Welfare and the household

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Introduction

Welfare economics and the household: a paradox

- Conceptually, welfare defined at the *individual* level

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  - empirical

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  ... but many recent progresses
- In all cases:

  Need a well defined, conceptual framework

Basic framework: the collective model

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Basic framework: the collective model

- Need a non unitary framework
- Need a general characterization of testability and identification
- Encompasses: unitary, bargaining, 'equilibrium', separate spheres, etc.
- Large body of (theoretical and empirical) work on characterization and identification

Roadmap

1. Conceptual framework
    1. Modeling household decision
    2. Measures of household welfare
2. Identification: results and applications
    1. 'Pure' identification in the collective model
    2. Singles and couples
    3. Some empirical results
3. Normative issues

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Conceptual Framework

1. Commodities:
   - K-person household; N public goods $Q = (Q_1, ..., Q_N)$; n private goods
   - Member a $(a = 1, ..., K)$ consumes $\left(Q, q_i^a\right)$ with $\sum_a q_i^a = q_i$.
   - An *allocation* is a $N + Kn$-vector $\left(Q, q^1, ..., q^K\right)$; market prices: N-vector P, n-vector p
2. Preferences:
   - In general:
   $$U^a\left(Q, q^1, ..., q^K\right)$$
   $\longrightarrow$ allows for externalities, etc.
   - Problem: identification!!! $\longrightarrow$ more specific forms:
     - egoistic $U^a\left(Q, q^a\right)$
     - ... but could be caring $W^a\left(U^1\left(Q, q^1\right), ..., U^K\left(Q, q^K\right)\right)$
     - ... although the welfare interpretation may be tricky
   - Ordinally defined; may depend on marital status

Conceptual Framework

3. Decision process: *efficiency*
$\rightarrow \exists\ \mu = \left(\mu^1, ..., \mu^K\right)$ with $\sum_a \mu^a = 1$ such that household solves

$$\max_{(Q, q^1, ..., q^K)} \sum_a \mu^a u^a \left(Q, q^a\right)$$

Therefore:

- Notion of 'power', fully summarized by the Pareto weights
- Can be seen as a 'reduced form' of a more structural background (Nash bargaining; matching; ...)
- Caring versus egoism: *any allocation that is efficient with caring utilities is efficient with egoistic utilities*
  - characterization: can assume egoistic preferences
  - identification: hard to distinguish altruism and power; if $W^a = \sum_s \delta_s^a u^s$ then

$$\sum_a \mu^a W^a = \sum_{a,s} \mu^a \delta_s^a u^s = \sum_s \left(\sum_a \mu^a \delta_s^a\right) u^s$$

Two basic notions

1. *Collective indirect utility* of a : the utility reached by a at the end of the decision process
   Formally, if $\left(\bar{Q}\left(p,P,y\right),\bar{q}^{1}\left(p,P,y\right),...,\bar{q}^{K}\left(p,P,y\right)\right)$ chosen bundle,

$$V^{a}\left(p,P,y,z\right)=u^{a}\left(\bar{Q}\left(p,P,y,z\right),\bar{q}^{a}\left(p,P,y,z\right)\right)$$

   Note that:

   - Depends on preferences *and* decision process
   - Fully summarizes individual welfare
   - But ordinal (as usual) $\rightarrow$ can one define a *money-metric* measure of individual welfare?
   - Answer:
     - Yes (MMWI, Chiappori-Meghir 2014) ...
     - ... but raises identification problems

Two basic notions

2. *Distribution factors*
   Definition: any variable that (i) does not affect preferences or the budget constraint, but (ii) may influence the decision process, therefore the Pareto weights.
   Example:
   - Threat points in a bargaining model
   - Individual incomes: if $\left(y^1, ..., y^K\right)$ is the vector of individual incomes and $y = \sum_a y^a$,
     - total income y is *not* a distribution factor (it enters the budget constraints)
     - but the $(K-1)$ ratios $y^1/K, ..., y^{K-1}/K$ are.

   Plays a crucial role:
   - For identification
   - For the normative issues

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Particular case: all goods are private

Assume *all commodities are privately consumed*. Then:

Proposition

Assume an allocation $\left(\bar{q}^1, ..., \bar{q}^K\right)$ *is Pareto efficient. Then there exists* K *non-negative functions* $\left(\rho^1, ..., \rho^K\right)$ *of prices, total income and distribution factors, with* $\sum_k \rho^k (p, y, z) = y$*, such that agent* a *solves*

$$\max_{q^a} u^a (q^a) \text{ under } \sum_{i=1}^{n} p_i q_i^a = \rho^a \qquad \text{(D)}$$

Conversely, for any non-negative functions $\left(\rho^1, ..., \rho^K\right)$ *such that* $\sum_k \rho_k (p, y, z) = y$*, an allocation that solves (D) for all* a *is Pareto-efficient.*

Interpretation: two-stage process

Basic insight:

For given prices, *individual welfare fully summarized by the sharing rule*

Public goods: Lindahl prices and generalized sharing rule

Proposition

Assume an allocation $\left(\bar{Q}, \bar{q}^1, ..., \bar{q}^K\right)$ *is Pareto efficient. Then there exists* K *non-negative functions* $\left(\rho^{*1}, ..., \rho^{*K}\right)$ *(the GSR) and* $K \times N$ *non-negative functions* $\left(P^1, ..., P^K\right)$ *of prices, total income and distribution factors, with* $\sum_a \rho^{*a} = y$ *and* $\sum_a P_j^a = P_j$*, such that agent* a *solves*

$$\max_{Q, q^a} u^a\left(Q, q^a\right) \text{ under } \sum_{i=1}^{n} p_i q_i^a + \sum_{j=1}^{n} P_j^a Q_j = \rho^{*a} \qquad \text{(D)}$$

Interpretation: decentralization via personal prices (MWP)
But: no one-to-one relationship between welfare and GSR
Why? $\longrightarrow$ neglects *price* of public consumption

Public goods: Money Metric Welfare Index

Definition

The Money Metric Welfare Index (MMWI) of agent a, $m^a(p, P, y, z)$, is defined by:

$$\begin{aligned} v^a(p, P, m^a(p, P, y, z)) &= v^a(p, P^a, \rho^{*a}(p, P, y, z)) \\ &= V^a(p, P, y, z) \end{aligned}$$

Equivalently, if c^a denotes the expenditure function of agent a, then:

$$m^a(p, P, y, z) = c^a(p, P, V^a(p, P, y, z))$$

In words, m^a is the monetary amount that agent a would need to reach the utility level $V^a(p, P, y)$, *if she was to pay the full price of each public good* (i.e., if she faced the price vector P instead of the personalized prices P^a).

Public goods: Money Metric Welfare Index (cont.)

- Unlike the GSR, the Money Metric Welfare Index fully characterizes the utility level reached by the agent.
- *If* preferences identical whether single or married, *then* m^a is the income a would need, *if single*, to reach the same utility level
- But this interpretation is not crucial.
- Case of private goods only: MMWI coincides with the sharing rule

A C-D example

- CD utilities

$$\begin{aligned} u^a &= \frac{1}{1+\alpha}\log q^a + \frac{\alpha}{1+\alpha}\log Q \\ u^b &= \frac{1}{1+\beta}\log q^b + \frac{\beta}{1+\beta}\log Q \end{aligned}$$

- Indirect utilities

$$\begin{aligned} v^a &= \log y - \frac{\alpha}{1+\alpha}\log P - \log(1+\alpha) + \frac{\alpha}{1+\alpha}\log\alpha \\ v^b &= \log y - \frac{\beta}{1+\beta}\log P - \log(1+\beta) + \frac{\beta}{1+\beta}\log\beta \end{aligned}$$

- Let μ be b's Pareto weight; then the couple's consumption is given by:

$$\begin{aligned} q^a &= \frac{1}{(1+\alpha)(1+\mu)}y,\ q^b = \frac{\mu}{(1+\beta)(1+\mu)}y \\ \text{and}\quad Q &= \frac{\alpha(1+\beta)+\mu\beta(1+\alpha)}{(1+\alpha)(1+\beta)(1+\mu)}\frac{y}{P} \end{aligned}$$

A C-D example (cont.)

1. Conditional sharing rule:

$$\tilde{\rho}^a = \frac{1}{(1+\alpha)(1+\mu)} y, \tilde{\rho}^b = \frac{1}{(1+\beta)(1+\mu)} y$$

2. Lindahl prices are

$$P^a = \frac{\alpha(1+\beta)}{\alpha(1+\beta)+\mu\beta(1+\alpha)} P, P^b = \frac{\mu\beta(1+\alpha)}{\alpha(1+\beta)+\mu\beta(1+\alpha)} P$$

and the generalized sharing rule is

$$\rho^{*a} = \frac{y}{1+\mu}, \rho^{*b} = \frac{\mu y}{1+\mu}$$

3. The two MMWIs are given by:

$$m^a = \left(\frac{\alpha(1+\beta)+\mu\beta(1+\alpha)}{\alpha(1+\beta)}\right)^{\frac{\alpha}{1+\alpha}} \frac{y}{1+\mu}$$

$$m^b = \left(\frac{\alpha(1+\beta)+\mu\beta(1+\alpha)}{\mu\beta(1+\alpha)}\right)^{\frac{\beta}{1+\beta}} \frac{\mu y}{1+\mu}$$

A C-D example (cont.)

Assume, now, that $\mu = 1$ but $\alpha = 2$ while $\beta = .5$, so that $q^a = y/6, q^b = y/3, PQ = y/2$.
Individual welfare?

1. GSR:

$$\rho^{*a} = \frac{y}{2} = \rho^{*b}$$

But a 'pays' twice as much for the public good ($P^a = \frac{2}{3}P$ while $P^b = \frac{1}{3}P$).

A C-D example (cont.)

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2. MMWIs:
$$m^a = .655y, m^b = .72y$$
Note that:
$$m^a + m^b = 1.375y$$
reflecting the gains stemming from public consumption

Household technology (BCL 2010)

1. Utilities identical when single or married
2. **But**: marriage (or cohabitation) gives access to a more productive technology
3. Implementation:
   - Utilities $U^a(c^a, C)$ for $a = 1, ..., K$, same as singles
   - Consumption (c, C), produced from market purchases q (plus time):

$$(c, C) = f(q)$$

   - In practice, private goods and linear or even Barten scales:

$$c = A.q \text{ or } c_i = \sum_a c_i^a = \eta_i q_i, i = 1, ..., n$$

     where η_j *degree of jointness* of good j. Affects income *and* prices
   - In addition, sharing rule
   - U^a recovered from singles, A and the SR from couples

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'Pure' identification

Basic result (CE 2009):

Generically, under one exclusion restriction per agent, collective indirect utilities are (ordinally) identified from demand functions.

$\longrightarrow$ Can identify the welfare-relevant concept

In practice:

- Public goods only: straightforward identification, since

$$\begin{aligned} V^a(P, y) &= U^a(Q_1, Q_3, \ldots Q_N) \\ V^b(P, y) &= U^b(Q_2, Q_3, \ldots Q_N) \end{aligned}$$

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- Does *not* work for the 'unitary' model $W\left(u^1, ..., u^K\right)$!!

Private goods: local identification

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- 3 commodities, 1 and 2 exclusive, 3 non assignable (C 88, 92); observe $q_i\left(p_1, p_2, y\right)$; goal: recover $u^a\left(q_1, q_3^a\right), u^b\left(q_2, q_3^b\right), \rho\left(p_1, p_2, y\right)$

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- Assume $\bar{u}^a, \bar{u}^b, \bar{\rho}$ is a solution; define u_K^a, u_K^b, ρ_K by:

$$\begin{aligned} \rho_K\left(p_1, p_2, y\right) &= \bar{\rho}\left(p_1, p_2, y\right) + K \text{ and} \\ u_K^a\left(q_1^a, q_3^a\right) &= \bar{u}^a\left(q_1^a, q_3^a - K\right), u_K^b\left(q_2^b, q_3^b\right) = \bar{u}^b\left(q_2^b, q_3^b + K\right) \end{aligned}$$

Then:

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Then:

- Same demand for q^1, q^2, q^3 (since $q_3^a = \bar{q}^a + K, q_3^b = \bar{q}^b - K$) $\rightarrow$ empirically undistinguishable

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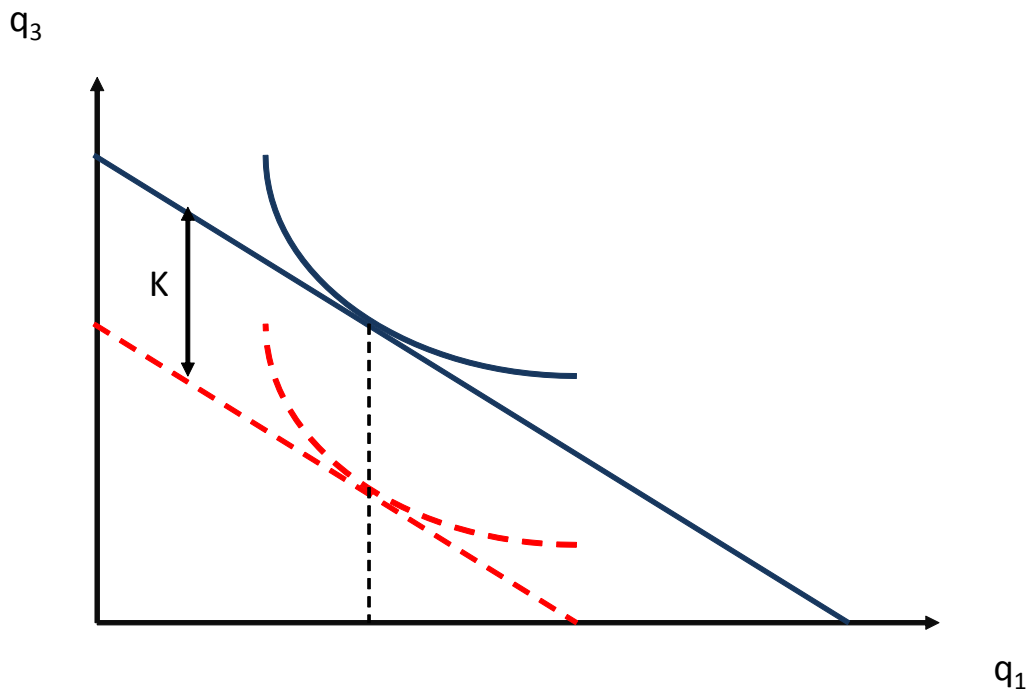
Then:

- Same demand for q^1, q^2, q^3 (since $q_3^a = \bar{q}^a + K, q_3^b = \bar{q}^b - K$) $\rightarrow$ empirically undistinguishable
- Different utility *functions* but same utility '*levels*': the constant is welfare irrelevant

Private goods: local identification

- 3 commodities, 1 and 2 exclusive, 3 non assignable (C 88, 92): *Sharing rule identified up to a welfare irrelevant additive constant*



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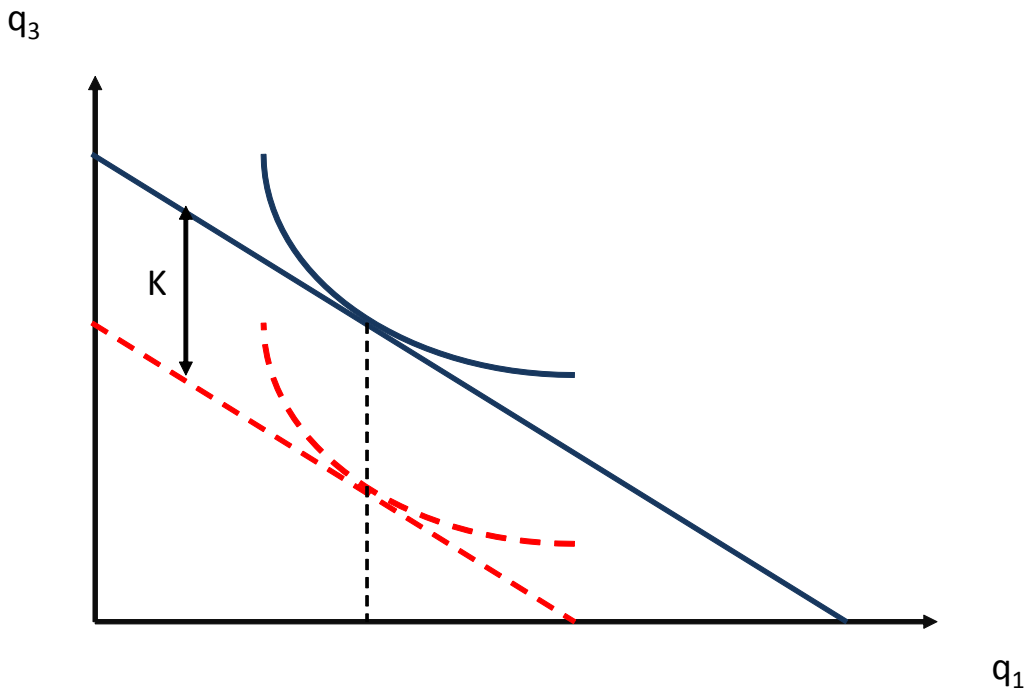

- In general:
  SR identified up to a welfare irrelevant additive function of non assignable prices

General case: local identification

- Same result:

The CSR, the GSR and the MMWI
are identified up to an additive function
of the prices of non exclusive private goods

General case: local identification

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- Related to 'revealed preference' approaches (Cherchye et al 2012).

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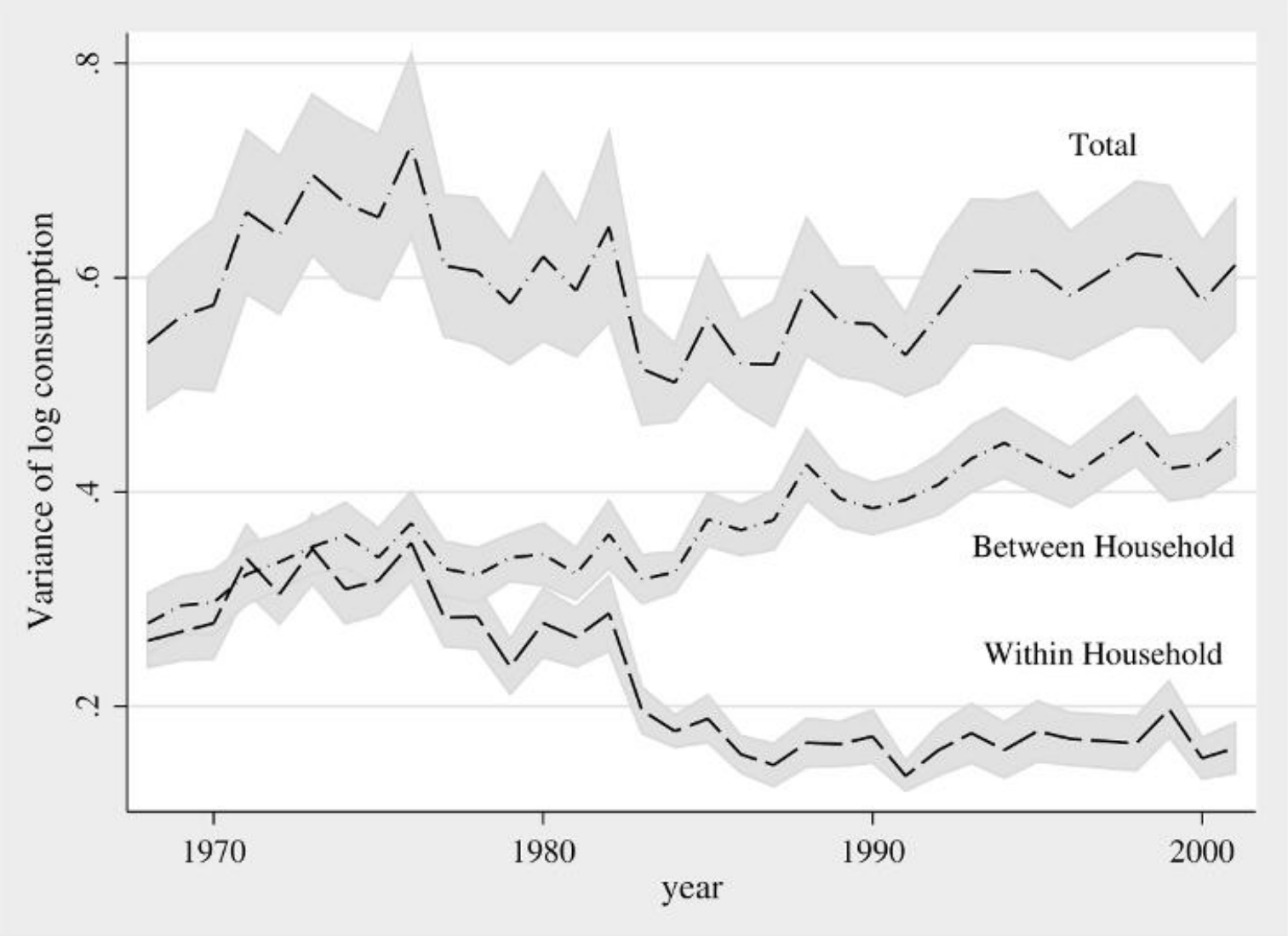
Empirical results 1: Lise and Seitz 2009



Empirical results 2: Dunbar Lewbel Pendakur 2010

Table 4: Estimated Resource Shares and Poverty Rates

		Mean	Std Dev	Min	Max	Pov Rate *Unequal*	Pov Rate *Equal*
one child	man	0.463	0.087	0.245	0.762	0.686	0.850
	woman	0.402	0.071	0.168	0.587	0.766	
	children	0.135	0.047	0.008	0.260	0.954	
	each child	0.135	0.047	0.008	0.260		
two children	man	0.516	0.078	0.282	0.786	0.547	0.916
	woman	0.273	0.063	0.075	0.475	0.885	
	children	0.211	0.044	0.059	0.326	0.970	
	each child	0.105	0.022	0.029	0.163		
three children	man	0.521	0.081	0.219	0.795	0.522	0.948
	woman	0.244	0.065	0.002	0.512	0.889	
	children	0.236	0.042	0.112	0.374	0.996	
	each child	0.079	0.014	0.037	0.125		
four children	man	0.441	0.080	0.170	0.701	0.538	0.972
	woman	0.267	0.066	0.043	0.532	0.838	
	children	0.293	0.037	0.178	0.402	0.989	
	each child	0.073	0.009	0.044	0.101		
All Households	man	0.489	0.088	0.170	0.795	0.582	0.913
	woman	0.304	0.093	0.002	0.587	0.842	
	children	0.207	0.070	0.008	0.402	0.974	
	each child	0.103	0.038	0.008	0.260		
All Persons	all	0.235	0.177	0.008	0.795	0.855	0.924

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Normative issues

- Notions of *compensating variation:*
  - Reform that changes the price vector from $\mathbf{p}$ to $\mathbf{p}'$.
  - Single agent, initial income x:

$$CV = e\left(\mathbf{p}', v\left(\mathbf{p}, x\right)\right) - x$$

- Collective framework:

Definition (Chiappori 2005)

Potentially compensating variation: amount such that agents *could* both reach the same utility level as before the reform
Actually compensating variation: amount such that agents *will* both reach at least the same utility level as before the reform

Potentially compensating variation

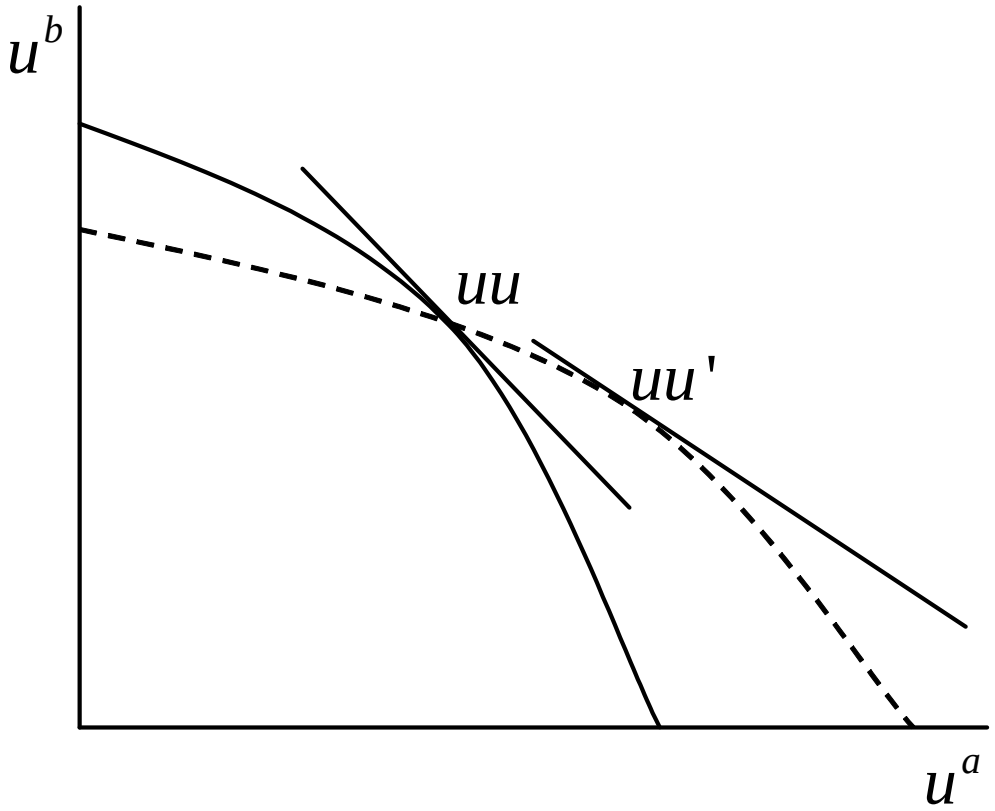

Figure: Potentially compensating variation.

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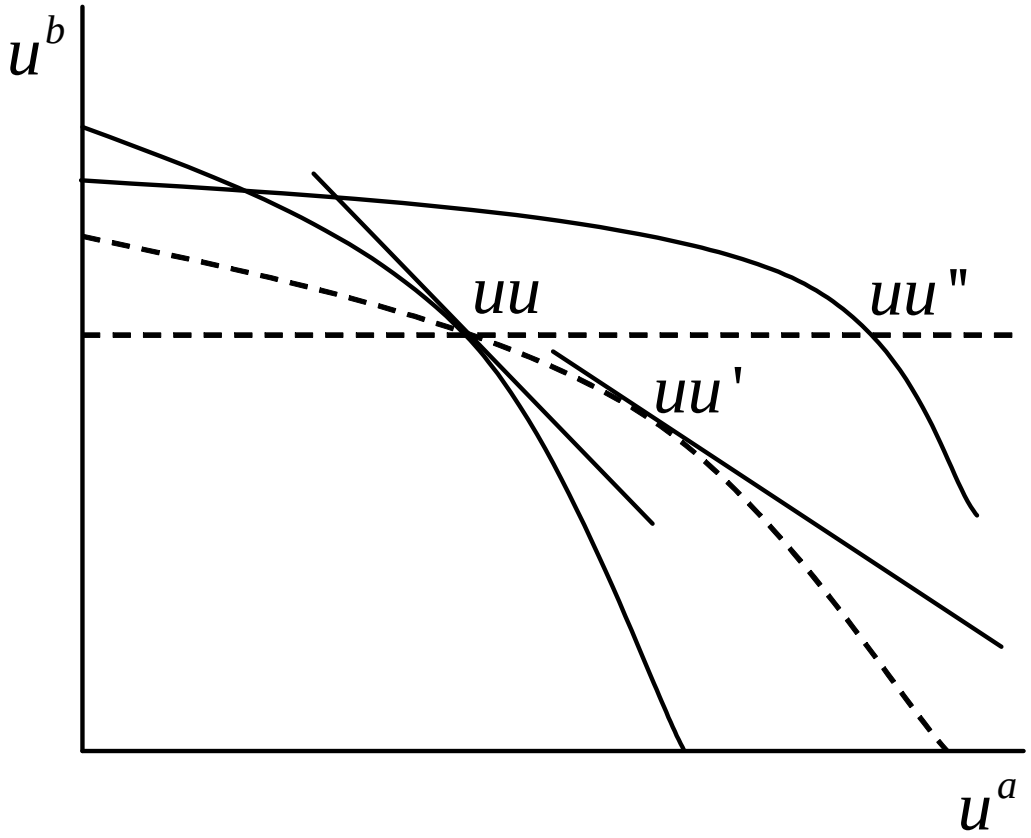

Figure: Actually compensating variation.

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  - Ex: 'targeting' (benefit can be paid to the husband or to the wife, in cash or in kind, etc.)