Measuring wealth: income capitalization with heterogeneous rates of return

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Measuring wealth

Motivation

- Wealth surveys offer direct evidence of individual wealth
  - but typically *omit the upper end* of the wealth distribution (e.g., the much debated top 1%)
- Income capitalization is a method to indirectly compute individual wealth from
  - the individual income it generates (typically offering better coverage of the *whole distribution* via, e.g., income tax data)
  - combined with aggregate wealth statistics (e.g., national accounts)

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  - the individual income it generates (typically offering better coverage of the *whole distribution* via, e.g., income tax data)
  - combined with aggregate wealth statistics (e.g., national accounts)
- Thus, income capitalization can *complement* wealth surveys for a better estimation of the wealth distribution
  - Saez E., and G. Zucman, "Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax Data", The Quarterly Journal of Economics, 131(2), pp 519-578, 2016

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Sketch of the income capitalization method

- Data inputs:
  - individual income by asset $y_{i,g}$
  - observed aggregate assets $k_g = \sum_{i \in N} w_{i,g}$
- Data outputs:
  - **homogeneous return** by asset r_g
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- Method a-theoretical, based on **accounting identities**:
  - homogeneous return derived from aggregates, $r_g = \sum_i y_{i,g} / k_g$
  - individual assets directly follow, $w_{i,g} = y_{i,h} / r_g$

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Limitations of income capitalization

- The standard income capitalization method relies on the assumption that rates of return are homogeneous within asset categories
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  - All individuals earn the same percentage on a unit of investment in equity (or bonds, deposits, housing, etc)
- There is however strong evidence that
  - within each asset category, individual returns are *positively correlated* with wealth level
  - these also correlate with portfolio composition suggesting *complementarities* across asset categories
    - Fagereng A., L. Guiso, D. Malacrino, and L. Pistaferri, "Heterogeneity and Persistence in Returns to Wealth", Econometrica, 88(1), pp 115-170, 2020

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This project

- We develop a simple extension of the income capitalization method:
  - allowing for estimation of *heterogeneous returns within asset categories* based on *asset complementarity*
  - using **same data inputs** as the standard income capitalization method
    - "micro income & macro wealth"
  - but with **data output enriched by theory** based on asset complementarities
    - "micro wealth & **micro returns**"
    - as opposed to "macro" returns by the (theory-free) homogeneity assumption

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Core idea:

- individual i's income $y_i = \sum_{g \in G} y_{i,g}$ is an increasing **(production!) function** of her wealth portfolio $w_{i,1}, \ldots, w_{i,m}$

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- Assuming positive cross derivatives, we then obtain that $r_{i,g}$ increases in $w_{i,g'}$ for $g' \neq g$ (thus **asset complementarity!**)

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Method designed for **financial assets & real estate** (generating capital income), but can/should we include **human capital** (generating labor income) as well?

- Berman Y., and B. Milanovic, "Homoploutia: Top Labor and Capital Incomes in the United States, 1950-2020", World Inequality Lab, WP 2020/27.

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Sketch of the proposed method

- Estimate rates of return $r_{i,g}$ and wealth levels $w_{i,g}$ based on
  - the observed aggregate assets $k_g = \sum_{i \in N} w_{i,g}$
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- In the most basic setup, this is done parametrically assuming
  - Cobb-Douglas form

$$f_i(w_{i,1}, \ldots, w_{i,m}) = \prod_{g \in G} w_{i,g}^{\alpha_{i,g}}$$

  - where $(\alpha_{i,1}, \ldots, \alpha_{i,m}) \in \Delta_m$ is to be estimated for each i
  - low complexity of returns, $r_{i,g} = \rho_i \delta_g$

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- Once the f_i are estimated, we obtain
  - rates of return by $r_{i,a} = \partial f_i / \partial w_{i,g}$
  - wealth levels by $w_{i,g} = y_{i,g} / r_{i,g}$
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  - via linear approximation of a large system of n equations in n unknowns
- Flavor of result: ρ_i derived as *eigenvector* (Perron-Frobenius Theorem), then δ_g derived from ρ_i...

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Validate & apply the method: two steps

- First step: estimate $r_{i,g}$ and $w_{i,g}$ based on k_g and $y_{i,g}$
  - k_g: accurate on aggregates
  - $y_{i,g}$: good coverage of the whole income distribution
- Second step: validate the method by comparison with observed $r_{i,g}$ and $w_{i,g}$
  - method validated if estimated $r_{i,g}$ and $w_{i,g}$ roughly match observed ones
  - crucial difficulty: $r_{i,g}$ and $w_{i,g}$ rarely observed for the whole distribution

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Application 1: Norway

- Team: Bozbay (USurrey), Halvorsen (Statistics Norway), Iacono (NTNU), Vesperoni (King's College London)
- Data sources: tax records from Statistics Norway, same as Fagereng et al. (ECTA 2020)
- Two-steps: household level & full country coverage for *both estimation and validation*

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Application 2: USA

- Team: Berman (King's College London), Vesperoni (King's College London)
- Data sources: tax records from Saez & Zucman (QJE, 2016); macro statistics on wealth & heterogeneous returns from
  - Smith M., O.M. Zidar and E. Zwick, "Top Wealth in America: New Estimates and Implications for Taxing the Rich", NBER WP 29374, October 2021
- Two-steps:
  - for *estimation*: tax records at household level & full country coverage
  - for *validation*: macro statistics on wealth & heterogeneous returns

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THANK YOU!