Measurement in the Modern Economy

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A Democratic Measure of Income Growth

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Seminar 1

GDP and Welfare

- It is well-known that GDP growth is not a good measure of growth in welfare.
1. It is gross of depreciation. A welfare measure has to be net.
2. Account needs to be taken of net investment income from abroad.
3. Money net income should be deflated by the price of consumption, not the price of output.
4. Some adjustment for population is needed.
- Real net national income growth *per capita* is a much better indicator of change in welfare

- But aggregate or average real growth weights individual growth rates according to the *level* of income of each household.

- A plutocratic indicator of welfare growth. High earners count for more.

- A democratic measure takes the growth in the real income of each household and averages this across all households.

Democratic Growth

- Sig Prais (1959) developed a democratic price index. It calculates the change in prices based on the spending pattern of an average household. CPI uses total spending, so high spenders have more influence.

- Tony Atkinson (1971) developed "inequality-averse" measures of income.

- We take the geometric mean of household income (A special case of Atkinson's inequality aversion) and deflate using Prais democratic price index.

- The output is the growth rate in real household income averaged across all households.

The Geometric Mean and Democratic Income

$$Y = \sqrt[n]{\prod_{i=1}^{n} y_i}$$

$$logY = logP + logQ = \sum_{i=1}^{n} \log(p_i q_i)/n$$
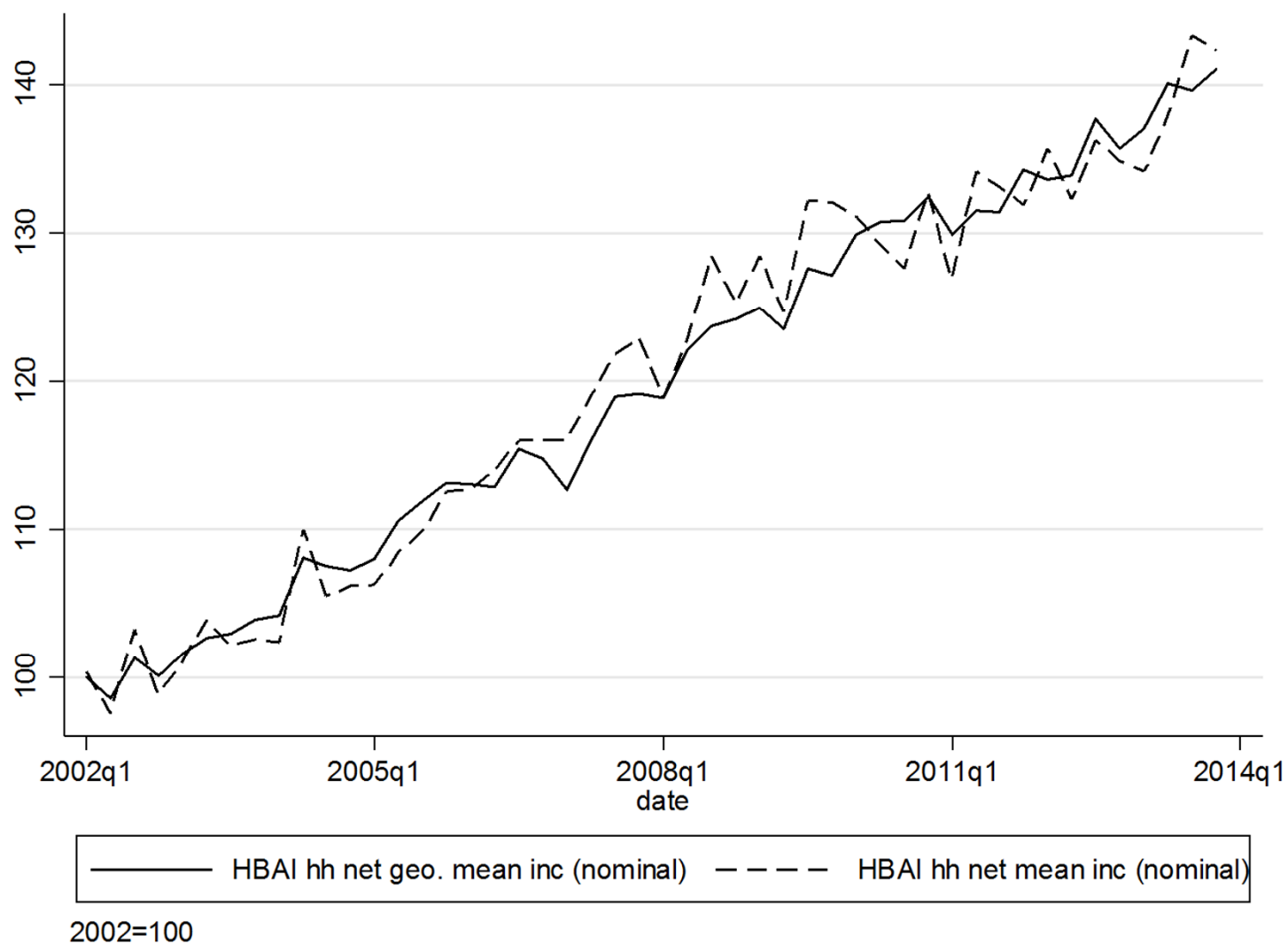
$$\frac{\Delta Y}{Y} = \frac{\Delta P}{P} + \frac{\Delta Q}{Q} = \frac{\sum_{i=1}^{n} \frac{\Delta p_i}{p_i} + \frac{\Delta q_i}{q_i}}{n}$$

The growth rate of the geometric mean of income is the sum of the growth rate of the democratic price index and a democratic quantity index.
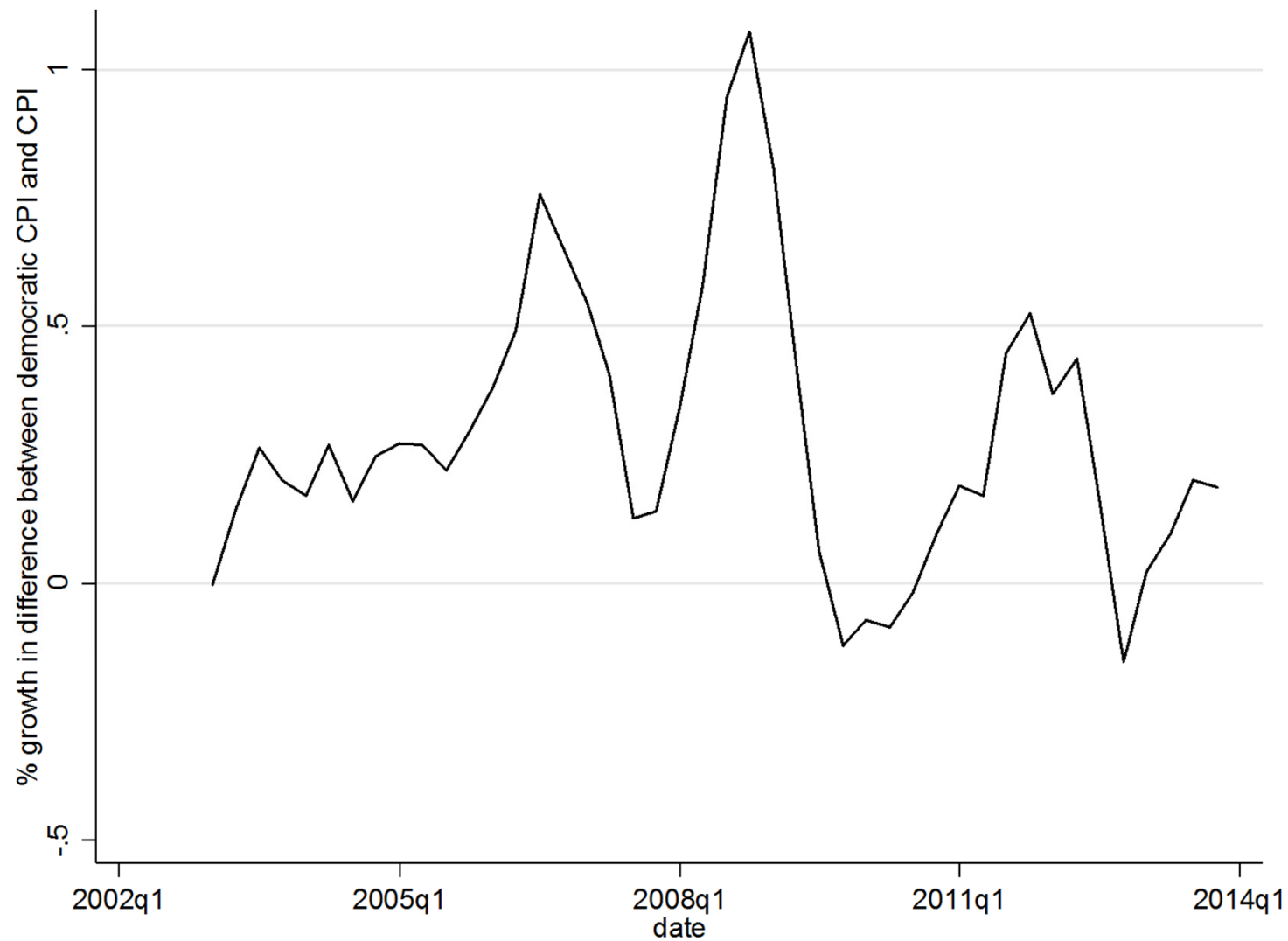
- Adjust household income for household size
- Use democratic CPI produced by Tanya Flower and Philip Wales at ONS for the Johnson Review[1]
- Results for household disposable income after housing costs taken from Households Below Average Income dataset

[1] http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/guide-method/user-guidance/prices/cpi-and-rpi/variation-in-the-inflation-experience-of-uk-households--2003-2014.pdf
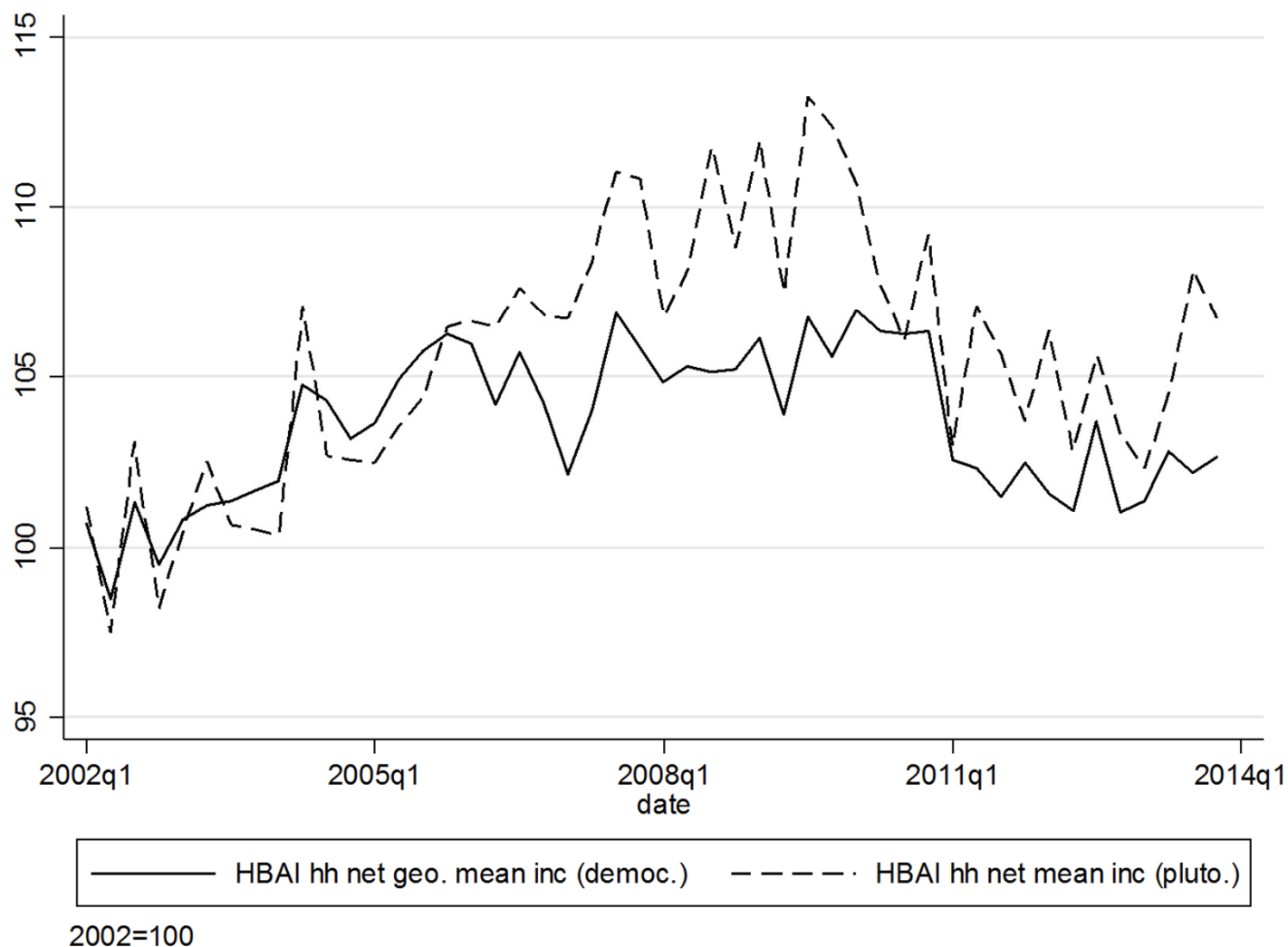
Mean and geometric mean net household disposable income (nominal)

2002=100

Growth in the difference between democratic CPI and CPI

Mean and geometric mean net household disposable income (deflated)

HBAI hh net geo. mean inc (democ.) — — — HBAI hh net mean inc (pluto.)

2002=100

Growth in household net disposable income

Income measure	% change (2002-2013)
Mean (pluto. deflator)	5.4
Geometric mean (pluto. deflator)	5.4
Geometric mean (demo. deflator)	2.2

Growth in real GDP p.c., real GDP, and real geometric mean household income

Next steps

- Broaden concept of income to include undistributed income of pension funds and companies, and publicly provided benefits in kind

- Improve data set by pooling HBAI and Earnings, Taxes and Benefits data sets.

- Bring democratic price index up to date

APPENDIX
Prices and Quantities in a General Framework of inequality aversion

Atkinson Inequality Aversion

$$Y = \frac{\left(\sum_{i=1}^{n} y_i^{1-\rho}\right)^{\frac{1}{1-\rho}}}{n} \quad (\rho \neq 1)$$

If $\rho = 1$ then $\quad Y = \sqrt[n]{\prod_{i=1}^{n} y_i}$

Assume now that there is an aggregate price measure P and quantity measure (real income) Q so that Y=PQ. Each household has a price index p_i and a quantity index q_i with $y_i = p_i q_i$ so that

$$PQ = \frac{\left(\sum_{i=1}^{n} p_i^{1-\rho} q_i^{1-\rho}\right)^{\frac{1}{1-\rho}}}{n}$$

Now take logs

$$logY = logP + logQ$$

$$= \frac{log\left(\sum_{i=1}^{n} p_i^{1-\rho} q_i^{1-\rho}\right)}{1-\rho} - logn$$

And differentiate

$$\frac{\Delta Y}{Y} = \frac{\Delta P}{P} + \frac{\Delta Q}{Q}$$

$$= \frac{\sum_{i=1}^{n} \Delta p_i p_i^{-\rho} q_i^{1-\rho} + \Delta q_i p_i^{1-\rho} q_i^{-\rho}}{\left(\sum_{i=1}^{n} p_i^{1-\rho} q_i^{1-\rho}\right)}$$

A General Measure

$$\frac{\Delta P}{P} + \frac{\Delta Q}{Q} = \frac{\sum_{i=1}^{n}(\frac{\Delta p_i}{p_i})p_i^{1-\rho}q_i^{1-\rho} + (\frac{\Delta q_i}{q_i})p_i^{1-\rho}q_i^{1-\rho}}{(\sum_{i=1}^{n}p_i^{1-\rho}q_i^{1-\rho})}$$

$$= \frac{\sum_{i=1}^{n}\left(\frac{\Delta p_i}{p_i}\right)y_i^{1-\rho} + (\frac{\Delta q_i}{q_i})y_i^{1-\rho}}{\left(\sum_{i=1}^{n}y_i^{1-\rho}\right)}$$

The household weights are $y_i^{1-\rho}$

If $\rho > 1$ then poor households are given more weight than rich households.

In the special case with $\rho = 1$

$$\frac{\Delta Y}{Y} = \frac{\Delta P}{P} + \frac{\Delta Q}{Q} = \frac{\sum_{i=1}^{n} \Delta p_i/p_i + \Delta q_i/q_i}{n}$$

$\frac{\Delta P}{P} = \frac{\sum_{i=1}^{n} \Delta p_i/p_i}{n}$ is the Prais Index

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