DOES FISCAL CONVERGENCE LEAD TO TAX CONVERGENCE? EVIDENCE FROM THE EUROZONE

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Abstract

Taxation is a major factor in political, economic, social and fiscal policy decisions. The current study looks at the eurozone Member States in order to establish if fiscal convergence towards the Maastricht criteria leads to tax convergence. The research method is sigma-convergence based on three different variation measures (the coefficient of variation, the Gini coefficient and the Theil index). The overall tax burden is used to define national tax systems. The research period is 1995-2013.

1. INTRODUCTION AND LITERATURE REVIEW

In the European Union, one of the main concerns of decision makers regarding fiscal policy is to reduce tax competition between Member States. One of the ways we can accomplish this goal is to achieve a higher degree of fiscal convergence between Member States. Using convergence as a means of analysis for economic phenomena is not a new idea (Barro and Sala-i-Martin, 1992). However, in the literature, there are various definitions for the concept of "convergence" when it is used in regard to taxation. Furthermore, even for the definition of "fiscal convergence" there is no universally accepted opinion or at least one definition that most researchers can agree on.

Thus, the literature distinguishes between the notions of "fiscal convergence" and "tax convergence". The first of these refers to the convergence of the Member State towards the Maastricht criteria and is widely used by researchers in this field. Some recent examples would be: Hutchison and Kletzer (1995), Holzmann *et al.* (1996), De Bandt and Mongelli (2000), Buti and Giudice (2002), Blot and Serranito (2006), Kočenda *et al.* (2008). The second term refers to a convergence of tax systems of the EU Member States. This sense is used, among others, by Esteve *et al.* (1999), Sosvilla Rivero *et al.* (2001), Zodrow (2003), Delgado Rivero (2006), Kemmerling (2010), Delgado and Presno (2011) in their published studies on this issue. In other words, fiscal convergence towards the Maastricht criteria does

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not have the same meaning as the notion of tax convergence of national tax systems, with all the elements that they bring together. When the scientific analyzes concern the convergence of the eurozone members, the differences between the two meanings come out clearly.

The eurozone (also called the euro area) comprises of the 19 Member States of the European Union (Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain). It is a monetary union. Besides these official eurozone members, there are four other countries that use the euro under a special agreement, although they are not part of the European Union (Andorra, Monaco, San Marino and the Vatican). There are also countries that use the euro without any formal agreement (Kosovo and Montenegro). As a general rule, any state that becomes a member of the European Union undertakes the obligation to become a member of the eurozone, when it meets the accession criteria (the Maastricht criteria). Nevertheless, the United Kingdom, for example, has opt-out clause which states that the UK may not join the eurozone even if it fulfills the Maastricht criteria.

A special case in the European Union is that of Denmark, which also benefits from an opt-out clause, but is currently in ERM II (Exchange Rate Mechanism). This is the last step before joining the euro area and it means that the national currency is pegged to the euro and it can fluctuate only within a very narrow margin (+/- 2.25% in the case of the Danish kroner). Although there are no guarantees in this regard, in the following study we considered that Denmark will become a member of the eurozone in the shortest time possible.

The current study is an analysis of tax convergence trends registered by the eurozone members. The hypothesis to be tested is that the existence of convergence towards the Maastricht criteria leads to tax convergence as well. The analysis method is sigma-convergence based on three different measures of diversity: the coefficient of variation (CV), the Gini coefficient and the Theil index.

2. RESEARCH METHODOLOGY AND DATABASE DESCRIPTION

Sigma-convergence refers to reducing the dispersion of the values recorded for the characteristics of certain objects (tax systems of the Member States of the eurozone, in this case) to be examined. Quantification methods used most frequently for σ-convergence analysis are the standard deviation or the coefficient of variation (CV). However, there are other indicators that can be used and which have interesting properties: the Gini coefficient, Atkinson index, Theil index and logarithmic deviation (MLD). In the current study we will be using the CV, the Gini coefficient and the Theil index.

The *coefficient of variation (CV)* can be calculated and interpreted in two different situations: in a single variable analysis and in the interpretation of a model. The standard formulation of the CV, the ratio of standard deviation of the mean, applies for a single variable analysis. In this context, the CV is calculated as the ratio of the square root of the errors' mean and the average of the dependent variable. In both cases, the CV is often presented as the given ratio multiplied by 100. The CV for a single variable is intended to describe the variable's dispersion in a manner that is independent of the variable's unit of measure. The more the CV increases in value, the greater the dispersion of the analyzed variable.

The results of empirical studies that will be discussed in more detail in the subsequent section refer to the CV calculated based on the formula shown in equation (1).

$$CV_t = \frac{\left(\frac{1}{n} * \sum_{i=1}^{n}(Y_{it} - \overline{Y}_t)^2\right)^{1/2}}{\overline{Y}_t} \qquad (1)$$

where n is the number of objects (Member States of the eurozone, in this case), t is the year for which the coefficient of variation is calculated, i represents each of the Member States taken into account in the analysis, and Y is the annual overall tax burden for member state i ($\overline{Y}$ is the annual average tax burden for the eurozone).

The *Gini index*, known as the Gini coefficient, was first introduced in the literature by Italian statistician Gini (1912), later being named after its creator. This index is a statistical measure of dispersion and was originally used to analyze the distribution of the income of a nation among its residents. The Gini index takes values between 0 and 1, where 0 represents perfect equality and 1 represents maximum inequality. In the empirical studies whose results will be presented in the subsequent section, the Gini index will be used to measure sigma-convergence of the tax systems of the eurozone members. Therefore, a decrease in the value attached to the Gini coefficient from one year to another will show a trend of convergence, while an increase in the index will be indicative of the lack of tax convergence.

By including the Gini index in the research methodology we hope to confirm and consolidate the results obtained using sigma-convergence based on the variation coefficient. The Gini index was determined for each year based on the formula shown in equation (2).

$$GINI = \frac{1}{n} \left[n + 1 - 2 * \left(\frac{\sum_{i=1}^{n}(n + 1 - i) * Y_i}{\sum_{i=1}^{n} Y_i} \right) \right] \qquad (2)$$

The variables are the same as in equation (1): n is the number of states included in the analysis and Y_i is the annual overall fiscal pressure for state i. However, in value of the Gini index is one of special significance because it shows rank relating to a specific state in a given year in terms of the tax burden.

In order for the Gini index to be correctly calculated, it is necessary for the variables to be placed in ascending order (from the state with the lowest tax burden to the state with the highest tax burden) per year. Therefore, the value of variable i will not be the same for a particular state from year to year, but will change based on the value of the tax burden registered in that state as compared to the values established for other Member States of the eurozone.

The *Theil index* is a tool for analyzing convergence and it is currently widely used in numerous scientific articles. However, most of this research focuses on the idea of income convergence (Wu, 1999; Cuadrado-Roura *et al.*, 1999; Galbraith and Garcilazo, 2005; Monfort, 2008). Terrasi (2002) uses the Theil index in a regional analysis of convergence in the European Union. The research is carried out for four different groups of countries EU9, EU12.1 (excluding East Germany), EU 12.2 (including East Germany) and the EU15. The author uses different time periods and compares national results with the results for the regional alterative aggregated approach in order to determine whether the influence of national factors will be replaced by European ones as a result of the integration process in the European Union.

In the studies which will be presented in the subsequent section, the Theil index is used in order to establish the existence or lack of tax convergence between the Member States of the eurozone.

The Theil index is calculated as shown in equation (3), where Y_i is the annual overall fiscal pressure for a country and $\bar{Y}$ is the average of the tax burden for all the eurozone.

$$THEIL = \frac{1}{n} \sum_{n}^{i=1} \left(\frac{Y_i}{\bar{Y}} * \ln \frac{Y_i}{\bar{Y}} \right) \tag{3}$$

As can be seen, unlike the coefficient of variation, for the Theil index it does no matter how many items (eurozone Member States) are included in the analysis. For each year an average is calculated for the eurozone and any individual value is adjusted according to the average. A final adjustment is made by dividing the results by the number of countries included in the analysis.

Just as for the Gini coefficient and the coefficient of variation, in any convergence analysis based on the Theil index we are looking for a downward trend over the studied period.

The research database includes information regarding the total receipts from taxes and social contributions (including imputed social contributions) after deduction of amounts assessed but unlikely to be collected, presented as a percentage of the GDP, on an annual basis. The information was collected from the Eurostat, online database, for the time period between 1995 and 2013. Unfortunately, at present, data for 2014 is not yet available. The data represents the overall tax burden for 20 Member States of the EU (the 19 eurozone members and Denmark).

The data was split into three different work databases. The first one contained information regarding the 19 euro area members, the second one comprised of information for those same 19 eurozone members and Denmark, while the third database included information for only 12 "old" eurozone members (countries that have adopted the euro prior to 2002: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and Greece). For each work database the three coefficients were calculated and tax convergence tendencies were analyzed. The results are presented in the following section.

3. RESEARCH RESULTS

The first part of the empirical analysis is based on information currently available for the 19 Member States of the euro area for the period between 1995 and 2013. Figures 1 and 2 show the results of the analyses performed. The values for all three indicators were not presented on a single chart as values obtained by calculations based on the Theil index are considerably lower than the other two sets of values. Consequently, these low values did not allow observations regarding the trend followed by the Theil index as compared with the other two coefficients.
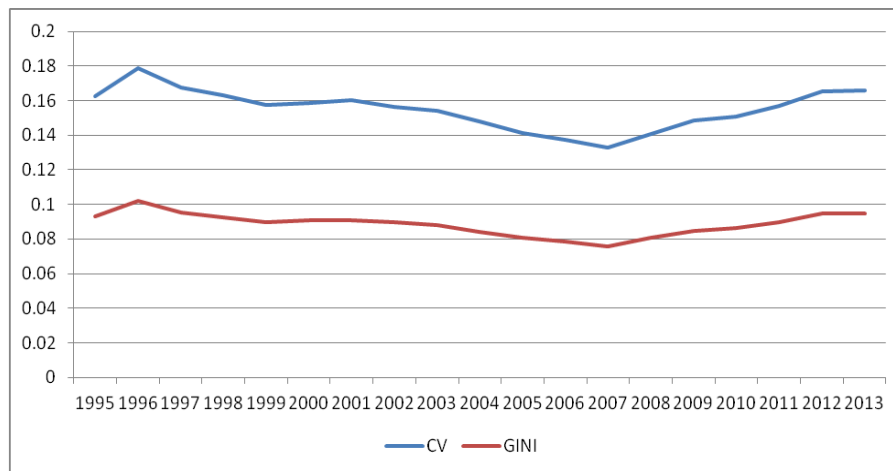
Source: own calculus
Figure no. 1 – Tax convergence in the eurozone – CV and Gini index (1995-2013)

If we compare the two charts, we see that the trend is the same whatever approach is used. Thus, each method not only complements the other, it also contributes to reinforcing the results. For all three coefficients the minimum value, which is called a peak of convergence is reached in 2007, while the maximum values appears in 1996. Overall, the three coefficients do not present a downward trend. However, for the period between 1996 and 2007 there is a constant decrease in the values of all three coefficients from one year to the next. Therefore, these results allow us to consider those years to be a period of convergence of the taxation systems of the Member States of the euro area.
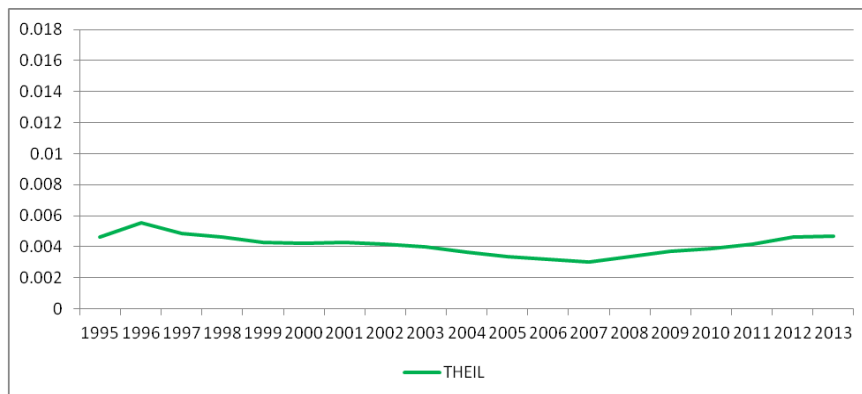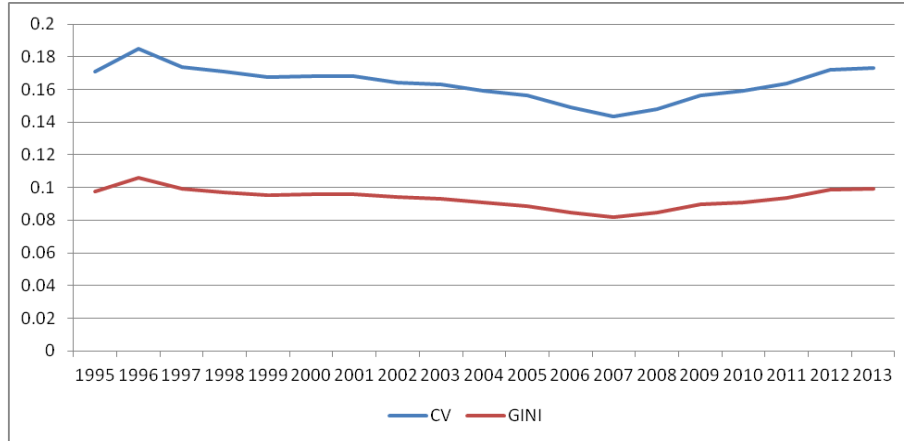

Source: own calculus
Figure no. 2 – Tax convergence in the eurozone – Theil index (1995-2013)

Unfortunately, the trend for recent years is an ascending one. This points to a lack of tax convergence in the eurozone starting with 2007. The values for 2012 and 2013 do not surpass those for 1996, but they are much higher than those registered in 2007. As 7 new

states have joined the euro area since 2007, we may conclude that fiscal convergence does not seem to also lead to tax convergence for the eurozone Member States.

Source: own calculus

Figure no. 3 – Tax convergence in the eurozone and Denmark – CV and Gini (1995-2013)

The second part of the research aims to establish if the addition of Denmark to the eurozone will in any way change the previous conclusions regarding tax convergence. Therefore, the analysis was renewed this time taking data from Denmark into account. Therefore, the results in Figures 3 and 4 present the findings for 20 countries (the current 19 members of the euro area and Denmark).Similar to what we found earlier, and if the charts are to be compared, we can note that the values for all three coefficients (CV, Gini and Theil index) give rise to identical lines on the charts. Moreover, these developments are surprisingly similar to those that resulted from the previous analysis.
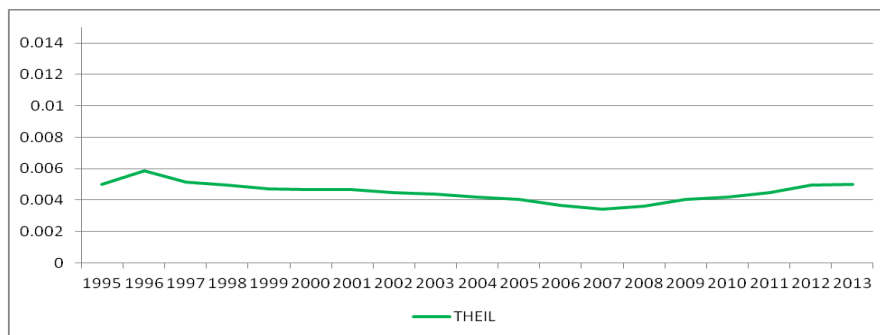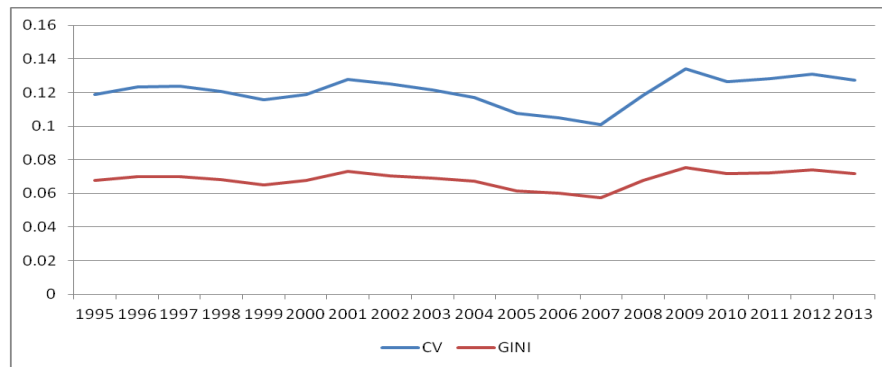

Source: own calculus

Figure no. 4 – Tax convergence in the eurozone and Denmark – Theil index (1995-2013)

There is the same lack of fiscal convergence for the whole period of analysis, but there is a convergence period between 1996 and 2007. The peak of convergence for this wider region was also recorded in 2007 and 2013 seems to indicate, perhaps, the beginning of a new period of fiscal convergence for the 20 countries included in this analysis.

All in all, it must be concluded that the addition of Denmark to the eurozone will not significantly affect overall trends in the convergence of national tax systems. These national taxation systems were defined based on the total annual tax burden in each state. The data that was analyzed and processed covers a period of almost two decades, which lends further credibility to the results we obtained.

Source: own calculus
Figure no. 5 – Tax convergence in the "old" eurozone – CV and Gini index (1995-2013)

In the last part of the research the aim was to determine if the initial research hypothesis can be confirmed at least for the 12 "old" members of the eurozone, countries that adopted the euro prior to 2002. In order to answer this new question, the three coefficients were again calculated and an analysis of tax convergence tendencies was undertaken for these 12 countries. The results are presented in Figures 5 and 6.
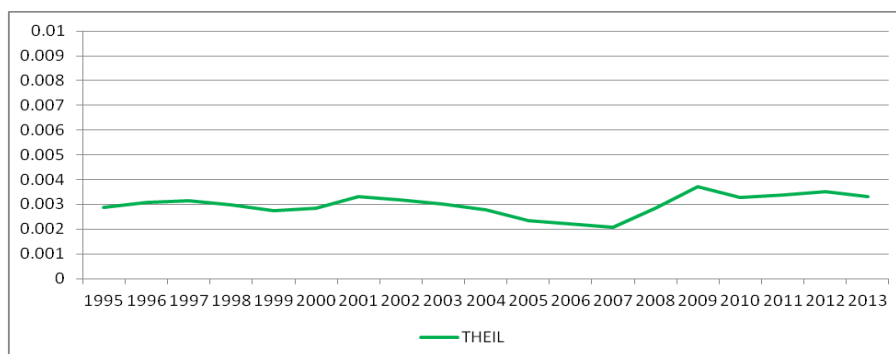
Source: own calculus
Figure no. 6 – Tax convergence in the "old" eurozone – Theil index (1995-2013)

As was the case for the previous two research directions, for these 12 eurozone members, the charts show the same evolution for all three coefficients. All three reach the maximum values in 2009, while the peak of convergence is 2007 according to all three coefficients.

However, there is no clear downward trend which points to the conclusion that there are no tax convergence tendencies, not even for countries that have been part of the monetary union for some years now. There is a slight descending tendency form 2001 to

2007, still that is not enough to consider this a tax convergence period. Overall, the lines on the chats are almost constantly parallel to the horizontal axis. This only comes to reinforce the lack of tax convergence conclusion. Therefore we must give a negative answer to the last research question, There is no clear evidence to support a claim that fiscal convergence leads to tax convergence for the 12 "old" Member States of the eurozone.

4. CONCLUSIONS

The current study consists of an analysis of convergence of the national tax systems of the euro area. The aim was to answer the question whether attainment of the Maastricht criteria and being a member of a monetary union leads to the convergence of tax systems. The scientific analysis was performed using sigma-convergence and it could not reveal evidence to enable the validation of an affirmative answer to the original research question. However, the conclusions are in line with previous research conducted regarding tax and fiscal convergence in the European Union, such as: Ayala and Blazsek (2012), Onorante (2004), Țibulcă (2015a), Țibulcă (2015b).

The general conclusion of the research is to reject the initial hypothesis. The empirical analysis was focused on sigma-convergence calculated using the variation coefficient, the Gini index and the Theil index. The individual tax systems were defined using the overall annual tax burden recorded according to information collected for the period between 1995 and 2013. The analysis underwent three different stages. Firstly, the current 19 Member States of the eurozone were taken into account. Secondly, Denmark was added to the initial research group. Lastly, the research was narrowed to only 12 countries that joined the eurozone prior to 2002. In all the situations, the results pointed to similar conclusions.

Looking at the research results, it can be said that no evidence was found to support the claim that fiscal convergence towards the Maastricht criteria leads to convergence of the taxation systems of those countries.

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