Analytical Challenges to Regional Development

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.illinois.edu
Analytical Challenges to Regional Development

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 and soon each MSA; housing market analysis and forecasts
- Annual forecasts for Illinois, Chicago and other Midwest state economies through 2040
- Developed models for states and regions in EU, Brazil, Colombia, Chile, Japan, Korea, Indonesia.
- Participants in 2009 from: Chile, Brazil, Indonesia, Bangladesh, Korea, Japan, Colombia, Italy, Turkey, Spain, Puerto Rico, Nigeria
- Provided support (2 years or more) for >40 doctoral dissertations in economics, agricultural economics, urban and regional planning and geography
- “bolsa sanduiche” program with University of São Paulo
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
- WDR 2009 *Rethinking Economic Geography*
- 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 that issues over oil – intra- and inter-national dimensions
Output Projections 1999-2012

Various Macro data

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

MATLAB
Data arrangement & Regression module

MERIP-NE 2001
Regional Econometric Input-output Model

Labor & H2O levels
Regression coeffs
Value added

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

Income
Production
Labor

Water use & output projections

Decision makers

10
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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>
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Table 2 Impact of Water Constraints on the Agricultural Sector and Total Employment

<table>
<thead>
<tr>
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<tr>
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<td>-153,404</td>
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<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>
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<tr>
<td>Rest</td>
<td>-211,566</td>
<td>-210,912</td>
<td>-204,880</td>
<td>-204,551</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

Chicago and Illinois firms rely more on inputs from outside state.

Gap between Local Production and Local Supplies increasing over time.
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Fragmentation of production – division of production into smaller, more specialized components – leading to greater interstate trade

1960s/1970s

Intra-state exchange

- Raw Materials
- Initial transformation
- Secondary transformation
- Finished product

1990s/2000s

Interstate transport

- Raw Materials
  - Minnesota
- Initial transformation
  - Indiana
- Secondary transformation
  - Illinois
- Finished product
  - Wisconsin

International

Delivery to market
# 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 inter-national 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

Diagram:
- Nation
- Region P
- Region S
- Province 1
- Province 2
- Province 3
- Province 4
- Province 5

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

ECONOMY-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)
-47390 -9778 -6286 -3268 -1810 -1641 0 18282
-17676 -9285 -8088 -6063 -3473 -6366
-11189 -6878 -4964 -2859 -1475 -1641
-10751 -1810 -1150 -4073 -5508
-9910 -1261 -1600 -6366

Net-Inflow to Chicago PMSA
Net-Outflow from Chicago PMSA
Net-Migration Patterns of AAGI Migration in Chicago PMSA (2000~2001)

Legend (in US $1,000)

<table>
<thead>
<tr>
<th>Net-Inflow to Chicago PMSA</th>
<th>Net-Outflow from Chicago PMSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>-99268</td>
<td>-88281</td>
</tr>
<tr>
<td>-85053</td>
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<td>-80019</td>
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<tr>
<td>-983</td>
<td>-19268</td>
</tr>
</tbody>
</table>

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

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

- Intermediate Demand
- Final Demand
  - Value Added
  - Total Output
- Household Consumption
- Total Demand
- Trade Block
- Macro Econometric model

RAS
Initial value based on 1991 survey data

CT (i)
CT (j)
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Background – Demographic transition in Japan

- (65+) / (Total)
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Background – Why life cycle is important - Japan

Medical Expense

Transportation

Education

Miscellaneous Expense

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Income growth by income quintile

Consumption growth by age group

Aging and the Chicago economy
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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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- Seoul Metropolitan Government
- Revenue and Savings
- Construction Investment
- Increase in Production
- Costs
- Transport Investment
- Construction of New Roads
- Changes in Trip Pattern
- Changes in Urban Activity
- Shortest Route Algorithm
- Calibration of Minimum Distance between Zones
- Enhancement of Accessibility
- Value-added Productivity
- Decrease in Production Costs
- Gross Regional Product
- Export
- Household and Government
- Increase in Production Costs
- Consumption Expenditure
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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 have 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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International trade balance

Region A
- Composite intermediate inputs
- Composite capital goods
- Composite consumption goods
- Local goods
- Interregional trade balance

Region B
- Composite intermediate inputs
- Composite capital goods
- Composite consumption goods
- Local goods

Imports
Exports
Exports
Imports

National border

Transportation services

Regional border
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- Impacts of RTS on São Paulo and Brazil

![Graph showing the impact of returns to scale (RTS) on São Paulo (SP), Rest, 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
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
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
  - In many countries “spatially blind” development policies may exert larger impact on economic development than spatially targeted policies