

# FISCAL CONVERGENCE IN AN ENLARGED EUROPEAN UNION

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## Abstract

Taxation convergence in the European Union has always been a heatedly debated issue, and it has constantly resurfaced to the limelight as more and more fiscal directive proposals are being discussed. The current study is an analysis of the evolution of taxation convergence tendencies within the European Union in recent years, using sigma-convergence and cluster analysis. Our goal is to analyze the fiscal convergence trends in the context of European Union enlargement over the last two decades.

**Keywords:** fiscal pressure, sigma-convergence, tax mix, cluster analysis.

## 1. Introduction

The fiscal policy decisions within the European Union have considered tax convergence as one of the main long-term objectives for a long time. As a result, there are many studies regarding this issue (Goodspeed, 2002; Zodrow, 2003; Kemmerling, 2010). However, the focus of the existing studies is either on convergence regarding the value added tax and tax legislation (Avi-Yonah, 2010), or on the impact of taxation on the convergence of accounting standards (Gee, Haller and Nobes, 2010), or on converging fiscal pressure in the EU and the OECD and the need to take steps against tax competition (Genser and Haufler, 1996; De Novelis and Parlato, 2003; Tanzi, 2011). As far as data is concerned, most of these studies focus on the 15 member states up until 2004. We believe this is a major problem because the European Union has almost doubled its number of member states after the enlargement processes in 2004, 2007 and the recent admission of Croatia to the EU in 2013. Therefore, it is unrealistic to consider that the results obtained for a research sample including just the previous 15 member states can be extrapolated for the entire European Union as it is today. At best, such results can be regarded as having a historical value in terms of comparisons and evolution.

While researching fiscal convergence, Esteve, Sosvilla-Rivero and Tamarit (2000) find evidence of convergence of total fiscal pressure in the European Union using a database for the years 1967 to 1994. The methods of analysis used are sigma and beta convergence with a convergence rate of 2.4% and with Germany set up as a benchmark in order to see the existence or the lack of a catching-up effect for the rest of the European Union member states. Another study of tax burden in the EU was conducted by Sosvilla Rivero, Galindo and Alonso Meseguer (2001) for the period during 1967 to 1995. They reached the conclusion that convergence has not been continuous, and that it took place only in the periods between 1967 to 1974, and 1984 to 1995.

The vast majority of studies on fiscal convergence techniques, such as sigma or beta convergence, use earlier economic convergence literature such as Barro and Sala-i-Martin (1992) as a starting point. In a more recent study on taxation convergence Delgado Rivero (2006) uses the same two techniques mentioned earlier and adds gamma convergence as a further method of study. His results suggest the existence of convergence of the tax structure and of fiscal pressure in the overall period during 1965-2003. However, he also concludes that the process has not been constant, reaching a climax of convergence between 1975 and 1990 with no major progress made afterwards. Konceda, Kutun and Yigit (2008) also discuss fiscal convergence in the EU, and they focus their research on the 10 countries that joined EU in 2004. The method used is beta-convergence, and their conclusion is that monetary unions do not also imply fiscal convergence for its members, as their results show poor fiscal performance across the EU. However, they consider fiscal convergence as being convergence towards the Maastricht criteria, namely a budgetary deficit of below 3% of the GDP, and a national debt of below 60% of the GDP.

Taking into consideration that most of the mentioned research was conducted only for a European Union with 15 member states, our current study aims to analyze fiscal convergence in the European Union as it is today, with all of the 28 member states being included. We will use two techniques: sigma-convergence and cluster analysis. The latter we have also used in a previous research (Vintilă and Țibulcă, 2012) because it brings a major advantage over all the other methods of analysis mentioned: objects (countries, in our case) can be defined by more than one characteristic (such as the total fiscal pressure, and the other indicators that describe the tax structure, in our case), and they can be classified in groups (clusters of converging fiscal systems, in our case) based on the similarities of multiple characteristics that define each object.

The current article is structured as follows: section 2 is dedicated to the descriptive presentation of the database we used and the way in which the analysis was conducted for both parts of the study (we also included the reasons for selecting these particular characteristics, and we also explained the method of quantification used for each characteristic); section 3 is dedicated to the results we obtained, both through sigma-convergence and cluster analysis (we also describe the clusters in terms of member states included in those clusters, as well as the characteristics that they have in common); section 4 is dedicated to the presentation of the overall conclusions and the implications of the results we reached during our research.

## **2. Research methodology**

In the current study, the database used is made up of information regarding the structure of the fiscal system and the fiscal pressure in all member states of the European Union, starting from 1990 and ending in 2011<sup>1</sup>. For the first part of the study, the data used was extracted from the OECD Revenue Statistics – Comparative Tables Database for 2013<sup>2</sup>, and it was enhanced with further data from the Eurostat database, using the online publication ‘Taxation Trends in the European Union – Data for the EU Member States, Iceland and Norway’ (European Commission, 2013). It was necessary to combine the data from the two sources because the OECD statistics did not include six of the European Union’s member states: Bulgaria, Cyprus, Malta, Latvia, Lithuania and Romania.

For the first part of the study, meaning the sigma-convergence based analysis, the information extracted regarded fiscal pressure, as the percentage of revenue from taxation in the GDP. Data was extracted for each of the EU member states for the above mentioned time period. For the second part of the study, the cluster analysis, we used information regarding four key factors that we considered as characteristics of the taxation system in each state: total fiscal pressure, direct fiscal pressure, indirect fiscal pressure, and social contributions fiscal pressure. Indirect fiscal pressure is the percentage of revenue from indirect taxation in the GDP, direct fiscal pressure is the

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1 Data from 2011 is the most recent information available at the moment.

2 <http://stats.oecd.org/Index.aspx?QueryId=21699>

percentage of revenue from direct taxation in the GDP, and the social contributions fiscal pressure is the percentage of social security contributions in the GDP. Total fiscal pressure is calculated as the percentage of total revenues from taxation in GDP. The first three indicators defined reflect the structure of the taxation system in each member state, and they also show what type of fiscal revenue each country relies on most. Indirect taxation refers mainly to taxes on goods and services, while direct taxation is comprised of taxes on income, wealth and capital.

The sigma convergence analysis used two different approaches. The first, the more classical one, was done using data for the total fiscal pressure in the 27 countries that were official members of the EU in the last year of the research period (2011). The second approach, a less conventional one, we believe to be more relevant for the purpose of our research: for each year in the time period (1991-2011) we only considered the data for the official member states of the EU at that moment and adjusted the calculus accordingly. The results are based on the following equation for the coefficient of variation (CV):

$$CV_t = \frac{\left(\frac{1}{n} \cdot \sum_{i=1}^n (y_{it} - \bar{y}_t)^2\right)^{1/2}}{\bar{y}_t}$$

where  $n$  is the number of objects (member states),  $t$  represents the year,  $i$  represents each of the member states considered in turn,  $y$  is the total fiscal pressure.

For the cluster analysis, data for Croatia was also included in the research, as it is the newest member state of the European Union starting with July 1, 2013. Croatia started the accession process in 2003 and, as a result, we considered data starting with that year for all the countries. Earlier data for Croatia would have not been relevant from a convergence point of view, since it is to be assumed that it only started to be interested in aligning its fiscal law with that of the EU when it started considering joining the Union. Information for Croatia was collected from the website of the Croatian Bureau of Statistics and the online versions of the Annual Statistics posted. Data for Croatia is not yet available on Eurostat.

Regarding the first part of our research, for the 12 states that joined the European Union in 2004 and 2007 data was only available from 1995 onward. However, this does not affect the results of our analysis because for the sigma-convergence analysis we considered a time period from 1995 to 2011, and for the cluster analysis we considered data starting from 2003, in order to include Croatia in the research, as explained above.

For the second part of the analysis, we used the database for multiple cluster analyses in order to illustrate if we can talk about taxation convergence in the enlarged European Union, in recent years. We considered the clusters we obtained as fiscal convergence groups, and this part of the study as an updated and improved continuation of the research results we have already presented in a previous study. The cluster analysis was done using statistical analysis software and on the basis of the k-means algorithm. In order to select the number of clusters ( $k$ ) for each analysis, we used the well-known rule  $k \sim \sqrt{n/2}$ , where  $n$  is the number of objects (28, as we considered all the member states of the European Union considered for the cluster analysis part of

our study). We adjusted the number of clusters considered as it became obvious that a larger number of clusters only split a larger cluster in two smaller clusters.

The conclusions regarding taxation convergence in the enlarged European Union are based on a selected few years from our time period (2003, 2004, 2007, 2010 and 2011) and on the results obtained as we realized a cluster analysis of the selected data for each year. The years were not randomly selected; we chose the two extremities of the time period (2003 and 2011) and the years when the European Union accepted new member states as points of reference for our research. We also included 2010 for comparison with previous results obtained from a similar research. Each cluster analysis was conducted using data from all current 28 member states of the European Union. We considered 3 clusters for each year, except for 2011, where our results made necessary the use of only 2 clusters.

### 3. Research results

The first part of our research consists of an analysis of sigma-convergence for 27 member states, using two different approaches. For the classical approach, the results we obtained are represented in Figure 1.

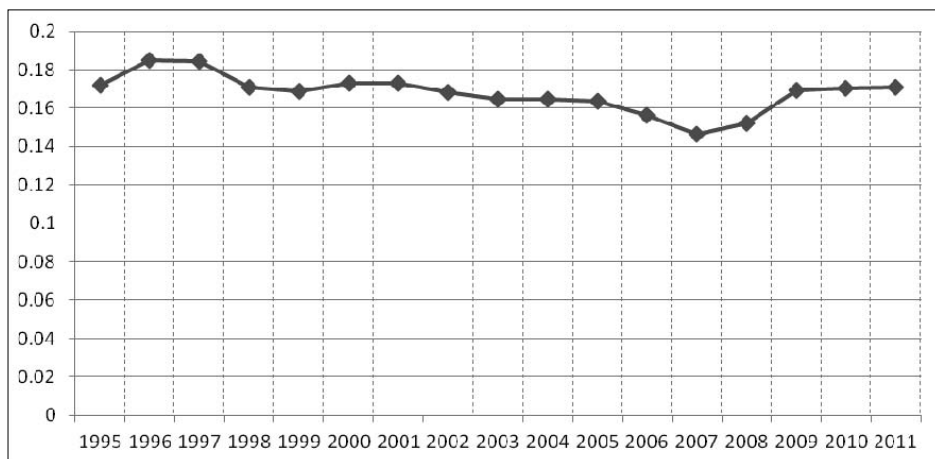


Figure 1: 1995-2011 convergence in the EU (27 member states)

Source: Authors' own calculations

Convergence tendencies for the member states can be observed until 2007. From 2008, the financial crisis and the fiscal measures some member states were forced to take in order to counteract its negative effects, have led to fiscal divergence in the EU. However, starting with 2009, the coefficient of variation (CV) is almost constant, which might suggest that it will start to decrease again as soon as the effects of the crisis are no longer visible. The maximum value of the CV was 0.185, and the minimum value of the CV was 0.146 in 2007, which only backs up our previous statements.

The research results for sigma-convergence were obtained using the second approach and a database made up of a different number of countries, according to the

official number of member states in each of the years considered for the study. Figure 2 illustrates these results.

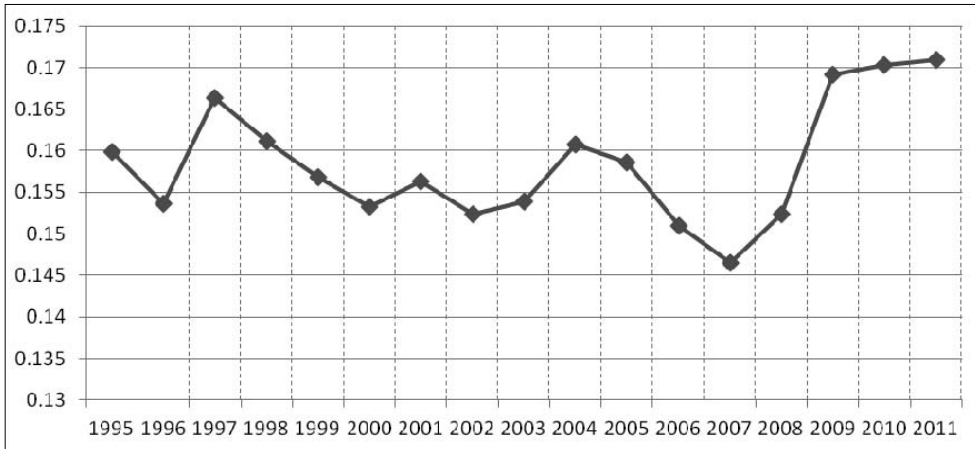


Figure 2: 1995-2011 convergence in the EU (varying number of member states)

Source: Authors' own calculations

Despite the different approach to the calculus, the yielded results are similar. The overall tendency from 1997 to 2007 is one of fiscal convergence among the EU member states. But from 2008, the tendency shifts abruptly and the divergence in taxation systems among member states increases in 2009. Still, from 2009 until 2011 the divergent tendency flattens to an almost straight line. This can be considered a sign that the trend is about to change again and the fiscal systems of the EU member states will start to converge once again when the effects of the financial crisis are no longer apparent. The maximum value of the CV was in 2011 (0.1709), while the minimum value of the CV was in 2007 (0.1465).

In the second part of our study, the convergence tendencies among member states of the European Union regarding taxation can be observed by comparing the results of successive cluster analyses. Table 1 presents the results of each cluster analysis in terms of determining the countries which have the most similar taxation systems. Taxation convergence tendencies can be noticed.

As previously mentioned, we considered all the 28 current member states of the EU for the cluster analysis part of our research. In 2003, the year when Croatia began the accession process for the EU, we can observe three clusters, with the middle one being made up of four countries (Belgium, Denmark, Finland and Sweden). In 2004, ten more countries officially joined the EU, and the structure of the three clusters formed the previous year changed. The most significant change is in the middle cluster, where only two countries (Denmark and Sweden) remained. The other two countries joined the first cluster. Another noticeable change is Croatia's move from cluster one to cluster three one year after it started the accession procedure.

In 2007, two more countries (Bulgaria and Romania) officially joined the EU. The result was another change in the structure of clusters one and three. Cluster two re-

mained the same. Cyprus and the UK moved from cluster three to cluster one, so the change cannot be seen as a really significant one.

Table 1: Cluster analysis results

Year/ Cluster	2003	2004	2007	2010	2011
1	Czech Rep, Germany, France, Italy, Hungary, Netherlands, Austria, Slovenia, Luxembourg, <i>Croatia</i>	Belgium, Czech Rep, Germany, France, Italy, Hungary, Netherlands, Austria, Slovenia, Luxembourg, Finland	Belgium, Czech Rep, Germany, Spain, France, Italy, Cyprus, Hungary, Netherlands, Austria, Slovenia, Luxembourg, Finland, UK	Belgium, Germany, France, Italy, Cyprus, Hungary, Netherlands, Austria, Slovenia, Luxembourg, Finland, UK	Belgium, Denmark, France, Italy, Austria, Luxembourg, Finland, Sweden
2	Belgium, Denmark, Finland, Sweden	Denmark, Sweden	Denmark, Sweden	Denmark, Sweden	–
3	Bulgaria, Estonia, Ireland, Greece, Spain, Cyprus, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, UK	Bulgaria, Estonia, Ireland, Greece, Spain, Cyprus, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, UK, <i>Croatia</i>	Bulgaria, Estonia, Ireland, Greece, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, <i>Croatia</i>	Bulgaria, Czech Republic, Estonia, Ireland, Greece, Spain, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, <i>Croatia</i>	Bulgaria, Czech Republic, Germany, Estonia, Ireland, Greece, Spain, Cyprus, Latvia, Lithuania, Hungary, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Slovakia, UK, <i>Croatia</i>

Source: Authors' own calculations

The results for 2010 show a few more countries shifting from cluster one to cluster three. Compared to our previous results (Vintilă and Țibulcă, 2012), the inclusion of Croatia in the analysis leads to a few changes in the structure of the three clusters. The most noticeable one is the reduction on the number of countries in cluster two (from five member states – Denmark, Ireland, Sweden, UK and Malta – to just two member states – Denmark and Sweden). However, this cannot be considered a sign of fiscal convergence because the variation limits for the characteristics of the objects included in each cluster have widened.

The cluster analysis for 2011 yields promising results because it leads to only two clusters of convergence. When we forced the issue and asked the software to form three clusters, cluster two had only one member state, Malta. When we asked for four clusters, cluster two was still made up of just one country, and cluster three was split into two other clusters. As a result, the best choice was to choose to remain with just two clusters, which shows the renewal of convergence tendencies regarding taxation within the EU.

The characteristics of the clusters yielded by our research are presented in Table 2. The main characteristics of each cluster do not change significantly throughout the analyzed time period. Cluster one is made up of countries with relatively high total fiscal pressure (35% to 45%), low direct fiscal pressure (below 20%), average indi-

rect fiscal pressure (10% to 20%), and high social security contributions (10% to 20%). Cluster three is characterized by low total fiscal pressure (25% to 35%), with low direct fiscal pressure and average indirect fiscal pressure. Cluster two is characterized by very high total fiscal pressure, with high direct fiscal pressure and low social security contributions.

**Table 2: Cluster characteristics**

Year/ Cluster	2003	2004	2007	2010	2011
1	TFP -> (35%; 45%)	TFP -> (35%; 45%)	TFP -> (35%; 45%)	TFP -> (35%; 45%)	TFP -> (35%; 45%)
	DFP -> (5%; 15%)	DFP -> (5%; 20%)	DFP -> (5%; 20%)	DFP -> (5%; 15%)	DFP -> (10%; 30%)
	IFP -> (10%; 20%)	IFP -> (10%; 20%)	IFP -> (10%; 20%)	IFP -> (10%; 15%)	IFP -> (10%; 20%)
	SSFP -> (10%; 15%)	SSFP -> (10%; 20%)	SSFP -> (5%; 15%)	SSFP -> (5%; 15%)	SSFP -> (1%; 15%)
2	TFP -> (45%; 50%)	TFP -> 50%	TFP -> 50%	TFP -> (45%; 50%)	–
	DFP -> (15%; 30%)	DFP -> (20%; 30%)	DFP -> (20%; 30%)	DFP -> (20%; 30%)	–
	IFP -> (10%; 20%)	IFP -> (15%; 20%)	IFP -> (15%; 20%)	IFP -> (15%; 20%)	–
	SSFP -> (1%; 15%)	SSFP -> (1%; 10%)	SSFP -> (1%; 10%)	SSFP -> (1%; 10%)	–
3	TFP -> (25%; 35%)	TFP -> (25%; 35%)	TFP -> (25%; 35%)	TFP -> (25%; 35%)	TFP -> (25%; 40%)
	DFP -> (1%; 15%)	DFP -> (1%; 15%)	DFP -> (1%; 15%)	DFP -> (1%; 15%)	DFP -> (1%; 15%)
	IFP -> (10%; 15%)	IFP -> (10%; 20%)	IFP -> (10%; 20%)	IFP -> (10%; 15%)	IFP -> (10%; 20%)
	SSFP -> (5%; 15%)	SSFP -> (5%; 15%)	SSFP -> (5%; 15%)	SSFP -> (5%; 15%)	SSFP -> (5%; 15%)

**Note:** TFP=fiscal pressure (total tax revenues as % of GDP); DFP=direct fiscal pressure (revenues from direct taxes as % of GDP); IFP=indirect fiscal pressure (revenues from indirect taxes as % of GDP); SSFP=social security contributions fiscal pressure (% of GDP).

The most noticeable change in the characteristics is the widening of the limits of the characteristics for clusters one and three in 2011, when the countries in cluster two join cluster one, and some of the countries included previously in cluster one move to cluster three. All the results are also represented in charts in Annex 1<sup>3</sup>.

#### 4. Conclusions

The results of our research point to the conclusion that the existence of convergence tendencies among the member states of the European Union in the area of taxation cannot be denied. Our conclusions are similar to those of previous studies on the matter, even if they were done using other research methods or considering different time periods.

Our conclusions are based on data collected for the total fiscal pressure and three other indicators that describe the taxation system or taxation mix in each of the member states: the percentage of the total taxation revenues that was collected from indirect taxation (taxes on goods and services), the percentage of the total taxation revenues that was collected from direct taxation (taxes on income and profit), and the percentage of the total taxation revenues that was collected from social security contributions.

<sup>3</sup> The charts are represented in 3D, while the cluster analysis is conducted for 4 variables.

The results of the sigma-convergence analysis show clear convergence tendencies before 2008, regardless of the calculus approach used. The effects of the worldwide economic crisis have led to pronounced divergent tendencies in taxation throughout the EU in 2008 and 2009. However, these tendencies seemed to have flattened in the last few years, and we considered this the signal that a reverse in the trend will soon follow.

The cluster analysis results seem to point in the same direction, especially with the results pointing only towards convergence clusters for 2011, with a large number of member states (20 of the total 28) included in the last cluster. This shows that the characteristics of the taxation systems in EU member states are becoming more and more similar. However, further research is necessary, especially in the light of the recent addition of Croatia to the European Union.

We would also like to underline the fact that the sigma-analysis method can only yield results for a single characteristic of the studied objects (the member states of the EU, in our case). Therefore, its results are limited, which also reflects on the accuracy of the conclusions reached. As a result, we believe that cluster analysis, which can consider a large number of characteristics for the studied objects, is a much more appropriate method for the study of tax convergence. Any fiscal system is defined by a multitude of traits which should all be analyzed together.

## ANNEXES

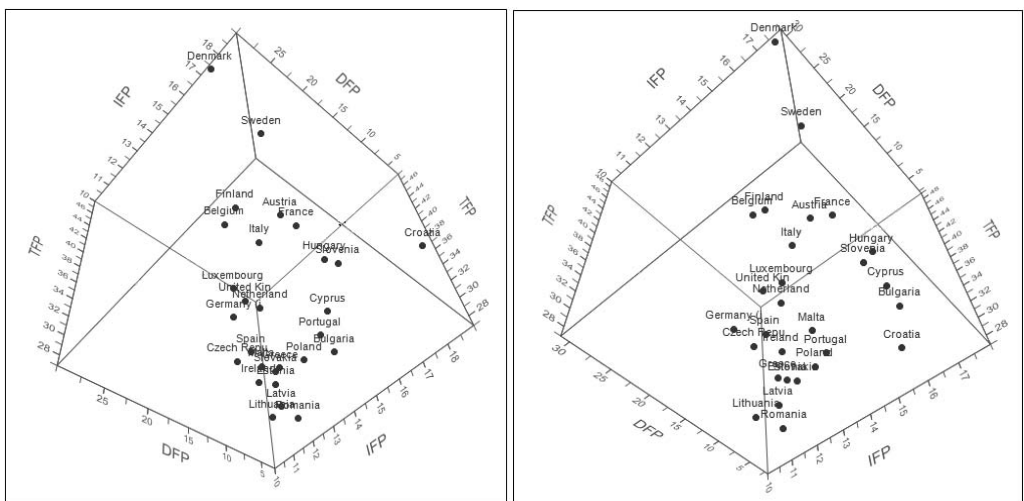


Chart 1: Cluster analysis results for 2003 (left side) and 2004 (right side)

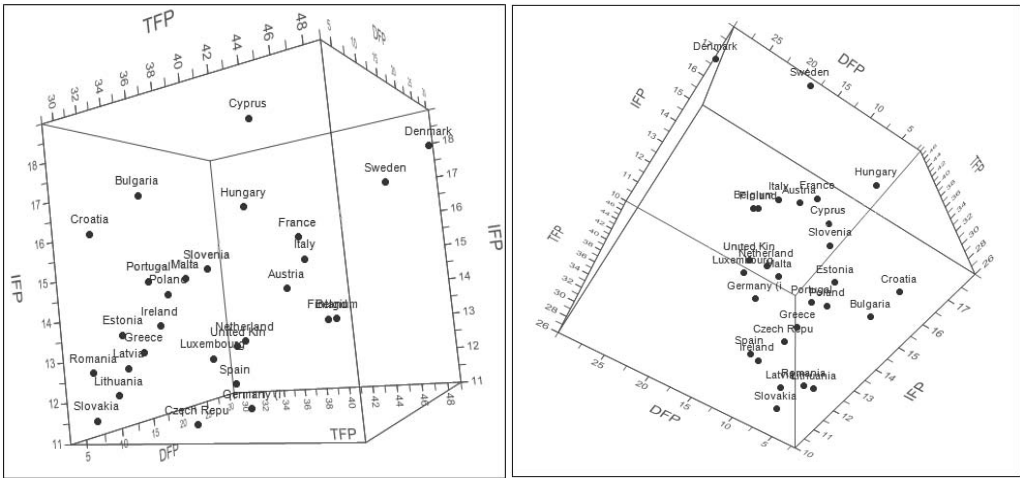


Chart 2: Cluster analysis results for 2007 (left side) and 2010 (right side)

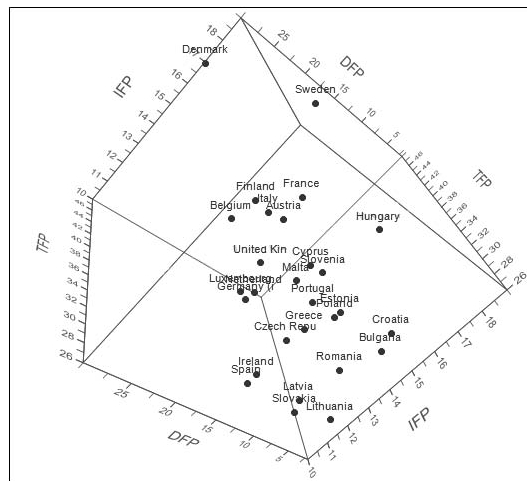


Chart 3: Cluster analysis results for 2011

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