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CONVERGENCE ANALYSIS OF NET SAVING

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ABSTRACT

In order to analyses the variation in the wealth of economic agents from each source, the following study assesses monetary unification, as well as European economic policies with regard to the net savings variable. Therefore, the study treats the twelve countries of the Eurozone and subjects them to a convergence analysis.

The method used to treat convergence is Phillips and Sul (2009). This way two clubs can be appreciated which tend towards a common stationary state. The first club is made up of France, Belgium, Austria, Spain, Luxembourg and Ireland. The second group consists of Portugal, Italy, Greece and Finland. In addition, there is a third classification constituted by countries that do not converge with any other club or between them, these are Germany and Netherlands.

Once obtained the results are attributed as underlying reasons of the classification the geography and similar particularities as far as the industry is concerned.

JEL codes: E21 C23 O47

In thanks to Javier Ordoñez, my previous tutor. He allows me to understand convergence process

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INTRODUCTION

Since 2002 there has been a group of countries that have shared a common currency: Spain, France, Portugal, Italy, Germany, Greece, Ireland, Finland, Austria, Luxembourg, Belgium and the Netherlands. Although Cyprus, Estonia, Malta, Slovakia and Slovenia have subsequently joined the Eurosystem, the study only takes into account the convergence in the savings levels of the participating countries since 2002, as a large time frame is needed to analyse convergence.

In order to measure convergence in the level of savings of countries, the analysis of absolute convergence will be carried out first. This type of convergence measures whether all countries go to the same stationary state, without controlling with any variable. However, since the differences in the savings variable between countries are notable, it is expected that this phenomenon will not occur. The Club Convergence, based on the Phillips and Sul method, will be analysed.

Once separated by clubs, we will seek for the reasons for grouping these countries according to their savings, the convergence process will be studied and hypotheses that could improve welfare of those countries falling behind will be sought.

As for the legal framework, within the European Union there are convergence economic policies such as the Maastricht Treaty (1992) and other objectives set by the Union for its member countries. The Maastricht Treaty guidelines regulate price stabilisation criteria and long-term interest and exchange rates. Specifically, inflation cannot exceed 1.5%, long-term interest rates must be below 2%, the deficit cannot be exceeded by 3% and the exchange rate must be kept at a stable level.

This study will serve to conclude whether these economic measures have been sufficient to bring convergence in the level of net savings of the economies. It will also be analysed in the event of convergence, whether the stationary state is optimal. We will therefore check whether the common economic policies improve the net saving levels of the countries or whether, despite meeting the economic convergence criteria established by the European Union, there are deficiencies in the single currency market.

On the other hand, the variations in savings suppose relevant changes in the macroeconomic variables, among them, their increases provoke differences in optimal decisions in the intertemporal consumption of the agents. In addition, the level of savings determines access to credit and therefore interest rates. Changes in net savings also

modify the per capita capital of an economy, thus establishing the guideline for economic growth, as a function of effective depreciation and productive development.

Savings is therefore a very interesting variable to study in order to obtain healthy economy, since the countries with higher savings rates will have more purchasing power, more bargaining power and therefore better salaries. This, in return, benefits the country's solvency, since a better remuneration for work improves the budget balance, thus allowing a state of well-being and better expectations of agents.

Therefore, a convergence in savings rates could unify, mainly the purchasing power of the Eurosystem economies. To this end, the possible convergence will be analysed using appropriate mathematical methods. In the first place, absolute convergence will be analysed. If all countries are not heading towards the same stationary state and therefore no absolute convergence is observed, the Club-Convergence will be analysed.

Therefore, the objective of this work is to analyze any possibility of convergence and if it is not found in any mathematical procedure, it will conclude in divergence. While it is true that some studies such as "*Convergence analysis: a new approach* (Attila Gaspar; 2012)" suggest divergence, the coefficient associated with omega (cluster dispersion meter) has a low and not very relevant correlation with the initial income variable. In addition, the study does not contemplate the separation by clubs to check if there are converging groups among them.

We will obtain absolute convergence to the extent that the correlation coefficients associated with the convergence analysis processes are negative and relevant. In other words, the higher the initial value of a certain variable in a country, the less growth that variable must have. This way, if those who had more net savings initial value grow less than those who had less at the same point in time, we will obtain a tendency of the countries towards the same stationary state.

As for the Club-Convergence method, the Phillips and Sul method will be used, where clusters will be differentiated endogenously. In this way, using a more powerful method in the convergence analysis, we will be able to differentiate between idiosyncrasies and structural contingencies of the countries. That is to say that parts are particular of each country and that part corresponds to behaviors associated to the rest of countries. In this study we will focus mainly on the idiosyncratic characteristics since they are the ones that have delimited the differences of growth with other countries.

DEFINITION OF CONVERGENCE

When we speak of convergence we refer to the process by which two variables tend to the same point called the stationary state. Convergence has been a relevant object of study for economists. From the classical Solow (1956) models, to the new growth theories based on theoretical models where agents have the capacity to maximize endogenous variables.

The concept of convergence has been in force since the appearance of the first model developed by Solow (1956). It is considered a neoclassical theory of growth, since it considers the achievement of convergence thanks to free market forces. On the other hand, economic growth occurs exogenously through technological progress.

Later, with Barro (1991) a new theory of economic growth appears, where human capital is included as an explanatory variable. It is then considered a dynamic model in which variables can be controlled to ensure the growth of physical and human capital. Thus, in this model convergence is not assured, since it depends on the value of the endogenous variables of each country.

Although there are more common convergence analyses such as real convergence (gdp per capita) or nominal convergence (interest rates), their study has application for any variable that requires grouped time series.

There may be divergence between certain economies mainly if they are located in separate geographical regions or if the production functions of each country are structurally different.

Thus, when we speak of convergence, we are referring to the tendency of different functions, in this study, of net savings to tend to the same point. For this reason, the slope of growth of the variable should be lower for the country that has an initial value of the same higher. Of course, it can happen that those more developed countries converge with a negative slope of growth with those that had a lower initial level (non-optimal sense of convergence). However, in any case, convergence implies a negative correlation between the initial level of the variable and its growth rate.

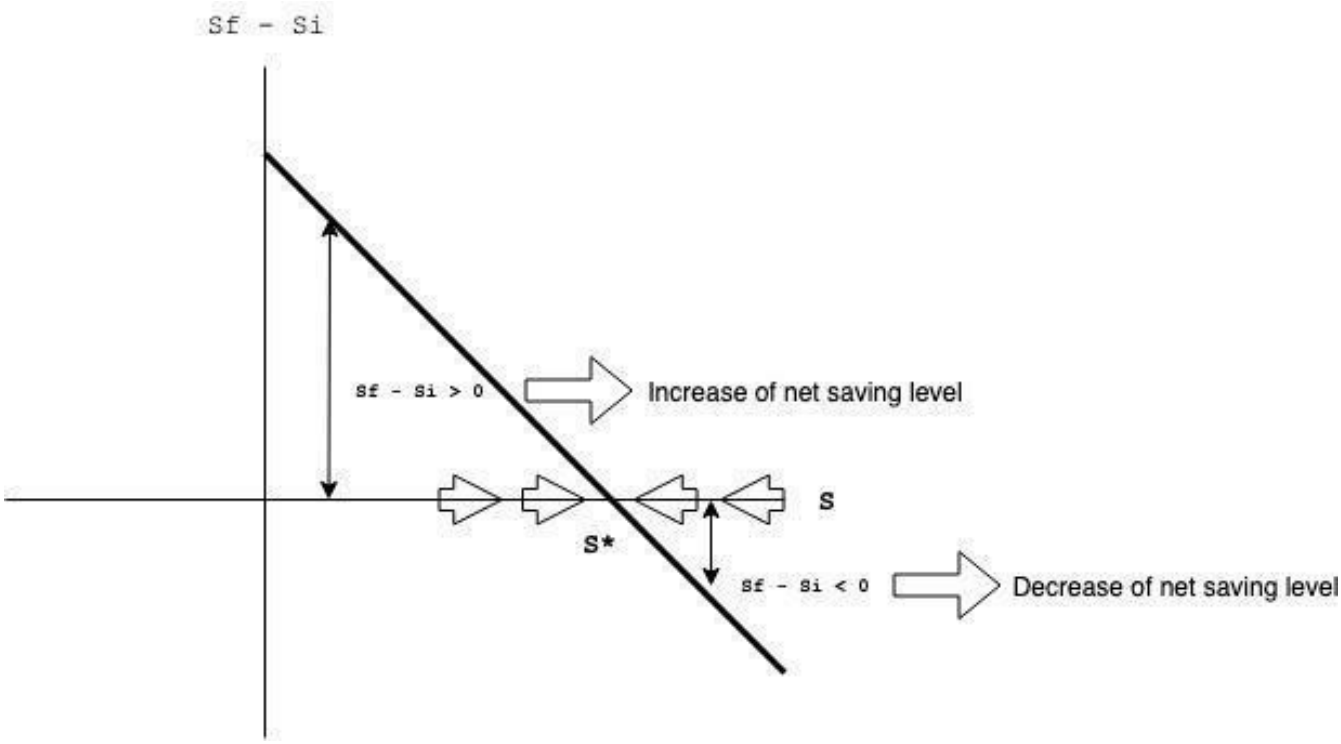

Figure 1. Absolute convergence based in Solow model.

As can be seen the parameter that determines absolute convergence (β) can be calculated using cross-section, panel or time series data. However, if the objective is to conduct a study on σ-convergence, club- convergence or Total Factor Productivity (TFP), it is necessary to use panel or cross-section data. If convergence within or across is to be analysed, the data must be time series.

To distinguish the types of convergence, we will start by differentiating between σ-convergence and β-convergence. In both cases, the trend is toward the same steady state, but different magnitudes are being measured. In the case of β-convergence, we measure the speed at which a less developed country converges with a more developed country. Therefore, the higher the coefficient β, the higher the speed of convergence.

On the other hand, there is σ-convergence if the differences between countries diminish over time. The coefficient is only one indicator of the dispersion of functions. Unlike the coefficient β, which is obtained by making a regression line between the variation of the variable and the initial value of the same.

Although a priori there is no absolute convergence (neither β -convergence or σ-convergence). The transition function can be relativized by controlling with other variables possibly correlated with the dependent one, which would result in relative convergence. There are factors such as human preferences, the quality of institutions, or cultural factors that limit this type of convergence. Conditional or relative convergence only allows

us to relativize functions that share the same stationary state, since it does not take into account idiosyncratic factors of the countries mentioned above.

When it happens that there are several stationary states, we cannot resort to the classical models of convergence (absolute and relative) because we will probably find a divergence between countries. As Professor Villafañe (2019) rightly names it, *if we consider the available data from all the economies of the world in the last decades, we can observe that there is neither sigma-convergence nor beta-convergence*".

As for convergence within or across, it simply indicates the space in which we are conducting the study. In our case, we will analyze a study between countries, therefore an across convergence model. However, analyses can also be made at the regional level, within a country's borders. An example of convergence analysis within and across is: Income Convergence within and between Countries (Fischer and Serra, 1996).

Finally, the Club-convergence, based on the endogenous differentiation of stationary states. Assuming that not all countries, because of their idiosyncratic characteristics, tend to have the same stationary state. In this way, stationary states are differentiated and it is contrasted which countries go to which. Based on this differentiation, it is also possible to study the speed at which convergence occurs (slope of growth of the transition function) or whether the deviations between them decrease (deviation with respect to the mean value of the selected data).

Thus, depending on which convergence study is to be carried out, a data format and a particular statistical method will be used to achieve optimal conclusions. This study will work with the Eurosystem countries' net savings variable, with a panel data structure, and will study the Convergence Club using the Phillips and Sul method (2006).

LITERATURE REVIEW

Today, convergence analyses have continued to be dealt with on the basis of the same production function structure on which Solow (1956) was based. Examples are Tebaldi and Mohan (2008) or Gaspar (2012). In the first article, the level of taxes is used as the elasticity of production. Thus, it is observed that recent studies include new variables to the Solow equation. In this first article, the extension of the Solow equation allows us to observe the behaviour of equilibrium capital per capita as a function of the reaction of the markets to the rise in taxes.

The second article looks at a different convergence meter associated with the Omega variable. This variable studies the standard deviation between country clubs. All members of the OECD. The article is interesting because it suggests divergence among

OECD countries: *a Omega is a modified, weighted standard deviation of cluster differences (Gáspár, 2010b. P.386)* it is observed that *significant differences was found among omega and other convergence indicators. In least developed and rest of world countries (mostly non-developed) convergence, while in OECD countries divergence was found. The speed of convergence is very slow* (pp. 388 l.11- 13).

Thus, there is no consensus between convergence or divergence of developed countries, since in many cases this is relativized or differentiated between zones.

In this way it will be plausible to find a divergence in our estimates, mainly when measuring absolute convergence; as some studies such as Rughoo and Sarantis (2015) *or* Caputo and Forte (2015) contemplate, we hope that Club-Convergence will appear in our study. This implies a differentiation by countries that tend towards common stationary states as a consequence of greater economic, monetary, social, political and cultural integration.

Many convergence studies have focused on the study of the output or income of different groups of countries; no articles have been found that focus their convergence on net savings. Thus, most are based on contrasting results between different analytical methods for the production variable such as *Higgins and Levy (2003).*

Although it is true, there are some studies that seek to analyze the European financial system, such as Rugho and Sarantis (2015*)* and compare it with other emerging economies, there are no articles that study net savings from the Club Convergence.

Whatever the variable of interest, the objective of the convergence analysis implies the search for the Optimal Monetary Areas (OMA). A hypothesis that seeks to identify optimal geographical areas in which countries can form a monetary union (Tavlas, 1993). Since the twentieth century, OMAs have been modelled in order to integrate monetarily, either through monetary union or fixed exchange rates, those countries that share trade links based on comparative advantages as well as abundant factor mobility.

The first to create a model of OMAs was Mundell (1961). Its model is considered as traditional since it is based on the analysis of the combination of efficient regional economic policies; concluding in the division of small and homogeneous monetary unions. However, after the emergence of this intellectual field, certain conditions were agreed upon which an OMA had to comply. These conditions include factor mobility, government and fiscal integration, degree of diversification and financial integration.

In 2002 a critique arose in which it is said that "there is an apparent contradiction in the work of Mundell (1961), to counter asymmetric macroeconomic shocks, his article is

based on forming smaller and more homogeneous monetary areas instead of making them larger and more heterogeneous" [McKinnon, (2002)].

The idea of heterogeneity and the large size of economies is based on the supply approach, a thought previously developed by Mundell (1973). The hypothesis suggests heterogeneity as a tool to disperse supply shocks among OMA member countries or regions. In this way, not only are demand crisis situations taken into account, but also those in which production functions may be affected by externalities linked to cost implementation.

Later, thanks to the works of Barro-Gordon (1983) relative to the study of open economies, the negative effects of devaluations and the weapon that expansive monetary policies can entail when expectations are included in the model are understood. Therefore, there is a consensus in the theoretical framework of the OMAs the search for a price stabilization that does not modify the expectations on the current fixed exchange rate.

Thus, for the constitution of an Optimal Monetary Area there are several determining factors that are not contemplated in the current treaty of the European Economic and Monetary Union, as known as the Maastricht Treaty (1992). It includes the following conditions for membership of the Eurosystem:

"In order to belong to the euro area, states must fulfil five criteria laid down in the Maastricht Treaty in 1992:

Its annual inflation rate should not exceed by more than 1.5 percentage points the average of the three EU countries with the best inflation rates.

The public deficit must not exceed the equivalent of 3 percent of the country's gross domestic product (GDP) and, if it exceeds this limit, it should have fallen substantially to approach this benchmark, or it is exceptional, temporary and close to the threshold.

Public debt must be at most 60 percent of the country's GDP or, if it exceeds this limit, they should be declining and approaching the bar substantially and at a satisfactorypace.

Long-term interest rates should not exceed by more than 2 percentage points the average of the three best-performing countries in terms of price stability and two-year participation in the European exchange rate mechanism, which limits fluctuations between the euro and national currencies.

In addition, national legislation in countries preparing to adopt the euro must respect all the requirements laid down in the EU Treaties, in particular those relating to the independence and tasks of their respective central Banks".

So, hypothetically, we cannot consider the Maastricht Treaty as rigorous convergence criteria, since the legislation in force is ignoring, from an economic point of view, the degree of industrial diversification. In other words, the ability of private investment to diversify sales in the face of shocks.

On the other hand, it does not take into account the degree of openness of the economy as well as its size. As a consequence, if the economy is at a different level of openness, or the export destinations are not idiosyncratically similar, the same economic measures can cause divergence, thus moving away from forming an Optimal Monetary Area.

As far as fiscal integration is concerned, legislation provides for mandatory compliance with European Union treaties. However, this proposal does not oblige fiscal cooperation where the optimal combination of fiscal policies between countries improves all countries in the system. That is to say, to apply different fiscal policies to each country and in each moment depending on the situation and circumstances. Giving rise to a cooperation which in turn provides greater mobility in the factor market.

Finally, there should be mechanisms to achieve maximum labour flexibility. To this end, the transfer of job offers to those countries with the best employment levels is achieved. In this way, the practical limitations of liberal theoretical models can be corrected.

Therefore, to form an Optimal Monetary Area it is not only a question of analyzing if there is convergence. This convergence may be based solely on the close commercial relationship. In order to achieve an OMA, it is also necessary a full mobility of factors as well as a commitment of the member countries to help each other in their economic well-being.

METHODOLOGY: CLUB CONVERGE

Filters such as Hodrick and Prescott (1997) have been commonly used for the decomposition of series and panels in trend and cycle. Resulting in the following equation:

$$X_{it} = g_{it} + \alpha_{it}$$

Equation 1. Hodrick Prescott (1997) equation.

Equation 1 shows the equation developed by Hodrick Prescott (1997) where X_{it} is the time variable under study in our case the net saving, g_{it} corresponds to the common pattern among all countries, i.e., the trend and α_{it} represents the most volatile economic cycle, as it is affected by economic shocks.

However, the method proposed by Phillips and Sul (2006) includes a part in the equation. Giving rise to the next equality:

$$X_{it} = \left(\frac{\alpha_{it}}{\mu_{it}}\right)\mu_{it} + \epsilon_{it}$$

Equation 2. Phillips and Sul (2009) equation 1.

Thus, considering the first part of the product of equation 2 as a single parameter, we obtain the following equation:

$$x_{it} = \mu_{it} + \delta_{it} + \varepsilon_{it}$$

Equation 3. Phillips and Sul (2009) equation 2.

Where x_{it} is the savings variable of each country in each period, μ_{it} is the common factor, or in other words the value added by a common pattern of growth among countries. On the other hand, δ_{it} determines the distance of each country from the common trend of the panel, i.e. the idiosyncratic part from the common factor.

So it will be this last parameter that we will analyses to measure convergence. It will be of interest to calculate the distance between them, in terms of the level of savings involved (once common factors have been taken into account). Therefore, our paper will emphasize the study of the deviation of countries from the panel average. By referencing equation 3, our convergence analysis will differentiate the clubs according to the parameter.

In order to calculate the parameter associated with the distance of each country's savings from the panel average and to approve the convergence, it will be necessary to study the transition function. In it, we will be able to appreciate the trend of each country and see if the growth path is common to all countries, differentiating endogenously those that do.

There will be absolute convergence if all countries tend towards the same point, i.e. towards the panel average. For this, we will need the transition functions to be degressive in those countries that have had higher rates of initial savings and increasing in those that started at a lower level.

The parameter that allows the transition function to be plotted, is obtained by dividing each savings observation (referring to a country and a year) by the average of all countries in the same period.

$$h_{it} = \frac{x_{it}}{\sum_{i=1}^{N} \frac{x_{it}}{N}} = \frac{\delta_{it}\mu_{it}}{\sum_{i=1}^{N} \frac{\delta_{it}\mu_{it}}{N}} = \frac{\delta_{it}}{\sum_{i=1}^{N} \frac{\delta_{it}}{N}}$$

Equation 4. Transition function equation.

In equation 4, the above explanation is represented, i.e. each point of the transition function will be an *h-value* of each country (i) in each year (t). As it appears, the common term can be suppressed, since although the distinction in clubs is produced thanks to the analysis of the same one, the relevant thing to analyze the convergence is the deviation that exists with respect to the average, considered point of equilibrium.

Therefore, the methodology of this study contemplates the Club-Converge assumptions in which it is considered that two countries with the same growth pattern can converge towards different equilibriums. In the same way, two countries with different growth trends may be converging to the same stationary state. This phenomenon is due to a different production function structure of the countries.

As for the contrast for the conclusions of the method, we will consider that the dispersion of the level of saving with respect to the average of the panel is zero for a period with tendency to infinity, if and only if the speed of convergence between the club, α, is greater or equal to zero. Therefore, the hypothesis contrast is as follows:

$$H_0: \delta_{it} = \delta \; and \; \alpha \geq 0$$
$$H_1: \delta_{it} \neq \delta \; and \; \alpha \leq 0$$

Equation 5. Club convergence test

To perform the test in figure 5, we must consider a continuous distribution, *log t regression*, where the provided that the statistician *t > -1.65*. In this case convergence will be ruled out.

Thus, Phillips and Sul's (2009) method seeks to find those groups of countries that have the same level of the variable when the temporal space tends to infinity. This procedure is performed using algorithmic procedures in which the panel data interacts.

Therefore, the definition of convergence according to the method of Phillips and Sul (2009) is based on the new theory of economic growth, where it is considered that the economy does not necessarily tend to a state of equilibrium common to all countries, but that this stationary state can volatilize according to the similarities or differences of the countries over time.

EMPIRICAL ANALYSIS

In order to obtain the results and therefore to differentiate the clubs of countries which tend towards a common stationary state, it has been necessary to search for data as far as level of net saving is concerned. This data has been constructed with a panel structure, for later execution with the Stata program.

The results of the convergence analysis of the Euro system's net savings rates, calculated using the Phillips and Sul (2009) method, have identified three groups which have different break-even points.

First, absolute convergence has been calculated to see if the trend of the countries coincides with the panel average. The result shows divergence, with a statistic far below the non-rejection region.

Variable	Coefficient	S.E.	T-stat
Log (knows)	-2.114	0.008	-249.016

Table 1. Absolute convergence contrast.

Since the statistic is much smaller than the critical value, the null hypothesis is rejected. In this way, we can affirm with sufficient statistical criteria the absence of a trend towards a common point among all countries.

To corroborate the discard of absolute convergence, we perform the transition function of the countries. This set of time series is plotted from equation 4 in order to check more visibly whether countries are moving towards the same steady state. The representation of the function is as follows:

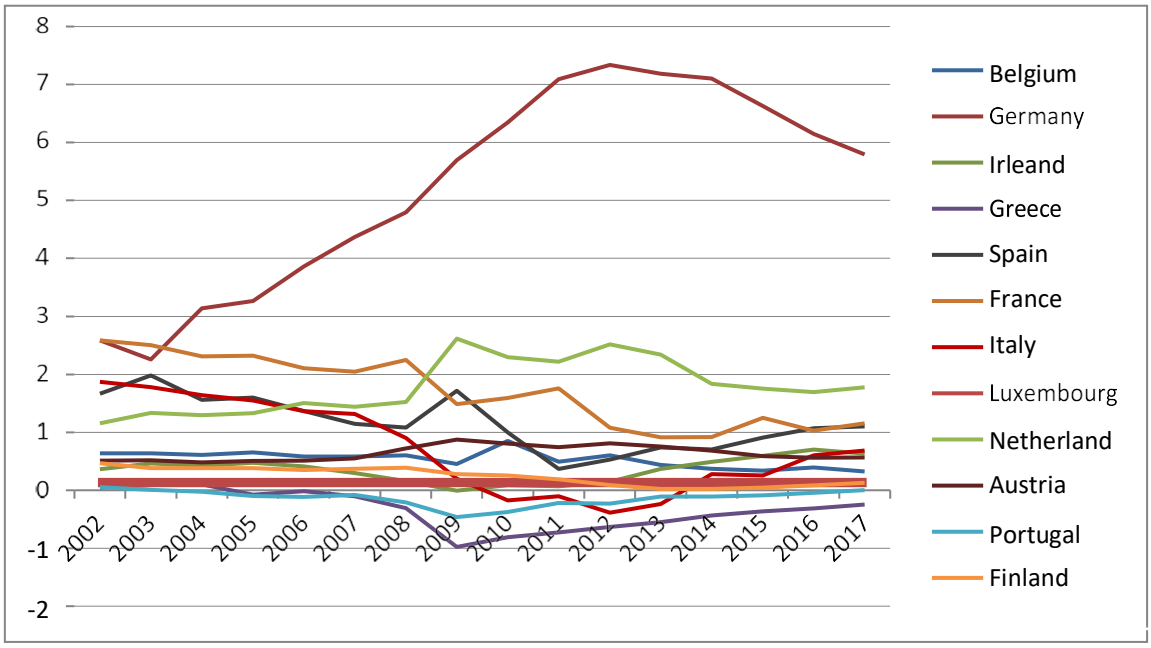

Figure 2. Transition function twelve countries.

The average value of the panel corresponds to one. Therefore, any country in number two on the ordinate axis will have twice the net savings as the panel average. As can be seen, the trend in the transition function is different from one. In order to analyse the standard deviation with respect to the mean and the monotony of each one, individualized graphs are made.

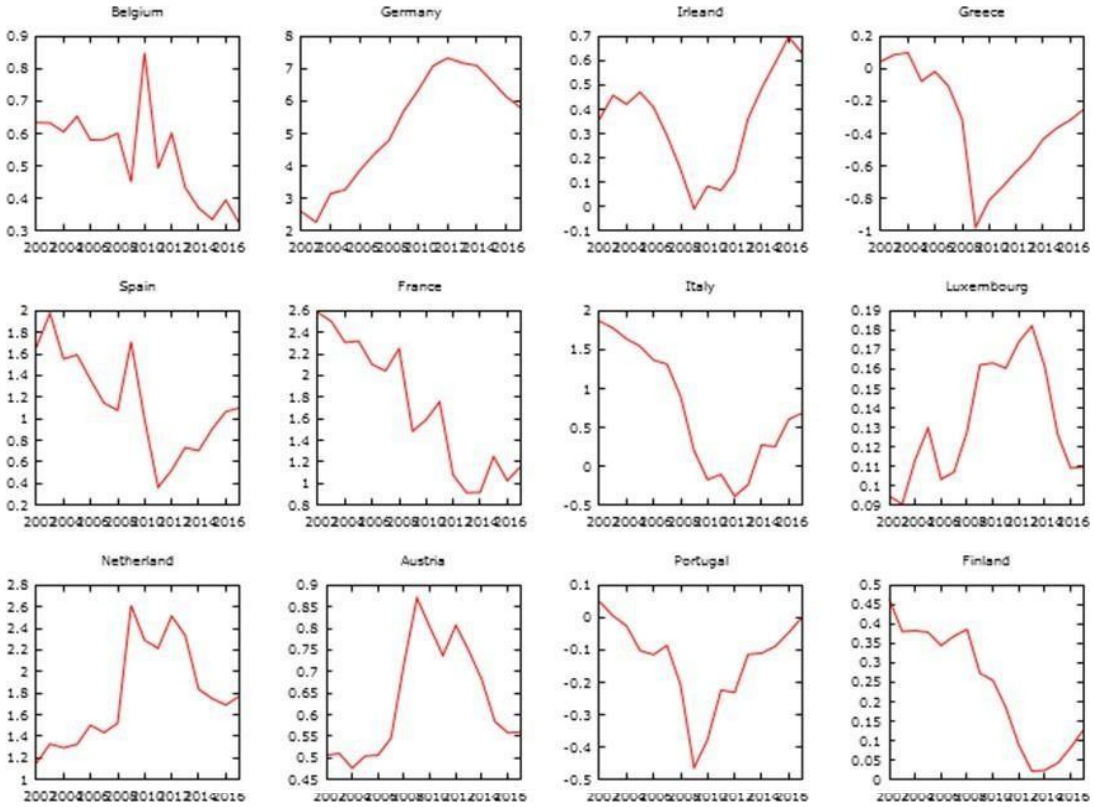

Figure 3. Individual transition function twelve Euro countries.

Most countries are concentrated in a range of (-1.3). However, Germany has much higher savings rates than other countries, reaching 7 times the average value of the panel. However, its effect is parabolic and could therefore redirect its trend towards a stationary state common to all countries.

In order to differentiate between the most volatile part of the variable, affected by shocks and uncertainties of the structural one and thus check the individualized trend, it will be convenient to filter the transition function. Through the procedure of Hodrick-Prescott (1997), in order to study monotony. In this method, the growth or trend function is separated, and cycle and is weighted by a parameter, λ; whose appropriate value is considered 100 when the series is annual.

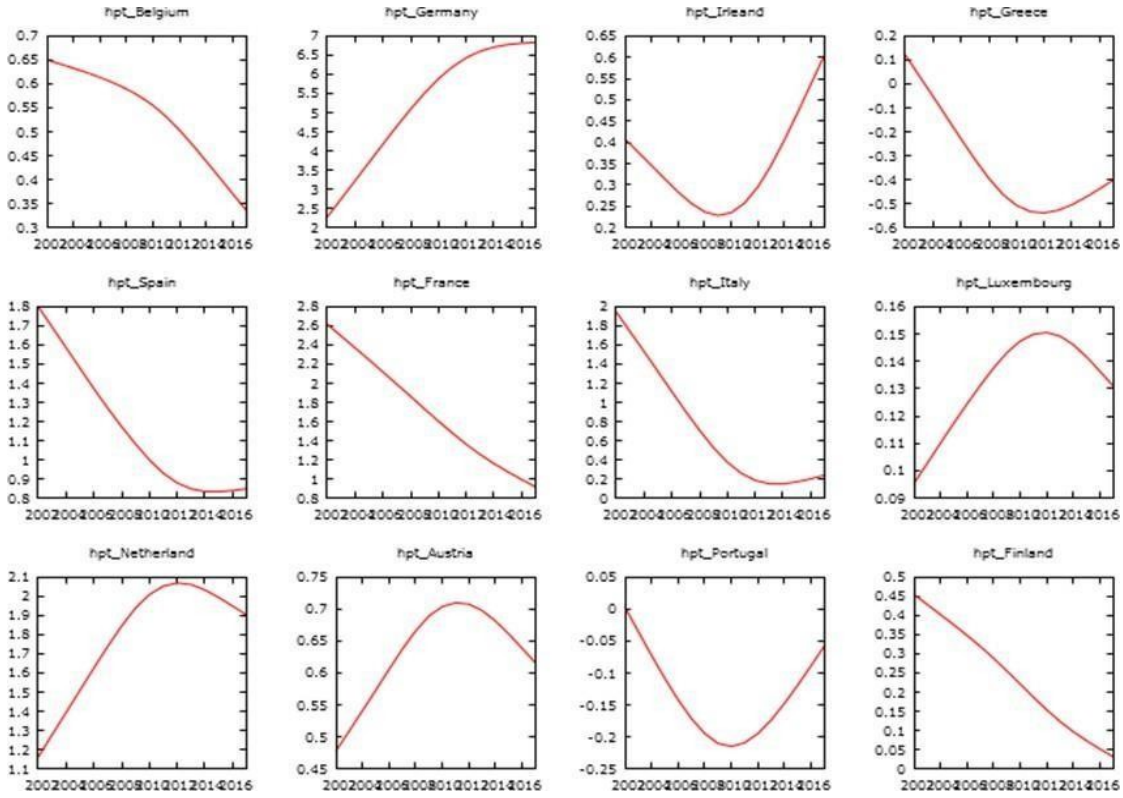

Figure 4. Smooth transition function with Hodrick-Prescott filter to twelve Euro countries (tendential part).

Figure 4 shows the trend in the transition function of the savings rates of the member countries in the euro since 2002. It is necessary to bear in mind that the range of the ordinate axis differs between them, however, the image allows us to study the monotony of the countries faithfully.

In the case of Belgium there is a decrease that increases its slope in the period 2008-2017. The path of the graph is positive and less than 1, which means that its savings are below the average of the panel. From 2008, as in many countries of the euro zone, there was excessive investment in fixed capital coupled with a downward revision in the expectations of producers and consumers (Economic and Commercial Office of the Embassy of Spain in Brussels).

As for Germany, it occupies a privileged position, since its growth is rectilinear and with a pronounced slope. However, stabilization can be observed from 2012-2013 onwards. The values taken by the function are positive, starting at 2.5 times the average in 2002 and ending at almost 7 times the average for all countries.

As for Ireland, we see a minimum in its net savings function; this reflects, as in other

countries, the bursting of a real estate bubble. In fact, Ireland was one of the first countries to enter into economic recession in the European Union. Little by little, with the support of the EU and the IMF, it manages to increase savings rates from 2010 onwards, definitively emerging from recession from 2013 onwards.

As can be seen in figure 4, Greece has experienced a severe decrease in its savings rates until 2012 when it manages to enhance its function despite acquiring negative values. The case of Greece is understood as one of the most powerful recessions within the European sphere. However, after several debt reclassifications to "junk" bonds and three rescue interventions, the economy manages to emerge from the recession, albeit with high levels of debt and deficits.

Spain's trend is steeply decreasing with a stabilisation in recent periods, without appreciating any notable growth in the same. In the case of Spain, the bursting of the real estate bubble led to debt reclassifications towards lower value, making the economic recession latent and modifying agents' expectations in prices. The main problem in Spain was adjudicating the property rights of the banking system. It was funded through nationalisations and rescue of banks via public and EU loans.

France shows a generalized decrease in the whole domain. Values change from 2.5 times the average in 2002 to even less than one, though close. This indicates the loss of savings capacity of the French economy during all periods.

In the case of Italy, the trend in savings rates has been decreasing until 2013, when the slope of the function becomes slightly positive. As in all other countries, Italy had to clean up its bank accounts mainly with the help of purchases of ECB Bonds. However, Italy did not need as much European aid to solve its crisis, ergo stabilize its savings levels.

Luxembourg, as in the case of Germany, shows a growth in its savings levels in most of the period studied. However, it begins to reduce its levels from 2013 onwards. The level is below the average value, which indicates that although the trend is increasing, the purchasing power of consumers is lower than the Eurosystem average.

Netherlands, experiencing a situation very similar to Luxembourg, there is a growth until 2013. The similarity between the two can be seen in the values taken by the function, as the two countries practically double their level of savings with respect to the initial value. However, in the case of the Netherlands, the panel average is doubled, while Luxembourg has a maximum value of 0.18 times the average. The following difference between Netherlands and Luxembourg is shown in the year in which the maximum is reached. In the case of the Netherlands the maximum occurs in 2012, while in Luxembourg in 2013.Austria also coincides in the year of its maximum value with Netherlands. Its transition function is similar, although Austria does not manage to double

its savings levels over the whole period, ergo has less growth to look forward to. The function takes values less than one, with a maximum value of 0.8 times the panel average in 2012.

Portugal represents a savings transition function with a concave parabolic effect. Thus, it has a low in 2009 and then resumes its growth at a speed similar to the previous decrease. Portugal's savings levels are negative in all periods, which represents the financing needs of the Portuguese economy.

Finland was one of the last, along with Greece, to end the recession. Thus, their apparently rigid levels of savings have not perceived the economic improvement that began in 2015. Net savings are shown to be decreasing along the entire abscissa axis, reducing the level of savings in the economy by almost half.

Using the Hodrick-Prescott filter we can observe the part of the progress of the variable that corresponds to the economic cycle. In this way, we will check the dispersion of the variable in terms of variation coefficients, that is, in percentages of dispersion with respect to the trend level. The individualised graphs corresponding to the cyclical part of the net savings variable are shown below.

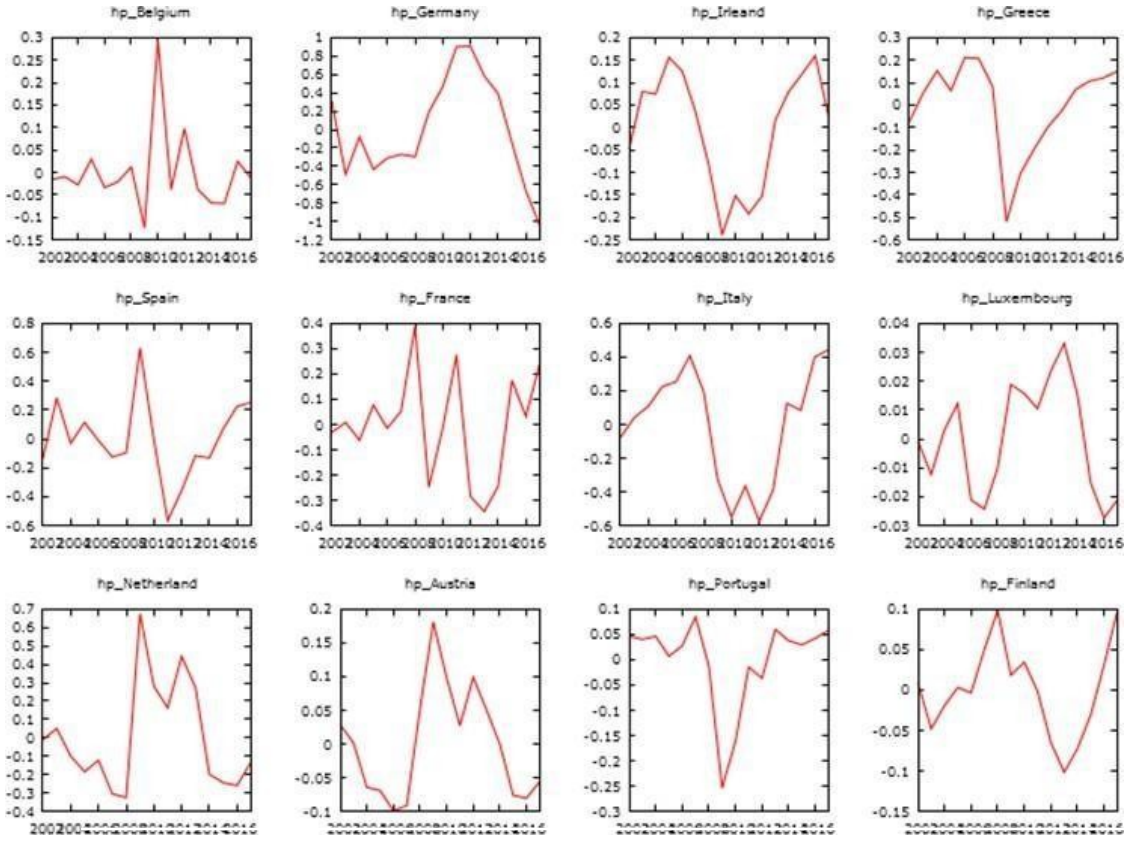

Figure 5. Ciclical part of transition function twelve Euro countries

The results state differences in the stability of net savings. On the one hand, there are countries such as Luxembourg, which has a dispersion of 4% with respect to the average. On the other hand, we see countries like Germany that have managed to achieve 100% dispersion. Below is a table with the maximum and minimum values, in terms of percentage variation with respect to the average. It will also be defined in which year this greater and lesser dispersion took place, in order to check whether shocks in net savings affect all countries simultaneously in the same direction and on the same scale.

	Minimum	Year	Maximum	Year
Belgium	-0.124	2009	0.294	2010
Germany	-1.046	2017	0.906	2012
Irleand	-0.239	2009	0.160	2016
Greece	-0.520	2009	0.211	2006
Spain	-0.566	2011	0.630	2009
France	-0.344	2013	0.388	2008
Italy	-0.574	2012	0.444	2017
Luxembourg	-0.027	2016	0.033	2013
Netherlands	-0.325	2008	0.674	2009
Austria	-0.099	2006	0.181	2009
Portugal	-0.254	2009	0.085	2007
Finland	-0.101	2013	0.098	2008

Table 2. Maximous and minimous in net saving per year.

Thanks to table 2, we can see that there is no clear grouping in terms of years of maximum and minimum dispersion with respect to the average. On the one hand, those years in which one country has had a maximum, it is feasible for another country to have a minimum. This is the case of the 2009 period, when Belgium, Irleand, Greece and Portugal had a minimum dispersion rate and Holland, Austria and Spain had a maximum, reaching a dispersion as in Netherland or Spain of more than 60%.

This delay in the variables that represent the most volatile part of the economy has as a possible explanation the different origins of the crisis. Those countries that acquire their minimum in 2009 have two characteristics in common. First, they were first to notice or recognize the financial crisis and then the economic crisis. Producer and consumer confidence declined and capital investment, mainly fixed, increased. This investment financed by high interest rates was not covered by the marginal productivity of capital. Second, (except in the case of Belgium, which saw a rapid and notable increase in savings, resulting in a 2010 peak of almost 30% above trend value) countries have managed to enhance their level of savings after that date, partly thanks to bailouts from European institutions.

Returning to the topic that concerns us, through the analysis of these transition functions studied above, we will proceed to the contrast of Clubb-Convergence results. This analysis of club differentiation is carried out with the Stata programme by means of endogenous calculations in which countries tending towards a common stationary state are separated. The results are as follows:

Club 1	Austria, Belgium, France, Ireland, Luxembourg, Spain
Club 2	Finland, Greece, Italy, Portugal
Not convergence group	Germany, Netherland

Table 3. Differentiation countries that convergence on the same steady state.

Thus, there are disparate trends in savings levels across countries, giving rise to two distinct groups each targeting a different stationary state. The results are different with respect to other studies such as Ordóñez, Sala and Silva (2015), since in terms of per capita income, clubs differ from countries known as PIIGS (Portugal, Ireland, Italy, Greece and Spain).

DISCUSSION OF RESULTS

The results have shown a convergence between Austria, Belgium, France, Ireland, Luxembourg and Spain. The same is true for Finland, Greece, Italy and Portugal and not for Germany and Netherland.

Once the difference of Clubs is obtained, it is interesting to know where they are going. For this purpose, it will be convenient to represent the transition functions of each club.

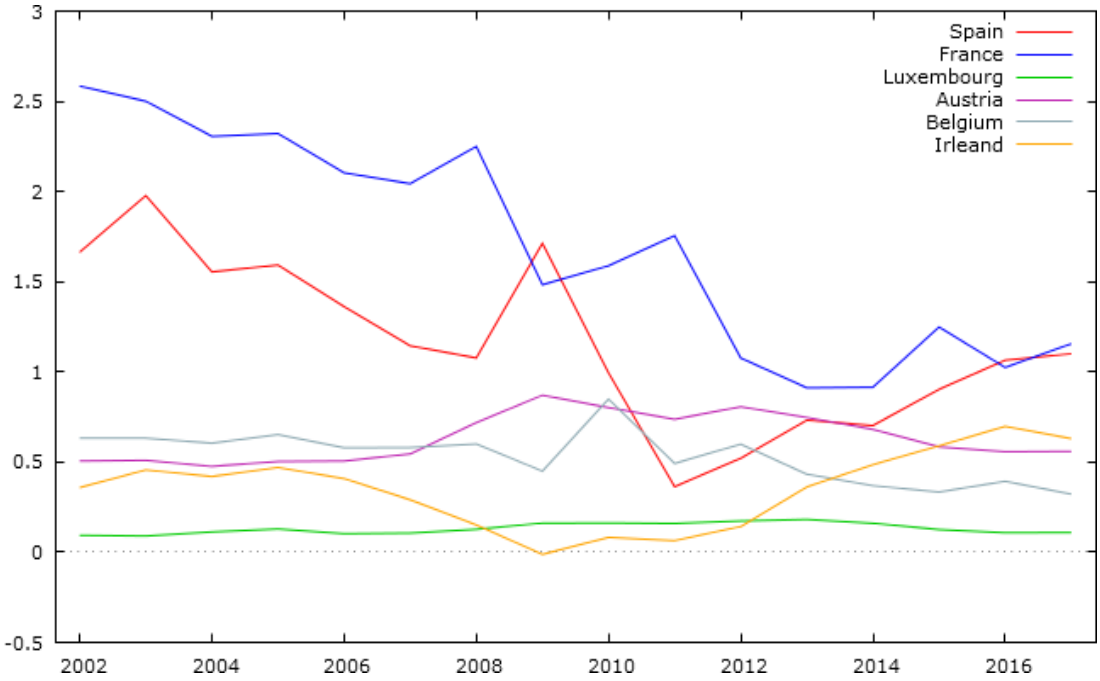

Figure 6. Transition function club 1.

As can be seen, at the beginning of the period studied, the difference between the country with the highest level of savings and the country with the lowest differs by up to 2.5 points. However, at the end of the period the difference is little more than one, which implies a reduction in dispersion of up to 1.5 times the mean value of the panel. In this case we can speak of convergence, with a statistic of 2,884, higher than -1.65 (critical value).

For the convergence process to take place, as mentioned above, it is necessary for those countries with the highest level of initial savings to lower their rates and for those with lower levels to increase it. In this case, we observe that the countries that have had savings rates clearly decreasing with respect to their initial level (France and Spain), have been able to integrate, in terms of savings with those that maintained their lowest but constant levels (Luxembourg, Ireland, Belgium, Austria); as shown in figure 6.

Below is a table with the variations of the countries of Club 1 as well as their initial and final value:

Club 1	S0	SF	SV
Austria	0,506	0,560	10,638
Belgium	0,634	0,323	-49,090
France	2,584	1,156	-55,269
Irleand	0,359	0,630	75,693
Luxembourg	0,095	0,200	16,041
Spain	1,663	1,100	-33,857
Simple average	0,973	0,646	-5,974

Table 4. Initial, final and increase value of saving transition function club1.

As shown in table 6, the variable Sv shows a negative average. This implies a decreasing evolution of the levels of savings over time in club 1. Specifically, the decrease of the club represents 5.97 points (percentage levels). Thus, we can think that the steady state has been inefficient in the sense of Pareto, since those countries that had a lower level of savings have not improved, but those that had a higher level of savings have lost a certain part.

However, there is convergence because those countries that initially had higher levels of savings (France and Spain), have had negative growth, approaching the levels of Belgium, Ireland, Luxembourg and Austria. The latter have also favoured the convergence process as their growth values have been positive. In this way, thanks to the increase in savings in some countries and the decrease in others, convergence is achieved within the Eurozone, as far as club 1 is concerned.

Therefore, in the long term, countries head jointly to a stationary state which, although undesirable for some, such as Spain or France (because they have had higher levels in the past), eliminates deviations in savings within club 1.

Club 2 is made up of four countries: Finland, Greece, Italy and Portugal. In order to visually appreciate the steady state to which countries are heading, the transition function of Club 2 is represented:

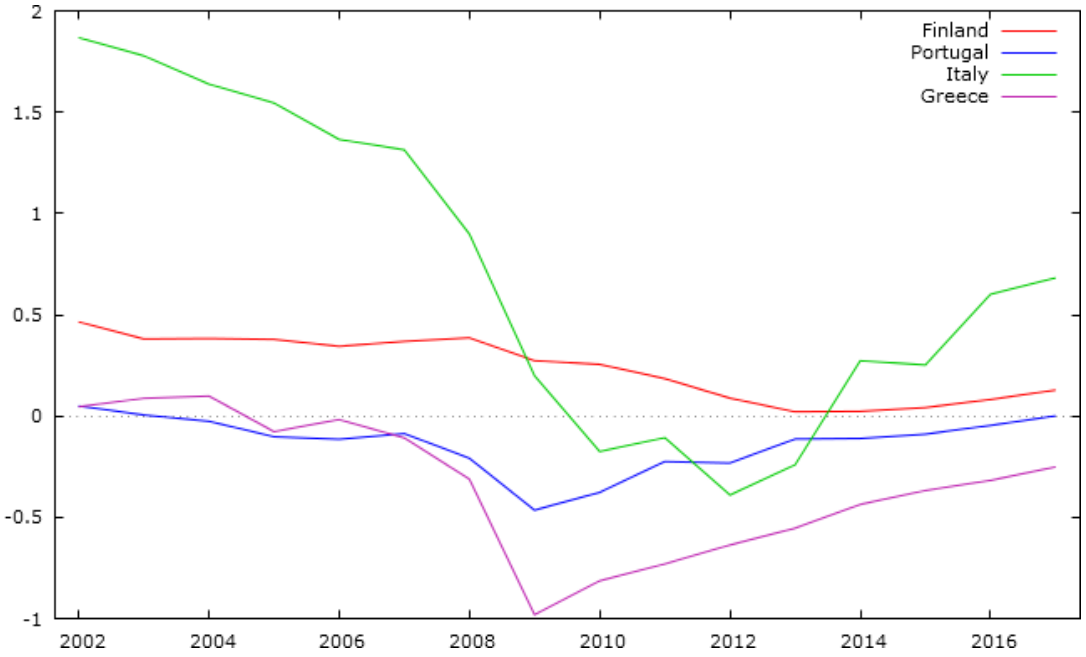

Figure 7. Transition function club 2.

In this case, as we can see in graph 7, the trend in the countries seems to be around zero. This means that by discounting debts and expenses, Finland, Portugal, Italy and Greece, do not save anything in their economy. However, as can be seen in graph 7, the last values of the straight lines seem to have a positive slope.

In order to check the evolution of savings rates and to consider the levels of growth, the following table has been drawn up where initial and final savings are included, as well as their variation during the time interval:

Club 2	S0	SF	SV
Finland	0,465	0,128	-72,434
Portugal	0,050	0,001	-98,753
Italy	1,867	0,682	-63,474
Greece	0,046	-0,251	-652,010
Simple avarage	0,607	0,140	-221,668

Table 5. Initial, final and increase value of saving transition function club 2.

It can be seen that Club 2 has savings values, mainly final, very close to zero, giving them a position lower than the average of the panel. In addition, the countries have had a notable decrease in purchasing power compared to the initial period (being higher in the case of Greece, which starts with positive levels of savings in 2002 and ends with a negative level of -0.25 times the average value of the panel).

In this case, all countries decline, without exception. However, some countries do so at a faster rate than others, or have had periods in which their level of savings has been drastically reduced. However, the range of dispersion in country functions has decreased over the period and convergence occurs. However, the coefficient associated with the non-repudiation region is not as higher as in the previous case. We must therefore look at the existence of convergence with a greater chance of making a mistake than in the previous case.

The countries of this club have been affected by the crisis as reflected in the decreases in the level of savings, as they have not been able to recover the initial levels. Therefore, this zero trend could be transitory, since otherwise, the need for financing caused by budget deficits is very plausible for these economies and the permanence of these economies within the Euro system could be questioned.

The recovery of savings will depend to a large extent on the growth of economic variables. The transition will be determined by the adjustment of the European Central Bank and the fiscal policies implemented by the member countries of the Euro system.

On the other hand, a third club consists of Germany and Netherland. They do not show any signs of convergence between them or between the different clubs. To corroborate the results, the joint representation of the transition functions is shown:

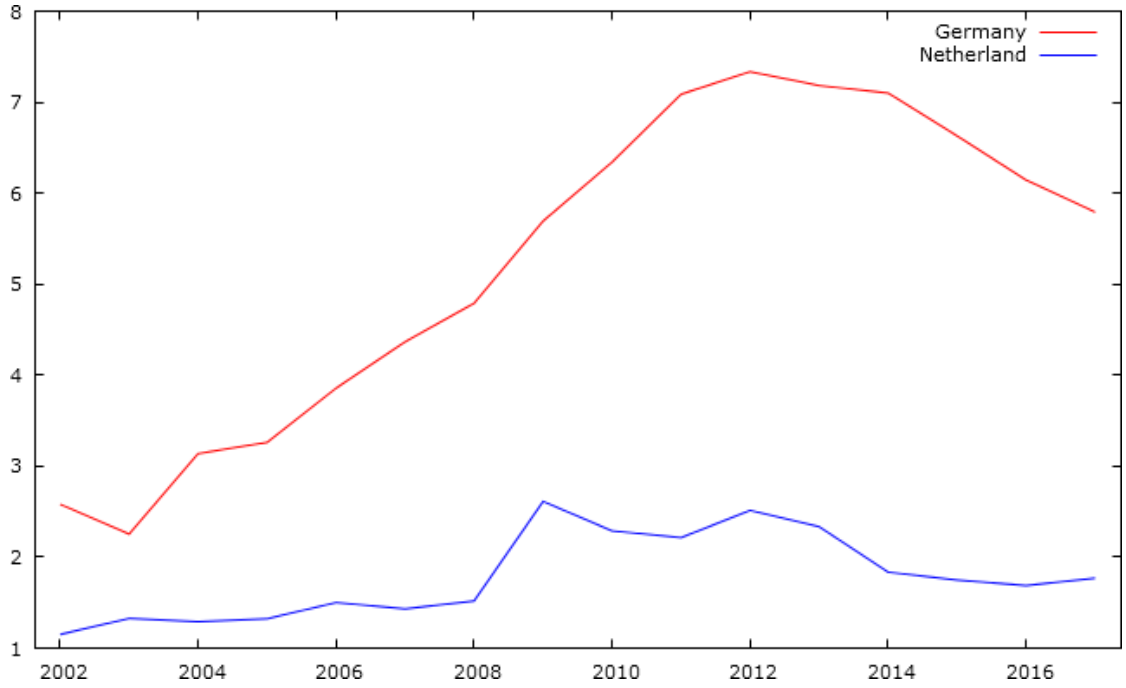

Figure 8. Transition function club 3.

In figure 8, it is noticeable that the savings levels of both countries do not share a common trend nor are they aimed at the same stationary state. In the case of the Netherlands, its savings level is very close to the average value of the panel, although it managed to double it in 2009. However, Germany has much higher savings rates than other countries, reaching up to 7 times the average value in 2007.

However, although we cannot include these countries within a club, we proceed to show in a table the evolution of the variable to make a comparative static.

	S0	SF	SV
Germany	2,582	5,792	124,342
Netherland	1,151	1,771	53,810
Simple avarage	1,866	3,781	89,076

Table 6. Initial, final and increase value of saving transition function club 3.

There is no doubt that the growth is remarkable, especially in the case of Germany, which in 2017 obtains a saving of more than double that of 2002. In contrast to the previous cases, accelerated growth and disparate trends between the two countries (main causes of non- convergence) prevail in these two countries.

The growth in savings in Germany has been motivated by an increasing trend in per capita income. The economic crisis in Germany has been transitory in nature, leading to high deviations from the trend (already observed in Figure 5 above) rather than to changes in the trend.

A similar situation as regards production has occurred in Netherland. Increases in per capita income mean increases in savings ceteris paribus. Therefore, if the expectations of the agents are not modified and the economy is believed capable of solving the critical situation, the crisis has a transitory effect. However, the accelerated growth of Netherland shows a decreasing rebound from 2013; unlike Germany that presents a greater stabilization of the variable with respect to time.

Thus, the results are different depending on the club we observe, making an economic integration impossible in a theoretical sense. In this way, we can think that the production functions are not similar in the countries and it could even be the case that the same functions are similar, in such a way that they never cross each other, causing some countries to have a systematically higher level of technology.

CONCLUSION

The results have shown us the differences that exist between the countries according to convergence criteria with reference to net savings from 2002 to 2017. Using a panel data structure, the convergence of the countries that make up the Euro as a currency has been analysed since its creation in 2002.

Thus, after ruling out absolute convergence with a statistical statistic 2.1138, less than the critical value -165, we have proceeded to verify the existence of different stationary states, that is, common points where the transition functions of countries are directed as a consequence of monetary and economic integration.

These clubs have been differentiated according to the method of Phillips and Sul (2009). This method discriminates according to a structural part and an idiosyncratic part. This structural part is known as the value added by a common pattern of growth among countries. While the idiosyncratic part is considered the distance of each country towards that common growth of the club.

The results have shown us three clearly differentiated clubs. The first club is made up of Austria, Belgium, France, Ireland, Luxembourg and Spain. Geographically, all of them are located in the western part of Europe. The commercial linkage caused by proximity may therefore have an impact on the similarity of economic characteristics.

On the other hand, the convergence is also influenced by the interests in the trade or investment of each country. Savings is a variable to be taken into account when measuring economic depressions, as it determines the purchasing power of the population. Therefore, when business relationships are affected for economic reasons, the consequences can be transferred directly into income and by extension into net savings.

For example, it is the case of Spain and Ireland that both have had problems in their banking sector (similar banking structure) and share bilateral commercial relations such as Plan Galicia (2013) where Galician products were promoted to Ireland as well as tourism and relations between these two companies were favoured.

Another example of the choice of economic relations within Club 1 is the case of France with Austria. There has been some simultaneity as far as the economic cycle is concerned. France is one of Austria's best trading partners as it managed to export to Austria a 18.6% of its total exports, at most, in the period studied.

Moreover, the commercial relations between France and Belgium have been very close, considering Belgium as the best commercial partners of France and vice versa. However, Belgium is also strongly linked to Austria and Luxembourg (neighbouring country).

Thus, one of the reasons for the convergence of these countries that make up Club 1 are geographical proximity, commercial relations as well as the capacity to transmit work, capital and information.

Club 2 is made up of Finland, Greece, Italy and Portugal. Geographical proximity does not seem to be an explanatory reason for the convergence phenomenon. Rather, it is economic particularities that can explain the trend towards the same stationary state. All four countries have suffered (though perhaps not simultaneously) a clear economic

recession that has affected their savings levels. They have reached a minimum in their transition function, provoking a recovery of levels, mainly in the last periods studied.

Referring to figure 7 and table 5, Italy, Portugal, Greece and Finland have had to face economic difficulties regarding the bankruptcy of banks and multinationals as well as small and large enterprises, thus affecting the level of savings. In addition, countries have been prevented from making devaluations that accelerate demand, leading to further declines in output, interest rates and savings.

While it is true that there are convergence criteria known as Maastricht criteria (1992) (do not present a budget deficit higher than 3%, control inflation with a level below 1.5% do not exceed interest rates by 2% in the long term. However, these criteria may seem insufficient to satisfy the theoretical framework of the Optimal Monetary Areas (OMAs).

For example, in the case of Finland, despite having complied with the guidelines of the Maastricht Treaty (1992), they have suffered an economic and financial recession that has also affected their levels of net savings.

Thus, in order to form an Optimal Monetary Area (OMA), not only economic objectives are necessary, but also an industrial and fiscal integration of the countries. This requires heterogeneity in terms of industry and fiscal cooperation.

On the one hand, heterogeneity in industry as well as a large and diverse economy deter economic shocks affecting certain sectors of the economy. This proposal was developed by Mundell (1973).

On the other hand, tax cooperation does not refer to the implementation of common tax policies between countries. It refers to fiscal intervention consistent with the countries making up the Euro system. Given the full mobility of factors, each country's fiscal policies affect all of them. Thus, in order to promote absolute convergence, each country should implement its policy according to common economic needs.

For example, in table 2 we observe that as far as the savings variable is concerned, in the same year, some countries have had the maximum for the period studied, while others have suffered

the minimum. This is the case, for example, in Belgium and the Netherlands. The first suffers a minimum and the second a maximum in 2009. Thus, fiscal policies should not be the same as far as obtaining absolute convergence of the savings variable is concerned.

Finally, in the case of Club 3, there is no convergence between them or with other countries. After performing the Phillips and Sul method (2009), the results have shown that there is no type of convergence.

As a result, in club 3 there have been differences in the savings values as well as in the evolution of the same. This causes a divergence phenomenon that may be undesirable from the point of view of the Currency Optimal Areas.

For example, Germany, which is considered to be a European power. This means that it has a high weighting as far as the indicators of the Maastricht Treaty are concerned. Mainly to control inflation, exchange rates and the long-term interest rate, Germany is taken as a reference.

As far as saving is concerned, it is a strict variable as far as the conditions of the Treaty on European Union are concerned. Thus, the net saving, in this case studied per capita, is in the production function of the companies and therefore affects the demand and supply of goods as well as money. On the other hand, we can also find savings as a determining variable for the propensity to consume, modifying GDP.

Therefore, those countries with the highest level of savings and the highest purchasing power will acquire if prices remain constant.

Since the Eurozone convergence criteria are mainly aimed at controlling prices (although they also include the budget deficit, debt level and exchange rates), as well as the monetary policies carried out by the central bank; it is plausible that prices will remain stable within the Eurozone, in the long run, those countries that obtain higher levels of savings will have greater purchasing power.

As a consequence of the difference in the level of savings within the countries of the Euro system, migration patterns occur. One of them is the well-known "brain drain". The phenomenon consists of the existence of highly skilled migrants who tend towards more developed countries in search of employment related to R&D sectors.

This creates a difficulty for the country where the education has been invested. On the one hand, the investment made in the training of the student is lost. On the other hand, the country cannot benefit from the productivity increase generated by R&D investment.

In this way, a migratory pattern can be created that causes detriment to the most backward countries, if the full mobility of factors (criterion for achieving an OMA) is not accompanied by a similar industry within the countries that make up the OMA. Because it can cause a differentiation in the productive fabric of countries thus avoiding the heterogeneous economy commented by Mundell (1973).

Thus, the pattern should change through the cooperation of countries and given the free movement of capital, countries should adapt their fiscal policies not only to the needs of their country but also to the needs of neighbouring countries. The Maastricht criteria (1992) and the European Central Bank's commitments to maintain inflation will be able to ensure this, together with the liberalisation of sectors and the full flexibility of the market as well as the formation of a common culture that eradicates any gesture of xenophobia.

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