Health adjusted income

Augmenting GDP to reflect aspects of wellbeing

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October 2024

European Commission

Agenda

- Health-adjusted income: why?
- Health-adjusted income: how?
- “Political use”: global comparisons
- Results: health-adjusted income in the future
- Some important challenges learned
- Another important area of a monetised ‘beyond GDP’ measure: adjustments for inequality
    - For our foresight perspective, projecting the distribution of income is critical

GDP misses important non-market aspects of wellbeing

- Satellite accounts for important non-market activities (resources, the environment, transportation, leisure, unpaid work…)
- People **value a longer and healthier life**, and are willing to pay for it
- It is an important aspect of improvements in wellbeing:

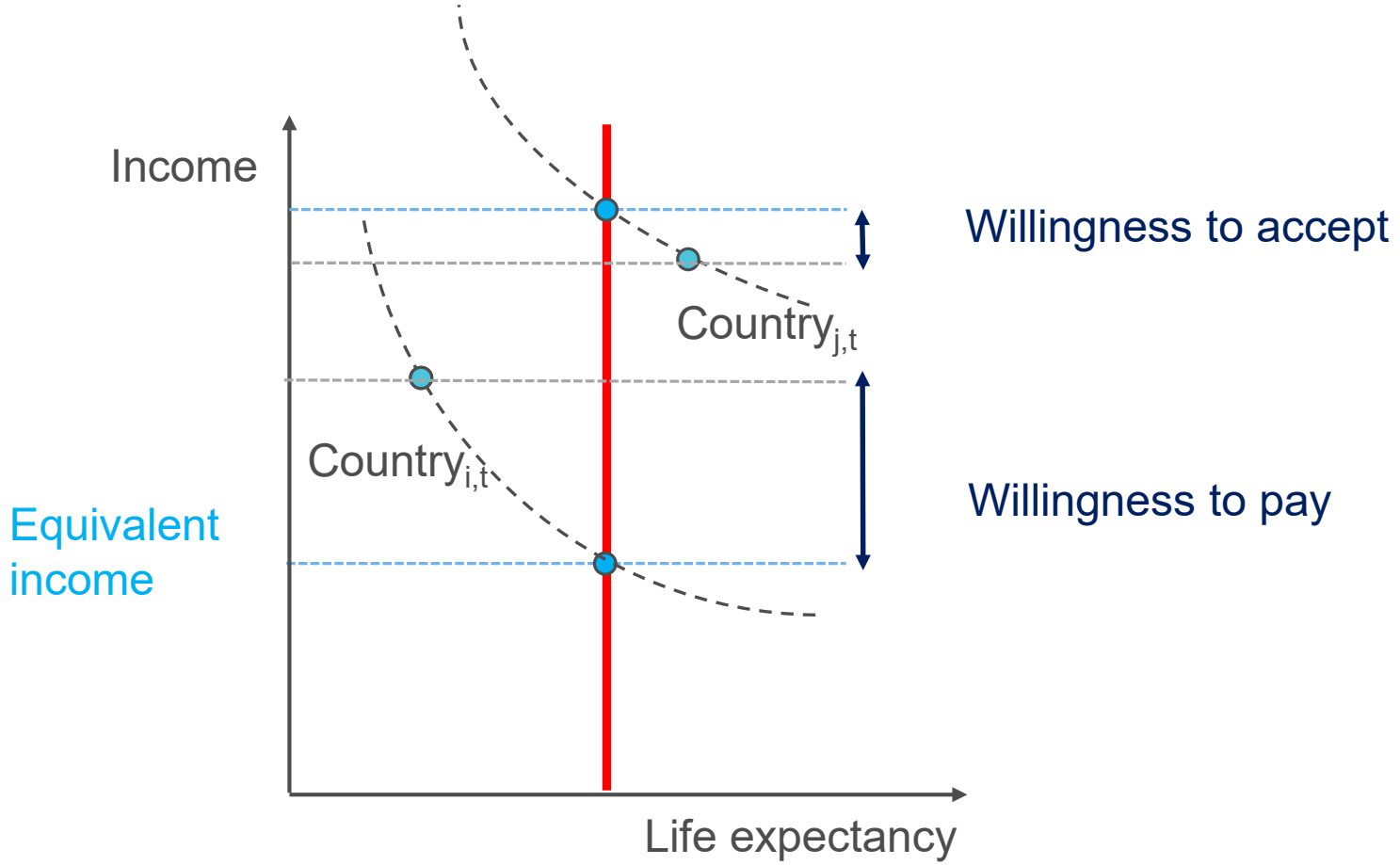
	World	Japan	Europe	North America
1950	46.5	59.2	62.8	68
2020	72	84.7	77.7	77.9
2050 (UN projection)	77.2	88.3	83.8	84

- A long-standing literature on the value people put on a longer and healthier life and that they are willing to put money on it
  - Value of a statistical life year (Jamison et al 2013, Usher 1973, Viscusi and Aldy 2003)
  - Welfare effects of health and life expectancy (Rosen 1988, Nordhaus 2003)

The willingness to pay approach

- The Nordhaus 2003 question: “You must choose either (a) 1948 health conditions and 1998 non-health living standards or (b) 1998 health conditions and 1948 non-health living standards. Which would you choose?”
- The methodology of equivalent income (in this case: health-adjusted income): fix a reference level of mortality and **compute the willingness to pay of the population** to obtain this reference level.
- Using **empirical studies** on people’s attitudes towards risk and savings
    - For example, the wage premium for risky jobs and occupations, and the intertemporal elasticity of substitution
    - More recently: using surveys on subjective wellbeing, income and health outcomes to infer the trade-off between income and health
- Need to set a reference level – should be “good health”.

The willingness to pay/accept approach



Income and wellbeing around the globe

GDP comparisons across countries and time may hide aspects of wellbeing

- Also over time, improvements in non-market factors may compensate for less favourable economic growth (cf "the first generation that is not better off than their parents")
- (not to steal the show from the GII method of the ONS, but even productivity dynamics can look very different if domestic production or climate degradation are taken into account)

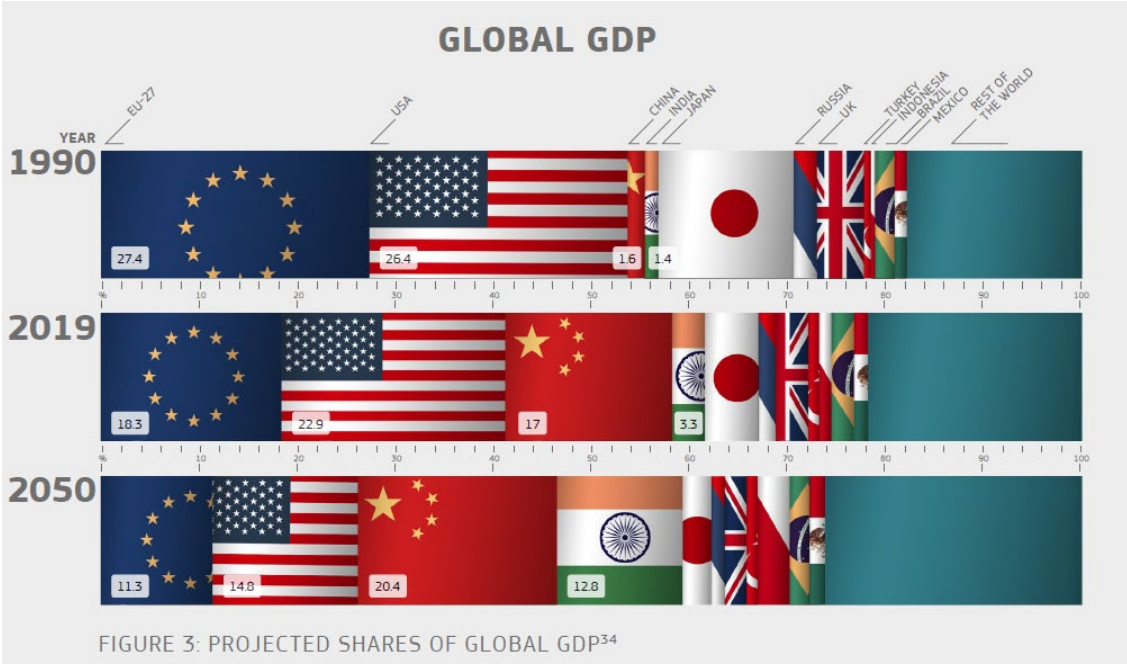


FIGURE 3: PROJECTED SHARES OF GLOBAL GDP[34]

Strategic Foresight Report 2021, European Commission

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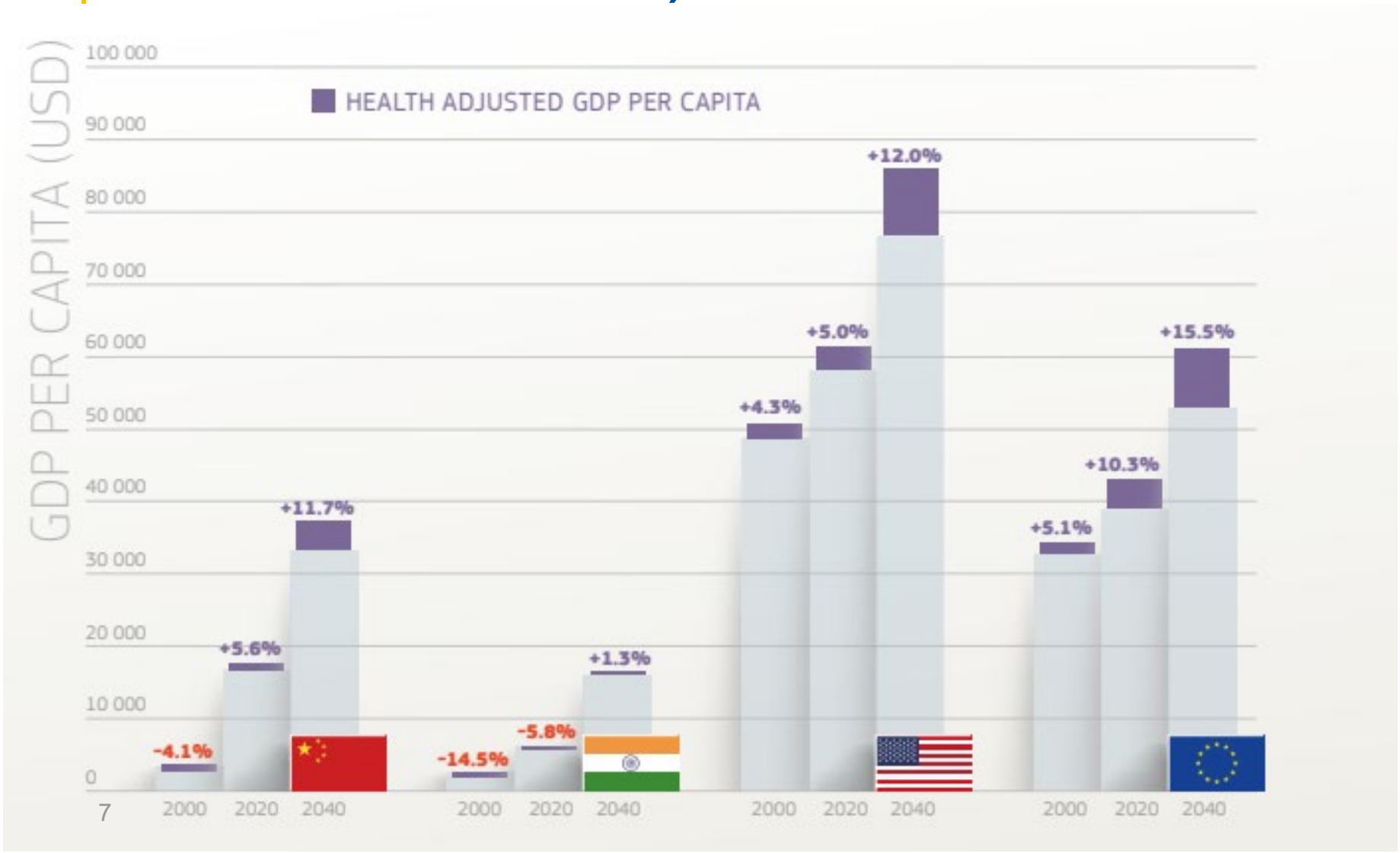
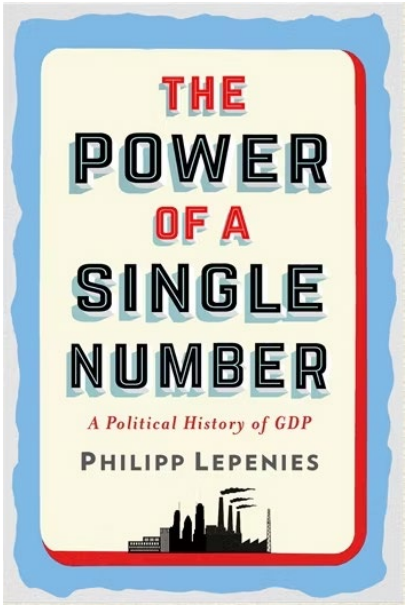
Health-adjusted income: first (and as of now "official" results)



Annual growth rate, 2000-2040

	unadj.	adj.
China	5.79	6.19
India	4.59	5.04
US	1.15	1.33
EU24	1.22	1.45



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Health-adjusted income: methodology

- The present discounted value of utility derived from a current income stream y under the current mortality scenario S equals the PDV of utility derived from an adjusted income stream $y+\delta_S$ under the reference mortality scenario S*
- To obtain this, we need to parametrize the attitudes of people towards income streams under an uncertain lifespan (“indirect utility function”)
- Data used:
  - Originally: OECD long term projections (released in 2021) for PPP GDP, UN World Population Prospects (historical, and medium variant projections)
  - Update: OECD 2023 projections, UN Population Prospects as of 2024

Health-adjusted income: technical details

- Fleurbaey and Gaulier, 2009 (FG hereafter):

$$E\sum_{t=0}^{T}\beta^t v(y) = E\sum_{t=0}^{T^*}\beta^t v(y+\delta_S)$$

$$v(y) = v(y+\delta_S)\frac{1-\beta^{T^*}}{1-\beta^T}$$

- Becker et al, 2005 (BPS hereafter) – more precisely, its discretised version:

$$V(Y,S) = \int_0^{\infty} e^{-\rho t}S(t)v((y(t))dt = v\big(y(t)\big)A(S)$$

$$v(y) = v(y+\delta_S)\frac{A(S^*)}{A(S)}$$

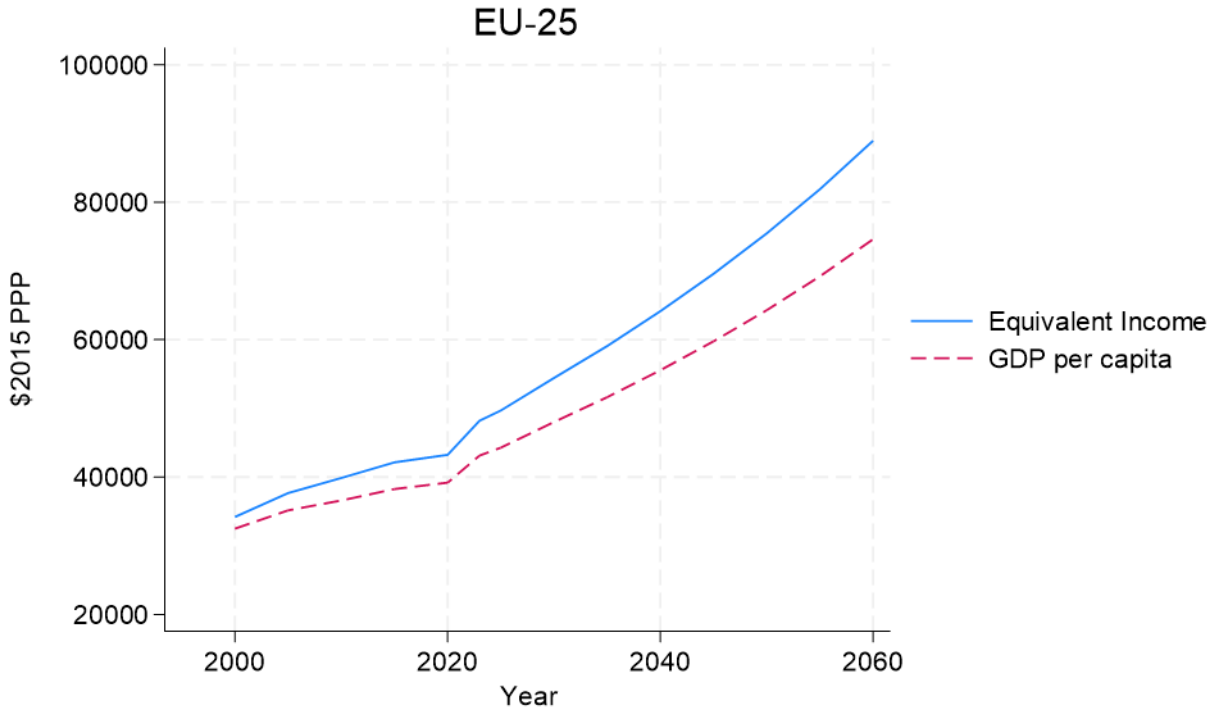
Health-adjusted income: calibration (BPS)

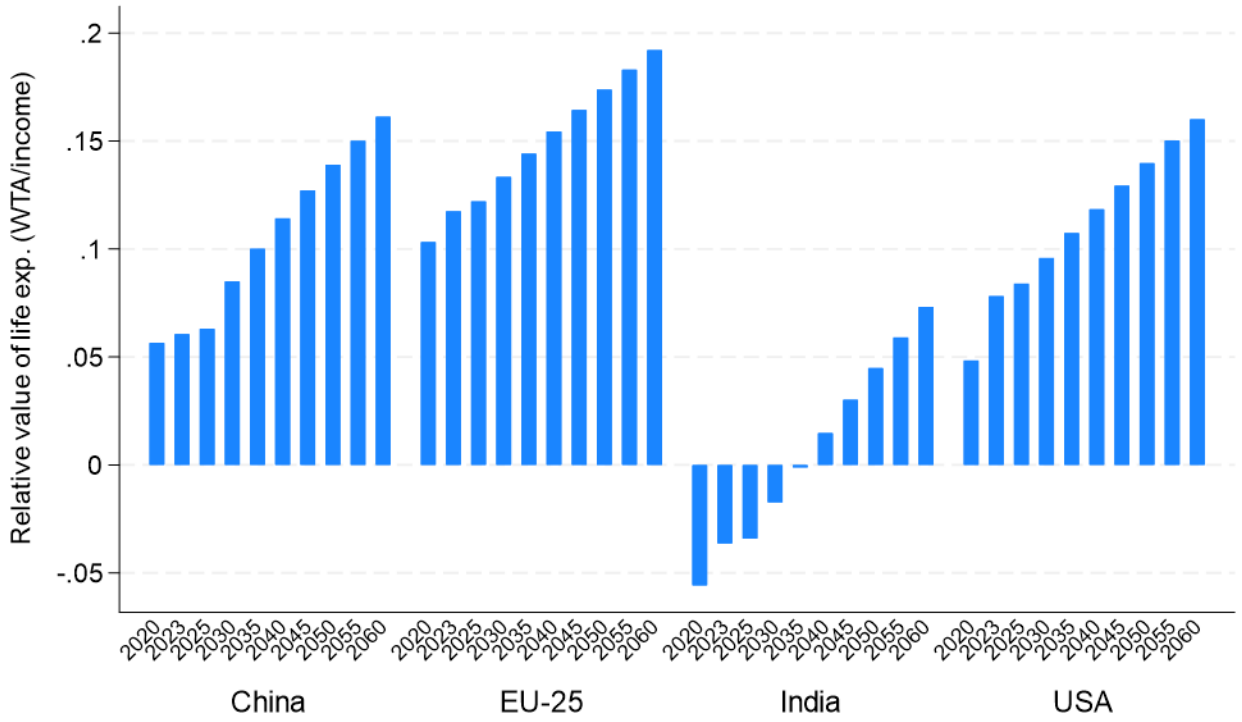
- v() is assumed to be of the form $\frac{1}{1-\varepsilon} y^{1-\varepsilon} + u_0$
- β is a standard 3%
- T*/S* is the world in 2050 (almost the same as EU in 2000; alternative: Japan in 2020)
- The parameter ε is the inverse of the intertemporal elasticity of substitution
  - Taken as 0.8 from the literature (Browning et al, 1999)
- The parameter u_0 is a subsistence level, at which "an individual with this income would be indifferent between being alive or dead"
  - Its value equals $c^{1-\varepsilon}\left(\frac{1}{\mu} - \frac{1}{1-\varepsilon}\right)$, where $\mu = \frac{u(c)'c}{u(c)}$ is the elasticity of the instantaneous utility function often estimated in studies of occupational mortality risk
  - Murphy and Topel (2003) report a value of 0.346 for the year 1990
  - We select the corresponding PPP income level for the US 1990 from our data to obtain u_0, equivalent to daily 1.4 USD appr.

Health-adjusted income: choices/options

- For the SFR2021 exercise, we worked with current USD and calculated shares from world – here we use fixed year PPP and work **only in per capita terms**
- **Reference point for the health adjustment**: we used the projected 2050 world level (77.2), which gives better visuals than Japan 2020 (84.8)
  - If set too high, we may overvalue life years which were not necessarily healthy
- Methodology: Lancet (2013), Jones and Klenow (2016), **BPS (2005), FG (2009)**
- **Subtracting health expenditures:** yes for the first two, not for the second
- Calibration: should we use the **same values for all countries and years**?
- Sensitivity: different reference levels, discount rates, two methodologies, varying the utility parameters in their confidence bands,…

Updated results (2023 OECD, 2024 UN data)





Equivalent incomes calculated relative to the 2050 World survival curve.
EU-25 equivalent incomes calculated with EU-27 survival curve.

The relative adjustment, 2020-2060

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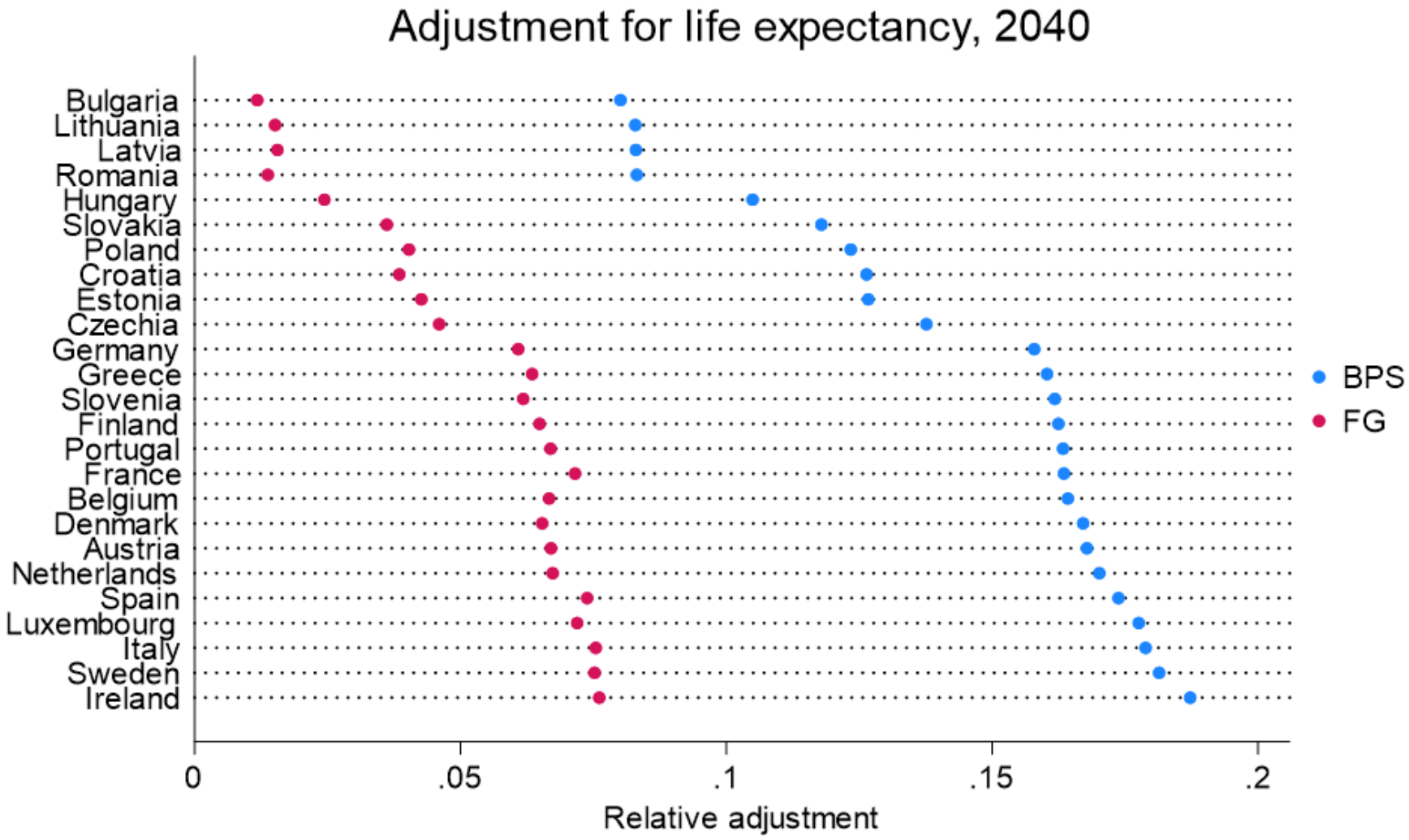
Indicative results by country



Sensitivity checks: cases (re)considered

	Baseline	Method	Less discounting	More discounting	Lower gamma	Higher gamma	Lower subsistence level	Higher subsistence level
Method (if not BPS)		FG						
rho	0.03	0.03	0.02	0.05	0.03	0.03	0.03	0.03
gamma	1.25	1.25	1.25	1.25	1.125	1.375	1.25	1.25
mu	0.346	0.346	0.346	0.346	0.346	0.346	0.306	0.444
y0 (per day)	1.44				3.29	0.36	0.54	5.37
y0/y	0.013				0.031	0.003	0.005	0.05

Sensitivity checks: selected results

	Unadj.	Base-line	FG	Less discounting	More discounting	Lower gamma	Higher gamma	Lower subsistence level	Higher subsistence level
China	5.79	6.18	5.96	6.26	6.09	6.14	6.22	6.26	6.05
India	4.58	5.03	4.76	5.07	4.97	4.84	5.23	5.22	4.70
US	1.23	1.40	1.35	1.48	1.32	1.42	1.39	1.42	1.38
EU-25	1.35	1.59	1.50	1.68	1.48	1.60	1.57	1.61	1.55

“Discounting” GDP per capita by inequality

- We use an Atkinson (1970) social welfare function:

$$W(\boldsymbol{Y}) = \left(\frac{1}{n} \left(\sum_i Y_i \right)^{1-\varepsilon} \right)^{\frac{1}{1-\varepsilon}}$$

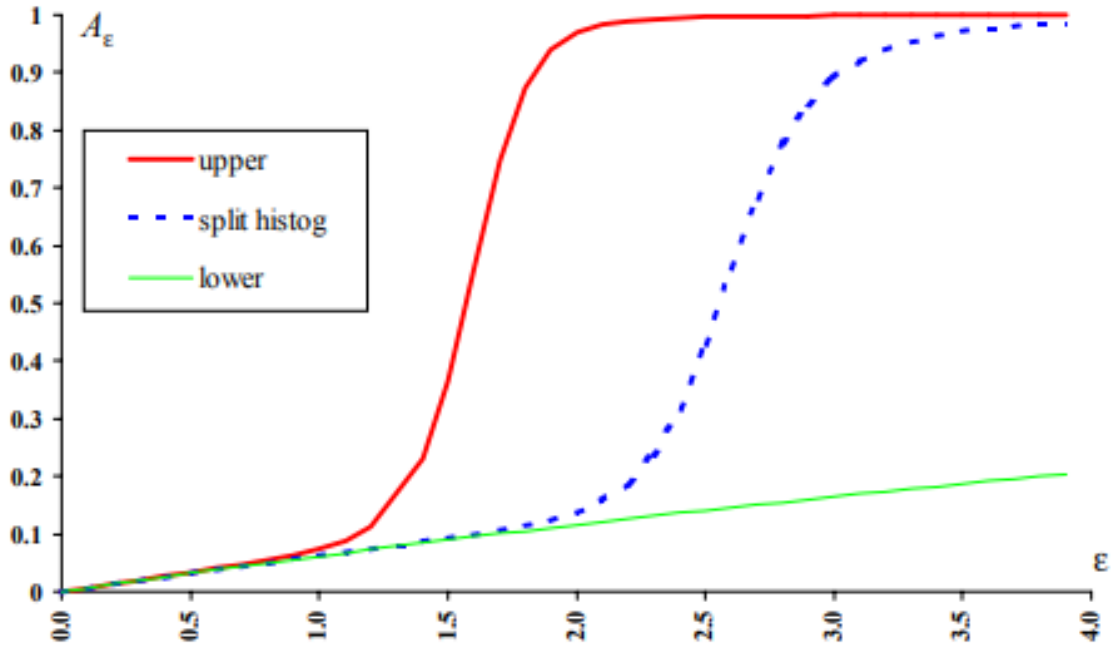
and then define the equally distributed equivalent that, if $Y_i = Y^{EDE}$ for all i, $W(\boldsymbol{Y}) = W(\boldsymbol{Y}^{EDE})$.

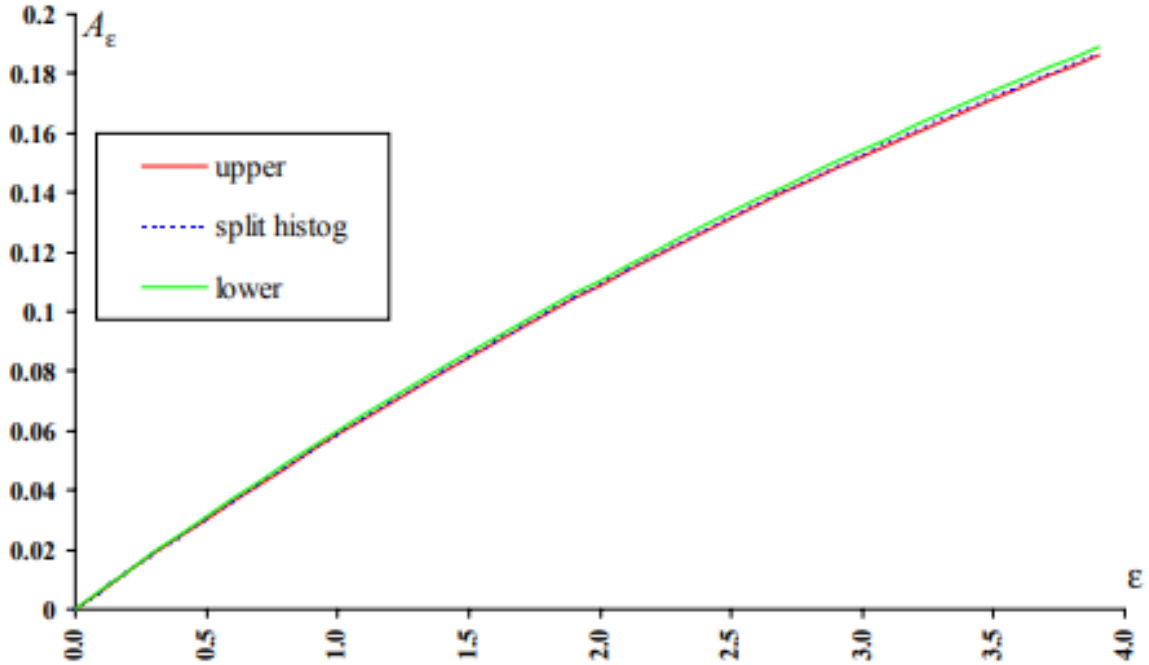
- It can be shown that $Y^{EDE} = \bar{Y}\left(1 - A(\boldsymbol{Y})\right) < \bar{Y}$, where $A(\boldsymbol{Y})$ is the Atkinson inequality index:

$$A(\boldsymbol{Y}) = 1 - \frac{\left[\sum_i (Y_i)^{1-\varepsilon} / n \right]^{\frac{1}{1-\varepsilon}}}{\sum_i Y_i / n}$$

- An important feature is its sensitivity to interpolation in the lowest end of the income distribution, where data is also less reliable, especially for ε>1

The sensitivity to the Atkinson parameter and to interpolation in the bottom of the distribution





From Cowell 2000, figures 5.16 and 5.17
1988 Czechoslovakian data with the first income range interpolated (left) or dropped (right)

But for the future? We need projections

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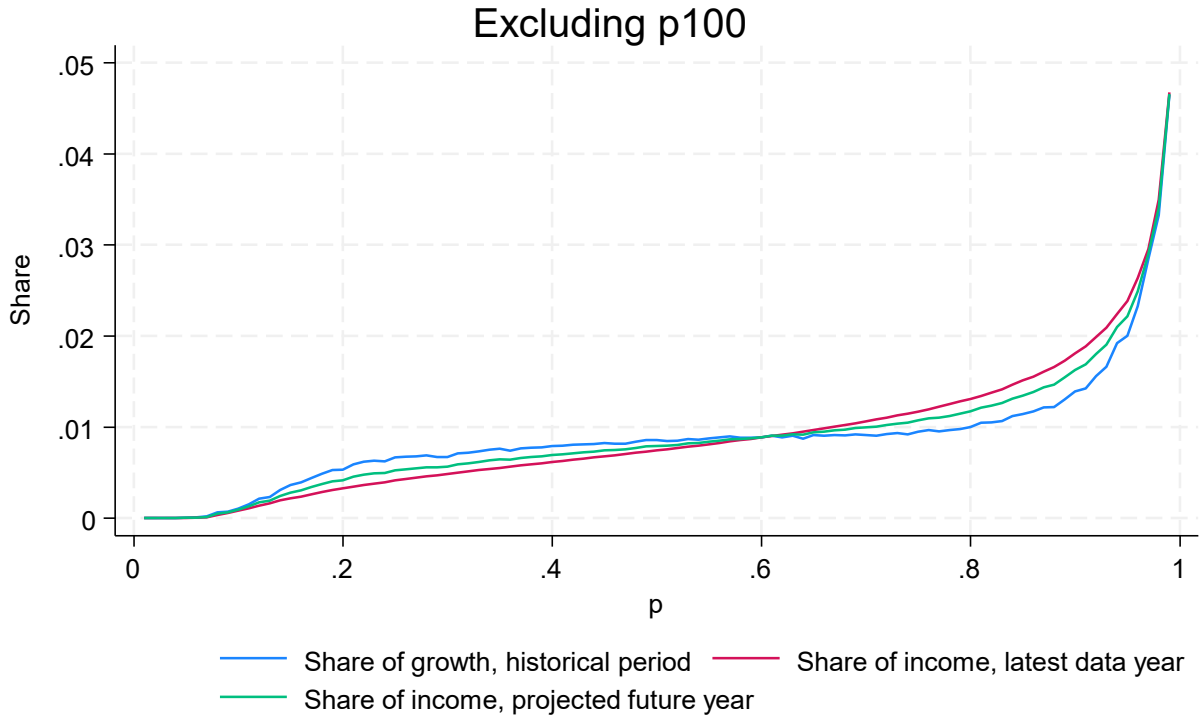

- We follow the approach utilised by Alvaredo et al. (2018) and WIR (2018)
- Important exception: we assemble the EU (25) income distribution from the population-weighted percentiles of the 25 countries
- The historical period seems to matter for the EU, due to the post-transition period of the CEE

Thank you

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https://joint-research-centre.ec.europa.eu/beyond-gdp-delivering-sustainable-and-inclusive-wellbeing_en

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