Using a Structural Labor Supply Model to Calculate Inverse-Optimum Social Marginal Welfare Weights

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This paper: Simple method to estimate inverse optimal weights

- Estimate implicit social marginal welfare weights $g(y)$ (see, e.g., Saez and Stantcheva, 2016) along the distribution of net incomes in Germany.
- If current system is optimal, weights indicate how much society values providing one additional Euro of consumption to individuals earning y.
- Equivalently, weights indicate the fiscal cost of redistributing one Euro to individuals with specific income. $\rightarrow$ Can identify small reforms with much "bang for the buck".
- We propose a simple method related to the marginal value of public funds (Finkelstein and Hendren, 2020; Hendren and Sprung-Keyser, 2020; Hendren, 2020) to obtain these weights.
- It imposes fewer restrictions than commonly used optimal-tax models.

Results: High weights for unemployed, low weights for working poor

- The tax-transfer system is optimal if society values one Euro for people at the 10th percentile twice as much as one Euro for people at the median.
- Weights for people at the 20th percentile slightly lower than for the middle class.
- Lower weight for working poor less pronounced than in related papers.

Uses

- Finding potential Pareto improving reforms (right-hand side of Laffer curve)
- Quantifying deadweight loss of feasible reforms
- Quantifying implicit value judgement if current tax-transfer system is considered optimal
- Testing validity of currently used optimal taxation models

Literature imposes several restrictions

- Many papers use optimal tax models with closed form solutions to calculate inverse optimal weights (Ayaz et al., 2021; Bargain et al., 2014; Blundell et al., 2009; Bourguignon and Spadaro, 2012; Hendren, 2020; Jacobs et al., 2017; Jessen et al., 2022; Lockwood and Weinzierl, 2016).
- Typical important simplifying assumptions:
  - No modelling of couples' labor supply
  - No participation decision, no discrete jumps (Saez, 2001)
  - No discrete jumps except for participation decision (Hendren, 2020; Jacobs et al., 2017)
  - Only discrete labor supply adjustments to close hours choices or out of work force (Saez, 2002)
- Often use labor supply models like ours to obtain elasticities and then impose restrictions.
- Typical result: Implied weights for working poor are lower than for middle class.
- Reason: High implicit marginal tax rate at the bottom.

Marginal Cost of Taxation = Inverse weight

- Consider a small increase in transfers for the poor.
- Benefit of 1 Euro transfer = 1 Euro for those who do not adjust labor supply
- In reaction some people reduce/increase labor supply $\rightarrow$ Welfare effect for these people: 0 (envelope theorem)
- Fiscal externality (FE)
- Cost of transferring 1 Euro = 1 Euro + FE
- Related: Marginal value of public funds in case of cash transfer: $1/(1 + FE)$ (Finkelstein and Hendren, 2020; Hendren and Sprung-Keyser, 2020)
- At optimum cost of transfer equals valuation of 1 additional Euro of consumption for that group (Hendren, 2020).
- Fiscal externality differs between different groups.

Simulation of Marginal Cost of Taxation

- Set up a labor supply model that allows to simulate labor supply responses to changes in net income.
- Increase net incomes for all households in specific percentile by 100 Euro per year per person.
- Benefit: 100Euro $\times$ Number of directly affected people
- Cost: Simulated increase in government expenditure:
  - Benefit + fiscal externality
  - Fiscal externality: total change in (gross income - net income) for households that adjust labor supply
- Then calculate cost per Euro of benefit, i.e.
  Total Cost/Total Benefit $= (1 +$ Fiscal Externality per Euro$)/1$

Calcualtion of Net Incomes with Representative Household Data

- RWI's microsimulation model EMSIM (Bechara et al., 2015)
- Calculates disposable income for every household in the Socio-Economic Panel (SOEP) given observed (or imputed) market income and characteristics
- Detailed modelling of taxes, social security contributions and transfers
- Calculate disposable incomes for different choices of work hours given a constant hourly wage
- Impute hourly wages for those who do not work currently using a Mincer-style selection-corrected wage regression

A Structural Labor Supply Model

- Follows Aaberge et al. (1995) and van Soest (1995).
- Utility of household for hours alternative z:

$$V_z = U(Lf_z, Lm_z, C_z) + \varepsilon_z \tag{1}$$

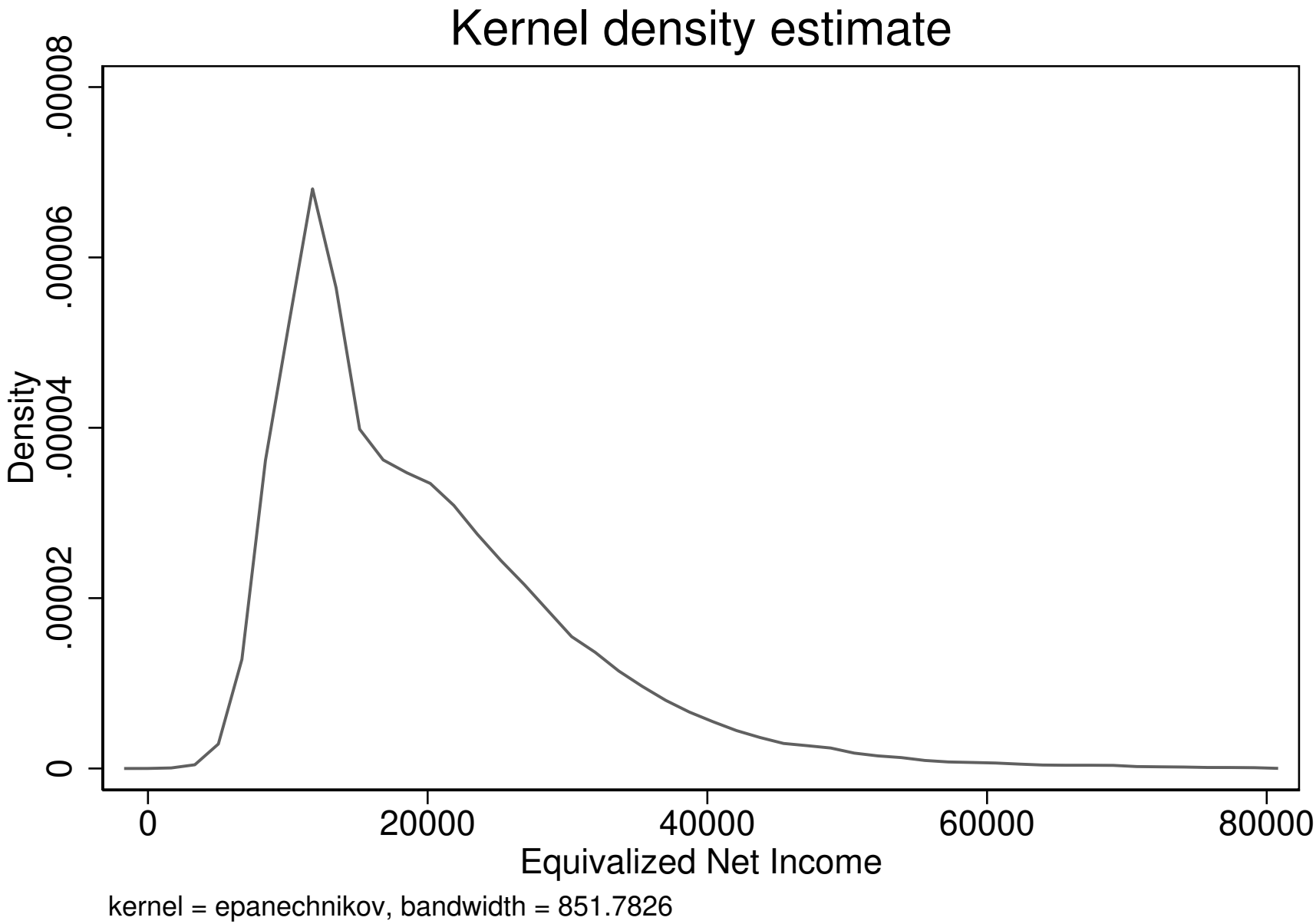
- Deterministic part of the utility function: translog utility function including interactions with socio-demographic household characteristics
- Error terms ε_z i.i.d. across hour categories and households according to the Extreme-Value type I (EVI) distribution
  $\rightarrow$ closed form solution for probability P^z that household chooses category z (McFadden, 1974)
- Probability that alternative z is preferred by the household:

$$P_d^z = Pr(V_z > V_j, \forall j = 1 \ldots J) = \frac{exp(U_z)}{\sum_{j=1}^{J} exp(U_j)}, z \in J. \tag{2}$$

The data: SOEP

- SOEP wave 2018 with retrospective questions for 2017
- Restrict sample to households with flexible labor supply
- Drop self employed (difficult to model), pensioners, people in parental leave
- 12,911 households, representative for 23,383,105 households and 53,944,893 persons.

The income distribution



Own-Wage Labor Supply Elasticities

- Simulated with a 1 percent increase in gross wages

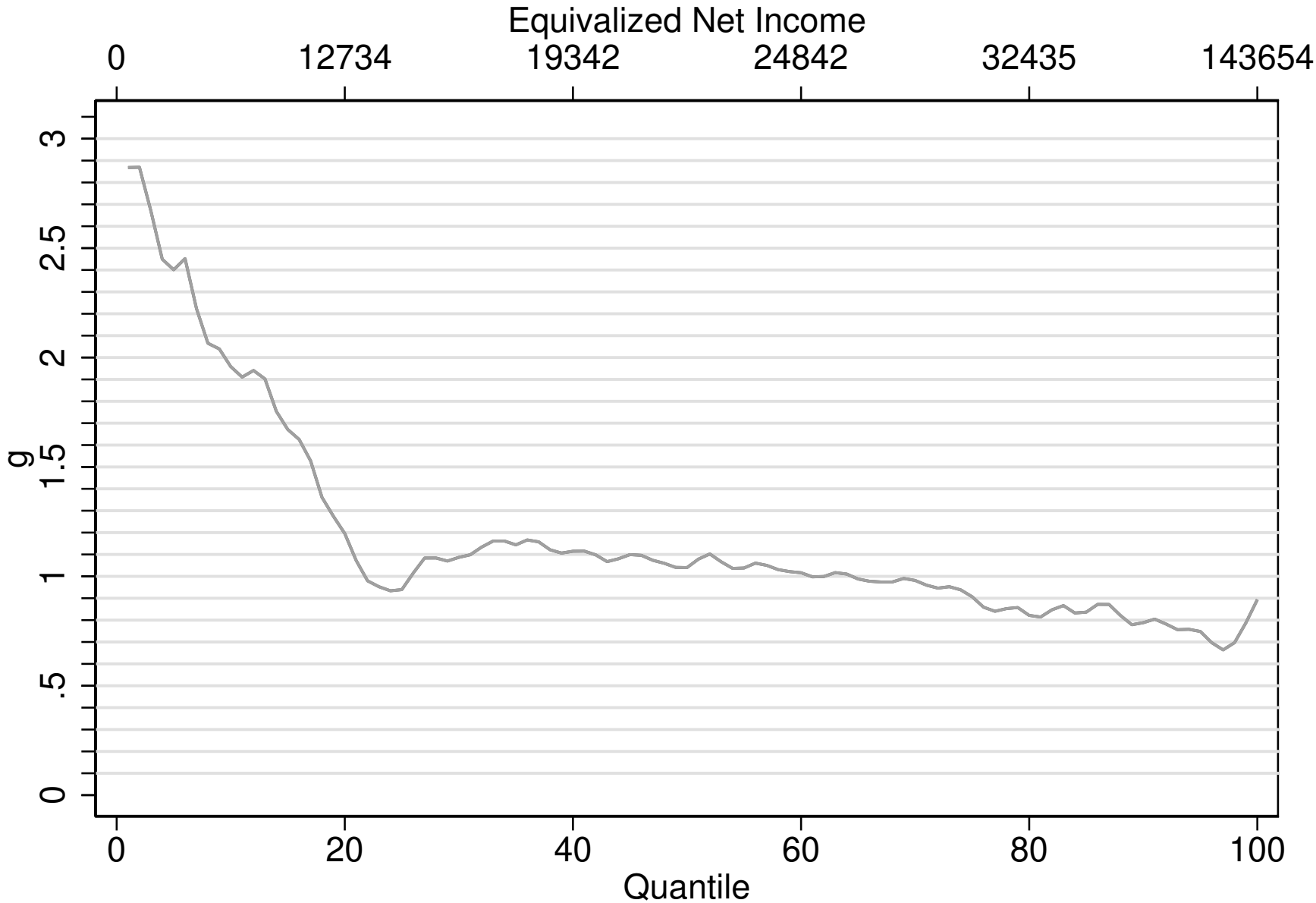
	women	men
single women	0.23	.
single men	.	0.29
couples, both flexible	0.39	0.15
couples, woman flexible	0.38	.
couples, man flexible		0.20
all	0.33	0.20

Own-Wage Participation Semi-Elasticities

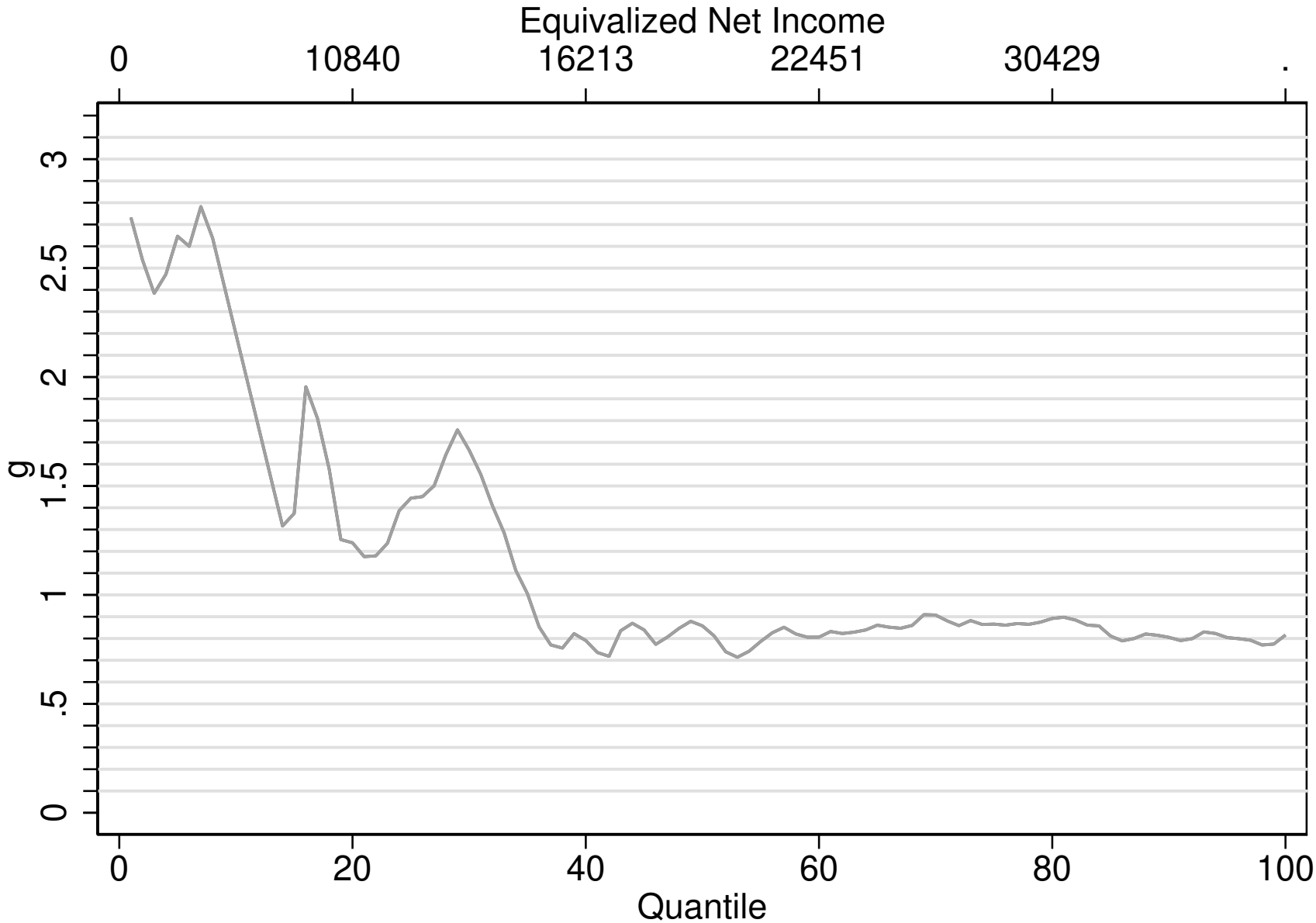
- Simulated with a 1 percent increase in gross wages
- Increase in participation rates to a one percent increase in gross wages

	women	men
single women	0.11	.
single men	.	0.14
couples, both flexible	0.15	0.08
couples, woman flexible	0.14	.
couples, man flexible	.	0.10
all	0.09	0.06

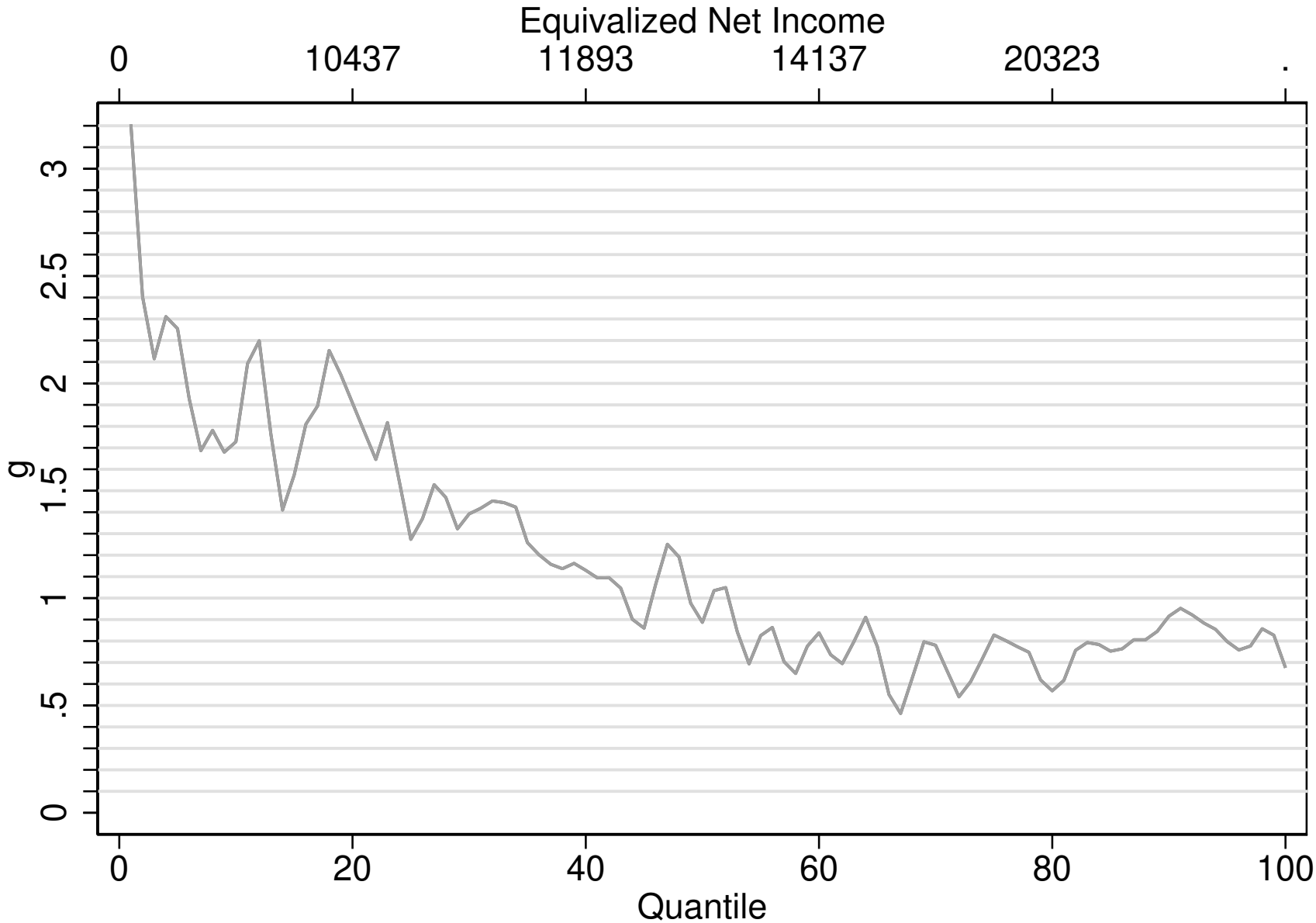
Inverse-Optimum Social Marginal Welfare Weights: All households



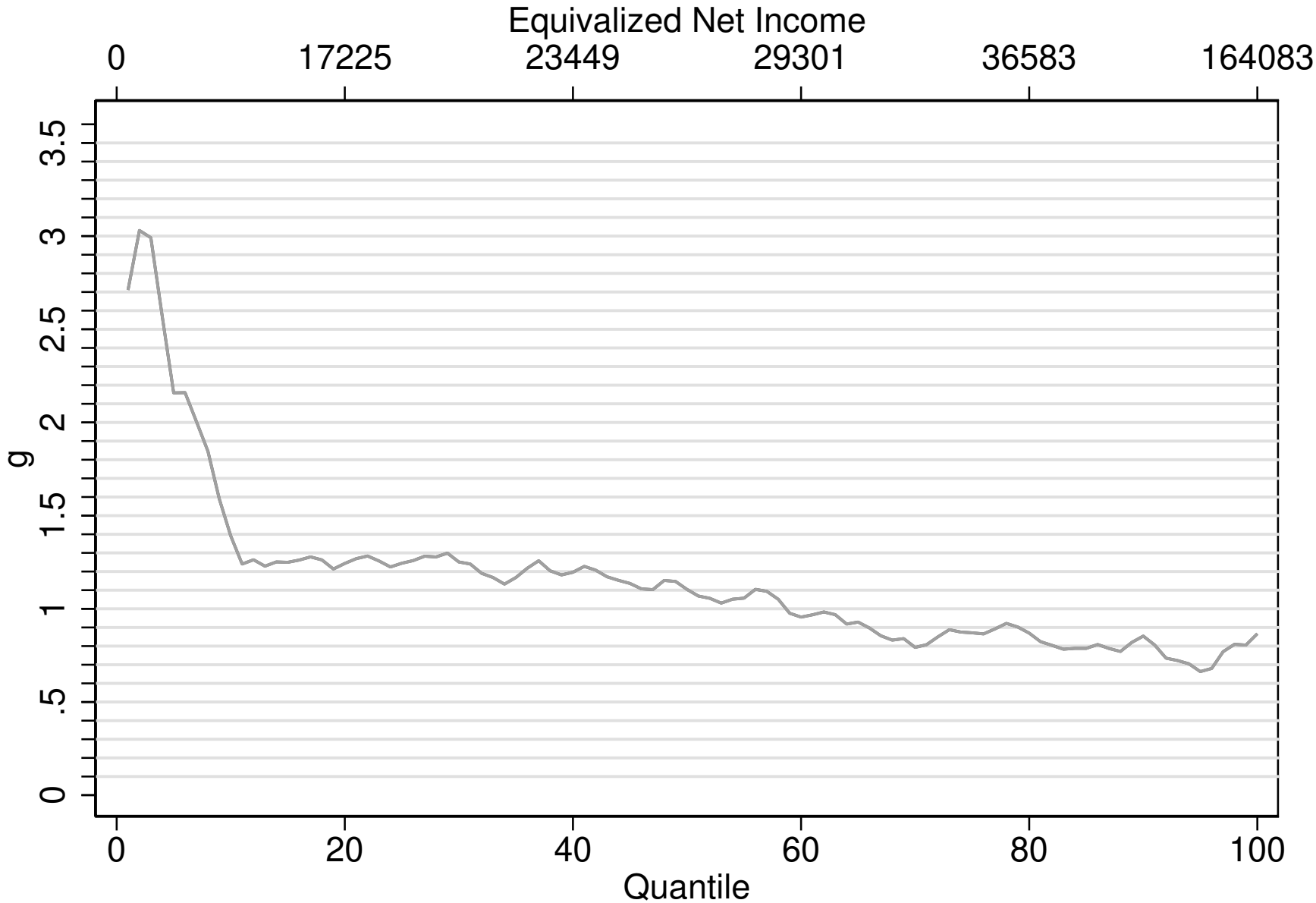
Inverse-Optimum Social Marginal Welfare Weights: Singles



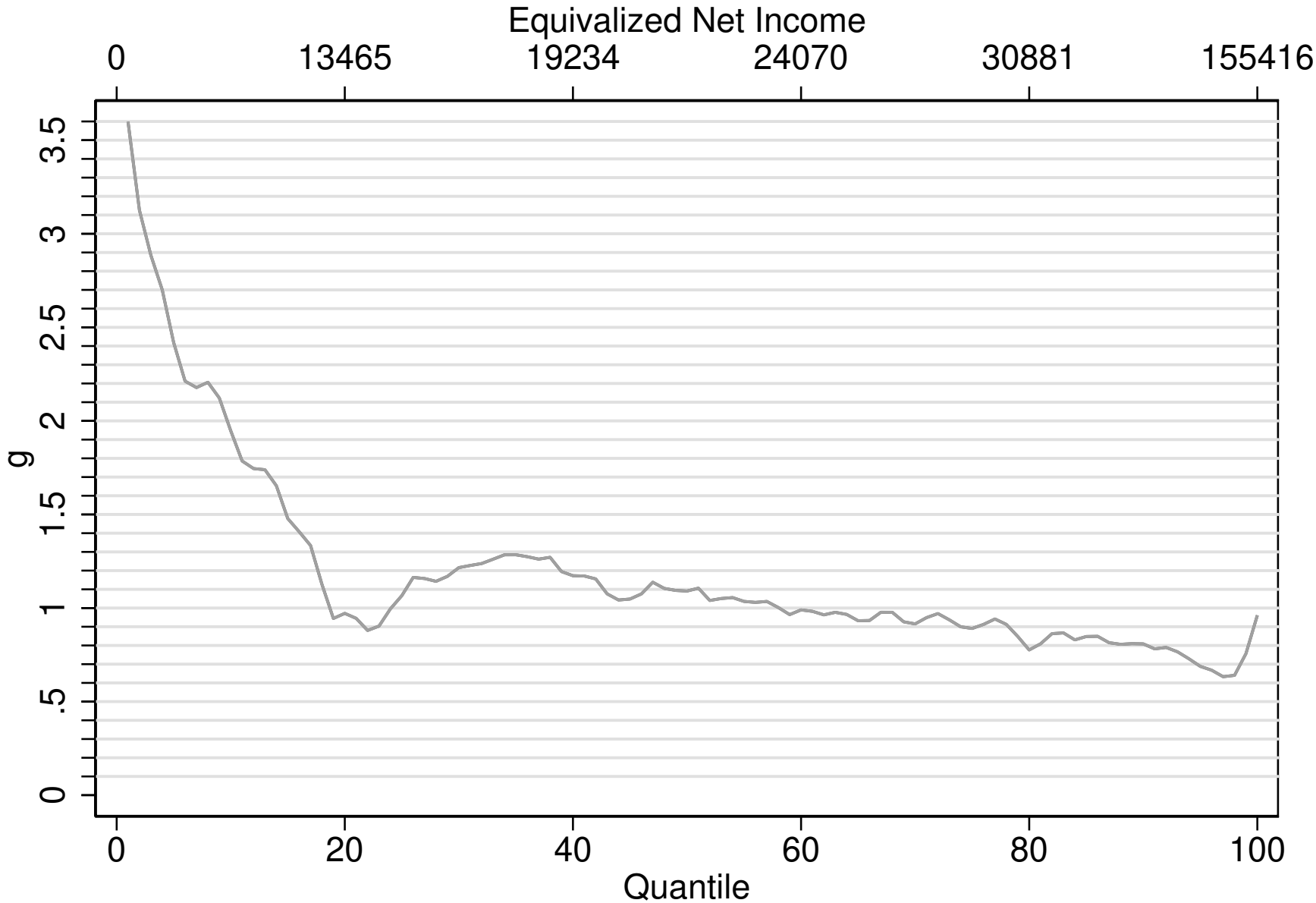
Inverse-Optimum Social Marginal Welfare Weights: Lone parents



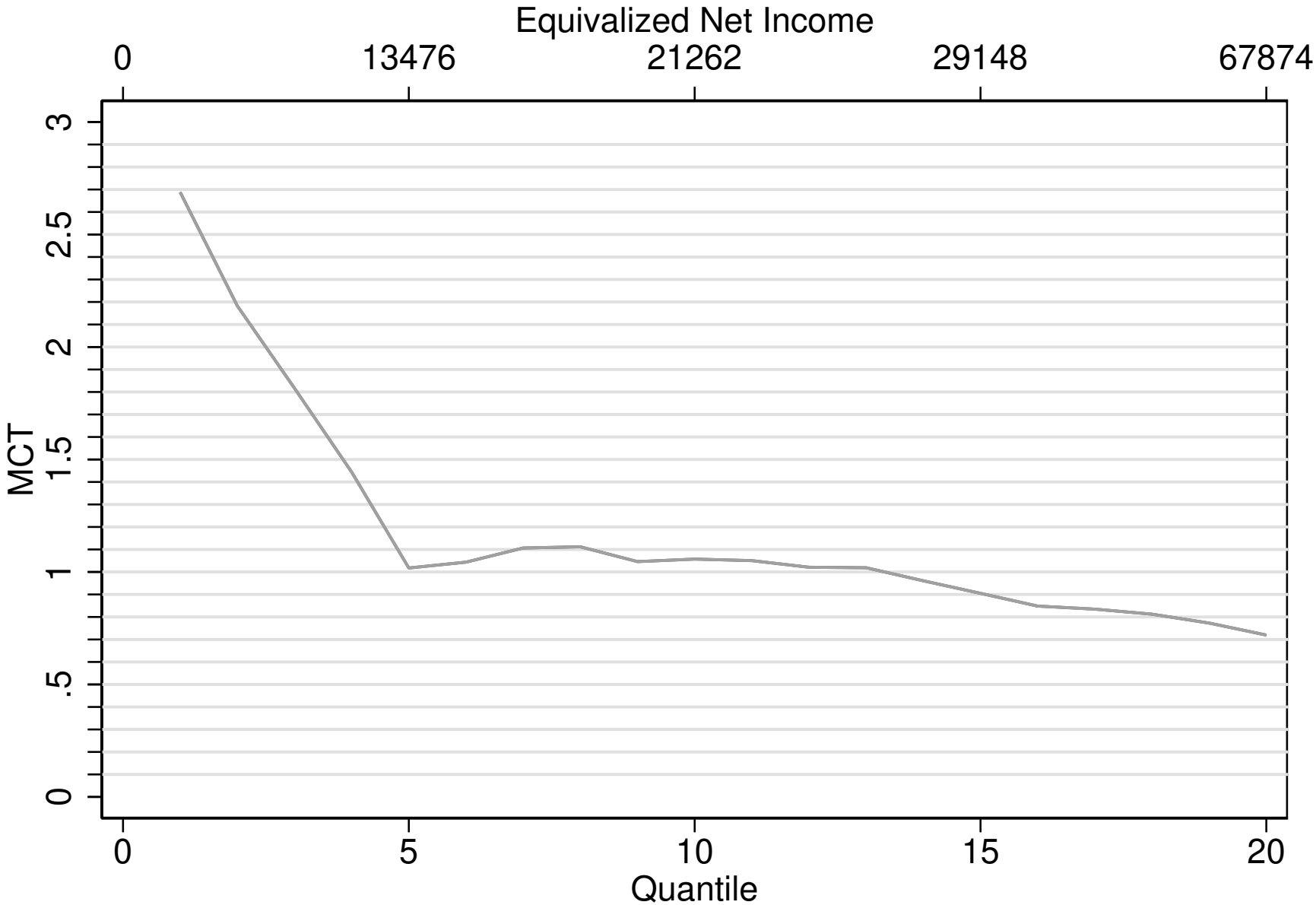
Inverse-Optimum Social Marginal Welfare Weights: Childless Couples



Inverse-Optimum Social Marginal Welfare Weights: Couples with children



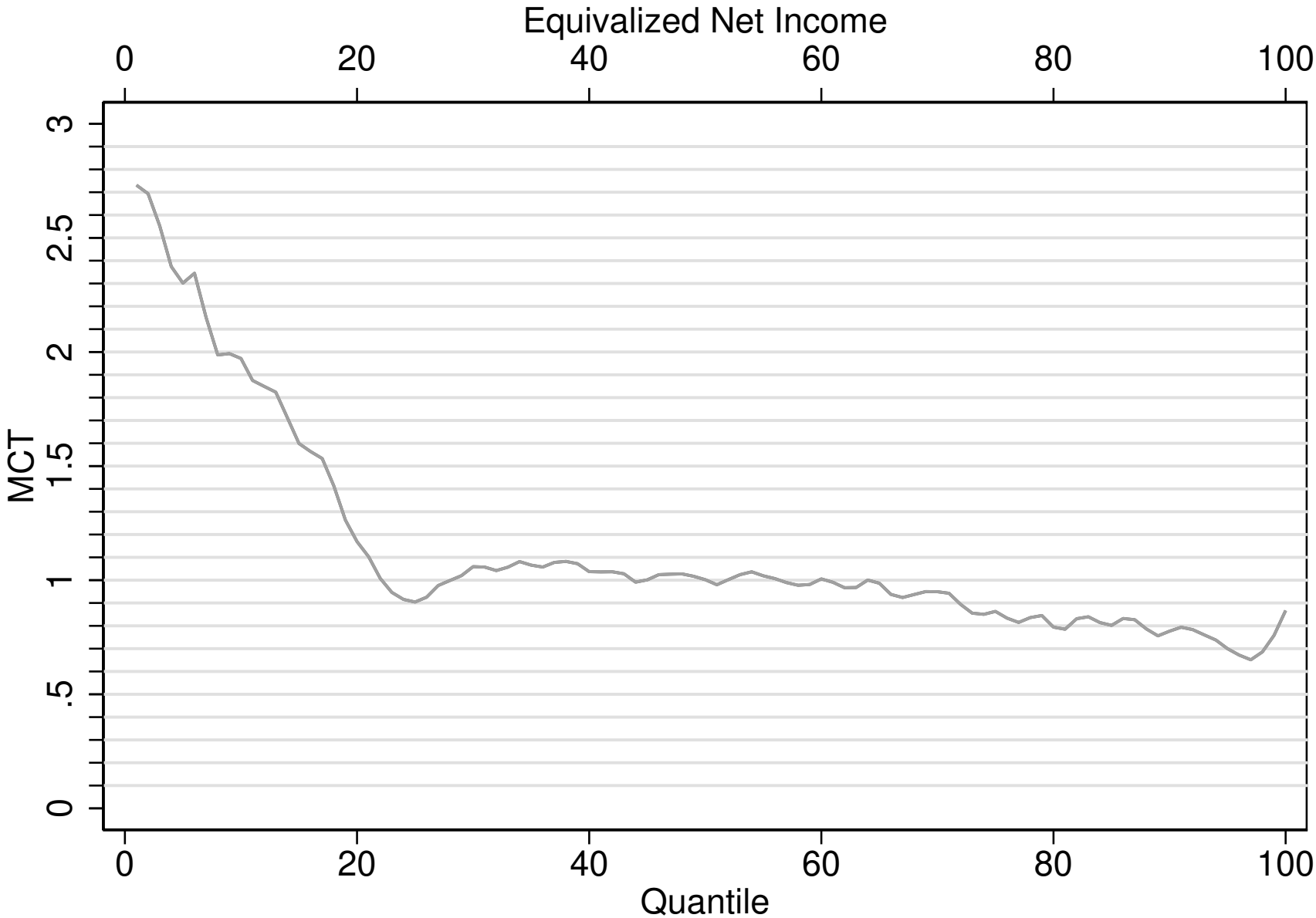
All households, but with 20 quantiles



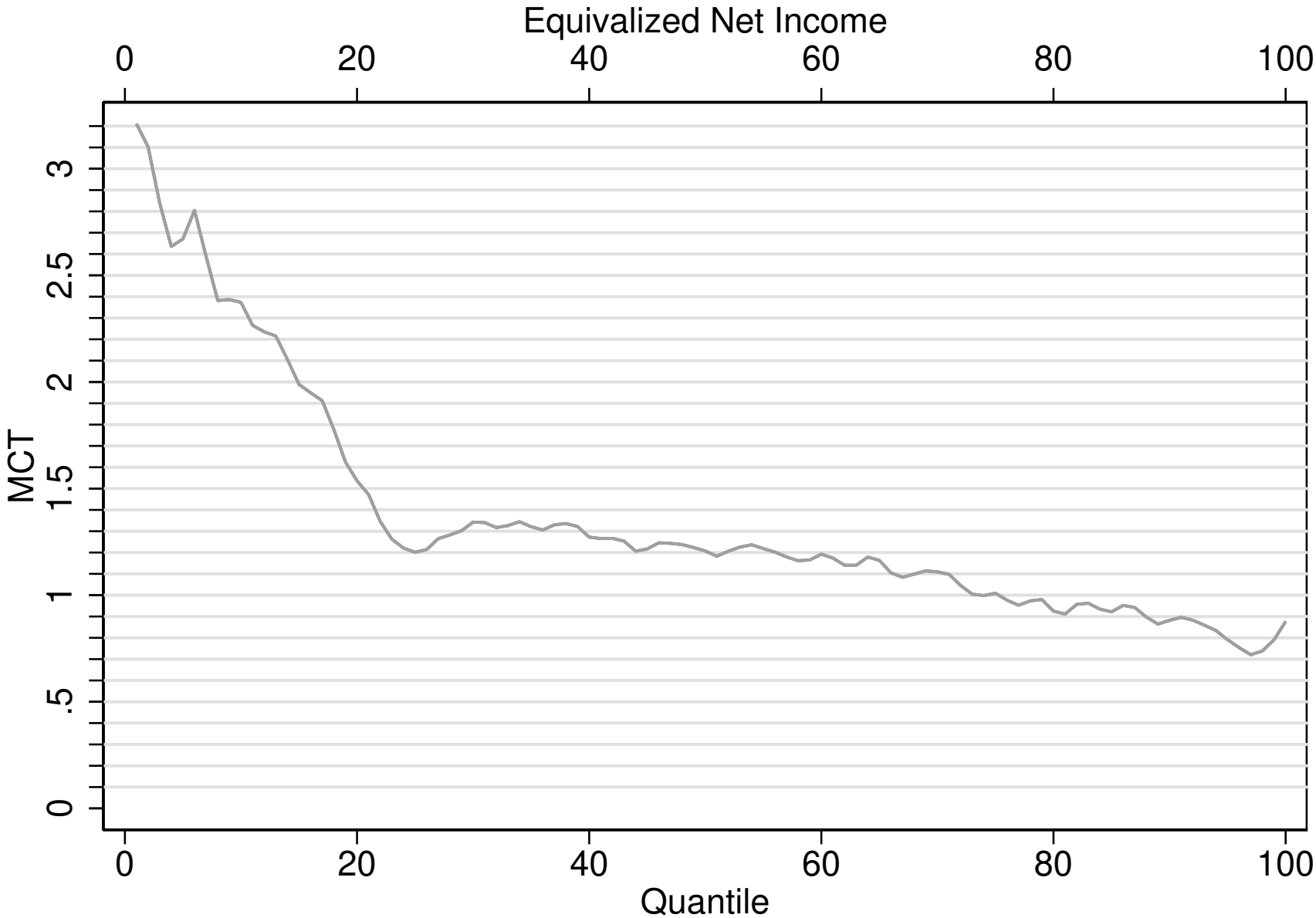
How does it scale?

- Estimated MCTs might differ for larger transfers because of the distribution of incomes, the utility functions and the tax-transfer-system
- Careful with interpretation:
  - Envelope theorem can only be applied for "small" transfers
  - Actual money metric loss due to transfer might differ from the calculated one
  - To do: Calculate equivalent variations for affected households
- What happens if the size of the transfer is smaller or larger?

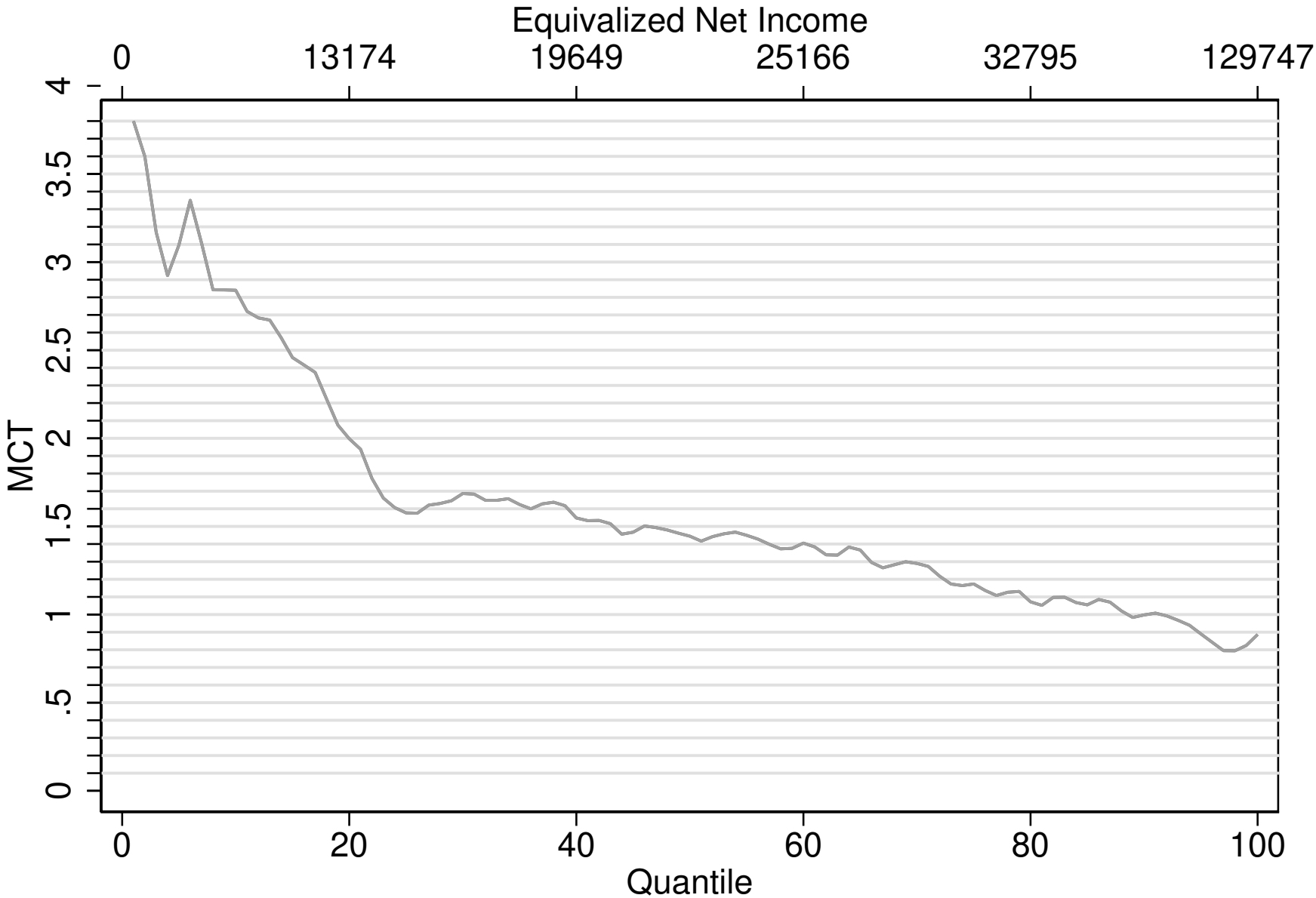
All households, but transfer is 10 Euro per person



All households, but transfer is 500 Euro per person



All households, but transfer is 1000 Euro per person



Different magnitudes for transfers: summary

- Cost of Transfer increases with size of transfer.
- This is expected as the excess burden of taxes increases with the marginal tax rate.
- Example: Increased net income for first quantile means a higher marginal tax rate for moving from first to second quantile.

Conclusions

- Current tax-transfer system is optimal if society values one Euro for people in the 10th percentile twice as much as one Euro for people at the median.
- Weights are slightly lower for working poor at 20th decile than at the middle.
- Equivalently, tax cuts for working poor offer a large "bang for the buck".
- Next steps:
  - Compare with other optimal tax models.
  - Describe what kind of labor supply adjustments occur with small reforms.
  - Calculate optimal tax schedule by imposing optimal weights and iterate until inverse weights equal imposed weights.

Thank you!

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Comparison of results to literature

- Higher cost of transfers for low income earners
- Relatively low cost of transfers for low to medium income earners
- Childless singles in Germany:
  - Bargain et al. (2014) use data for 1998 and find 8 times higher weights for the unemployed than for most working groups; weights of zero for the working poor and relatively constant weights for medium to high income workers.
  - Jessen et al. (2018) use data for 2014; weights of unemployed more than 2.5 times as high as those for other groups: lowest, but still positive, weights for the working poor. Likely reason for difference: substantially smaller elasticities for working poor than in Bargain et al. (2014).
- Blundell et al. (2009)—lone mothers in Germany: Weight for unemployed more than twice that of other groups, lowest weight for working poor

Reducing net incomes

- Now we reduce net incomes by 100 Euro, i.e. "transfer" of -100 Euro per person
- Here calculation is not 100 percent correct because benefit of a 1-Euro transfer is 1 only for those who do not adjust labor supply (to do: calculate equivalent variations)
- When reducing net income some of those whose net income decreases before labor supply adjustments will choose to adjust labor supply

All households, but transfer is -100 Euro per person (reduce net income)