



**El Colegio
de la Frontera
Norte**

Regional Input Output Model: A Bibliometric Approach for Mexico

**Dr. Noé Arón Fuentes, Dr. Alejandro Brugués,
Mtra. Lilian Albornoz y Dr. Rafael Ortiz Pech**

Mexico, D. F.

25 y 26 de Julio, 2013


Walter Isard

- ▶ “My work provides a distinction between the national input-output model and three spatial models: regional, interregional y multiregional”


___Walter Isard (1951).



Outline

- The Concept of Bibliometrics
 - Scope of Bibliometrics
 - Application to Regional Input Output Model in Mexico
 - Regional Input Output Model
 - Schematic Diagram of a Region
 - Regional Input Output Table Structure
 - The Network Theory
 - Visualization
 - Representation
 - Results of the Structural Analysis of Networks
 - Conclusion
- 

Concept of Bibliometrics

- Hawkins (1977) defined bibliometrics as “the application of quantitative analysis in the bibliographic references of a body of literature”.
 - The British Standard Institution (1976) described the same word as the “application of mathematical and statistical methods in the study of the use of documents and publication patterns”.
- 

Scope of Bibliometrics

```
graph TD; A[Scope of Bibliometrics] --> B[Descriptive Studies]; A --> C[Evaluation Studies]; B --> D["Productive Count  
Which attempts to study the body of literature by counting its contributing countries, authors, journals, year of publication, and disciplines"]; C --> E["Literature usage count  
Which attempts to study the use of a body of literature by using citation analysis"];
```

Descriptive Studies

Productive Count

Which attempts to study the body of literature by counting its contributing countries, authors, journals, year of publication, and disciplines


Evaluation Studies

Literature usage count


Which attempts to study the use of a body of literature by using citation analysis

Application to Regional Input Output Model in Mexico

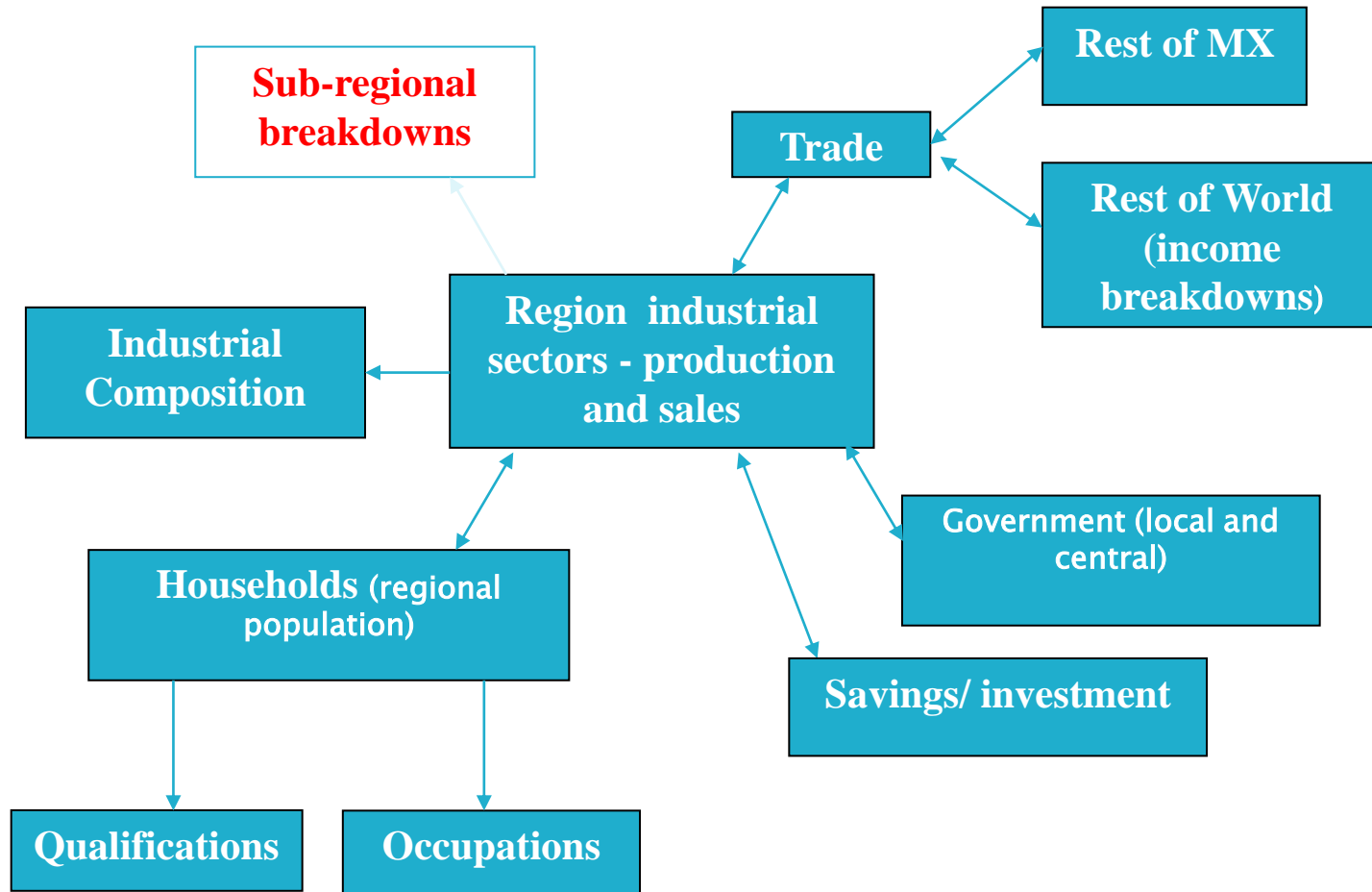
We are interested in studying:

- The research trends and growth of the field of Regional Input Output Model.
 - To identify authorship trends in academic papers on the subject of Regional Input Output Table.
 - To identify present publishing trends.
 - To make a multilevel structural network analysis.
- 

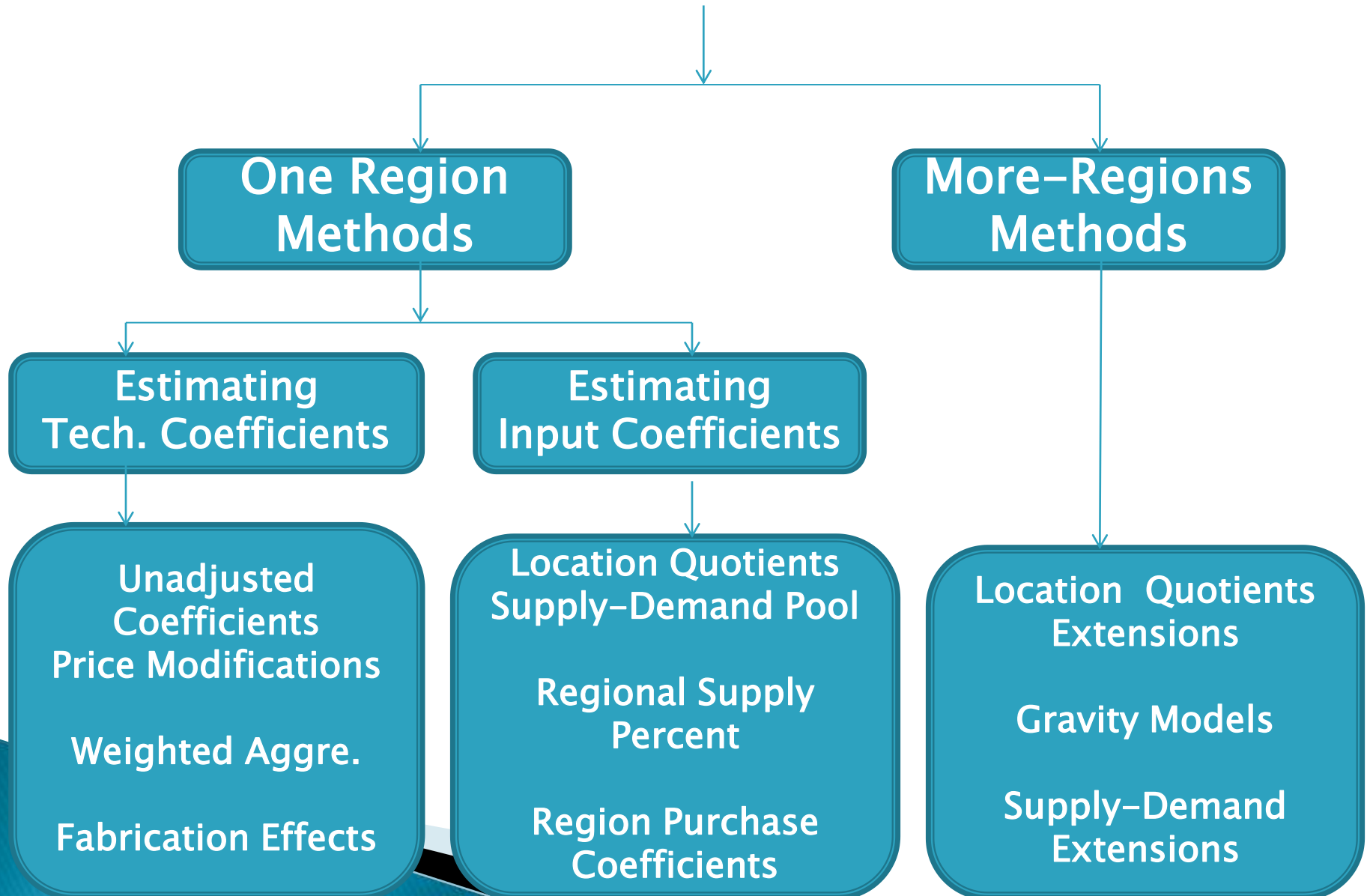
Regional Input Output Model

- Because of the economic globalization phenomenon the sub-national regions turned into entities that determined their own growth and development conditions. Therefore, the regions required useful tools or ones with great potential for the analysis of the economic structure.
 - INEGI published the National Input Output Table in 2008.
 - Construction of RIOM still represents the most important objective for numerous types of research.
- 

Schematic Diagram of a Region



Non-Survey Methods' Scheme



Input-Output Table Structure

Intermediate Demand

	S ₁	S ₂	S ₃	S ₄
S ₁	40	10	0	0
S ₂	0	25	20	40
S ₃	0	0	35	0
S ₄	0	45	0	15

VA	30	40	30	35
M	20	40	10	0
X	90	140	95	90

Final Demand

C	G + I + E
10	30
40	15
45	15
15	15

Gross Outlay

X
90
140
95
90



415

Basic Matrices

Transactions Matrix

40	10	0	0
0	25	20	40
0	0	35	0
0	45	0	15

$$A =$$

Technical Coefficients Matrix

.44	.07	0	0
0	.18	.21	.44
0	0	.37	0
0	.32	0	.17

Leontief Inverse Matrix

$$(I - A)^{-1} =$$

1.8	0.2	0.07	0.11
0	1.54	0.51	0.82
0	0	1.58	0
0	0.59	0.20	1.52

Network Theory

The unit of interest in a network are the combined sets of actors and their relations.

We represent *actors* or *participants* with points and *relations* with lines.

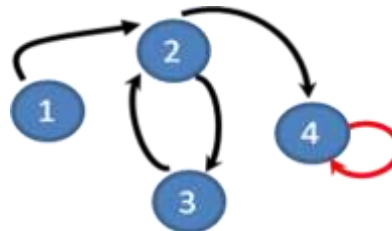
Actors are referred to variously as:

Nodes, vertices, actors or points

Relations are referred to variously as:

Edges, Arcs, Lines, Ties

Example:



From Matrices to Pictures

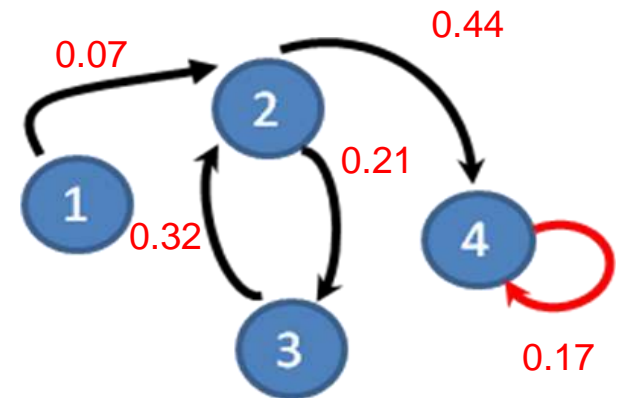
Because matrices are hard to visualize, we often use a *map* to represent the network.

The matrix (X) on the right represents a network. Both the row and the column are listed as a one node.

The i^{th} row and the j^{th} column (X_{ij}) records the value of a tie from node i to node j . For example, the entry in the first row¹ and second column (2 in blue) is represented as the line between nodes 1 and 2.

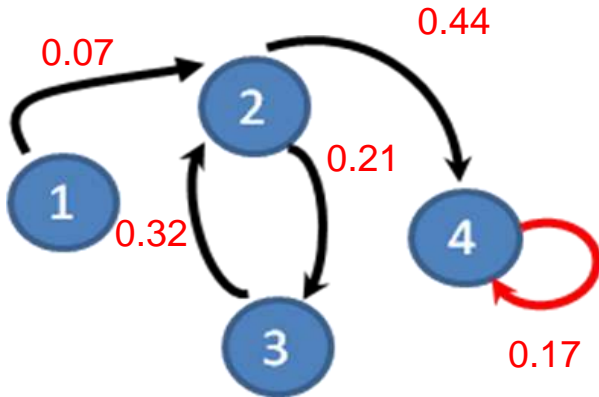
The diagonal elements of the matrix are treated as self-loops (in red)

.44	.07	0	0
0	.18	.21	.44
0	.32	.37	0
0	0	0	.17



Matrices Associated to a Picture

Edges lists



Adjacency Matrix

Vertex	Vertex
1	2
2	3
2	4
3	2

Vertex	1	2	3	4
1	-	1	0	0
2	0	-	1	1
3	0	1	-	0
4	0	0	0	-

Connectivity Matrix

Path Matrix

Vertex	1	2	3	4
1	1	1	1	1
2	0	1	1	1
3	0	1	1	1
4	0	0	0	1

Vertex	1	2	3	4
1	3	2	2	2
2	2	3	3	2
3	2	3	3	2
4	2	2	2	3

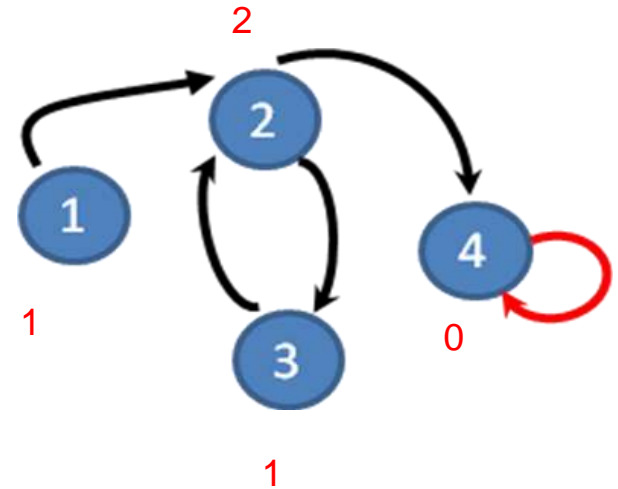
Degree of Centrality

A node's (in) or (out) degree is the number of links that lead into or out of the node

Often used as a measure of a node's degree of connectedness and hence also influence and/or popularity.


Useful in assessing which nodes are central with respect to spreading information others in their immediate 'neighborhood'.

In an undirected graph they are of course identical



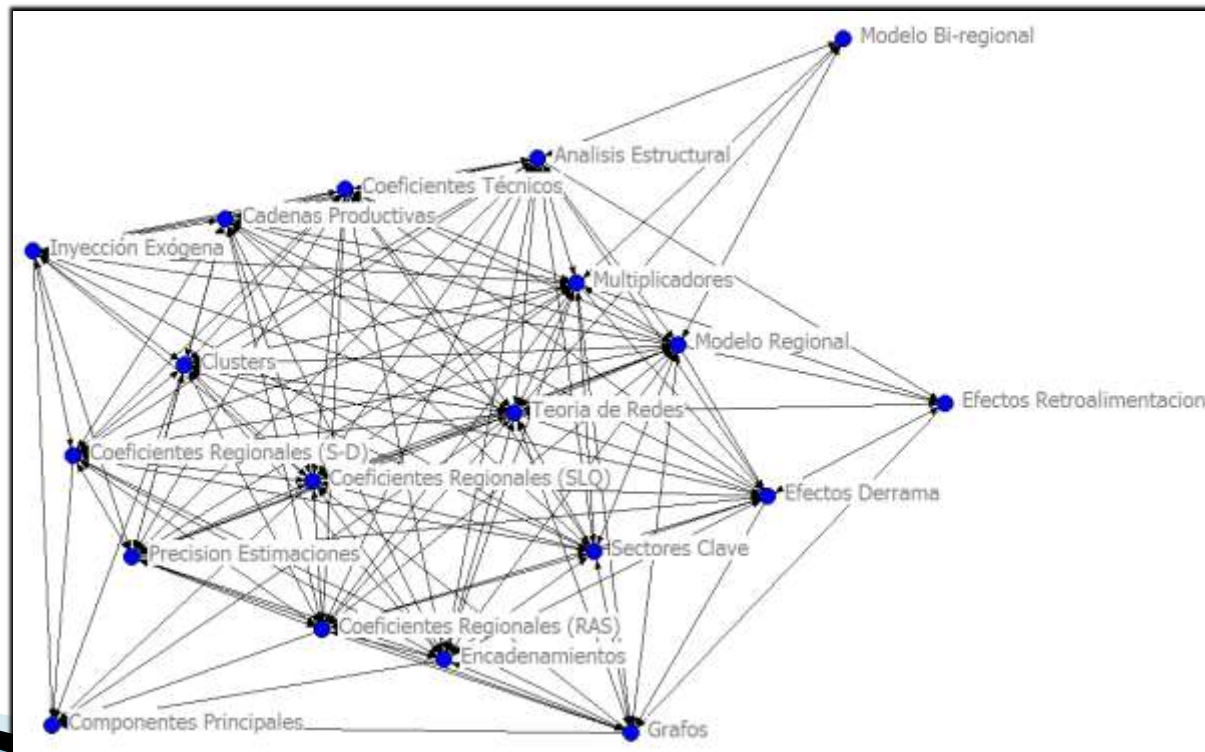
Node 2 has the highest degree (2)

Data Base and Programs

- Between 2011 and 2012 we reviewed articles on Regional Input Output Model available on web pages such as CONRICYT, EBSCOHOST and JSTOR; as well as in databases like ECONLIT LATINDEX.
 - We use Sitkis Software Version 2 (exclusively for bibliometric analysis)
 - We also use MS ACCESS © and UCINET © (in the interpretation of the results obtained with Sitkis)
- 

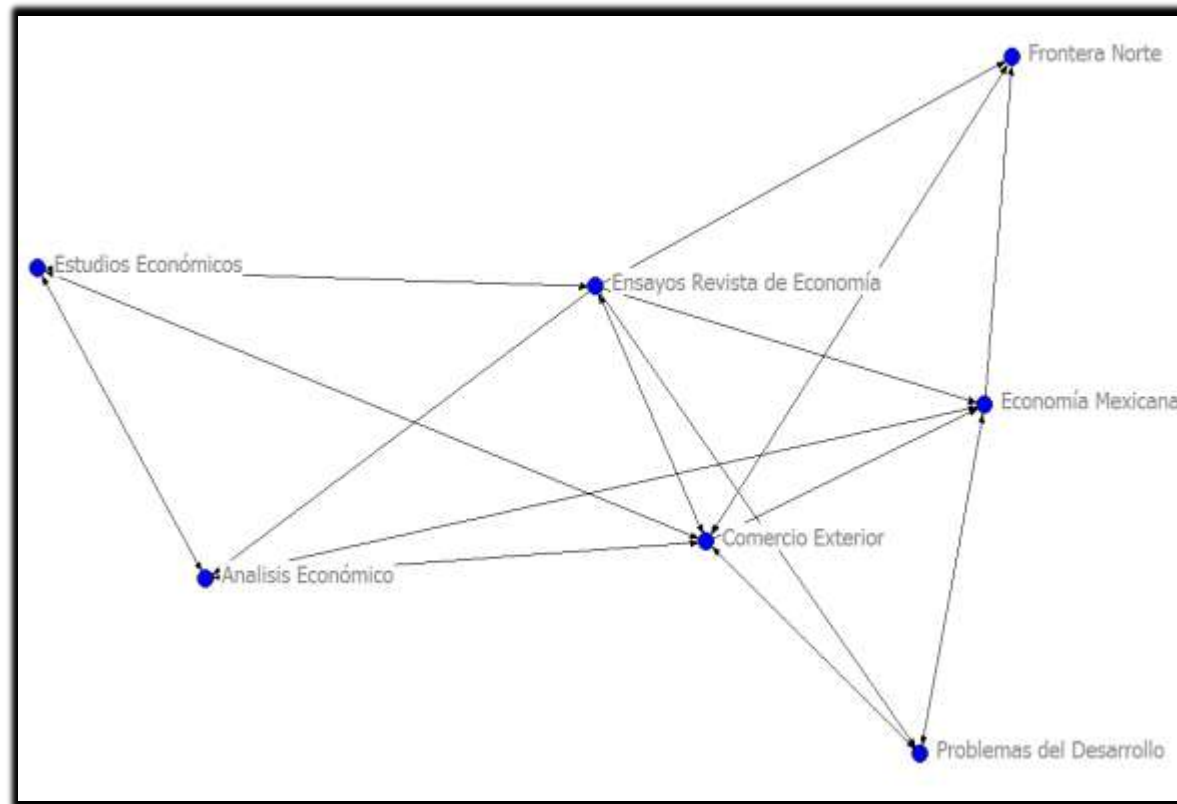
Results of Structural Analysis of Networks


- In Mexico the volume on literature on RIOM has had an astounding increment in the last decade. The most frequently used “KEY WORDS” were:



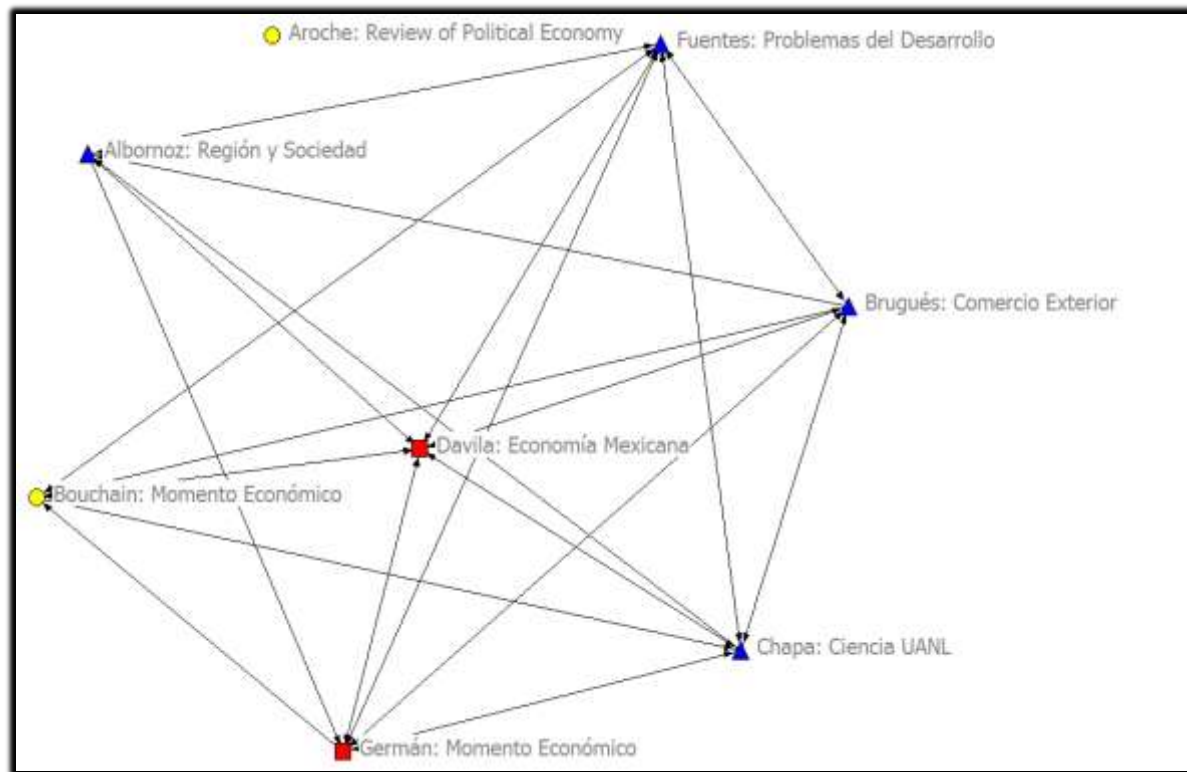
- The most frequently used key words were “regional input–output model”, “coefficients of regional trade” and “regional multipliers”. Almost all authors study the ability of indirect methods for converting the national technical coefficients into regional.
- Also, key words appear relative to the relationship between the regional production system and the regional economic policy, in particular the following words: “clusters”, “chains of production”, “key sectors” and “economic development strategies”.
- Finally, key words appear relative to the calculation and interpretation of the technical coefficients: “structural analysis” and “structural decomposition”


- In Mexico, there is an effort by scholars on RIOM to publish in journals included in the Social Science Citation Index (SSCI), which meets certain quality requisites.




- Among the most important international references “Economic Systems Research”, “Review of Economic and Statistics”, “Journal of Regional Sciences” and “Econometric” top the list of cited publications.
 - The highlighted national magazines are “Economía Mexicana Nueva Epoca,” “Problemas del Desarrollo”, “Momento Economico” y “Comercio Exterior”.
 - Finally, it confirms the obvious lack of scholars to publish in international journals.
- 

- In Mexico, there is a huge interaction between academic scholars in RIOM. The relationship between different subgroups of investigation can be seen by the degree of centrality, intermediation and density.




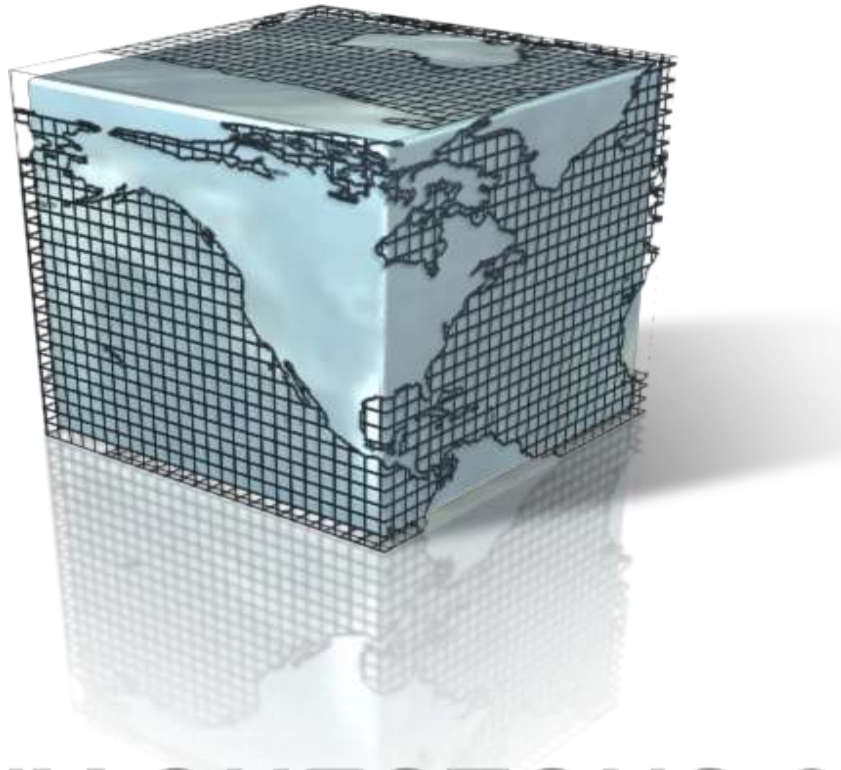
- The most referenced authors according to the criterion of the number of citations are from 8 different Universities.
 - The academic articles represented with a triangle are those that study the indirect methods of elaboration of single regional matrixes and bi-regional matrixes, the calculation of multipliers using primarily the network theory and maps, as well as how to quantify the interregional trade flows, feedbacks and spillovers
 - The square have as primary objective to estimate the internal structure of the matrix representation for unique region with its main components .
- 

Conclusions

- ▶ Increasing need of studying regional economies and lack of information at regional level are the main reason for the development of RIOM in Mexico.
 - ▶ Published in 2008 by INEGI, the National I–O Table is the first input output tables in 22 years.
 - ▶ Construction of RIOM still represents an important objective for numerous types of research.
 - ▶ The high costs associated to the survey–base methods is a reason to attempt Non–survey techniques.
- 

Conclusions

- ▶ The interest in RIOM appeared late in the country. However the volume of literature on RIOM has had an astounding increment in the last decade.
 - ▶ A group of academic researchers have created the Mexican Input Output Association (AMMIP) in the year 2012, in order to bring together researchers in the field of the input–output without restriction of origin. The AMMIP was founded with researchers from 15 public and private universities, as well as with researchers from 3 federal and state research centers.
- 



ANY QUESTIONS ?