Title of session
Social Network Analysis and Input Output Analysis
5 July 2007

Description of the theme
'Input-Output Analysis is a method of systematically quantifying the mutual interrelationships among the various sectors of a complex economic system" (Leontieff, 1986, p. 19). In spite of the Leontieff's definition it is a common practice to use input output data without making use of a structural theory considering the systemic nature and the complexity of economy. Social Network Analysis (SNA) is a methodology that offers a perspective and a set of methods for the study of social structures. According to it the structural position of individuals (persons and any kind of institution) or groups (social groups, groups of firms, regions, countries) in the set of relations they maintain explains the regularities in their behaviour and the opportunities for and restrictions on their actions. In SNA the unit of analysis is not the individual, but an entity that consists of a collection of individuals and the linkages among them. Therefore, it focuses on the relational structure of a group of entities and on the properties of that relational system. SNA is therefore fully compatible with IOA, involving a theoretical strength for the analysis of IO data and for their necessary enrichment with historical, social, geographical and political information in order to understand complex economic systems and their evolution or regression.

Objectives for the session
The session will show the compatibility of IOA and SNA, theoretically and empirically. From a theoretical point of view it is expected to arouse a debate on the use of SNA as a methodology, or even a paradigm, or just as a set of tools without taking into account its theoretical implications. Empirically, it could be checked that results and conclusions can significantly change when complementing the traditional IOA with SNA measures. It will also be seen the important enlargement of aspects of a subject, or even of new subjects, that can be included on the analyses. As SNA benefits, in many senses, from its interdisciplinarity, it evolves thanks to continuous debates, the appearance of new software for analyses, the proposals of new indicators and the improvement of traditionally used tools. The consideration of those questions will also be objectives of the session.

Organizer
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Economic relations, trade patterns and dependence in North America. A network perspective

An economic network perspective allows analysing the set of liaisons between the set of agents in the economic system. From a meso economic viewpoint agents are identified as industries or sectors. Those networks are also located in given territories, and respond to given institutional conditions, which confer given characteristics to those nets. The North American economy has become a bloc within the world economy, which nevertheless maintains some ties with other nations and economic blocs. Moreover, within the bloc the three country members have increased their economic relationships in a differentiated way, determined by their initial levels of development and their ability to compete. This paper intends to identify the way these economies complement one another and have developed a trade pattern according to their economic structures. The dependence degree shown by each of these economies is also different and is determined by their size and development level prior to integration as well. The dependence pattern can also be studied by the network perspective adopted in this paper. Such study uses a trilateral IO table, which includes the national transactions, as well as the exchanges between the three members of the area and those performed with the rest of the world. The numerical data is further transformed into qualitative tables in order to characterise the bloc's economic structure.

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Constructing intersectoral innovation diffusion networks with input-output: how to get relative flows? An illustrative application to six OECD technological systems for the middle '90s

The paper addresses the problem of scale-effects in comparing different technological systems at the country level on the basis of their innovation intersectoral flows matrices. Is it the technological system of one country really more connected (in terms of intersectoral relationships) than another one irrespectively from the different scale of their national innovation activities? What can we say about the "structural" role that a certain economic sector and/or subsystem, independently from the absolute size of its R&D expenditure?
These and other issues can be dealt with by applying Social Network Analysis (SNA) indicators to innovation intersectoral flows matrices only once they have been properly dichotomized and, before than that, relativized. With this scope, some relativization procedures can be, and have been used so far which, although intuitive and quite straightforward to apply, suffer from some limitations: in particular, they either tend to alter the actual meaning of standard SNA indicators, or they do not properly take into account the actual composition of countries' final demand, thus neglecting the role of the so-called market sub-system. In order to overcome these problems, a new relativization procedure is therefore put forward which, by measuring innovation flows embodied in a unit value basket of final demand, gets rid of scale-effects without introducing any bias in SNA measures and properly retains all the information provided by the original matrix of intersectoral innovation (embodied) flows.
An illustrative application of the effects of the different relativization procedures on the distribution of the main SNA indicators is carried out by comparing the technological systems of 6 structurally different OECD countries (Japan, Korea, Netherlands, Poland, Spain, USA) in the middle '90s. In so doing, the robustness of their conventional innovation ranking is tested and discussed.

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Innovation clusters in technological systems: a network analysis of 15 OECD countries for the middle '90s

The paper aims at investigating how innovations cluster in different technological systems (TSs) when their "techno-economic", rather than "territorial" space is considered. Innovation clusters of economic sectors are identified by applying network analysis to the intersectoral R&D flows matrices of 15 OECD countries in the middle '90s. Different clusterization models are first tested in order to detect the way sectors group on the basis of the embodied R&D flows they exchange. Actual clusters are then mapped in the different TSs by looking for intersectoral relationships which can be qualified to constitute "reduced-TSs" (ReTSs). In all the 15 TSs investigated the techno-economic space appears organized in hierarchies, along which its constitutive sectors group into clusters with different density and composition. Once ReTSs are looked for, the 15 TSs display highly heterogeneous structures, but with some interesting similarity on the basis of which different clusters of TSs can be identified in turn.

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The role of agriculture from a structural and relational perspective

The agricultural economics perspective emphasizes two aspects as characterising economic development. On one side there is the sector's decline, owing to its loss of employment and of relative output. On the other side there is the sector's evolution, from a position showing poor links with other sectors (self-sufficiency), proper of less developed agricultures, to positions implying its increasing integration and interdependence with industrial and service activities. When Davis (1956) and Davis and Goldberg (1957) introduced the concept of Agribusiness they already remarked the relevance of those mentioned relationships. However, it is still necessary to offer satisfactory explanations, from alternative perspectives, to the role of certain activities on systems and to the dynamics of economic structures. This paper offers an attempt to examine the role of agriculture on certain economic structures, by applying the concepts and tools of Social Network Analysis (SNA). In that form, the structural position of agriculture, in three Spanish regions, is analysed from a relational methodological perspective, considering also the changes experienced by the studied sector in the 1980-1995 period. Different concepts of SNA have been applied in order to do so (Centrality, Blockmodelling, Center Periphery Structure) and the results have been interpreted and compared to the deduced from the application of traditional Input Output indicators (Streit, Rasmussen). The analysis, focused on the agriculture sector, is developed by considering the role and the relational dynamism of agriculture on the agro-food system and also on the whole economic system.

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Introducing blockmodeling to input-output analysis

Complexity raises uncertainty and uncertainty calls for distinct actions to reduce complexity and to establish an overview (*i.e.* order). This paper gives a review on recent developments in a branch of research that aims at gaining insight into the complex interweavements of relational data (graphs). It discusses a set of methods for simultaneously clustering nodes and partitioning edges called blockmodeling.

Originally, blockmodeling was developed for applications in sociometry and psychometry. Recent results of research, however, indicate the potentials of blockmodeling for econometrics, input-output analysis in particular. Even though the methods are in their infancy, it becomes apparent that blockmodeling provides an interesting way to generate information to support the coordination of relations between economic units. This might eventually benefit application fields of methods of input-output analysis such as supply chain management. Extracting structural information from relational data appears to become an important capability in an increasingly 'networked' economy and a precondition for supporting business collaboration.

Blockmodeling and especially a branch of blockmodeling research termed 'generalized blockmodeling' might enhance the instruments of input-output analysis that are geared to these –usually both exploratory and confimatory- structure analytical purposes.

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Industry Network within the region –by compiling 1985-2000 regional input-output tables in accordance with a size of enterprises-: the case of Kanagawa prefecture in Japan