What drives productivity of small states, global, regional or country specific factors?

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Productivity - Why is it important? How do we measure it?

"Productivity isn't everything, but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker." Paul Krugman, The Age of Diminishing Expectations (1994)

Several measures of productivity exist. We will focus on „Total Factor Productivity (TFP)".

Also defined as (Havik et al. (2017)):

rGDP

Labour
(working hours)

$$TFP = \frac{Y}{K^{(1-\alpha)} \times L^{\alpha}}$$

Capital

How much we produce per labour and capital. Controls for size. Growth of TFP is also the difference between growth rate of output minus combined growth rates of capital and labour.

It measures efficiency (and utilization) in production.

In the long-run TFP is driven by technological progress.

What do we do?

- For 115 countries we decompose their productivity growth to world, regional and country specific factors.

- We then estimate what is the relative contribution of each factor to the dynamics of TFP growth? (what share of variance of TFP is due to global, regional and country specific factors)

- Do countries with a higher share of productivity related to global dynamics grow faster than countries with a lower share of productivity related to global dynamics? We find that it delends if a country is big or a small…

- We find that region specific factors play a minor role in explaining fluctuations in productivity. Kose et al. (2003, AER) find similar result for economic activity.

Model(s) & Data

MODEL

We use a simplified version of Beck, Hubrich and Marcellino (2015, JAE) model.

- They use a statistical procedure (Principal Components Analysis) to extract Euro Area, country and regional factors that drive inflation rates.

- We use their procedure to extract world, regional and country specific factors and investigate their contribution to the growth of productivity.

DATA

- Pen World Tables data for TFP and other variables.

- The Conference Board classification of world regions.

- World Bank classification of countries by income (H,UM,LM,L).

- Data was screened for outliers (observations outside of the 4 times the interquartile range are treated as outliers).

- For years 1990-2014 (due to balancing the data).

- Includes 115 countries.

RESULTS (1) – descriptive analysis

- We extract 2 world factors (Bai and Ng (2004) test proposes 2 or 9 factors).

- We extract 1 regional factor per region (due to data constraints for certain regions).

- Robustness checks up to 5 global factors and 5 regional factors (where possible).

Table 1: Average share of TFP growth related to Global, Regional and Country specific factors, by region and population size, 1991-2014

A: By region

Region \ Factor	Global	Regional	Global&Regional	Country
Africa	18%	14%	32%	68%
Asia	25%	28%	54%	46%
Cent. and East. Eur. and Cent. Asia	52%	22%	73%	27%
Latin America	17%	23%	40%	60%
Middle East	30%	19%	49%	51%
North America	54%	45%	99%	1%
Oceania	40%	16%	56%	44%
Western Europe	46%	19%	65%	35%

B: By population size

Region \ Factor	Global	Regional	Global&Regional	Country
POP2016 > 3.5mio (N=23)	30%	24%	54%	46%
POP2016 <= 3.5mio (N=92)	30%	14%	44%	56%

Source: Pen World Tables, UN and own calculation.

Figure 1: Average TFP growth and share of TFP growth attributable to global factors, by population size, 1991-2014
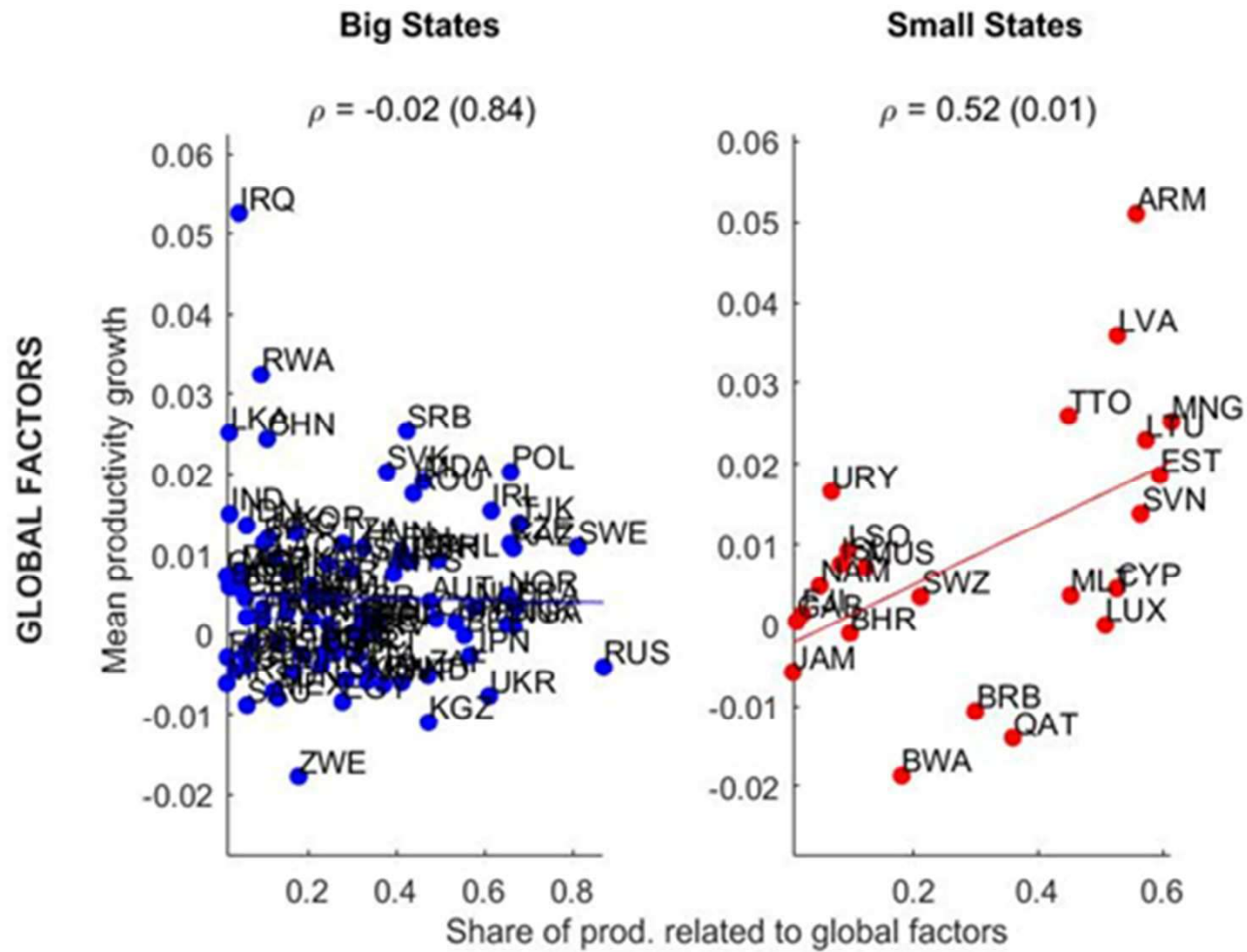
RESULTS (2) – regression analysis

- In the 80s and 90s economists tried to establish linkages between long-term economic growth, economic-policy, political and institutional factors.

- Levine & Renelt (1992, AER) examine if studies linking the above factors to economic growth are robust.

- They find majority of results to be fragile.

- They establish that robust explanators of economic growth include: Initial level of real GDP (GDP_INIT), average annual rate of population growth (POP), investment share of real GDP (INV), secondary school enrolment (HC).

- We replace economic growth with productivity growth (TFP_GR - calculated as log-difference).

- **We find that, for small states, a higher share of dynamics related to global factors is associated with higher productivity growth. This relation is absent for big states.**

	(1) TFP_GR	(2) TFP_GR	(3) TFP_GR	(4) TFP_GR	(5) TFP_GR	(6) TFP_GR	(7) TFP_GR
LGDP_INIT	-0.639*** (0.000)	-0.696*** (0.000)	-0.681*** (0.000)	-0.719*** (0.000)	-0.750*** (0.000)	-0.975*** (0.000)	-0.768*** (0.000)
INV	0.107 (0.288)	0.091 (0.376)	0.086 (0.408)	0.089 (0.390)	0.085 (0.414)	0.012 (0.918)	0.038 (0.724)
HC	0.487** (0.004)	0.519** (0.001)	0.516** (0.001)	0.514** (0.002)	0.532*** (0.001)	0.588*** (0.000)	0.547*** (0.001)
POP_GR	-0.313* (0.013)	-0.289** (0.007)	-0.289** (0.008)	-0.292** (0.006)	-0.293** (0.007)	-0.300** (0.007)	-0.306** (0.005)
EXP_TOT	-0.047 (0.615)	-0.045 (0.617)	-0.067 (0.489)	-0.042 (0.634)	-0.067 (0.461)	-0.072 (0.418)	-0.078 (0.399)
EXP_TOT_SS		0.239** (0.009)	0.314* (0.023)	0.242** (0.007)	0.232* (0.011)	0.263** (0.004)	0.235** (0.010)
SS			-0.088 (0.576)				
RGN				0.036 (0.741)			
INC					-0.106 (0.359)		
KL						0.309 (0.137)	
EXP_SHARE							0.154* (0.012)
N	115	115	115	115	115	115	115
R-sq	0.217	0.271	0.273	0.272	0.279	0.288	0.284
F	5.672	5.544	5.660	5.771	4.593	4.605	6.017

Standardized beta coefficients; p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Summary

- Global factors explain approx. 30% and the regional approx. 20% of productivity dynamics.

- For small states only, a higher share of productivity related to global dynamics is associated with higher average productivity growth.

- It is likelly that big states can rely on an internal market whereas small states need access to an external market, thereby strengthening the statistical association for the case of small states.

- This result could imply that promotion of international trade could aid productivity growth for small countries. This should be interpreted with caution since we do not establish causation.

Shortcomings and future work

- We identify global and regional factors by using a statistical approach, devoid of economic theory. Further work should focus on identifying sources of global and regional dynamics (technology/global deman/world credit cycle/demographics…).

- For identification purposes we assume factors are orthogonal. Moench et al. (2013) bypass this assumption by assuming a different model.

- Our factor model assumes constant variance for the period 1990-2014. It could be extended to allow for a time varying variance.

- „Share of variance explained by global factors" is estimated/uncertain. Therefore we are likely over-estimating its statistical significance. A bootstrap procedure would be needed to correct for this.

Thank you for your attention!

Figure 1: Average TFP growth and share of TFP growth attributable to regional factors, by population size, 1991-2014

Big States

$\rho = 0.05\ (0.6)$

Small States

$\rho = -0.1\ (0.66)$

REGIONAL FACTORS

Mean productivity growth

Share of prod. related to regional factors