

# Welfare Analysis and Microsimulation

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- This talk: attempt to summarize some of the research
  - using EUROMOD
  - and/or research that could feed into (welfare analysis using) microsimulation
- Certainly not complete...thanks in advance for suggestions/corrections
- I assume that
  - social welfare is a/the policy objective
  - individual welfare as a basic component
- Let's start with "standard practice" in microsimulation

### Welfare analysis with microsimulation: standard practice

- A simple approach describes social welfare (SW) as:

$$SW = W\left(\frac{c_1(y_1, z_1)}{e(z_1)}, \dots, \frac{c_N(y_N, z_N)}{e(z_N)}\right)$$

$c_h$  : consumption (disposable income), as obtained by microsimulation  $c()$

$y_h$  : gross income

$z_h$  : household characteristics

$e(z_h)$  : equivalence scale of household  $h$

- Function  $W$  corresponds to:
  - poverty index, inequality index, mean income, etc.
  - other functions of the income distribution
  - combinations of them (intensity of poverty, generalized Lorenz, etc)

- This is broadly the basis for welfare analysis nationally and in Europe
- Limited definition of welfare: household equivalized income
- Yet **many advantages**:
  - simple to explain
  - directly link policy simulation and welfare implications
  - income can be aggregated (not "utility")
  - equivalent scales uniform & comparable across countries (ex: OECD modified scale)
  - reducing poverty and inequality: clear & reasonable (nonwelfarist) policy objectives
- Also, the approach grasps much heterogeneity in the population
  - heterogeneity that explains transformation of charact.  $(y_h, z_h)$  into  $c_h$
  - not so much the case in applied econ (lots of unobs heterogeneity)
  - well...that's because we're less ambitious on the notion of welfare

### Many applications

- Many interesting applications
- In particular EUROMOD distributional analyses:
  - analyses of actual reforms
  - hypothetical reforms (flat tax, BI, MI, EU tax system, etc) and policy swaps
  - decomposing time changes (see next)
  - stress testing, nowcasting, ,
  - etc..

- Ex: counterfactual simulations to extract role of policies
  - with Tim (France, Ireland) or on Labour reforms of 1998-2001 (see also Mike's): offset much of the rise in market income inequality:

	Total change	Shapley Decomposition	
		Policy effect	Other effects
Gini	<b>0.3</b> <b>(0.6)</b>	<b>-1.5</b> <b>(0.0)</b>	<b>1.8</b> <b>(0.6)</b>
FGT0 (%)	<b>-1.7</b> <b>(0.7)</b>	<b>-2.6</b> <b>(0.2)</b>	<b>0.9</b> <b>(0.6)</b>

- Over time:
  - during the crisis (ex: with Tim, Karina & Claire; papers by Chrysa & Manos; Paola, Alari, Holly & Iva, etc)
  - over the long period: political cycles (US 1979-2007, with Andreas, Mathias, Dirk, etc)
- Also across countries
  - ex: how much of the poverty gap btw UK and France is explained by taxben system?
  - "system swap" counterfactuals (doable?)

### Limitations

- No behavioral responses
  - yet, policy reforms have impact on incentives (on  $y_h$ )
- Welfare as "household equivalized income"
  - why income only?
  - why the household?
  - why unrealistic "synthetic" equivalizing scales?
- The rest of this talk: take each of these points in order

- Before that, note that a more general setting:

$$SW = W(u_1^1(c_1^1, x_1^1), \dots, u_1^{n_1}(c_1^{n_1}, x_1^{n_1}), \dots, u_N^1(c_N^1, x_N^1), \dots, u_N^{n_N}(c_N^{n_N}, x_N^{n_N}))$$

$u_h^i$  : "welfare" of individual  $i$  in household  $h$

$x_h^i$  : vector of relevant dimensions (other than consumption)

seems better as

- individual basis
- multiple dimensions beyond income
- possibly behavioral responses, etc
- ...yet, still **not without problem**
  - old and difficult problem of aggregation & interpersonal comparability
  - moving to money metrics not without difficulties (understated in Bourguignon & Spadaro, 2006, see Fleurbaey & Blanchet 2013)
- And which  $W()$  to use?
  - possible to opt for specific & explicit inequality aversion
  - or revealed social preferences approach (cf. Bourguignon & Spadaro 2012; Herwig with Saez, Kleven, Kreiner; bunch of paper with Andreas & co, etc)



### Adding behavioral response into microsimulation

- Many possibilities:
  - in dynamic microsimulation: savings
  - in static microsimulation: benefit take-up, labor supply, resource sharing (see later), tax migration ...
- Many advances, for ex:
  - UCL/IFS (Mike, Richard, etc) on labor supply and takeup
  - Manos, Holly, Stephen, Alari, Horacio, Maria, etc + Euromod/AIMAP on take up
  - taxable income  $y_h$  (EIT: gather many dimensions; cf Saez et al, work of Andreas & co,etc)
- Yet, not systematically incorporated into microsimulation
  - too many assumptions? look too esoteric?
    - well... not sure microsimulation looks assumption-free to the public
    - and sensitivity analysis possible (use levels of elasticities for instance, ex: Saez & Piketty, US paper with Andreas & team, etc)

- Ex: labor supply
  - important one as basis for redistribution (opt tax)
  - explicit form used for welfare analysis (ETI: more comprehensive but "reduced-form"...sufficient stat for welfare analysis? Chetty 2009 yes...Doerrenberg et al 2014 no!)
- The basic models goes as follows:

$$\begin{aligned} & \max u_h(c, l) \\ \text{s.t. } & c = c(y_h, m_h) \text{ and } y_h = w_h l \\ & \text{with } l : \text{ hours of work} \\ & \quad w_h : \text{ hourly wage} \\ & \quad m_h : \text{ nonlabor income} \end{aligned}$$

- A lot of this literature focuses only on the behavioral effects (participation, hours)
  - important for policy analysis: which groups respond to reform and by how much
  - still we can say something about preferences used to assess welfare
  - ex: labor supply elasticities in Europe and the US (with Andreas and Kristian): small difference across countries mainly due to different work preferences (and not to existing taxben systems)

- Sometimes, it incorporates welfare analysis:
  - money metric: Creedy & al for Australia, Colombino & Aaberge for Italy/Norway,..
  - poverty/inequality: ex. simulation of WTC (with Kristian):
    - shows that in Germany, poverty reduction enhanced by incentive effect among lone mothers

	baseline	no response	with response
<b>Germany</b>			
<i>poverty rate - line at 50% of the median</i>	5.65%	5.51%	5.41%
variation in the number of poor hh (line at 60%)		-4.3%	-5.6%
variation in the number of poor hh (line at 50%)		-2.5%	-4.4%

Note: poverty line kept fixed at the baseline value

- to enrich counterfactual analysis, ex: Labour reforms of 1998-2001 contributed to a strong decline in poverty amongst single parent households in the UK, again, partly because of positive incentive effect of WFTC in this group

Poverty of single parents in the UK: 1998-2001				
	Total change	Shapley Decomposition		
		Policy effect	Behav. response	Other effects
FGTO (%)	-7.9 (3.5)	-8.6 (1.5)	-2.3 (0.6)	3.7 (3.4)

- Increasing use of labor supply response into microsimulation, incl. EUROMOD WP:
  - Ayala & Paniagua 2016 for Spain
  - Figari & Narazani 2015, Colombino 2012, for Italy
  - Decoster et al for Belgium
  - Berger et al for Luxembourg
  - Bargain et al for US/EU15, ...etc
- Yet still problems
  - identification of preference versus productivity: requires tax change in the data
  - beneficial to combine with natural experiment (recent paper with Karina)

### Beyond income

- Looking at income only:

$$SW = W(u(c_1), \dots, u(c_N))$$

- under assumptions on  $u()$ , can be interpreted in terms of welfare
  - dominance results from income inequality (Atkinson theorem)
- Yet no heterogeneity in preferences
  - with further assumption, dominance results with difference in needs (Atkinson-Bourguignon theorem)
- And renewed interest in:
  - multidimensional welfare ("beyond GDP")
  - subjective dimensions (ex: happiness)

- Subjective well-being:
  - fully welfarist, assuming interpersonal comparability
  - may be problematic and requires cleaning (different aspirations)
- Multidimensional measures, ex: functioning/capabilities
  - basic version: HDI, but arbitrary choice of dimensions
  - pb of double counting (health and income..but income can buy better health!)
  - no respect for individual preferences (dominance principle)
- Maybe better to have a comprehensive choice setting:
  - for ex:  $u_h(c(w_h l, m_h), l)$  with explicit (income, leisure) tradeoff
  - consistent with individual preferences/choices
  - yet how to compare welfare levels  $u_h(c, l)$  of different  $h$  when they have heterogeneous preferences over multiple dimensions of good life (for instance  $c$  and  $l$  in our case)?

- Promising approach is revival of money metric utility through "fair allocation" theory
  - Fleurbaey, Maniquet, Shokkaert, Sprumont etc
  - based on compensation principle (when preferences are equal, compensate for inequality due to nonresponsibility factors)
  - reject IIA (Arrow) and respect preferences (dominance restricted to subsets)
- For instance, when extending welfare measure to leisure:
  - again,  $(c, l)$  are key dimensions for normative analysis of redistributive policies!
  - ? is how to put a price on leisure? how to compare people with different preferences?
  - fundamental question: (by how much) should we hold the poor responsible for being so if poverty is not only on account of low productivity but also different preferences for leisure?

- Start by "respecting preferences" and define wellbeing at optimal choice

$$u_h^* = \max_l u_h(c(w_h l, m_h), l)$$

- then using taxfree linearized budget constraint for various possible money metrics, for instance one defined as nonlabor income  $m_h^*$ , leading to the same welfare level:

$$u_h^* = \max_l u_h(\tilde{w}l + m_h^*, l)$$

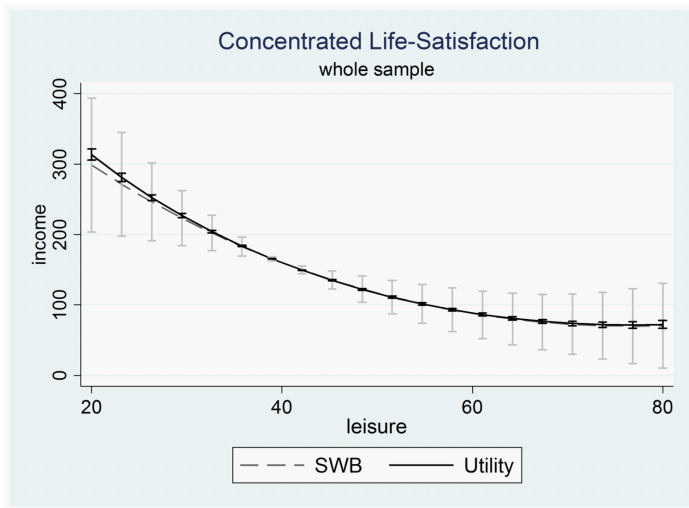
for some reference wage  $\tilde{w}$  (ex: "Rente" metric with  $\tilde{w} = 0$ )

- Fair allocation:
  - whole range of possible ethical priors on reference set (price of time)
  - our ex: polar case with  $\tilde{w} = 0$ , people with work aversion minimally responsible for it (their relatively higher leisure minimally valued)
- Recent applications:
  - using revealed preferences to elicit preference heterogeneity (with André & al, ...)
  - using revealed preferences versus subjective well-being (with Xavier and Aslan)



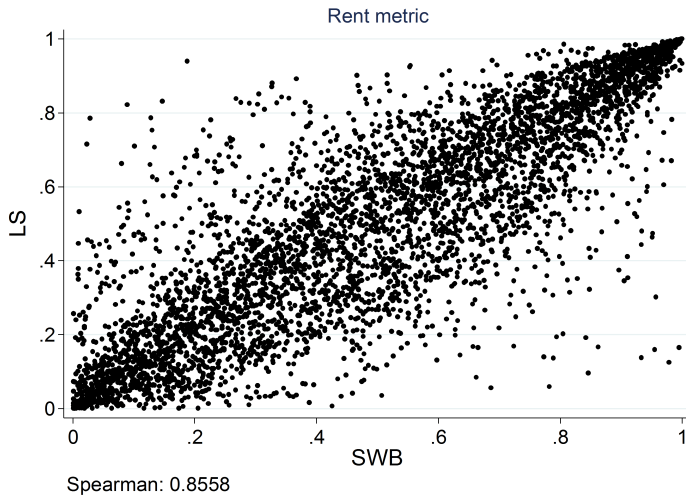
# Welfare Analysis and Microsimulation

## III. Going beyond income / overall income-leisure preferences



# Welfare Analysis and Microsimulation

## III. Going beyond income / income-leisure preferences: distribution of money metric (Rente)



### From households to individuals

- Some attempts to split income among household members in EUROMOD simulations:
  - sensitivity to different sharing rules (Orsini and Spadaro, 2006; Figari, Immervoll, Levy and Sutherland 2007; recent paper by Silvia, Daria & Olga, etc)
- Econ literature: many ad hoc model of household decision
  - ex: Nash bargaining with specific threat points
- Most comprehensive: "collective model" (Chiappori, 1988)
  - ordinal preferences of each family member
  - assume efficiency "only"
  - recently merged with traditional literature on equivalence scale

### From equivalence to indifference scales

- Equivalence scales:
  - how do we compare household with different composition?
  - difference in needs, ex: need of 1 adult + 1 child < 2 adults (OECD: 1.3 < 1.5)
  - economies of scales, ex: 1 couple < 2 singles (OECD: 1.5 < 2)

- Traditional definition of  $e_h$ :

$$U_h(c) = U_0\left(\frac{c}{e_h}\right)$$

- answer the question: "*how much income needed for a family of composition h to be as well off as some reference household 0 (ex: single living alone)*"
- Problems (see Chiappori's lecture at RES 2015)
  - conceptual issues (interpersonal comparability + what is household welfare?)
  - ignore possible unequal sharing within families
  - not identified without assumptions (Engel, Rothbarth,...)

- Better idea: to refer to individual welfare functions  $u_i()$  (individualism)
- Define an **Indifference scale**:
  - comparing utility of the same person in different family contexts:

$$u_i(c) = u_i\left(\frac{c}{I_{i,h}}\right)$$

- answer the question: "*How much income needed for individual  $i$  living in family of composition  $h$  to be as well off as when living alone*"
  - Lewbel, Browning, Chiappori, Pendakur, Pollak, etc.
- Indiff scale depends on consumption technology and intrahousehold allocation:

$$\frac{1}{I_{i,h}} = \frac{\eta_{i,h}}{\sigma_{i,h}}$$

- $\sigma_{i,h}$ : econ of scales due to joint consumption  
(ex: "price" of 1/2 if public consumption in a couple)

- $\eta_{i,h}$ : resource share of person  $i$

(note that  $c/I_{i,h}$  is a money metric utility, yet with specific reference prices .... for more general normative characterization of sharing rules as equivalent income, see Chiappori and Meghir, 2015)

### From household to individual welfare

- Basic collective model of consumption ( $K$  goods):

$$\begin{aligned} & \max_{c_{1,h}^1, \dots, c_{1,h}^K, \dots, c_{n_h,h}^1, \dots, c_{n_h,h}^K} \sum_i \rho_{i,h}(\theta) u_i \left( \frac{c_{i,h}^1}{\sigma_{i,h}^1}, \dots, \frac{c_{i,h}^K}{\sigma_{i,h}^K} \right) \\ \text{s.t. } \eta_{i,h} c &= p^1 c_{i,h}^1 + \dots + p^K c_{i,h}^K \text{ for } i = 1, \dots, n_h \\ \text{with } \theta &= (p^1, \dots, p^K, \text{ distribution factors}) \end{aligned}$$

- Most of the (older) literature:
  - test of efficiency
  - retrieve "marginal" sharing rule ( $\partial \eta / \partial c$ )
- More recently, identification of complete sharing rule & scaling factors
  - Browning & al (2006), Lewbel & Pendakur (2008), Bargain & Donni (2012), Dunbar et al. (2013)...

- Identification: simple idea is to use preferences of singles
  - restrictive as preference change with marriage/children + selection bias
  - yet, the idea of status comparison behind equiv. scales
- Generalization of the idea behind Rothbarth approach
  - Engel curve estimations for good  $k_i$ , assignable to individual  $i$ 
    - data on families of type  $h$  :  $c^{k_i} = \alpha + \beta(c/l_{i,h})$
    - data on singles alone :  $c^{k_i} = \alpha + \beta c$
  - ex: female clothing (sharing in couple), adult goods (share of children), etc
  - "generic" identification results readily available

# Welfare Analysis and Microsimulation

## IV. From households to individuals: application for poverty analysis

- Ex: individual poverty
    - child resources ('cost of children') used to compute original child poverty measures
    - i.e. not poor as "living in poor hh" but because own resources are low
- Ex: estimation on Cote d'Ivoire (Bargain, Donni & Kwenda 2014):

Poverty of	Childless Couples	Couples with 1 child	Couples with 2 children	Couples with 3 children
Household	0.211	0.318	0.439	0.506
Women	0.216 (0.056)	0.372 (0.082)	0.349 (0.085)	0.377 (0.081)
Men	0.249 (0.052)	0.414 (0.105)	0.403 (0.099)	0.386 (0.100)
Children		0.498 (0.078)	0.652 (0.063)	0.740 (0.060)

Poverty line at \$2/day for adult and \$1.2/day for children



### Bringing intrahousehold sharing into microsimulation?

- Can reasonably be done with consumption model
  - yet not clear how tax-benefit policies themselves should enter the sharing rule  $\eta_{i,h}$
- Then, more complicated when adding labor supply
  - price variation (wage) to handle in extension of Browning, Chiappori, Lewbel (ongoing)
  - yet important to endogenize earnings in a poverty context

- Early 2000s: "Laisney project"
  - attempt to operationalize collective model with labor supply and nonlinear taxation
  - also use info from singles, but calibration rather than estimation
  - sharing rule as a function of spouses' relative contributions (...ad hoc)
  - still, interesting simulations of intrahh redistribution effect of reforms (WFTC)
- Related attempts
  - more structural approach (Bargain and Moreau 2005: Nash-bargaining model)
  - other reforms (Beninger et al 2006: switch from joint to indiv. taxation)
  - full estimation but no complete taxben (Lise and Seitz, 2011)

### Concluding remarks

- Microsimulation and "economic research" (applied theory, estimated models) are two related worlds
  - but they do not talk much together
  - many exceptions in the room!
- Maybe wishful thinking, but I believe
  - models can be operationalized more systematically in welfare analyses based on microsimulation
  - already done/ongoing in some dimensions: labor supply, take-up...
  - going beyond income and beyond the household is important and can be pursued
- Of course, compounded difficulties
  - ex: which ethical views and money metric for (income,leisure) choices in a couple?
- Inversely, microsimulation can support research
  - precise rendering of individual financial incentives (ex: for natural experiments)
  - inform about implicit (=tax-benefit revealed) social preferences (SW, equiv scales,...)

Thank you!  
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