Wiener Institut für
Internationale
Wirtschaftsvergleiche

The Vienna Institute for
International Economic
Studies

www.wiiw.ac.at

Session: The truth lies in the data – new data developments in view of estimating potential output

Capital stock and MFP estimations: A comparison

Robert Stehrer
The Vienna Institute for International Economic Studies (www.wiiw.ac.at)

Joint OGWG - ECFIN - JRC Conference: "Assessment of output gaps and potential output in the context of the COVID-19 pandemic and its aftermath"

Online conference, 29-30 September 2021

Ongoing research within the project ESTAT/C/2018/016 "Growth and productivity accounts – Capital productivity and multifactor productivity"

Background

- ESTAT Growth and productivity accounts (GPA) project (co-operation with NSIs, DG ECFIN, DG GROW, ECB and OECD)

  - ➤ Quality assessment of data underlying productivity statistics (labour inputs, capital stocks)

  - ➤ Aim to disseminate selected additional and new indicators

    - Labour productivity statistics
    - Capital productivity statistics } Regular statistics
    - Multi-factor productivity statistics   Experimental statistics

© wiiw

Overall aims

➤ Assess quality of capital stock data available from Eurobase*

– Relevance and availability

– Coherence and comparability

from user perspective

➤ Suggestion to publish various capital-productivity indicators

– Definitions, potential usefulness, and applicability

– Comparison accross countries and industries and over time

– Suggestions for publication in Eurobase

*For details see:
Hanzl, D. and R. Stehrer (2021), Quality analysis of capital-productivity (CAPI) and multi-factor productivity (MFP) indicators, Deliverable 1.2.
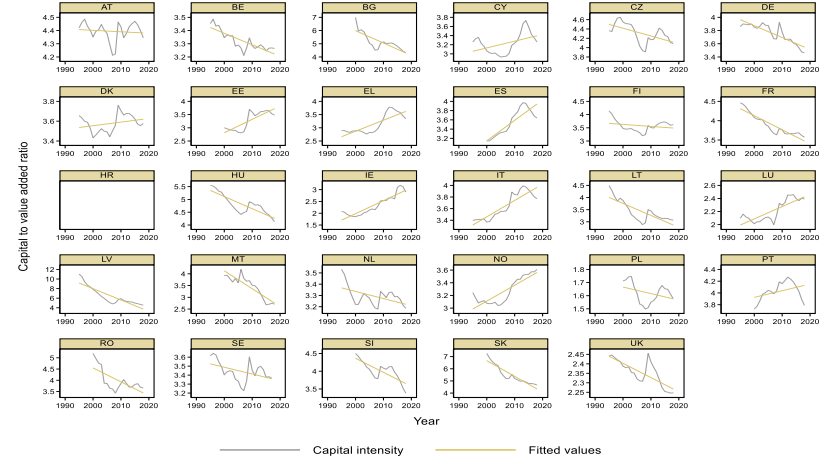
* See next presentation by Julio Cabeca (Eurostat)

© wiiw

Total economy and total fixed assets: Net capital stock per hour worked
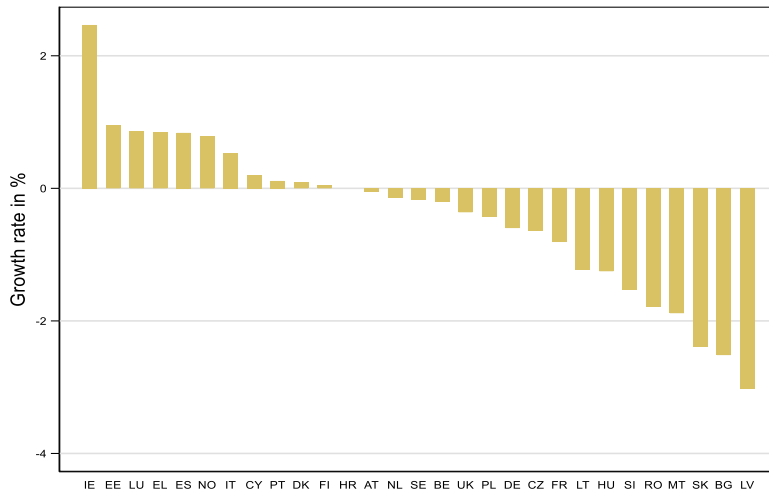
Net capital stock per hour worked ('capital-intensity')
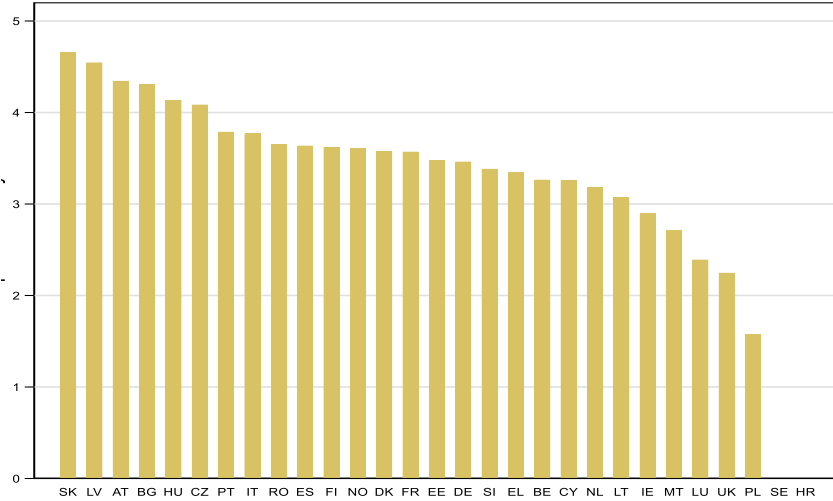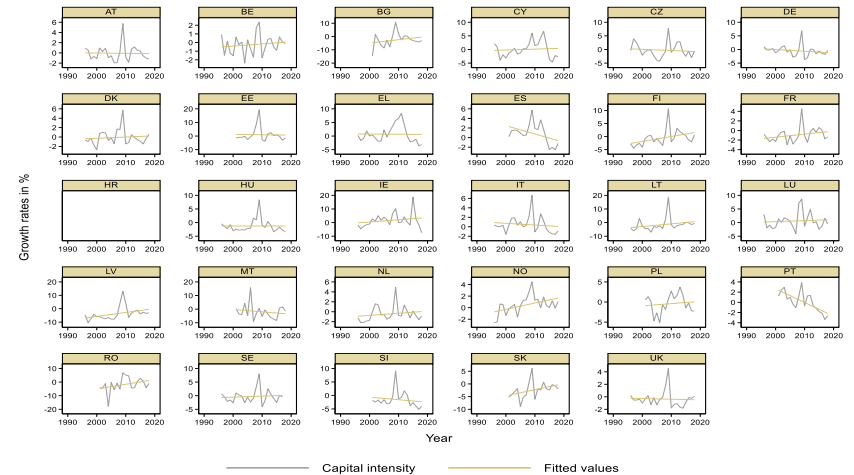

Levels over time

Average annual growth rates ('capital-deepening')

Annual growth rates

Note: Download 15/02/2021
Source: own elaboration based on Eurobase

Selection criteria and decisions

➢ Purely based on National Accounts figures

  ➢ i.e. no calculation of capital services or labour services which would require additional (not undisputed) assumptions

➢ CAPI provide rich dataset for researchers and policy-makers for studying role of capital in productivity dynamics

  ➢ only changes over time included

  ➢ Quality assessment suggests need of further harmonization in compilation methods (enhancing the quality) for estimation of capital stocks and related indicators across countries

  ➢ Allows for easy and up-to-date updating procedures

➢ Transparent method allows for further comparisons with more sophisticated approaches (basically taking out parts from crude MFP)

➢ Selection of indicators should allow for easy-to-understand and relevant information for non-technical experts and policy makers

  – Particularly preserving broad trends in productivity dynamics

© wiiw

Indicators 1:
Selected capital productivity indicators (CAPI) to be published

		Capital productivity	Capital-output ratio	Capital deepening	
		Gross value added per unit of net capital stock (real)	Net capital stock to gross value added ratio (real)	Net capital stock per person employed (real)	Net capital stock per HW (real)
FORMULA	Numerator	Real Value added (in CLV)	Real Capital Stock (in CLV ***)	Real Capital Stock (in CLV ***)	Real Capital Stock (in CLV ***)
	Denominator	Real Capital Stock (in CLV ***)	Real Value added (in CLV	Persons employed	Hours worked

Industry detail	Asset detail				
Total economy	Total fixed asset	X	X	X	X
A21*	Total fixed asset	X	X	X	X
Total economy	Main asset types (4 +ICT)**		X	X	X

Units: Index (2015=100), percentage changes t-1, t-3, t-5, t-10

* Excluding NACE-Rev2 sections L, O, P, Q, T and U (aligned with the breakdown by industries for labour productivity indicators)
** The 4 main asset types are the following: 1) N11K (Dwellings + Other buildings and structures); 2) N11M (Machinery and equipment);
3) N115(cultivated biological resources); 4) N117(intellectual property products) plus N1132 (ICT equipment).
*** Capital Stock data expressed in Chain Linked Volumes (CLV) are not transmitted by countries.
They need to be calculated from data in current and previous year prices

Comparison to other sources

➢ Purely based on National Accounts data (available from Eurobase) on capital stocks (i.e. not calculated with similar method from GFCF data)

  ➢ Could have some merits, but – in the longer run - NA capital stock based data could be superior in information content if well harmonised

  ➢ Work stream (FIXC-CAP EUROSTAT project) in investigating the compilation method of stocks of fixed assets and estimation of consumption of fixed capital under ESA 2010 *[see next presentation]*

➢ No calculations of capital services (which requires further assumptions)

Comparison of growth rates between capital stocks and capital services
2000-2018, in %
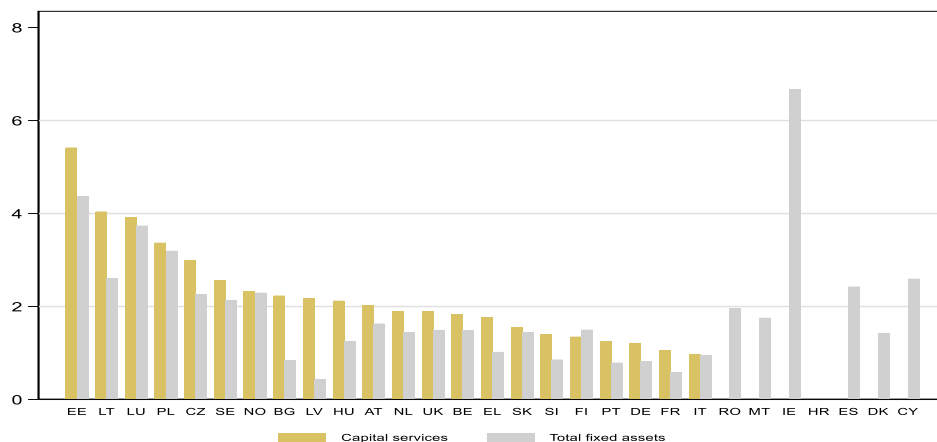
Indicators 2:

Experimental data: Crude MFP growth

➢ Total economy

➢ Based on NA data (allows for transparent calculation)

➢ Formulas

$$\text{MFP}_t = \widehat{\text{VA}}_t - \overline{\text{sh}_{\text{LAB},t}}\widehat{\text{H}}_t - \overline{\text{sh}_{\text{CAP},t}}\widehat{\text{K}}_t$$
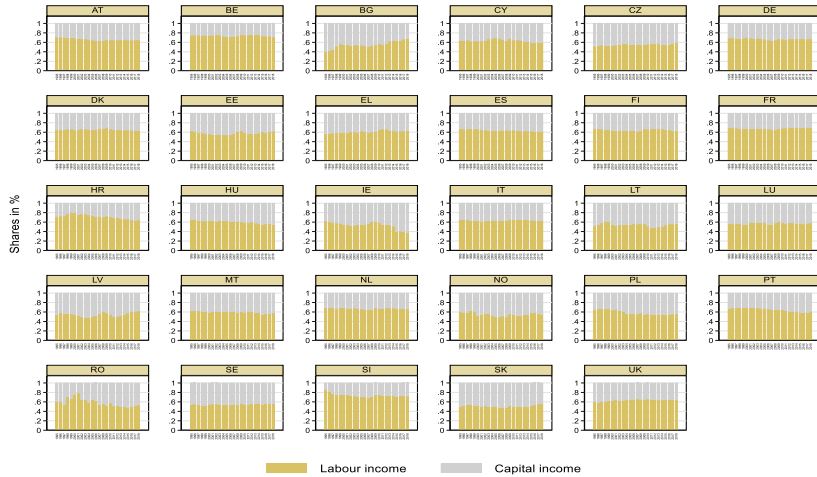
$$\text{LAB}_t = \frac{\text{H\_EMP}_t}{\text{H\_EMPE}_t}\ \text{COMP}_t$$

$$\text{sh}_{\text{LAB},t} = \frac{\text{LAB}_t}{\text{VA}_t}\ \text{COMP}_t \qquad \text{and} \qquad \text{sh}_{\text{CAP},t} = 1 - \text{sh}_{\text{LAB},t}$$
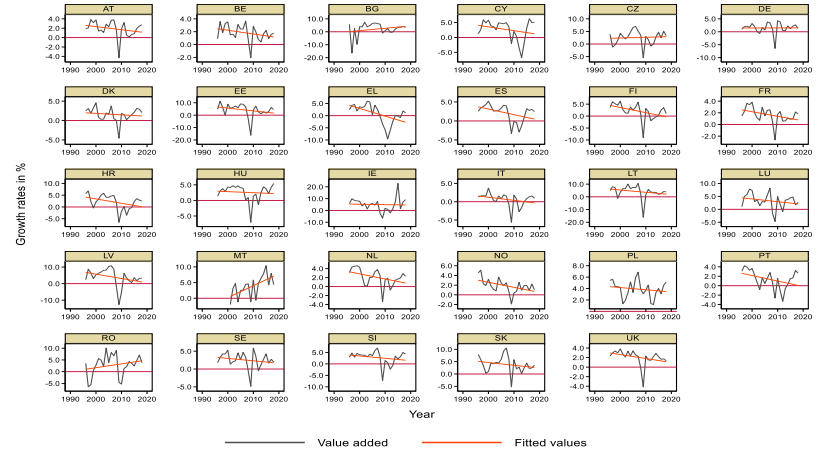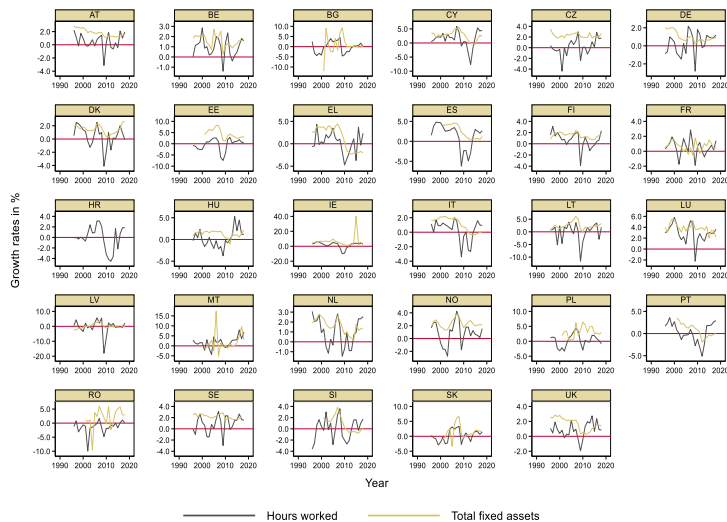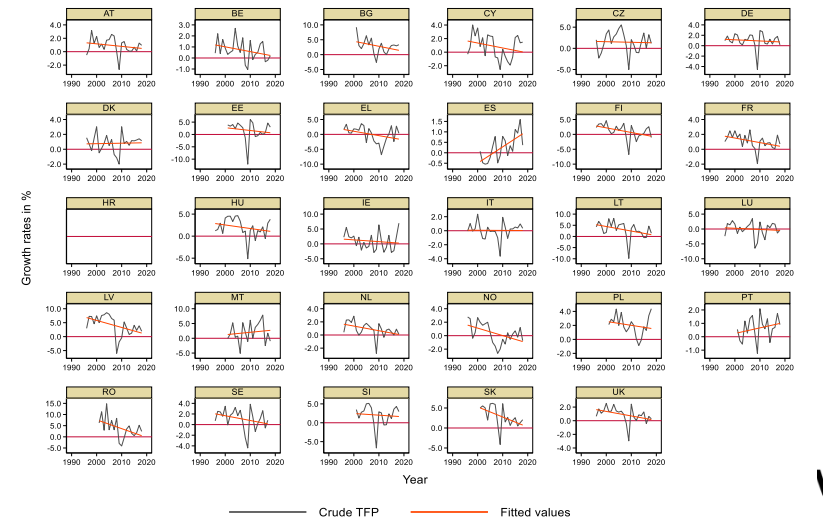
Inputs to calculations

Income shares

Labour income · Capital income

Value added growth rates

Value added — Fitted values

Growth rates of hours worked and capital stocks

Hours worked — Total fixed assets

Crude TFP

Crude TFP — Fitted values

Comparison to other sources

➢ Total economy

➢ Calculated purely based on NA data

 – Also for capital stocks rather than 'capital services' (see before)

 – allows for transparent calculation (no specific assumptions needed)

 – No further data sources (like EU LFS, EU SES) needed

➢ Difference between capital stock and capital services growth and hours worked and labour services growth is included in crude MFP

Correlation of MFP growth rates, 2000-2018
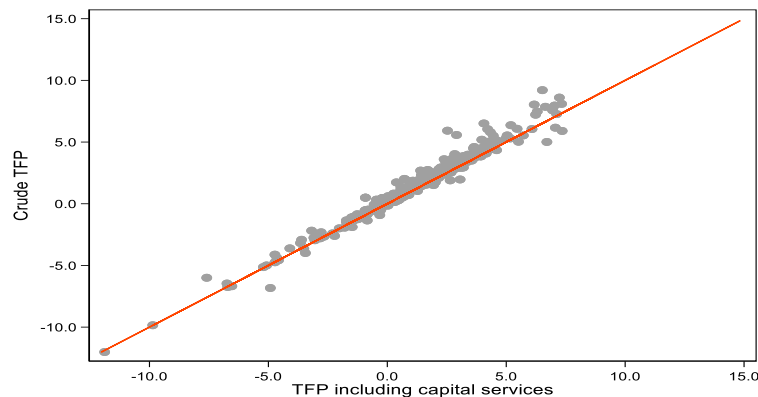
Note: Red line is 45 degree line
Note: Download 15/02/2021
Source: own elaboration based on Eurobase

Comparing NA data and AMECO:

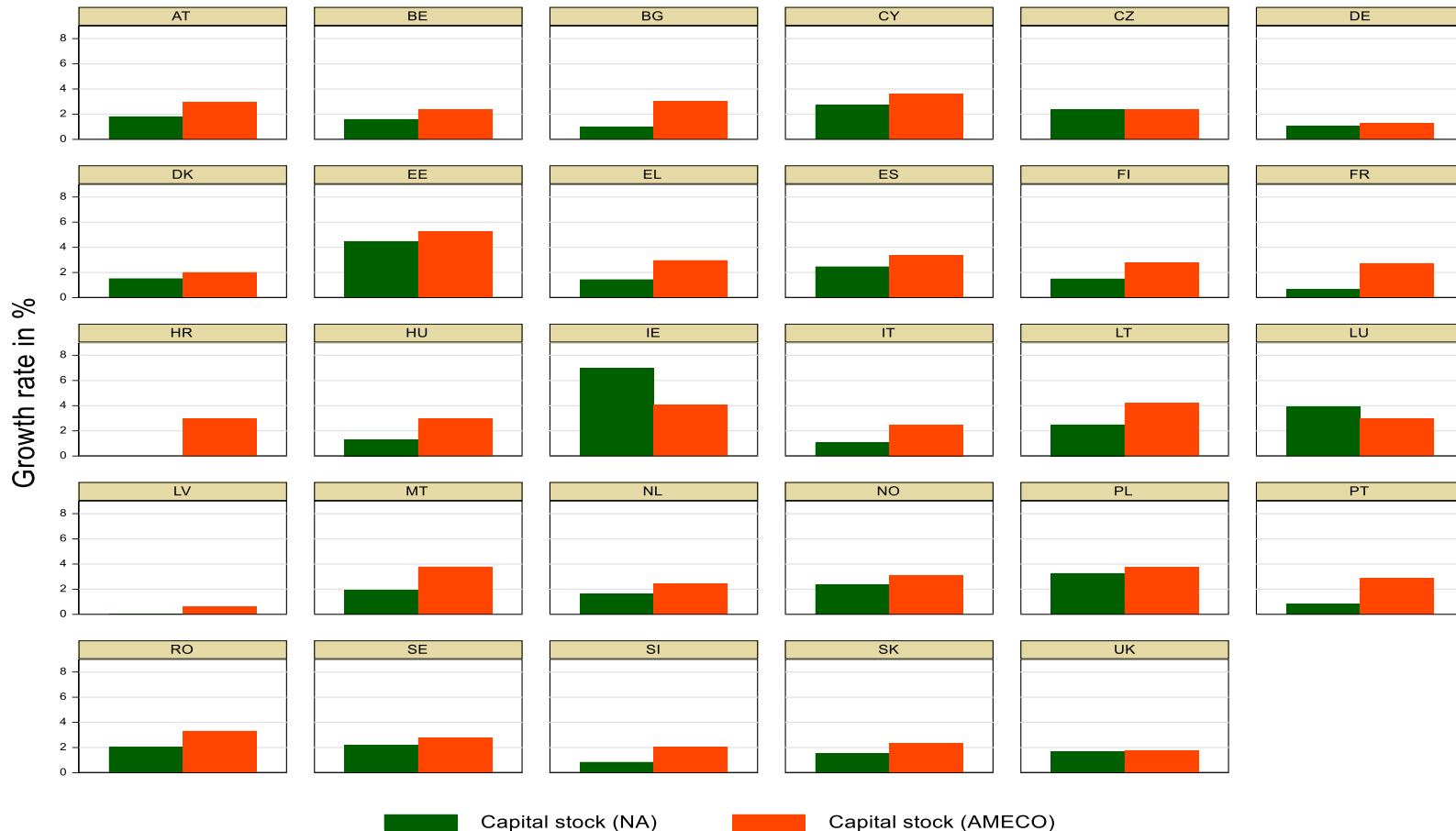# Selected observations on longer term trends

[see backup slides for details]

Production function approach for output gap calculations (see Havik et al, 2014)
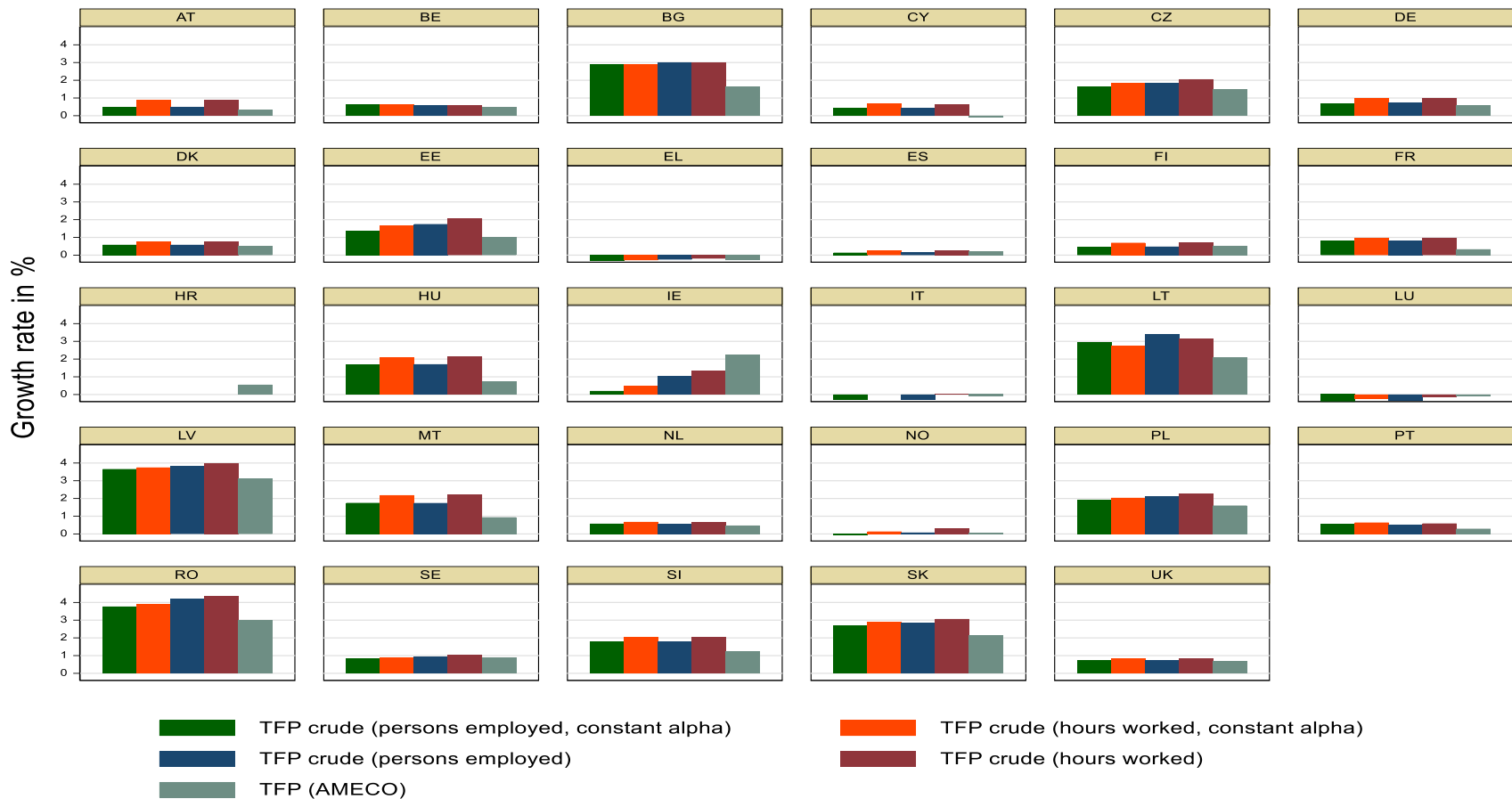
$$Y = A \, L^{0.65} K^{0.35}$$

Capital stock growth rates on average higher in AMECO

Average annual growth rates, 2000-2018, in %

TFP growth rates lower in AMECO

Average annual growth rates, 2000-2018, in %

Growth rate in %

- TFP crude (persons employed, constant alpha)
- TFP crude (hours worked, constant alpha)
- TFP crude (persons employed)
- TFP crude (hours worked)
- TFP (AMECO)

© wiiw

TFP/CrudeMFP + capital growth contributions more similar

Average annual growth contributions, 2000-2018, in %

Growth contribution (in %)

Capital growth contribution (with weight 0.35)   TFP growth contribution
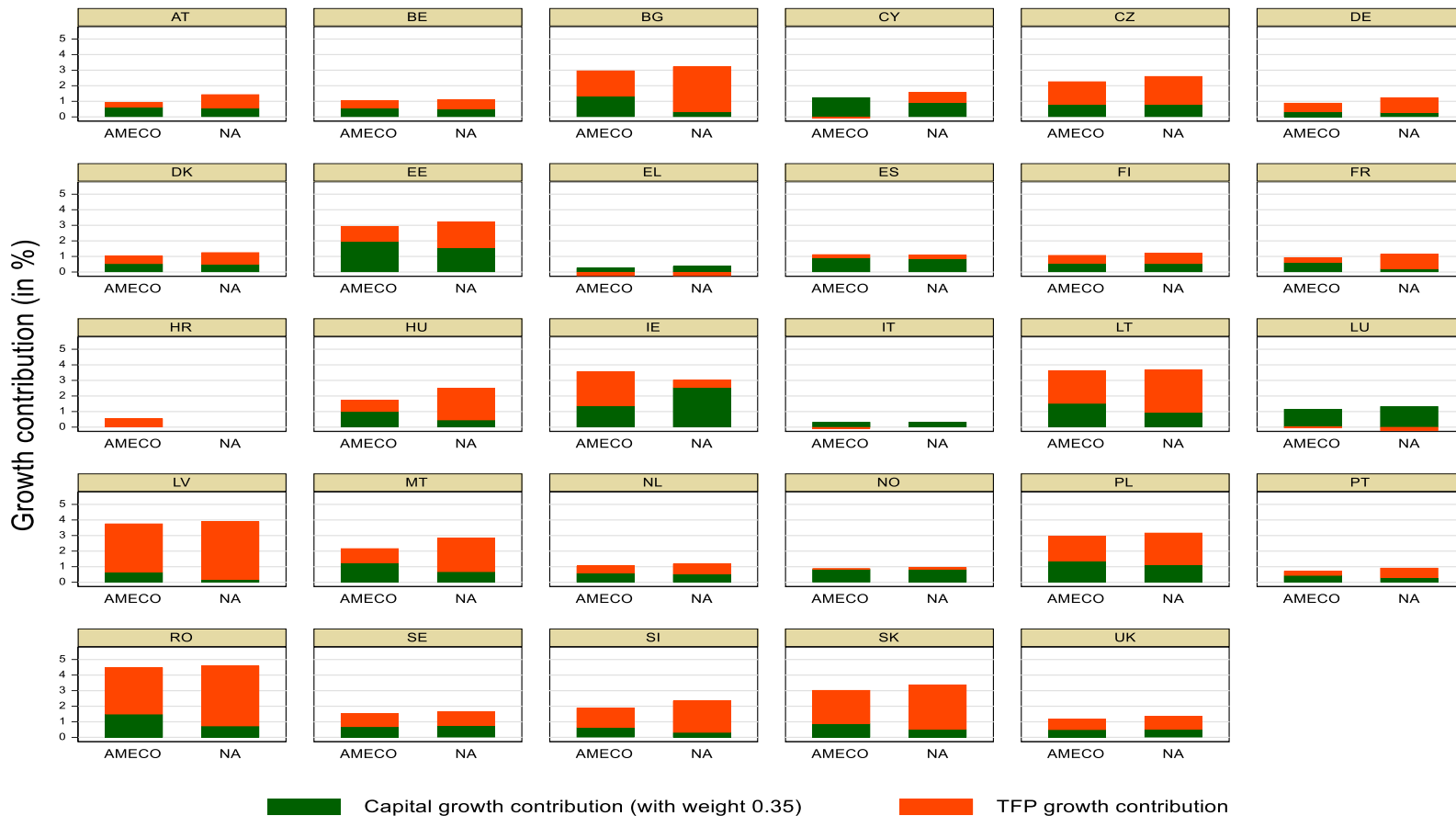
Summary/Conclusions

➢ Capital are important factors for production and (embodied) technical change and therefore needs attention

➢ Need for quality assessment and harmonization of methods

- Ongoing efforts (TF on productivity indicators and TF on fixed capital)

- Provision and comparison of various indicators allow for quality checks

- Important for policy debates (Extension of transmission programme to detailed assets at industry level is recommended)

➢ Pros and cons of using NA (NSI) data versus ‚harmonized calculation of stocks‘ based on GFCF (e.g. PIM) depends on application

- Assessment of methods and assumptions underlying capital stock estimations across countries is urgently needed (see next presentation)

➢ Comparison of NA data and AMECO indicates some differences to be investigated further

- However, for output gap calculations differences are partly ironed out due to interdependency between capital stock and TFP growth (given labour inputs growth)

Ⓒ wiiw

wiiw

Wiener Institut für
Internationale
Wirtschaftsvergleiche

The Vienna Institute for
International Economic
Studies

www.wiiw.ac.at

Thank you for your attention!

Comments welcome!

Follow us:

Robert.Stehrer@wiiw.ac.at
The Vienna Institute for International Economic Studies (wiiw)
www.wiiw.ac.at