Regional convergence in the European Union: Does location matter?

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Notes:

- This presentation is based on research undertaken while working as a Lecturer in Economics at the University of Bradford, UK (before joining the ONS).
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Structure:

1 – The research issue
2 – Technical method
3 – Results
4 – Relevance
5 – Concluding comments
1 – The research issue

Background:

• Around the world, areas of rapid growth are geographically distinct from those with a poor growth performance;

• Objectives of the European Union:
  – 'a high degree of convergence of economic performance';
  – 'economic and social cohesion' (Article 2, Treaty of Rome);
Background:

• much empirical work has been carried out in order to
  – estimate the rate of convergence
  – evaluate the degree of persistence in the heterogeneity of growth rates across countries and periods;
Background:

• the locational fundamentals theory:

the geographical characteristics of locations are strongly related to their opportunities for growth (Davis and Weinstein, 2001);
Background:

Coverage in the literature:

• Foundation: growth theory (Barro, 1997); largely
  – based on data aggregated at national level;
  – not concerned with the relevance of location to economic growth and convergence.
Background:

- Locational fundamentals (Davis and Weinstein, 2001):

  'there are deep, very likely geographical, characteristics of particular locations that have a very strong influence on their opportunities for growth relative to other locations in a common technological regime' (p1285).
Research questions:

• Does location matter to regional convergence in Europe?

• Is the relative economic performance of EU regions consistent over time?
2 – Technical method

Empirical approaches:

• regression analysis
• analysis of distributions
• regression analysis

conditional convergence:

\[ g = \alpha - y_{0i}\beta + X\gamma + \varepsilon \]

\[ \beta > 0 \implies convergence \]

i.e. poor regions tend to grow faster than rich ones

• \( g \) = growth rate in income per capita
• \( y_{0i} \) = initial income per capita
• \( X \) = control variables
• spatial specification

(Carrington, 2003):

\[ g = \alpha - y_{0i}\beta + X^*\gamma + \delta W y_{0k} + \varepsilon^* \]

• *ceteris paribus*, the economic performance of the neighbours is one of the determinants of economic growth for each region:

\[
\begin{align*}
    w_{ij} = \begin{cases} 
        \frac{R & D_i}{\sum_{j=1}^{k} R & D_j} & \text{for contiguous regions, } 1 \leq k \leq i \\
        0 & \text{otherwise}
    \end{cases}
\end{align*}
\]
• analysis of distributions

(Quah, 1996a; 1996b)

– Markov chains

• assume that additional knowledge concerning the past behaviour of the process under analysis does not alter the probability of any future behaviour once the current state is known;

• estimate the transition probabilities from state \((n)\) to state \((n+1)\) as observed fractions of transitions out of a specific state:

\[
p_{ij} = P\{X_{n+1} = j | X_n = i\}, \quad \sum_j p_{ij} = 1
\]
• analysis of distributions

– Second order stochastic dominance (SOSD)
  • Two sets of random outcomes $X_1$ and $X_2$ with cumulative distributions $F_1$ and respectively $F_2$;

$$F_1 \succsim_2 F_2 \iff \int_{-\infty}^{x} F_1(u)du \leq \int_{-\infty}^{x} F_2(u)du, \quad \forall x$$

tested using the Kaur, Rao and Singh (1994) test;
  • if $X_1$ and $X_2$ have the same mean, $F_1$ is more compactly placed around it than $F_2$. 

3 – Results

Data on income per capita from EUROSTAT NUTS2 regions:

– 1989 to 1998 for regression analysis [latest available at the time of writing];

– 1984 to 1993 for distribution dynamics [decade leading up to the entry into force of the Maastricht Treaty];
Regression analysis:

• estimated speed of convergence:
  • $\beta \approx 2\%$ (Barro and Sala-i-Martin, 1995);
  • with spatial specification:
    – across regions: $1.8\%$ ($\beta$)
    – across neighbourhoods: $-1.6\%$ ($\phi$)

• i.e. the speed of convergence within neighbourhoods of regions is larger than the speed of convergence across such neighbourhoods: $\beta > 0 > \phi$;

• NB: $\beta > \phi > 0$ for the US (Chua, 1993);
Regression analysis:

• estimated spillover effect:
  
  • \( \delta \cong 0.3\% \) (Barro and Sala-i-Martin, 1995);
  • with spatial specification: \( \delta \cong 1\% \)
## Estimated transition probabilities

<table>
<thead>
<tr>
<th>period</th>
<th>$\Delta$ st.dev.</th>
<th>state</th>
<th>A(&lt;50%)</th>
<th>B(50-75%)</th>
<th>C(75-100%)</th>
<th>D (&gt;EU)</th>
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<tr>
<td>1984-1993</td>
<td>-0.062</td>
<td>A</td>
<td>0.15</td>
<td>0.85</td>
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<td></td>
<td></td>
<td>B</td>
<td>0.56</td>
<td>0.44</td>
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<td></td>
<td></td>
<td>C</td>
<td>0.17</td>
<td>0.83</td>
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<td>D</td>
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<tr>
<td>1984-1987</td>
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<td>0.15</td>
<td>0.85</td>
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<td>1.00</td>
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<td></td>
<td></td>
<td>C</td>
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<td>0.66</td>
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<td>1.00</td>
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<tr>
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<td>A</td>
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<td></td>
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<td>B</td>
<td>0.82</td>
<td>0.18</td>
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<tr>
<td></td>
<td></td>
<td>C</td>
<td>0.50</td>
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<td></td>
<td>D</td>
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<td>1.00</td>
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<tr>
<td>1990-1993</td>
<td>+0.028</td>
<td>A</td>
<td>1.00</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>B</td>
<td>0.89</td>
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<td></td>
<td></td>
<td>C</td>
<td>0.50</td>
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<td>D</td>
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<td>1.00</td>
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Cumulative distributions: 1993 vs. 1984; 1984 vs. 1987

- Cumulative probability vs. income per capita for 1984 and 1993.
- Cumulative probability vs. income per capita for 1984 and 1987.
Cumulative distributions: 1987 vs. 1990; 1990 vs. 1993

![Graph showing cumulative distributions for income per capita for years 1987, 1990, and 1993. The graphs display cumulative probability against income per capita for each year, with distinct lines for each year.]

1. For 1987, the cumulative distribution shows a moderate rise in cumulative probability with income per capita.
2. The 1990 graph indicates a higher cumulative probability compared to 1987, suggesting an increase in income per capita distribution.
3. The 1993 graph, represented by a dashed line, shows an even higher cumulative probability, indicating a significant increase in income per capita distribution compared to 1990.

These graphs illustrate the changes in income distribution over the specified years.
Analysis of distributions:

• Markov chains:
  – persistence;
  – upward mobility;
  – tendency of polarisation;

• SOSD:
  – sub-periods of convergence/divergence;
  – sensitivity to choice of time period.
4 – Relevance

• the incorporation of **spatial effects** into the empirical analysis of regional convergence is both necessary and, with the development of suitable econometric techniques, possible (Anselin and Griffith, 1988);

• taking the presence of spatial effects (autocorrelation and heterogeneity) into account enabled us to distinguish between convergence and divergence movements across the EU;
4 – Relevance

- the use of spatially disaggregated economic data is more revealing than analysing economic data at national level;
- as far as informing regional policy is concerned, we need to remain aware of the risk of gerrymandering in relation to alternative areal aggregation: it is possible to reach diametrically opposed conclusion from the same model, using data at different levels of spatial (dis)aggregation (Steinnes, 1980).
5 – Concluding comments

• Location matters to regional convergence in Europe;
• New insights can be gained into economic growth and convergence by applying novel (spatial) analysis techniques to regional data;
• Good theoretical models can only be brought to life, empirically, through the availability of reliable data:
  – Dynamics and the time dimension;
  – Comparability of data in time and space;
• SCORUS.
References: