Measuring Inequality
When Individuals Live in Households

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May 25, 2015

Introduction

People are heterogeneous, and people live in households.

Equivalence scales, which measure the ratio of cost (functions) across household types, are venerable (Engel (1895), Sydenstricker and King (1921), Rothbarth (1943), Prais and Houthakker (1955), Barten (1964), Gorman (1976), Lewbel (1985)...)

- *Equivalent income* (aka: "equivalent expenditure"), equal to income scaled by the equivalence scale, gives the amount of money needed for a single individual to attain the same utility level as the household.
- But, households don't have cost (or utility) functions–people do.
- And, comparing cost across people is comparing utility across people.

Becker (1965, 1981) got us thinking about households as collections of individuals with utility. Apps and Rees (1980s) and others provided specific empirical models.

Chiappori and friends spurred recent *collective household* models which see households as collections of individuals who have utility functions. (Chiappori (1988, 1992), Bourguignon and Chiappori (1994), Browning, Bourguignon, Chiappori, and Lechene (1994), Browning and Chiappori (1998), Vermeulen (2002), Browning, Chiappori and Lewbel (2013), Lise and Seitz (2004), and Cherchye, L., B. De Rock, and F. Vermeulen (2008).)

- Browning, Chiappori and Lewbel (2008) develop *indifference scales*, which measure the ratio of cost across individuals living in households versus living alone.
- The individual here is the same person, just in a different environment.
- *indifferent income*, equal to income scaled by the indifference scale, is the amount of income needed to get to the same indifference curve that they attained in the household.

Aggregative welfare analysis, such as poverty, inequality and social welfare measurement, typically starts from a distribution of measures of well-being (utility).

But generating this distribution can be cumbersome. Eg, to do social welfare measurement, you need utility for every person in the population. It must be comparable across people (at least in a limited way).

So, do we use equivalent incomes or indifferent incomes as a basis for this? (We'd typically need even more, ie, the form of the social welfare function over utilities and the form of the utility function over income. Sigh.)

This Talk

Distaste for interpersonal comparisons has led some (eg, Lise and Seitz 2007; Browning, Chiappori and Lewbel 2013) to reject equivalence scales entirely in favour of indifference scales.
Equivalence and Indifference scales can be kind of hard to estimate.
Collective household models usually characterise children as possessions or characteristics, rather than people.

In this talk, I will

- make the case for unification of equivalence and indifference scales in the measurement of inequality and welfare;
- show you that estimating equivalence and indifference scales can be easy (ish) (Lewbel and Pendakur 2008);
- show you how children can be incorporated into the collective household model as people (Dunbar, Lewbel and Pendakur 2013).

Equivalence Scales (redux)

$\mathbf{p}$ price vector, x expenditure, $\mathbf{z}$ characteristics vector, u utility, $\mathbf{w}$ budget-share vector. Plus $\mathbf{d}$ are distribution factors (for later).
$C(\mathbf{p}, u, \mathbf{z})$ cost to attain utility u for person with characteristics $\mathbf{z}$ when facing prices $\mathbf{p}$. $V(\mathbf{p}, x, \mathbf{z})$ indirect utility (inverse of cost over u).

$$\Delta(\mathbf{p}, u, \mathbf{z}) = C(\mathbf{p}, u, \mathbf{z}) / C(\mathbf{p}, u, \bar{\mathbf{z}})$$

is the equivalence scale relating costs for a person with characteristics $\mathbf{z}$ to a person with characteristics $\bar{\mathbf{z}}$.

- Δ is not identified from behaviour: given a $\mathbf{z}$-specific monotonic transformation $\phi(u, \mathbf{z})$, $\Delta(\mathbf{p}, \phi(u, \mathbf{z}), \mathbf{z}) \neq C(\mathbf{p}, u, \mathbf{z}) / C(\mathbf{p}, u, \bar{\mathbf{z}})$
- $\phi(u, \mathbf{z})$ affects the equivalence scale, but not behaviour: thus there are an infinite number of equivalence scale functions consistent with the same behaviour.
- $\phi(u, \mathbf{z})$ structures interpersonal comparisons of utility.

Whining and Complaining

- If characteristics $\mathbf{z}$ include household size, then the cost function $C(\mathbf{p}, u, \mathbf{z})$ may be a nonsensical object. In a multimember household, whose costs would $C(\mathbf{p}, u, \mathbf{z})$ capture?
  - Children live in multi-member households. What do we do about them?
- Functional form restrictions structure interpersonal comparisons. Many economists don't like to take stands on interpersonal comparisons of well-being.

Two Families of Models of Families

- Chiappori (1988, 1991) and a stream of subsequent work provides a class of models where little model is specified, but nonetheless some objects of interest are identified.
  - The genius of Chiappori's contribution(s) is to recognize that the assumption of efficiency is very strong. If we assume that households reach an efficient allocation, then we can use many tools and results from 1950s general equilibrium theory:
  - the contract curve is a one-dimensional object;
  - aggregate behaviour can illuminate features of individuals;
  - everyone faces the same price vector for private goods;
  - shifts in endowments result in shifts along the contract curve.
- Becker (1965, 1981) , Apps and Rees (1980s), Browning, Chiappori and Lewbel (2013), and Lewbel and Pendakur (2008) provide models where everything of interest is identified, but sometimes the assumptions are heroic: e.g., you need to observe individual preferences.

Chiappori 1988: Sharing Rules and Distribution Factors

- The household buys some public goods and some private goods.
- Each member consumes all of each public good and some of each private good.
- Efficiency $\implies$ public goods prices equal the sums of Lindahl prices.
- GE $\implies$ you can decentralise this model: it is as if each person pays their Lindahl price for each public good and the market price for the amount of each private good they consume. They pay for this with a shadow budget, called a *sharing rule*.
- Assume there exist *distribution factors* which shift bargaining power (aka: endowments) within the household, and which do not affect preferences. Then changes in such distribution factors result in changes in each person's shadow budget.
- Chiappori shows that we can identify the **response** in the shadow budget to a **change** in distribution factor by seeing how household-level demands (which are the sum of individual-level demands) respond to changes in distribution factors.

BCL 2013: Identification via Observed Preferences

Browning Chiappori and Lewbel (2013) provide a structural model of the household in which

- individuals (and not households) have utility;
- consumption decisions within the household are efficient;
- household decisions may be decentralized: individuals within households can be thought of facing an unobserved shadow budget constraint;
- the shadow constraint is characterised by shadow prices and a shadow budget equal to a *resource share* times the household expenditure;
- the shadow constraint is identified from household-level behaviour;
- the **level** of the shadow budget is identified;
- and the shadow constraint determines the indifference scale.

Consumption Technology

In BCL, the *consumption technology* and the *resource share* together define the shadow budget constraint for an individual.
The consumption technology converts market purchases of goods into within-household private good equivalents.

- It captures commodity-specific scale economies.
- It changes the effective price of consumption within the household, and so determines the slope of the shadow budget constraint.
- We'll use linear technologies.
- Linear technologies result in linear within-household budget constraints faced by each person. Thus, there are fixed within-household prices at which individuals buy goods.

Example

perfectly sharable good (such as home heating), n-person household, consumption technology scales market purchase by n, so within-household consumption costs only $1/n$ of the market price; perfectly private good (such as clothing), consumption technology doesn't change market purchase, so within-household consumption costs exactly the market price; somewhat shareable goods (like private transportation), the scale for consumption (divisor for the price) is between 1 and n.

Let $\mathbf{A}^{-1}$ be a matrix giving the multipliers to consumption and thus $\mathbf{A}$ gives the multipliers to market prices. The shadow budget constraint has a slope of $\mathbf{Ap}$. Everybody faces the same shadow-price vector.

Resource Shares

The consumption technology gives the slope of the shadow budget constraint. This is common for all household members.

The resource share gives the extent of the shadow budget constraint. This is different for different household members. Efficiency demands that all the money get spent, so the issue is who gets to spend what share of the money.

Let $t = 1, ..., T_h$ index people in household h. The resource share of person t, η_t, depends on the characteristics of people, and also on distribution factors which affect the bargaining power of individuals in the collective household.

- Distribution factors could include the relative wages of individuals, relative education levels, cultural backgrounds, etc.

Indifference Scales

In the household, each person faces a shadow budget constraint whose slope is $\mathbf{Ap}$ and whose extent is given by $\eta_t x$.

If a person's indifference curves do not change upon entering a household (a big if), then we can define the *indifference scale* I_t as the fraction of a household's income an individual t living alone needs to attain the indifference curve over goods that the same individual attains as a member of the household.

This is a standard consumer surplus exercise: the indifference scale solves

$$V_t\left(\mathbf{p}, I_t x, \mathbf{z}\right) = V\left(\mathbf{Ap}, \eta_t x, \mathbf{z}\right)$$

- no interpersonal comparisons of well-being are required (it is the same person);
- no restrictions on preferences are required (because there is no identification problem).

Example Uses of Indifference Scales

Given a poverty line income level for singles, the poverty line for a household is the money needed by the household to get each household member to the same indifference curve they would be on as singles at the poverty line.

The minimum required life insurance policy on a working husband is income required to get the wife to the same indifference curve (over goods) when living alone that she now attains as a member of the household. Also wrongful death lawsuits, alimony calculations.

Answers depend on issues ignored by traditional equivalence scales, such as, what percentage of household income is controlled by (or percentage of houshold expenditures is received by) each member? This is in addition to the usual questions of sharing or economies of consumption.

Identification in BCL

Consider a childless couple, so $t = m, f$. Suppress dependence of utilities and budget shares on characteristics $\mathbf{z}$; let $W^j(\mathbf{p}, x, \mathbf{A})$ be the couple's budget share of good j (observed); let $w_t^j(\mathbf{p}, x)$ be person t's shadow budget share function for good j (not observed); define $\eta(\mathbf{p}, x, \mathbf{A})$ to be f's resource share, and $[1 - \eta(\mathbf{p}, x, \mathbf{A})]$ is m's resource share.

BCL model with shadow prices equal to scaled market prices gives household budget shares as weighted average of individual budget shares facing shadow budget constraints:

$$\begin{aligned} W^k(\mathbf{p}, x, \mathbf{A}) &= \eta(\mathbf{p}, x, \mathbf{A}) w_f^k(\mathbf{Ap}, \eta(\mathbf{p}, x, \mathbf{A})x) + \\ &\quad [1 - \eta(\mathbf{p}, x, \mathbf{A})]\, w_m^k(\mathbf{Ap}, [1 - \eta(\mathbf{p}, x, \mathbf{A})]\, x) \end{aligned}$$

- $\eta(\mathbf{p}, x, \mathbf{A})$ and $\mathbf{A}$ are nonparametrically identified if w_j^k are identified;
- identify w_j^k from the behaviour of singles, and $\eta(\mathbf{p}, x, \mathbf{A})$ and $\mathbf{A}$ from the behaviour of couples;

Using Both Indifference Scales and Equivalence Scales

Indifference scales let you convert a person living in a household into a welfare-equivalent person living alone. Many believe that this is sufficient information to engage in inequality measurement (eg, Lise and Seitz 2007, BCL and others). The 'natural' thing to do with an indifference scale when it comes to inequality measurement is to treat all indifferent income as the same. This means using an equivalence scale of 1 for everyone. But it is not the right thing to do.
The problem is that people, even single individuals, are still heterogeneous (they have different $\mathbf{z}$) in at least two relevant ways.

- They have different needs;
- They have different preferences.

Able and Infirm

Consider a population with disabled people and able people, but where disabled and able people have identical preferences.
They live in households. Using the methods of BCL and data which record who is disabled, we can recover the indifference scales for both types.

- We can generate 'indifferent incomes' (equal to household income scaled by the indifference scale) for each person in the population.
- But, these indifferent incomes will not be comparable across people because disabled people have different (ie, greater) needs. Although they have the same indifference curves, the same amount of money generates less utility for them.
- There are many characteristics that a priori affect the needs of individuals: eg, being elderly, living in isolation, etc.
- To deal with this, we need to use interpersonal comparisons of utility. Indifference scales cannot replace equivalence scales because indifference scales do not do interpersonal comparisons of utility.

Men and Women

Collective household models typically:

- allow for the fact that women and men have different preferences;
- model household decisions are a mixture of those two distinct preferences;
- allow for assignable goods, consumed by only the man or the women.

The collective household model gives us indifferent income, but we cannot treat indifferent income identically for all people in inequality analysis.

- For example, assume clothing is assignable. Say that, for some $\mathbf{p}$, the true equivalence scale relating the costs of single men to those of single women is 1. Now, imagine that the price of women's clothing goes up. The equivalence scale for women must rise above 1.
- Blundell and Lewbel's (1994) point: the price responses of equivalence scales are completely identified from behaviour.
  - Thus, we can empirically test whether or not equivalence scales for all single people are equal to 1 at all price vectors.
  - If there is preference heterogeneity, you fail the test.

What Should We Be Doing

- For a long time, people (myself included) have used equivalence scales to compare people across household types.
- This is not necessary. Collective household models do this better.
- However, we still need equivalence scales to proceed with inequality measurement, welfare measurement, poverty measurement.
- We can still use methods based on functional restrictions (Blackorby and Donaldson 1993, Donaldson and Pendakur 2004, 2006).
- We can also use methods based on asking people about the cost of characteristics like age and disability for single people (Carsten, Kouvoulatianos, and Schroeder 2005, 2007)
- Pretending we aren't using equivalence scales is just pretending. An equivalence scale of 1 is still an equivalence scale.
- But, it is a poor choice because it is demonstrably false.

Making BCL Easier: Collective Engel Curves

Independent-of-Base Scale Economies (IBSE) (Lewbel and Pendakur 2009).

- Recasts BCL problem into an Engel curve (rather than demand system) problem;
- and removes much nonlinearity.

IBSE: For each person t, there exists a scalar $D_t(\mathbf{A}, \mathbf{p})$ such that

$$V_t(\mathbf{Ap}, x) = V_t\left(\mathbf{p}, \frac{x}{D_t(\mathbf{A}, \mathbf{p})}\right).$$

or, equivalently,

$$V_t(\mathbf{Ap}, \ln x) = V_t\left(\mathbf{p}, \ln x - \ln D_t(\mathbf{A}, \mathbf{p})\right).$$

(Ratio-) scale economies due to **Ap** are independent of base utility.

- Like IB/ESE (Lewbel 1989; Blackorby and Donaldson 1993), except **A** is consumption technology instead of demographic characteristics modeled as Barten-type price scales.

More Shape-Invariant Engel Curves

- IBSE is a joint restriction on preferences V_t and technology $\mathbf{A}$ (Jorgenson and Slesnick (1987) translog satisfies it).
- For individuals, IBSE implies a shape-invariance condition:

$$w_t^k(Ap, \ln x) = w_t^k(p, \ln x - \ln D_t(\mathbf{A}, \mathbf{p})) + d_t^k(\mathbf{A}, \mathbf{p})$$

where $d_t^k(\mathbf{p}, \mathbf{A}) = \partial \ln D_t(\mathbf{p}, \mathbf{A}) / \partial \ln p^k$.

- **Ap**, the shadow price vector, projects onto **p**, the market price vector.

Household Engel Curves

Suppose we only observe data in one price regime, $\overline{\mathbf{p}}$. Both $\overline{\mathbf{p}}$ and $\mathbf{A}$ are constants, so we can define individuals and couples budget share Engel curves:

$$w_t^k(x) = w_j^k(\overline{\mathbf{p}}, x), \qquad W^k(x) = W^k(\overline{\mathbf{p}}, x, \mathbf{A}).$$

Theorem: Assume BCL, Barten technology, IB, and η independent of x. Then indifference scales I_f and I_f do not depend on x, and

$$W^k(x) = h^k + \eta w_f^k(x - \ln I_f) + (1 - \eta) w_m^k(x - \ln I_m)$$

For estimation, add demographic characteristics $\mathbf{z}$ and error terms. Note that

$$\ln I_t = \ln D_t - \ln \eta_t.$$

Nonparametric Identification

THEOREM: As long as there exists a little nonlinearity and dissimmilarity between single's Engel curves $w_f^k(x)$ and $w_m^k(x)$, resource shares and indifference scales are nonparametrically identified.

Sufficient for identification is two nonlinear Engel curves not proportional to each other.

Sufficient for identification is one *assignable* good for each person, e.g., men's clothes not consumed by women and vice versa.

Data

Pooled 1990 and 1992 Canadian Family Expenditure Surveys (same as Pendakur 2005).

$J = 12$ commodities: food at home, food out, gasoline, personal care, toys, recreation services, tobacco, alcohol, men's clothing, women's clothing, rent, and household furnishings and equipment.

To strengthen identification, we assume clothing is assignable (recoding 4% nonzeros to zeros)

Urban, rental-tenure households, full-year members, age 25-59.

419 single men, 450 single women, and 332 married childless couples.

$\mathbf{z}_f$, $\mathbf{z}_m$ = female and male age - 40, years of education - 12.

$\mathbf{z}_h$ = woman's share of household income (plus dummy for ¡10%).

Parameter Estimates: Scale Economies

	Model 1		Model 2		Model 3		Model 4	
	Est	StdErr	Est	StdErr	Est	StdErr	Est	StdErr
$d_{0,f}$	-0.351	0.406	-0.619	0.333	-0.233	0.277	-0.334	0.287
$d_{0,m}$	-0.245	0.377	-0.159	0.437	-0.301	0.269	-0.223	0.215
$d_{age,f}$	-0.050	0.024	-0.064	0.017	-0.045	0.016		
$d_{age,m}$	-0.014	0.014	0.016	0.015	0.010	0.012		
$d_{educ,f}$	0.125	0.149	-0.254	0.097				
$d_{educ,m}$	-0.210	0.107	-0.070	0.146				
outliers	Yes		No		No		No	
educat	Yes		Yes		No		No	
age	Yes		Yes		Yes		No	
# obs.	1201		1082		1082		1082	

Evaluate at base of 40 years old with 12 years schooling. Base distribution factor is 40% gross income share (the median).

Expect scale-economy parameters between 1/2 (full sharing) and 1 (completely private). $d_{0,f}$ and $d_{0,m}$ should be in $[\ln 0.5, \ln 1] = [-0.7, 0]$.

Estimated scale economy parameters are in this range, though unstable, around -0.30 yielding scale economies D_j in the neighborhood of 0.70.

Scale economies increase a little with age for women, varies little for men and by schooling.

Standard errors large and unstable. Scale economies are hard to identify, just like shape-invariant translations in other contexts.

Parameter Estimates: Resource Shares

	Model 1		Model 2		Model 3		Model 4	
	Est	StdErr	Est	StdErr	Est	StdErr	Est	StdErr
r_0	0.460	0.078	0.361	0.074	0.455	0.077	0.400	0.076
$r_{inc\ \ share}$	0.074	0.032	0.076	0.030	0.080	0.038	0.138	0.040
$r_{inc\_sh=0}$	0.012	0.015	0.005	0.018	0.022	0.017	0.007	0.023
$r_{age,f}$	0.000	0.001	0.004	0.002	0.003	0.002		
$r_{age,m}$	-0.001	0.001	-0.007	0.002	-0.008	0.002		
$r_{educ,f}$	0.026	0.009	0.027	0.096				
$r_{educ,m}$	-0.018	0.013	-0.024	0.012				
outliers	Yes		No		No		No	
educat	Yes		Yes		No		No	
age	Yes		Yes		Yes		No	
# obs.	1201		1082		1082		1082	

Resource share more stable with small standard errors.

r_0 is the resource share η for women with base characteristics. So, for women aged 40 with 12 years of schooling and 40% gross income share: $\eta = r_0$ is 0.36 to 0.46.

Small age and education effects (these affect both preferences and shares η). Zero to 1/2 of income share raises η by 0.025 to 0.062.

Indifference scales equal scale economy divided by resource share: $I_j = D_j/\eta^j$. For women I_f around 1.53; for men I_f around 1.44.

$I_f = 1.53$ means a woman needs about two thirds, $1/1.53$, of couple's income to reach the same indifference curve living alone that she attains living with a partner. A man needs slightly more, $1/1.44$.

Collective Engel Curves

1. Simple restriction on scale-economies makes the collective household model of BCL much easier to implement.
    1. Instead of a highly nonlinear model where price effects are hard to measure and very important, we have a somewhat nonlinear model where prices derivatives (and thus price data) are not needed.
    2. We can identify resource shares, scale economies and indifference scales, including the level of resource shares (not just responses to distribution factors).
2. There are no untestable utility comparison assumptions. Instead, we compare individuals living inside households to individuals living alone using indifference scales.
3. But, like BCL, identification requires 'pre-identified' demand equations (Engel curve functions) for singles. This won't do for children.

Children in a Collective Household Model

Dunbar, Lewbel and Pendakur (2013) tackle the problem of identifying children's resource shares in collective households.
The literature thus far has a couple of drawbacks in this area:

1. Children are typically modeled either as possessions or characteristics;
2. Men's and women's preferences are assumed the same in and out of households;
3. To address poverty rates, one needs the level of the child's resource share, rather than just its response to distribution factors.

Basic Idea

- We want to estimate the level of resource shares of children in collective households.
- We don't want to use the behaviour of singles to identify the preferences of people living in collective households.
    - Chiappori 1988, 1992 and many others don't depend on singles' data, but they don't get the levels of resource shares—just their dependence on distribution factors.
- We adapt BCL to contain a 3rd person type: children.
- We don't see them alone, so we won't be able to identify everything. But we can identify their resource share η_c.

Assignable Goods

- We don't have singles to identify w_f^k, w_m^k, w_c^k—-we'll lean on assignable goods instead.
- An assignable good is consumed exclusively by one person, and its price is not connected to the within-household shadow price of any other good.
- Let w_t denote person t's unobserved shadow budget share function for person t's assignable good. Let W_t denote the household's observed budget share function for person t's assignable good. Then, in BCL:

$$W_t(\mathbf{p}, x, \mathbf{A}) = \eta_j w_t(\mathbf{Ap}, \eta_t x)$$

  for $j = m, f, c$ with $\eta_c = 1 - \eta_f - \eta_m$.
- Now, instead of getting a signal on w_j from a single individual of type j (tough for children), we get a signal on w_j from a different collective household. If children are all alike, then such different collective households can be those with more than 1 child.

Identification

- In BCL, identification of parameters for 2 people requires seeing each person twice: once in the collective household and once on their own.
- In our case, we use collective household types. To identify the parameters for 3 people (m, f, c) requires seeing each type of person 3 times, for example in households with 1,2 and 3 children.
  - We need to see each person an extra time because we can only use comparisons between types.
- As in the general BCL case, identification requires some nonlinearity and some dissimilarity of (latent) budget share functions across types.]
- In addition, we require that η is independent of x.
- We have identification results for different types of assignable goods as well:
  - goods that are assignable to more than 1 person (eg, alcohol assignable to the adults);
  - goods that are assignable to a single person, but you don't know which person that is.

Semiparametric Identification

- A very simple framework to use is to assume that:
  - resource shares are independent of prices and expenditure;
  - budget-share functions are in the Almost Ideal (AI) class.
  - AI: $w_t(\mathbf{p}, x) = \alpha_t(\mathbf{p}) + \beta_t \ln x$.
  - the Engel curve is linear, and its slope does not depend on $\mathbf{p}$.
  - This is semiparametric structure, because p can enter α_j any old way.
- Let $s = 1...3$ index collective households with $1, 2, 3$ children. Let W_{ts} give the household budget share for the good assignable to person t in a household with s children and let η_{ts} give the resource share of person t in household with s children. Note that η_{cs} gives the resource share of all the children together in a household with s children. Note that scale economies $\mathbf{A}_s$ may vary across s.

$$\begin{aligned} W_{ts}(\mathbf{p}, x, \mathbf{A}_s) &= \eta_{ts} w_t(\mathbf{A}_s \mathbf{p}, \eta_{ts} x) \\ &= \eta_{ts} \alpha_t(\mathbf{A}_s \mathbf{p}) + \eta_{ts} \beta_t \ln \eta_{ts} + \eta_{ts} \beta_t \ln x \\ &= a_{ts} + \eta_{ts} \beta_t \ln x \end{aligned}$$

Parametric Identification

- The slopes of budget shares for assignable goods are equal to the resource share of the person multiplied by the (latent) personal slope coefficient.

$$\beta_{ts} \equiv \partial W_{ts}(\mathbf{p}, x, \mathbf{A}_s)/\partial \ln x = \eta_{ts}\beta_t$$

- With $s = 1, 2, 3$, and $t = m, f, c$, there are 9 observed β_{ts}'s, 3 unobserved β_t's, 9 unobserved η_{ts}'s and 3 restrictions (the η_{ts}'s sum to 1 for each s).
- Thus, ratios of slope coefficients give ratios of resource shares. Eg,

$$\frac{\partial W_{c1}(\mathbf{p}, x, \mathbf{A}_s)/\partial \ln x}{\partial W_{c2}(\mathbf{p}, x, \mathbf{A}_s)/\partial \ln x} = \frac{\eta_{c1}}{\eta_{c2}}$$

- With 3 collective household types, 6 ratios are identified, which exactly identifies the 6 resource share parameters.
- Although this is a highly parametric empirical model, the intuition goes through nonparametrically **if** you assume that η_{ts} is independent of $\mathbf{p}, x$.

Data

- We use the Malawi Integrated Household Survey, conducted in 1998-1999 (IHS1) and 2004-2005 (IHS2):
    - from the National Statistics Office of the Government of Malawi with assistance from the International Food Policy Research Institute and the World Bank.
    - each survey include roughly 11,000 households, in a multi-stage stratified sample.
- The data are of high quality: enumerators were monitored; big cash bonuses were used as an incentive system; about 5 per cent of the original random sample in each years had to be resampled because dwellings were unoccupied; (only) 0.4 per cent of initial respondents refused to answer the survey in the IHS2.
- We use 7731 households comprised of married couples with 0-4 children aged less than 15.

Table 3: Data Means, Malawian micro-data

		childless	couples with			
		couples	1 child	2 children	3 children	4 childrer
Number of Observations		1404	2062	1914	1414	937
clothing share	women	1.71	1.53	1.49	1.30	1.18
(in per cent)	men	1.41	1.13	1.09	1.00	0.73
	children		0.75	1.05	1.20	1.43
footwear share	women	0.34	0.24	0.20	0.17	0.13
(in per cent)	men	0.31	0.29	0.27	0.24	0.26
	children		0.08	0.15	0.16	0.15
log-total-expenditure		-0.044	-0.086	0.023	0.077	0.143

Table 4: Malawian Engel Curves, Households with Children					
		Clothing Only		Both	
person	household	share	std err	share	std err
man	couple w/1 kid	0.345	0.043	0.409	0.038
	couple w/2 kids	0.412	0.039	0.417	0.040
	couple w/3 kids	0.459	0.052	0.481	0.045
	couple w/4 kids	0.286	0.054	0.341	0.049
woman	couple w/1 kid	0.439	0.039	0.385	0.033
	couple w/2 kids	0.320	0.044	0.279	0.034
	couple w/3 kids	0.314	0.043	0.246	0.035
	couple w/4 kids	0.346	0.052	0.270	0.039
child(ren)	couple w/1 kid	0.216		0.206	
	couple w/2 kids	0.268		0.303	
	couple w/3 kids	0.227		0.273	
	couple w/4 kids	0.367		0.389	
η	contain	s		s	
β	contain	t		t	

Children in Collective Models

Children can be included in collective household models as people with utility, and as such we can talk about their poverty and include them in inequality analysis.

Collective household models don't have to rely on crazy assumptions about preference stability over, eg, having children.

Resource shares in collective models can, under a lot of parametric structure, be revealed simply by comparing slopes of assignable good budget shares across household types.

Conclusions

- Interpersonal comparisons of utility are neccessary for applied studies of poverty, inequality and social welfare.
- Collective household models can 'transform' people in households to welfare-equivalent single individuals.
- These individuals are still heterogeneous, and pretending that the equivalence scale between them is 1 does not make it so, and indeed, it cannot in general be so.
    - Think disabled peoples' needs and assignable goods price effects.
- Thus, equivalence scales (ie, structure on interpersonal comparisons of well-being) are still necessary.
- Collective household models look hard to implement, but they need not be.
- Restricting scale economies with IBSE easifies the problem.
- Collective household models can accomodate children's well-being.
- And can identify people's (including children's) resource shares even if people's preferences are not directly observed.