

Equivalence Scales for Social Policy

Taking Needs Seriously

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Outline

- ① Context & motivation
- ② A simple model of EQ scales that accounts for minimum needs
- ③ Empirical analysis at the EU level
- ④ Summary & policy conclusions

The context

Societies undergo profound demographic change

- populations age, fertility rates plummet, household landscape changes
- switch from traditional multi-generational households towards single-person households
- important implications for living costs, scale economies, consumption patterns

Fertility decisions / mobility / HH arrangements are increasingly shaped by economic factors

- housing costs, labor market uncertainty, work-life balance are important drivers
- high-income groups exhibit more stable demographic and housing patterns than low-income groups (Fjellborg, 2021; Ioannides & Ngai, 2025)

For sound social analysis, accurate welfare comparisons of different arrangements are crucial.

Equivalence scales

Equivalence scales

- standard tools of welfare comparison across HHs of different size & composition (Buhmann et al., 1988)
- unobserved utility & context-dependence → variety of methods/data/apps (Blundell & Lewbel, 1991)

International policy & monitoring typically involve common simplified scales

- OECD scale (1/0.7/0.5) , modified OECD scale (1/0.5/0.3), square root scale

More sophisticated analysis & direct applications at the national level

- evidence of decreasing scale economies at lower standards of living (Donaldson & Pendakur, 2004; Koulovatianos et al., 2005; De Ree et al. 2013)
- criticism about the common scales understating needs of larger HHs & children (Pearce & Leyland, 2024)

Choice is consequential for distributional analysis but less so for central tendencies.

This paper

This paper argues that equivalence scales

- have dual functions reflecting both needs and preferences
- may be qualitatively different among high-income and low-income HHs
- need recognition as a stand-alone social policy tool

Three main objectives:

- 1 Build a simple model of equivalisation featuring minimum needs
- 2 Carry out comprehensive EU-wide analysis of EQ scales among low-income HHs
- 3 Make sense / synthesise these results and draw conclusions for EU social policy

A model of equivalisation with minimum needs - Individual problem

Simplest modelling framework following Browning et al. (2013)

- symmetric log utility specification
- two individual types (M and F), two consumer goods (A and B)
- exogenously given minimum bundles (γ_A^i and γ_B^i)

Subject to relative price p and individual income y^i , individuals solve the following problem:

$$\max_{x_A^i, x_B^i} \log(x_A^i - \gamma_A^i) + \log(x_B^i - \gamma_B^i) \quad \text{s. t.} \quad px_A^i + x_B^i = y^i$$

The relevant Marshallian demand functions are given by

$$x_A^i = \gamma_A^i + \frac{y^i - (p\gamma_A^i + \gamma_B^i)}{2p} = \gamma_A^i + \frac{y^i - \bar{y}^i}{2p} \quad x_B^i = \gamma_B^i + \frac{y^i - (p\gamma_A^i + \gamma_B^i)}{2} = \gamma_B^i + \frac{y^i - \bar{y}^i}{2}$$

A model of equivalisation with minimum needs - Household problem

Consider the case of the household with two individuals (F and M) living together.

Assume that

- there are economies of scale due to different consumption technologies
- good A is consumed individually ($z_A = x_A^F + x_A^M$), while good B is fully shared ($z_B = (x_B^F + x_B^M)/2$)
- Pareto weights and minimum bundle for the shared good are equal for both members ($\gamma_B^i \equiv \gamma_B$)

The household's problem is then stated as follows:

$$\sum_{i \in F, M} \log(x_A^i - \gamma_A^i) + \log(x_B^i - \gamma_B^i) \quad \text{s. t.} \quad \sum_{i \in F, M} (px_A^i + x_B^i/2) = y$$

For sufficient levels of household income y , the optimal demand solutions are given by

$$x_A^i = \gamma_A^i + \frac{y - (p \sum_i \gamma_A^i + \gamma_B)}{4p} = \gamma_A^i + \frac{y - \bar{y}}{4p} \quad x_B^i = \gamma_B + \frac{y - (p \sum_i \gamma_A^i + \gamma_B)}{2} = \gamma_B + \frac{y - \bar{y}}{2}$$

Derivation of equivalence curves

Equivalence curves are derived from $S^i \equiv y/y^i$ that yields the same level of individual utility.

- Define equivalence ratio associated with zero utility as the subsistence ratio $\kappa^i \equiv \bar{y}/\bar{y}^i$

Given the optimal demand solutions, the condition for utility equivalisation yields

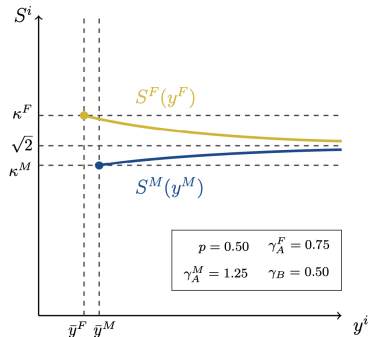
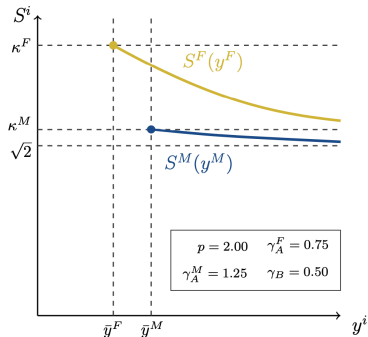
$$\log\left(\frac{S^i y^i - \kappa^i \bar{y}^i}{4p}\right) + \log\left(\frac{S^i y^i - \kappa^i \bar{y}^i}{2}\right) = \log\left(\frac{y^i - \bar{y}^i}{2p}\right) + \log\left(\frac{y^i - \bar{y}^i}{2}\right)$$

The solution to this is given by

$$S^i = (1 - \bar{y}^i/y^i)\sqrt{2} + (\bar{y}^i/y^i) \kappa^i = \underbrace{(1 - \bar{y}^i/y^i)\tilde{S}^i}_{\text{"preferences"}} + \underbrace{(\bar{y}^i/y^i) \kappa^i}_{\text{"needs"}}$$

- where $\tilde{S}^i$ is the equivalence ratio that would prevail in absence of minimum needs

Equivalence scales between needs and preferences



Equivalence scales

- are determined entirely by the subsistence ratio at low incomes and converge to $\tilde{S}^i$ at high incomes
- are higher for individuals whose basic needs are inferior to their partner's
- can be upward-sloping

The empirical analysis focuses on equivalence scales among low-income HHs across the EU.

Three different measurement approaches are explored:

- 1 EQ scales based on HH expenditure patterns
- 2 EQ scales based on subjective perceptions
- 3 EQ scales based on reference budgets

Equivalence scales based on expenditure patterns

- most common regression-based approach using HBS microdata (Dudel et al., 2021)
- traditional Engel method focused on the food exp. share (Deaton & Muellbauer, 1986)
- regression specification featuring per capita income (y_h/n_h) and HH size n_h on the RHS

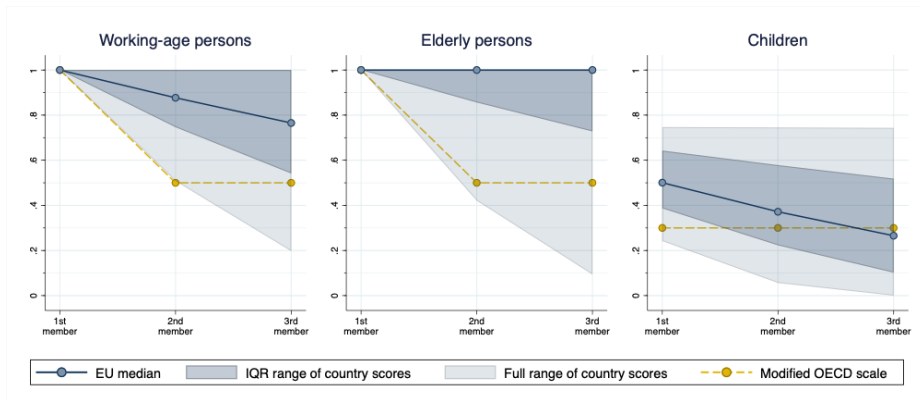
$$s_h^F = \alpha + \beta_y \ln(y_h/n_h) + \beta_n n_h + \gamma' \mathbf{x}_h + \epsilon$$

- normalised scales for particular HH type H relative to reference type R is calculated as:

$$S_H = y_H/y_R = (n_H/n_R) e^{(\beta_n/\beta_y)(n_R - n_H)}$$

Equivalence scales based on expenditure patterns

Results based on the analysis of the 2015 wave of the EU-HBS



- individual weights are consistently higher than MOECD and imply small economies of scale
- cross-country variation is substantial

Equivalence scales based on subjective perceptions

- established approach based on direct reference to HHs' subjective well-being / perceptions
- objectivised vs. fully subjective methods using information on perceived minimum needs
- intersection method to identify HHs where actual & perceived minimum income coincide (Goedhart et al., 1977)

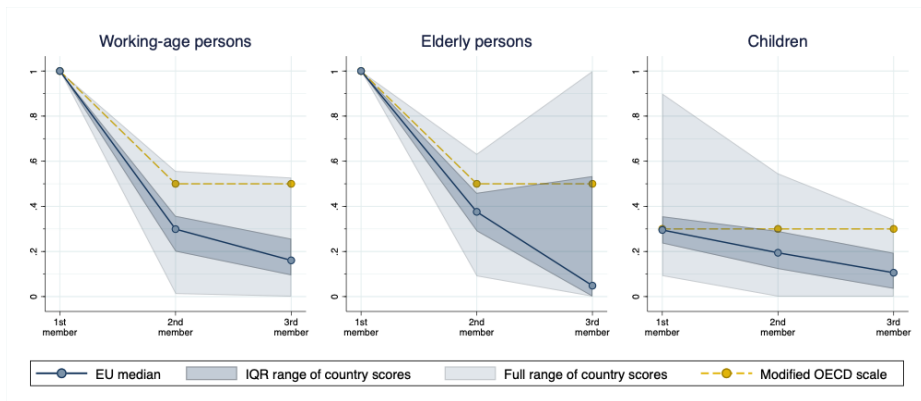
$$\ln(y_h^{\min}) = \alpha + \beta \ln(y_h) + \gamma' \mathbf{x}_h + \epsilon$$

- subjective poverty line SPL_H for HH type H is calculated as:

$$\text{SPL}_H = e^{(\hat{\alpha} + \hat{\gamma}' \mathbf{x}_h) / (1 - \hat{\beta})}.$$

Equivalence scales based on subjective perceptions

Results based on the analysis of the 2019 wave of the EU-SILC (variable HS130)



- individual weights are significantly lower than MOECD and imply very large economies of scale
- cross-country variation is substantial

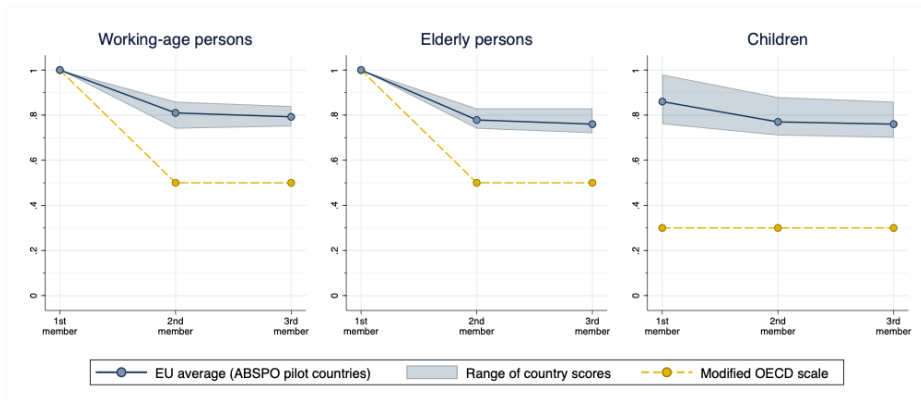
Equivalence scales based on reference budgets

Reference budgets

- represent the cost of illustrative baskets of goods and services associated with a pre-determined standard of living
- ideal tools for equivalisation in theory
 - modular & flexible construction allowing for piecemeal welfare comparisons
 - may integrate subjective / consensual / expert-based perspectives
- rarely used in practice
 - mostly illustrative and focus on selected HH arrangements
 - highly subjective in character
 - decidedly low-income focus on the social minimum

Equivalence scales based on reference budgets

Results based on mixed-method reference budgets from the ABSPO project



- individual weights are significantly higher than MOECD and imply very small economies of scale
- only a handful countries are covered (Belgium, Finland, Hungary)

Conclusion & policy implications

Analysis

- a model of equivalence scales that shows their dual functions related to needs and preferences
- rather comprehensive empirical analysis of low-income equivalence scales

Results

- implied equivalence scales are highly variable across countries and methods alike
- moreover, subjective and expenditure-based EQ scales are negatively related across countries

Policy implications

- sticking to the modified OECD scale is not a bad choice, after all
- more research needed, esp. for growing EU agenda on adequate incomes / wages / unemployment benefits