

Urban Dynamics: Some Critical Modeling Issues



GEOFFREY J.D. HEWINGS

R | E | A | L

**Regional Economics Applications Laboratory
Institute of Government & Public Affairs
University of Illinois
607 S. Mathews, Urbana, IL 61801-3671
hewings@illinois.edu
www.real.illinois.edu**

Outline



- Organization of research – REAL
- The Context
- Stylized Facts
- General Perspectives
- Regeneration Economies
- Structural Changes in Urban Economies
- Challenge of Supply Chain Analysis
- What is happening inside City Regions?
- Final Thoughts

Introduction to the Regional Economics Applications Laboratory (REAL)



- 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 each Illinois 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 2012 from: Colombia, Chile, Brazil, Peru, Argentina, China, Indonesia, Bangladesh, Korea, Japan, Italy, Turkey, Spain, Puerto Rico, India, Guatemala
- 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

Questions



- Organization of urban and regional research in Morocco?
- Karlsson – role of teams in generating research
 - REAL organized like science lab – need to consider development outside IRES
- How and where is the next generation being trained?
- Possibilities for international collaboration?
 - With RSAI
 - Individual university centers in EU, North America and Asia

The Context



- World-wide, over 50% of the population is located in urban areas
- Forecasts 50, 40, 30, 20, 10 years ago all suggested that there was an upper bound to the size of metropolitan areas – but the larger ones continue to grow notwithstanding the presence of significant negative externalities (congestion, pollution, inefficiencies)

The Intellectual Legacy



- Systems of cities: concept initially rested on propositions of central place theory now posited within the context of the New Economic Geography
- Internal organization of cities: initially von Thunen (regarded by Samuelson as a greater contributor to economic theory than Ricardo) then Muth-Mills-Alonso, new urban economics etc.
- Challenge has always been to link the two

Stylized Facts



- Cities in the developed world transformed in the last half century from dominance by manufacturing to service production of physical goods replaced by production of ideas
- Cities at one and the same time becoming more competitive and more complementary as a result of:
 - Hollowing out
 - Fragmentation
- Exchange of self-contained to interdependence
- Exploitation of scale economies/cheap transport/love of variety/greater exchange
- Intercity trade growing faster than >> City Gross Product

General Perspectives



- Policy makers rarely take the time to discover how their city works
 - How and in what direction it is likely to change
 - Formal evaluation of expected outcomes of alternative development strategies
 - Policy without formal analytical support is just speculation
- REAL is part of a consortium operating under the umbrella **Regeneration Economies**, A Civic-Market Collaborative Leveraging its Assets to Revitalize Great Lakes Economies

We cannot solve today's economic development problems with the same thinking that got us here

[with apologies to Albert Einstein]

General Perspectives



- New business recruitment and relocation initiatives and incentive programs must be combined with programs that stimulate growth of existing and emerging enterprises to benefit a community or region.
- Growing viable firms must be linked with sustainable workforce demand and development
- Unmeasured economic development is resource *expenditure*, not investment; meaningful and visible measurement of outcomes supports wise management of economic development resources.

Regenerative Urban Economies

Diagnosis and Analysis

- Regional occupational and business cluster identification and assessment against a portfolio of metrics (REAL)
- Diagnose practices and performances to assess competitive position (e.g., PROBE, TBM)

Output: Full assessment of trends, opportunities and barriers

Collaborative Innovation

- Strategic Doing Workshops and Training for developing strategy to establish networks
- Workshops in regional strategy, workforce development collaborations, sustainable development, and business clusters

Output: Collaborative strategies with clear owners and metrics

Delivering Outcomes

- Action plan development to accelerate the journey to competitive leadership
- Strategy and marketing leadership for individual firms and local and regional initiatives

Output: multi-generational solutions to support short-term viability and long-term sustainability.

Regenerative Urban Economies



- Analysis requires consideration of the MACRO regional economy
- Then, evaluation of the MICRO (firm-level) economy especially in the context of key VALUE CHAINS
- Development of a strategic DEVELOPMENT STRATEGY
- Cycle back to evaluation of options at the MACRO level (impacts on production, income, employment, growth rates, population, migration....)



Two Major Structural Changes in Urban Economies



1. Each state is **hollowing out** – typical establishment is now less dependent on sources of inputs within the state and on markets within the state ---- *ripple effects of change within the state are now smaller than 20 years ago*
2. Structure of production is changing – **fragmentation** is now a characteristic of production
 - ✦ The value chain is now longer
 - ✦ Firms are organizing production to exploit economies of scale in individual plants in specialized component production and shipping to other plants to add further components



Changes in the Structure of Production

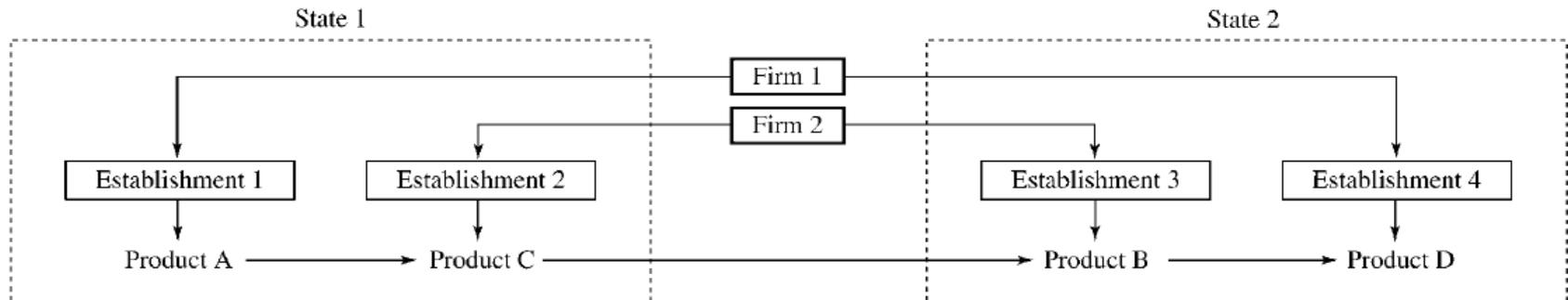


Limited interstate trade

1960s/1970s (high transportation costs)



1990s/2000s (lower transportation costs and changes in firm organisation)



Commodity chain of production has a higher probability of involving interstate trade

Fig. 2. Changing spatial organization of firms (from four firms to two firms/four establishments)

Spatial Interdependence: Job Losses in the Recession



Change in
Metro

Impacts in

Area



Area	Chicago	Indianap.	Detroit	Columbus	Madison	Rest of Midwest Total	Rest of US
C	-	5.98%	4.70%	5.13%	3.85%	19.66%	80.34%
I	9.36%	-	6.19%	12.00%	2.33%	29.88%	70.12%
D	5.78%	5.73%	-	13.10%	5.06%	29.66%	70.34%
C	4.54%	6.47%	8.24%	-	1.98%	21.24%	78.76%
M	7.91%	3.64%	8.35%	5.00%	-	24.91%	75.09%

Urban Regions as Competitors & Complements



- As urban regions become both more competitive and interdependent at the same time, it will be even more important to know:
 - The nature and importance of external trade
 - The geography of this trade – important trading partners
 - Sustainability of trade and the nature of economic vulnerability (e.g. supply chain disruptions)
 - Policy instrument that a single region can employ to enhances its competitiveness
- Without access to formal models, none of this will be possible

Challenge of Supply Chain Analysis



- Work at the country level (e.g. Kukasaku, Meng and Yamano, 2011) has revealed greater country integration in Asia as a result of fragmentation of production
- Expectations:
 - Decrease in intra-region elements as production value chains involve more establishment to establishment flows
 - More interregional and international flows
 - But process may not be homogenous – trade-off between increase in complexity and increase in spatial fragmentation

Challenge of Supply Chain Analysis



- In analysis of Chicago economy, two dimensions are differentiated within the fragmentation process:
 - Spatial: decrease in the complexity of production systems inside any given economy
 - Functional: outsourcing may increase the density of transactions and linkages within a given economy
- Implications for the Chicago region were studied from a set of input-output tables estimated for the period 1978-2014 using Average Propagation Lengths (APLs).

Challenge of Supply Chain Analysis



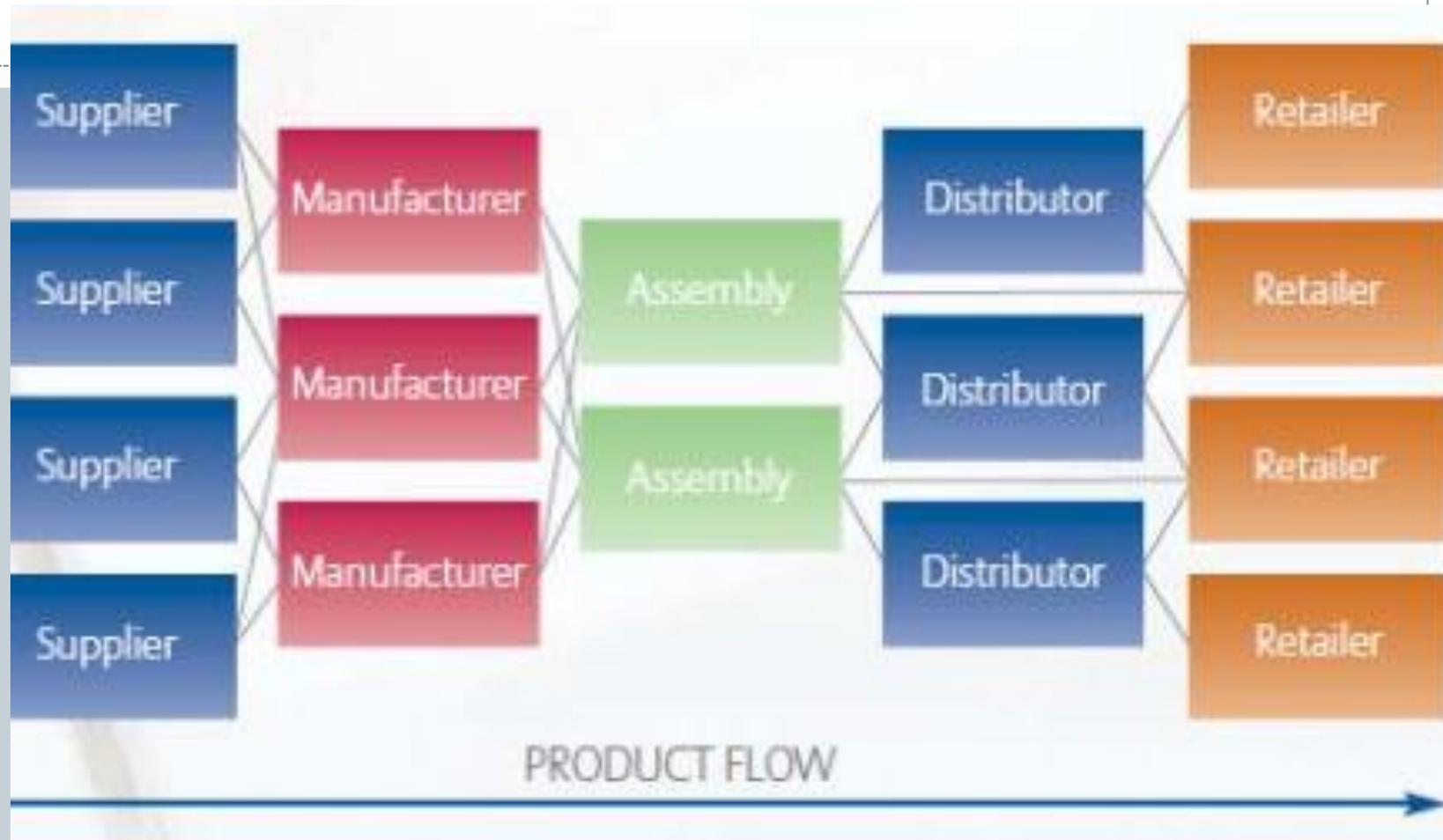
- (1) The Chicago economy has experienced a process of hollowing out due to spatial fragmentation, causing an overall reduction in intermediation – multipliers are decreasing
- (2) A decrease in the variety of goods and services produced in any one sector (i.e. secondary product production has decreased).
- (3) An increase in the specialization of production in each sector.
- This latter observation is consistent with the NEG ideas of the dominance of scale economies and the ability of an individual establishment to serve more extensive geographic markets.

Challenge of Supply Chain Analysis: Vulnerability and the 3-D printing



- Fukushima tsunami revealed dangers of excessive fragmentation+consolidation
 - DENSO encouraged to concentrate production of chip controlling use of battery/gas engine in hybrid cars
 - Factor destroyed in tsunami – loss of 9 months’ production
- 3-D printing offers prospect of further agglomeration of supply chains around sites of final production
 - Saving of logistics/coordination costs
 - Increased flexibility – easier to solve problems
 - Findings of Romero et al in Chicago may be first indication

Supply Chains



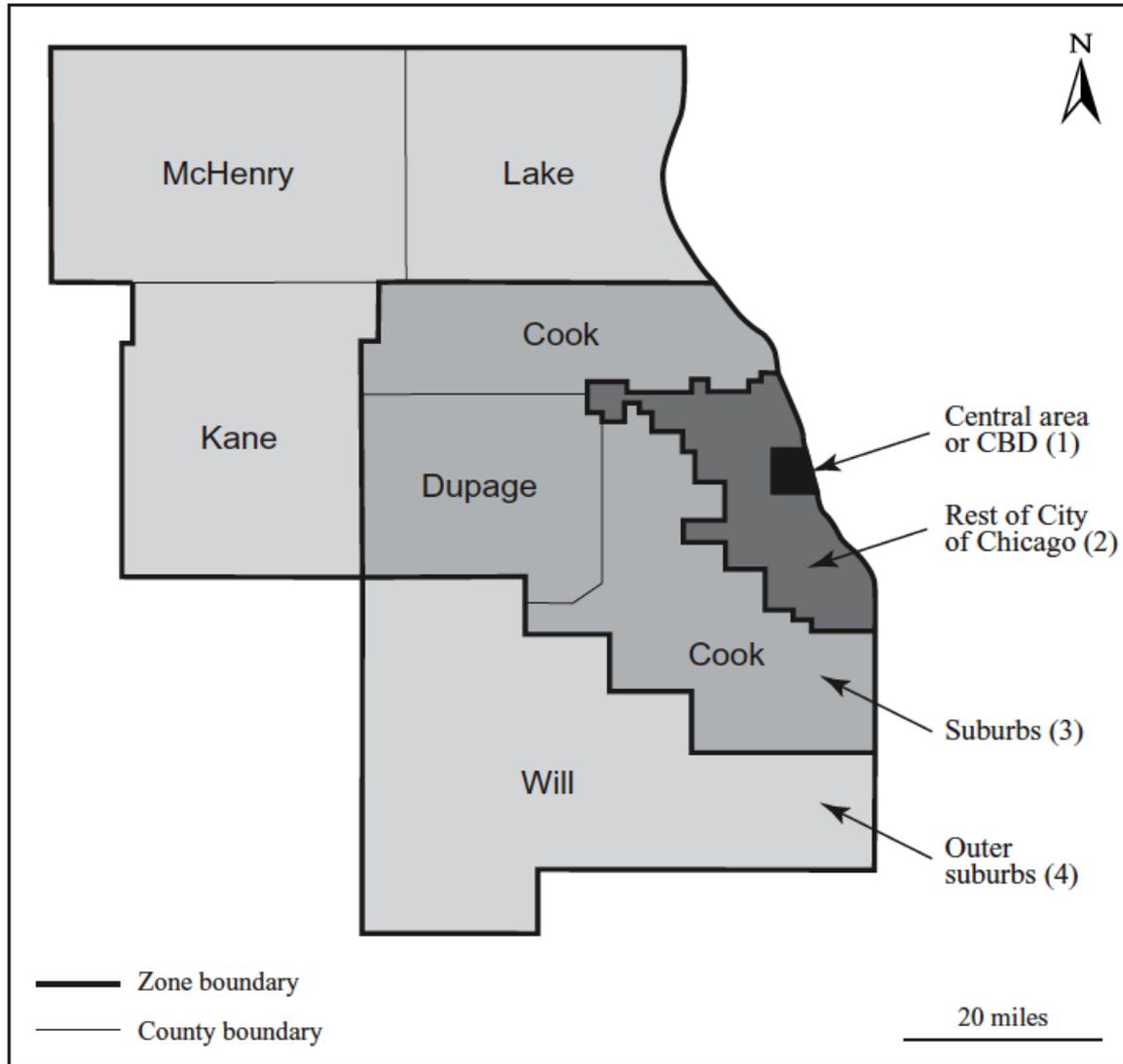
- NOW: Dispersed-----Concentrated-----Dispersed
- 3-D: Concentrated....Concentrated..... Dispersed.

What is happening Inside Metro Regions?



- Krugman has argued that patterns and impacts of trade have similar impacts
 - Between countries
 - Between regions inside countries
- What about within large metropolitan regions?
- Detailed analysis of the Chicago economy provides some insights into the nature and strength of trading relationships
 - Goods and services
 - Flows of people (commuting)
 - Flows of expenditures by households

Spatial Division of Chicago



Chicago Intra Metropolitan Flows

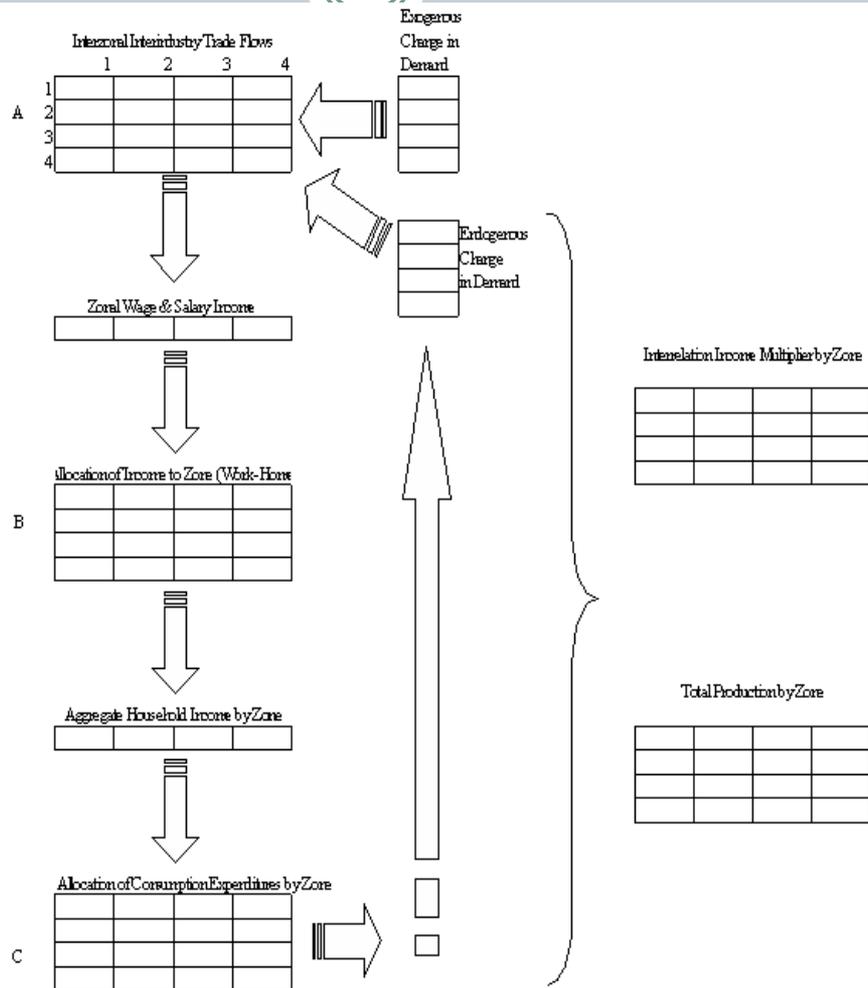
Goods and Services
Flows

Wages and salaries

Flows of commuters
and their incomes by
zone

Household expenditures

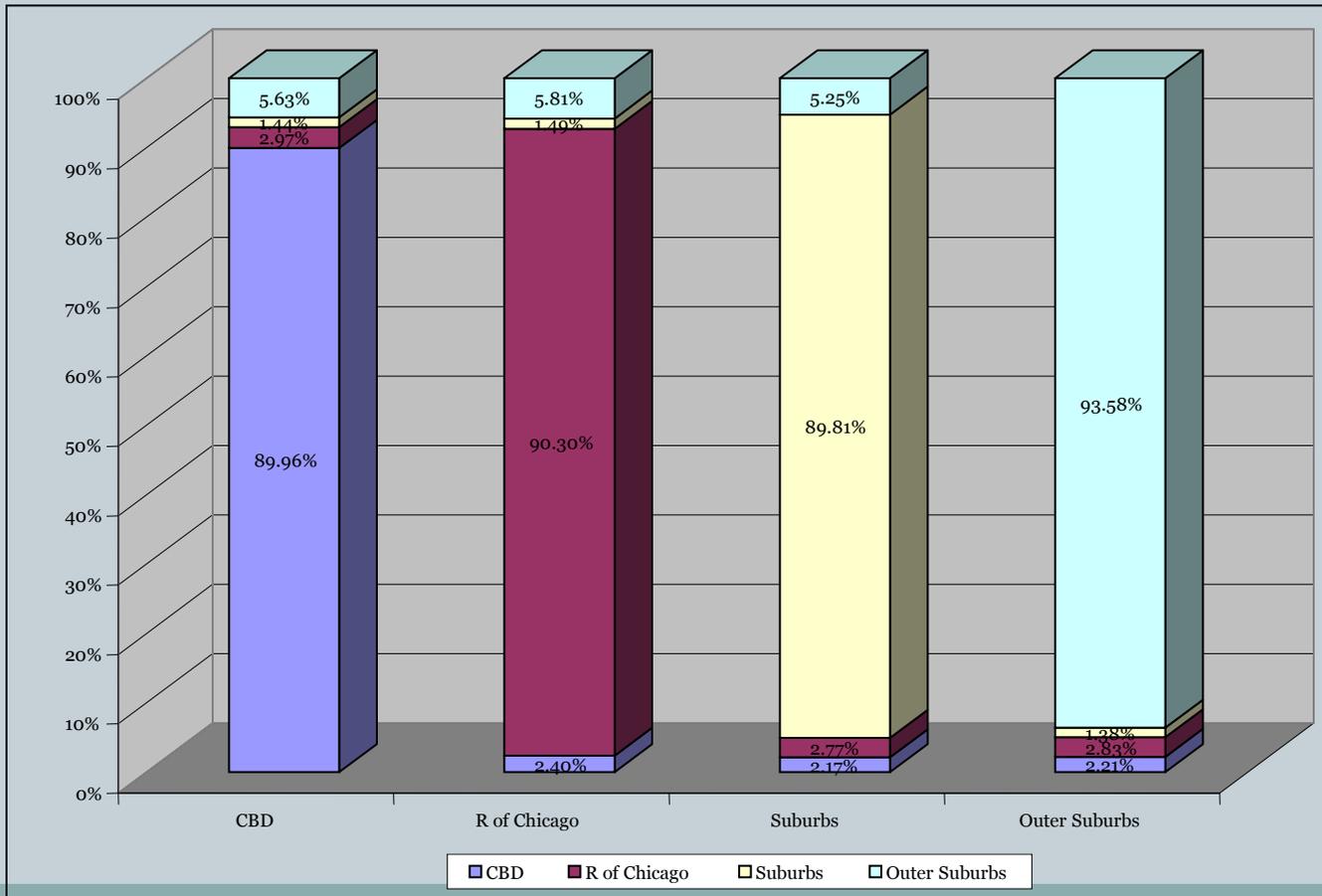
Flows of expenditures by
zone



Interindustry Interdependence

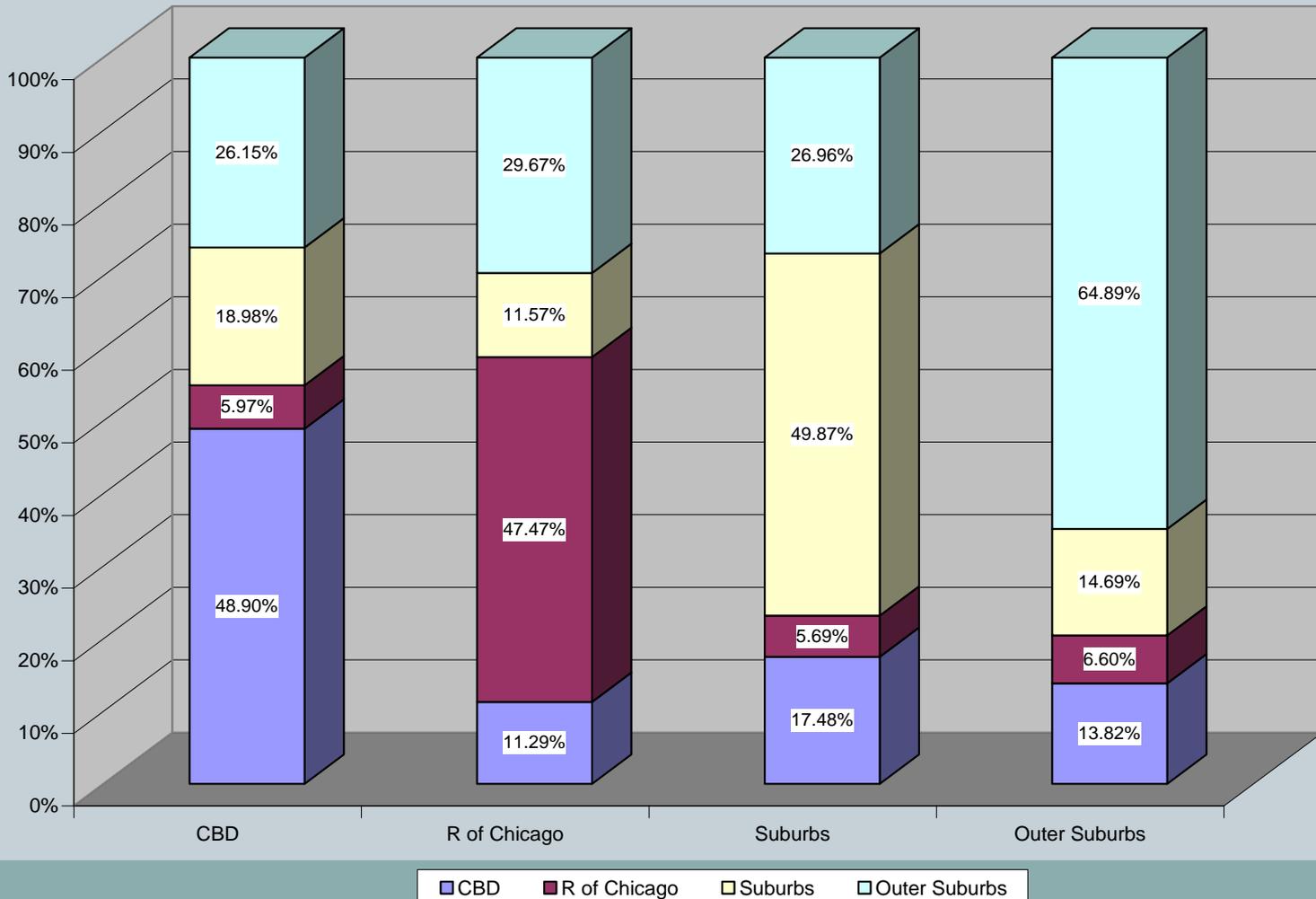


- Limited connections across regions



Total Spatial Interdependence

Substantial interdependence when all interactions considered



Changes Nature of Dependence and Complication Increases



- **Layer 1**

- Intrazonal flows dominate the production relationships in the assembly of \$479 billion worth of goods and services.
- Somewhere between 90% and 94% of the direct and indirect effects of trade remain within the zone

- **Layer 4**

- With the exception of zone 4, less than 50% of the total production impacts can be traced, directly and indirectly, to activity that is generated within the zone
- Almost 14% of the impact in zone 4 (outer suburbs) can be traced to zone 1 (the central area or CBD) with a further 6% traced to zone 2 (rest of the City of Chicago)

Unexpected Result: The Miyazawa Interrelational Income Multiplier



Miyazawa's Interrelational Income Multipliers

	region of income origin			
	Region 1	Region 2	Region 3	Region 4
Region 1	1.23	0.12	0.16	0.07
Region 2	0.11	1.28	0.13	0.05
Region 3	0.03	0.03	1.06	0.01
Region 4	0.44	0.56	0.50	1.77
Total	1.81	1.99	1.85	1.90

- Region 2 – least prosperous but generated largest income multiplier
- Significant asymmetric spillovers – suburbs benefit more from income growth in other regions than vice versa

Final Thoughts



- World Bank, OECD, IDB, ADB have all discovered that the internal heterogeneity of countries requires them to focus on region-region interactions
- Metropolitan areas are similarly heterogeneous and thus there is a need to focus on
 - Nature and strength of the external linkages
 - The interactions between parts of the internal metropolitan structure
 - Interactions between the two – role of internal connectivity is as important as external connectivity
- Known for a long time about inter-urban connectivity across countries but less about how the internal structure affects international competitiveness