European integration and domestic regions: A geographical economics approach

Arne Melchior
Norwegian Institute of International Affairs
NUPI; www.nupi.no
ERSA-Nordic/ ESPON-NORBA workshop
NIBR, 14-15 March 2012, Oslo

Domestic regions – an international issue

• Traditionally domestic concern
• But we can get new insights from a comparative + international perspective
• Regions are affected by international integration
• China and India – regions at the size of a large European country
  – Should they be compared to Luxembourg?
Papers on European regions

- Output from ENEPO project, coordinated by CASE/Warzaw
  - Regional inequality in Europe, 1995-2005 (NUPI WP748, 2008 + CASE S&A 374)
  - European integration and domestic regions: A numerical simulation analysis (WP749, 2009 + CASE S&A)
  - East-West Integration and the Economic Geography of Europe (WP750, 2009 + CASE S&A)
  - Author of all: Arne Melchior

China and India, using real map

- Globalisation, Domestic Market Integration, and the Regional Disparities of India, NUPI Paper 780, 2010

Diagram 7: The “world map” of the model simulation
Location of 166 regions, countries and country groups
NUPI regional data collection

Regional economic data for:

- EU-27 and EEA
- Russia, Ukraine, Croatia, Turkey, China, India
- Other OECD: Australia, USA, Canada, Japan, Korea, Mexico
- Sources: Regio/Eurostat, OECD, national sources
- >35 countries, comparative and comprehensive focus

Regional inequality up in 22 of 35 (Ginis, 1995 and 2005)
Map of change, Europe
Darker = more increase in regional inequality
Covering EU-27, Norway, Ukraine, Croatia

Integration and the regions: Earlier research ambiguous

• Integration = regional convergence
  – Theory: E.g. Krugman and Elizondo 1996, Crozet and Soubeyran 2004 (with asymmetric regions)
  – Empirics: Crozet and Soubeyran (2004, Romania), Redding and Sturm (2005, German unification)

• Or: Integration = regional divergence
  – Theory: Monfort and Nicolini 2000, Monfort and van Ypersele 2003, symmetrical regions
  – Empirics: Kanbur and Venables (2007, survey), Hanson (2003, Mexico), Egger et. al. (2005, CEA)
One answer or many?

• Earlier research: Searching for a single answer
• Outcome here: Result depends on the type of integration.
  – Concepts: Spatial and non-spatial liberalisation
  – Also in Behrens et al. 2007
• Many regions: The question is not only if but also where there is agglomeration
• Need for multi-region modelling
  – Fujita and Mori (2005): Top priority in NEG (New Economic Geography)

Outline

1. Model simulations
2. Empirical analysis
Modeling approach

- Need for tractability
- Avoid multiple equilibria
  - Multiple equilibria: Potentially several
- Avoid catastrophic agglomeration
  - Example: Bosker et al. 2010: With interregional labour mobility, all European manufacturing is located in Île-de-France
- Therefore: New Trade Theory, not New Economic Geography (NEG) approach

Models used

1. The "Home Market Effect" model of Krugman (1980), generalised to n regions
   - Two sectors, "numeraire" sector
   - Not well-behaved for wide parameter ranges
2. The "wage gap model"
   - No net trade effects, only intra-industry trade, only one sector
   - Market access differences show up in nominal and real wage differences
   - Well-behaved, used in the analysis for Europe
3. More complex model used for India and China
Net trade or wage effects?

- Mostly NTT and NEG rely on trade effects
  - Market access affects specialisation and comparative advantage
- Alternative: Wage not trade effects
  - Effect first shown by Krugman (1980)
- Trade effects often supported by arbitrary asymmetries between sectors
  - E.g. free trade for numeraire sector
- Wage effects more empirically supported than trade effects (Head and Mayer 2004, survey)

Comparing the two models

**HME model**
- One factor, labour
- "Manufacturing" sector
- Numeraire sector
- Wage fixed and equal
- Number of firms endogenous
- Diversification assumed
- Net trade effects, net + intra-industry trade

**Wage gap model**
- One factor, labour
- "Manufacturing" sector
- Only one sector
- Wage endogenous
- Number of firms proportional to size
- Diversification non-issue
- Balanced intra-industry trade
Research approach

• Not CGE, but numerical theory
• Alt. 1: Numerical model simulation with true geography
  – Example: 166-unit world economy model used in the study of China (own work)
  – Model predictions can be compared directly with data
• Alt. 2: Stylised representations of space
  – Easier to interpret
  – "Principal" hypotheses, not numerical
  – Chosen for Europe, with 1200 regions at NUTS3

A synthetic landscape
(each dot = one region)
Technicalities, wage gap model

• Simulated with MATLAB
• Analytical solution only in special cases. Not so helpful.
• Standard algorithms do not work
• Genetic algorithm + Excel link
• Collapsed into one set of 90 equations
• Each run: 15-30 minutes, now much faster
• More regions: More time

Scenarios (selected)

• WIDER: Regional integration between west and central Europe
• WTO: Reduction in multilateral trade barriers
• SPATIAL: Distance-related trade costs are reduced
• CAPITAL: Hub-and-spoke effects
• Simulated by changing trade costs between regions and countries
• Generates real and nominal wage changes
WIDER, key words

- Standard integration effects:
- New members of trade bloc gain
  - "Wage shifting" not "production shifting"
- Real income gains also in former bloc
- "Agglomeration shadow": Loss for outsiders
- Regional gradients inside each country
  - Central Europe: More positive for the west
WTO, key words

- WTO leads to "preference erosion" by reducing the relative advantage of being inside the trade bloc
- Therefore the gain is larger outside the WEST bloc
- and larger for regions close to this bloc
SPATIAL, key words

- Reduction in distance-related trade costs leads to pan-European decentralisation
- Some nominal income loss in central areas
- Welfare/real income gain in all regions
- U-shaped pattern
  - Different from the U-pattern examined in NEG
CAPITAL effects in the east: Changes from WEST
For regions along the 2nd latitude

CAPITAL effects, key words

• Shows change from WEST situation if some of the trade of E1-E3 has to be routed through capitals
• Stylised modeling of a hub-and-spoke pattern
• Arbitrary that is applies only to the east, could also be relevant for others
• Strong capital region effects in E2 and E3
Implications

• The impact varies strongly between scenarios
  – No general answer about international integration and the regions
• Standard country-level integration effects
  – Production-shifting (Puga, Venables, etc.) or "wage shifting"
  – Better integrated blocs are better off (Martin and Rogers 1995)
  – "Domino" effects (Baldwin etc.), "agglomeration shadow"
• In addition: Distinct region-level effects

From theory to empirics

• Step 1: Comparison between scenarios and growth patterns
• Step 2: Regression analysis of regional growth
• Time period 1995-2005: Likely that more scenarios are relevant
  – WIDER gradually implemented
  – WTO implemented from 1995
  – SPATIAL: Uncertain but may result from internal market
  – CAPITAL: Empirically important
Income levels 1995-2005, regional averages by longitude (for EU27/EEA)

Figure 2: Average income levels in EU-27/EEA regions by longitude, 1995 and 2005

Reality vs. Simulation, levels
Europe: V-shaped pattern

Levels of per capita income by longitude

Growth in per capita income by longitude, 1995-2005

Figure 2: Average income levels in EU-27/EEA regions by longitude, 1995 and 2005

Figure 2: Per capita income growth rate averages

Data source: Eurostat, World Development Indicators.
First impression, step 1

• U-shaped pattern conforms with SPATIAL
  – Monetary integration, implementation of the EU internal market?
  – Has Europe finally "become smaller"?
  – Alternative: Neoclassical convergence

• Eastern growth 2000-2005 conforms with WIDER

• CAPITAL, in conformity with evidence

Step 2: Country-level regressions

• Descriptive regressions: Does growth within countries have an east-west or north-south gradient?
  – Is the U-shape in SPATIAL also reflected inside countries?
  – Does WIDER lead to more growth in western Poland?

• Controlling for
  – agglomeration around capital region (CAP)
  – agglomeration around economic centre point (CORE)
Regressions continued

• \( g_i = \alpha + \gamma_1 \cdot \text{LON}_i + \gamma_2 \cdot \text{LAT}_i + \gamma_3 \cdot \text{CAP}_i + \gamma_4 \cdot \text{CORE}_i + \varepsilon_i \)

• \( g = \text{growth rate (average over period)} \)
• Also run with \( \text{CAP} \) and \( \text{CORE} \) in log form or with quadratic term added, and robust regressions to check for outliers
• Results for 24 European countries, including Russia, Ukraine and Turkey
• At NUTS3 level, from 14 to 414 observations
• Right-hand side variables constant or with little change; therefore cross-section approach

Results, EU15 + Norway

• We do find the expected east-west gradients in many countries
• We also find a \( \text{CORE} \) effects which is not easy to explain from the model
• But the evidence provides tentative support for the SPATIAL hypothesis
• Has to be followed up with specific research on distance-related trade costs
East-west gradients of growth
Blue = western, green = eastern, grey = not significant, white = not covered

CAPITAL effects
Blue = CAPITAL effect, green = reversed effect, grey = not significant, white = not covered
Conclusion

• Some support for a mixed scenario with WIDER + SPATIAL + CAPITAL
• Tentative and not conclusive
• Western Europe: The "invisible hand" at work
• Central Europe: Mixed, still transition