follows Koulovatianos, Schröder and Schmidt (2005a and 2005b), but is extended to three developing countries, China, India, and Botswana in this paper, our respondents make this conversion: we ask questions of the form "which net family income level can make a household with two adults and one child as well off as a household with one adult and no children and a net family income of \$1000?" Thus, we collect incomes that make the material comfort of households with different family types equal, i.e. a range of *subjective equivalent incomes*.

We use a single-childless adult household as a *reference household* and we ask this question for several different incomes of the reference household, i.e. for several *reference incomes*, that capture several levels of material comfort. So, we obtain a range of equivalent incomes for several household types, that practically create a stepping stone for the identification of family-type fixed costs (subsistence levels): the so called, "*equivalent income functions*." Equivalent income functions contain and reflect information about the expenditure functions for the different household types they relate. This information enables us to distinguish the fixed component of expenditure functions from their variable component.

In particular, our database enables more than the identification of the fixed component of expenditure functions. It also allows for a testing of the nature of the variable component of the equivalent-income functions. This is a task of equal importance to identifying the fixed component of expenditure functions, because it serves as a guide for building applied household demand models. Specifically, Donaldson and Pendakur (2006) suggest a formulation for equivalent-income functions with a fixed component and a variable component that is proportional to the reference income. This formalization is termed "Generalized Absolute Equivalence Scale Exactness" (GAESE). Our data from six countries, Germany, France, Cyprus, China, India and Botswana, indicate that GAESE is the correct specification of equivalent-expenditure functions. *A specification test for GAESE is passed for all family types, and in all countries.*

The direct estimates of the fixed component of the equivalent income functions are also direct estimates of the fixed component of the expenditure functions for all family types except from this of the single childless adult, the reference household.[1] What is crucial about our compelling evidence in favor of the GAESE formulation is that a simple parametric functional form is available and, through our parameter estimates, it can carry information easily for several applications. One of these applications is the identification of family-type subsistence incomes. As we mentioned above, the available functional form reveals the fixed-cost of consumption for each family type directly. The key is that this fixed cost is linked with within-household economies of scale in consumption. Household economies of scale are logically related to the sustainability of a household type, or at least with how rational it is to form a particular household type given an available household income. We follow the convention that whenever economies of scale become zero, a household type is not (at least rationally) sustainable. By our convention, the income that corresponds to zero economies of scale is the family-type subsistence income. We report estimates of significantly positive

[1] As the reference household serves the purpose of defining levels of material comfort through the assignment of reference incomes, our respondents cannot provide any insights for the fixed component of the expenditure function of the reference household. The fact that this information cannot be obtained is the only shortcoming compared to other methods of estimation, such as these of estimating a demand system (see Donaldson and Pendakur (2006)). Yet, for the latter approach one needs to specify a structure for a demand system, whereas our method has the advantage of obtaining non-parametric estimates.

family-type subsistence incomes for all six countries.

The GAESE relationship is a generalization of the usual "Equivalence Scale Exactness (ESE)," as named by Blackorby and Donaldson (1991 and 1993), or earlier called by Lewbel (1989) "Independence of Base (IB)," which implies that all family types have zero fixed costs of consumption and that economies of scale in consumption should be the same at all levels of material comfort. The IB/ESE property has been a central assumption in the literature before Donaldson and Pendakur (2004 and 2006).[2] Estimating a "Translated Quadratic Almost Ideal" demand system, Donaldson and Pendakur (2006) have demonstrated that allowing for the GAESE property outperforms the restricted model that complies with IB/ESE, and allows for the identification of family-type fixed costs. Moreover, the authors find positive fixed costs of consumption for all family types in their sample.

Despite being able to show that GAESE improves upon IB/ESE, the methodology of Donaldson and Pendakur (2006) for the identification of fixed costs cannot test the GAESE property *a-priori*. So, whether the specification of the demand system under the GAESE restriction is best and also the validity of the estimated fixed costs, remain under question. Our study aims at filling exactly this gap.

Nevertheless, survey methodologies are not free from potential problems due to framing effects. In Koulovatianos, Schröder and Schmidt (2005a) we found that framing effects may influence quantitative results slightly. But one framing effect we have not been able to test so far is *anchoring*: the possibility that some respondents, due to that they are asked to evaluate 35 hypothetical questions, may feel tired to report their true evaluations and use their first stated increments (the difference between their stated equivalent incomes and the reference

[2] Donaldson and Pendakur (2004) introduce the property termed "Generalized Equivalence Scale Exactness (GESE)," which is characterized by an affine relationship between the log of any two equivalent incomes in a demand system. Evidence from Germany and France presented in Koulovatianos, Schröder and Schmidt (2005a) who use the questionare and some of the data of the present paper shows that GESE is not an unreasonable assumption and that IB/ESE is strongly rejected.

income for the poorest single-childless-adult household) as an anchor, "contaminating" in this way their reports, projecting a false GAESE pattern. We explain this possibility in a separate section of this paper and propose that, in future research, a questionnaire asking respondents to evaluate only one reference income should be tested.

In Section 2, we discuss our methodology and sampling. In Section 3 we explain how the concept of equivalent income functions is related to the identification of family-type subsistence levels, and, in particular, how the GAESE formulation of Donaldson and Pendakur (2006) contributes to this end. In Section 4 we present specification tests of the GAESE functional form for equivalent income functions. In Section 5 we present our estimates of family-type subsistence needs. In Section 6 we discuss the possibility that anchoring could drive our results, and in Section 6 we provide our conclusions.

2. Questionnaire and samples

The survey was conducted in six countries, Germany in 1999, Cyprus in 2000, France in 2002, China in 2004, India and Botswana in 2005. The complete questionnaire appears in Appendix A.1 of Koulovatianos, Schröder and Schmidt (2005a, pp. 993-4). In the first part a table with eight family types was provided to respondents, ranging from a single childless adult to a two-adult household with three children (all setups with one or two adults with a number of children ranging from zero to three). The single childless adult was used as *reference household* and provided a net monthly income for this family type (reference income). Respondents were asked to provide the net family incomes that bring the remaining seven household types to the same level of material comfort as this of the single childless adult. This task was repeated for five different reference incomes.[3]

[3] In Botswana the questionnaire consisted of questions about three reference incomes instead of five. This was because several languages (mainly Setswana and Kalanga, but also Sekgalagadi) are used and this required that interviewers had to resort to oral interviews. The response rate with five reference incomes

In the second part of the questionnaire respondents were asked about their personal characteristics. A list of these characteristics and our sample frequencies for Germany and France appear in Table 1 of Koulovatianos, Schröder and Schmidt (2005a, p. 972) and for Cyprus in Table A.1 in Koulovatianos, Schröder and Schmidt (2005b, pp. 25-6). We compile these again in Table 1a for completeness of exposition. In the three developing countries that are appearing in this study for the first time, we requested some additional respondent personal characteristics that could possibly be important in affecting respondents' evaluations of material comfort. All characteristics and sample frequencies appear in Table 1b. An important new feature is the "living area" variable that distinguishes between rural and urban residence of the respondent.

The sample sizes for Germany, France, and Cyprus (appearing in Table 1a) are 167, 223, and 130. As it can be seen from Table 1b, the sample sizes for China, India and Botswana are, 196, 214 and 159. Although these samples seem "small," given the fact that each respondent provides 35 answers, we obtain enough observations to run our tests.[4]

The sampling region in China was the urban area of Hangzhou and several towns in the province of Zhejiang. In India the data were collected from cities and villages of three states of south India, Tamil Nadu, Andhra Pradesh and Karnataka. The cities where our respondents were found are Chennai (Madras) in Tamil Nadu, Hyderabad (Andhra Pradesh) and Bangalore in Karnataka. The questionnaire was provided in the dialects of Tamil (Tamil Nadu), Telegu (Andhra Pradesh), in the English language (respondents from Karnataka preferred English instead of our questionnaires provided in the dialect Kannada) and elderly

was low and given our planned budget and time constraints we modified the questionnaire so as to increase the response rate. For the purpose of testing the income dependence of equivalence scales three reference incomes serve this task very well. For the main focus of this paper, which is to test the GAESE hypothesis, three reference incomes are marginally sufficient for such a test. Nevertheless, we include this country in this study as complementary information.

[4] In Botswana it is 21 answers (see footnote 3 above).

respondents were given the option of a questionnaire in Hindi. In Botswana sampling was from the capital Gaborone and villages around it. Apart from questionnaires provided in English, a large part of the respondents were interviewed orally mainly in the languages Setswana and Kalanga.

In India a distinct social feature about household types is that, typically, three or more generations may live in the same household (extended families).[5] This has motivated us to include the variable "number of adults in the household," that appears in Table 1b.[6] Moreover, since the family-income distribution in India is very skewed and fat-tailed, due to the presence of very large households, we have split the top quintile into two subcategories (with 11500 Indian Rupies being the low bound of the highest category), which explains the presence of the sixth family after-tax income category in Table 1b.

3. The structure of equivalent-income functions with family-type subsistence income levels

3.1 Preliminary concepts

An equivalent-income function relates incomes of different family types that provide the same level of material comfort for the members of these family types. Using a single childless adult as a reference household, for a given reference income, y^r, an equivalent-income function is given by,

$$y^h = \Phi\left(V\left(y^r\right)\right) \ , \tag{1}$$

where y^h is the equivalent income of household type "h," $V\left(y^r\right)$ is the value function of the single childless adult and Φ is the inverse of the value function of household type h. Notice that we have ignored the price vector, given that we collect subjective evaluations of

[5] For example, in many regions of India it is customary that after marriage a wife is expected to move to the household of the husband and live along with his parents.

[6] For example, in our sample there was a respondent from a 19-member household (15 adults and 4 children).

equivalent incomes at a particular point in time, so the price vector has no variation in our database.

We define a *family-type subsistence income level* as the minimum expenditure requirement that guarantees a borderline formation and sustainability of a certain family type living as a household. At such a level, according to (1), there is a minimum reference income of the single childless adult, that is a function of the household type h, namely $\underline{y}^r(h)$, such that,

$$\underline{y}^h = \Phi\left(V\left(\underline{y}^r(h)\right)\right) \equiv b^h \ , \tag{2}$$

where $\underline{y}^h$, is the family-type subsistence income of family h, denoted as b^h from hence and on. It is important to comment on the fact that the minimum reference income of the single childless adult, $\underline{y}^r(h)$, is a function of the household type h. Different family types can benefit from different within-household economies of scale in consumption. This is important for defining the level of family type basic subsistence needs. For example, housing and heating facilities contain a high sharing potential. Most likely, the per-capita income needed to be at the subsistence level is lower for larger family types. For this reason, it is plausible to allow for the minimum reference income of the single childless adult that corresponds to the subsistence level of a family type to be a function of the family type, namely $\underline{y}^r(h)$. Of course, if $\underline{y}^r(h)$ varies with h, then the material comfort of family members at the subsistence level is different in different family types. This is not an implausible statement. At the same time, this complicates the task of identifying family-type subsistence levels, b^h. As we will stress below, the identification of equivalent income functions is the key to capturing correctly the family-type subsistence levels, b^h, but also a conventional theory of family-type marginal sustainability at subsistence is necessary. We therefore continue with the prerequisite task of discussing the identification of equivalent-income functions.

Combining (1) and (2), we can write a candidate equivalent-income function as,

$$y^h = b^h + f\left(V\left(y^r\right)\right) \ , \qquad \text{with } \ y^r \in \left[\underline{y}^r\left(h\right), \infty\right) \ , \tag{3}$$

where

$$f\left(V\left(y^r\right)\right) \equiv \Phi\left(V\left(y^r\right)\right) - \Phi\left(V\left(\underline{y}^r\left(h\right)\right)\right) \ .$$

So, the equivalent-income function given by (3), is written in an additively separable form with two components, (i) the family-type subsistence level, that captures a household's basic needs, and, (ii) a function that provides extra expenditures that lead to increases in material comfort through household choices that involve household "wants" over non-subsistence goods.

The way we have expressed the equivalent income function of a household h in (3), calls for a test on whether family-type subsistence levels, b^h are positive and significantly different from 0. Specifically, with our survey data we can run regressions of alternative functional forms to capture $f\left(V\left(\cdot\right)\right)$ and to test whether b^h is positive. We normalize the functional form given by (3), dividing both sides by the reference income, y^r, i.e.,

$$\frac{y^h}{y^r} = \frac{b^h}{y^r} + \frac{f\left(V\left(y^r\right)\right)}{y^r} \ , \qquad \text{with } \ y^r \in \left[\underline{y}^r\left(h\right), \infty\right) \ , \tag{4}$$

where the ratio y^h/y^r is, by definition, the *relative equivalence scale* of household type h, at the reference income level y^r. To the extent that a robust specification test on a functional form testing (4) includes a significant positive estimate for b^h, family-type subsistence levels are present and affect consumption planning.

3.2 GAESE and identification of family-type subsistence levels

In a recent study Donaldson and Pendakur (2006) suggested a particular functional form for equivalent-income functions, namely

$$y^h = A^h + R^h y^r \ . \qquad (5)$$

The property that equivalent income functions comply with the specific functional form given by (5) was termed "Generalized Absolute Equivalence Scale Exactness (GAESE)." In the special case where $R^h = 1$, equivalent incomes are characterized by "Absolute Equivalence Scale Exactness" (AESE) (see Donaldson and Pendakur (2006)). If the general equivalent-income function given by (3) complies with GAESE, then it should be that,

$$f\left(V\left(y^r\right)\right) = -\phi^h + R^h y^r \ , \qquad \text{with } \ y^r \in \left[\underline{y}^r\left(h\right), \infty\right) \ , \qquad (6)$$

so,

$$A^h = b^h - \phi^h \ ,$$

and

$$\phi^h = R^h \underline{y}^r\left(h\right) \ .$$

It is important to stress that the parameter $A^h = b^h - \phi^h$ captures the fixed costs of consumption expenditures. It is the additive component of the expenditure function of household type h. This must be contrasted to the family-type subsistence income, b^h, which is a cutoff income level for sustainability of household type h.

If GAESE holds, in order to identify the family-type subsistence level, b^h, it is necessary to follow a conventional concept of household formation/dissolution. We can think of household economies of scale as a key factor that allows a household-type to be formed under the principle of rationality with respect to maximizing utility from consumption of economic goods. When economies of scale disappear, we may assume that the household dissolves. This is consistent with the rational trend in family economics that pervades marriage-decision models: that marriage is driven by an effort to benefit from within-household economies of scale in consumption. Theoretically, under the additional convention that each family member (adults or children) have the same subsistence needs, this would mean that if a household type, h, has n^h family members, then the relative equivalence scale, y^h/y^r, should be less than or equal to n^h. This convention of treating adults and children in the same way at subsistence is not implausible. It is plausible that calorie and nutrition needs of adults and children are similar, considering the quantity and quality of food that enables children to grow normally. Moreover, clothing, heating, and shelter *subsistence* needs must be similar among adults and children.[7]

If equivalence scales are decreasing in reference income, y^r (a feature that should be present if GAESE holds and there are positive family-type subsistence income levels), then below the threshold level $\underline{y}^r(h) = b^h/n^h$, the equivalence scale y^h/y^r is greater than the number of family members, n^h. So, there are diseconomies of scale in consumption and the household type h is not rational to be formed.

These concepts are depicted in Figure 1. At the top graph we provide a relative equiva-

[7] Empirically, at higher levels of material comfort children are less costly compared to an adult. Yet, in Koulovatianos, Schröder and Schmidt (2005a and 2005b) we find that as the living standards fall, children become more expensive relative to an adult (our estimate for France is 72%, 67% for Germany, and 86% for Cyprus at the poverty line, with these figures applying after controlling for the average overall household economies of scale). So, to assume that adults and children cost about the same at the subsistence level is not far from our calculations. In Pitt, Rozenzweig and Hassan (1990, Table 1, p. 1140) evidence from Bangladesh suggests that average calorie consumption of the age group of children between 6-12 years is about 67% of this of an average adult in a sample from 15 villages (in our questionnaire children are between 7-11). Yet, this ratio exceeds 80% when taking into account the activity levels of adults versus these of children. This sample of Pitt, Rozenzweig and Hassan (1990) does not focus on the poorest families with survival problems, although the population in the examined regions is certainly poor.

lence scale that is consistent with GAESE, according to the formula

$$\frac{y^h}{y^r} = \frac{b^h - \phi^h}{y^r} + R^h \ , \tag{7}$$

which follows from (5). We place an upper bound on the relative scale value, namely the number of household members of household type h, n^h. The equivalence scale is n^h below the reference-income level $\underline{y}^r(h) = b^h/n^h$, that is the equivalent income of a single childless adult corresponding to the subsistence income level of family type h.[8] At the bottom graph we plot the equivalent-income function of h, following equation (5). Apparently, the family-type subsistence income, b^h, can be uniquely identified by the point of intersection of the equivalent-income function and the line given by $n^h y^r$, provided that the slope R^h is strictly less than n^h when $b^h - \phi^h > 0$.

With this background we are ready to test whether GAESE is a property of equivalent-income functions that is met by our survey data and to provide estimates of family-type subsistence levels. To see this, we run specification tests of the formula given by (7).

4. Specification tests of the GAESE formulation of equivalent income functions

In Table 2 we present the descriptive statistics of equivalence scales in all countries.[9] In all 6 countries it is transparent that, for each family type, equivalence scales fall as reference income increases, and this drop occurs at a decreasing rate. So, the functional form of

[8] Another way to express b^h/n^h is "per-capita subsistence level of family type h." The fact that it coincides with the equivalent income of a single childless adult comes from our convention that all family members in a household (adults or children) have the same subsistence needs. Of course, due to the immediate possibility for household consumption economies of scale in multi-member families, the level $\underline{y}^r(h) = b^h/n^h$ does not coincide with the subsistence level of a single-childless-adult household. For example, the minimum expenditure for shelter and heating, that contain significant sharing possibilities, should be borne solely by a single childless adult. This means that, plausibly, single-childless-adult households should exhibit the maximum (per-capita) family-type subsistence levels.

[9] The symbol "A" denotes one adult, while a child is denoted by "C." So, for example, "AAC" denotes a household with two adults and one child.

equation (7) seems to be a good candidate for capturing the income-dependence pattern of equivalence scales.

It is notable that for the lowest reference incomes in India and Botswana, our respondents provided average equivalence scales for two-adult families that are slightly higher than the level of household members. This is due to the fact that the reference incomes that we provided for the lowest income class, based on features of the income distribution in India and Botswana, turn out to be "too low." In particular, according to our calculations in Section 5, these reference incomes for the single childless adults appear to be below the subsistence level that allows for a formation of a single-adult household. We return to a discussion of this point in Section 5.2.

In Tables 3a-3f we present a specification test of regressions of our respondents' stated equivalence scales against the reference income, separately for each household type. We report regressions using the specification,

$$\frac{y_i^h}{y^r} = R^h + \frac{\left(b^h - \phi^h\right)}{y^r} + a_0^h \text{Ref. Income Dummies} + a_1^h PERSONAL_i + \varepsilon_i^h \ . \tag{8}$$

By y_i^h we denote the equivalent income that was stated by respondent i about a household of type h, for a given reference income, y^r. Therefore, the endogenous variable, the ratio y_i^h/y^r is the relative equivalence scale for h, stated by respondent i. The variable y^r takes the values $y^A \cdot Y^r$, where y^A is the lowest monetary value assigned to the single childless adult (lowest reference income) in PPP-adjusted 2004 US dollars, and Y^r is a vector indicating how many multiples of y^A correspond to the reference incomes provided to the respondents in each country, so as to capture features of the income distribution in these countries. For the three developed countries of our data, Germany, France and Cyprus, $Y^r = [1, 2.5, 4, 5.5, 7]^T$, whereas as it can be seen from Table 2, Y^r varies in the three developing countries. In particular, $Y^r = [1, 2, 4, 8, 16]^T$ in China, $Y^r = [1, 4, 7, 10, 13]^T$ in India, and $Y^r = [1, 2.5, 4]^T$ in Botswana. The assigned values for y^A in PPP-adjusted 2004 US dollars are, $y^A = 568.18$ in Germany, $y^A = 587.12$ in France, $y^A = 346.24$ in Cyprus, $y^A = 277.78$ in China, $y^A = 154.47$ in India, and $y^A = 170.58$ in Botswana.

"Ref. Income Dummies" is a set of dummy variables that assigns 1 whenever reference income is equal to the corresponding reference income given in a question, and 0 otherwise. So, if the functional form given by (7) is not sufficient to explain the variation in our data, the additional variation will be captured by these reference income dummies. Thus, a test for inclusion of these dummies is our specification test for the GAESE formulation. Since the term $\left(b^h - \phi^h\right)/y^r$ together with the constant term, R^h, are perfectly correlated with all income dummies, we exclude the dummy that corresponds to the highest income class.

Since for each family type the same respondent has provided five equivalent income evaluations, the error terms across the seven family types might be cross correlated. This can generate a loss in the efficiency of estimators and can weaken the confidence in our specification tests. To cope with this problem we estimate a system of 7 seemingly unrelated regressions.

None of the personal characteristics ("$PERSONAL_i$") of our respondents appeared as robust. In rare cases coefficients on personal characteristics appeared as significant. Significant personal characteristics in some regressions were either non-significant in alternative family types, or with a different sign. Thus, we only report the estimators of parameters R^h, $\left(b^h - \phi^h\right)$ and a_0^h, but in all regressions these coefficients are controlled for all available personal characteristics. All regressions that correspond to (8) and include the income dummies are called "unrestricted," and they are presented in columns having the symbol "U" throughout Tables 3a-3f. The regressions of the form (8) under the restriction that $a_0^h = 0$, are presented in columns named "R" in the same tables.

At the bottom of each household type regression, and in between columns "U" and "R," we report the F-test statistic on exclusion of reference income dummies. Underneath these F-test statistics, the level of significance of the test appears in brackets. With the highest value of the F-test statistic being 1.78, it is transparent that *in all 42 cases examined the GAESE formulation passes the specification test.*

This result has important implications. According to our survey approach, ESE does not hold in any examined case. In particular, the evaluations of our respondents support that all family types experience increasing economies of scale in consumption at higher levels of well-being *solely* due to the presence of positive fixed costs in consumption. Yet, another special case of GAESE, the case where $R^h = 1$ in equation (5), is present in our sample. This property is called "Absolute Equivalence Scale Exactness (AESE), as $R^h = 1$, implies that the absolute equivalence scales $(y^h - y^r)$ remain constant at all levels of well-being. So, under AESE, adding members in a household implies the addition of fixed costs only, at all levels of well-being. In our samples, based on Wald tests on the restriction that $R^h = 1$, AESE is present for all single-parent family types in Germany and France, and in single-parent families with one child in Cyprus. This is an indication that, according to the perceptions of our respondents in these high-income countries, children in single-parent families imply only fixed consumption costs at all levels of well-being. In India AESE is present for all family types and in Botswana in all family types except from AC and ACC. However, in China there is no family type exhibiting AESE.[10]

[10]These Wald tests for AESE are available from the authors upon request.

5. Estimates of Family-type Subsistence Incomes

5.1 Results and cross-country differences

Given the ample evidence presented above (Tables 3a-3f) in favor of the GAESE formulation, we proceed to identify estimates of family-type subsistence levels. According to our convention that a household type is formed solely on the basis of rational consumer-choice advantages (ignoring a possibly strong cultural background behind household formation, that is beyond the scope of our analysis), these subsistence incomes, captured by parameter b^h, can be identified by the bottom graph of Figure 1, explained in Subsection 3.2 above. The algebraic formula corresponding to the graphical identification of b^h in Figure 1 is,

$$b^h = \frac{n^h A^h}{n^h - R^h} = \frac{n^h \left(b^h - \phi^h\right)}{n^h - R^h} \ . \tag{9}$$

Based on our estimates of $A^h = \left(b^h - \phi^h\right)$ and R^h from the columns "U" of Tables 3a-3f, we provide our estimates of family-type subsistence incomes in Table 4. All numbers are net monthly incomes in 2004 PPP-adjusted US dollars. Underneath each number in Table 4, the per-capita family-type subsistence level, b^h/n^h, appears in brackets.

In principle, these subsistence levels are higher in countries with higher per-capita GDP. Germany exhibits the highest of all. This might be due to the additional heating needs due to the German climate. Nevertheless, perceptions of respondents may also be different from country to country. These differences in perceptions may stem, for instance, from relative-price differences, or even from the fact that the most commonly observed living standards can differ from country to country and practices of the poor for dealing with everyday needs can be perhaps more transparent to the average respondent in poorer countries.

5.2 Estimates of subsistence incomes that are higher than the lowest provided reference incomes

Another important remark is that in India and Botswana our per-capita family-type subsistence incomes for two-adult families are above the lowest reference incomes that we provided to our respondents for single-childless adults (USD 154.47 for India and 170.58 for Botswana - see our discussion in footnote 8 above about why these numbers may be below the subsistence level of a single childless adult as well). Our estimates of subsistence levels for the poorer countries of our sample, and especially for India, are often significantly higher than the officially stated poverty lines.

Our chosen reference incomes were consistent with features of the income distribution in both countries, where a significant fraction of their populations lives below the poverty line. In Section 4 above we noted that, on average, respondents suggested equivalent incomes that yield equivalence scales higher than the number of adults in a household for the lowest reference income. This possibly reflected a form of "objection" by respondents, that one cannot form a household at such a low reference income. Yet, in developing countries a significant fraction of the poor is homeless. At the same time, our convention of applying *solely* the principle of rational consumer choice for the formation of a household (and ignoring cultural factors), may also be responsible for a discrepancy between observed incomes and our identified family-type subsistence levels.

Another explanation for the high equivalence scales for the poor, is that respondents could feel sympathetic towards the poor and try to compensate by "inflating" their stated equivalent incomes for different family types. Yet, in Koulovatianos, Schröder and Schmidt (2005a, pp. 982-7) we have provided a test for framing effects of our survey method, using the largest family type as the reference household and asking respondents to subtract amounts in order to give equivalent incomes. If respondents are reluctant to give additional amounts to the poor, their hesitation to subtract high amounts from the poor (that would express the same feeling of sympathy) would result to low equivalence scales for the poor. Following our analysis in Koulovatianos, Schröder and Schmidt (2005a, pp. 982-7), we conclude that such an effect tends to be present, but not as strongly as to have a sizable quantitative impact on our conclusions. Moreover, subtracting numbers is more difficult than adding them while filling out the questionnaire. This is a disadvantage of applying the alternative survey presented in Koulovatianos, Schröder and Schmidt (2005a, pp. 982-7), and extracting estimates from it.

6. A critique of the pilot survey: the possibility of anchoring

The pilot survey gives respondents a task that requires them to put a considerable amount of effort: the questionnaire asks them to evaluate equivalent incomes for 35 hypothetical household types. It would be reasonable to suspect that respondents are trying to economize on thinking effort and re-state numbers they reported in preceding questions. Respondents might be influenced by their own answers to previous questions: some values stated first might serve as anchors. In this section we present two examples where anchoring may alter entirely the profiles respondents have in mind, leading the outcome of the survey to test positively for either AESE or GAESE in cases where true equivalent incomes are not characterized by any of these two properties.

Let a sample of N respondents who are provided with three different reference incomes for a single-childless-adult household, y_1^r, y_2^r, and y_3^r, and let respondents be asked to state their assessment of the equivalent income of household type h. Assuming no prior pattern in respondents' true assessments, and denoting respondent i's, $i \in \{1, ..., N\}$, stated equivalent income for household h with reference income y_j^r, $j \in \{1,2,3\}$, as $y_{j,i}^h$, respondents' answers can be expressed in the following way:

$$\left\{ \begin{array}{l} y_{1,i}^h = \left(1+\psi_{1,i}^h\right) y_1^r \\ y_{2,i}^h = \left(1+\psi_{2,i}^h\right) y_2^r \\ y_{3,i}^h = \left(1+\psi_{3,i}^h\right) y_3^r \end{array} \right\} \text{ true assessment of } i \in \{1,...,N\} \tag{10}$$

where $\psi_{j,i}^h$ is respondent i's specific innovation in their assessment of equivalent income $j \in \{1,2,3\}$. Now suppose that each respondent, instead of (10), reports,

$$\left\{ \begin{array}{c} y_{1,i}^h = \left(1+\psi_{1,i}^h\right) y_1^r \\ y_{2,i}^h = y_2^r + \lambda_i \psi_{2,i}^h y_2^r + (1-\lambda_i)\,\psi_{1,i}^h y_1^r \\ y_{3,i}^h = y_3^r + \lambda_i \psi_{3,i}^h y_2^r + (1-\lambda_i)\,\psi_{1,i}^h y_1^r \end{array} \right\} \text{ report of } i \in \{1,...,N\} \text{ suffering from anchoring} \tag{11}$$

Notice that parameter λ_i in (11), which is specific to respondent i, captures the extent to which a respondent economizes in terms of thinking by using the original innovation that he/she initially stated for reference income y_1^r so that stated increments for y_j^r with $j > 1$ are "contaminated" by this anchoring effect.

6.1 Anchoring and AESE

Notice that if the survey is capable of eliciting respondents' true evaluations, given by (10), then there would be no particular pattern of equivalent incomes, unless we assume some pattern for the respondent-specific innovation parameters, $\psi_{1,i}^h$, $\psi_{2,i}^h$, and $\psi_{3,i}^h$, for each $i \in \{1,...,N\}$. Let's not assume any such pattern and examine the extreme case of perfect anchoring for all respondents, namely that $\lambda_i = 0$ for all $i \in \{1,...,N\}$.

$$[(11) \text{ and } \lambda_i = 0 \text{ for all } i \in \{1,...,N\}] \Rightarrow \frac{1}{N}\sum_{i=1}^{N} y_{j,i}^h = \alpha^h + y_j^r \ , \ j \in \{1,2,3\},$$

$$\text{with } \alpha^h = \frac{y_1^r}{N}\sum_{i=1}^{N} \psi_{1,i}^h \ ,$$

i.e., the observed result would lead to an affirmative test for an AESE pattern across reference incomes. As we report in Section 4, for some countries and for some particular household types in our pilot surveys the resulting pattern has tested positively for AESE.

6.2 How actual IB/ESE and anchoring lead to an affirmative test for GAESE

Now assume that all respondents truly think that equivalent incomes are characterized by IB/ESE, so each respondent's innovations should be restricted to $\psi^h_{1,i} = \psi^h_{2,i} = \psi^h_{3,i} = \psi^h_i$. Notice that ψ^h_i need not be the same across respondents. So, if the questionnaire is free from framing effects and able to elicit all information from respondents, the observed outcome should be

$$\left.\begin{array}{l} y^h_{1,i} = \left(1 + \psi^h_i\right) y^r_1 \\ y^h_{2,i} = \left(1 + \psi^h_i\right) y^r_2 \\ y^h_{3,i} = \left(1 + \psi^h_i\right) y^r_3 \end{array}\right\} \Rightarrow \frac{1}{N}\sum_{i=1}^{N} y^h_{j,i} = \beta^h y^r_j \ , \ j \in \{1,2,3\} \, , \text{ with } \beta^h = \frac{1}{N}\sum_{i=1}^{N}\left(1 + \psi^h_i\right) \ ,$$

i.e., the result would indeed be the property of IB/ESE.

Let some respondents $i \in \{1, ..., N\}$ having $\lambda_i \in [0, 1)$.

$$\left[(11) \text{ and } \psi^h_{1,i} = \psi^h_{2,i} = \psi^h_{3,i} = \psi^h_i \text{ and } \lambda_i \in [0,1) \text{ for some } i \in \{1, ..., N\}\right] \Rightarrow$$

$$\Rightarrow \frac{1}{N}\sum_{i=1}^{N} y^h_{j,i} = \alpha^h + \beta^h y^r_j \ , \ j \in \{1,2,3\} \, , \text{ with } \alpha^h = \frac{y^r_1}{N}\sum_{i=1}^{N}\left(1 - \lambda_i\right)\psi^h_i$$

$$\text{and } \beta^h = \frac{1}{N}\sum_{i=1}^{N}\left(1 + \lambda_i \psi^h_i\right) \ ,$$

i.e., the observed result would lead to an affirmative test for a GAESE pattern across reference incomes. Notice that in this case if all respondents have IB/ESE in mind and *only some* respondents are "lazy" and anchor, then the conclusion would be wrong. Most importantly, anchoring would always lead to $\alpha^h > 0$, consistently with our results. The global prevalence of GAESE in our pilot surveys calls for further investigation: if we do not preclude the possibility of anchoring we cannot be sure that GAESE is the correct pattern over IB/ESE. For this reason a different survey design where respondents are provided with *only one* reference income to evaluate should be an immediate extension for future investigation.

7. Conclusion

Using a survey method we provided subjective estimates of equivalent incomes across several family types (incomes that retain the same living standard across all family types) in 6 countries, Germany, France, Cyprus, China, India and Botswana. Our survey targeted the estimation of subjective equivalent incomes for different levels of material comfort in each country. Thus, our database enabled us to test for a particular formulation of equivalent-income functions, depending on living standard. Specifically, we tested the formulation provided by Donaldson and Pendakur (2006) termed "Generalized Absolute Equivalence Scale Exactness (GAESE)." One key feature of the GAESE formulation is that it takes into account family-type fixed costs of characteristics, and that it provides a way to identify family-type subsistence levels of consumption/income. We ran 42 specification tests of the GAESE formulation and we found that GAESE passes the test in all these cases.

Our finding may provide confidence to using the GAESE formulation in other applied approaches to consumer choice such as this of Donaldson and Pendakur (2006). Moreover, our results lend support to the idea that family-type subsistence needs must be a significant part of the explanation on the finding of Donaldson and Pendakur (2004 and 2005) and Koulovatianos, Schröder and Schmidt (2005a and 2005b) that within-household economies of scale that increase with the level of material comfort. Using our regression-coefficient estimates and the convention that family-type subsistence incomes are defined by the point where within-household economies of scale are zero, we provided estimates of family-type subsistence levels of income.

Nevertheless, our surveys are pilot, and the possibility that anchoring may drive this strikingly simple GAESE pattern has not yet been investigated. Using a questionnaire where each respondent is asked to evaluate only one reference income and using a larger number of respondents should provide a comprehensive and reliable test for the GAESE property of equivalent incomes.

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Table 1a - Breakdown of the samples in Germany, Cyprus, and France

		Germany		Cyprus		France	
		Sample: 167 obs.		Sample: 130 obs.		Sample: 223 obs.	
		N	%	N	%	N	%
Gender	Male	96	57.49	73	56.15	117	52.47
	Female	71	42.51	57	43.85	106	47.53
Partner in the household	Yes	97	58.08	75	57.69	154	69.06
	No	70	41.92	55	42.31	69	30.94
Living with parents	Yes	---	---	37[a]	28.46	---	---
	No	---	---	93	71.54	---	---
Number of children in the household	0	123	73.65	82	63.08	102	45.74
	1	18	10.78	18	13.85	45	20.18
	2	15	8.98	23	17.69	46	20.63
	3 or more	11	6.59	7	5.38	30	13.45
Family after-tax income class	1	32	19.16	9	6.92	18	8.07
	2	44	26.35	25	19.23	30	13.45
	3	37	22.16	24	18.46	41	18.39
	4	37	22.16	31	23.85	49	21.97
	5	17	10.18	41	31.54	85	38.12
Occupational group	Welfare recipient or unemployed	7	4.19	2	1.54	7	3.14
	Blue-collar worker	10	5.99	2	1.54	6	2.69
	White-collar worker	83	49.70	40	30.77	48	21.52
	Civil servant	13	7.78	40	30.77	29	13.00
	Pupil, student, trainee	34	20.36	30	23.08	102	45.74
	Self-employed	7	4.19	13	10.00	13	5.83
	Pensioner	10	5.99	0	0.00	6	2.69
	Housewife, -man	3	1.80	3	2.31	12	5.38
Education	Below 9 years of education	1	0.60	4	3.08	0	0.00
	Completed Extended Elementary School	21	12.57	8	6.15	13	5.83
	Completed Special Secondary School	39	23.35	---	---	43	19.28
	Completed Secondary School	65	38.92	65	50.00	37	16.59
	Technical School/University degree	41	24.55	53[b]	40.77	130	58.30
Number of siblings during childhood	0	31	18.56	9	6.92	37	16.59
	1	55	32.93	34	26.15	72	32.29
	2	47	28.14	40	30.77	59	26.46
	3 or more	34	20.36	47	36.15	55	24.66

Note. The threshold of the first "family-after tax income class" is the country-specific poverty line for a single childless adult. Then, we add increments such that the mean of the third income class is about the mean household income in the respective country.

[a] One of the respondents who were living with their parents also had a partner and two children.

[b] 14 out of the 53 highly educated respondents in Cyprus had finished a technical school (3 years of higher education).

Table 1b - Breakdown of the samples in China, India, and Botswana

		Botswana		China		India	
		Sample: 159 obs.		Sample: 196 obs.		Sample: 214 obs.	
		N	%	N	%	N	%
Gender	Male	70	44.03	130	66.33	136	63.55
	Female	89	55.97	66	33.67	78	36.45
Partner in the household	Yes	89	55.97	146	74.49	---	---
	No	70	44.03	50	25.51	---	---
Number of adults in the household	1	---	---	---	---	12	5.61
	2	---	---	---	---	73	34.11
	3	---	---	---	---	35	16.36
	4	---	---	---	---	56	26.17
	5	---	---	---	---	22	10.28
	6	---	---	---	---	10	4.67
	7 or more	---	---	---	---	6	2.80
Number of children in the household	0	48	30.19	159	81.12	74	34.58
	1	26	16.35	27	13.78	48	22.43
	2	40	25.16	7	3.57	62	28.97
	3 or more	45	28.30	3	1.53	30[a]	14.02
Family after-tax income class	1	10	6.29	42	21.43	4	1.87
	2	18	11.32	47	23.98	22	10.28
	3	48	30.19	56	28.57	24	11.21
	4	42	26.42	32	16.33	39	18.22
	5	41	25.79	19	9.69	37	17.29
	6	---	---	---	---	88	41.12
Occupational group	Welfare recipient or unemployed	30	18.87	4	2.04	8	3.74
	Blue-collar worker	19	11.95	11	5.61	26	12.15
	White-collar worker	24	15.09	5	2.55	41	19.16
	Civil servant	53	33.33	5	2.55	23	10.75
	Pupil, student, trainee	15	9.43	140	71.43	54	25.23
	Self-employed	13	8.18	28	14.29	42	19.63
	Pensioner	2	1.26	0	0.00	9	4.21
	Housewife, -man	3	1.89	3	1.53	8	3.74
	Farmer	---	---	---	---	3	1.40
Education	No schooling	---	---	4	2.04	1	0.47
	Basic schooling	5	3.14	16	8.16	3	1.40
	Completed Primary School	7	4.40	9	4.59	15	7.01
	Completed Junior High School	21	13.21	13	6.63	44	20.56
	Completed High School	39	24.53	147	75.00	93	43.46
	Technical School/University degree	87	54.72	7	3.57	58	27.10
Number of siblings during childhood	0	31	19.50	71	36.22	33	15.42
	1	20	12.58	58	29.59	52	24.30
	2	27	16.98	35	17.86	47	21.96
	3 or more	81	50.94	32	16.33	82	38.32
Age group	Less than 20	---	---	---	---	49	22.90
	Between 20 and 40	---	---	---	---	127	59.35
	40 or more	---	---	---	---	38	17.76
Living area	Urban	107	67.30	104	53.06	190	88.79
	Rural	52	32.70	92	46.94	24	11.21

Note. The threshold of the first "family-after tax income class" is the country-specific poverty line for a single childless adult. Then, we add increments such that the mean of the third income class is about the mean household income in the respective country.

[a] In India. 8 households have 4 children. 2 households have 5 children. and 3 households have 6 or more children.

Table 2 Descriptive statistics of stated equivalence scales

Country	y_r		AC	ACC	ACCC	AA	AAC	AACC	AACCC
Germany	1	Mean	1.57	2.02	2.47	1.75	2.27	2.73	3.17
		Median	1.50	2.00	2.30	1.80	2.25	2.70	3.00
		Std.error	(0.02)	(0.03)	(0.05)	(0.02)	(0.03)	(0.04)	(0.06)
	2.5	Mean	1.24	1.44	1.63	1.49	1.72	1.92	2.12
		Median	1.20	1.40	1.60	1.52	1.72	1.92	2.08
		Std.error	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
	4	Mean	1.17	1.32	1.45	1.46	1.61	1.76	1.89
		Median	1.15	1.27	1.39	1.50	1.63	1.75	1.88
		Std.error	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
	5.5	Mean	1.13	1.23	1.34	1.39	1.51	1.61	1.73
		Median	1.11	1.22	1.31	1.36	1.51	1.60	1.68
		Std.error	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
	7	Mean	1.11	1.21	1.29	1.39	1.49	1.59	1.68
		Median	1.10	1.19	1.27	1.43	1.50	1.57	1.66
		Std.error	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
France	1	Mean	1.58	2.06	2.49	1.73	2.22	2.67	3.09
		Median	1.50	2.00	2.40	1.67	2.17	2.67	3.00
		Std.error	(0.02)	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.06)
	2.5	Mean	1.30	1.54	1.76	1.51	1.76	1.98	2.19
		Median	1.27	1.49	1.67	1.47	1.73	1.93	2.13
		Std.error	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
	4	Mean	1.25	1.44	1.61	1.44	1.64	1.81	1.97
		Median	1.25	1.42	1.54	1.42	1.58	1.75	1.88
		Std.error	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
	5.5	Mean	1.21	1.37	1.51	1.40	1.57	1.71	1.85
		Median	1.18	1.33	1.44	1.33	1.52	1.64	1.76
		Std.error	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
	7	Mean	1.20	1.34	1.47	1.40	1.55	1.68	1.81
		Median	1.19	1.29	1.40	1.38	1.52	1.62	1.71
		Std.error	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
Cyprus	1	Mean	1.73	2.34	2.96	1.81	2.44	3.07	3.67
		Median	1.60	2.10	2.73	1.75	2.45	3.00	3.50
		Std.error	(0.03)	(0.05)	(0.08)	(0.03)	(0.04)	(0.07)	(0.09)
	2.5	Mean	1.33	1.61	1.88	1.49	1.77	2.06	2.33
		Median	1.30	1.50	1.80	1.40	1.70	2.00	2.30
		Std.error	(0.02)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.05)
	4	Mean	1.26	1.49	1.70	1.42	1.65	1.87	2.07
		Median	1.25	1.50	1.63	1.38	1.59	1.81	2.00
		Std.error	(0.02)	(0.02)	(0.04)	(0.02)	(0.03)	(0.04)	(0.05)
	5.5	Mean	1.23	1.43	1.61	1.38	1.58	1.77	1.95
		Median	1.18	1.36	1.55	1.36	1.50	1.68	1.82
		Std.error	(0.02)	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.05)
	7	Mean	1.20	1.36	1.52	1.34	1.52	1.68	1.84
		Median	1.14	1.29	1.43	1.29	1.43	1.57	1.71
		Std.error	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.04)	(0.05)

Note. y_r =1 describes the lowest living standard in the three countries. It is 2004 PPP adjusted US$ 277.78 in China, 154.47 in India, and 170.58 in Botswana. So, for example, y_r = 7 in India means that the reference income is 7x154.74=1081.29 PPP adjusted US$.

Table 2 (continued)

Country	y_r		AC	ACC	ACCC	AA	AAC	AACC	AACCC
China	1	Mean	1.84	2.73	3.59	1.90	2.80	3.74	4.64
		Median	1.75	2.50	3.20	2.00	2.60	3.50	4.00
		Std.error	(0.03)	(0.07)	(0.10)	(0.03)	(0.05)	(0.09)	(0.14)
	2	Mean	1.58	2.14	2.72	1.76	2.32	2.87	3.41
		Median	1.50	2.00	2.50	1.80	2.30	2.80	3.20
		Std.error	(0.02)	(0.04)	(0.07)	(0.03)	(0.04)	(0.06)	(0.08)
	4	Mean	1.42	1.79	2.16	1.65	2.03	2.41	2.81
		Median	1.40	1.75	2.03	1.75	2.00	2.30	2.73
		Std.error	(0.02)	(0.03)	(0.05)	(0.03)	(0.04)	(0.05)	(0.07)
	8	Mean	1.35	1.67	1.98	1.59	1.91	2.23	2.59
		Median	1.25	1.50	1.75	1.66	1.96	2.16	2.48
		Std.error	(0.02)	(0.04)	(0.05)	(0.02)	(0.04)	(0.05)	(0.07)
	16	Mean	1.31	1.61	2.04	1.60	1.94	2.28	2.65
		Median	1.25	1.50	1.75	1.73	2.00	2.25	2.50
		Std.error	(0.02)	(0.04)	(0.09)	(0.03)	(0.04)	(0.06)	(0.07)
India	1	Mean	1.95	2.72	3.60	2.26	3.18	4.11	5.04
		Median	1.65	2.40	3.00	2.00	3.00	3.50	4.50
		Std.error	(0.06)	(0.09)	(0.14)	(0.07)	(0.10)	(0.13)	(0.17)
	4	Mean	1.33	1.62	1.91	1.54	1.85	2.15	2.48
		Median	1.25	1.50	1.75	1.50	1.75	2.00	2.25
		Std.error	(0.02)	(0.03)	(0.05)	(0.03)	(0.04)	(0.05)	(0.07)
	7	Mean	1.24	1.45	1.66	1.41	1.63	1.86	2.10
		Median	1.14	1.34	1.43	1.29	1.50	1.71	1.92
		Std.error	(0.02)	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.06)
	10	Mean	1.23	1.42	1.61	1.40	1.59	1.79	2.00
		Median	1.20	1.35	1.50	1.30	1.50	1.60	1.80
		Std.error	(0.02)	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.06)
	13	Mean	1.21	1.37	1.54	1.37	1.54	1.72	1.92
		Median	1.15	1.23	1.38	1.23	1.35	1.46	1.62
		Std.error	(0.02)	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.06)
Botswana	1	Mean	1.99	2.98	3.98	2.33	3.39	4.50	5.62
		Median	2.00	3.00	3.75	2.00	3.00	4.00	5.00
		Std.error	(0.04)	(0.08)	(0.13)	(0.08)	(0.10)	(0.14)	(0.19)
	2.5	Mean	1.57	2.12	2.69	1.86	2.43	3.01	3.56
		Median	1.50	2.00	2.50	2.00	2.50	3.00	3.50
		Std.error	(0.03)	(0.05)	(0.08)	(0.04)	(0.05)	(0.07)	(0.10)
	4	Mean	1.42	1.83	2.25	1.73	2.17	2.59	3.03
		Median	1.31	1.75	2.13	2.00	2.19	2.50	2.81
		Std.error	(0.03)	(0.05)	(0.07)	(0.03)	(0.05)	(0.07)	(0.10)

Note. y_r =1 describes the lowest living standard in the three countries. It is 2004 PPP adjusted US$ 277.78 in China, 154.47 in India, and 170.58 in Botswana. So, for example, y_r = 7 in India means that the reference income is 7x154.74=1081.29 PPP adjusted US$.

**Table 3a - ** F-tests for the GAESE specification, Germany (1999)

Seemingly unrelated regressions (SUR)
Endogenous variable: equivalence scales stated by respondents
Number of observations: 835 (Germany)
Standard Errors in parentheses
p-values of F-tests in brackets

Number of adults		**Number of Children**							
		0		**1**		**2**		**3**	
1				**AC**		**ACC**		**ACCC**	
				U	**R**	**U**	**R**	**U**	**R**
	Constant			0.99^{***} (0.02)	0.99^{***} (0.02)	1.03^{***} (0.05)	1.02^{***} (0.04)	1.09^{***} (0.06)	1.09^{***} (0.06)
	$\frac{1}{y_r}$			303.38^{***} (9.73)	303.72^{***} (8.38)	540.18^{***} (16.59)	541.11^{***} (14.28)	781.36^{***} (24.72)	782.01^{***} (21.28)
	Dummy Inc Class 2			-0.01 (0.01)		-0.01 (0.02)		-0.02 (0.03)	
	Dummy Inc Class 3			0.01 (0.01)		0.01 (0.02)		0.01 (0.04)	
	Dummy Inc Class 4			-0.01 (0.01)		-0.01 (0.02)		-0.01 (0.04)	
	$\bar{R}^2$			0.61	0.61	0.63	0.63	0.62	0.62
	F			0.30 [0.83]		0.30 [0.82]		0.22 [0.88]	
2		**AA**		**AAC**		**AACC**		**AACCC**	
		U	**R**	**U**	**R**	**U**	**R**	**U**	**R**
	Constant	1.27^{***} (0.04)	1.27^{***} (0.04)	1.26^{***} (0.06)	1.26^{***} (0.05)	1.30^{***} (0.07)	1.30^{***} (0.06)	1.36^{***} (0.09)	1.36^{***} (0.08)
	$\frac{1}{y_r}$	241.22^{***} (18.17)	241.64^{***} (15.66)	514.62^{***} (22.67)	515.82^{***} (19.53)	754.65^{***} (28.44)	756.02^{***} (24.50)	992.01^{***} (36.49)	992.80^{***} (31.42)
	Dummy Inc Class 2	-0.00 (0.02)		-0.01 (0.03)		-0.01 (0.04)		-0.01 (0.05)	
	Dummy Inc Class 3	0.03 (0.03)		0.02 (0.03)		0.03 (0.04)		0.02 (0.05)	
	Dummy Inc Class 4	-0.02 (0.03)		-0.02 (0.03)		-0.02 (0.04)		-0.02 (0.05)	
	$\bar{R}^2$	0.24	0.24	0.46	0.46	0.53	0.53	0.54	0.54
	F	0.88 [0.46]		0.54 [0.66]		0.46 [0.71]		0.22 [0.89]	

Table 3b - F-tests for the GAESE specification, France (2002)

Seemingly unrelated regressions (SUR)
Endogenous variable: equivalence scales stated by respondents
Number of observations: 1115 (France)
Standard Errors in parentheses
p-values of F-tests in brackets

Number of adults		**Number of Children**							
		0		**1**		**2**		**3**	
1				**AC**		**ACC**		**ACCC**	
				U	**R**	**U**	**R**	**U**	**R**
	Constant			1.03*** (0.03)	1.03*** (0.03)	1.07*** (0.05)	1.07*** (0.05)	1.08*** (0.07)	1.08*** (0.07)
	$\frac{1}{y_r}$			262.12*** (11. 81)	261.28*** (10.17)	489.66*** (19.97)	487.80*** (17.20)	694.65*** (28.05)	694.25*** (24.15)
	Dummy Inc Class 2			-0.01 (0.02)		-0.02 (0.03)		-0.02 (0.04)	
	Dummy Inc Class 3			0.01 (0.02)		0.01 (0.03)		0.01 (0.04)	
	Dummy Inc Class 4			-0.00 (0.02)		-0.00 (0.03)		-0.01 (0.04)	
	$\bar{R}^2$			0.38	0.38	0.42	0.42	0.43	0.44
	F			0.46 [0.73]		0.36 [0.78]		0.26 [0.85]	
2		**AA**		**AAC**		**AACC**		**AACCC**	
		U	**R**	**U**	**R**	**U**	**R**	**U**	**R**
	Constant	1.26*** (0.04)	1.25*** (0.04)	1.26*** (0.06)	1.26*** (0.05)	1.25*** (0.08)	1.25*** (0.07)	1.24*** (0.10)	1.23*** (0.09)
	$\frac{1}{y_r}$	226.55*** (16.37)	231.14*** (14.09)	459.99*** (22.30)	463.71*** (19.20)	675.66*** (30.12)	679.43*** (25.92)	879.98*** (38.78)	885.16*** (33.37)
	Dummy Inc Class 2	0.00 (0.02)		0.01 (0.03)		0.00 (0.04)		-0.01 (0.05)	
	Dummy Inc Class 3	-0.00 (0.02)		-0.00 (0.03)		-0.00 (0.04)		-0.00 (0.05)	
	Dummy Inc Class 4	-0.02 (0.02)		-0.01 (0.03)		-0.01 (0.04)		-0.02 (0.06)	
	$\bar{R}^2$	0.20	0.20	0.35	0.36	0.39	0.40	0.40	0.40
	F	0.21 [0.89]		0.16 [0.92]		0.05 [0.98]		0.04 [0.99]	

Table 3c - F-tests for the GAESE specification, Cyprus (2000)

Seemingly unrelated regressions (SUR)
Endogenous variable: equivalence scales stated by respondents
Number of observations: 650 (Cyprus)
Standard Errors in parentheses
p-values of F-tests in brackets

Number of adults		**Number of Children**							
		0		**1**		**2**		**3**	
1				**AC**		**ACC**		**ACCC**	
				U	**R**	**U**	**R**	**U**	**R**
	Constant			1.08*** (0.05)	1.08*** (0.05)	1.19*** (0.09)	1.19*** (0.09)	1.28*** (0.14)	1.28*** (0.13)
	$\frac{1}{y_r}$			215.53*** (10.32)	214.46*** (8.89)	393.48*** (17.77)	390.05*** (15.32)	581.39*** (26.65)	578.16*** (22.97)
	Dummy Inc Class 2			-0.03 (0.02)		-0.04 (0.04)		-0.07 (0.06)	
	Dummy Inc Class 3			-0.00 (0.02)		0.00 (0.04)		-0.00 (0.06)	
	Dummy Inc Class 4			0.01 (0.02)		0.02 (0.04)		0.02 (0.06)	
	$\bar{R}^2$			0.48	0.48	0.51	0.51	0.50	0.50
	F			0.76 [0.52]		0.73 [0.53]		0.76 [0.52]	
2		**AA**		**AAC**		**AACC**		**AACCC**	
		U	**R**	**U**	**R**	**U**	**R**	**U**	**R**
	Constant	1.24*** (0.07)	1.25*** (0.07)	1.31*** (0.10)	1.31*** (0.09)	1.43*** (0.14)	1.44*** (0.13)	1.52*** (0.17)	1.52*** (0.16)
	$\frac{1}{y_r}$	188.68*** (13.81)	184.22*** (11.89)	371.17*** (18.84)	367.15*** (16.22)	558.18*** (26.05)	552.92*** (22.43)	739.57*** (32.66)	734.88*** (28.13)
	Dummy Inc Class 2	0.01 (0.03)		-0.02 (0.04)		-0.03 (0.06)		-0.06 (0.07)	
	Dummy Inc Class 3	0.02 (0.03)		0.01 (0.04)		0.01 (0.06)		0.01 (0.08)	
	Dummy Inc Class 4	0.02 (0.03)		0.02 (0.05)		0.03 (0.06)		-0.03 (0.08)	
	$\bar{R}^2$	0.30	0.30	0.45	0.45	0.49	0.49	0.52	0.52
	F	0.15 [0.93]		0.26 [0.85]		0.30 [0.82]		0.40 [0.75]	

Table 3d - F-tests for the GAESE specification, China (2004)

Seemingly unrelated regressions (SUR)
Endogenous variable: equivalence scales stated by respondents
Number of observations: 980
Standard Errors in parentheses
p-values of F-tests in brackets

Number of adults		Number of Children							
		0		1		2		3	
1				AC		ACC		ACCC	
				U	R	U	R	U	R
	Constant			1.47*** (0.11)	1.47*** (0.11)	1.67*** (0.22)	1.65*** (0.22)	1.93*** (0.37)	1.80*** (0.36)
	$\frac{1}{y_r}$			155.91*** (9.05)	156.61*** (7.88)	330.90*** (18.83)	336.33*** (16.38)	460.19*** (31.02)	490.64*** (27.04)
	Dummy Inc Class 2			0.03 (0.03)		0.01 (0.06)		-0.05 (0.09)	
	Dummy Inc Class 3			0.01 (0.03)		-0.05 (0.06)		-0.19** (0.10)	
	Dummy Inc Class 4			0.00 (0.03)		-0.02 (0.06)		-0.16 (0.10)	
	$\overline{R}^2$			0.31	0.31	0.32	0.32	0.27	0.27
	F			0.32 [0.81]		0.24 [0.87]		1.56 [0.20]	
2		AA		AAC		AACC		AACCC	
		U	R	U	R	U	R	U	R
	Constant	1.49*** (0.12)	1.48*** (0.12)	1.80*** (0.20)	1.75*** (0.20)	2.13*** (0.31)	2.01*** (0.30)	2.68*** (0.44)	2.52*** (0.44)
	$\frac{1}{y_r}$	87.72*** (10.37)	92.92*** (9.03)	254.80*** (16.79)	269.46*** (14.63)	432.54*** (26.06)	457.06*** (22.72)	592.07*** (37.50)	622.23*** (32.69)
	Dummy Inc Class 2	0.02 (0.03)		-0.02 (0.05)		-0.09 (0.08)		-0.17 (0.11)	
	Dummy Inc Class 3	-0.01 (0.03)		-0.08 (0.05)		-0.16** (0.08)		-0.23** (0.12)	
	Dummy Inc Class 4	-0.03 (0.03)		-0.09 (0.05)		-0.15* (0.09)		-0.19 (0.12)	
	$\overline{R}^2$	0.15	0.15	0.29	0.29	0.32	0.32	0.29	0.29
	F	0.56 [0.64]		1.10 [0.35]		1.68 [0.17]		1.75 [0.16]	

Table 3e - F-tests for the GAESE specification, India (2005)

Seemingly unrelated regressions (SUR)
Endogenous variable: equivalence scales stated by respondents
Number of observations: 1070
Standard Errors in parentheses
p-values of F-tests in brackets

Number of adults		**Number of Children**							
		0		**1**		**2**		**3**	
1				**AC**		**ACC**		**ACCC**	
				U	**R**	**U**	**R**	**U**	**R**
	Constant			0.92*** (0.11)	0.91*** (0.11)	0.97*** (0.16)	0.97*** (0.16)	0.93*** (0.24)	0.92*** (0.23)
	$\frac{1}{y_r}$			123.77*** (7.48)	124.42*** (6.28)	224.74*** (10.82)	224.96*** (9.07)	344.95*** (16.19)	345.40*** (13.58)
	Dummy Inc Class 2			-0.01 (0.04)		-0.01 (0.06)		-0.02 (0.09)	
	Dummy Inc Class 3			-0.02 (0.04)		-0.02 (0.06)		-0.03 (0.09)	
	Dummy Inc Class 4			0.01 (0.04)		0.01 (0.06)		0.02 (0.10)	
	$\bar{R}^2$			0.28	0.28	0.38	0.38	0.39	0.39
	F			0.15 [0.93]		0.07 [0.97]		0.08 [0.97]	
2		**AA**		**AAC**		**AACC**		**AACCC**	
		U	**R**	**U**	**R**	**U**	**R**	**U**	**R**
	Constant	1.06*** (0.12)	1.06*** (0.12)	0.93*** (0.17)	0.93*** (0.17)	0.87*** (0.24)	0.85*** (0.23)	0.64*** (0.31)	0.63*** (0.30)
	$\frac{1}{y_r}$	150.01*** (8.27)	150.04*** (6.93)	274.25*** (11.99)	274.82*** (10.05)	399.76*** (16.16)	401.07*** (13.55)	523.44*** (21.20)	524.95*** (17.77)
	Dummy Inc Class 2	0.01 (0.05)		-0.00 (0.07)		-0.02 (0.09)		-0.02 (0.12)	
	Dummy Inc Class 3	-0.02 (0.05)		-0.02 (0.07)		-0.03 (0.09)		-0.04 (0.12)	
	Dummy Inc Class 4	0.01 (0.05)		0.01 (0.07)		0.01 (0.10)		0.01 (0.13)	
	$\bar{R}^2$	0.31	0.32	0.42	0.42	0.46	0.47	0.47	0.47
	F	0.15 [0.93]		0.07 [0.98]		0.09 [0.96]		0.05 [0.99]	

Table 3f - F-tests for the GAESE specification, Botswana (2005)

Seemingly unrelated regressions (SUR)
Endogenous variable: equivalence scales stated by respondents
Number of observations: 477
Standard Errors in parentheses
p-values of F-tests in brackets

Number of adults		**Number of Children**							
		0		**1**		**2**		**3**	
1				**AC**		**ACC**		**ACCC**	
				U	**R**	**U**	**R**	**U**	**R**
	Constant			1.40*** (0.14)	1.42*** (0.14)	1.56*** (0.28)	1.60*** (0.28)	1.61*** (0.44)	1.67*** (0.43)
	$\frac{1}{y_r}$			129.59*** (9.93)	126.83*** (9.39)	261.64*** (19.55)	256.27*** (18.49)	393.24*** (30.17)	385.25*** (28.52)
	Dummy Inc Class 2			0.03 (0.04)		0.07 (0.08)		0.10 (0.12)	
	$\bar{R}^2$			0.31	0.31	0.32	0.32	0.32	0.32
	F			0.69 [0.41]		0.67 [0.41]		0.63 [0.43]	
2		**AA**		**AAC**		**AACC**		**AACCC**	
		U	**R**	**U**	**R**	**U**	**R**	**U**	**R**
	Constant	1.15*** (0.24)	1.16*** (0.23)	1.47*** (0.31)	1.49*** (0.30)	1.56*** (0.43)	1.58*** (0.43)	1.75*** (0.59)	1.76*** (0.58)
	$\frac{1}{y_r}$	136.54*** (16.30)	135.90*** (15.40)	278.58*** (21.27)	277.51*** (20.10)	434.35*** (29.90)	431.60*** (28.25)	590.06*** (40.50)	588.85*** (38.27)
	Dummy Inc Class 2	0.01 (0.07)		0.01 (0.09)		0.03 (0.12)		0.01 (0.16)	
	$\bar{R}^2$	0.18	0.19	0.33	0.33	0.38	0.38	0.38	0.38
	F	0.01 [0.91]		0.02 [0.88]		0.08 [0.78]		0.01 [0.93]	

Table 4 - Household and per-capita monthly subsistence incomes (b^h, b^h/n^h)

	Germany	France	Cyprus	China	India	Botswana
AC	604	538	470	585	228	430
	[302]	[269]	[235]	[293]	[114]	[215]
ACC	822	762	654	746	333	547
	[274]	[254]	[218]	[249]	[111]	[182]
ACCC	1076	952	856	888	448	657
	[269]	[238]	[214]	[222]	[112]	[164]
AA	658	610	494	346	318	323
	[329]	[305]	[247]	[173]	[159]	[161]
AAC	888	792	657	639	399	546
	[296]	[264]	[219]	[213]	[133]	[182]
AACC	1120	984	868	923	512	711
	[280]	[246]	[217]	[231]	[128]	[178]
AACCC	1365	1170	1060	1275	600	908
	[273]	[234]	[212]	[255]	[120]	[182]

Note. Numbers in brackets give per-capita subsistence incomes for each household type (US$ PPP adjusted 2004).

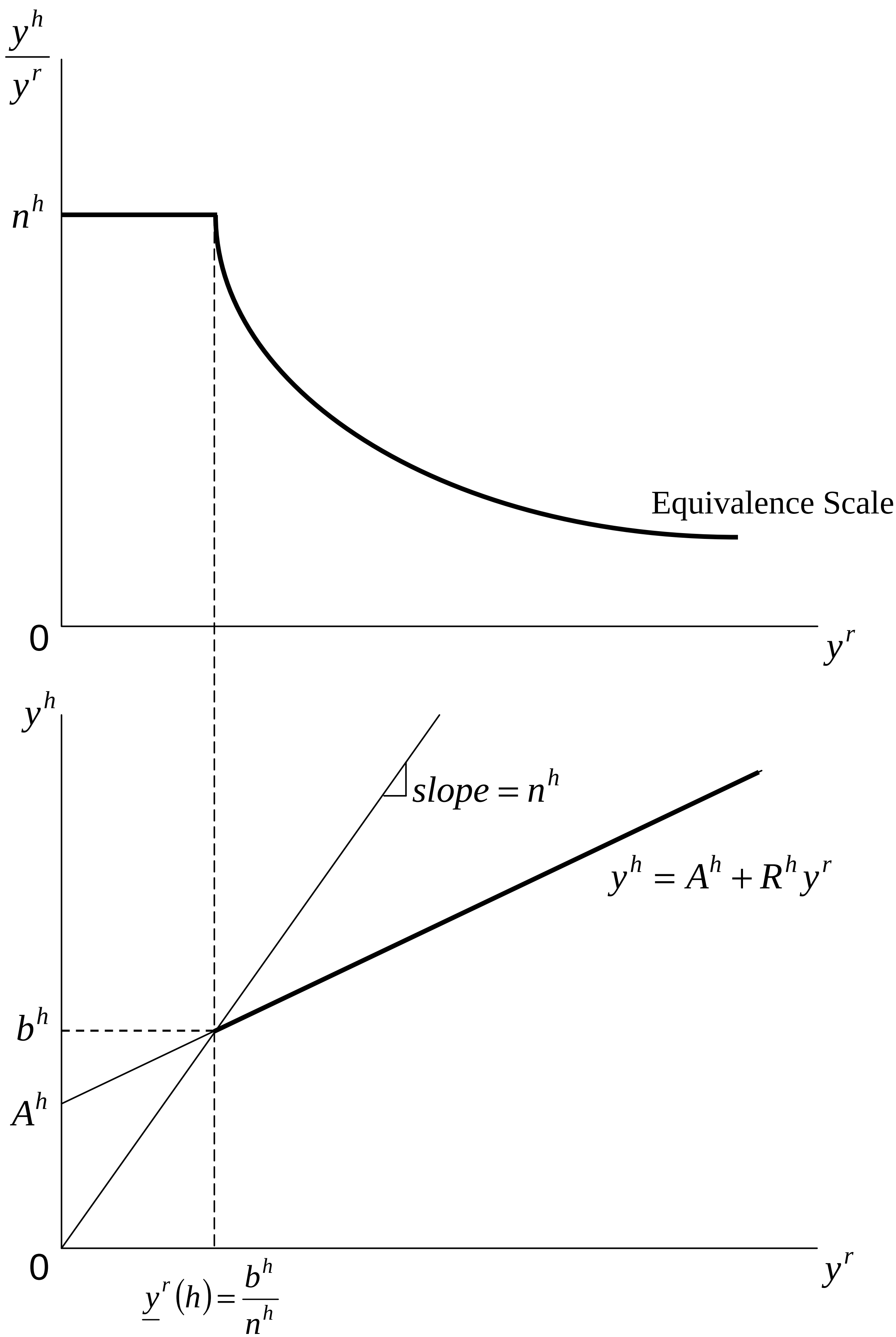

Figure 1 Identification of the family-type subsistence level, b^h