Community Detection Algorithms and Clustering of Input-Output Linkages — Analysis of their interconnections

Topic: Input-output and the network theory
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The problem of finding groups of industries particularly connected to each other and relatively disconnected from the rest of the inter-industry network is not new in input- output literature — starting from Leontief (1986[1963]), who translated it into the problem of block-partitioning the inter-industry transactions table in order to isolate blocks of non-zero elements.
Since an inter-industry transactions table can be seen as a weighted, directed graph representing a network, network theory can be very useful in providing efficient techniques for the identification of groups of industries — or, using network theory terminology, for the detection of communities. A wide range of community detection algorithms have been developed which allow to isolate clusters. However, typically different algorithms lead to different partitions.
The great majority of these algorithms have been developed with no reference to specific real networks. Moreover, different algorithms rely on the translation into mathematical terms of different operational definitions of what a cluster is. Some of these definitions might be appropriate for certain kinds of networks but not for others. The definition of a cluster might be very different in the context of a biological network than within a social network.
In order to define an appropriate method for partitioning I-O networks, contributions coming from traditional I-O and network theory need to be synthesised. The present paper aims first at giving a precise definition of a cluster of industries. In the second place, the possible economic interpretation of the community detection algorithms most commonly used in I-O applications will be scrutinised, in order to assess their appropriateness for I-O networks. Finally, they will be related to the ideas at the basis of earlier attempts coming from traditional I-O clustering literature. All these issues will be illustrated with an empirical application.

References
Leontief, W.W. (1986[1963]). Input-Output Economics, The Structure
of Development, pp. 162–188. Oxford University Press. Second Edition.