

# Conditional convergence, regional disparities and economic growth. The evidence from the V4 regions

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# Economic growth and convergence theory

- Facts about the economic growth (Kaldor, 1963):
  - ❖ Per capita output grows over time, and its growth rate does not tend to diminish
  - ❖ Physical capital per worker grows over time
  - ❖ The rate of return to capital is nearly constant
  - ❖ The ratio of physical capital to output is nearly constant
  - ❖ The share of labor and physical capital in national income are nearly constant
  - ❖ The growth rate of output per worker differs substantially across countries
- Kuznets (1973, 1981) brings other characteristics of modern economic growth. The rapid structural transformation involving shifts from agriculture to industry and services. This process provokes urbanization, shifts from home work to employee status and increasing of education....increased role of foreign commerce...technological progress....and more

# Economic growth and convergence theory

- What is convergence?
- Hypothesis that poorer economies per capita income will tend grow faster than richer economies (catch-up effect); (Sollow-Swan growth model)
- Several types of convergence (Galor,1996):
  - ❖ Absolute convergence: lower initial GDP will lead to a higher average growth rate
  - ❖ Conditional convergence: a country's income per worker converges to a country-specific long-run level as determined by the structural characteristics of that country
  - ❖ Club convergence: over time, observing different "clubs "or groups of countries with similar growth trajectories is possible.

# Economic growth and convergence theory

- Many amendments and flaws to this theory was attributed (Romer, 1986; Lucas, 1988; Sachs and Warner, 1995;)
- Many countries don't show convergence of growth at all; there is no sign of catching-up with the growth rates (among developing countries) towards to developed ones
- **Convergence within the EU**
- Empirics differ in its conclusions about the convergence achievement within the EU (Yin et al.,2003; Vojinovic, 2009; Borsi and Metiu, 2015; and Strielkowsky and Höschle, 2016)
- Also club-convergence and convergence of so called NMS found mixed results (Varblane and Vahter, 2005; Rapacki and Próchniak, 2009; Szeles and Marinescu, 2010; Dobrinsky and Havlik, 2014)

# Materials and Methods

- The paper aims to find evidence about the conditional convergence hypothesis on a sample of regions of the V4 countries on the NUTS3 level
- Standard, neoclassic production function may be specified as

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha} \quad (1.0)$$

However in a steady state

$$\ln y = \ln A + \frac{\alpha}{1-\alpha} [\ln s - \ln(n + g + \delta)] \quad (1.1)$$

And if assumed that steady state is the same for all economies, than

$$\Delta \ln y = \ln y_0 + \ln A \quad (1.2)$$

We speak about the absolute convergence, otherwise

$$\Delta \ln y \cong g + \frac{(1 - (1 - \lambda)^T)}{T} \left\{ \ln A_0 + \frac{\alpha}{1 - \alpha - \beta} [\ln s^K - \ln(n + g + \delta)] + \frac{\beta}{1 - \alpha - \beta} [\ln s^H - \ln(n + g + \delta)] - \ln y_0 \right\}$$

Known as conditional convergence (Mankiw, Romer and Weil, 1992); speed of the convergence appx:  $\lambda \cong -t^{-1} \log(1 - t\beta)$ .

# The model

- cross-sectional data on NUTS3 regional level were used ( $n = 115$ )
- time span: 2004-2020

$$\Delta \ln y_{it} = \beta_0 + \beta_1 \ln y_{i,t-1} + \beta_2 \ln s - \beta_3 \ln(n + g + \delta) + \varepsilon_i$$

- Spatial dispersion of convergence ( $\delta$ -convergence)

$$\sigma_{\log y,t}^2 - \sigma_{\log y,t+T}^2 > 0$$

# V4 Countries in Glance

- Share on the EU GDP

7.34% (2021)

- Share of population on EU

14.25% (2021)

- GDP per capita in PPS (2021) v €:

Czechia: 28 445

Slovakia: 22 280

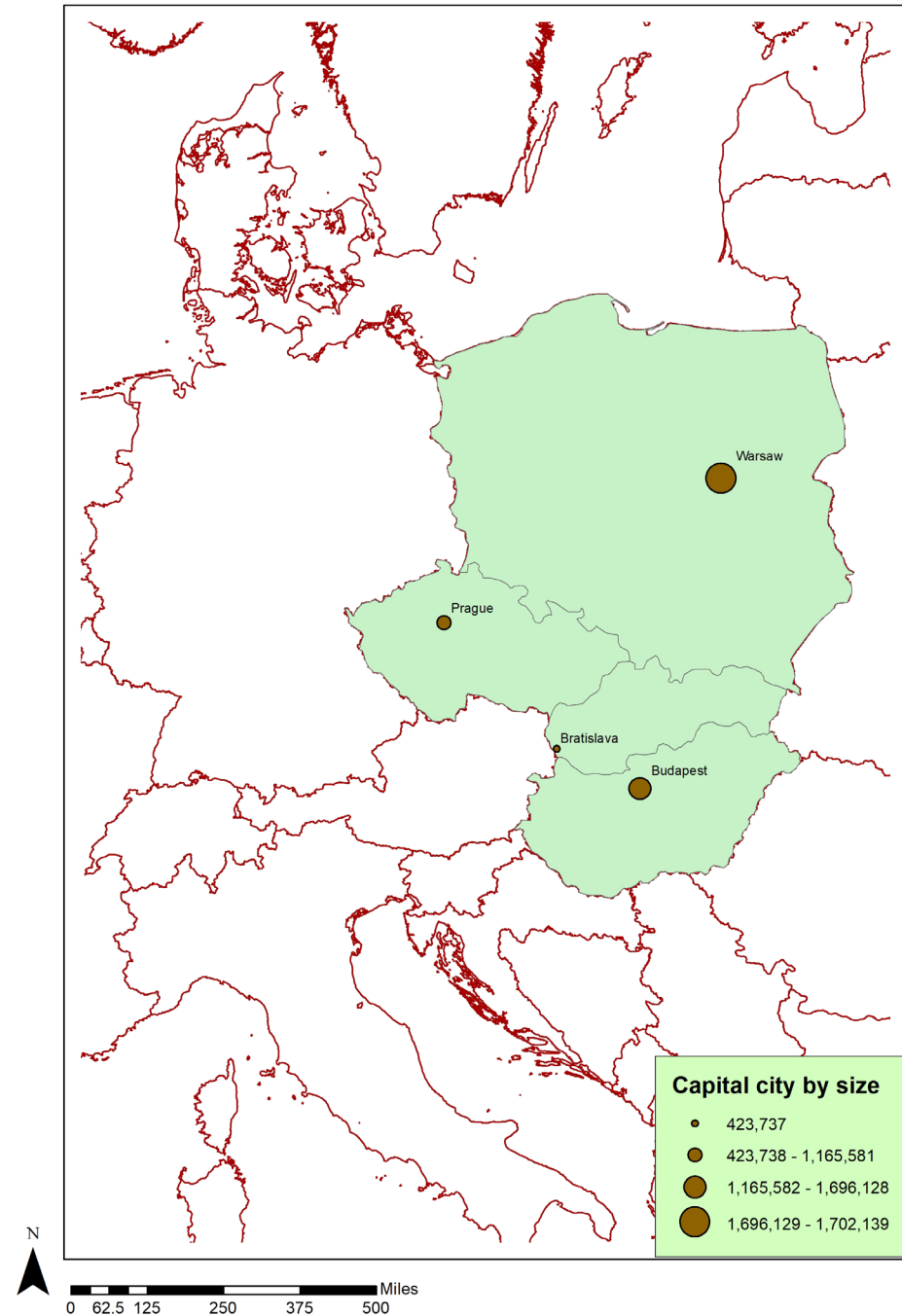
Hungary: 23 613

Poland: 23 876

- Economic growth (7-year average)

EU-27: 2.77%

V4: 4.34%



# Results

- Coefficient  $\beta$  ( $GDP_{t-n}$ ) became negative and statistically significant what suggests presence of the  $\beta$  -convergence; on the yearly basis= -0.013 (17-year data span)
- Estimation of the speed of the convergence, according to

$$\beta = -(1 - e^{-\lambda t})$$

According to results

$$-(1 - e^{-\lambda t}) = -0.2292$$

Hence:  $\lambda = 0.0153$

- Estimated speed of the convergence is 1.53% what is a small value

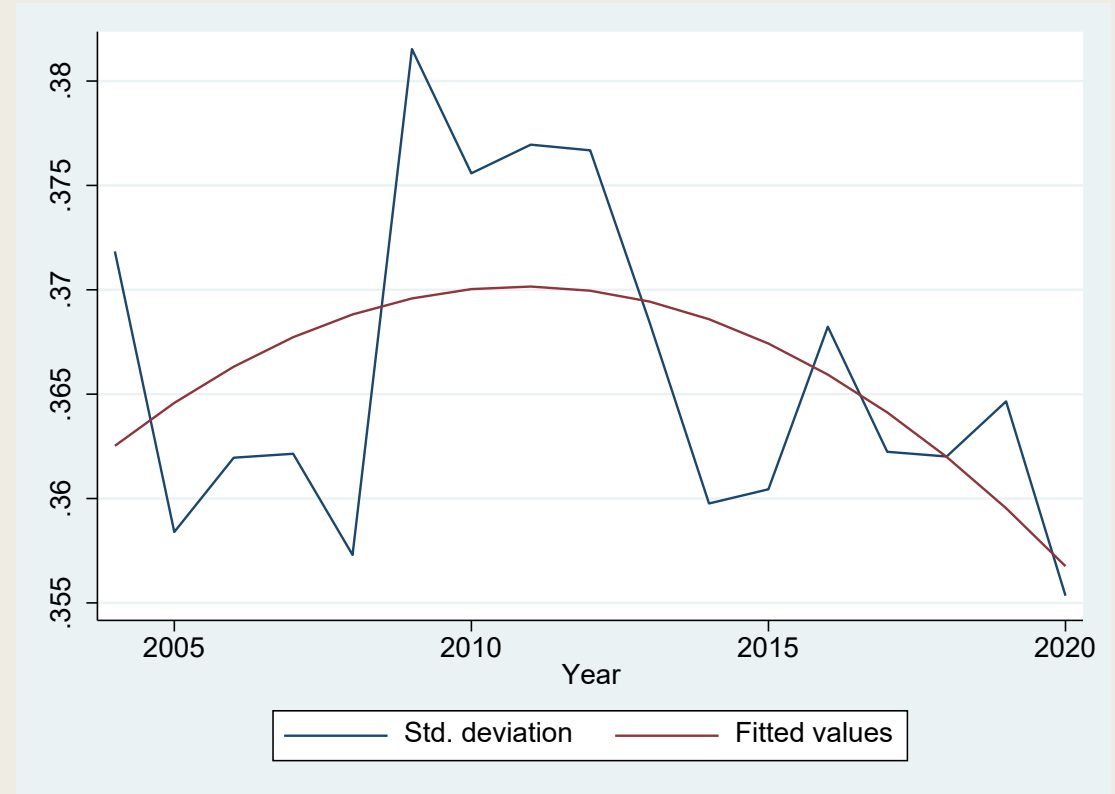
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Linear regression                               Number of obs   =           115
                                                F(3, 111)       =           17.76
                                                Prob > F        =           0.0000
                                                R-squared       =           0.3421
                                                Root MSE       =           .15346
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                |               Robust
diff_GDP | Coefficient  std. err.   t    P>|t|    [95% conf. interval]
-----+-----
    GDPn |   -0.2292468   .0444422   -5.16  0.000   -0.3173121   -0.1411816
   GFCFg |   -1.293046   .4895167   -2.64  0.009   -2.263056   -0.3230364
    POPg |    2.567581   .671883    3.82  0.000    1.2362    3.898962
   _cons |    2.864249   .376106    7.62  0.000    2.11897    3.609528
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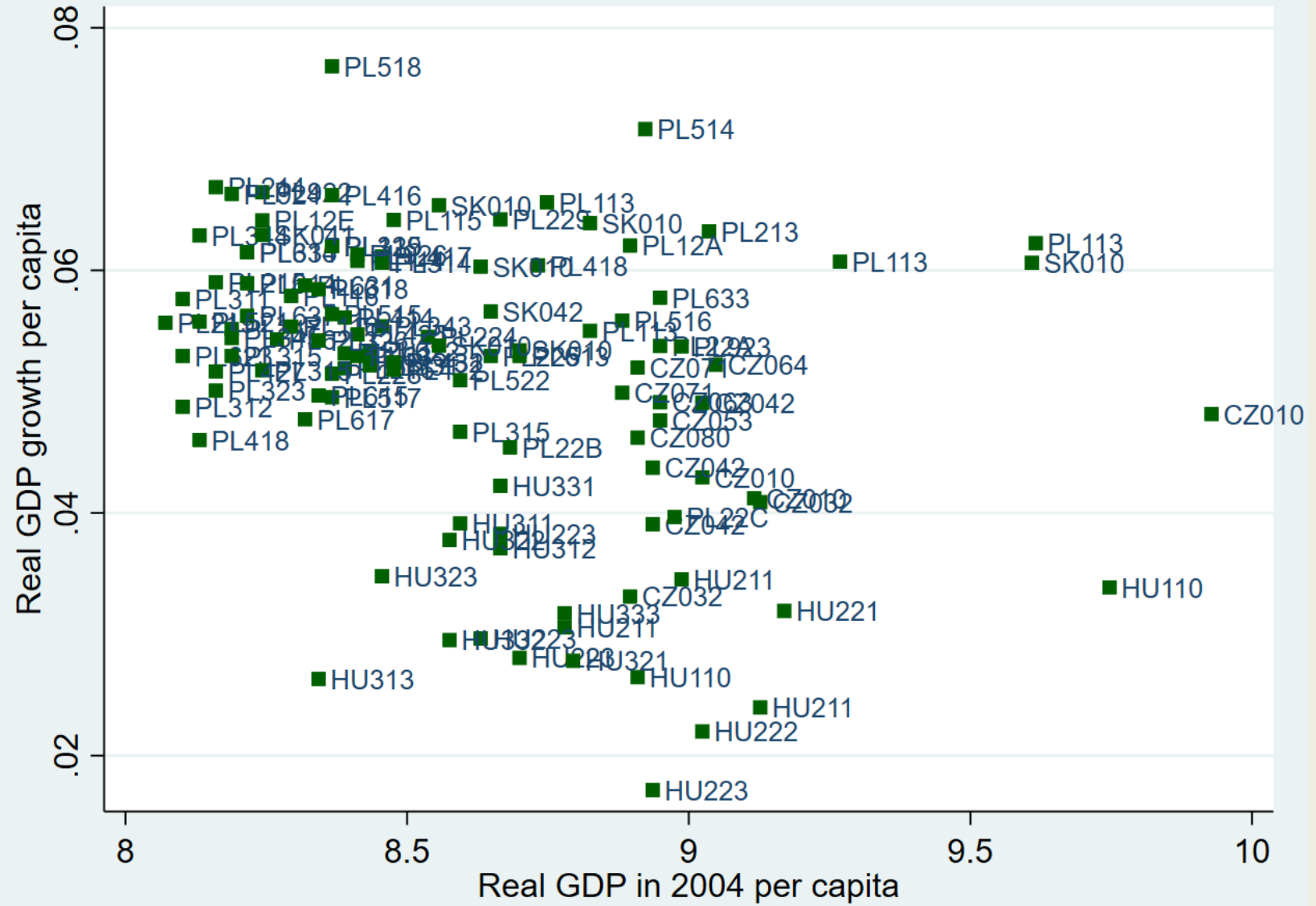


# $\sigma$ -convergence

- Overall trend of the deviation shows irregular pattern
- Two-sample test shows a significant difference in the mean values of both samples (t-observed: -17.047; p-value<0.0001)
- Based on the results, we might confirm the presence of the  $\beta$ -convergence and  $\sigma$ -convergence



# Results



# Conclusion

- The study aims on evaluation of the convergence process within the V4 countries
- The  $\beta$  coefficient became highly significant, and the  $\sigma$  coefficient shows a substantial decline over the research period
- Furthermore, it should be noted that the convergence process has a selective character
- The highest level convergence have shown Poland and the lowest Hungary