Recent Developments in Regional Economic Analysis

Geoffrey J.D. Hewings

Regional Economics Applications Laboratory
University of Illinois
Urbana, Illinois 61801-3671, USA
+1.217.333.4740 (244.9339 fax)
www.real.uiuc.edu
Recent Developments in Regional Economic Analysis

Outline
- Introduction to the Regional Economics Applications Laboratory
- Regional competitiveness
- Convergence
- Economic-ecological
- Fragmentation – where will new products be produced?
- Infrastructure impacts of trans investment
- Labor skills and mobility
- Modeling new economic geography
- Summary comments
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Introduction to the Regional Economics Applications Laboratory

- Formed in 1989
- Goal: enhance quality of public policy decision-making through creation of strategic analysis of state and local economies
- Move from theory to formal analysis to public policy presentation
- Train next generation of economic analysts to be “schizophrenic”
  - Present analysis in one form for academic audience
  - Present modification in form suitable for policy analysts
- Provide monthly employment analysis Illinois; monthly index leading indicators for Chicago economy
- Annual forecasts for Illinois, Chicago and other Midwest state economies through 2030
- Developed models for states and regions in EU, Brazil, Colombia, Chile, Japan, Korea, Indonesia.
- Participants in 2007 from: Chile, Brazil, Indonesia, Bangladesh, Korea, Japan, Colombia, Italy, Turkey, Spain, Puerto Rico, Nigeria
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Regional Competitiveness

Issues:

1. Over the next several decades, competition will be centered on regions not nations.
2. Regions are becoming more interdependent – a region’s competitiveness will be a function of:
   1. The region’s endowments
   2. The competitiveness of the regions with which it trades
   3. Dynamics of change likely to accelerate creating enormous challenges for analysis, assessment and forecasting
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Regions Competitiveness - responses

- World Bank, Inter-American Development Bank focusing activities on regional issues in re-considering economic development strategies
- FAO Latin American office focusing on regional development strategies
- OECD launched major new research initiative on regional competitiveness
- In US, recent reorganization of regional and urban funding into more strategic focus
Regional Competitiveness: Challenges for Regional Science

- How to we define competitiveness? – no consensus
- How do we model it?
- What techniques are available in the regional science toolbox?
- Recent Spatial CGE work offer some interesting perspectives – analyzing alternative forms of spatial competition
- Enormous opportunities to craft new models/approaches to bring a more holistic perspective that combines ideas of competitive advantage, growth centers, spatial spillovers etc.
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Convergence: Issues

- Issue: does economic growth result in movement towards convergence of regional economies within a nation?

- Earlier work of Williamson (1965) and subsequent contributions of Barro and Sala-i-Martin have generated a flood of analyses exploring the degree to which convergence is or is not taking place
  - in Europe, focus on role of infrastructure investment and role in reducing regional disparities
  - in Brazil – impact of regional development policies in NE
  - in US – degree to which “market driven forces” have resulted in convergence
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**Convergence: Challenges**

- Earlier work ignored spatial correlation/spillover impacts
- Newer work uses methodology of spatial econometrics – revealed that capture of spatial correlation effects changed outcomes (convergence/divergence) in some cases or speed of convergence/divergence
- Further challenges
  - spatial scale – climate analogy - convergence at one scale, divergence at another
  - time scale – analysis over 5, 10, 15 or 20-year period often yields different outcomes
  - space-time problem – modeling spatial-time series (panel data) presents current major challenge
    - Endogenous identification of “breaks” in the series
    - A priori or endogenous specification of spatial weight matrix
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Economic-Ecologic Linkages Issues:

- Analysis of regional impacts of climate change and their economic impacts
- Hurricane Katrina and Rita, earthquakes in Pakistan, Tsunami in S Asia, floods in Bangladesh all point to new emerging field of economic impacts of unexpected events
  - Modeling in continuous time
  - Modeling in disequilibrium conditions
- Modeling spatial exchange of pollution permits, climate and energy futures
- Water allocation – probably a greater conflict than issues over oil – intra- and inter-national dimensions
Various Macro data

Output Projections 1999-2012

GAMS

Multi-objective module
(water allocation to meet growth objectives in the region overall)

Percentage change in output values for some industries

MERIP-NE 2001
Sensitivity and impact analysis

Water use & output projections

Labor & H2O levels
Regression coeffs
Value added

MATLAB

Data arrangement & Regression module

Employment data
Water data
Value of production data
Input-output coefficients

Decision makers

MERIP-NE 2001
Regional Econometric Input-output Model

Employment data
Water data
Value of production data
Input-output coefficients

Percentage change in output values for some industries

MERIP-NE 2001
Sensitivity and impact analysis

Income
Labor
Production
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Results

<table>
<thead>
<tr>
<th>Industries</th>
<th>Percentage of change in output value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-CULTURAS INDUSTRIAIS</td>
<td>-12.05%</td>
</tr>
<tr>
<td>2-GRÃOS</td>
<td>-12.05%</td>
</tr>
<tr>
<td>3-FRUTICULTURA E OLERICULTURA</td>
<td>-14.23%</td>
</tr>
<tr>
<td>4-BOVINOCULTURA</td>
<td>-13.77%</td>
</tr>
<tr>
<td>5-AVICULTURA E SUINOCULTURA</td>
<td>-13.51%</td>
</tr>
<tr>
<td>6-OUTROS PRODUTOS AGROPECUÁRIOS</td>
<td>-14.78%</td>
</tr>
</tbody>
</table>

Table 2 Impact of Water Constraints on the Agricultural Sector and Total Employment

<table>
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<tr>
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<tbody>
<tr>
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<td>-456,225</td>
<td>-458,943</td>
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<tr>
<td>2</td>
<td>-172,770</td>
<td>-153,404</td>
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<td>3</td>
<td>-86,800</td>
<td>-92,989</td>
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<td>4</td>
<td>-148,735</td>
<td>-155,272</td>
<td>-161,041</td>
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<td>5</td>
<td>-10,187</td>
<td>-11,304</td>
<td>-12,111</td>
<td>-12,568</td>
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<tr>
<td>6</td>
<td>-99,301</td>
<td>-110,763</td>
<td>-120,538</td>
<td>-125,762</td>
</tr>
<tr>
<td>Rest</td>
<td>-211,566</td>
<td>-210,912</td>
<td>-204,880</td>
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<tr>
<td>Total</td>
<td>-1,173,771</td>
<td>-1,190,869</td>
<td>-1,186,142</td>
<td>-1,195,271</td>
</tr>
</tbody>
</table>

Loss of >1 million jobs about 6.5% total employment
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Fragmentation, Hollowing Out and Spillovers

- Production systems have become more interdependent and less constrained by political barriers…..
- Spatial organization of production systems increasingly viewing location from an *apolitical* perspective
- Chicago/Midwest experience…..
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Relationship Between Total Sectoral Outputs and Intermediation, 1975-2011

- Total Intermediation
- Total Sectoral Outputs

Gap between Local Production and Local Supplies increasing over time

Chicago and Illinois firms rely more on inputs from outside state
Figure 1: Flow of Goods through a Production Process

**1960s/1970s**

- **Raw Materials** → **Intra-state exchange**
- **Initial transformation** → **Secondary transformation** → **Finished product**
- **Interstate transport** → **Delivery to market**

**1990s/2000s**

- **Raw Materials** → **State 1** → **Indiana**
- **State 2** → **Illinois**
- **State 3** → **Wisconsin**
- **State 4** → **International**
- **Delivery to market**

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Fragmentation of production – division of production into smaller, more specialized components – leading to greater interstate trade.

- Minnesota
- Indiana
- Illinois
- Wisconsin
Interregional Impacts of International Trade Expansion in the Midwest of the US

**Fragmentation** of production generates increased interregional dependence
Dynamic Simulation with VAR Model

Recessions caused by national shock

Illinois lags Indiana 3-4 months in response to national shock
Illinois lags Michigan 4-5 months

Illinois lags Ohio 3-4 months

Illinois lags Wisconsin 2-3 months

Illinois - solid line: other state - dotted line
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Why does this happen?

National Common Shock

Manufacturing

. . . . . .

Services

Industry Combination of Each State and Production Sequence

Differences in State Business Cycles
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Issues to be Explored

- How does fragmentation change the nature of international and inter-regional linkages?
- Can regions become more integrated and competitive at the same time?
- Role of intra- and inter-industry trade
- Changes competitive advantage of regions
- What is the role of changes in firm ownership and organization?
- Are processes observed in Japan, US and Europe likely to be repeated in China, India, Indonesia, Bangladesh...?
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- Need to reflect on the fact that the nature of interdependence varies with spatial scale:
  - Between nations – trade in goods and services
  - Between regions – trade in goods, services and labor
  - Within regions – daily commuting and their impacts dominate
- Economic impact of these network connections varies
- One alternative is to explore hierarchical interaction patterns
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Strict Hierarchical Interaction: macro regions interact but sub-regions only interact within macro regions

Note: —— Vertical interaction
       ——— Horizontal interaction
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- Strict hierarchical interaction applied to Indonesian case study (Nazara and Hewings, 2004) to capture spatial correlation (spatial spillovers)

- Application to Spanish Regions (Marquez et al., 2005) involved determination of national and local effects in competitive structure
  - Regional competition may be regarded as the market process by which economic activities or employed factors of production are allocated through time among the regions of a nation;
  - Examined a region's competitiveness through ability to maintain or increase its share of the GNP through time
  - Are changes influenced by national or “neighborhood” effects?
  - Differences in long- and short-run?
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Evolution of the regional shares

Variety of experiences evident

Downward

Cyclical

Upward
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Spanish Regional System
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NEIGHBOURHOOD EFFECT

ECONYM-WIDE EFFECT

Green color indicates a significant negative coefficient. –Blue color indicates a significant positive coefficient. –Gray color indicates a non-significant coefficient.
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- **Interpretation**
  - Evidence of ‘divergence forces’ operating with peripheral regions showing negative economy-wide effects, while core regions are being affected by positive national effects.
  - This implies that, in terms of the whole Spanish system, peripheral regions are not increasing their relative productive capacities.
  - However, no economic/explanatory mechanism has been identified - analysis is formal spatial econometrics.
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Labor Skills, Mobility and Ageing of Population

- Operation of labor markets not been prominent feature of many regional models
- Problems of market cleaning, selective migration generating different impacts:
  - Examine impacts of migration out of Chicago
  - Problem of ageing population
Net-Migration Patterns of AAGI Migration in Chicago PMSA (1992~1993)

Legend (in US $1,000)

-47380  -9778  0  18262
-17678  -9268  2043  20024
-11189  -6988  3283  27450
-10751  -1810  3473  43408
-9310  -1841  6386

Net-Inflow to Chicago PMSA
Net-Outflow from Chicago PMSA
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- Fiscal Block
- Population, Labor Force
- Macro Econometric Model
- Energy Model
- Trade Block
- Industrial Model (I-O table)
- Regional Model

CRIEPI Long-term Forecasting System
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I-O model, Consumption Matrix

Value Added

Total Output

Total Demand

Trade Block

Macro Econometric model

CT (j)

CT (i)

RAS
Initial value based on 1991 survey data
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Background – Demographic transition in Japan

![Graph showing demographic transition in Japan with labels for different age groups and year markers from 1955 to 2045. Key points include: 32.3% for the year 2045, 17.2% in 2025, and 65+ population proportion as a percentage of the total population.]
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Background – Why life cycle is important?
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Income growth by income quintile

Consumption growth by age group

Aging and the Chicago economy
Transportation Infrastructure and Economic Development

- Broad significant issue for regional analysis

- Two illustrations
  - Korean Expansion of Freeway System
  - Use of integrated CGE and Commodity Flow Model to examine impact of unexpected event (earthquake in Midwest of US)
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Map of South Korea showing regions:
- Seoul Metropolitan Area
- Central Area
- Southeast Area
- Southwest Area

Diagram with nodes:
- Transport Investment
- Construction Investment
- Government Revenue and Savings
- Increase in Production Costs
- Consumption Expenditure
- Changes in Trip Pattern
- Changes in Urban Activity
- Calibration of Minimum Distance between Zones
- Enhancement of Accessibility
- Value-added Productivity
- Gross Regional Product
- Decrease in Production Costs
- Export
- Household and Government

Legends:
- Existing Expressway
- Planned Expressway
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Integration of interregional Econometric input-output Model with transportation Flows

Evaluate impact of earthquake On interstate trade
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Analytical Importance of Links

Economics

Engineering

TC/DR ratio
- Below 100
- 100 - 200
- Above 200

Disruption ratio
- Below 20%
- 20 - 40%
- Above 40%
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Economics versus engineering – not much agreement!

\[ y = 214.53x - 1329.1 \]

\[ R^2 = 0.2011 \]
Modeling the New Economic Geography

Work of Krugman, Fujita, Thisse, Venables and others generated significant theoretical challenges to regional economic models.

Many of the propositions not been subjected to empirical testing.

Next example, small test of role of scale economies and role of transportation costs in Brazilian economy.

Modeled transportation costs as a margin not in terms of iceberg costs.
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Diagram showing the flow of international and interregional trade, including imports, exports, local goods, and regional and composite goods.
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- Impacts of RTS on São Paulo and Brazil

![Graph showing impacts of RTS on São Paulo and Brazil](image-url)
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Non-economic factors – social networks

- Compare two regions – similar economic structure (using Isserman’s methodology on “twinning”) but one grows more rapidly than the other - Missing variable problem?
- Burt (structural holes), Kilkenny (keystone sectors) focus on structure of social relationships
- Carvalho and Kilkenny compared structure in rural US with Portugal
  - Portugal – public (government) entities critical
  - Rural US – private sector entities (banks especially)
- Recent work in Chile focused on role of social organizations in contributing to a region’s social capital and hence its competitiveness
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Portfolio, structure and growth

- Several decades ago, regional portfolio analysis (drawing on Markowitz) was popular.
- May need to revisit idea as a way of assessing attributes of a region’s competitiveness and integrate with some of the ideas of cluster-based development strategies.
- Fritz and Streicher (2004) explored ways to use shift-share regression analysis to explore changes in regional competitiveness over time.
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Portfolio, structure and growth

- Portfolio ideas need to be broadened to include:
  - Nature and strength of a region’s external trade, especially sensitivity to changes in national trading regimes (bilateral and multilateral agreements)
  - Degree of competition-complementarity with other regions
  - Role of occupational/social capital
  - Innovation potential
  - Fiscal capacity
  - Leadership potential
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- **Final Thoughts**
  - Spatial scale is important – convergence/divergence may not be consistent at different levels (state, sub-state, municipalities)
  - Regional development problems framed within Free Trade Area agreements present very different challenges (EU experience, for example)
  - Future competition likely to focus more on region-region interaction that country-country
  - Challenge for the development of models and analytical methods that can embrace these new competitive forces