The diminishing of the marginal utility of income under latent individual specific heterogeneity

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Several questions in normative public economics can only be answered with reference to the deminishing of the marginal utility of income. The relation between income and its marginal utility is usually described in terms of a constant elasticity. That is, a 1% increase in income lowers it's marginal utility by ρ%. The Atkinson measure of inequality (Atkinson, 1970), for example, uses this parameter, though it is called inequality aversion in this context. An empirical assessment of this elasticity is provided by Layard et al. (2008). Others, for example Schwarze and Härpfer (2007) and Pirttilä and Uusitalo (2008) also examine inequalitiy aversion empirically, but the concept they used corresponds more to the semantic than to the formal dimension of inequality aversion.

A utility function that describes the relation between income and utility, and that implies a constant elasticity is

$$u_i = \begin{cases} \frac{y_i^{1-\rho}-1}{1-\rho}, & \text{if } \rho \neq 1; \\ \ln(y_i) & \text{if } \rho = 1, \end{cases}$$

where u_i denotes the utility of individual i, y_i individual i's income, and ρ is the income elasticity.

In order to estimate ρ we use panel data on income satisfaction that enable us to acount for latent individual specific heterogeneity. Following Layard et al. (2008) we assume a linear relationship between individual utility and an individual's satisfaction, which is reported on a scale that ranges from 0 to 10. Referring to the mentioned welfare function our analysis is based on

$$s_{it} = \alpha \frac{y_{it}^{1-\rho}}{1-\rho} + \sum_{j=1}^{k} \beta_j x_{jit} + \tau_i + \varepsilon_{it},$$

where s_{it} denotes the satisfaction of individual i at time t, x_{jit} denotes control variables j for individual i at time t, τ_i captures an individual random constant, and ε_{it} denotes a stochastic error term.

In a first step we estimate ρ using a maximum likelihood evaluator that accounts for the individual constant random effects τ_i. In a second step we question if the income elasticity of the marginal utility of income is as constant as assumed in theory. To examine heterogeneity in ρ we allow individual random slopes via consideration of random coefficients, see Swamy and Arora (1972) and Train (2003). The parameter vector $\delta = \{\beta, \alpha, \rho\}$ is hence modeled as a unit specific random variable

$$\delta_i \overset{\text{iid}}{\sim} \mathcal{N}(d, W), \quad i = 1, \ldots, n,$$

where d and W are the mean and the variance of the underlying mixing distribution $f(\beta_i)$. The corresponding econometric analysis is based on Bayesian estimation techniques, since the resulting non nested model specifications are best (in terms of computational burden and assessment of parameter uncertainty) inspected using Bayesian estimation based on MCMC methodology. A major advantage of a Bayesian estimation approach is the possibility to compare non nested model specification using e.g. the marginal likelihood. This allows to gauge the empirical evidence in favor of the heterogeneity within the marginal utility of income on a common scale.

For our analysis we use data from the German Socio-Economic Panel Study covering the years 2002 to 2008. Since these data provide information on the household size and structure we are able to examine the marginal utility of monthly equivalent income. This accounts for the number of persons that have to share the household income in order to meet their needs, which is of some importance in this context as the results of Schwarze (2003) suggest. Though first sensitivity analyses indicate that results are more or less robust to the choice of equivalence scales within the range of $0.3 \leq e \leq 0.8$, where e denotes the elasticity with respect to household size (cf. Buhmann et al., 1988).

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