Process of convergence in EU

Convergence – types and methods of measurement

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Convergence

- From latin *convergere*
- to converge = to approach towards a definite value over time or towards an equilibrium
- divergence – the opposite of convergence

Types of economic convergence

Basic division:

- **Real convergence** (refers to levels of development)
  - tendency towards greater uniformity of real economic variables such as GDP per capita or productivity levels
- **Nominal convergence**
  - tendency towards greater uniformity of nominal variables such as wages, prices etc.
  - or refers also to so-called Maastricht convergence criteria (rules that a EU country must fullfill in order to get into the Euro zone)

Types of real convergence

- **Sigma convergence**
- **Beta convergence**
  →Catching-up

Sigma (σ) convergence

- ***the reduction of dispersion*** of per capita GDP within a sample of countries (regions) over time (usually the degree of dispersion is measured by: ***standard deviation, coefficient of variation, range, Gini index, Theil index*** etc.)
- relative gap in the level of economic development between countries or regions analysed is getting smaller in the course of time

$$\sigma_{t0+T} < \sigma_{t0}$$

- especially useful in the analysis of interregional relations within one unity – ex. regions within the EU

Statistics of dispersion

standard deviation $\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$ $s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2}$

coefficient of variation $CV = \frac{\sigma}{\mu} \times 100$ $CV = \frac{s}{\bar{x}} \times 100$

range $R = x_{max} - x_{min}$

inter-quartile range $R(Q) = Q_3 - Q_1$

semi-interquartile range $Q = \frac{R(Q)}{2}$

Example of sigma convergence analysis [measure of dispersion adopted: Gini index]

Source: Sala-i-Martin X. The World Distribution of Income: Falling Poverty and… Convergence, Period, *Quarterly Journal of Economics*, Vol. 121, No. 2: 351-397, May 2006

Beta (β) convergence

- Hypothesis according to which **poor countries (or regions) grow faster than rich regions**
- negative relationship between GDP per capita *growth rate* over the period and the *level* of GDP per capita
- In the long run it should lead to the equalization of the levels of GDP per capita

Types of beta convergence

A. Unconditional (absolute) convergence - when economies with different levels of a given variable approach the same point

e.g. absolute real beta convergence: is described as having occurred if a *negative relation between initial per capita incomes and their rates of growth* is estimated empirically, without accounting for any other (than initial development levels) differences across countries

B. Conditional convergence - when economies with different levels of a given variable approach but the identical point will not be reached

e.g. conditional real beta convergence: is described as having occurred if a negative relation between initial per capita incomes and their rates of growth holds only controlling for other characteristisc such as: the possibility of different rates of saving (and hence investment) *and of different endowment of* human capital across economies

Beta convergence – analytical equations

absolute

$$\frac{1}{T}\ln\left(\frac{y_{it}}{y_{i,t-T}}\right)=\alpha+\beta\ln\left(y_{i,t-T}\right)+\xi_{it}$$

conditional

$$\frac{1}{T}\ln\left(\frac{y_{it}}{y_{i,t-T}}\right)=\alpha+\beta\ln\left(y_{i,t-T}\right)+\psi X_{it}+\xi_{it}$$

Looking at the relation between the initial level of a given variable and its grow:

if the coefficient beta < 0 – convergence

> 0 – divergence

= 0 ……

Methodological problems:

- explanatory variable is the lagged value of income
- Method of estimation – which estimator?
- Conditional convergence - the income gap between countries that share the same characteristics.
- Useful for describing the data, but not for estimating causal effects of the explanatory variables
- These variables typically correlated with growth, but not necessarily exogenous (e.g., investment, human capital, life expectancy)

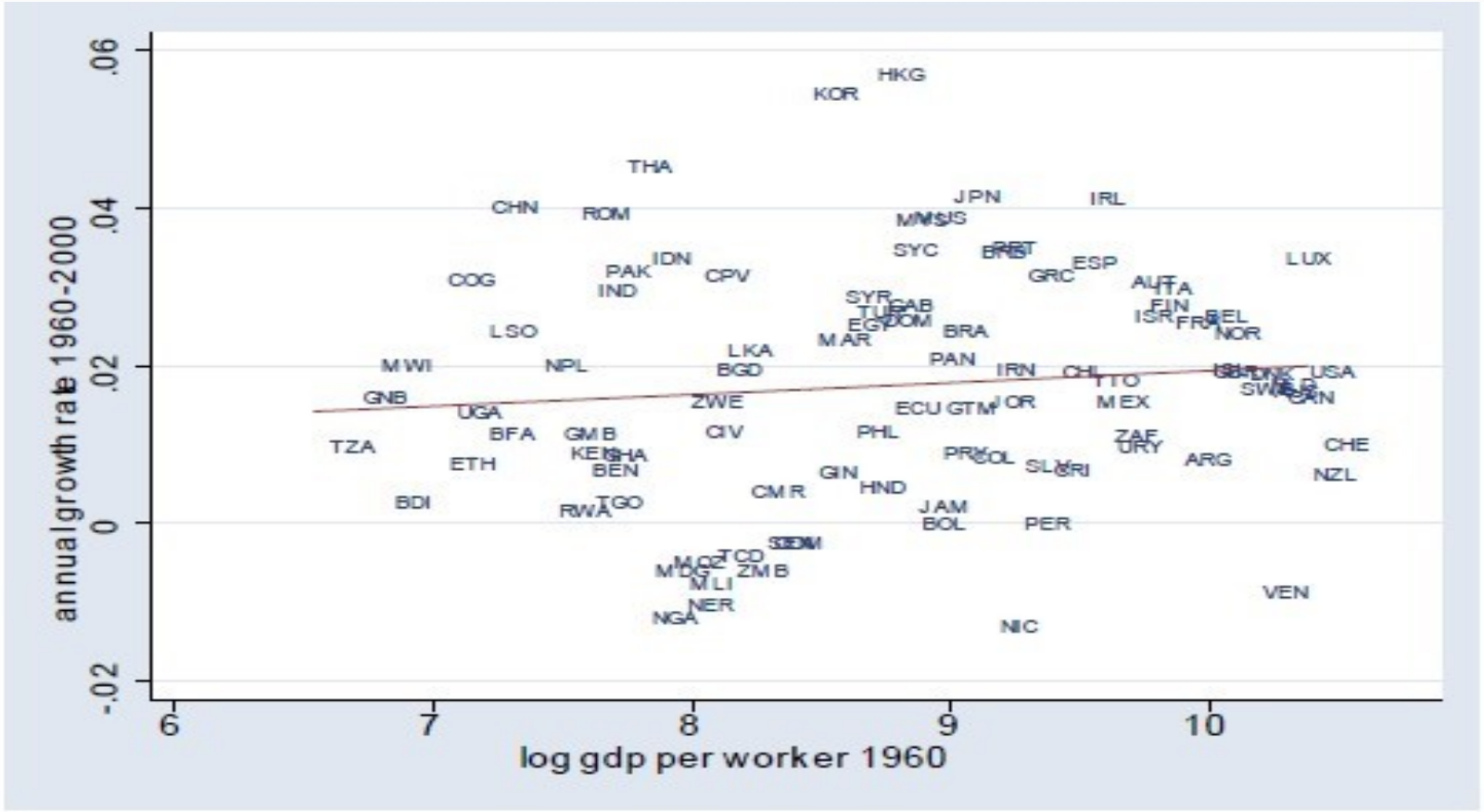


Figure: Annual growth rate of GDP per worker between 1960 and 2000 versus log GDP per worker in 1960 for the entire world.

Source: Advanced Economic Growth: Lecture 1, Daron Acemoglu MIT, 2007.

But a Different Picture Among Relatively Similar Countries

- Convergence among (original) OECD countries.

Figure: Annual growth rate of GDP per worker between 1960 and 2000 versus log GDP per worker in 1960 for core OECD countries.

Source: Advanced Economic Growth: Lecture 1, Daron Acemoglu
MIT, 2007.

Real beta convergence? (1)

- Divergence in the world But convergence among more homogeneous countries

- Why?
  - Convergence is more likely to take place within groups of countries of similar characteristics
  - When the differences in technology, infrastructre, education level etc. are too big, then absolute convergence is less plausible

→ *Conditional convergence* is more realistic
→ It is very hard to prove *unconditional* beta convergence (empirical tests: different results depending on country sample, time period, adopted methods etc.)

Real beta convergence? (2)

What are the possible sources of „***catching up"*** ?

- *Technology transfer* –from developed to developing countries
  - But it is conditional upon the ability to transfer and adopt knowledge!

- Quicker *capital accumulation* in case of developing countries → Solow model

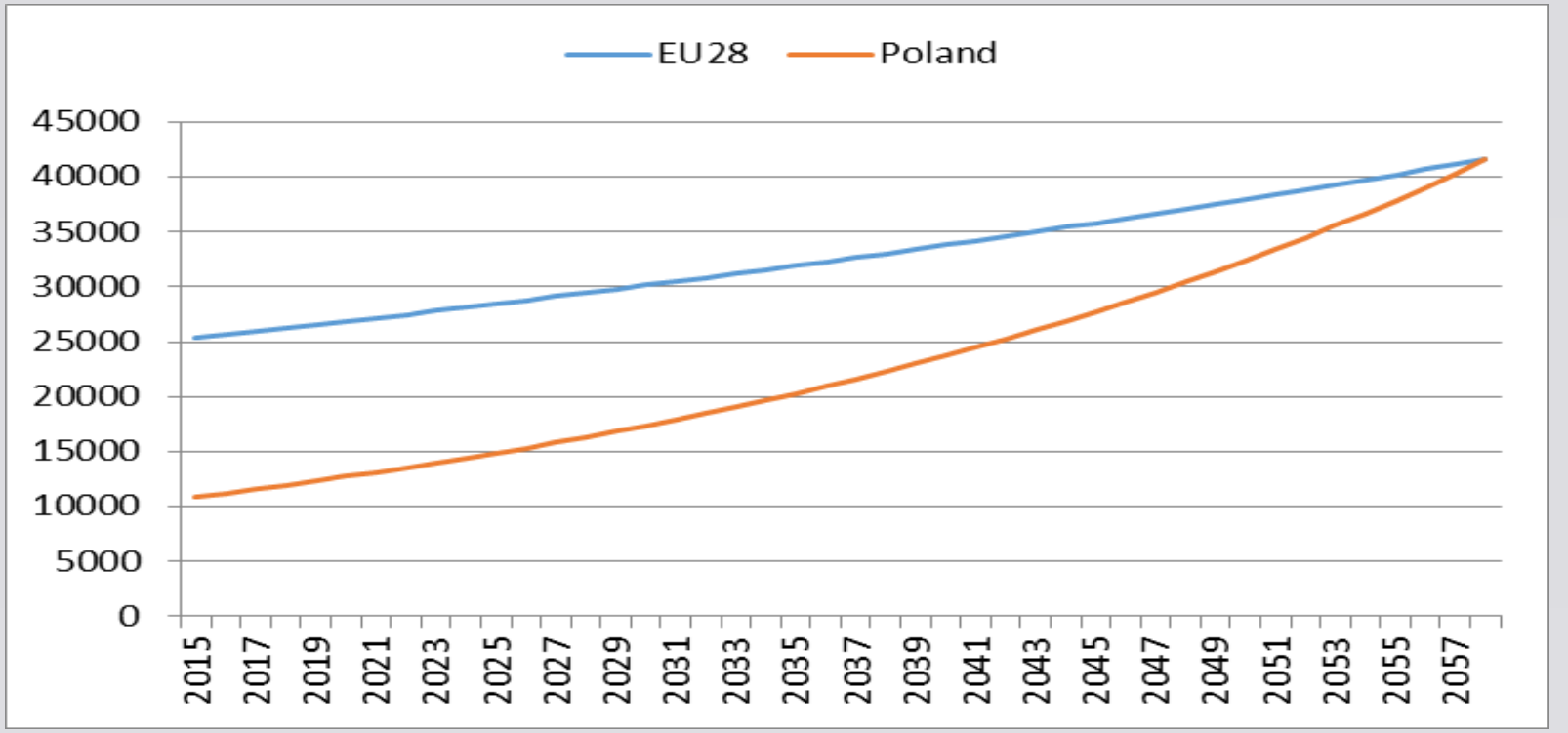
- Doyle P., Kuijs L., Jiang G. (2001): "***It would take* 3 decades or more *for the CEEC5 (Poland, Czech Republic, Slovak Republic, Hungary and Slovenia) to catch up with the EU average***, also assuming EU average per capita grows at 2 percent a year."

- Fisher (1998): "It ***would take the CEEC5* between 11 and 24 years *to catch up with the low income EU countries*** (Greece, Portugal and Spain)"

Projections revealed to be true?

When Polish economy will catch up with the EU28 average?

Make the scenario that the EU28 is growing at the pace of its annual average growth from the last 10 years (1.16%) and Poland is growing + 2 p.p (3.16%)



Key terms

- Convergence
- Divergence
- Real convergence
- Nominal convergense
- Sigma convergence
- Beta convergence

Sources:

- Sala-i-Martin X. (2006) The World Distribution of Income: Falling Poverty and Convergence Period, *Quarterly Journal of Economics*, Vol. 121, No. 2: 351-397
- Advanced Economic Growth: Lecture 1, Daron Acemoglu MIT, 2007.
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