

Income Inequality and the Economic Value of Nature

Motivation

How does the distribution of income among members of society affect the social willingness to pay (WTP) for environmental public goods?

Relevance for (i) benefit transfer and (ii) sustainability policy aiming at allocative efficiency and distributive justice.

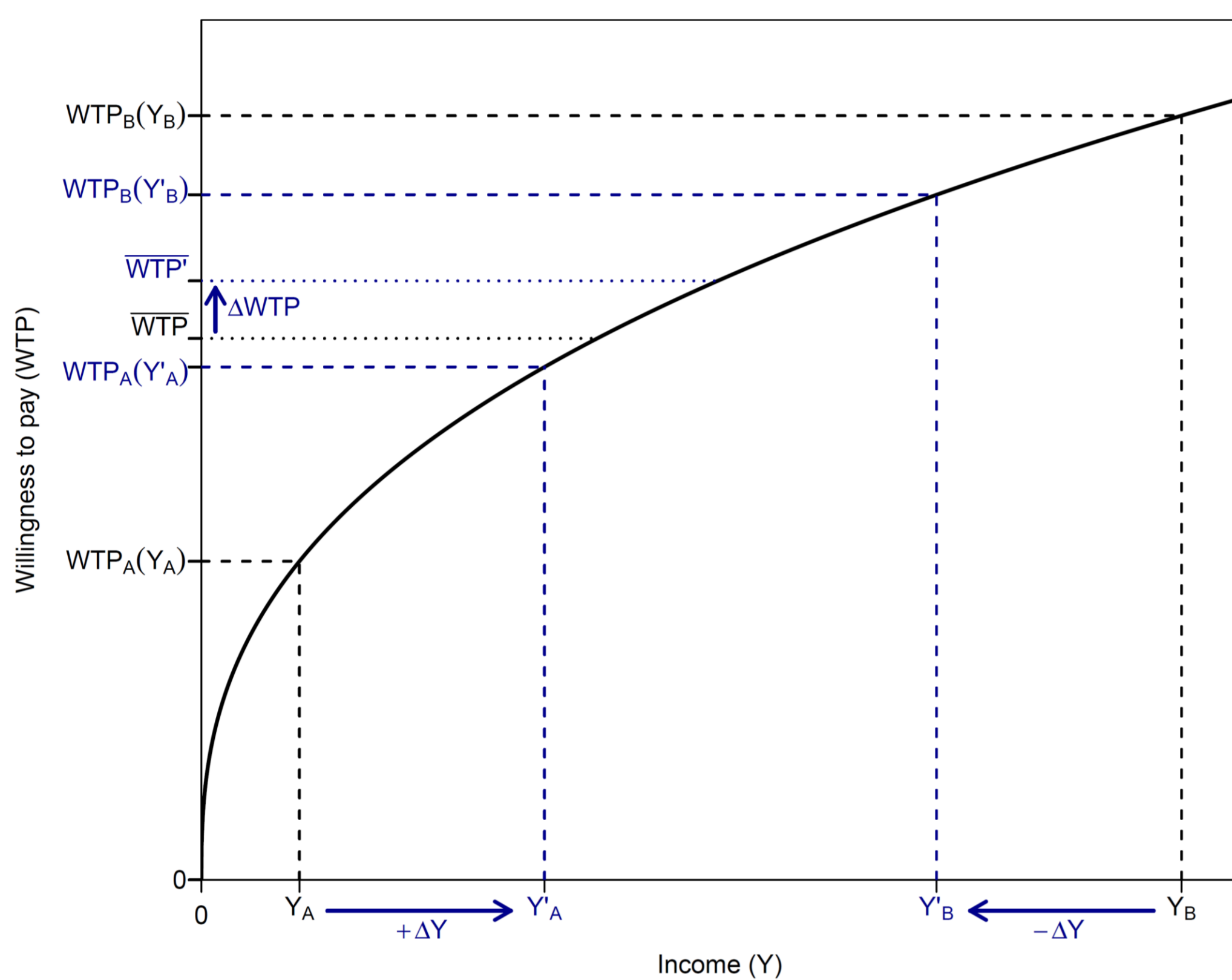


Figure 1: A more equal distribution of income increases mean WTP for environmental public goods of two households ($\Delta WTP > 0$), if the income elasticity of WTP is below unity.

Model

Households' well-being is determined by consumption of a private consumption good X (traded on a market at given price $p > 0$) and a pure public environmental good E (exogenously given level $E > 0$).

Households have identical preferences over (X, E)

$$U(X, E) = \left(\alpha X^{\frac{\theta-1}{\theta}} + (1 - \alpha) E^{\frac{\theta-1}{\theta}} \right)^{\frac{\theta}{\theta-1}}, \text{ with}$$

constant elasticity of substitution $\theta \in (0, +\infty)$ and $\alpha \in (0, 1)$.

Following Ebert (2003, *ERE*) household's total WTP is

$$WTP(Y) = \kappa Y^\eta \text{ with } \kappa = \frac{1-\alpha}{\alpha} (pE)^{\frac{\theta-1}{\theta}},$$

where $\eta = \frac{1}{\theta}$ is the income elasticity of WTP.

Income Y is log-normally distributed with mean μ_Y and standard deviation σ_Y . Mean WTP for the environmental good at level E is then given by

$$\mu_{WTP} = \kappa \mu_Y^{\frac{1}{\theta}} (1 + CV_Y^2)^{\frac{1-\theta}{2\theta^2}}, \text{ where } CV_Y = \frac{\sigma_Y}{\mu_Y}.$$

References:

- Drupp, M.A., Meya, J.N., Baumgärtner, S., Quaas, M.F. (2018): Economic inequality and the value of nature. *Ecological Economics*, 150: 340-345.
 Meya, J.N., Drupp, M.A., Hanley, N. (2018): Income inequality and the international transfer of environmental values. *Kiel Economics Working Paper No 2017-03*.
 Baumgärtner, S., Drupp, M.A., Meya, J.N., Munz, J.M., Quaas, M.F. (2017): Income inequality and willingness to pay for public environmental goods. *Journal of Environmental Economics and Management*, 85: 35-61.

Data: Global biodiversity conservation

- WTP data is taken from a meta-study by Jacobsen and Hanley (2009, *ERE*), who gathered 145 WTP-estimates for all kinds of biodiversity conservation
 $\mu_{WTP} = 89,50$ [2006-PPP-US\$], $\eta = 0.38 \pm 0.14$.
- Lognormal distribution of global household income is specified using world per-capita income (Pinkovskiy/Sala-i-Martin 2009, *NBER*) and household size (Dorling et al. 2010).

Selected results

Proposition: Mean WTP for the environmental public good decreases (increases) with relative income inequality, CV_Y , if and only if the environmental public good and the private consumption good are substitutes (complements).

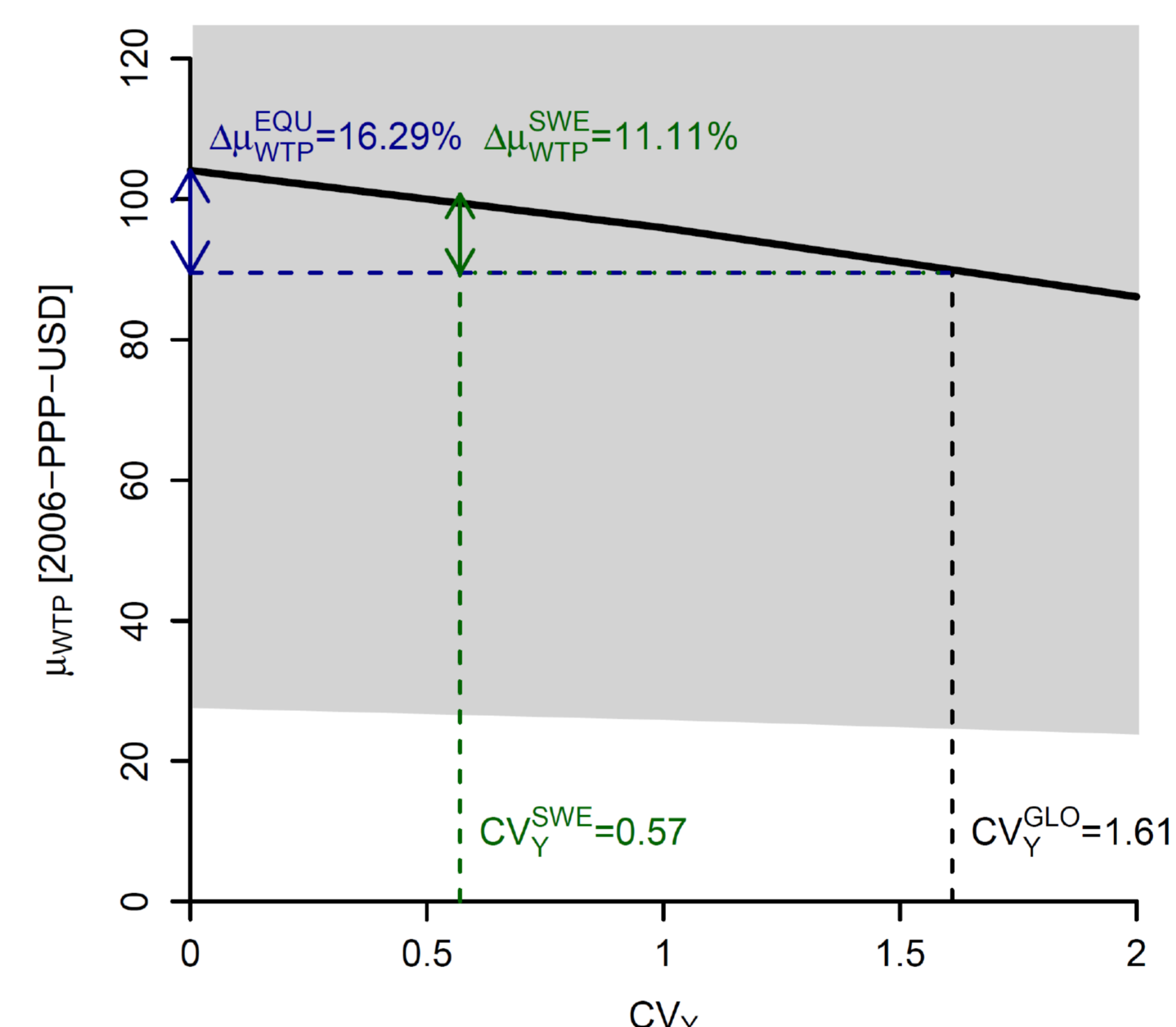


Figure 2: How mean WTP for global biodiversity conservation is affected by global income inequality.

Conclusion

- Benefit transfer:** Correct WTP estimates for differences in income inequality between policy and study context.
Sustainability policy: Adjust WTP estimates for income inequality and use inequality-corrected WTP-estimates for efficiency (e.g. cost-benefit) analysis.

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Topics: Internationale Environmental Agreements; Energy Transition; Inequality

Current lectures: Microeconomic Theory; Advanced Microeconomics; Public Economics

Key Publications

- C. Helm, M. Mier (2018): Efficient diffusion of renewable energies: A roller-coaster ride, *University of Oldenburg, Department of Economics, Working Papers V-389-16*.
- C. Helm, F. Wirl (2016): Climate Policies with Private Information: The Case for Unilateral Action. *Journal of the Association of Environmental and Resource Economists*, 3(4): 893-916.
- C. Helm, R.C. Schmidt (2015): Climate cooperation with technology investments and border carbon adjustment. *European Economic Review*, 75: 112-130.