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Measurement of labour productivity growth: the Belgian experience

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The origin: EUKLEMS2003 (first release March 2007)

Aim: create a **long-term database on productivity by industry** for EU MS with a breakdown into contributions from capital (K), labour (L), energy (E), materials (M) and service inputs (S)

⇒ heterogeneity in output, inputs and productivity growth across industries and across countries

⇒ **harmonisation** of basic data to generate growth accounts in a consistent and uniform way

Methodology: industry-level MFP/TFP based on the **growth accounting decomposition** (Jorgenson, Gollop and Fraumeni (1987) and in Jorgenson, Ho and Stiroh (2005))

For all aggregations: **Tornqvist quantity index**

⇒ Decomposition of industry output growth:

$$\Delta lnY_{jt} = \overline{v_{jt}^{X}}\ \Delta lnX_{jt} + \overline{v_{jt}^{K}}\ \Delta lnK_{jt} + \overline{v_{jt}^{L}}\ \Delta lnL_{jt} + \Delta lnA_{jt}^{Y}$$

⇒ Decomposition of industry value added growth:

$$\Delta lnV_{jt} = \overline{w_{jt}^{K}}\ \Delta lnK_{jt} + \overline{w_{jt}^{L}}\ \Delta lnL_{jt} + \Delta lnA_{jt}^{V}$$

Evolution of methodology for intermediate inputs

Decomposition of industry output growth **only in the first release** of the project. Intermediate inputs were divided into 3 groups, energy (E), materials (M) and services (S) from SUT

$\Rightarrow$ useful for better productivity evolution assessment by also including changing patterns and efficiency gains in intermediate consumption

How ? Estimation of consistent SUT in current and constant prices (1995-2003) by the FPB based on price data from the National Bank of Belgium, compatible with NA totals

Now ? SUT not yet available at constant prices for long period => growth accounting based on total output (and MFP) no more available

Evolution of methodology for capital input (1/3)

Measurement requirements: capital stock of different assets, user costs of capital and capital income share in total output /value added

Construction of capital stock estimates for all asset types (2007 release):

Harmonised methodology: Perpetual Inventory Method (PIM), geometric pattern with common constant depreciation rate for all countries (different for each of 9 assets)

- PIM : weighted sum of past investments, long historical series of investment crossing industries and assets needed !
- 9 asset types of which 3 are ICT assets: Computing equipment, Communications equipment and Software. In Belgium, not available!

Link to official data: long-term investment series transmitted to the NBB for the revised national accounts release

- ICT deflators: investment in **constant-quality efficiency units**
  - ⇒ estimation based on US hedonic prices
  - ⇒ significant impact on the contribution of ICT capital and TFP
- Utilisation of capacity: fluctuations of the rate of utilisation of the capital stock not measured and therefore picked up by TFP

Evolution of methodology for capital input (2/3)

Construction of capital stock estimates (EUKLEMS 2017/WIIW 2019 release)

No harmonised methodology: capital stocks from National Accounts

In Belgium: log-normal survival function and straight line depreciation function

$\Rightarrow$ Impact on the contribution of capital and TFP

User cost of capital: $uc_t^i = Q_{t-1}^i(r_t + \delta^i - \varepsilon_t^i + \delta_i \varepsilon_t^i)$

with q investment price, r the net rate of return (ex-post), δ the depreciation rate (= loss in market value due to ageing), ε the revaluation or capital gains (asset price change)

- depends on deflator choice and assumption on depreciation rate (in the case of geometric depreciation, the age-price and age-efficiency profile follow the same geometric pattern) $\Rightarrow$ Impact on the contribution of capital and TFP

Evolution of methodology for capital input (3/3)

Capital income share:

- **Capital taxes:**

Capital compensation (CAP) is defined as the sum of gross operating surplus, capital part of mixed income and other net taxes on production (D29-D39), allocated to CAP by assumption.

Not suitable for BE: employment subsidies in D39

- **Capital compensation of self-employed**

Mixed income not allocated between labour and capital compensations in National Accounts => shares to be estimated

Evolution of methodology for labour input (1/2)

Measurement requirements: hours worked by types of labour, price of one hour worked of each type and labour income shares

- the labour force divided into categories based on various characteristics:
  - Age (15-29, 30-49, 50 and more)
  - Gender
  - Qualifications (low, medium, high)

- Qualitative employment data for Belgium:

- use of administrative data (Social security data for wage earners, Social security data for self-employed),
- use of survey data (Labour force survey (LFS), Structure of Earnings Survey (SES))
- Application of regression techniques for small (sample) sub-groups and for sub-groups not present in sample

- Assumption: workers are paid at their marginal productivity

  In BE : centralised wage formation mechanism capped by law

Evolution of methodology for labour input (2/2)

Labour income share

Labour compensation (LAB) is defined as the sum of labour compensation of employees and the labour part of mixed income.

➢ **Labour compensation of self-employed**

Labour compensation of self-employed not available in National Accounts

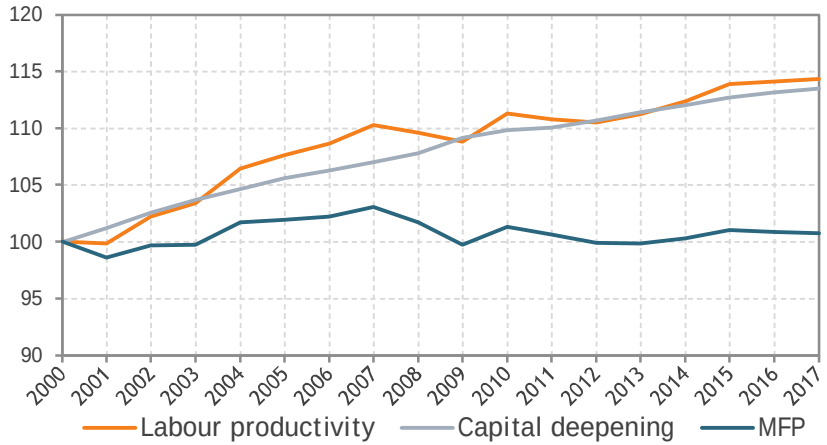
Evolution of assumptions since 2007 release, now: distribution keys applied based on 2 estimations:

- Estimation of the labour income of self-employed workers based on hourly wage of employees by industry and hours worked by self-employed workers.
- Estimation of capital income of self-employed workers based on rate of return on capital per industry of the economy without the household sector and net capital stock of the household sector
- Creation of a virtual mixed income and report of the respective labour and capital share on National accounts mixed income

Impacts of methodological choices: Belgian data

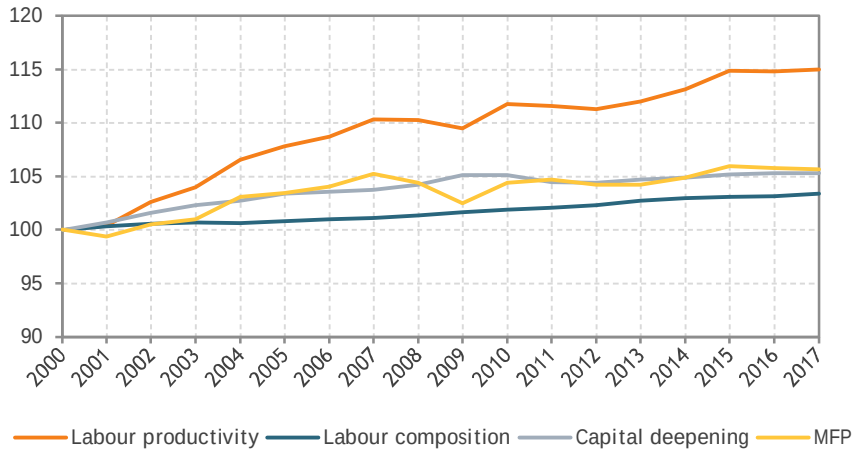
Contributions to labour productivity growth, Belgian data 2000=100

- OECD productivity database : 2019 Release



	2000-2017	2000-2007	2012-2017
LP	0.79	1.39	0.68
K/H	0.74	0.96	0.51
TFP	0.04	0.43	0.17

- EUKLEMS database: 2019 Release (WIIW)

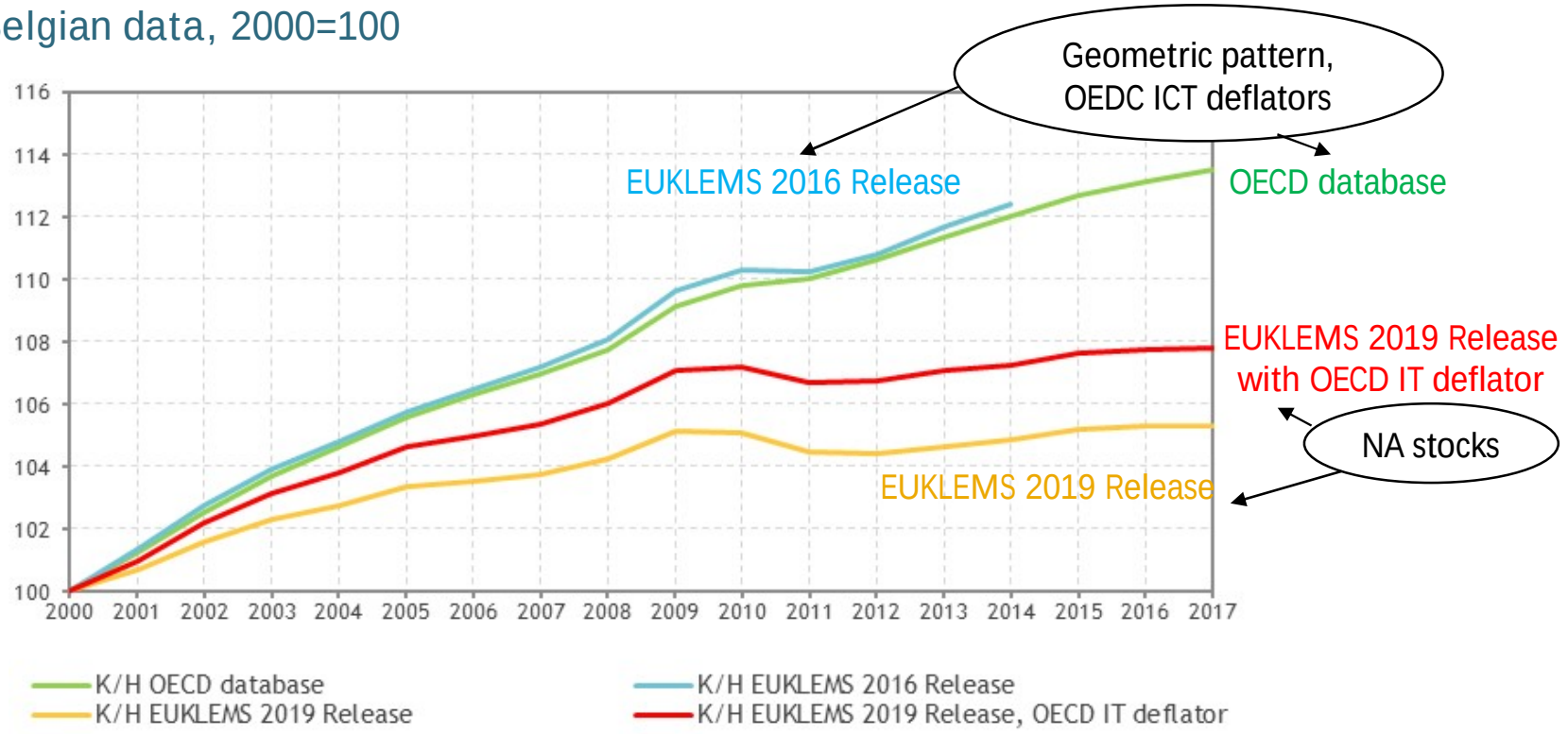


	2000-2017	2000-2007	2012-2017
LP	0.82	1.40	0.66
LCE	0.19	0.15	0.21
K/H	0.30	0.52	0.17
TFP	0.32	0.73	0.28

Impacts of methodological choices: Belgian data

Capital deepening contribution to labour productivity growth,

Belgian data, 2000=100



Conclusions

- Methodological choices have significant impact on capital, labour and TFP contributions to labour productivity growth affecting analysis of LP slowdown determinants and policy recommendations

- Use of National Accounts data limits international comparability ⇒ clear need for greater harmonisation of official data

- Futur improvements:

  ⇒ Effective flow of capital services instead of potential flow of capital services

  ⇒ MFP by decomposing total output instead of total value added