



Individual Welfare Metrics with Random Terms

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1. Policy evaluation by disposable incomes

- The evaluation of tax reforms or other policies is mostly limited to the impact on *disposable income* of households or individuals.
- This has the somewhat surprising consequence that the evaluator might judge a policy *A* to be better than a policy *B* for an individual *i*, while that person would, according to her own preferences, prefer *B* to *A*.

Example

Ann's preferences over income y and leisure ℓ can be represented by the utility function $U = y - \ell$.

Policy *B* (baseline) allows Ann to choose between unemployment, yielding a benefit of 1000€ (option 1), or working half time and earn 1500€ (option 2). Ann prefers to remain unemployed, as $U_1^B = 1000 \cdot 1 = 1000 > U_2^B = 1500 \cdot 0.5 = 750$.

Government proposes to lower unemployment benefits and to reduce social security benefits to stimulate Ann to work (alternative policy *A*). If remaining unemployed, Ann's benefits would reduce to 750€ (option 1) while working half time would yield 1600€ (option 2). Ann now prefers to work, as $U_1^A = 750 \cdot 1 = 750 < U_2^A = 1600 \cdot 0.5 = 800$.

How do we rank both policies? Using *disposable income* as a criterion, the *alternative policy A* is preferred to *policy B*, as income is higher under policy *A* (1600€) than under policy *B* (1000€). Ann however prefers policy *B* to policy *A*, as her most preferred option under policy *A* is less preferred than her most preferred option under policy *B*:

$$U_2^A = 800 < U_1^B = 1000.$$

Using disposable income as an individual welfare metric neglects a person's valuation of leisure, and more generally, a person's own judgements or preferences.

2. Respect for individual preferences

- An individual welfare metric that does not suffer from such a preference reversal property is said to exhibit the property of RESPECT FOR INDIVIDUAL PREFERENCES (Decancq, Fleurbaey, Schokkaert, 2015).
- The class of *money metric utility* functions (MMU, Samuelson, 1974) provides an example of a welfare metric satisfying respect for individual preferences.

Money metric utility is the, for a given set of reference prices, minimal amount of unearned income necessary to obtain a bundle of goods to which the individual would be indifferent as compared to the actual bundle under consideration.

Example

Consider again Ann, and assume policy *A* is in vigour. She earns 1600€ a month and works half time ($h = 0.5$ or 20 hours a week). Her hourly wage w then equals 18.46€. At an alternative reference wage w^r of 9€, Ann would need a lump sum grant of 674€ per month, in order to be able to obtain an alternative bundle to which she is indifferent as compared to her actual bundle. This lump sum grant is the MMU.

4. MMU with and without random terms

Calculating MMU for an income y_0 and labour time h_0

- The traditional approach neglects random preference differences (e.g. Decoster and Haan, 2015). This amounts to calculating MMU using utility function V :

$$MMU \equiv \min_{M,h} M$$

$$\text{s.t. } V(y_0, h_0) = V(M + w^r h, h)$$

- Taking random terms into account. Step 1: Calculate MMU using the random utility function U_k :

$$MMU(\epsilon_0, \epsilon_1; w^r) \equiv \min_{M,h} M$$

$$\text{s.t. } U_0(y_0, h_0) = U_1(M + w^r h, h)$$

with $U_k(y, h) = V(y, h) + \epsilon_k; k = 0, 1$.
 This first step yields an MMU for every value of ϵ_1 .
 Step 2: Average over these values of ϵ_1 :

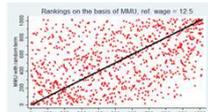
$$MMU \equiv \int MMU(\epsilon_0, \epsilon; w^r) f(\epsilon) d\epsilon,$$

where $f(\epsilon)$ is the distribution assumed by the empirical model for the random preference terms. In logit-models this is for example the Gumbel Extreme Value Type 1 distribution.

- We have implemented this proposal on a subsample of 449 single males and 571 single females from SILC-Belgium 2007. First we have estimated a *random utility random opportunity (RURO) job choice model* (See Aaberge, Colombino and Strøm, 1999 for RURO, and Capéau and Decoster, 2016 for our estimation results). The estimated random and systematic part of the utility functions where used for calculating MMU metrics.

5. Results

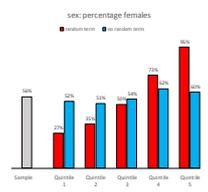
- Does taking random preferences into account affect the welfare ranking of individuals?



The red dots then indicate the corresponding ranks of that individual for an MMU with random preference differences taken into account, on the vertical axis.

The welfare ranking of individuals is largely affected by the integration of random preference differences into the measure.

- Who is better off when taking random terms into account?



When taking random preference differences into account, females tend to be more predominantly ranked into the higher quintiles.

This conclusion was confirmed by a multivariate (ordered logit) analysis. An intuitive explanation of this result does not seem straightforward.

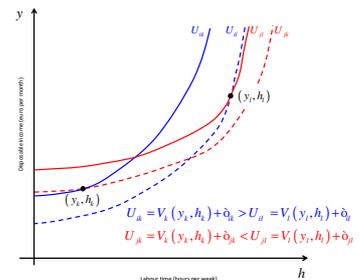
3. Coping with preference heterogeneity

- A work horse model for the analysis of labour supply behaviour is the discrete choice random utility model of Van Soest (1995). Given an hourly wage w , an individual can choose between a finite set of labour time regimes (e.g. 20%, 25%, 50%, 75% or full time) or not working and receiving a replacement income. Utility derived by i from choosing option k equals:

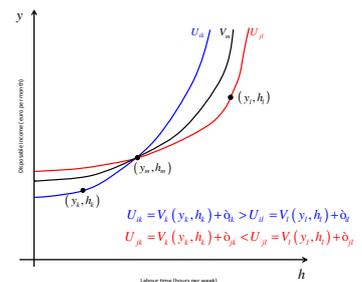
$$U_{jk}(y_k, h_k) = V_{jk}(y_k, h_k) + \epsilon_{jk},$$

where y_k is disposable income earned by offering h_k hours of work, taking into account non-labour income and taxes net of transfers.

- The V_{jk} capture *systematic preference differences*, possibly dependent on observable individual j specific characteristics. The ϵ_{jk} account for *unobservable preference heterogeneity* or, alternatively, these can be interpreted as utility derived from unobserved attributes of job k .
- Suppose that the systematic part of preferences is the same for two individuals i and j , that is $V_{jk} = V_{ik} \equiv V_k; V_{ji} = V_{ii} \equiv V_i$, but random preferences differ, as illustrated in the next figure.



In the next figure we add the indifference curve that would result if one would neglect random preference differences.



Using only the systematic part of preferences to calculate the MMU would therefore give other results as compared to taking into account unobserved (random) preference differences.

In the former case both i and j would be considered equally well off when receiving the same bundle, while this would not necessarily be the case when taking into account random preference differences.

Conclusion and further research questions

- Taking for granted that welfare metrics should satisfy respect for individual preferences, accounting or not for random preference differences matters. The explanation of the differences between both approaches is however not straightforward.
- What about the determination of the reference wage? Higher reference wages tend to consider the one with relatively more intense preference for leisure to be better off than a person who is more inclined to work, for a given bundle. A complete normative theory of the choice of reference prices still has to be developed however.
- The set of MMU's is not the only class of welfare measures satisfying respect for individual preferences. For example, the crossing point of the indifference curve with the vertical axis, that is the monetary compensation necessary in case of not working in order to be as well off as with the actual bundle. The natural question then arises whether the main impact on welfare comparisons would stem from the choice of metric, reference wage, or from taking into account or not random preference differences.
- How to construct individual welfare metrics for persons living in multi-person households?

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