

# European Union and European monetary Union as clubs. The unsatisfactory convergence and beyond

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## SUMMARY OF THE PAPER

The first section presents the two economic theoretic paradigms that are the basis of the work i.e. e. Buchanan public choice club model as applied to Union of States and to Monetary Unions and convergence in neoclassic growth models, to derive the parameter of convergence. Then follow the mathematical model of measure of convergence based on Hamming distance algorithm, as for the convergence of the Economic and Monetary Unions of countries and the description of the parameters relevant for the club, which consist of those basic in the neoclassic growth model and of those basic in the economic constitution of the EU. The second section analyses the homogeneity-inhomogeneity trend and the stability-instability trend of the five main Eastern EU States – i.e. Bulgaria, Check Republic, Hungary, Poland and Rumania – and of the five Western EU States –Germany, France, Italy, Spain and UK. The third section presents the weight of the parameters and of their spreads to single out those that are determinant in the convergence- divergences. In the fourth Section, we compare the results obtained for the EEU main countries with those of the WEU main countries. The results obtained in the paper signal the need of changes in institutions and policy tools more coherent with the market economy requisites of the theoretical models of the two clubs.

### SECTION 1

#### **Plan of the paper. Buchanan Public Choice Theory of Clubs applied to Union of State and Monetary Unions and European Unions and Euro Area.**

1.1. In this the first section, we first present the two economic theoretic paradigms that are the basis of this work: Buchanan public choice club model as applied to Union of States and to Monetary Unions and convergence in neoclassic growth models, to derive the parameter of convergence. Then follows the mathematical model of measure of convergence which we adopt, based on Hamming distance algorithm, as for the convergence of the Economic and Monetary Unions of countries, here considered, taking account of the Caputo memory formalism. The section ends with the description of the parameters relevant for the club, which consist of those basic in the most updated version neoclassic growth model and of those basic in the economic constitution of the European Union.

In the second section, on the basis of the mentioned model, we examine the homogeneity-inhomogeneity trend and the stability-instability trend of the five main Eastern European States belonging to the EU – i.e. Bulgaria, Check Republic, Hungary, Poland and Rumania – and of the five Western European states of EU -Germany, France, Italy, Spain and UK.

In the third section, we examine the weight of the parameters and of their spreads to single out those that are determinant in the dynamics of the divergences and in its structure.

In the fourth Section, we compare the results obtained for the EEU main countries with those of the WEU main countries.

In the Conclusions, we summarize the results obtained as for the convergence-divergence patterns in the 2003-2011 period. We found that convergence with growth did develop before the great financial fluctuation; then divergence spread out; convergence, then, reappeared, cum semi-stagnation. GDP's resulted as the dominant parameters, while GDP per capita as the least important.

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The results obtained signal the need of changes in institutions and policy tools more coherent with the market economy requisites of the theoretical models of the two clubs.

1.2. Our paper studies the issue of the viability of the club approach as for the states member of the EU Monetary Union. The “club approach” is used in the economic literature in different meanings\*. Here we refer to James Buchanan seminal theory of club goods and of the Governments as clubs offering a single public good or a set of public goods to their members (Buchanan 1965 and 2001a)\*. Those who belong to a given public goods club may get the common benefits of the goods that the club offers, but must accept the price rules and the other rules of the club required to enable its members to get the common usage without harming the other users. In addition, there may be a conflict among the users on how the public good should be shaped. A given shape may please some member of the club and harm other members. In between solutions might distribute the harms i.e. the external diseconomies among all members, in an attempt to minimize it\*. Thus the appartenance to a given public good club implies direct costs as prices and taxes for the production and maintenance of that public good and indirect costs consisting in the external diseconomies undergone in the usage of it. In the case of a multiple public goods clubs supplying goods with different benefit-costs relations, a would-be participant, should weigh the benefits and costs of each of them to assess whether the net benefits from the public good whose gross benefits are higher than the costs of the goods whose costs exceed the gross benefits.

A toll motor way may be the example of a single good club that may be present in the market economy and in the public economy. Those who do not like the price charged and the external diseconomies to undergone in the usage, may not enter in it. An example of multiple public goods in market and public economy may be a school. Some courses, from the point of view of a given attendant, may give a net benefit while other courses may have a cost in the time and efforts required that exceed their benefits. If the net benefits does not exceed the net costs of the attendance plus the fee, one has no reason to apply to that school. If is already attending to it, should opt out, in a roper moment, to apply to another school, more suited to him or her or—in is not a compulsory course, should adopt other choice. Compulsory schools are an example of multiple clubs, for whom the only option available is to chose one of the club supplying them. In this case the freedom of choices increases the more number of available club increase, the more their supplies and the composition of their members, as for their relevant characteristics and preferences varies and the more the entrances in the various clubs and the opting out are easy.

Territorial Governments, at the central state, regional and local levels may appear as clubs of this type, as for and the individuals and firms who are obliged to choose one of them. On the other hand, the Union of sovereign states are more similar to non-obligatory schools.

1.3. The Union of States, however may be either clubs supplying only one good as Nato, that offers the public good of reciprocal external defense or the WTO that offers the public good of fair international trade and the International Monetary Fund that offers the common good of international monetary stabilization and assistance. United Nations offers, in a weak way, the public good of political international order. A monetary union among sovereign states, i.e. a Currency Union, is, per se, a multiple public goods club providing two joint public good of the common currency, those

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\*1 Clubs (here referred to the countries, in other studies referred to the local entities of a given country) has assumed different meanings from the time of its employment by W. Baumol (Baumol 1986). Some ambiguity relates to the subjective component of the paradigm: i.e. notion of club. This notion tends to have two meanings: one proper and the other figurative. The proper concept of club refers to the club as an institution providing (public) services, endowed of an own regulation and of a procedure for the admittance of the members. The figurative concepts refers to the club as a statistical notion, of a cohort of subjects statistically similar, as for given characters. To be unambiguous, one, for this figurative meaning, may use the word “cluster”.

\*2 The theory of club goods has had a broad theoretical development and diverse application [see Pauly (1970a) and (Pauly 1970b), Berglas (1976), Sandler & Tishart (1980), Breannan & Flowers (1980), Casella & Frey (1992), Cornes & Sandler (1996), Sandler & Tishart (1997), (S.Scotchmer,2002)].

\* Cfr. See Fedeli and Forte (2002), with Comment by Chakrawarty and Skott (2002)

deriving from the reduction of the transaction costs as for the internal transaction and those deriving from the external ones, i.e. reciprocal external economies as for the monetary but may also imply external diseconomies due to the imperfection of the rules club and to imperfect application of them, by the Union political authorities and by the Central Bank .

The Currency Union is a club. Therefore it differs from a mere Currency Area, which consists of two or more countries that share a common currency because one or more of them have decided to peg their exchange rates to the currency of another country, in order to keep the value of their currency at the level of that country. In the mere Currency Area, there might be a pact of cooperation and for in the monetary policy between the country that issues principal currency and the country who have pegged their currencies to it. This is what takes places, in different ways, between the Vatican State or San Marino Republic and Italy and the Monaco's State and France, and therefore with the EMU, as for the euro.

One of the main goals of a Currency union is to synchronize and manage each country's monetary policy. The Vatican State, San Marino and Monaco are not "agent" and "principals" of the ECB, the Central Bank, regulating the euro as the central banks of a "monetary union".

The fact that a Monetary Union as a club supplies monetary common goods for the members of its currency area, as for their internal and external transactions, means that it has supply the public good of regulation of the banks of the states, member of the Monetary Union, because most of the money is circulated and created by banks. This regulation may assigned to its Central Bank, as in the EU or to an autonomous ad hoc authority. The public good shared, i.e. the common currency provides to all the members of the club the benefits of the trade with the same currency in the internal market and in the external transactions with the markets of countries in other currency areas.

1.4. James Buchanan has hinted that EU and EMU may be *viable* monetary clubs [See Buchanan (1990 in 2001b), Buchanan (1995 in 2001b), Buchanan (1966 in 2001b) and Buchanan (1997 in 2001b)]\*.

However, Buchanan's basic club model assumed that the members of a club are free to move to another club, while, as we shall see, this principle hardly can be applied to a monetary union. Wohlgemuth and Brandi (2010), has considered monetary union among states as clubs in an evolutionary conceptual perspective by more problematic conclusions.

However, like the supply of defense or justice, the supply of this common good gives different benefits and harms to the various members, in relation to its specific modalities, as for the basic principles chosen and their concrete application. For the currency, the benefits and harms, obviously, derive from the monetary rules fixed in the chart of the club and from the degrees and modalities of their practical application by the central bank. The preferences as for the level of the inflation rate may differ among the electors of the different countries, even if all of them share the view that the common currency, basically, should have a low and as far as possible stable change in the price level. The inflation rate, emerging in the monetary union, may not have the same effect in the various countries, if their nominal wages and the behavior of their budget parameters differ.

Countries with higher nominal deficits and public debts ratios to GDP may prefer a higher price level than countries with low deficits and low debt/GDP ratios. The central bank interest rate may originate different interest rates in the different countries. In addition to the fact that the benefits and costs of any given shape taken by the supply of the good "common currency" as for the internal market, there are different benefits and costs, for the individuals and firms of the different countries of the club, as for the external transactions with individuals and firms the other currency areas.

However, Buchanan's basic model refers to Union of states, conceived as clubs that , as in Einaudi model of a Confederation of states, retain their own money and their money with a Central bank responsible of the monetary policy, so that a competition would develop among the various currencies inside the Union.

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\* Seed also Ohr (2003), Ahrens, Hopen and Ohr (2005), Mora (2005).

He defined his model as that of a Confederation rather than that of a federation. Actually, EU it is not a Confederation in the proper sense of the word, because the Government of the Union has no domestic fiscal power, nor supplies own common goods of order (i.e. defense and justice) or own infrastructures. Its public goods are only law, external fiscal power and money.

1.5. For James Buchanan the virtue of fiscal federalism consists in the conception of the member states as competitive clubs. A competitive Union of states does not need to be a federation or confederation, i.e. an operational Government as contrasted to a mere regulatory Government, which supplies merely law goods and does not levy any tax.

The present model of the EU has a budget of no more than 1% of the GDP of the Union and consists mostly of an agricultural budget and of structural Funds of the less developed parts of the Union. It differs from the federal or quasi-federal models also because it is Club of Clubs.

Generally, Clubs of Clubs of Governments are multilayer organizations with a Federal or Confederal Government or a Union of states at the top and members that are Federations of States or Unitary States with a Central Government and some Autonomous Regions and/or lower level Governments.

The peculiarity of the EU as a Club of Clubs is that consists of two clubs, without barriers among them. One is a mere regulatory club and the other EMU offers additionally a common money. Individuals and entities member of it may move in and out of the two clubs, with their capital, their labor, their enterprises their residence.

There is another basic difference between the EU and EMU, and Buchanan's Clubs Theory of Government, relating to the possibility of opting out, for the communities who belong to one of these clubs. i.e. to secede.

More generally, the secession of a community with its territory is a complex issue. Here two additional related problems arise: the persistence of the club if some of its most important members secede and the credibility of the supply of some of the basic common goods offered by the club, if the secession of its members is possible.

For a monetary union, whose basic common good is the common currency, obviously, the possibility of secession implies a deterioration of the supply of that good.

Multiple goods clubs of private and public economy may offer goods optional in the provision as well as in the cost. The members who do not want them are not obliged to get them. However, any multiple goods club necessarily also offers goods that cannot vary "à la carte", and does not offer other goods, prevented by the statutes of admittance and of permanence in the club.

In the Simple Multiple Club model the Union of States as EU or EMU, unlike in that of a Confederation or Federation, the Government of the Club has a limited fiscal policy because its budget is very limited. The redistribution policy is only a minor task of the club, and is mostly a task of the governments of its member states.

Moreover, the debts of the member Government are in their responsibility, the central government does not take care of them and does not issue debts for the member states. The Central Banks of the member states cannot buy debts of the member states in exchange for their money supply, because their monetary policy is divorced from the fiscal policy of the member states and the same is true for the Central Bank of the Monetary Union.

The evolution of EU as a SC (Club of States), in contrast to its evolution toward a Federation, implies an adaptation of its member states to the convergence to conditions in which they can survive develop without the supply of goods offered by a confederation or federation. Similarly, those who are member of a club of "vegans" must converge to a condition of fitness, in which they do not need eggs, milk and cheese or any food with them, not to speak of meat and fish. In other words, they must adapt to these constraints.

On the other hand, the Government of the club must adapt its supplies to these constraints and must adopt all the vegetarian surrogates that can virtuously replace the forbidden food.

1.6. Maastricht rules of admission to EU have five parametric criteria, which are mostly constraints:

1. The inflation rate of a given Member state must not exceed by more than 1.5 point that of the three best performing Member states in terms of price stability.
2. The annual government deficit must not exceed 3% of GDP [N-1].
3. Government debt must not exceed 60% of GDP [N-1].
4. Exchange Rate: Applicant countries must not devalue their currency. Member state must have participated in the Exchange Rate Mechanism under the European Monetary System (EMS) for two consecutive years before the examination, without severe tensions.
5. Long-term interest rates must not be more than 2% higher as those of the three best performing Member states in terms of price stability\*.

These constraints become more stringent under the EMU, because here the inflation rate under the control of the Central Bank of the club. The monetary policy of EMU, unlike that of the Federal Reserve of US, it is primarily addressed to the objective of monetary stability. Only subordinately it may pursue the employment objective.

This means that the Central Bank does not take in consideration the Philips curve. In this curve, under the assumption of rigid wages conditions, the level of employment depends from the level of prices so that an increase of the inflation rate may help to increase the employment level, by overcoming the obstacle of too high nominal wages. The member countries must take the low inflation rate as given in their international trade internal to the common currency.

Furthermore, in the EMU it is excluded any currency devaluation that derogates to the monetary stability objective. To achieve full employment the member countries cannot count on cuts in the real wages by an imported inflation that reduces the labor costs in foreign currencies.

And since the rate of exchange of the EMU with the other currencies is, to a large extent, determined by the degree of competitiveness of the best performing countries, the rate of exchange, from the point of view for the other countries is similar to that of a fixed exchange rates: they must take this rate as given .

Because the variable "rate of exchange" is frozen, some other variable must be "free", in order to achieve the GDP growth and a high level of employment: labor contracts must be flexible to adapt to the fact that the rate of exchange is given.

The tax burden and other constraints on capital must converge with those of the best performing countries to allow a high rate of profitable investment. Clearly, to overcome the differentials in the other factor costs, *labor in this model of Monetary Union must be flexible, to achieve growth and full employment.*

1.7. With a multiple clubs set, in Buchanan's theorization of Union of States as clubs, any community member of one of the various clubs is free to choose the club that matches their wants. However, in the EU, member states deluded by the membership, unlike in the Buchanan's model, cannot always decide to opt out.

They may be obliged to stay in the club, by a decision of the majority if it believes that their exit would damage the club endowments for some of its main goods. This may be particularly true as for a Monetary Union whose main common good is the supply of a money as "stable purchasing power entity". But also the secession from the Union of states which is not a monetary union may not be allowed to a member state if the majority of them believes that it may endanger a main common good, i.e. external security or access to the sea or important natural resources.

On other hand while for the mere participation to a non-monetary club the cost of leaving may be limited, the exit of a state from a Monetary Union *to which is unfitted* may be enormous not only when the exit has been decided, but also and even more, when it may appear likely.

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\* In addition to them there are qualitative criteria:

I) geographical appartenance to Europe; II) institutions guaranteeing democracy; III) institutions guaranteeing the rule of law; IV) respect of the human rights; V) respect for and protection of minorities; VI) functioning market economy; VII) capability of coping with the competitive pressure of the market economy; VIII) acceptance of the Community *acquis* laws in line with the EU legislation; IX) commitment to adherence to the aims of political, economic and monetary union.

This is so, because all the obligations in the common currency of the members of the state that may leave that Monetary Union appear at risk of devaluation. On the other hand, the states who appear “over fitted” for the Monetary Union may have a revaluation when the weak states may appear to be obliged either to fit or to leave.

To sum up, the governments of the countries that do not converge to the virtuous path, that allows to exploit the positive factors of growth offered by the club, cannot opt out, because the short and long term costs of leaving the EMU would appear too great and because they may be obliged to stay. If they do not conform to the rules of the club, stagnation shall, at best be, their destiny. On the other hand, the countries over fitted may decide to leave the club if it becomes inadequate to them.

Therefore, Buchanan’s option of secession of Government here is asymmetrical. The situation as for the choice of the membership to EMU is similar to that of the contract of Faust with the devil. The first step is voluntary, the further ones are obligatory

The situation may be different for the firms and to an extent for the citizens of the “not virtuous” countries of EMU, who diverge from the conditions necessary to benefit from the participation to it. Indeed the citizens may migrate to or put their main stable residence to other countries of the EMU or of SC or to outer countries that offer them better labor opportunities, may invest their capitals in the financial institutions of other places inside and outside the union where the conditions appear to them more favorable.

The firms may externalize their production in other states of the club or elsewhere or /and opt out. These choices may sometime appear as positive sum games both for the individual and firms that opt out of the not virtuous countries of origin and for these states. Thus, they foster the convergence. In many other cases they may produce negative effects for the not virtuous state aggravating its situation of divergence.

An example of the positive sum game may be the outsourcing practiced by the firms of the not virtuous countries to other places inside or outside the EMU and the EU, that allows these firms to grow and to increase their exports from the home country. An example of a zero or negative sum game may be that of the capital outflows from the EMU not virtuous countries. Notice that similar choices inside and outside the EMU may be done also by citizens and firms of the virtuous countries to better exploit the opportunities of the EU club. Generally, these options are positive sum game, increasing the convergence both for the individuals and firm and for the countries of the EMU, and the countries of EU not in EMU or in EMU where they transfer the factors of production or productions.

1.8. Convergence in endogenous and exogenous growth models. “Clubs convergence” – first employed by W. Baumol 1986) – has several different meanings\*. Some derive from the ambiguity of the subjective component of the paradigm: i.e. notion of club, referred to the countries, in other studies referred to the local entities of a given country and so on. This subjective notion tends to have two meanings one proper, the other figurative. The proper concept of club refers to the club as an institution. The figurative concept refers to the club as a statistical notion of cohort of subjects in which one finds the ones statistically similar for given characters, i.e. the “clusters”. The concepts and formulas of convergence in relation to growth, traditionally have been dealt with the analysis of the behavior of the neoclassical exogenous and models of economic growth respectively of Solow and of Sala y Martin.

In Solow model [Solow (1956), Mathunjwa and Temple (2007) and Barro & Sala y Martin (1994), Chapter 1] there is only one final commodity that represents GDP as a whole consumed and produced in the considered country, under a fixed rate of saving. This rate generates a fixed rate of

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\* See Dorwick & Duc Tho Nguyen (1989), Barro & Sala y Martin (1992), Barro & Sala y Martin (1994), Galor (1996), Ben-Daviv (1996), Evan & Carra (1997), Ben-David (1997), Ortiguera & Santos, (1997), Reiss (2000), Dowrick & A.J.B De Long (2003), Islam (2003), Lee & McAleer (2004), Busetti, Forni, Harvey & Venditti (2006), Cunado, Gil-Alana & Perez de Gracia (2006), Fischer and Stirbook (2006), Mathunjwa and Temple (2007), Cavenaille and Dubois (2010), Caputo (2014).

investment of capital (together with the depreciation rate on the previously invested capital). The economic growth, then, is determined by two paramount factors: the given endogenous rate of accumulation of capital “k” under a diminishing return hypothesis and the technological progress taken as exogenous. Under a given stage of technological progress, soon or later, is reached the stationary state.

Under the same stage of technological progress, taken as invariant and the same ratio of net k to GDP also taken as constant, the “high GDP” countries (H countries) that have started to grow in the past shall have a slower rate of growth than the emerging countries E with smaller GDP level, that started the growth process more recently.

This needs to happen in the model because the rate of return on k of H it is systematically lower than that of E. Therefore, considering a group of countries E, at relatively low level of GDP and another group at of countries H at a higher level, the convergence path shall be assured, if S/GDP and, therefore, K/GDP of the E countries is = or > than that of H countries\*.

1.9. The model is oversimplified. Convergence is not granted, nor necessarily in that way. Return to capital may not need to be decreasing, it may be increasing, while the amount of saving may need not remain constant, it may increase for low-income countries during a rapid growth period. It may, then, tend to diminish, in the maturity, slow growth period, with an increased welfare.

On the other hand, Capital does not consist only of material KM, it is also relevant the human capital KH. Furthermore, technologies change as result of the investments in KM and KH. Research and Development (RD) expenditures are important, together with the expenditures on education. As argued by Barro and Sala y Martin (1994), in the lower income countries the endogenous growth with constant return and gradual diffusion of technology may give origin to a sustained growth with a tendency to a slow decline that may explain the convergence.

Labor productivity may increase, if there is flexibility in the labor supply and the level of skills increases in the industrialization process. The marginal price of labor is an important variable. This variable intrinsically differs in the H and E countries, because an high average income implies also high average wages and personal service prices and a low average income implies also low wages and low service prices.

In a SC and in a MUC with a single market the firms of H will flow MK and HK to the E countries to decentralize there their production, because even if their productivity is lower, cannot be not so lower if they adopt there their technologies and send to E some of their HK. Therefore, the opening of the international market shall increase the returns, and Economic Unions and Monetary Union may enhance growth.

However divergence may reappear both inside the H and E countries and between them, before the full convergence has been realized, for a host of factors [for EU and EMU as club see T. Mora (2006)].

Growth – as argued by G. Dufrénot, V. Mignon and T. Naccarato (2010) – may be characterized by “heterochronic” changes better explained with “biological models” of growth. Organizational process underlying growth – government policies, industry clusters, market organization, civil relationships, etc. – has varying permutations of new and old institutional relationships and strikes differently according to cultural, history and political systems.

To this effect it may be interesting to consider the 12 factors of competitiveness, that may generate growth, according to the Global Competitiveness Index of the World Economy Forum, designed by Xavier Sala Y Martin\*. In the third pillar of this model, we have monetary stability, as

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\* See Islam (1995), Caselli, Esquivel and Lefort (1996), Bernanke and Gurkaynak (2001), Masanjala and Papageorgiou (2004), Beaudry, Collard and Green (2005).

\* The WEF Competitiveness Model is articulated in 3 stages: A) the first stage – *factors driven* – proper of low income countries is characterized by 4 classes factors: 1) Institutions, 2) Infrastructures, 3) Macroeconomic requisites, 4) Health and primary education. B) the second stage – *efficiency driven* relating to middle income countries – is characterized by other 6 classes of factors: 5) higher education and training, 6) goods market efficiency, 7) labor efficiency, 8) financial market development, 9) technological readiness, 10) Market size. C) The third stage relating to the high income countries – *innovation driven* – is characterized by two factors: 11) Business sophistication and 12)

given by the low but positive inflation rate, and fiscal soundness , which means small public deficit/GDP and moderate debt/GDP. An important factor of sound finance that has emerged in the most recent studies on macroeconomic stabilization and growth is the level of taxation which, obviously, at given level of deficit/GDP, depends from the level of the public expenditure (see Forte and Magazzino 2011).

1.10. Following Caputo on the role of the memory (see Caputo 2012), the habits of the past agricultural society in which high savings and hard labor were necessary, may be gradually lost in the consumption society. The decline of savings /GDP and of the hours of work reduce the rate of growth. On the other hand, the adoption of new technologies and institutions and the development of human capital may be eased by the decline of the memory of the customs of the past. The combination of the two conflicting roles of the positive and negative memory of the past may lead to different results.

Furthermore, monetary and financial factors, with their fluctuations, do matter too, in market and public economy operations. Divergence may reappear in H and E Clubs of countries and between them for a host of reasons. For EU and EMU as Clubs see T. Mora (2006); for OECD countries see J. Le Sun (2010). Nevertheless, a viable model must consider only basic general factors.

Combining the basic economic growth theory and the basic rules of EU constitution, we study the degrees of convergence of the EEU and WEU clubs with the following parameters.

**TABLE 1. THE PARAMETERS TO ASSESS EEU AND WEU CLUBS CONVERGENCE**

1. GDP rate of growth	9. VA agriculture/GDP
2. GDP per capita	10. VA Industry /GDP
3. Inflation rate	11. Public Expenditure/GDP
4. Unemployment	12. General Government deficit/GDP
5. Labour product per person	13. Balance of Payments
6. Labour product per hour	14. Balance pf payments-Current
7. Investments/GDP	15. Bond Yelds
8. Gross savings/GD	

The first 8 parameters, with exception of the third, are the main variables of neoclassical real growth model, with the exception of the “inflation rate”, a Maastricht monetary variable which measures the degree or rigidity of the supply of the factors of production (particularly labour). The next two are specifications of the neoclassical growth parameter. Parameter 9 signals the stage and structure of the economy and is particularly relevant for the memory factor .It is also particularly important as for the EU Club own budget and interventions. Parameter 10 too is particularly relevant as structural indicator of development. The next 5 parameters plus parameter 3 are the financial parameters of the Maastricht treaty and of the fiscal compact as for the fiscal, monetary and financial equilibrium.

**1.2 The Index of Divergence of members of the EU clubs.**

To measure the degree convergence-divergence of the countries of the considered clubs and the degree of homogeneity of the club we adopt a Club Divergence Index (CD-Index) which measures the distances among the various countries with an algorithm somewhat different from the Hamming distance algorithm. Our Index of Divergence differs from the Hamming algorithm because the strings of the Hamming distances are fixed and given, our distances are variable and interact through time,

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Innovation. The 12 pillars competitive model introduces in the endogenous growth model more variables and some of them, as “Institutions” and “Innovations” have a discontinuous behavior affected by shocks. The shocks in the institutions may be driven by their reforms while those in the innovations may be due to discoveries.



as we measure a dynamic phenomenon of evolution. Hamming standard deviations are normalized on average values; those of our index are normalized on the maximum values. Hamming measures a geometric figure, we measure as the geometric figure changes, so that we have not only standard deviations from the maximum distances. We also have standard deviations of the standard deviations.

We consider the yearly values  $U(t)$  of the sum of all the distances of the parameters  $p_j$  between the 5 members of the club as the measure of the degree of Club Divergence.  $U(t)$  is the sum of the values  $U_i(t)$  which give the distances of the  $p_j$  parameters of each  $i$ -th member of the club to the other members. To measure the instability of the clubs we shall consider the standard deviation of the values  $U_i(t)$ . In geometric terms  $U_i(t)$  is the sum of the geometric distances of the  $u_{(n)}$  parameters of the  $i$ -th member from the others.  $U_i(t)$  is the measure of the club itself, that is the sum of the distances between all the  $p_j$  of all club members\*.

Obviously, the distances obtained are only abstract tools and so far we may compare the different economies and finances with the understanding that larger values of  $U(t)$  imply relevant differences among them.

The spread (standard deviation) of the distances is obtained normalising each parameter  $p_j$  to the yearly maximum value of its norm, acquiring a new set of normalised parameters  $q_j$  and considering the set  $x_{ik,j}$  of the couples of difference of the normalised parameters  $q_j$ ;  $p_j$  is then substituted with

$$(3) \quad q_j = p_j / |p_{j \max}|$$

where  $q_{ij} \leq 1$  defines a new Cartesian space.

We first assume the case when all parameters  $p_j$  have positive values and consider the differences

$$(4) \quad x_{ik,j} = q_{ij} - q_{kj}$$

with  $|x_{ik,j}| \leq 1$  which are the components of an abstract distance between the economy identified by  $k$  from that identified by  $i$  relative to the parameter  $j$  in the Cartesian space of the parameters  $q_j$ .

From the definition (3) follows that

$$(5) \quad \sum_{j=1}^n [(p_{ij} - p_{kj}) / p_{j \max}]^2 < n$$

or

$$(6) \quad D_{ik} = \left[ \sum_{j=1}^n [(q_{ij} - q_{kj})]^2 \right]^{0,5} / \sqrt{n} < 1$$

where  $D_{ik}$  is the abstract distance of the economies  $i$  and  $k$ . in the Cartesian space defined by the parameters  $q_j$ .\*

\* The evolution of the 5 club members considered here has already been tentatively studied using 29 parameters taken almost at random among those available in the 3 years 2000, 2005, 2010 (Caputo 2014); but the results, mostly

due to the limited resolution of the data, but also to the limited time interval used, were inconclusive  $|x_{ik,j}| \leq 2$ .

\* The normalizing factor of  $D_{ij}$  is obtained considering first the case when all parameters assume non negative values and  $m$  is even: if the values of the parameters of a given subset of  $u < m$  of the  $m$  economies of the set are unity and all the others are zero, then the sum of all the  $m(m-1)/2$  distances is  $n0,5u(m-u)$  whose maximum is obtained when  $u = m/2$  which gives the distance  $m2 n0,5 /4$ . If one, or more than one, of the zero value parameters were to assume a positive value the sum of the distances would decrease. The same applies also to the case when the values are smaller than 1. The case when  $m$  is odd is obtained with the same procedure. It is seen that when all parameters assume non negative values the sum of the distances  $D_{ik}$  is smaller than

(7)  $n0,5 m2/4$  when  $m$  is even  
 $n0,5(m2 - 1)/4$  when  $m$  is odd

## SECTION 2

### Trends of Clubs convergence-divergence and Countries' correlations

#### 2.1 GDP growth of the EEU and WEU countries from 2000 to 2013 and the patterns of the Club Convergence Index U(t).

Table 2 shows the GDP growth rates of the countries of the EEU and WEU club. As one can see from Table 2, the average GDP growth rate of the EEU club is much higher than that of the WEU club – 3.3 as against 1.2 – as one may predict on the basis of the neoclassical growth models of convergence.

From 2001 to 2004, the average growth of the EEU Club fluctuates between 3.6% and 4.5%; then, until 2007, between 5.1% and 6.3%, with Hungary in quasi 0 growth rate already in 2007. In 2008, the average growth rate of the EEU falls back to 4.5%, with a small recovery of Hungary at 0,9 and Czech Republic at 3,1 while Bulgaria, Poland and Romania are still booming.

In 2009, there is a severe recession in most EEU Club countries, the only exception being Poland. After the average negative growth rate of 4.4 of 2009, there were two years of gradual recovery of 1.4% and 2.4 % with Romania still in recession in 2010; then the average growth rate falls back to about 0.8% because Bulgaria and Poland growth go down, Czech Republic and Hungary fall back in recession, while Romania as a small recovery.

In the WEU club between the 2001-2005 there is a period of growth between 1.3 and 2.3%. Then in the 2006-2007 period there is an upward cycle of 2,9-3%, followed by a recession in the 2008-2009 period, a small recovery in 2010-2011, and an new period of average recession in the 2012-2013 period, with Germany and UK immune and Italy and Spain as the worst performers.

**TABLE 2.**  
**GDP GROWTH IN REAL TERMS 2000-2013 of EEU and WEU COUNTRIES**

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
Bulgaria	5.7	4.2	4.7	5.5	6.7	6,4	6,5	6,4	6.2	-5,5	0,4	1,8	0,8	0,9	3.6
Czech Rep.	4.2	3.1	2.1	3,8	4,7	6,8	7,0	5,7	3,1	-4,5	2,5	1,9	-1,3	-0,4	2.8
Hungary	4.2	3.7	4,5	3,9	4,8	4,0	3,9	0,1	0,9	-6,8	1,3	1,6	-1,7	0,2	1.6
Poland	4,3	1,2	1,4	3,9	5,3	3,6	6,2	6,8	5,1	1,6	3,9	4,5	1,9	1,1	3.6
Romania	2.4	5.7	5.1	5,2	8,5	4,2	7,9	6,3	7,3	-6,6	-1,1	2,2	0,7	1,6	3.5
<b>EEU CLUB</b>	<b>4.2</b>	<b>3.6</b>	<b>3.6</b>	<b>4.5</b>	<b>6.0</b>	<b>5.0</b>	<b>6.3</b>	<b>5.1</b>	<b>4.5</b>	<b>-4.4</b>	<b>1.4</b>	<b>2.4</b>	<b>0.8</b>	<b>0.7</b>	<b>3.1</b>
France	3.7	1.8	0.9	0,9	2,5	1,8	2,5	2.3	-0,1	-3,1	1,7	2,0	0,0	-0.1	1.2
Germany	3,1	1.5	0.0	-0,4	1,2	0,7	3,7	3,3	1.1	-5,1	4,2	3,0	0,7	0,4	0.9
Italy	3.7	1.8	0,5	0,0	1,7	0,9	2,2	1,7	-1,2	-5,5	1,7	0,4	-1,4	-1,3	0.4
Spain	5.0	3.7	2.7	3,1	3,3	3,6	4,1	3,5	0,9	-3,7	-0,3	0,4	-1,4	-1,5	1.7

which we, for simplicity, assume as normalizing factor of the distances. Finally, taking into account the possible presence of  $r$  parameters which may assume negative values and that the corresponding values of  $x_{ikrj}$  are subject to the limit, formulae (7) are approximated with

$$(8) \quad U = Dik / [(n + 3r)0,5 m^2 / 4] \quad \text{when } m \text{ is even}$$

$$U = Dik / [(n + 3r)0,5 (m^2 - 1) / 4] \quad \text{when } m \text{ is odd.}$$

U.K.	4.2	2.9	2.4	3,8	2,9	2,8	2,6	3,6	-1,0	-4,0	1,8	1,0	0,3	0,5	1.7
WEU CLUB	3.9	2.3	1.3	1.5	2.3	2.0	3.00	2.9	0.0	-4.3	1.8	1.3	-0.4	-0.4	1.2
EMU-Subgroup	3.9	2.2	1.0	0.8	2.2	1.8	3.1	2.7	0.2	-4.4	1.8	0.2	-05	-0.6	1.0

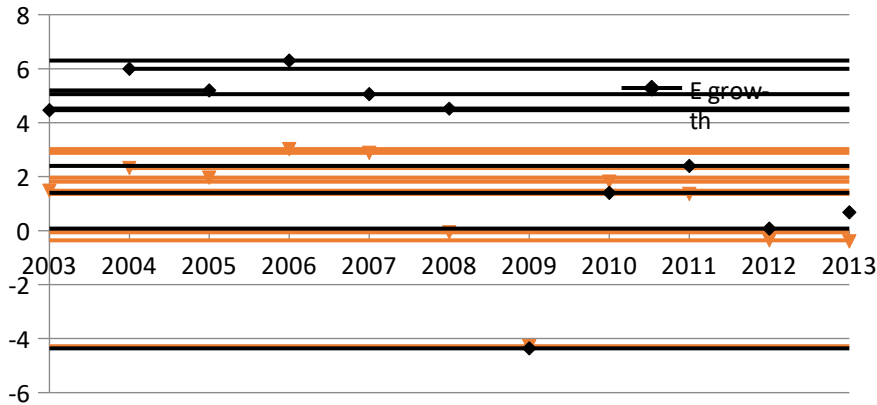
In Figure 1 we compare the patterns of the two growth rates curves of EU and WEU club in the 2003-2013 period. Clearly, they follow the similar pattern with a more pronounced fluctuation of the EEU curve which, as we have seen, has a much higher growth rate than the WEU curve. The profiles of the two curves tend to coincide in the subsequent period of recession and initial recovery, with that of the EEU club initially below that of WEU club. Then they remain similar and quite close one to the other, with that of EEU club above that of WEU. While in the boom period the two curves have a simultaneous behaviour, in the recession and in the subsequent shaky recovery period the pattern of EEU curve is somewhat retarded, allowing to recognize a sort of dependence from the pattern of the WEU curve.

The correlation between the two curves is 0,878: clearly very significant.

While the GDP growth patterns of the EEU and WEU club tend to be closely similar, the same cannot be said as for the pattern of the average rate of GDP growth and that of the Divergence index  $U(t)$  of the EEU and of the WEU club.

Let us now consider the pattern of the curve of the average GDP growth of the EEU club and that of the curve of  $U(t)$ , the Divergence Index of the club, as for 2003-2011 period.

**FIGURE 1. PATTERNS OF GDP GROWTH RATES EEU AND WEU CLUB 2003-2013**



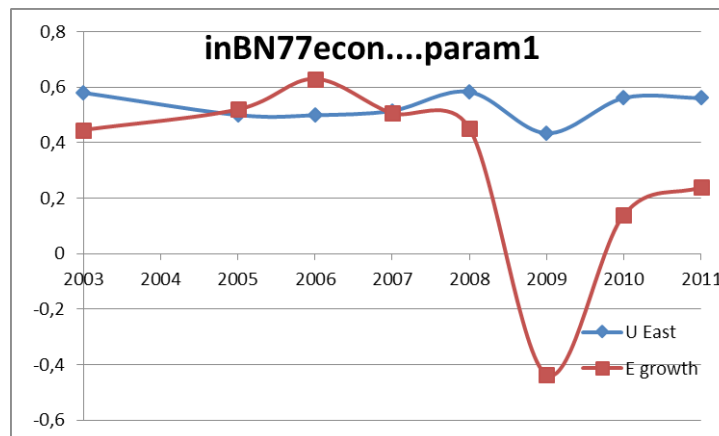
CD-Index of EEU decreases continuously from 2003 to 2006 while the GDP growth curve moderately increases fluctuating between 3,6 and 4,5 rates. In 2005 the two curves cross each other signally that the good GDP growth period was leading to the club to convergence. The pattern of the two curves is inverted in the 2006-2008 period of boom with the GDP average growth rate of the club fluctuating between 6 and 4.5, while  $U(t)$  has a tiny decrease, reaching its first minimum, while the CGD curve reaches its maximum. Then GDP curve decreases while  $U(t)$  curve increases. But then, in 2009, both decrease by a diverging gradient. In the recession, the Divergence Index reaches its minimum value. With the resumption of GDP growth, the Divergence Index increases again. This time however the GDP growth rate curve has only modest increases.

The correlation between the growth rate curve of EEU club and its CD Index curve  $U(t)$  is 0,350, a not significant value.

This lack of correlation appears to signal the lack of control of the exogenous financial cycle that hit the EEU club in the observed period, both by the national governments of the countries member of the Club and by the EU Government.

Notice that the exogenous cycle that hit the EEU club was mostly due to the dependence of the GDP growth of the EEU club from that of the WEU club, which emerges from the close correlation between the patterns the GDP growth rates curves of the two clubs and from the lagged behaviour of that of the EEU club.

**FIGURE 2. PATTERNS OF DIVERGENCE INDEX AND OF GDP RATE OF GROWTH-EEU CLUB 2003-2011.**



The Government of the EU Club, apparently, was not able to control the perturbations from one side to the other side the club, to smooth them.

## 2.2. Divergence and spreads of the EEU Club and of its member countries as measures of homogeneity and stability

Let us now compare (Fig.3), the pattern of  $U(t)$  of the EEU club and its average spread with the two curves normalized.

The patterns of the two curves are quite similar, with the spread curve somewhat lagged. It has its minimum in 2006, while the Divergence Index  $U(t)$  curve reaches a minimum level in 2005 and remains in it in 2006 too. Both curves have their maximum in 2008, the last year of the boom period.

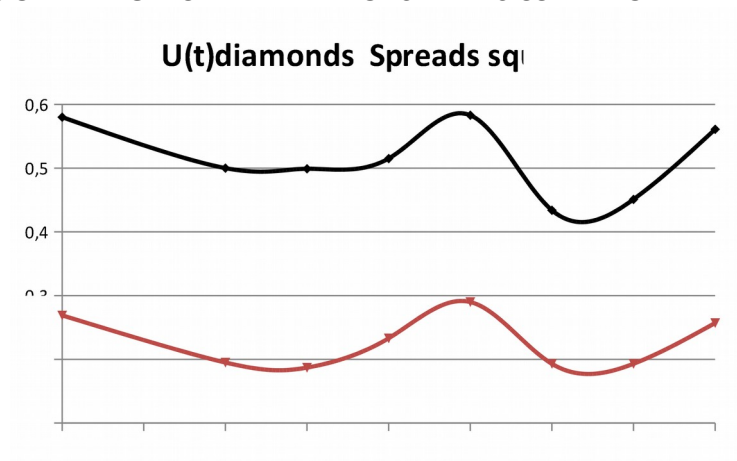
Both curves have in 2009 a new minimum, lower than the first one of 2005. However, while the CD index curve in 2010 increases, the spread curve resumes its upward pattern one year later, in 2011 signalling its dependence from the CD curve.

The similarity of the gradients in the pattern of  $U(t)$  curve and in the pattern of the average spread curve in Figure 3 is clear.

$U(t)$  curve increases until 2008 – the year of the peak of the boom – as the spread curve.  $U(t)$  curve minimum is reached in 2009-the year of recession- as that of the average spread curve.

An increased  $U(t)$  accompanies the resumption of growth after the crisis, because the degree of recovery differs among the countries member of the EEU club .

**FIGURE 3. PATTERNS OF DIVERGENCE INDEX AND OF SPREADS CURVE NORMALIZED-EEU CLUB**



The gradient of the average spread curve follows, with a lag, the same pattern and the increase of instability of the EEU club.

The correlation coefficient between  $U(t)$  and the average spread curve, as for EEU club, actually, it is 0,93.

2.2. Let us, now, consider the Divergence Index pattern, of the five EEU countries in the 2003-2011 period

For four of the five considered countries, the exception being Poland, the maximum of  $U_i(t)$  occur in 2008 year. Hungary and Czech Republic are leaders, with Bulgaria in a third distanced position. All the five countries have a steep convergence trend in the short period from 2003 to 2005. Then four of them (the exception being Poland) have a divergence trend with an increase of the inhomogeneity up to 2008.

After this year four of the five countries (Poland being again the exception) present a deep decrease  $U_i(t)$  with a bottom in 2009: the year in which these four countries, for the first time, have a negative GDP growth rate (see Table 2). Then  $U_i(t)$  values increase again for all the five countries.

However, in 2011 none of them reaches the 2003 levels. The  $U_i(t)$  of Czech Republic and Hungary lead the 2008 peak. Poland  $U_i(t)$  has a milder fluctuation: is at the 0,32 level both in 2003 and in 2011 with a bottom in 2009, while the other four  $U_i(t)$  are peaking.

In Table 3 we present the correlations between the  $U_i(t)$  of the countries of the EEU club in the 2003-2011 period.

**TABLE 3. CORRELATION OF  $U_i(t)$  OF THE COUNTRIES OF THE EEU CLUB**

<b>Bulgaria- Czech Republic</b>	<b>0.53005</b> <b>1 &gt;</b>
<b>Bulgaria- Hungary</b>	<b>0.50469</b> <b>1&gt;</b>
Bulgaria-Poland	- 0.61761 2
<b>Bulgaria-Romania</b>	<b>0.60170</b> <b>8 &gt;&gt;</b>
<b>Czech Republic-Hungary</b>	<b>0.94318</b> <b>2&gt;&gt;</b>
Czech Republic-Poland	- 0.343 594
Czech Republic-Romania	- 0.18916
Hungary-Poland	- 0.38952 7

A strong positive correlation actually exists between the  $U_i(t)$  of Czech Republic and Hungary. We also found a quite significant positive correlation between the trends of Bulgaria and Romania, and a significant correlation between Bulgaria and Czech Republic.

However, the transitivity principle does not operate as for Hungary and Bulgaria were, one the contrary, there is a weakly significant negative correlation of 0.50 plus some other fractions. A negative nonsignificant correlation exists between Hungary and Poland and Hungary and Romania while a negative correlation emerges as significant between Poland and Romania, so that here the transitivity principle operates, in the negative way.

Bulgaria and Poland too have a nonsignificant negative correlation, as if were idiosyncratic.

Czech Republic, Hungary and Poland in 2003 had a relatively low value added of agriculture – (3%, 4% and 3% of GDP respectively) – while Romania and Bulgaria had a high value added of agriculture on GDP (13 and 10%). The similar role of the memory of the traditional habits, generally less important for the urban population of the industrialized countries and more important for the rural populations may be an explanation of the positive strong correlations of  $U_i(t)$  of Czech Republic and Hungary and of the positive correlations of the  $U_i(t)$  of Romania and Bulgaria. These two more rural countries, actually, were able to join EU only in 2007.

A less pronounced – but remarkable – negative correlation exists between the  $U_i(t)$  of Bulgaria and Poland and of Bulgaria and Hungary too. The negative correlation between the  $U_i(t)$  of these two couples of countries may be explained by the different role of the memory in the two countries, due to the different role of agriculture, that may also explain why they were accepted in the EU in different times.

Generally speaking the  $U_i(t)$  paths of the EEU countries are not positively correlated as their average correlation is close to a zero value.

In the previous paragraph, we noticed the lack of capability of the EU institutions of taking care of the financial shocks between the Western and the Eastern sub clubs of its club. In this paragraph emerges that the EU institutions so far have had a limited control of the homogeneity and stability inside the EEU club.

### SECTION 3

#### Weight of the parameter in the divergence pattern of EU Club

##### 3.1. Weight of the *parameters* in the dynamics of the Divergence Index $U(t)$ of the EEU club.

Let us pursue the pattern recognition of the dynamic of the Divergence Index  $U(t)$  of EEU club by examining which *parameters* have been the most important in it and which have a similar pattern.

We consider as the most important, in the dynamic of  $U(t)$ , the parameters whose weight, in the average of the 9 years is at least  $(1/15) \times 110 = 0,73^*$ . The results are in Table 4

Two parameters present the largest effect on the path of the Divergence Index: GDP growth rate (Series 1 in Figure 4) and Government Deficit (Series 4 in Figure 4), with similar wide fluctuations in their behaviour and importance. GDP growth rate is leading the convergence up to 2007 (see Figure 4). In this year it has an impact of less than 0,06, while in 2003 its impact was around 0,08%. Similarly Government deficit which in 2003 had a level around 0,13 in 2007 has its minimum at a level slightly lower than 0,8. Its downward gradient is greater than that of GDP.

**TABLE 4. PARAMETERS OF EEU CLUB WITH AVERAGE EFFECT ON  $U(t)$  EQUAL OR LARGER THAN 0,75**

1.	Parameter 1	GDP rate of growth (Series 1 in Figure 4)
2.	Parameter 3	Inflation rate (Series 2 in Figure 4)
3.	Parameter 9	VA Agriculture (Series 3 in Figure 4)
4.	Parameter 12	General Government Budget Balance (Series 4 in Figure 4)
5.	Parameter 13	Balance of Payment Deficit/Surplus (Series 6 in Figure 4)
6.	Parameter 14	Current Balance of Payment Deficit/Surplus (Series 5 in Figure 4)

From 2007 year on GDP growth rate is leading the divergence pattern, with a peak at 0,16 in 2009, the year in which the Divergence Index of the EEU Club reaches its minimum. Notice, however, that the peak of the divergence of the budget precedes the peak of the divergence of GDP as if was causing it. Then both divergence parameters have a bottom in 2010, and peak again in 2011, with the peak of the divergence of the budget deficit systematically lower than that of GDP, as if the reduction of the divergence in the budget balance was paid with a greater divergence in the growth rates.

To sum up, in the period of economic and financial fluctuations of GDP, the Divergence Index  $U(t)$  for the EEU Club increases and the divergence in the GDP growth rates leads the  $U(t)$  increase.

A third parameter with important weight on the pattern of the Divergence Index of the EEU club is the inflation rate (Series 2 in Figure 4). Its trend, until 2007, is similar to that of the government budget balance. Then it follows that of the GDP growth.

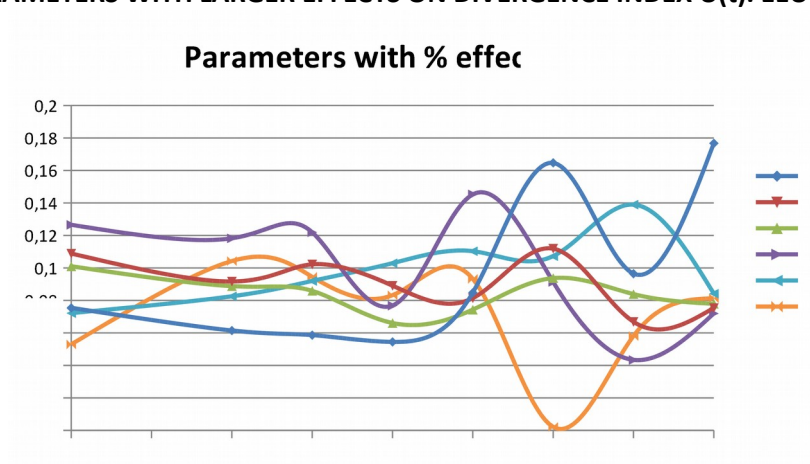
A fourth parameter whose dynamics presents similarities to that of GDP growth is the share of value added of agriculture on GDP (Series 3 in Figure 4), however with a smoother fluctuation. Its

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\* If each parameter had the same weight its average yearly value would be 1/15. Considering as most important the parameters that exceed the average value at least by 10% we have the average value of  $1/15 \times 110 = 0.733$ . See Caputo-Forte (2015).

weight reaches its top in 2009, as the GDP rate of growth and the budget balance. However, in 2011 is declining while the weight of the other four parameters are going up.

**FIGURE 4. PARAMETERS WITH LARGER EFFECTS ON DIVERGENCE INDEX  $U(t)$ . EEU CLUB**



### 3.2 The most important *spreads* of the parameters as structural measure of $U(t)$ of the EEU club.

Table 5 shows, with bold characters, which parameters do matter most in the structural divergence, considering those which, at the beginning and at the end of the considered period have a spread that contributes to the aggregate divergence with a share of more than 20%.

**TABLE 5. IMPACT OF THE SPREADS OF THE PARAMETERS ON THE DIVERGENCE INDEX OF EEU CLUB.**

Param.	STANDARD DEVIATION OF THE PARAMETERS								Stan.dev. of standardev.
	2003	2005	2006	2007	2008	2009	2010	2011	
1	<b>0,2477</b>	0,2181	0,1884	0,2464	0,3474	0,5032	0,4919	<b>0,6239</b>	<b>0,1616</b>
2	<b>0,2523</b>	0,2436	0,2294	0,2172	0,2553	0,2009	0,1906	0,1785 <<	<b>0,029</b>
3	<b>0,3788</b>	0,327	0,3628	0,3396	0,3234	0,3364	0,3011	<b>0,2806</b>	0,0314
4	<b>0,2977</b>	0,2518	0,2059	0,1656	0,171	0,1583	0,1583	0,1827	<b>0,0508</b>
5	<b>0,2587</b>	0,2044	0,1832	0,2164	0,2194	0,1718	0,1547	0,1962	0,0322
6	<b>0,2261</b>	0,1939	0,2235	0,1914	0,1979	0,2047	0,1942	0,1675	0,0188 <<
7	0,1228	0,1141	0,1185	0,1589	0,1901	0,085	0,102	0,1129	0,0334
8	0,1096	0,1422	0,1173	0,1587	0,1369	0,066	0,1318	0,1351	0,028 <<
9	<b>0,3515</b>	0,3169	0,3048	0,2534	0,2913	0,2818	0,2547	<b>0,2575</b>	0,0347
10	0,0824	0,094	0,0837	0,0854	0,1159	0,1129	0,1034	0,0941	0,013 <<
11	0,0952	0,1262	0,1378	0,0659	0,0875	0,0806	0,0962	0,1011	0,0234 <<
12	<b>0,4404</b>	0,4221	0,4329	0,3412	0,4853	0,2748	0,2457	<b>0,257</b>	<b>0,0945</b>
13	<b>0,2511</b>	0,2946	0,3264	0,3168	0,3459	0,3225	0,308	<b>0,3019</b>	0,0281 <<
14	0,1842	0,3721	0,3355	0,2033	0,3421	0,63	0,3831	<b>0,3213</b>	<b>0,1291</b>
15	0,1664	0,247	0,2498	0,1783	0,1986	0,2091	0,1922	0,1922	0,0301



These parameters in 2003 are the followings nine: GDP growth rate, GDP per capita, inflation rate, unemployment, productivity of labour per person, productivity of labour per hour of work, value added of agriculture, Government budget deficit, balance of payment balance.

In 2011, the spreads of parameters structurally more relevant were six, because four real economy parameters, i.e. GDP per capita, unemployment, productivity of labour per person, productivity of labour per hour were gone below the 20% level, likely because of the effects of real economy convergence factors as those described by the neoclassic economic growth models.

In the divergence pattern, as measured by the spreads, in 2011 remained important the following parameters, which were important in 2003 too: GDP growth rate, unemployment of the labour force, value added of agriculture, government deficit, aggregate balance of payment results.

On the other hand, in 2011, the current accounts balance of payment had entered in the group of the parameters with a value larger than 20%.

Two other parameters important in 2013, had an increased relevance: they are GDP growth rate and aggregate balance of payments.

On the other hand, three other parameters: i.e. inflation rate, government deficit, value added of agriculture, while remaining above 25% had a reduced relevance in comparison with the initial period. Likely, there has been some nexus between the increase in the divergence of GDP growth rate and the deflationary effects of the reduced inflation rate and of reduced budget deficit.

The EU fiscal and financial policy apparently was not very effective as for a convergence cum growth of the EEU club. The above observation it is reinforced by considering the standard deviations of the spreads: which are particularly high as for GDP, unemployment, government deficit and balance of payment, revealing a particularly relevant dynamic though time of these spreads.

For the pattern recognition is also interesting to check the correlation between the spreads and  $U(t)$  (see Table 6).

Correlations exist only for two parameters: productivity per person and investments, signalling that the patterns of most parameter are influenced by different perturbations.

**TABLE 6. CORRELATION BETWEEN  $U(t)$  AND THE SPREADS OF THE PARAMETRES**

1	0.044319	5	0.593023 Correlated	9	0.163919	13	0.046938
2	0.412752	6	-0.16089	10	0.180846	14	0.330129
3	-0.131	7	0.743464 correlated	11	-0.15012	15	-0.37403
4	0.141189	8	0.36044	12	0.487261		

## SECTION 4

### Comparison between the EEU and the WEU Clubs

#### 4.1. Pattern recognition as for the relation between the GDP growth rate and the Divergence Index and the average spreads curve of WEU club.

In the first section, we have found that the patterns of the GDP growth rates of the WEU and EEU Club are closely correlated.

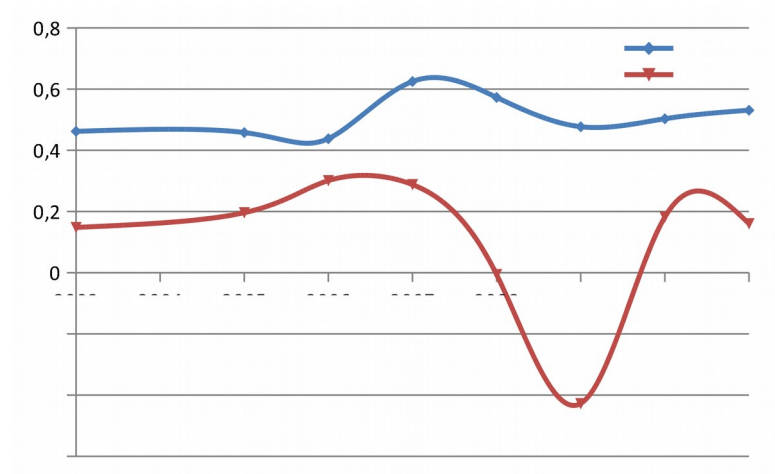
Let us, then, compare the pattern the Divergence Index of the WEU club and that of its GDP rate of growth to see what happened to  $U(t)$  in relation to the fluctuation of the GDP rate of growth.

As one can see from Figure 5, the GDP growth pattern of WEU Club and of EEU Club in the observed period converge until 2006 with the GDP growth rate curve increasing and the  $U(t)$  decreasing. Then the patterns of the two curves converge, as  $U(t)$  increases with the rate of growth of

GDP increase until 2007. Then, the patterns of both curves decrease. However, while that OF GDP growth rate falls by several percentage points, reaching a deep downward point in 2009, the U(t) curve has a much smaller downward fluctuation. In 2010, the GDP curve has a dip increase. U(t) curve too increases, but only by a small percentage.

In 2011 the two patterns tend again to diverge with U(t) continuing to moderately increase while GDP decreases. The two patterns are uncorrelated, as the value of the correlation is a mere 0,107192

**FIGURE 5. PATTERNES OF DIVERGENCE INDEX AND OF GDP GROWTH RATE. WEU CLUB-2003-2011**



To sum up, the big fluctuation of GDP has halted the convergence process of the WEU club, with a short return to convergence in a phase of severe recession. In the subsequent weak economic recovery, the Divergence index increases again. The lack of correlation of the two patterns of the curve of the average GDP growth rate and of the Index of Divergence of the WEU club presents strong similarities with that of the two curves of the EEU club.

Thus, one may argue that the same comment can be drawn. I.e.: the lack of correlation appears to signal the lack of adequate control of the exogenous financial cycle that hit both the club in the considered period, both by national governments of countries member of the Club and by the EU Government.

While as for EEU club, one might observe that the countries belonging to it only recently have re-joined the market economy systems and the democratic regimes, are new members of the EU and not (yet) of the EMU, the same cannot be said as for the countries belonging to the WEU club. Indeed, all of them are old members of the EU, have market economy systems and democratic regimes from many years and four of them are the core members of the EMU.

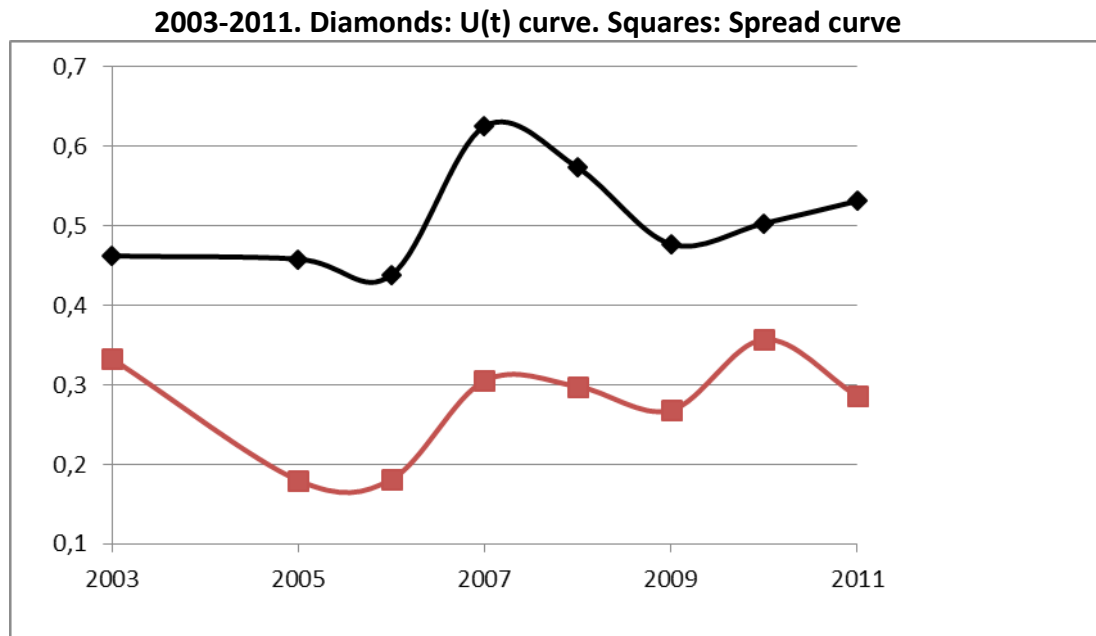
Let us consider (Figure 6) the patterns of the curve of the Divergence Index U(t) and of the curve of the spreads as for the WEU club.

Both U(t) and the spreads curve go down until 2006, in the period of normal growth. However, the minimum level spreads curve is attained in 2005 while that of U(t) is attained in 2006. Both U(t) and the spread curve peak in 2006 with similar gradient. Both curves reach a minimum in 2009, a recession year. However, their gradient differ, because that of U(t) is steep while that of the spread curve is smooth.

Then U(t) increases while the spread curve after its higher peak in 2010, goes down to a level lower than that of 2003.

Clearly, the patterns of the two curves, except for a limited period, have a dissimilar behaviour.

**FIGURE 6. PATTERNS OF DIVERGENCE INDEX AND SPREADS CURVE NORMALIZED. WEU CLUB**



The correlation coefficient between the U(t) Divergence and the average spreads curve of WEU, actually, it is a mere 0,398 , while – as we have seen above (§2.1) – between U (t) of EEU club and its average spreads curve the correlation coefficient is 0,902.

The low correlation coefficient of U(t) of WEU with the spreads seems to indicate that the stabilization policy aiming to the convergence in the fiscal and parameters created a divergence of the spreads of the members of the club, dividing them in two groups of countries well performing and less performing.

#### **4.2. Pattern recognition of Divergence Indexes of WEU and EEU clubs and of their members.**

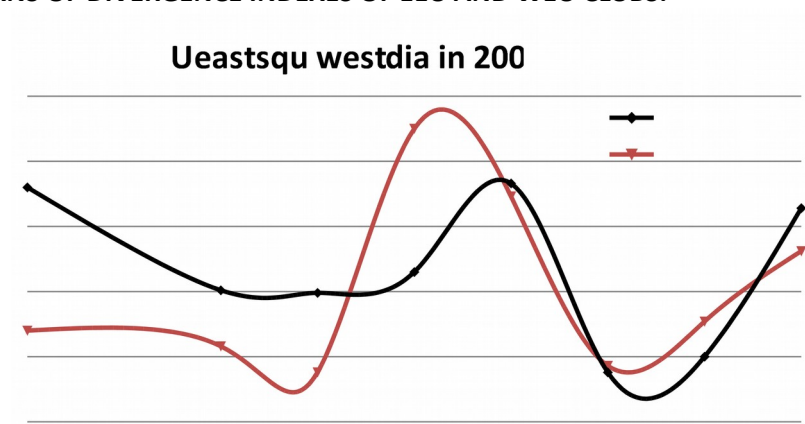
Let now compare (Figure 7) the convergence patterns of the two clubs, considering the patterns of their Divergence Indexes U(t) .

Both WEU club U(t) and EEU club U(t) have a downward pattern until 2005. U(t) of WEU continues to go downward also in 2006 while that of EEU club remains stable. Then U(t) of WEU Club climbs to a peak followed by that of EEU club in the subsequent year. The upturn of U(t) of WEU club takes place in 2010 as that of WEU club. In the 2003-2006 period of convergence the Divergence Index of the WEU club is lower than that of the EEU club.

In the boom period the patterns of the WEU club curve is above that of the WEU curve. Then they coincide and subsequently that of WEU club tends to be slightly above that of the EEU club. In 2011 is again below, signalling that EU policy pays more attention to its WEU core countries.

As the two U(t) curves of the West and East clubs mostly have similar patterns, with a lag of the U of the East club, the correlation coefficient of the U(t) of the two Club is not significant but close to be significant, being 0,448.

**FIGURE 7. PATTERNS OF DIVERGENCE INDEXES OF EEU AND WEU CLUBS.**



On the other hand, there is a significant correlation of 0,509 between the gradients of the two  $U(t)$  that reinforces the correlation between the two patterns, indicating both the dependence of pattern of the EEU Club from that of the WEU club the homogeneity of the effects of the EU policy.

On the other hand, it emerges that the EU policy is not capable of assuring convergence cum growth because after the recession the Divergence Index increased in both clubs to similar levels.

The pattern of similarity of the two clubs, that we found as for the two  $U(t)$ , does not hold as for the patterns of the  $U_i(t)$  of them.

**TABLE 7 CORRELATIONS OF  $U_i(t)$  OF WEU CLUB COUNTRIES.**

France-Germany	0.457 289
France-Italy	<b>0.662</b> <b>886</b>
France-Spain	<b>0.865</b> <b>914</b>
France-Uk	<b>0.760</b> <b>1553</b>
Germany-Italy	<b>0.817</b> <b>838</b>
Germany-Spain	<b>0.601</b> <b>758</b>
Germany-UK	0.277 307
Italy –Spain	<b>0.826</b>

As seen, the average correlation of the  $U_i(t)$  of the EEU club is close to zero. On the contrary for the WEU club the average correlation of the  $U_i(t)$  is significant being 0,61 (see Table 7 below).

Actually, in the WEU club, 6 out of the 10 couples of  $U(t)$  – (France and Spain, France and Italy, Italy and Spain and Italy and Germany, Spain and Germany and France and UK) – are positively well correlated. Italy and Germany, Spain and France and France and UK have strong correlations of more than 0,8 or near 0,8 (see Table 7). The  $U(t)$  of Spain and UK and of France and Germany are not correlated but their value result very close to those of a significant correlation.

Only those of UK and Germany and of UK and Italy are clearly uncorrelated. However, UK is outside EMU and geographically distant from UK both by land and by sea.

So that one may argue that in the WEU club the integration of EU-EMU countries the integration is quasi complete, because only between Germany and France there is not a clearly significant correlation.

A first explanation of the lack of significant correlation between the  $U_i(t)$  of the two countries is the different role of the memory, in the two countries, in relation to the different relevance of their agricultural sector, quite important in France and of minor importance in Germany.

Another explanation of the incomplete correlation might be their different technological development. Both those of Germany and of France are related to their heavy military expenditure, developed separately as they have been enemy particularly in the period of intense industrialization from the at the end of the XIX century until the end of the second world war. Even after the war, they diverged, particularly as for the energy sector, as for the different role of the nuclear sector. A third explanation, complimentary to the former two, may be found in the different orientation of the trade relations in relation to different geopolitical views: those of Germany as of Italy more projected to the East, those of France more projected to the North-South relation with UK and the former western African colonies.

But given the fact the  $U_i(t)$  of two of the older EU main countries member of EMU are incompletely correlated one may argue that the EMU unique market structure is incomplete of EU and/or that the rules and policies of the EU club are inadequate.

### 4.3. Most relevant Divergence parameters and spreads of WEU and EEU clubs and common patterns.

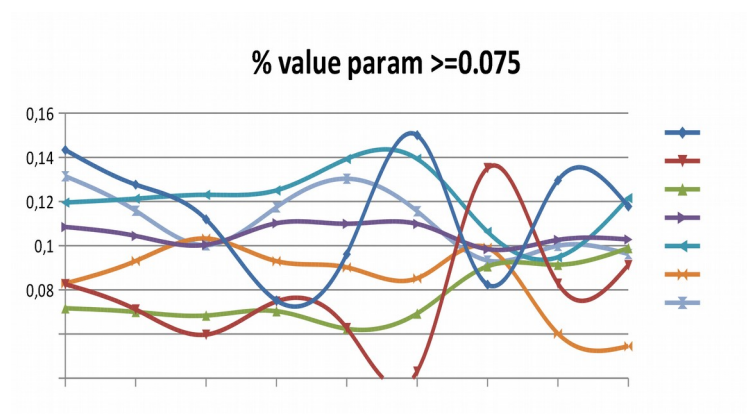
As one can see from Figure 8, the most relevant parameters of Divergence as for the WEU club in 2003 are GDP Growth rate, Inflation, Value Added of Agriculture, Budget Deficit, Balance of Payment, Current Accounts of the Balance of Payments, Bond Yield. In 2011, Unemployment must be added to the list.

Both in the EEU and WEU clubs, the weight of the GDP growth spread parameter in 2011 is greater than in 2003, signalling an Europe “at different speed” both in West and in East.

Continuing in the pattern recognition as for a common pattern of the two clubs, let us now compare the *distance* parameters of WEU club and EEU club that matter most in the dynamic of the convergence. The parameters most relevant as for the WEU club are the seven listed in the right part of Figure 4.2. Of them, unemployment, i.e. parameter 4, is not among the most important in the EEU club.

The likely explanation of this difference is the one, already above noted, that while the EEU countries are free to alter their own currency rate of exchange, four of the five WEU sub club are member of the EMU, which implies a unique rate of exchange. If in the EU-AMU club there was really a unified flexible labour market, the unique rate of exchange would not cause, high divergences in the unemployment levels.

**FIGURE 8. PARAMETERS OF WEU CLUB WITH AN AVERAGE EFFECT ON ITS  $U_i(t)$  LARGER OR EQUAL TO 0.075.**



In WEU too, as in EEU, the most important distance dynamic parameters are the GDP growth and the General Government budget balance. In the two clubs, the two parameters have similar trends as for their peaks, which take place in 2008. In the WEU club, GDP growth rate parameter has a

minimum in 2006, while in the EEU club the minimum of GDP growth rate is in 2007. A new minimum is reached by the WEU growth rate parameter, in 2009, again one year before that of the GDP growth rate parameter of EEU sub club.

A similarity between the two clubs maybe observed also for the dynamics of the inflation rate and of the current account balances of payment. One may argue that the application of the EU rules for the reduction of the Governments deficits to too many countries, with different economic and financial structures and flexibility has caused different deflationary effects on their GDP, price levels and balances of payment, not counter balanced by a re-equilibrating common expansionary fiscal and monetary policies.

Let us now compare the *spreads* of the parameters that are more important in the Divergence pattern of the EEU and WEU Clubs.

Eight spread parameters in WEU club show a % >0,20% in 2003. They are the bond yields, which has the largest value, followed by GDP growth rate, followed by the current balance of payment result, by Government budget deficit, and by the value added of agriculture all of them with a value > 30%. Then there are the aggregate balance of payment result and the inflation rate and the level of unemployment.

All of these parameters, except that of the balance of payment current accounts are also among the spread parameters > 20% of the EEU club in 2003. Thus a common pattern can be recognized as for the E(t) of the two clubs. Two parameters whose spread were very large in 2003 for the EEU main countries-productivity of labour per person and per hour- were not relevant for the WEU main countries. The likely explanation is that, due to the unique rate of exchange of the common currency, the rigidities of the wages in the lower productivity countries shifted the

**TABLE 8 IMPACT OF THE SPREADS OF THE PARAMETERS ON CONVERGENCE. WEU COUNTRIES.**

	2003	2005	2006	2007	2008	2009	2010	2011	Dev.St.De v.St.
1.	<b>0,414683</b>	0,346611	0,20216	0,268581	0,822006	0,181089	0,379984	<b>0,689343</b>	<b>0,229361</b>
2.	0,04959	0,225758	0,05989	0,048368	0,040242	0,050438	0,082257	0,086313	<b>0,061031</b>
3.	<b>0,238849</b>	0,18485	0,200885	0,175256	0,117732	0,401444	0,242992	<b>0,266975</b>	<b>0,084074</b>
4.	<b>0,207211</b>	0,211614	0,189084	0,174205	0,18974	0,269241	0,267905	<b>0,289469</b>	0,044018
5.	0,047047	0,094178	0,103652	0,04586	0,076525	0,12033	0,152455	0,029613	0,041968
6.	0,095976	0,054068	0,054068	0,09872	0,048805	0,048402	0,048016	0,09583	0,024027 <<
7.	0,154578	0,160794	0,176628	0,178014	0,161581	0,149343	0,127425	0,127848	0,019281 <<
8.	0,116155	0,128242	0,13806	0,145875	0,148728	0,160617	0,175939	0,167011	0,020029 <<
9.	<b>0,313748</b>	0,310809	0,296235	0,307071	0,300934	0,292409	0,30089	<b>0,30089</b>	0,007212 <<
10.	0,13629	0,158948	0,158948	0,182651	0,170663	0,17204	0,181273	0,182219	0,0159714 <<
11.	0,10751	0,104172	0,102206	0,096478	0,084632	0,070653	0,06982	0,077137	0,0154359 <<
12.	<b>0,34576</b>	0,761855	0,67243	0,778211	0,381623	0,315665	0,277851	<b>0,355741</b>	<b>0,2125048</b>
13.	<b>0,23980</b>	0,319585	0,250015	0,251986	0,233393	0,200213	0,176506	0,15944	0,0503345
14.	<b>0,38031</b>	0,620465	0,631356	0,364143	0,633405	0,554085	0,586222	<b>0,281498</b>	<b>0,1414799</b>
15.	<b>0,045091</b>	0,105054	0,105054	0,067406	0,056843	0,103692	0,155903	0,161854	0,043021

workers with lower productivity in the unemployed or inactive population.

In 2011, the spread parameters with a level >20% in WEU club are 6: GDP growth, inflation, agriculture, government budget, current balance of payment. Bond yield and aggregate balance of

payment are no more relevant, likely because the control of the financial market by the ECB is becoming effective.

The main differences between the EEU and the WEU the most important spread parameters in 2013 concerns inflation and unemployment parameters: whose weight in 2011 in the EEU club was much lower than in 2003 while in WEU club happened the opposite. Likely, the in the EMU area the countries with different rigidities in their economies react differently to the unique rate of exchange and to the common monetary policy.

Observing the standard deviations of the spreads in the WEU and EEU clubs, here too one notes extremely high values in most of the parameters with an important weight. As for the WEU Club, these are the GDP growth rates, the government budget deficits and the inflation rate. For EEU Club they are the growth rate, the productivity per hour, the budget deficit and the aggregate balance of payment.

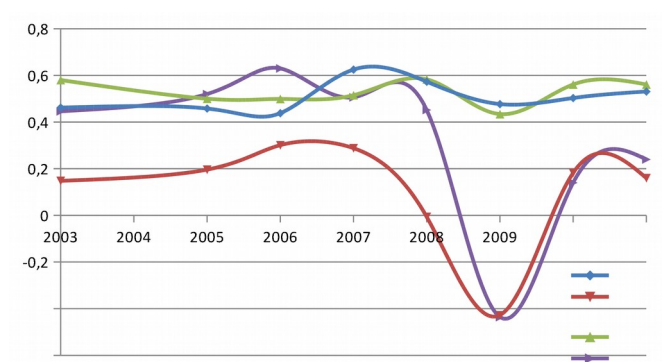
The erratic behaviour of four of the six most important spreads in both clubs evidences the inadequacy of the EU governance, both for the older and the new main member countries.

## 5. Main conclusions

The institutions and policies of Union of countries as Clubs must be consistent with the welfare maximization of their members, since this is the rationale for any country to participate to a Union of sovereign states. *A fortiori* this is true when the Union as Club includes a Monetary Club.

We have examined the patterns of the Divergence Indexes of the two Clubs of EEU and WEU core countries\* as a sub Clubs of EU, in the 2003-2011 period, to test whether they presents a dynamics capable of assuring the EU viability which requires fiscal and financial equilibrium cum growth for its members.

**FIGURE 9 PATTERNS OF GDP GROWTH AND OF DIVERGENCE INDEX WEU AND EEU CLUBS.**



These results do not appear assured, at the beginning of the new century, in West and in East.

Both the  $U(t)$  of WEU club and EEU club, after an initial period of convergence with growth, experienced a short phase of divergence with growth, then a short phase of convergence and recession, to enter in a phase of shaky growth and diverging patterns between the two clubs and inside them.

\* Respectively in Section 2, § 2.1 and Figure 2 and comments there and in Section 4, § 1 and Figure 6 and 7 e comments there.

**TABLE 9. CORRELATION COEFFICIENTS OF COVERGENCE OF WEU AND EEU CLUBS.**

CORRELATION OF GDP GROWTH RATES OF WEU AND EU CLUBS	0.878
CORRELATION OF DIVERGENCE INDEX $U(t)$ OF WEU CLUB AND ITS AVERAGE GDP GROWTH RATE	0.193
CORRELATION OF DIVERGENCE INDEX $U(t)$ OF EEU CLUB AND ITS AVERAGE GDP GROWTH RATE	0.350
CORRELATION OF DIVERGENCE INDEXES $U(t)$ OF WEU AND EEU CLUB	0.448
CORRELATION GRADIENTS OF DIVERGENCE INDEXES $U(t)$ OF WEU AND EEU CLUBS	0.509
CORRELATION AVERAGE SPREADS CURVE OF WEU CLUB AND OF EEU CLUB	0.446
CORRELATION OF DIVERGENCE INDEX $U(t)$ OF WEU CLUB AND ITS AVERAGE SPREADS CURVE	0.398
CORRELATION OF DIVERGENCE INDEX $U(t)$ OF EEU CLUB AND ITS AVERAGE SPREADS CURVE	0.902
AVERAGE OF THE CORRELATIONS OF THE DIVERGENCE INDEXES $U_i(t)$ OF WEU CLUB MEMBERS	0.613
AVERAGE OF THE CORRELATIONS OF THE DIVERGENCE INDEXES $U_i(t)$ OF EEU CLUB MEMBERS	0.027
MOST IMPORTANT DIVERGENCE PARAMETERS OF WEU CLUB:	1,3,4,9,12,13,14
MOST IMPORTANT DIVERGENCE PARAMETERS OF EEU CLUB:	1,3,9,12,13,14
MOST IMPORTANT SPREADS OF DIVERGENCE PARAMETERS OF WEU CLUB- IN 2003 AND 2011	1,3,4,9,12,13,14,15 1,3,4,9,12,14
MOST IMPORTANT SPREADS OF DIVERGENCE PARAMETERS OF EEU CLUB: IN 2003 AND 2011	1,2,3,4,5,6,9,12,13 1,3,9,12,13,14
WORST STANDARD DEVIATIONS OF THE SPREADS OF DIVERGENCE PARAMETERS OF WEU CLUB	6,7,8,9,10,11
WORST STANDARD DEVIATIONS OF THE SPREADS OF DIVERGENCE PARAMETERS OF EEU CLUB	6,8,10,11,13



The Divergence Indexes of WEU and of EEU club are un-correlated with their respective GDP growth rates and the lack of correlation is more pronounced as for the WEU Club, which is the core of the EU, than for the EEU Club whose countries entered the EU in more recent years and are not member of EMU. The two coefficients, being, respectively, 0.193 and 0.350 (Table 7, above). The rules and institutions of EU and EMU, so far have been unable to realize the basic condition of viability of the Union as a Club: i.e. to assure the convergence of its countries and to let them benefit of a sustainable growth condition.

On the other hand, as has been shown above (see Section I, §1), and as one can see from Table 9, the GDP growth rates of the WEU and of the WEU Club are strongly correlated, the coefficient being close to 0,9. The EEU Club economic and financial patterns strongly conditions that of EEU Club.

Contrary to what one might expect the negative transitivity principle does not apply here, as the Divergence Indexes of WEU and EEU Club are weakly correlated. As has been shown above (Section 4, §4.2 and Figure 8) the coefficient of correlation of  $U(t)$  of WEU Club and of  $U(t)$  of EEU Club is 0.448. The convergence curve  $U(t)$  of EEU Club follows a pattern similar to that of WEU in the period of boom and subsequent deflation, with a lag that signals the dependence of the dynamic of EEU club from exogenous shock coming from WEU. The gradients of the WEU and EEU  $U(t)$  curves are correlated with a 0.509 value (Table 9).

The explanation of the lack of transitivity of the uncorrelation between the GDP growth rates and the  $U(t)$  of the WEU and EEU Club to the relation between their  $U(t)$  may lie in the similarity of negative effects of the EU fiscal and financial equilibrium policies on the average GDP growth rates of the two clubs. But these negative effects differ in intensity, particularly after the crisis, when the EU policies became more active.

After the crisis, indeed the gradients of the patterns of EEU and WEU clubs differ. Both return to divergence, but the curve of EEU club is steeper than that of WEU; and while that of WEU smooths in 2011, the same does not seem to happen for that of EEU.

The spread of the EEU club, after the crisis, increased, showing a disharmonic behaviour of the five countries. Instead, in the WEU countries, after the crisis, the spread curve decreased signalling a regrouping of the member countries, between the better performing and the less performing, which reduced the sum of the spreads. As a result, one can see from Table 9 the correlation coefficient between the two spread curves is a mere 0,446.

Actually, in EEU Club there is a strong correlation of 0.902 between the Divergence Index  $U(t)$  and its average spread curve (Section 2, §2.2 and Figure 3). In WEU Club the correlation between  $U(t)$  and the average spread curve, is 0,398 (Section 4, §4.1 and Figure 9), signalling a divide between well performing countries with better GDP growth rates and employment rates and unsatisfactorily performing countries with worse GDP and employment rates.

The average of the correlations of the Divergence Indexes  $U_i(t)$  of couples of EEU countries is a mere 0.027 while the average of the correlation of the Divergence Indexes  $U_i(t)$  of couples of WEU countries is 0,613. The countries of the EEU club are less integrated than the WEU countries\* and being outside the EMU and have a higher degree of autonomy, so that the incidence on them of the EU institutions and policies is more limited as compared to those of the domestic institutions and policies. Therefore, that each EEU country has a different behaviour.

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\* For the EEU countries, see Section 2, §2.2, Table 3 and comments there. For the WEU countries see Section 4, §4.2, Table 7 and comments there.

In the Western area, after the crisis, the convergence, as for the club of the five main countries, it is hindered by the existence of two currencies and two monetary and banking policies: the pound and the BOE in UK and the euro and the ECB in the other four countries. Here, the unique rate of exchange and the common monetary and banking policy, because of the lack of unification of the markets, acted in a dual way, according to the different elasticities of their structures and institutions.

An interesting recognition of common patterns has been pursued as for the parameters important for the  $U(t)$  of the two clubs and their spreads (see Section 3, §3.1 and §3.2 and Section 4 §4.3 and Table 9). GDP growth rate, inflation, unemployment, value added of agriculture, government budget deficit, current balance of payment deficit/surplus are among the parameters with important weight in the dynamic of convergence in both clubs.

Unemployment is important in the  $U(t)$  curve of the WEU countries, and not in that of EEU, likely because their labour market is more flexible and additional flexibility is given by the manoeuvre of the rate of exchange, as in them does not operate the constraint of the EMU unique rate of exchange. On the other hand, the aggregate balance of payment has an important weight in the dynamic of convergence of EEU club and not in that of the WEU club.

Four of the parameters with an important weight in the WEU club- GDP growth rates, Government deficits, inflation and current balance of payment have high standard deviations (see Table 9).

As for the EEU club, 6 spreads which have an important weight, have high standard deviations. They are: GDP growth rate, productivity of labour per person, government budget balance and aggregate balance of payment (see Table 9). These erratic behaviours of most of the spreads of the most important parameters of the two clubs homogeneity seems to evidence of the low control by them by the EU and EMU institutions, in the observed period.

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## APPENDIX

**TABLE 10.1. INFLATION RATE**

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	10.3	7.4	5.8	2.3	6.1	6.0	7.4	7.6	1.2	2.5	3.0	3.4
Czechia	3.9	1.4	-0.1	2.6	1.6	2.1	2.1	3.0	6.3	0.6	1.2	2..1
Hungary	10.0	9.1	5.2	4.7	6.8	3.5	4.0	7.9	6.0	4.0	4.7	3.9
Poland-	10.1	5.3	1.9	0.7	3.6	2.2	1.3	2.6	4.2	4.0	2.7	3.9
Romania	45.7	34.5	22.5	15.3	11.9	9.1	6.6	4.9	7.9	5.6	6.1	5.8
France	1.8	1.8	1.9	2.2	2.3	1.9	1.9	1.6	3.2	0.1	1.7	2.3
Germany	1.4	1.9	1.4	1.0	1.8	1.9	1.8	2.3	2.8	0.2	1.2	2.5
Italy	2.6	2.3	2.6	2.8	2.3	2.2	2.2	2.0	3.5	0.8	1.6	2.9
Spain	3.5	2.8	3.6	3.1	3.1	3.4	3.6	2.8	4.1	.0.2	2.0	3.1
U.K.	0.8	1.2	1.3	1.4	1.3	2.1	2.3	2.3	3.6	2.2	3.3	4.5

**TABLE 10.2. UNEMPLOYMENT RATES 2000-2012**

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	13.7	12.1	10.1	9.0	6.9	5.6	6.8	10.2	11,3
Czechia	7.8	8.3	7.9	7.2	5.3	4.4	6.7	7.3	6,7
Hungary	5.9	6.1	7.2	7.5	7.4	7.8	10.0	11.2	10,9
Poland-	19.7	19.0	17.8	13.9	9.6	7.1	8.2	9.6	9,7
Romania	7.0	8.1	7.2	7.3	6.4	5.8	6.9	7.3	7,4
France	9.0	9.3	9.3	9.2	8.4	7.8	9.5	9.7	9,6
Germany	9.3	9.8	11.2	10.3	8.7	7.5	7.8	7.0	5,9
Italy	8.4	8.0	7.7	6.8	6.1	6.7	7.8	8.4	8,4
Spain	11.1	10.6	9.2	8.5	8.3	11.3	18.0	20.0	21,7
U.K.	5.0	4.7	4.8	5.4	5.3	5.7	7.6	7.8	<b>8,0</b>

**TABLE 10.3. SHARE OF AGRICULTURE ON GDP**

Country	2003	2005	2006	2007	2008	2009	2010	2011
Bulgaria	10.0	9.3	8.5	6.2	7.3	5.6	5.3	5.6
Czechia	4.0	3.0	2.9	2.6	2.3	2.2	2.4	2.1
Hungary	4.0		4.3	4.2	4.3	3.0	3.5	5.4
Poland-	3.0	4.8	4.4	4.3	4.5	3.6	3.5	3.6
Romania	13.	10.1	9.6	8.8	7.2	7.0	6.7	7.4
France	3.0	2.2	2.0	2.2	2.0	1.7	1.8	1.8
Germany	1.0	0.9	0.9	0.9	0.9	0.8	0.9	0.9
Italy	3.0	2.3	2.1	2.0	2.0	1.8	1.9	2.0
Spain	3.0	3.3	2.0	2.9	2.8	2.6	2.7	2.5
U.K.	1.0		0.9	0.9	0.8	0.8	0.7	0.7

**TABLE 10.4. GENERAL GOVERNMENT BUDGET BALANCE**

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	-0,4	1,9	1,0	1,9	1,2	1,7	-4,3	-3,1	-2,0
Czechia	-6,7	-2,8	-3,2	-2,4	-0,7	-2,2	-5,8	-4,8	-3,3
Germany	-4,2	-3,8	-3,3	-1,6	0,2	-0,1	-3,1	-4,1	-0,8
Spain	-0,3	-0,1	1,3	2,4	1,9	-4,5	-11,2	-9,7	-9,4
France	-4,1	-3,6	-2,9	-2,3	-2,7	-3,3	-7,5	-7,1	-5,3
Italy	-3,6	-3,5	-4,4	-3,4	-1,6	-2,7	-5,5	-4,5	-3,8
Hungary	-7,3	-6,5	-7,9	-9,4	-5,1	-3,7	-4,6	-4,3	4,3
Poland	-6,2	-5,4	-4,1	-3,6	-1,9	-3,7	-7,4	-7,9	-5,0
Romania	-1,5	-1,2	-1,2	-2,2	-2,9	-5,7	-9,0	-6,8	-5,6

U.Ki.	-3,4	-3,5	-3,4	-2,7	-2,8	-5,1	-11,5	-10,2	-7,8
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SOURCE: EUROSTAT

**TABLE 10.5. BALANCE OF PAYMENTS DEFICIT OR SURPLUS AS % GDP**

Country	2004	2006	2007	2008	2009	2010	2011
Bulgaria	-5.8	-15.7	-21.5	-25.3	-9.1	-1.3	+1.7
Czechia	-6.1	-3.3	-2.7	-3.1	-1.1	-3.2	-3.7
Hungary	-8.6	-6.6	-4.9	-8.7	+0.3	-1.1	+1.0
Poland	-4.2	-3.2	-3.7	-5.4	-1.6	-4.7	-2.7
Romania	-8.4	-10.4	-14.1	-12.2	-4.5	-4.0	-3.9
France	-0.4	-1.3	-1.2	-2.0	-1.9	-1.7	-2.6
Germany	+3.7	+5.0	+7.6	+6.6	+5.0	+5.7	+5.6
Italy	-0.9	-2.6	-2.5	-3.4	-3.2	-3.5	-3.3
Spain	-5.3	-8.6	-10.1	-9.5	-5.5	-4.6	-3.7
U.K.	-1.7	-3.2	-4.2	-1.7	-1.1	-2.5	-1.3

**Abstract:** Gli Autori presentano due paradigmi teorici economici che costituiscono le basi del presente lavoro: la teoria dei club, parte della teoria di public choice di Buchanan, pensato come modello dell'Unione di Stati e per l'Unione monetaria; la convergenza nei modelli neoclassici di crescita, per derivare i parametri di convergenza, e comparare così i risultati della crescita e delle fluttuazioni.

**Parole chiave:** convergenza, stabilità, teoria dei club, unione europea monetaria, modelli di crescita.

**Abstract:** Authors present two economic theoretic paradigms that are the basis of this work: Buchanan public choice club model as applied to Union of States and to Monetary Unions and convergence in neoclassic growth models, to derive the parameter of convergence. Then, they compare the pattern the Divergence Index of the WEU club and that of its GDP rate of growth to see what happened to  $U(t)$  in relation to the fluctuation of the GDP rate of growth.

**Keywords:** convergence, stability, theory of clubs, European monetary union, models of growth

*JEL* : E52; E62; H41; O47.

