

# Productivity in Luxembourg

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# The aim of this talk

- ▶ Why productivity?
  - ▶ Source of economic growth
  - ▶ Measure of living standard
- ▶ Productivity measures the ability to use resources efficiently and to produce more
- ▶ Different methods & data sources give insights into different sources of productivity growth
- ▶ The measurement of productivity is challenging

# Outline of this talk

1. Definition of productivity
2. Drivers of productivity
3. The study of productivity in Luxembourg:
4. Measures based on aggregate data
5. Measures based on firm-level data
6. The evolution of productivity in Luxembourg
7. Challenges of measuring productivity
8. The research ahead

.. **not working harder but working smarter!** (OECD)

- ▶ Productivity expresses how well countries/industries/firms use their resources.
- ▶ Measured as **ratio of output to inputs** used to produce those output.
- ▶ It is a **relative** concept.

- ▶ **Partial vs. total** factor productivity measures:
  - ▶ **Labour productivity** compares output to the labour input.
  - ▶ **Total Factor Productivity (TFP)** compares output to the stock of capital and labour.
- ▶ They are related:  $\Delta(GDP/L) = \Delta(K/L) + \Delta(TFP)$   
Labour prod. growth = capital deepening + TFP growth

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Source: <http://www.osteriafrancescana.it/>

What explains productivity? Why productivity differ?

- ▶ Efficiency, technical progress, factor allocation.
- ▶ Internal drivers:
  - ▶ Quality of inputs.
  - ▶ Intangible assets: know-how, organisation, reputation.
  - ▶ Knowledge capital: skills, management, HR practices.
  - ▶ Innovation and R&D.
  - ▶ More recently: workers' incentives, job satisfaction.
- ▶ External drivers:
  - ▶ Technological spillovers, trade, market structure.

Concepts of efficiency:

- ▶ **Productive efficiency:** ability of a producer to obtain maximal output from a given level of inputs use.
- ▶ **Allocative efficiency:** state of an industry where resources employed by most productive producers.



- ▶ Several data sources and methods to analyse **productive efficiency** and **allocative efficiency**.

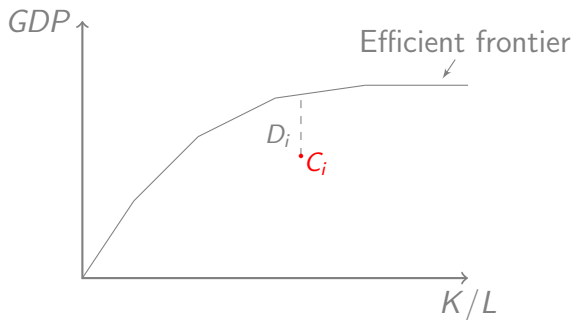
Two projects:

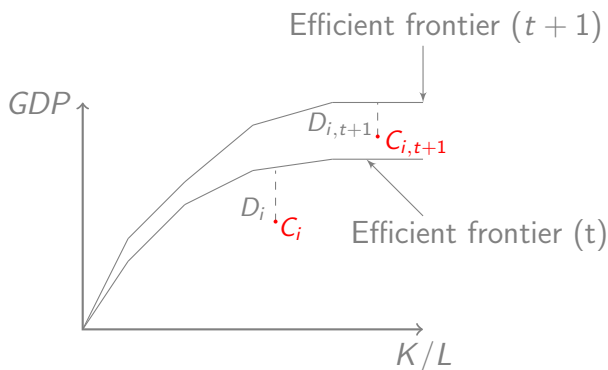
- ▶ **LuxKLEMS**: **National Accounts** data to compute productivity indices at national and industry level.
- ▶ **LuxPROD**: **firm-level data** to investigate issues:
  - ▶ Productivity, mark-ups and international trade.
  - ▶ Resource mis-allocation and productivity slowdown in Luxembourg.

## National Accounts framework:

- ▶ Countries use resources to produce goods and services:
  - ▶ Stock of capital (**K**), Labour (**L**), Energy (**E**), Materials (**M**), and purchased Services (**S**).
- ▶ Use aggregate data for many countries and industries.
- ▶ Objective: comparative indices of Total Factor Productivity (TFP).
- ▶ Analyse **productive efficiency** and **technical progress**.

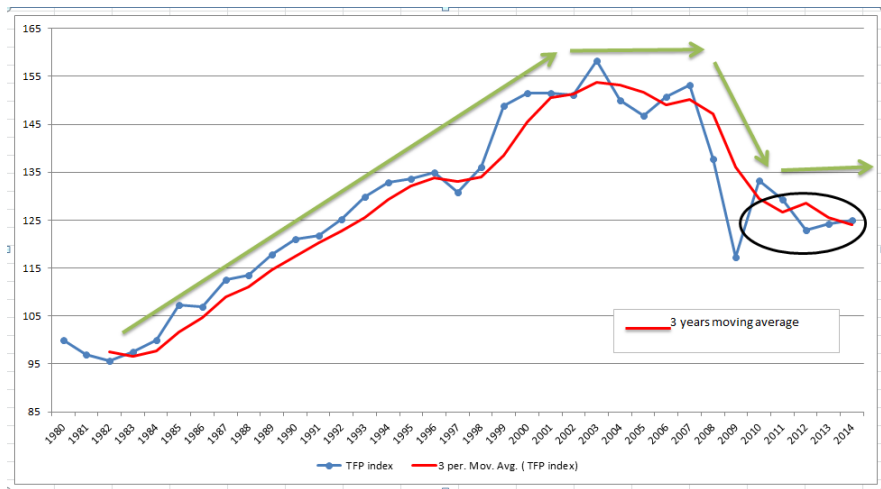
# Productive efficiency





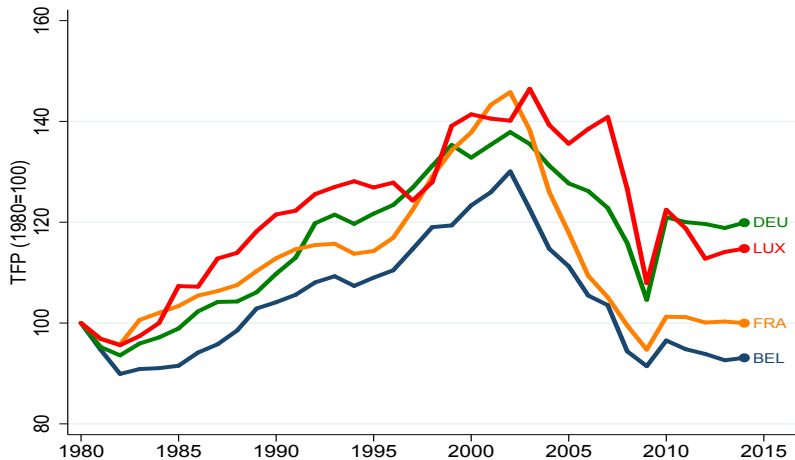
Changes in TFP = changes in eff. + tech. progress

# TFP evolution in Luxembourg



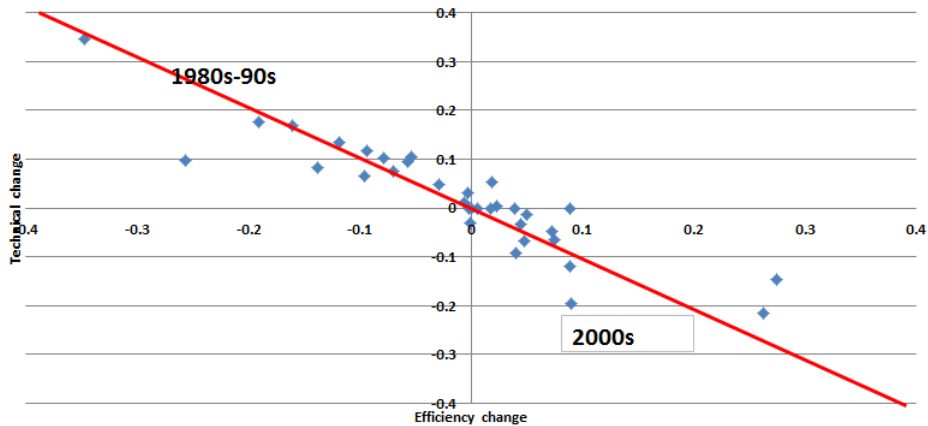
Source: Penn world tables.

# TFP evolution: country comparison



Source: Penn world tables.

# Technical progress and efficiency in Luxembourg



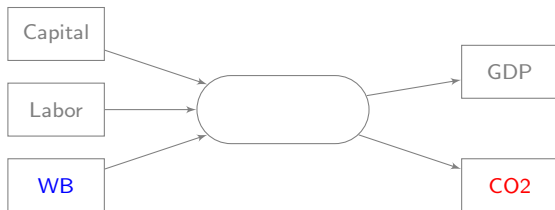
Source: Penn world tables.

Need to adapt LuxKLEMS to the new data framework:

- ▶ New European System of National Accounts (ESA2010):
  - ▶ Implemented by EU countries in 2014;
  - ▶ Major data revisions for all years;
  - ▶ R&D recorded as investment expenditure.
  
- ▶ New industry classification NACE Rev.2.



- ▶ Quality of life: does **well-being** matter to productivity?;
- ▶ Quality of environment: **environmental efficiency**.



Productivity reflects economic cycle and structural changes:

- ▶ Fall in GDP during crisis due to **fall in TFP**.
- ▶ Fall in productivity is **persistent**.
- ▶ **Luxembourg productivity slow-down preceded the crisis.**
- ▶ Similar patterns across countries.
- ▶ Aggregate conceals **industry and within-industry variations**.

# Studies on firm-level data: Allocative efficiency

- ▶ Aggregate productivity depends on **efficiency in the allocation of resources** across producers.
  - ▶ State of an industry where (important portion of) resources are employed by most productive producers.
- ▶ Micro data inform on how industries responded to the negative productivity shock.
- ▶ Data: Structural Business Statistics & Business Register.

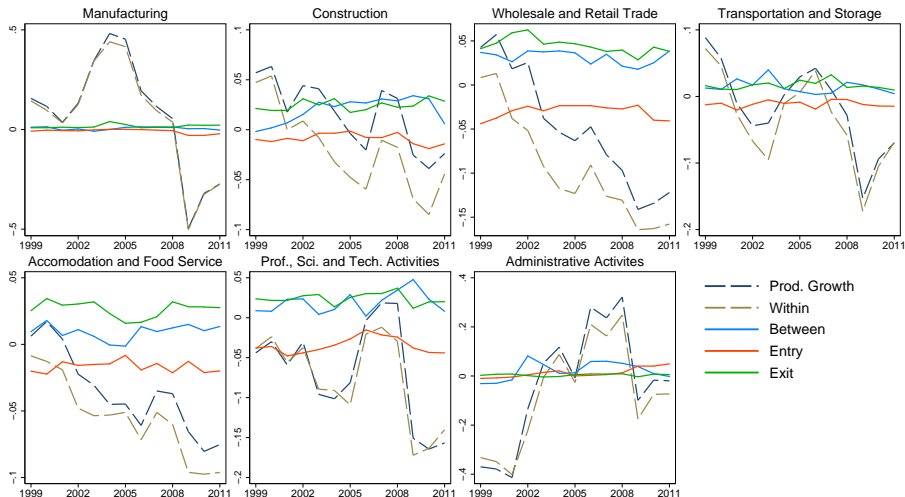
Sources of allocative efficiency:

- ▶ Some firms become more productive (**within**);
- ▶ More productive firms become larger in size (**between**);
- ▶ **Exit** of inefficient producers;
- ▶ **Entry** of new firms.

Next: some results on **labour productivity** in Luxembourg industries.

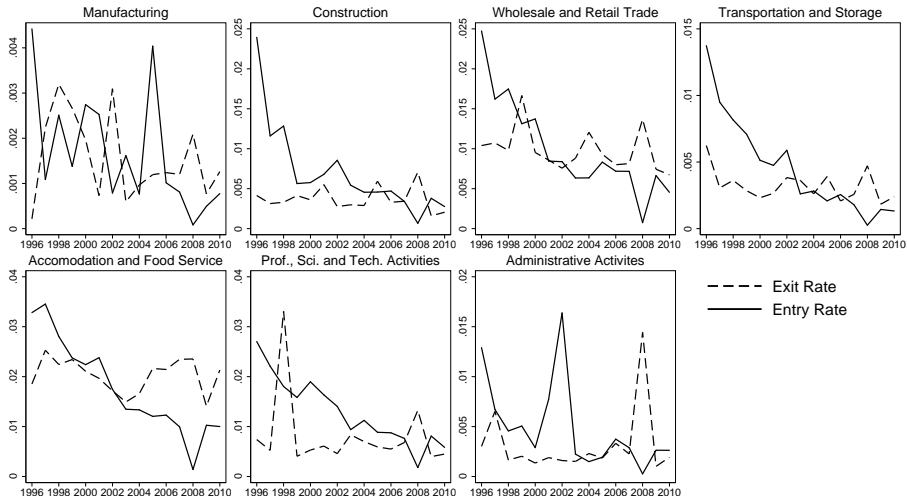
Source: Business Register data.

# Sources of labour productivity growth



Source: U. Kilinc on BR data.

# Entry and exit

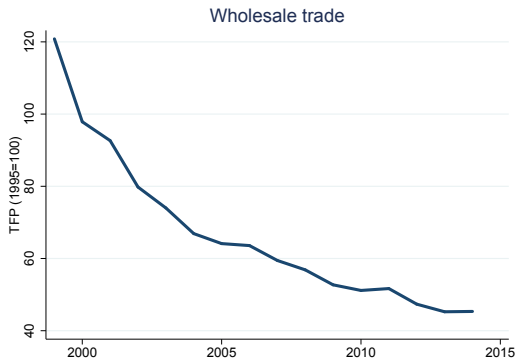


Source: U. Kilinc on BR data.

# Some new results based on macro data: TFP in service industries

(very preliminary)

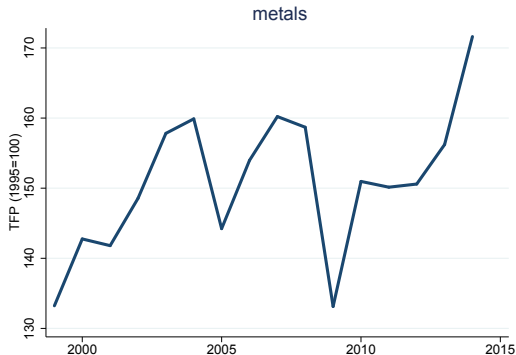
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Luxembourg



Source: CH Di Maria on NA data.

# Some new results based on macro data: TFP in manufacturing industries

**STATEC**  
Luxembourg



Source: CH Di Maria on NA data.



Combines different data sources:

- ▶ LuxKLEMS: productivity indices based on minimal assumptions;
- ▶ Robust to availability of new data (obviously not to sample-wide revisions);
- ▶ Evidence based on micro-data allows robustness checks and explains aggregate outcomes;
- ▶ Firm-level and national-level data give insights into sources of productivity growth.

- ▶ Data availability.
  - ▶ Coverage, transmission lags, revisions;
- ▶ **Inputs** to production are often estimated or proxied.
  - ▶ Capital stock: cumulated investment by asset type;
  - ▶ Human capital highly problematic.
- ▶ **The measurement of productivity in services is difficult.**
  - ▶ **Output** of services is hard to define and measure.
  - ▶ **Financial services**: FISIM to capture implicitly priced services of banks.

- ▶ Productivity compares output to inputs to production.
- ▶ Different methods give insights into sources of productivity growth: productive efficiency; allocative efficiency; changes in technology.
- ▶ A key issue in the analysis of productivity is the definition and measurement of inputs and output(s).
- ▶ Why is this important?
  - ▶ Apparent slow-down in Luxembourg's productivity.
  - ▶ The results have policy implications.

- ▶ Continue the current work to produce up-to-date figures.
- ▶ Continue research effort on productivity drivers.
- ▶ Measures of productivity in key industries.
- ▶ New important issues (well-being, environment).
- ▶ We need data!

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