International comparisons of income mobility

Philippe Van Kerm

CEPS/INSTEAD, Luxembourg
philippe.vankerm@ceps.lu

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Outline

Part I:

Preliminaries

Part II:

Case 1: The classic US/German comparison of income mobility

Part III:

Case 2: Income growth and inter-temporal inequality in EU countries

Part I

Preliminaries

Mobility of what?

The income concept

Single-adult equivalent household income

- Incl. all sources: earnings, self-employment income, public and private transfers, capital income, minus (direct) taxes paid and social insurance contributions ...
- ... from all household members pooled ...
- ... (typically) over a year ...
- ... divided by number of ‘single adult equivalents’ in household (to account for economies of scale)

Mobility of what? (ctd.)

The various sources of income changes

Over a short period of time, a person's "equivalent income" may vary for a number of reasons

- labour market transitions (tenure, promotion, job mobility, unemployment, retirement)
- demographic transitions (birth, split, death of household member, "nest leaving")
- tax and benefit changes
- + investments, private transfers, etc.

Part II

The US/Western Germany case

Received wisdom

Expectations about mobility in the US and (Western) Germany are clearly contrasted. Two large industrialized economies, but "institutions" differ

- more employment protection in Germany
- more centralized wage setting
- more generous social welfare system
- higher taxation and more redistributive policies

$\Longrightarrow$ lower inequality in Germany ...

$\Longrightarrow$ ... but higher mobility in the US

(Some argue that the latter compensates the former)

The Burkhauser and Poupore (1997) study

Received wisdom has been challenged by a number of studies!

The Burkhauser and Poupore (*Rev. of Econ. and Stat. 1997)* study

- CNEF data, 1983–1988 (growth period)
- Shorrocks measure of mobility (ratio of inequality of "permanent income" over cross-section inequality)
- (substantially) more mobility in Western Germany than in the US!

The Burkhauser and Poupore (1997) study

Shorrocks' index of mobility

$$\mathrm{SHOR}(\mathbf{Y}) = 1 - \frac{I\left(\overline{Y}\right)}{\mu\left(\overline{Y}\right)^{-1} \sum_{t=1}^{T} \mu(Y_t) I(Y_t)}$$

Comparison of inequality of long-term incomes to 'snapshot' inequality

Relative, not directional, maximum with complete reversals

(Also see Maasoumi–Zandvakili for a generalization, or similar Chakravarty–Dutta–Weymark and Fields indices)

A selective sample of subsequent analyses

Some subsequent analyses of the same data (up to mid-nineties) confirmed this finding but also showed seemingly contradicting results

For example,

- Maasoumi and Trede (REStat 2001)
- Schluter and Trede (IER, 2003)
- Houtenville (V.zur Wirtschaft., 2001), Van Kerm (Economica, 2004)

Houtenville (V.zur Wirtschaft., 2001)

Houtenville (V.zur Wirtschaft., 2001) contrasts Shorrocks' index with average rank jump and Fields-Ok indices

Average rank jump

$$\mathrm{AJ}((Y_1, Y_2)) = \int_{\Omega_{\mathbf{y}}} |\mathrm{rank}(y_1) - \mathrm{rank}(y_2)| dH(y_1, y_2)$$

Exclusively sensitive to 'exchange' mobility (similar to looking at diagonal of transition matrix) – so not directional, by definition
Average rank change still higher in Germany

Houtenville (V.zur Wirtschaft., 2001) (ctd.)

Fields-Ok indices

$$\mathrm{FO96}\left((Y_1, Y_2)\right) = \int_{\Omega_{\mathbf{y}}} |y_1 - y_2| dH(y_1, y_2)$$

$$\mathrm{FO99}\left((Y_1, Y_2)\right) = \int_{\Omega_{\mathbf{y}}} |\log(y_1) - \log(y_2)| dH(y_1, y_2)$$

Captures the 'magnitude' of income movements. No value to reranking or inequality.
Income movements are now (much) higher in the US!

A table from Van Kerm (2004)

MOBILITY INDICES, 1985–1997

	Belgium	W. Germany	USA
Fields–Ok (1999) index	0.335	0.392	0.523
	(0.008)	(0.009)	(0.008)
Fields–Ok (1996) index (*as a fraction of avg. income*)	0.370	0.399	0.534
	(0.010)	(0.009)	(0.010)
King (1983) index ($\eta = 0$, $\gamma = 1$)	0.263	0.300	0.375
	(0.012)	(0.011)	(0.027)
Hart (1976) index	0.584	0.630	0.544
	(0.021)	(0.024)	(0.016)
Chakravarty *et al.* (1985) index	0.030	0.040	0.038
	(0.004)	(0.003)	(0.004)
Fields (2000*a*) index	0.122	0.138	0.091
	(0.014)	(0.011)	(0.009)
Shorrocks (1978) index	0.150	0.161	0.137
	(0.006)	(0.007)	(0.004)

The US vs. Germany comparison

In sum

1. Expectation that there is more volatility in US is true
2. That does not translate into more “reranking” (surprizingly)
   - likely because income distance between ranks is wider in the US (since marginal more unequal)
3. That does not translate in smaller long-term inequality
   - Why? Likely that how gains and losses are distributed is important. Here W.German situation appears more favourable.

Illustration of difficulty of analysing income mobility, esp. when marginal distribution differ a lot (normative or statistical choices have important implications) – cf. Fields’ discussions of the ‘many facets of income mobility’.

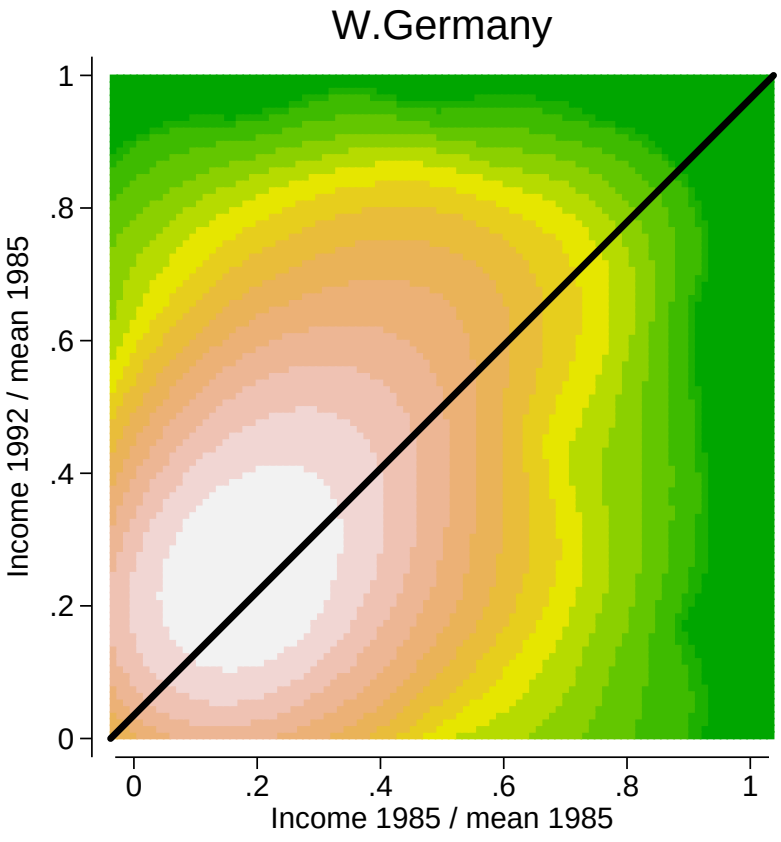
Western German – USA, 1985–1992

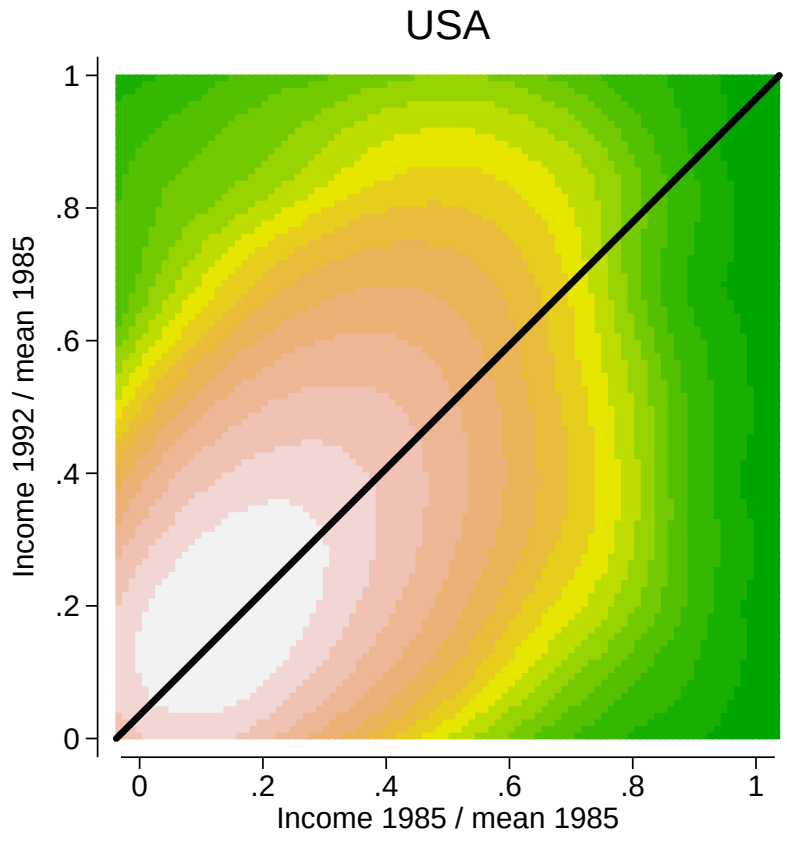
Illustrative dataset

- CNEF–PSID for USA, CNEF-SOEP for West. Germany
- Mobility between 2 survey years: 1985 and 1992
- Single adult equivalent income definition (see infra)
- Top and bottom 0.5 percent of observations discarded

Charting income mobility

Bivariate density distributions compared

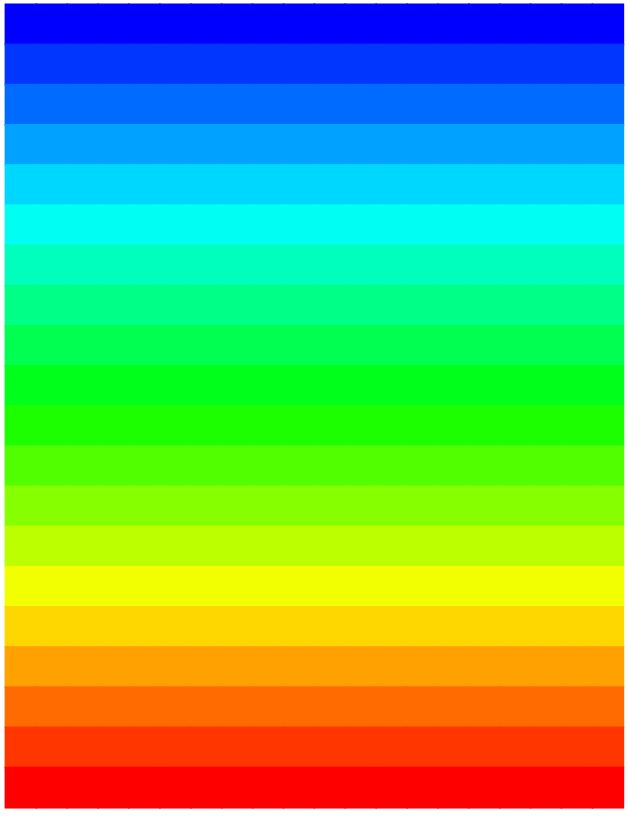




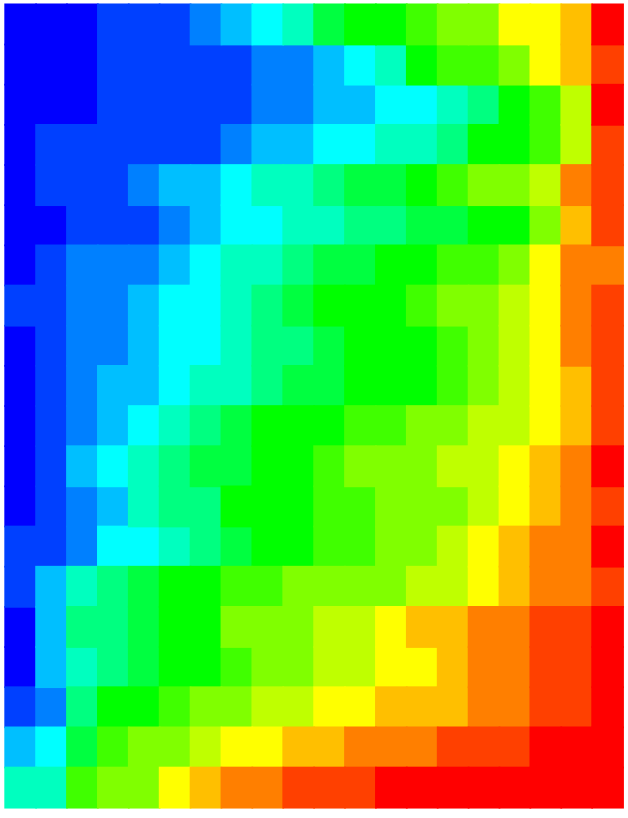
Charting income mobility

Transition probability colour plots

W.Germany 1985



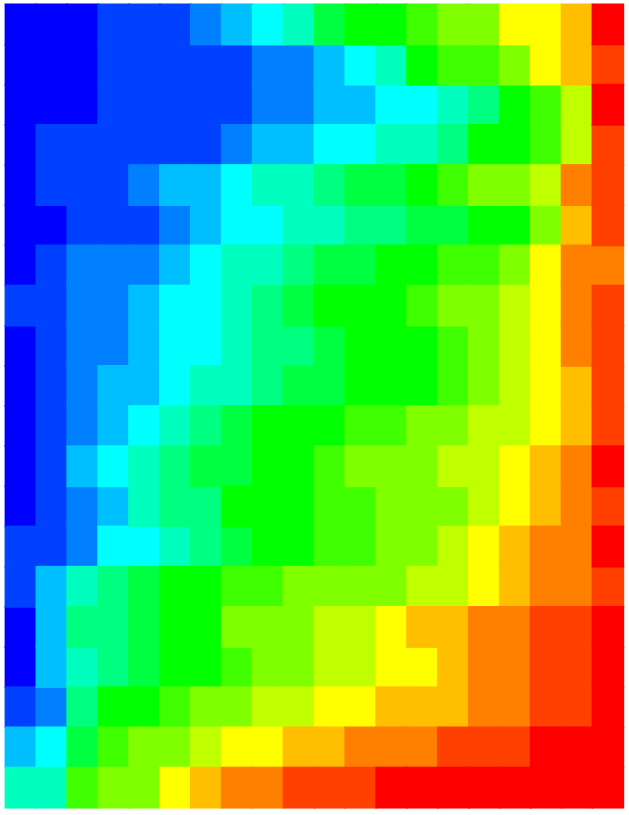
W.Germany 1985−1992



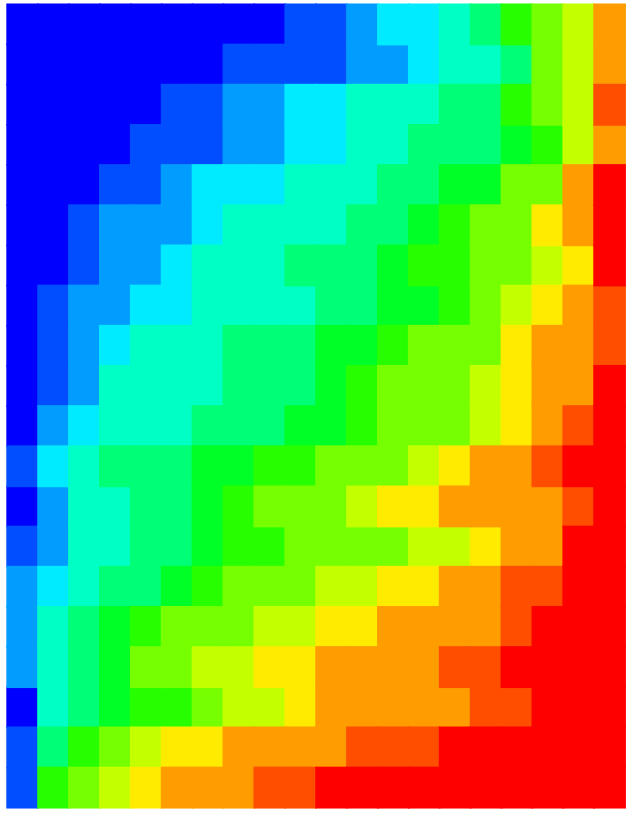
Charting income mobility

Transition probability colour plots compared

W.Germany 1985−1992



USA 1985−1992



Snapshot and long-term inequality

Gini coefficients and Shorrocks' index

Inequality higher in the USA ...

	Ger.	USA
Gini coefficient 1985	0.229	0.298
Gini coefficient 1992	0.242	0.314
Gini coefficient of average income	0.205	0.276
Shorrocks' index	0.132	0.101

... and inequality-based measures of mobility higher in Germany

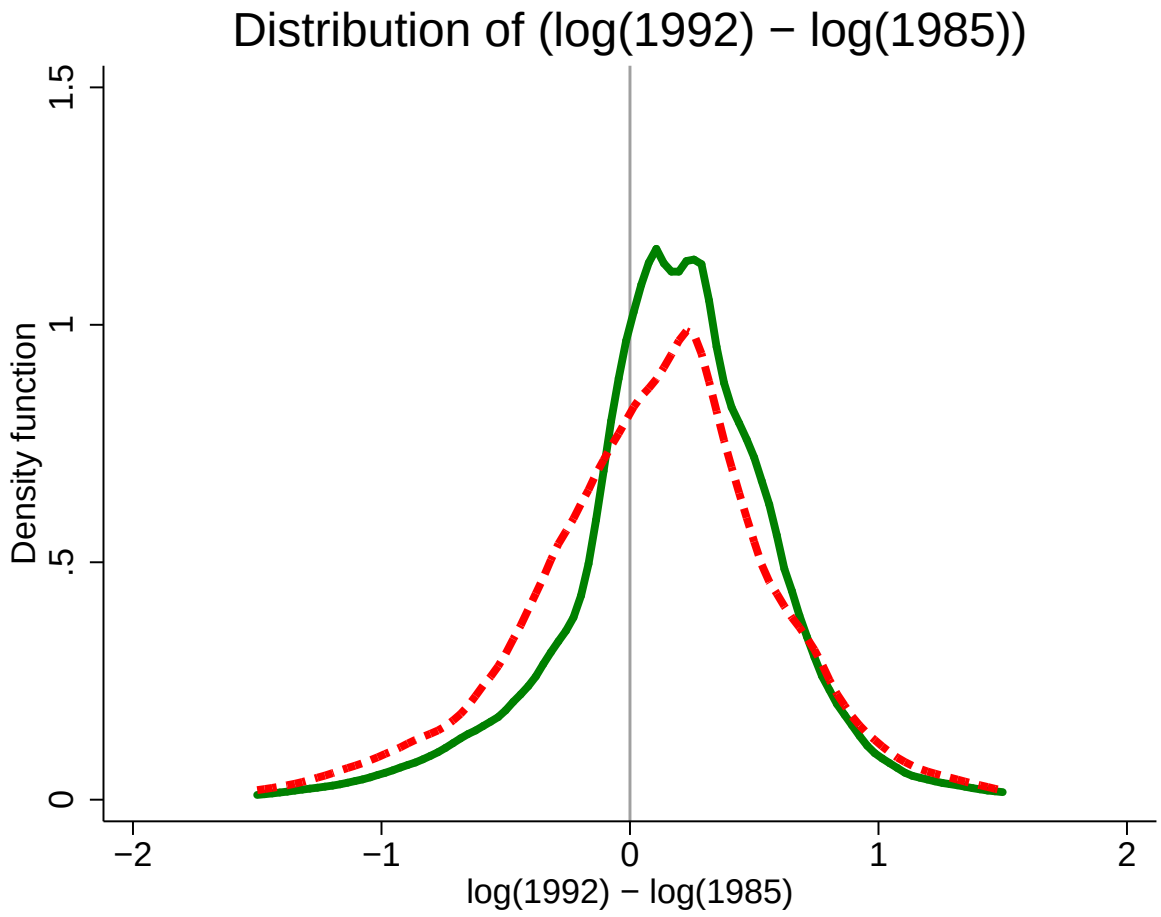
Distance-based statistics

As expected, story is less clear with alternative measures ...

	Ger.	USA
Mean $\lvert\mathrm{rank}(y) - \mathrm{rank}(x)\rvert$ (Average jump)	22	19
$1 - r(\log(x), \log(y))$ (Hart index)	0.563	0.414
Mean $\lvert\log(y) - \log(x)\rvert$ (Fields-OK 1999)	0.379	0.429
Mean $(\log(y) - \log(x))$ (Fields-OK 1999)	0.156	0.078

Income volatility was higher in the USA

The PDF of individual income growth



A simple but useful device?

Van Kerm, Econ. Letters 2009

Income mobility profiles

1. Select a measure of individual income change $\delta(y_1, y_2; H)$
2. Plot

$$\mathrm{E}(\delta(y_1, y_2; H)|p)$$

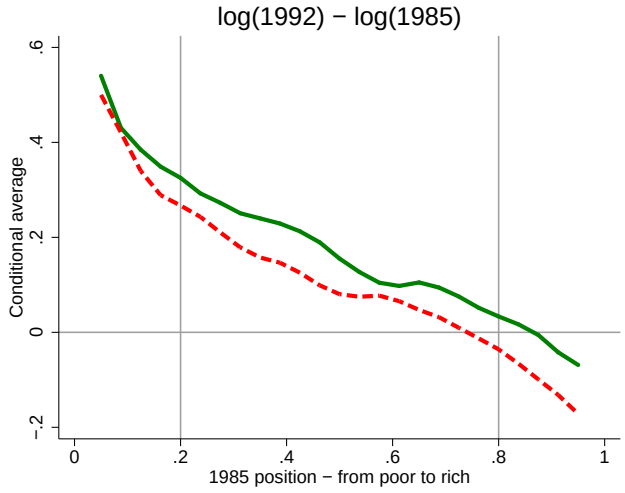
against p where $p = F_1(y_1)$ is rank in initial income distribution corresponding to y_1

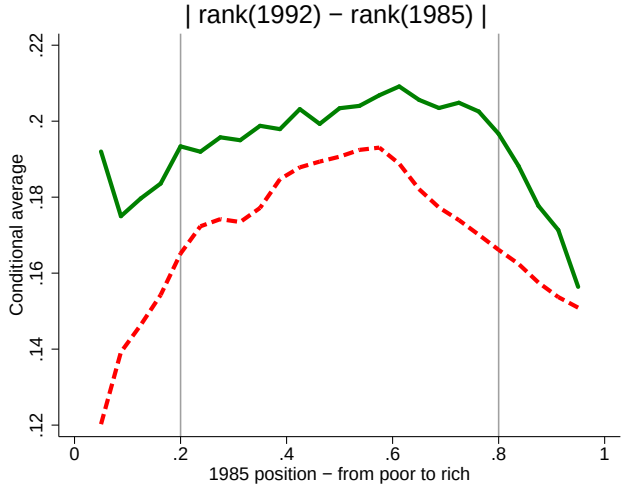
Notes:

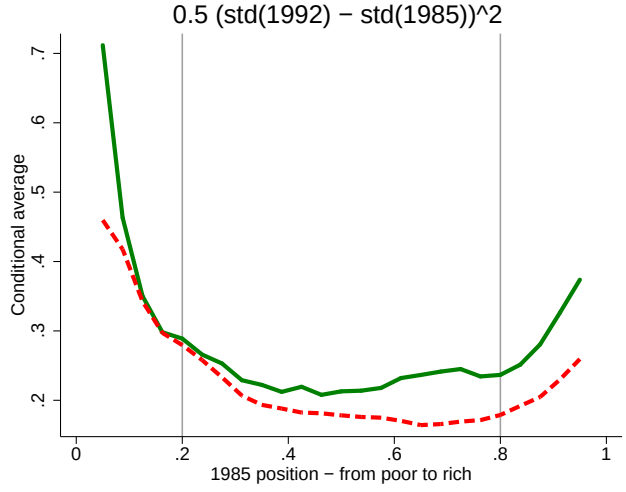
- For 'distance-based mobility measures', the area under the curve is the aggregate index
- $\mathrm{E}(\delta(y_1, y_2; H)|p)$ estimated with non-parametric regression techniques (boundary adjustment needed)
- Be aware of measurement error driven regression to the mean

Charting income mobility

Alternative income mobility profiles







The US vs. Germany comparison

Lessons?

- With identical data and income concepts, conclusions can be *very* different depending on measures used... (the least one must do is discuss why a particular concept is adopted)
- Problems compounded when countries have different marginal distributions
- IMHO, graphical tools help
- Note that more recent comparisons hampered by change in PSID data collection post 1992

Part III

Intertemporal inequality and mobility in the EU

The EU-SILC data

The pros

- Dataset for computing official EU Social Indicators (follow the ‘ECHP 1994–2001’ dataset)
- Detailed on income receipts of households
- Cross-country data covering, to date, 27 countries (EU-27 -BG -RO +NO +IS)
- Interesting source for looking at new member states

The EU-SILC data

The cons

- Rotating panel design (limited to 4 years for most countries)
- 'Output harmonization' leaves freedom for much variations in sampling and definitions
- Mix of 'register' and 'survey' data
- New, so still relatively immature at this stage? (esp. for longitudinal analysis)? Take results with caution at this stage

Data definition

- Mobility between 2 consecutive years for 26 countries (all pairs pooled)
- Mobility between t and $t + 3$ for 14 countries (all pairs pooled)
- Combine three datasets: 2003–04–05, 2003–04–05–06 and 2004–05–06–07 files
- Single adult equivalent income definition (as above)

Inference

Bootstrap sampling

Ideally, create *R* replicate datasets by applying the original sampling procedure.

In fact, impossible because key sampling variables not available in dataset (confidentiality).

Approximation:

- sample *households* with replacement from each rotation group (at initial period, stratified by NUTS-1 region)
- select all selected household members, and all subsequent (split-off) households and household members
- for all pair of years, use final period "design weights" (not possible to post-stratify/calibrate weights for bootstrap replications)
- then calculate 'endogenous' variables (e.g., rank), estimate indices and graph coordinates for all replicate sample and combine to assess sampling variabuility

Individual income growth

Mean, Mean absolute growth, and risk-adjusted mean growth

Individual income growth (focus on individual relative income gains)

$$\delta(y_1, y_2) = \exp(\ln(y_2) - \ln(y_1)) - 1$$

Mean growth

$$\mathrm{E}(\delta; Y_1, Y_2) = \int_{\Omega_{\mathbf{y}}} \delta(y_1, y_2) dH(y_1, y_2)$$

Mean absolute growth ($\approx$ Fields-Ok index)

$$\mathrm{E}(|\delta|; Y_1, Y_2) = \int_{\Omega_{\mathbf{y}}} |\delta(y_1, y_2)| dH(y_1, y_2)$$

Individual income growth

Mean, Mean absolute growth, and risk-adjusted mean growth (ctd.)

Consider a rank-dependent (S-Gini) welfare measure to derive a measure of growth 'deflated' by the degree of undertainty (a.k.a. risk, inequality) of the income growth:

Risk- or Inequality-adjusted mean growth

$$\mathrm{CE}(\delta, Y_1, Y_2; \upsilon)) = \int_{\Omega_{\mathbf{y}}} \omega(\delta(y_1, y_2); \upsilon)\delta(y_1, y_2) dH(y_1, y_2)$$

with

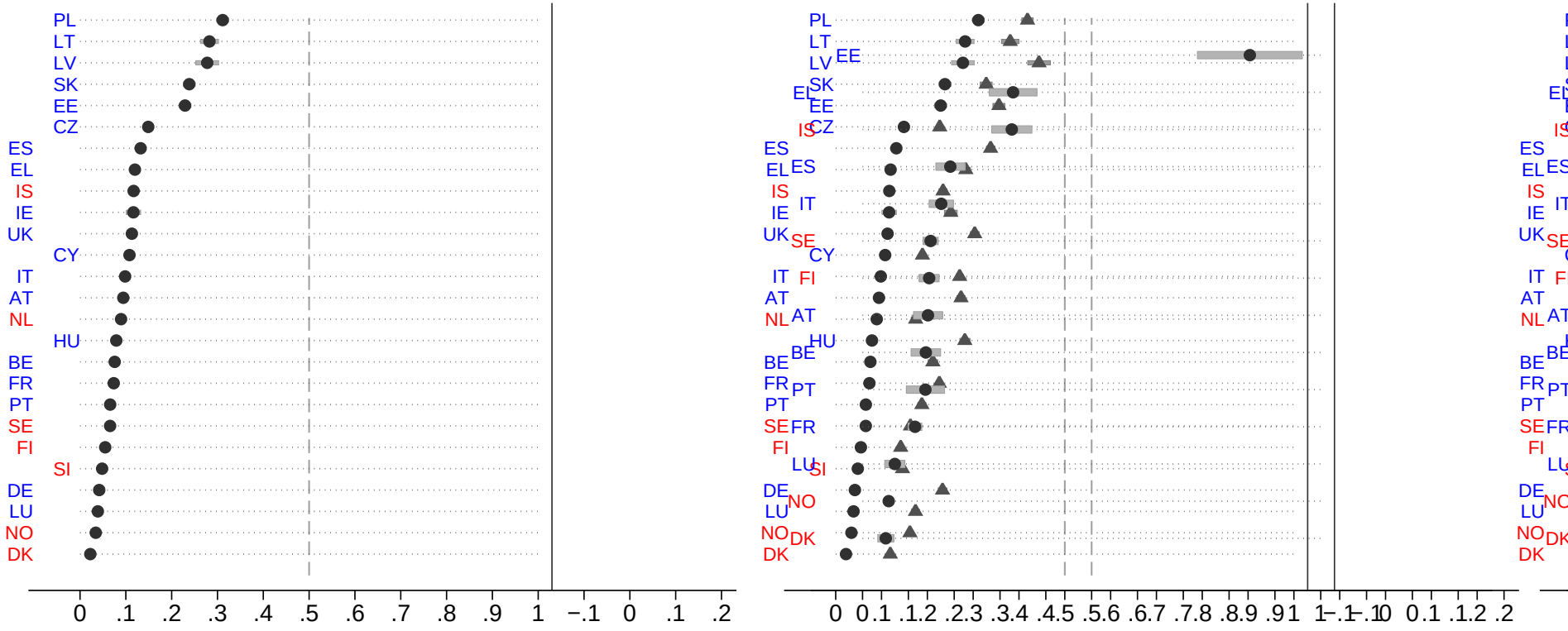
$$\omega(\delta(y_1, y_2); \upsilon) = \upsilon(1 - G(\delta(y_1, y_2)))^{\upsilon - 1}$$

where G is the empirical CDF of the individual income growth distribution.

(Focus here on $\upsilon = 2$)

Individual income growth

Mean, Mean absolute growth, and risk-adjusted mean growth



Individual income growth

Progressivity and progressivity-adjusted mean growth

In inter-temporal context, some form of anonymity can be relaxed: preference for gains to be larger for those starting at the bottom, a.k.a. progressivity of growth (tends to reduce inequality):

Progressivity-adjusted mean growth

$$P(\delta, Y_1, Y_2; \upsilon) = \int_{\Omega_y} \omega(y_1; \upsilon)\delta(y_1, y_2)dH(y_1, y_2)$$

with

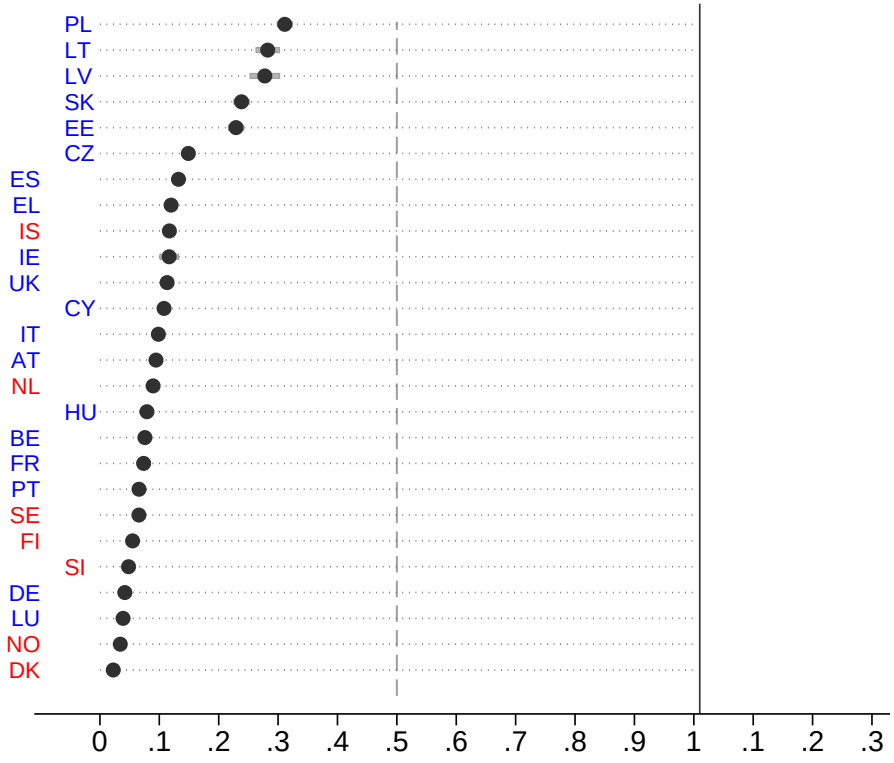
$$\omega(y; \upsilon) = \upsilon(1 - H_1(y))^{\upsilon-1}$$

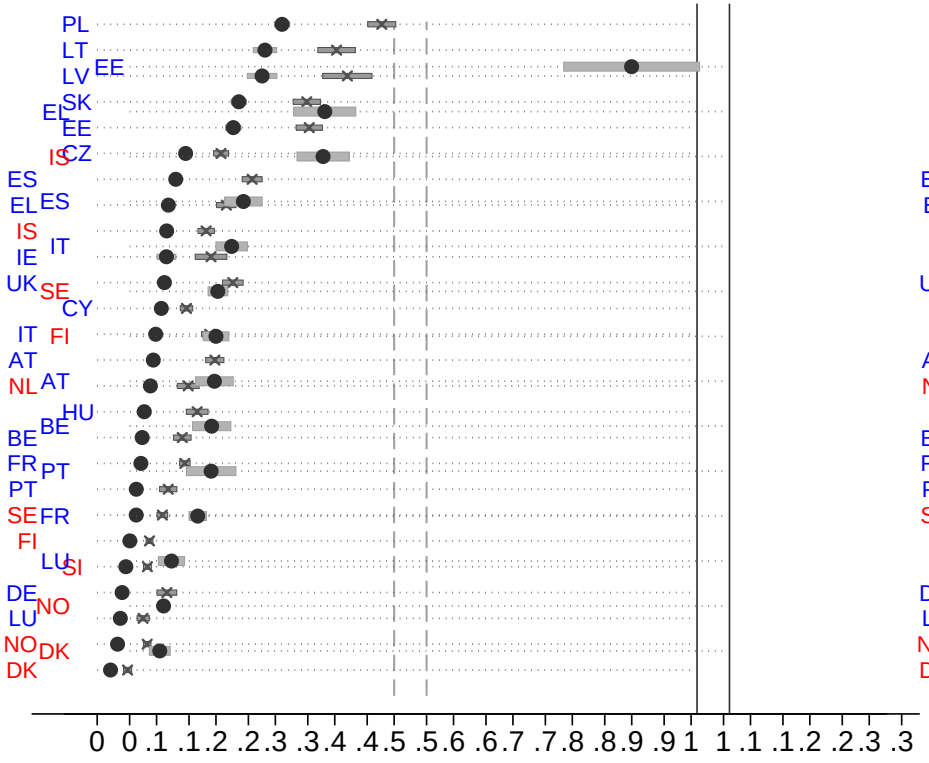
where H_1 is the empirical CDF of the individual base period income distribution (Van Kerm, Econ. Letters 2009)

Progressivity measure: $P(\delta, Y_1, Y_2; \upsilon) - E(\delta; Y_1, Y_2)$

Individual income growth

Mean, Progressivity, Progressivity-adjusted mean growth





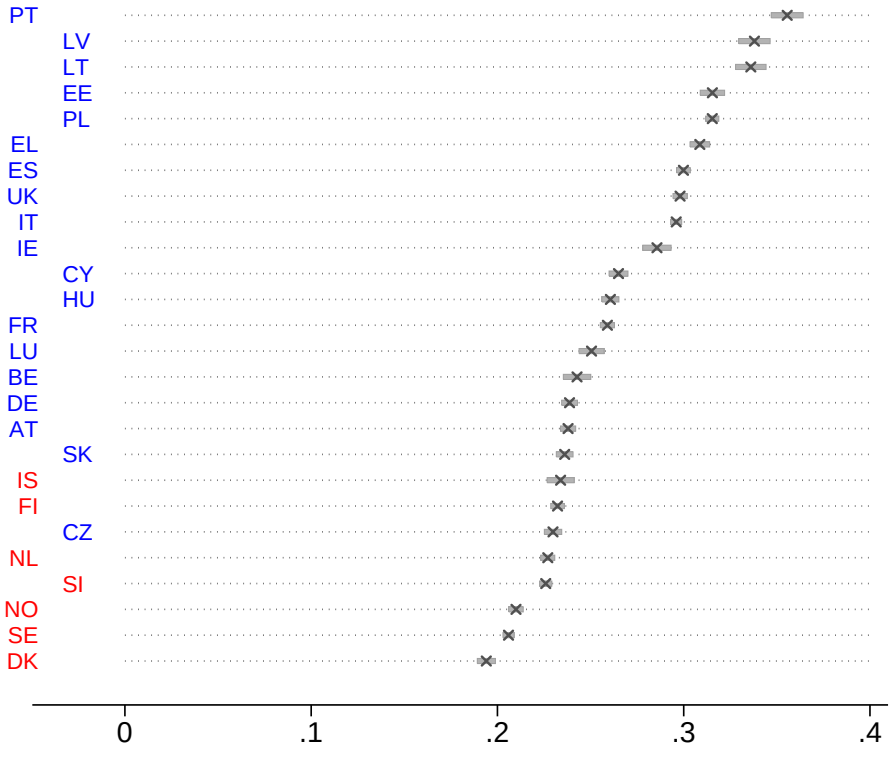
Individual income growth

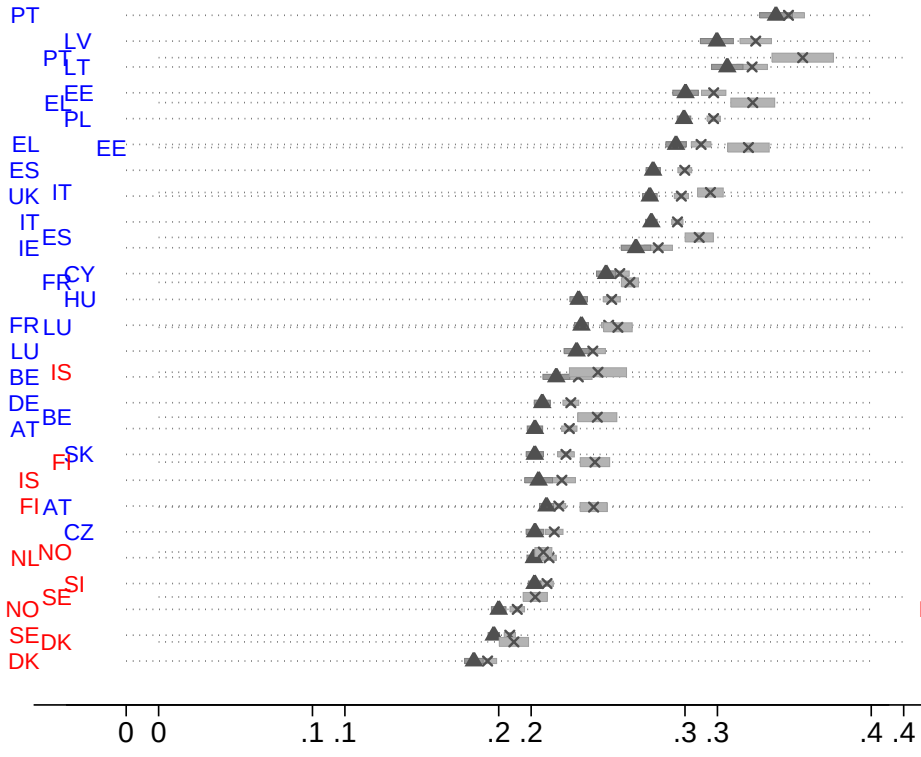
Main observations

- High income growth in Central Europe and Baltic States (except CZ, HU, SI)
- If we ‘penalize’ uncertainty in growth, picture changes
  - good performance of CY or NL (in addition to most CE and Baltic states)
  - worst cases for ES, UK (despite high mean growth) and HU(!) and DE(?)
- If we ‘reward’ progressivity of growth, yet other different picture
  - PL above all countries
  - good performance of ES or UK
  - poor performance of CZ or CY ... and most ‘register’ countries

Intertemporal inequality

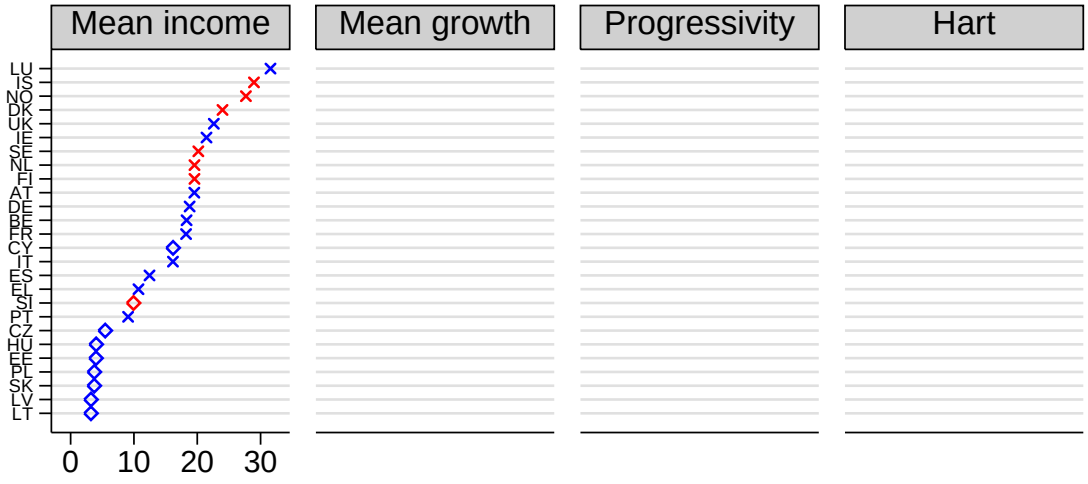
Inequality, inequality of time-averaged income and Shorrocks' index

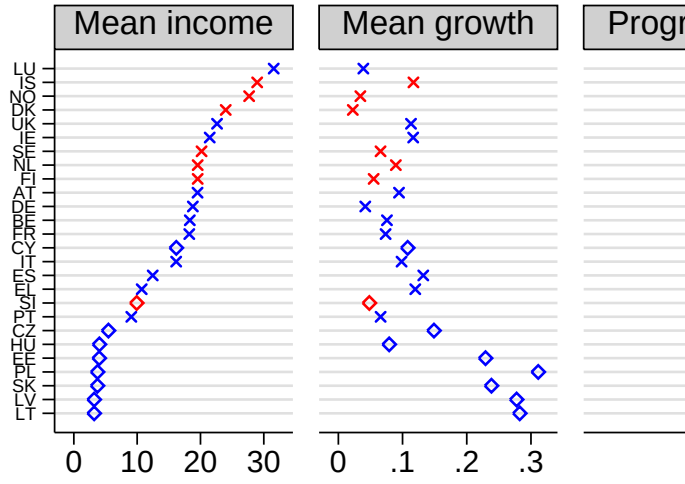


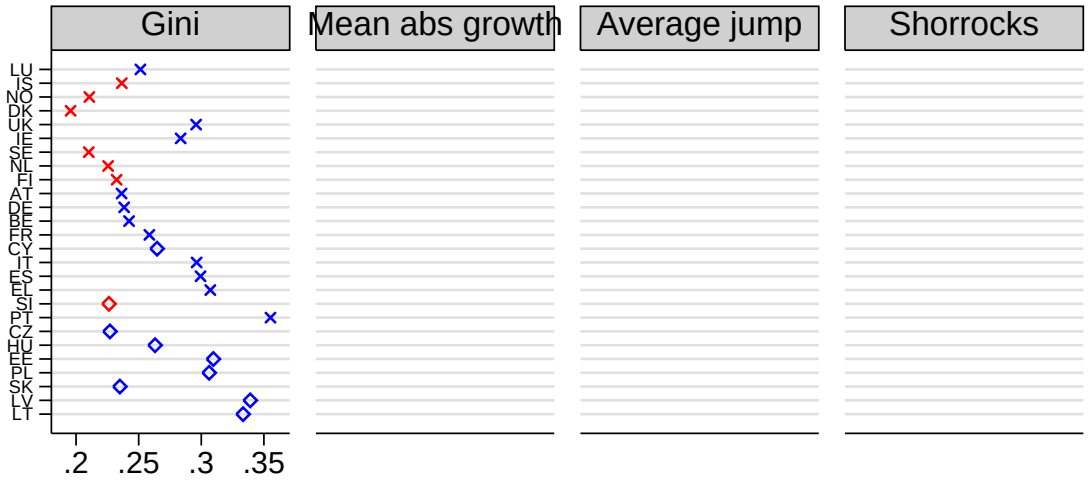


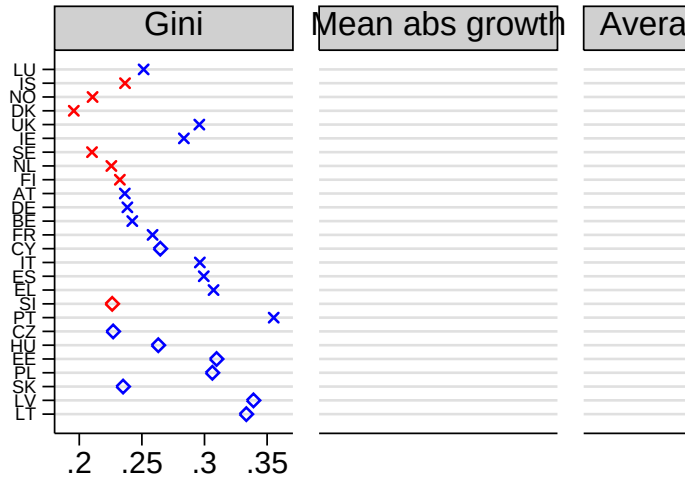
Association between measures

Level, inequality, growth, mobility



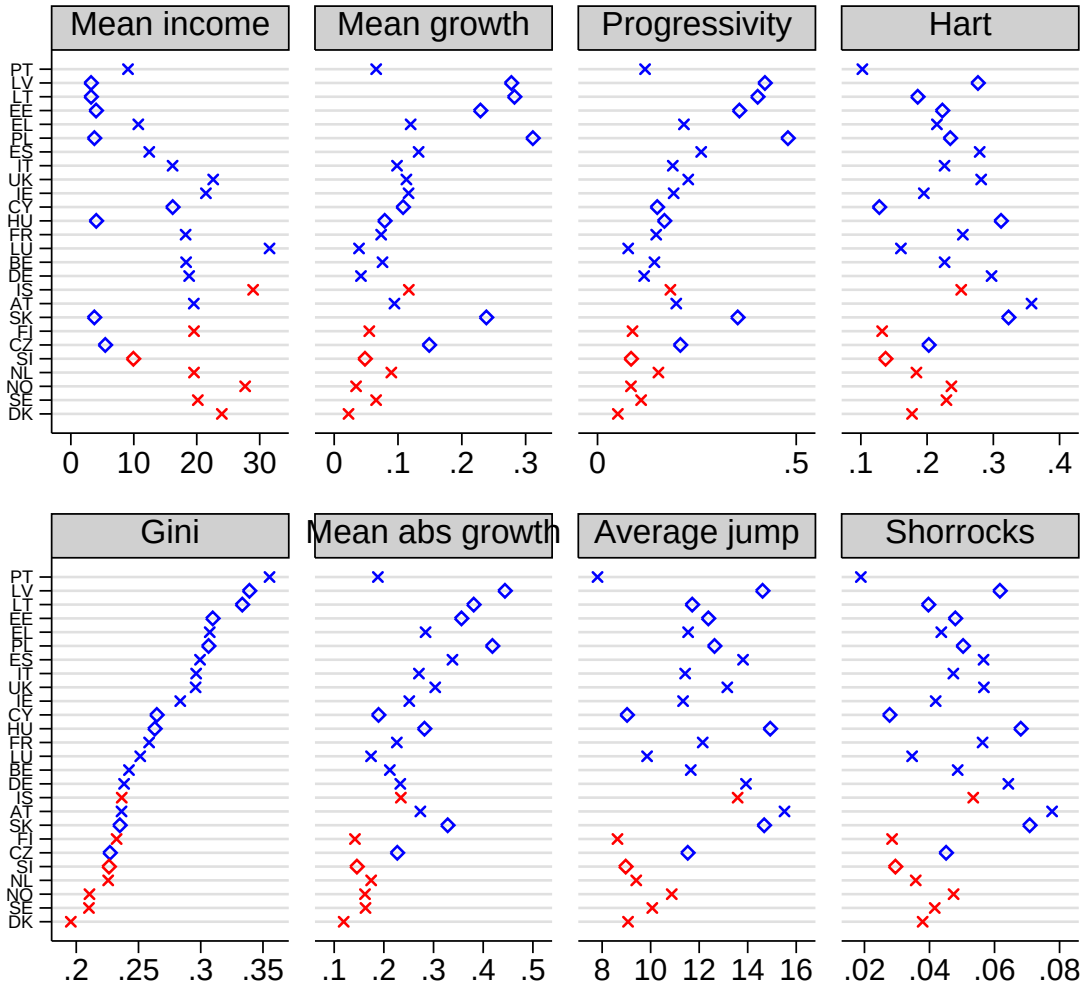






Association between alternative measures

Level, inequality, growth, mobility



Basic robustness assessment

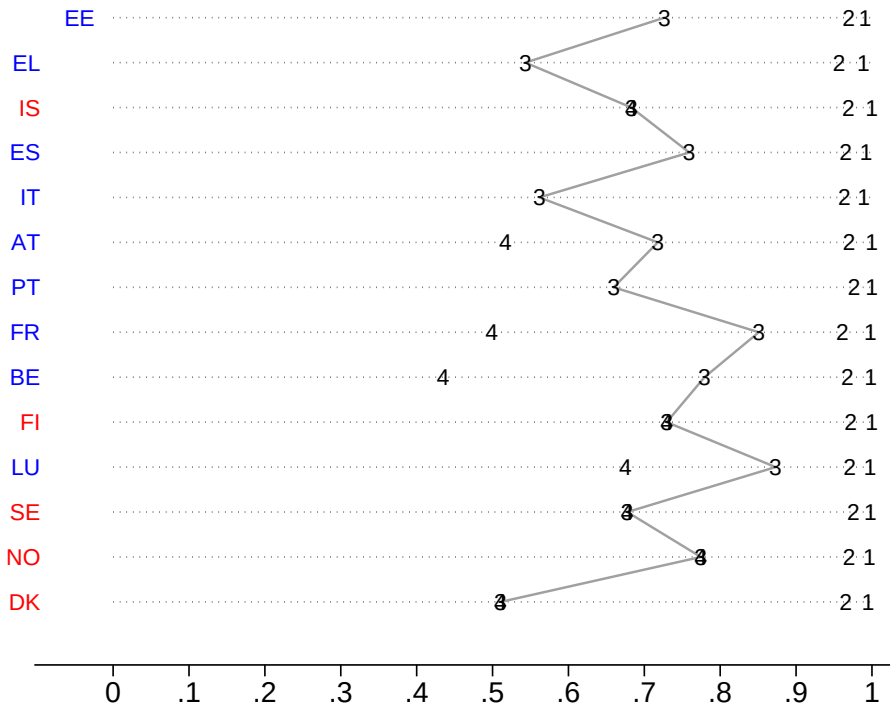
Most statistics presented so far are sensitive to

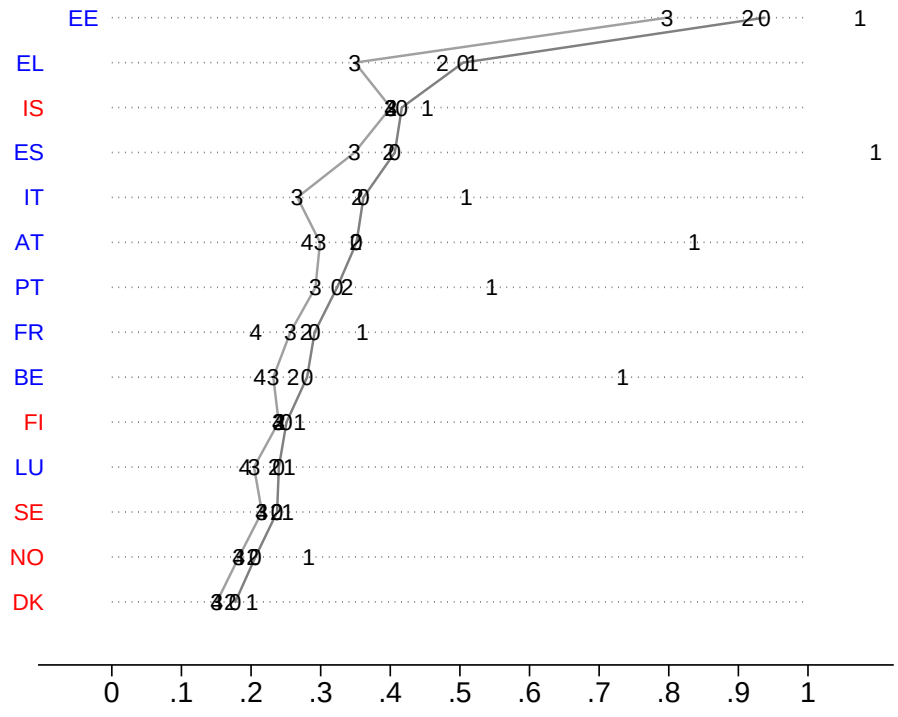
- extreme data (outliers) – non-robust much like most inequality measures
- measurement error – with random error uncorrelated over time particularly problematic (false mobility and spurious regression to the mean)

Dropped all incomes above $1.25 \times P99$ or below $0.75 \times P01$ – but also considered alternative samples as a robustness check (self-employment income and imputations)

Basic robustness assessment

Mean abs. growth with alternative subsamples





Accounting for cross-country differences?

Can the cross-country differences be easily explained by differences in household and employment dynamics?

Apparently ‘No’. An exercise of direct standardization suggests that differences in prevalence of change in household size and number of people at work employed explain very little of the cross-country variation.

More detailed examination needed (... and need determine how much of differences are driven by data collection differences)