The Wellbeing of Nations: A Multidimensional Mixture Distribution Analysis of Poor Nation-Rich Nation Status
by Gordon Anderson, Alessio Farcomeni, Maria Grazia Pittau and Roberto Zelli

Discussion by Andrea Brandolini
Bank of Italy, DG Economics, Statistics & Research

Aim of the paper

- Examine the **progress of groups of nations** by studying the **joint distribution** of the components of the Human Development Index (HDI), without predetermining the number of groups or their boundaries

  - *Semi-parametric technique for class categorisation*

  - *Analysis of poverty, inequality and polarisation of the groups*

  - *Convergence as measured by the evolution of the joint distribution*

$\Rightarrow$ **Very interesting paper, but I feel sometimes lost in technicalities that prevents me from grasping economic meaning**

Empirical methods

- **Assumption 1**: well-being attributes jointly normally distributed

$$f\left(\mathbf{y}; \Psi\right) = \sum_{j=1}^{k} w_j f_j\left(\mathbf{y}; \boldsymbol{\mu}_j, \Sigma_j\right)$$
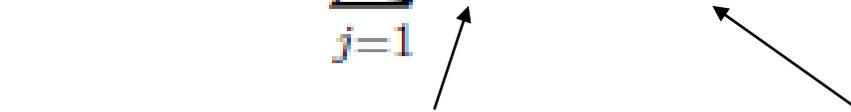
mixing proportions   multivariate normal density

- **Assumption 2**: As there are inter-temporal links, outcomes are _conditional_ on an unobserved discrete latent variable

  Discrete latent distribution is natural way to cluster nations, allowing for transitions between groups and year-specific number of clusters

  $\Rightarrow$ **What economic interpretations for w_i's?**

Data

- Three HDI components: (1) log of per capita GNI; (2) life expectancy at birth; (3) expected years of schooling

- All three standardised with respect to initial year 1990 ⇒ **How?**

	Means			Std Deviations		
	Low	Medium	High	Low	Medium	High
	GNI per capita					
1990	-1.23	-0.02	1.15	0.287	0.253	0.308
1995	-1.18	0.02	1.31	0.431	0.187	0.172
2000	-1.11	0.09	1.36	0.417	0.172	0.186
2005	-1.00	0.24	1.41	0.402	0.157	0.174
2010	-0.91	0.39	1.44	0.328	0.149	0.137
2014	-0.81	0.46	1.46	0.332	0.138	0.133

⇒ **Negative numbers?**

Results (1)

- The number of components k of the multivariate distribution is fixed and equally to three.

  - This endogenously determined clustering contrasts the four categories proposed by the 2014 Human Development Report for country grouping the HDI

  ⇒ **How do the two clustering compare each other (size, country participation)?**

Year	Relative group size		
	Low HD	Medium HD	High HD
1990	0.41	0.43	0.16
1995	0.41	0.42	0.16
2000	0.40	0.43	0.17
2005	0.38	0.45	0.17
2010	0.35	0.47	0.18
2014	0.34	0.47	0.19

Results (2)

- Transitions

Final year	Initial Year		
	Low HD class	Medium HD class	High HD class
5 year			
Low HD class	0.971	0.003	0.005
Medium HD class	0.025	0.927	0.005
High HD class	0.004	0.058	0.991
25 year			
Low HD class	0.863	0.016	0.021
Medium HD class	0.106	0.733	0.021
High HD class	0.031	0.251	0.958

$\Rightarrow$ **Discuss number of countries. In 1990, 16% of 164 countries were in High HD class = 26 countries. What does it mean 0.5% of 26?**

Results (3)

- "The final results are based on the assumption that the component means are fixed while the variances are not equal between components and each component variance may vary over time according to a specific GARCH-type regression."

- "The analysis detected a slowly evolving, relatively immobile world, over the period the Low group diminished in size (which may be interpreted as a reduction in the poverty rate) reflective of some upward mobility."

$\Rightarrow$ **It follows from the fact that the model with trends in mean was excluded as it was "rather unstable largely because the number of countries is fixed and relatively small as compared to the number of parameters involved in such model". Is this conclusion sensible?**

Thank you for your attention!