Modelling cultural entrepreneurial regimes in Central and Eastern Europe: A symbolic data analysis approach

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Extended Abstract

In this article, we study cultural entrepreneurial regimes in European countries with a focus on the countries of Central and Eastern Europe (CEE). Although entrepreneurial regimes is a topic, receiving a lot of research attention, the existing studies mainly use common methods from multivariate analysis and some type of institutional related analysis (i.e. Amable, 2003; Acs et al., 2014; Dilli and Elert, 2016). Although several constraints - such as the strong economic instability, the lack of public support to start-up and specific governmental regulations, an adverse culture and social attitude to entrepreneurship (Earle and Sakova, 2000), some inherent inefficiencies from the Socialist regimes, the low risk tolerance, the limited culture to networking, etc.-, the de novo firms were characterised by an exponential growth in the early and mid-1990s. The transition experience - a sort of year zero - for the economic system in many CEE countries was a unique context for entrepreneurship to flourish. On average, transition economies present lower rates of entrepreneurial activities compared to other developed and developing economies (Aidis et al., 2008). Estrin and Mickiewicz (2011) explain that by the negative effect of the legacy of the communist culture and planning.

We approach cultural entrepreneurial regimes applying a symbolic data analysis approach (Diday, 1987a; b; Brito, 2011), using Amadeus data for the period 2006-2015.
We use data from the Amadeus database covering 28 EU countries (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom) and including also 5 non-EU countries: Albania, Bosnia Her., FYR of Macedonia, Montenegro and Serbia. We included the last five countries in order to be able to estimate the full heterogeneity present in the CEE countries. We extract a set of histogram variables related to characteristics of the firms for 33 European (EU and non-EU) countries and features of their macroeconomic environment (GDP per capita, employment, institutional quality). From the existing database we extract the following variables:

- Characteristics of cultural and creative firms in individual countries: Operational revenue (OpRev); Number of employees (Empl); Level of firm capital (Capi); Level of long-term debt (Debt); Profit/Loss (difference between revenues and expenses); Total assets (TotAss); Solvency ratio (Solv; in %); Level of gross profit (GrProf); Operating Profit/Loss (PLOp); Financial Profit/Loss (PLFin)

and add the following macroeconomic variables:

- GDP per capita (GDPpc)
- Unemployment rate (Unemp);
- Political Stability (PolStab); Government Effectiveness (GovEff); Rule of Law (RuleLaw); Control of Corruption (ContCorr) to measure institutional quality (based on the World Governance Indicators – WGI).

Due to the nature of Amadeus database, which is a large scale database, including for each year more than 10,000 cultural firms, we utilise a symbolic data analysis, which is a special type of statistical analysis of large datasets, developed in recent decade (see e.g. Billard and Diday, 2003; 2006; Diday and Noirhomme-Fraiture, 2008; Noirhomme-Fraiture and Brito, 2011). In the classical data framework one numerical value or one category is associated with each individual (microdata). However, the interest of many studies lays in groups of records gathered according to the characteristics of the individuals or classes of individuals, leading to macro data. The traditional approach for such kind of situations is to associate with each individual or class of individuals a central measure, e.g., the mean or the mode of the corresponding records. However, with this option the variability across the records is lost. To avoid this unsatisfactory
result, Symbolic Data Analysis (SDA) proposes that a distribution or an interval of the individual records’ values is associated with each unit, thereby considering new variable types, named symbolic variables. One such type of symbolic variable is the histogram-valued variable, where to each entity under analysis corresponds an empirical distribution that can be represented by a histogram or a quantile function. To this purpose, it is necessary to adapt concepts and methods of classical statistics to new kinds of variables (see Dias, 2013).

These variables are employed in the symbolic clustering analysis using Mallow’s distance (Košmelj and Billard, 2011; Irpino, Verde and De Carvalho, 2015). We identify and interpret four main temporally robust clusters, based on the positions of individual countries/regions. Figure below presents a dendrogram of hierarchical cluster analysis for the initial year 2006, showing the approximate positions of individual countries. As can be seen, four clusters can be extracted from the data: to the very left is the cluster of the CEE countries mainly outside of the EU (Montenegro, Albania, Bosnia Her., Macedonia, Serbia), complemented by Croatia (the most recent EU entrant) and Bulgaria and Romania (the least developed of the EU countries). Next to the right is the cluster of most developed Western countries, including separate sub-cluster for the Nordic countries (Finland, Denmark, Sweden) and one clear CEE-EU outlier: Slovenia. Next to the right is cluster of mainly Mediterranean countries (Greece, Italy, Portugal, Spain, Cyprus, Malta) including another apparent CEE-EU outlier: Estonia. Finally, to the very right is the cluster of “traditional” Eastern European (EU) countries: Lithuania, Poland, Slovakia, Latvia, Czech Republic and Hungary.

*Figure 1: Dendrogram of hierarchical cluster analysis, 2006*
Figure below displays the distribution of the clusters across the used variables for the initial year 2006. Cluster 1 includes the worst performing countries (the worst in both cultural firms’ characteristics as well as general and institutional development), including mainly the non-EU CEE countries. In terms of entrepreneurial characteristics it mainly lags in capital financing and operating profits. Next, Cluster 2 is the cluster, including the “traditional” Eastern European countries (the accessors to the EU in 2004) and is slightly better than the Cluster 1 in particular in macroeconomic and institutional development, but still lagging significantly behind the latter two clusters. Cluster 3 includes mainly the Mediterranean countries (and another CEE outlier: Estonia) and is characterized by a solid level of entrepreneurial development, in particular in the profit/loss and operating revenues criteria. It is also solidly developed in terms of GDP per capita and unemployment rate as well as having a solid level of institutional quality. Finally, Cluster 4 includes the most developed Western countries and a CEE outlier, Slovenia. In terms of entrepreneurial characteristics it is significantly ahead in particular in operating revenues and total assets, but is clearly ahead in most of the entrepreneurial, macroeconomic and institutional characteristics.

Figure 2: Distributions (barycenters) of clusters over the used variables, year 2006
In the article we also include the full dynamics of clusters over the years. As can be seen, the clusters are extremely stable. The positions of countries did not change significantly despite the financial crisis. The only notable changes due to economic crisis were the changes of the position of Croatia to Cluster 1 following the start of the crisis in 2008. Moreover, following the severe consequences of the financial crisis, the positions of Slovenia (in 2013) and Greece (in 2015) have changed, the first moved to Cluster 3 and the latter even to Cluster 1. The changed position of Greece could partly be attributed to the consequences of the financial crisis but also to similarity in terms of geographic location (being closer to e.g. Bulgaria, Albania and Macedonia than e.g. Czech Republic or Slovakia). Interestingly, two clear outliers from the general positions of the CEE-EU countries are present in the data: Slovenia counts as a highly developed country at least compared to the other CEE-EU countries and clusters mainly in the Western European cluster (i.e. Cluster 2), while Estonia clusters clearly closer to Cluster 3, which is probably due its special characteristics related to the public spending for culture and importance of culture in the country in general (see e.g. Compendium, 2017).

The results, therefore, show that cultural and creative entrepreneurship in CEE countries performs differently compared to other European countries. Based largely on the level of development and quality of institutions, those countries can be separated into two
clusters. We provide explanation for changes in clusters over time and mainly relate them to the financial crisis. We conclude by reflecting on the findings for future research on this topic.

**Keywords:** entrepreneurial regimes, regional development, cultural entrepreneurship, symbolic data, cluster analysis, Central and Eastern European countries

**JEL codes:** L26, L25, C55, C38, R11, R12