

# Productivity and economic development

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After this lecture you will

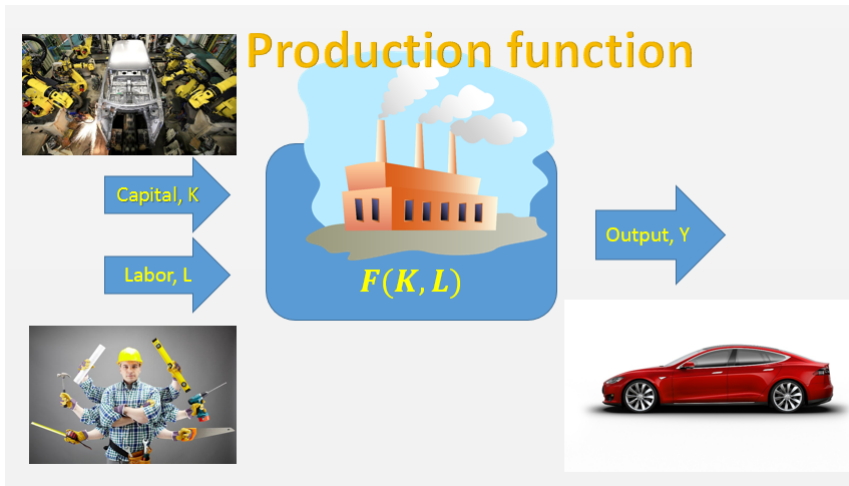
- Learn about Total Factor Productivity
- Be able to discuss sources of economic growth
- Get a picture of economic policy that promotes productivity

# What determines economic development?

*Productivity isn't everything, but in the long run it is almost everything. — Paul Krugman*

- Most differences in GDP per capita across nations are due to differences in productivity
- How can a country increase productivity?

To measure productivity we introduce



# Aggregate production function

Production of all firms is described by aggregate production function

$$Y = F(K, L)$$

$Y$  - Gross Domestic Product (GDP)

$K$  - Value of all Fixed Assets

$L$  - Total Employment

# Total factor productivity (TFP)

- Cobb-Douglas production function
  - $Y = A \times K^\beta \times L^{1-\beta}$ ,  $0 < \beta < 1$
- Total factor productivity (TFP),  $A$ 
  - measures how much output a worker can produce with a unit of capital
  - **doubling productivity doubles GDP!**
  - ... which is not true for capital or labor
- How is TFP related to labor productivity?
  - $Y/L = A \times (K/L)^\beta = A \times k^\beta$
  - i.e Labor Productivity = TFP  $\times$  (Capital per worker) $^\beta$

# Example

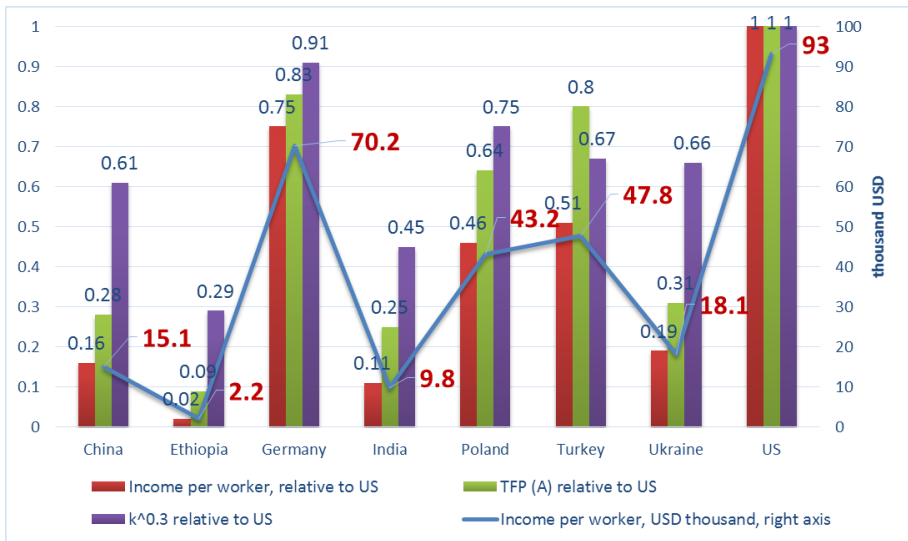


Labor Productivity does not distinguish between these two farmers!

# Why some countries are rich and some are poor?

More due to lower productivity than to lower capital per person!





Data: Penn World Tables 2011. Author's calculations. Table shows differences in income per worker, TFP, and capital per worker relative to US (left scale). It also shows income per worker (right scale)

# Questions for further discussion

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- Can we introduce a policy that would increase productivity?

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- What does explain differences in productivity?
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- Of course, countries do not produce, firms do
- => Study firms

# Modeling approach

## Consider industry

- Firms differ in productivity
- Competition is imperfect
  - Oligopoly
  - Monopolistic Competition
- Each year
  - firms expand and contract market share
  - some firms shut down
  - and some firms enter

Industry productivity is defined as a weighted average of firms' productivities

$$A_j = \sum_{i \in \Omega_j} s_i a_i$$

$$s_i = \frac{y_i}{Y_j}$$

where  $y_i$  is firm  $i$  sales,  $a_i$  is TFP of firm  $i$ , and  $Y_j$  is total industry  $j$  sales.

# Sources of industry productivity growth

- Existing firms increase their productivity
  - Technology
  - Learning
  - Organization of production
- Reallocation of resources towards more productive firms
- Creative destruction

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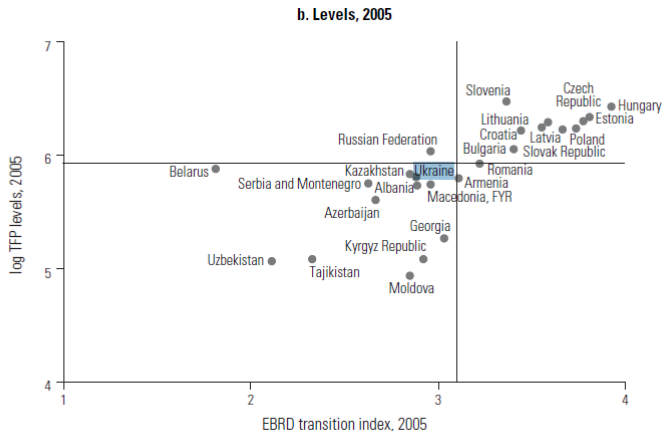
- Existing firms increase their productivity
- Reallocation of resources towards more productive firms
  - More productive firms increase their market share
  - In more regulated, more corrupt economies resources are not allocated efficiently
    - i.e India and China can increase their GDP by 30 percent just by reshuffling capital and labor towards more productive firms Hsieh and Klenow (2009)
- Creative destruction



# Sources of industry productivity growth

- Existing firms increase their productivity
- Reallocation of resources towards more productive firms (Melitz, 2003; Melitz and Ottaviano, 2008)
- Creative destruction (Foster et al., 2001)
  - Firm churning:
    - low productive firms exit
    - new, more productive firms enter

# Are firms in Ukraine productive?



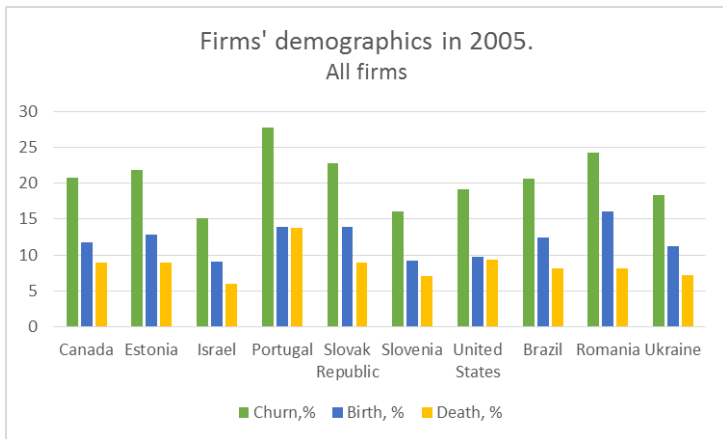
Sources: EBRD 2006; Amadeus Database 2006.

# Are resources in Ukraine allocated efficiently?

Ryzhenkov (2015):

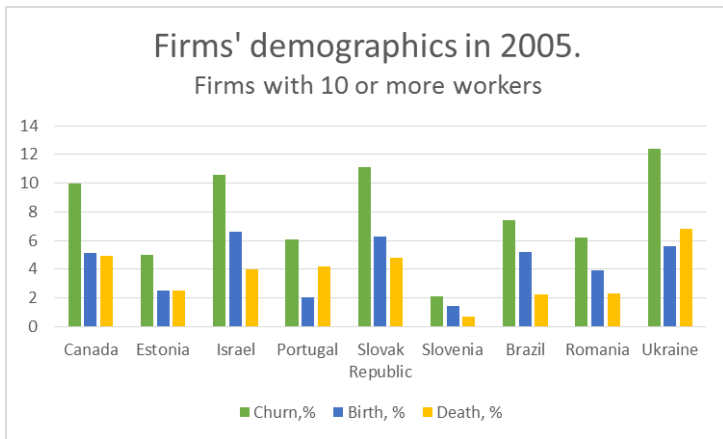
- Eliminating all market distortions in Ukraine would **triple** manufacturing production
- Keeping distortions at the US or EU level would **double** manufacturing production.
  - most enterprises should downsize their level of production
  - major reallocation of resources occur among the most and the least productive enterprises

# Churning of firms. All



Data: OECD, Author's calculations. Manufacturing and business services

# Churning of firms. Large



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# Creative destruction?

Table : Average productivity in Ukraine, 2002 and 2010

Year	Productivity					
	Unweighted			Weighted		
	Exit	Stay	Entry	Exit	Stay	Entry
2002	0.59	0.93	0.87	0.39	1.75	2.46
2010	1.57	1.64	1.72	3.05	2.34	3.05

Author's calculations

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- Large productive firms exiting!

# Creative destruction?

Table : Average productivity growth in Ukraine in 2002-2010

Productivity growth, %					
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Exit	Stay	Entry	Exit	Stay	Entry
-1.1	5.0	31.7	12.5	10.8	-10.2

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- Small new firms rapidly increase productivity
- **Large new firms experience productivity decline!**

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- But, it is also beneficial for the whole economy!

Exporters are different. In US Bernard et al. (2003) found that exporters:

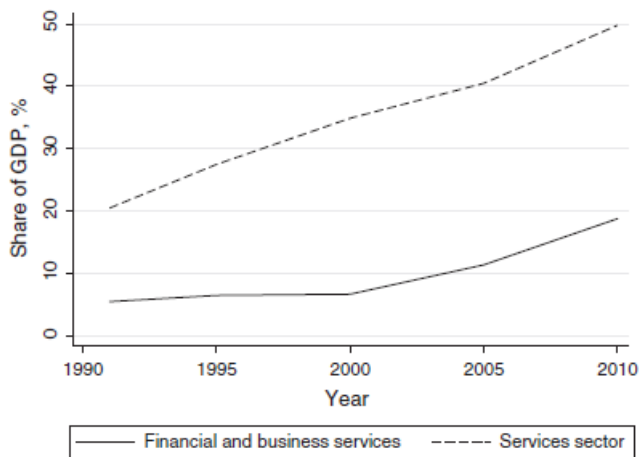
- employ 97 percent more workers
- 3-11 percent more productive
- pay 5 percent higher wages
- 12 percent more capital per worker
- 11 percent more skills per worker

- Firm-specific effects
  - Learning by doing
    - increase in firm-specific productivity by learning (De Loecker, 2007)
  - Scale effects
    - increase in foreign competition reduces market power
    - expansion of production and movement down along the cost curve
  - Technology transfer and innovation incentives Aghion et al. (2001)
    - easier access to foreign technologies
    - learning from foreign companies

# Did WTO accession help Ukraine?

- Ukraine has joined WTO on 16 May 2008
  - Small reduction in tariffs
  - Large changes in services sectors!
- Results
  - Shift from manufacturing to services
  - Increase in productivity in manufacturing

Figure 2. Evolution of services in Ukraine, 1991–2009



Source: Shepotylo and Vakhitov (2015)



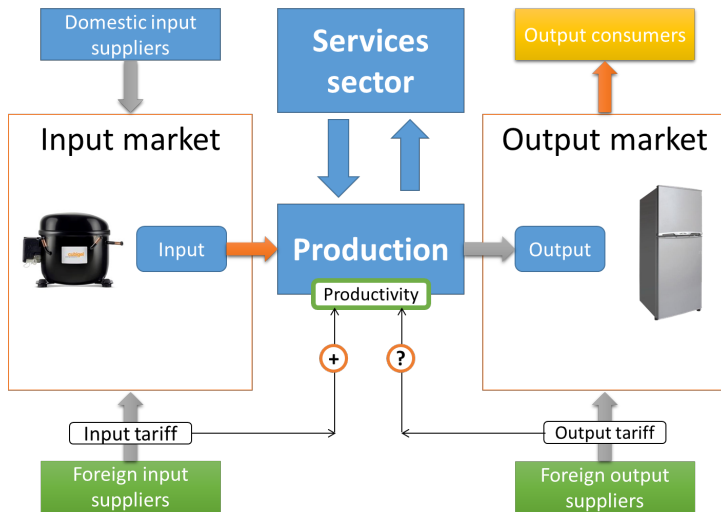
# Foreign Direct Investment (FDI) in services

Figure 3. FDI stock in Ukraine, 2001–07

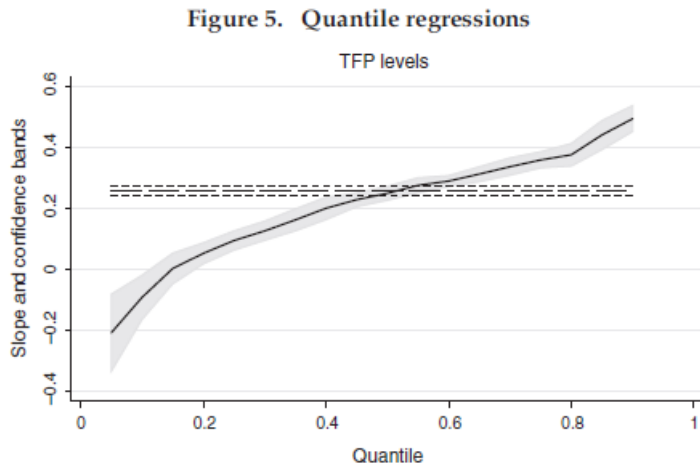


Shepotylo and Vakhitov (2015)

# Trade liberalization and productivity. Channels



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Shepotylo and Vakhitov (2015) More productive firms gained more as a result of services liberalization

- Services liberalization and productivity (Ukraine; Shepotylo and Vakhitov, 2015)
  - An increase in services liberalization index by a standard deviation leads to a 9.2 percent increase in productivity among manufacturing firms
  - One standard deviation increase in foreign presence in services leads to a 6.8 percent increase in productivity
  - Matthew effect: More productive firms benefited more - leads to efficient reallocation of resources
  - Effect is stronger for domestic and small firms.

- Productivity improvements are the key to economic growth
- Growth in Productivity depends on
  - Increase in productivity of firms
  - Allocative efficiency of economy
  - Highly dynamic churning of firms
- This can be achieved through
  - Liberalization of trade
  - Deregulation of economy
  - Inclusion into global production chains

# Questions?

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