Technology Clustering: The Case of Greece

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Extended Abstract

In the globalization era economic research has consistently shown that innovation effects tend to be clustered. For instance, cooperative relationships with regard to R&D between sectors or organizations belonging to the same sector are a good example. In this context, an important finding of empirical research is that in several countries innovations are concentrated in specific clusters. This situation implies that regional technology and local levels of research are important determinants for clustering activity.

Despite these findings, very few researchers have studied the clustering of sectors. Thus, it would be of great interest to investigate whether structural changes in different sectors tend to cluster, i.e. to form groups of sectors sharing similar technology and growth characteristics. In this context, we investigate the case of Greece, since the enlargement of the European Union (E.U.) to the East will create a new allocation of resources. Consequently, factors such as Total Factor Productivity (T.F.P.) will play a decisive role for competitiveness in this area.

Since the mid 1990s, Greece, a small open economy of the E.U., experienced strong growth closing the gap vis-à-vis the E.U.-15 and has built a sectoral structure which corresponds to a relatively modern economy. Unemployment in the country is high and the share of high productivity small and medium companies appears to be low; the size of the unofficial economy is very big and competition from other EU countries and economies is likely to intensify. However, Greece has considerable potential for development in its role as international gateway to the eastern part of the enlarged E.U. and the Middle East.

In this context, the purpose of this paper is to group the twenty-one sectors of economic activity in Greece, into clusters of sectors sharing similar characteristics regarding technological change and growth by means of Cluster Analysis.

Analytically, a general question in applied economics is how to organize observed data into meaningful structures and cluster analysis has been used since long for grouping together entities with similar characteristics. Nowadays, it has acquired increasing attention as a solution to the complexity related to voluminous datasets. The reason for its increased significance and convenience is that it relies on creating natural groups in the existing data rather than classifying them on the basis of some externally imposed criteria.
Cluster analysis refers to a data analysis tool which aims at sorting different data into groups in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise. The method’s flexibility is its main advantage. The methodology can be applied to a very wide range of cases. Clearly, the flexibility of the algorithms that are associated with it explains the great diversity of its applications.

The methodology of Cluster Analysis will be applied to the various sectors of economic activity in Greece by using the available data collected from the publications of the National Statistical Service of Greece (2001, 2002) and the estimates from previous studies by the authors. Next, the paper will group the various sectors of economic activity into clusters with similar technology and growth characteristics. The data available covers the period 1988-1998. The variables used are the annual growth rates (%) of output: (dY), labour (dL), capital (dK), labour productivity (dI), capital productivity (dk), T.F.P. (dA), human capital (dH) and technology’s contribution to economic growth (π). Using $K$-means algorithm and the Euclidean distance we partition these variables into distinct clusters.

Preliminary findings suggest that the twenty-one (21) clusters of economic activity in Greece tend to form three (3) distinct clusters and the estimated clusters are, in general terms, consistent with the general structure of the economy into three main sectors (i.e. primary, secondary, tertiary).

Key words: Technology, productivity, competitiveness, clustering, sectors, Greece.