

**AN EXPLORATION OF A MARKOV CLUSTER APPROACH TO
THE IDENTIFICATION OF FUNDAMENTAL ECONOMIC
STRUCTURE: THE CASE OF INDONESIA**

By:

**M. Handry Imansyah^a, Alhadi Bustaman^b, Mark McGovern^c, Guy West^d and
Rodney Jensen^e**

^a School of Economics and Finance, Queensland University of Technology and Faculty of Economics, Lambung Mangkurat University

^b Institute for Molecular Bioscience, University of Queensland and Department of Mathematics, University of Indonesia.

^c School of Economics and Finance, Queensland University of Technology

^d School of Economics, University of Queensland

^e School of Economics, University of Queensland

AN EXPLORATION OF A MARKOV CLUSTER APPROACH TO THE IDENTIFICATION OF FUNDAMENTAL ECONOMIC STRUCTURE: THE CASE OF INDONESIA

ABSTRACT

This paper is an attempt to identify a fundamental economic structure in the Indonesian economy using a Markov Cluster approach. The fundamental economic structure (FES) developed by Jensen, West and Hewings (1988) provided a framework that economic systems have some common patterns and regularities using input-output analysis. Two approaches were developed to identify fundamental economic structure, a partitioned approach and a tiered approach. Jensen *et al.* (1988b) provided a research direction on input-output analysis using a set of input-output tables to identify some regularities of economic structure. In addition, based on several studies, Jensen *et al.* proposed a provocative hypothesis: that most of the economic structure is more similar rather than different. This argument conflicts with the current assumption that most of the economic structure is different and unique and that, therefore, it is difficult to make classifications or groupings of economies. Facing these difficulties, Jensen *et al.* (1988a) suggested that the FES can be used as a foundation of economic taxonomy. However, little effort had been made to develop such methods to provide the foundation. for taxonomy.

Therefore, we propose an alternative approach to identify fundamental economic structure by using Markov Cluster (MCL) approach as the approach can be used to identify pattern recognition (Nieland, 2000). The Markov Cluster algorithm became widely used in many fields especially in bioinformatics after van Dongen (2000) proposed a fast algorithm to handle as wide a range of graphs as possible and as fast as possible. Nieland (2000) described the MCL approach as very simple to simulate many random walks (or flows) within the whole graph, strengthening flows where it was already strong and weakening where it was weak. This repeated process causes an underlying cluster structure to gradually become visible. From an input-output perspective, this means that existing connections between sectors will be enhanced if they are strong and diminished where weak. Therefore, one can identify underlying patterns and regularities of economic structure in an economy which is the so-called the fundamental economic structure.

The data used are based on nine input-output tables for Indonesia from 1971 to 2003. The tables are aggregated to 30 sectors. The results show that the fundamental economic structure is revealed in the tertiary and secondary sectors. The cluster of sectors is mainly on group of tertiary and secondary, and to a lesser extent in some primary sectors. The finding is consistent with the previous studies. Interestingly, this pattern persisted despite the Asian Crisis that began in 1997. Markov cluster methods appear to provide an efficient way for searching input-output tables for underlying regularities that persist over time.

Keywords: economic structure, input-output analysis, graph theory.

JEL Classification: C670, O100, C650