Elasticity of Marginal Utility of Consumption in the European Region: The Absolute Equal-Sacrifice Approach

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Why Elasticity of MU of Consumption?

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- Welfare estimation has remarkable implications for the allocation of funds to various social projects

- The efficiency of such social projects is usually evaluated through benefit-cost analysis (BCA)

- The key aspect of the estimation of social welfare lies in determining **the social discount rate (SDR)**, which states the rate at which society is willing **to accept the inter-temporal trade-offs of consumption.**

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Research Questions

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- Is our estimate in line with the estimates coming from elsewhere?
- What is the implication of our research on the value of the social discount rate?

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Determining the social discount rate (SDR)

- (Ramsey, 1928) suggested using the following formula known as the Ramsey rule:

$$r = \rho + \mu g(C)$$

- r is the social discount rate
  ρ is the rate of pure time preference
  $g(C)$ is the real growth rate of per capita consumption
  μ is **the elasticity of marginal utility of consumption**

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- Typically, the value of ρ equals 3%, 1%, 0%, or a near-zero rate of time preference as in the case of the 2006 Stern Review on the Economics of Climate Change (Dasgupta, 2021; Tol, 2013).

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- μ attracts various economic interpretations: μ refers to intra-temporal inequality aversion, inter-temporal inequality aversion or risk aversion (Dasgupta, 2008; Drupp et al., 2018; Sælen et al., 2009)
- Most Integrated Impact Assessment (IAM) models, including DICE, PAGE, FUND, and WITCH have used the values of $\mu = 1$ or $\mu = 1.5$

Determining μ

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- The parameter μ can be estimated relying on **indirect behavioural evidence**, **social values revealed through acceptance of tax schedules**, or survey data that contain information about felicity (Evans, 2005)
- This study focuses on a robust estimation of the parameter μ for the European region using income tax schedules, **namely the absolute equal-sacrifice approach**

The absolute equal-sacrifice approach

- The electorate has agreed on the tax structure such that each consumer should equally sacrifice (Groom & Maddison, 2019; Mill, 1848, Bk. V, Ch. II):

$$U(Y) - U(Y - T(Y)) = k$$

- k is constant
  $T(Y)$ is the the total tax liability
  Y is the gross income

- Proportional and Marginal approaches

The absolute equal-sacrifice approach

- It requires the use of the iso-elastic utility function - constant relative risk aversion (CRRA) functions:

$$U(Y) = \frac{Y^{1-\mu} - 1}{1 - \mu}$$

- μ is the coefficient of relative risk aversion (used as **the elasticity of marginal utility of consumption**)
  Y is the gross income

The absolute equal-sacrifice approach

- Putting all assumptions together we get:
  computed

$$\mu = \frac{ln(1 - M\hat{T}R)}{ln(1 - \frac{T(Y)}{Y})}$$

  or regressed

$$ln(1 - M\hat{T}R) = \mu ln(1 - \frac{T(Y)}{Y}) + \epsilon$$

- $M\hat{T}R$ is the Marginal Tax Rate (derived by OLS estimation $T(Y)_{t,j,h} = MTR_{t,j} * Y_{t,j,h} + e_{t,j,h}$ from the individual data)
  $\frac{T(Y)}{Y}$ is the Average Tax Rate for whole sample (or groups)

Data

- EU SILC datasets covering information about households between 2004 and 2020 from 30 countries
- Information about Income, Paid Income Tax (PIT), Social and Health Insurance (paid by employee and employer), Social Benefits

Data

- Approaches:

  Computed
  Regressed with 95% CI

- Variable definition:

  TAX = PIT + Social and Health Insurance
  Income = all income **included** Social Benefits

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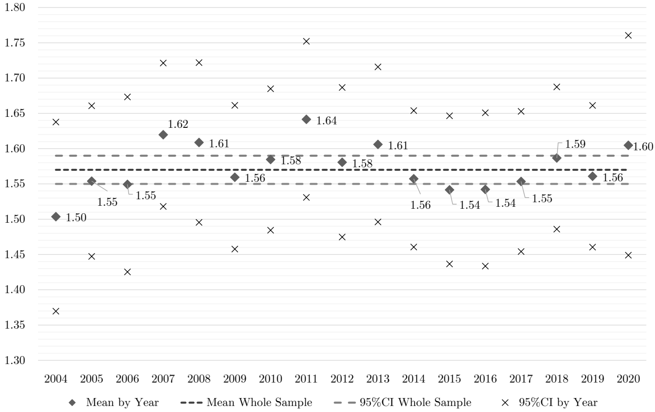
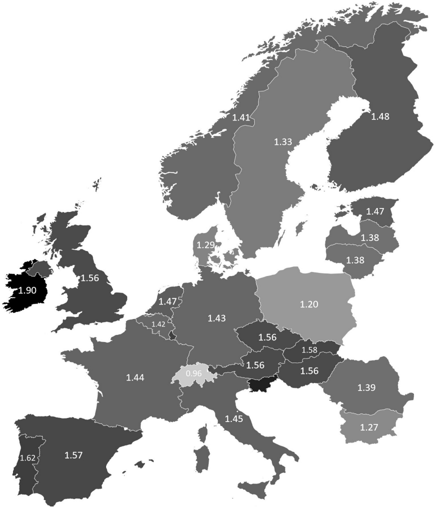
Results, Computed, by year

Figure: Estimate of the parameter μ



Note: Own computation using SILC datasets, pooled data 2004 until 2020, 95% CI

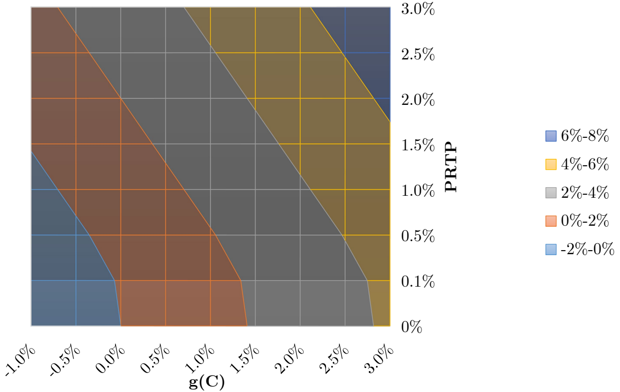
Results by Country (regressed)



Slovenia indicates $\mu_{SI} = 1.77$, Luxembourg $\mu_{LU} = 1.61$, Malta $\mu_{MT} = 1.59$, Cyprus $\mu_{CY} = 1.57$, Iceland $\mu_{CY} = 1.40$ and Greece $\mu_{EL} = 1.37$.

Discussion & Implication

Figure: Central estimate $\mu = 1.42$



Note: $\mu = 1.42$ is our central estimate for covered countries (regression method)

Discussion & Implication

- Past studies have provided a wide range of estimates of μ, ranging between 0.2 up to even 10 (Evans, 2005; Groom & Maddison, 2019), with the most cited **values between 1.3 and 1.6**

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- Our study **does not support** the standard use of $\mu = 1$

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Future Research

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- Put into contrast intra-temporal, inter-temporal and risk aversion aspects of μ

Questions