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Europe at the Crossroads of Economic Integration: Multidimensional Scaling Analysis of the period 1970-2010

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This paper analyzes thirteen EMU countries and their similarities during the integration process throughout the last four decades. The analytical and numerical assessment of this long-run perspective reveals combinations of countries and periods with close connections between the macroeconomic variables related to national government accounts, balance of payments equilibrium, and economic growth. The Multi-Dimension Scaling method is used for a quantitative analysis. Such features reflect major national achievements, for sustaining the European society vis-à-vis rising globalization.

Cet article analyse treize pays de l'Union européenne et leurs similitudes pendant la période d'intégration des quatre dernières décennies. L'évaluation analytique et numérique de cette perspective de longue durée indique des combinaisons de pays et de périodes avec des connections étroites entre les variables macro-économiques liées

* We thank John Huffstot for correcting our English. All remaining errors are our own mistakes.

aux comptes nationaux, à l'équilibre de la balance de paiements, et la croissance économique. La méthode de graduation multidimensionnelle est employée pour une analyse quantitative. Elle reflète les importantes réalisations nationales pour soutenir la société européenne vis-à vis de la montée en puissance du processus de mondialisation.

> "A wave of fiscal austerity is rushing over Europe and America. The magnitude of budget deficits-like the magnitude of the downturn-has taken many by surprise."
> (Stiglitz, Joseph E. The Dangers of Deficit Reduction, *The Economists' Voice*, March, 2010, p. 1, www.bepress.com/ev)

INTRODUCTION

Since the late 1950s Europe has enjoyed a long and successful economic integration process, but is today faced with economic growth hesitations, and sovereign debt insolvencies in Mediterranean partners. As heir to the two Ancient Civilizations of Greece and Rome, Europe pioneered industrialization, and developed the ambitious project of economic integration that would provide a geopolitical identity and performance to this continent, in the global context, particularly following the creation of the Monetary Union. In fact, in a world perspective, the large dimension of some national economies brought scale and scope challenges to the small European nations that fought the Second World War.

Post-war Europe re-emerged in a global context comprising large American countries, such as the United States, Canada, and Brazil, and large Asian partners such as Russia, India, and China. The Allied victory led to democratic values and government investment in education, technology, and infra-structures, which committed all partners to mutual assistance and a trade union that aspired to be a monetary space using a common currency. A decade of monetary union experience is now available for thoughtful analysis, and it raises a global alarm on some excessive government spending that has translated into enormous public debt accumulation. According to Stiglitz [2010], faster growth and a 5 to 6 percent return to public investment would be enough to cancel sustainability problems of excessive debt accumulation, offsetting any default dangers in the euro-currency area.

According to some opinions "Western Europe's post -World-War II success story" may not be a consequence of the rapid intra-European

integration.[1] It is undeniable that in 60 years of economic growth in Europe the volume of exports grew fifty-fold, and free trade prevailed in intra-European commerce. However, some researchers argue that globalization can explain the extraordinary progress of specialization and trade, for both the agricultural and industrial productive sectors. It is known that Europe increased its share in international trade, and that neither Japan nor the USA experienced comparable increases, but it is argued that free capital flows within Europe may not necessarily be the pivotal explanation. In fact, Europe was recovering from the Second World War disasters, and the capital-freeing process was slow in the years from 1950 to 1970, improved in the '80s, but reached a significant meaning only after the 1992 Single Market Program, which led to the creation of the euro as a common currency.

Once more, globalization also created financial systems that were more and more sophisticated to cancel costly controls. Moreover, it is clearly demonstrated that portfolio preferences had a strong bias in favor of using domestic assets.[2] So, productivity gains were not necessarily pulled by the process of promoting the European Union, but are the result of understandable technological spillovers in the context of a global world. There was also a prevailing belief that the European Common Market enlargement from six countries to the East and to the Balkan nations was the turning point for the splendid growth and prosperity in Europe. Nevertheless, this widely-held vision is being put into doubt. The European economic integration was only a regional aspect in the global context of new opportunities. So, the usual evocation of the names of bright men, such as Jean Monnet, Robert Schuman, and Jacques Delors, as founding fathers of important political milestones such as the European Community of Steel and Coal, the Treaty of Rome, the Single Market, and the Stockholm convention for the European Free Trade Association, may be an exaggerated view on politics, it is said.[3]

Without Monnet, multiple equilibria would have occurred, determined by reality in the wider historical system. Coal and steel would have been traded and, in the absence of the European Monetary System, stable exchange rates would have prevailed because economic and financial systems respond to historical needs.[4] A rapid relaxation of

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[1] [Eichengreen and Boltho (2008), p.2].

[2] [Eichengreen and Boltho (2008), p.44], using Feldstein-Horioka tests for capital-mobility.

[3] [Eichengreen and Boltho (2008), p.6].

[4] Quoting Fogel [1964] counterfactual methodologies contribution.

wartime controls must have occurred in the same way, because peace reflects co-operation. The French-German co-operation was a great post-war achievement, but the Marshall Plan was a crucial element, from this perspective, in obliging the Europeans to sit at the Paris Conference to divide up the funds among the European countries. The Marshall Plan was also a vital element in overcoming savings shortage, to encourage investment for recovery and growth in European countries. [5]

Moreover, the Marshall Plan's technological support was also key in the rate of European technical progress, from the perspective of its exogenous character in economic growth Solowian models. It is also argued that as technology is embodied in equipment, the Marshall Plan offer was a shock to the European capital/labor ratio, in agriculture, thanks to tractors, and in industry, thanks to industrial automation. In models of endogenous growth this technological shock is embedded as an engine for faster rate of growth, because higher productivity creates higher profits, and higher profits drive more capital formation, which means a new round of productivity growth in a virtuous circle for reaping scale and scope economies toward prosperity. Community Keynesian policies have also been evoked as an example of encouragement for the adoption of good practices underpinning government policies.

In one way or another, stagnation threatens most of the European partners, in spite of the performance achieved and economic growth, and fiscal consolidation is now being recommended. The economic downturn and budget cuts affect many economic (and political) variables. In some countries, such as Greece and Italy, political and social unrest are explained as the usual consequences of debt crises and austerity measures undertaken to avoid defaults. [6] Debt crises and defaults have been the subject of extensive studies during recent decades. [7] Was the intra-European Union economic integration really useless from a historical perspective?

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[5] Mata [2010] also agrees.

[6] [Ponticelli and Voth (2011)].

[7] Capie and Wood [1986] offers the distinction between banking and currency crises. More recently, Kindleberger [2000] lists all crises until 1998, Bordo *et al.* [2001] analyse crisis severity in the last 120 years, while Eichengreen et al., [2003] address the southern periphery of Europe (and Latin America). Bordo [2005] develops a mismatch analysis for public deficit and balance of payments, while Reinhart and Rogoff [2008] examine to the current global financial crisis, after dealing with banking, financial, and debt crises.

This paper seeks to demonstrate that even if all of the arguments presented lead us to mitigate the role of the intra-European economic integration, there was a process of levelling the partners regarding growth performance and welfare, as well as catching-up phenomena in government spending for public goods provision throughout European societies. Greater government spending is associated with greater public goods provision, crowding-out, greater taxation, and public debt accumulation, while the aging European society is highly concerned with the prospects of welfare-state spending sustainability. Greater imports are associated with dependency on sources for domestic consumption, and also with dependency on foreign decisions that drive other items of countries' balances of payments, such as exports, emigrants' remittance flows, and other countries' foreign direct investment decisions. The variables selected address governmental financial activity and foreign trade, and are considered both in the Neoclassical and Keynesian paradigms as being key factors for GDP performance. The goal of this paper is to bring evidence to bear on the degree of similitude of government budget deficits and balance-of-payments problems across-countries over the last four decades.

Government and foreign imbalances may have occurred separately, or all together, depending on the characteristics of the periods in this cross-country analysis. If occurring together, these *twin problems* suffer from more difficult economic-policy correction mechanisms. [8] The current paper also aims to identify long-run European clubs of countries, concerning trade and public goods consumption, and government spending stimulation. Were some countries routinely prodigious in terms of export and import capacity, and/or prodigal in government spending? Can we identify similar problems in a cross-country European analysis over time?

The methodology used here begins by defining a vector of the macroeconomic variables available for each year and each country, which are common to all countries during the time window of analysis, and adopts the Multi-Dimensional Scaling (MDS) methodology, in order to obtain a measure of similarity, or "likeness", for combinations of countries and periods of time. This quantitative method of analysis and visualization has already been applied to the identification of US crises, [9] and stock-market index fluctuations. [10] As countries' dimen-

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[8] As Bordo [2005)] demonstrates.

[9] [Machado *et al.* (2011)].

[10] [Machado *et al.* (2011a) , (2011b)].

sions vary significantly in Europe, the methodology employed uses measures for similarity (or, alternatively, of dissimilarity) between the vectors, duly normalized by population. The measures are Gross domestic product per capita, Exports per capita, Imports per capita, and Effective Public Expenditure per capita. Prices may affect the purchasing power parity. One might suppose that tradable goods are subject to a single market competition, and tend to be uniform in this context; especially when considering export and import flows, as is the case in this MDS exercise. A second vector normalization was introduced in order to consider the range of variation of each of the variables.

The results obtained are quite interesting in providing a very plausible manner in which to picture the evolution and economic similarity of the European countries' problems throughout the last four decades.

I. – MULTIDIMENSIONAL SCALING ANALYSIS AND OBJECT DATA DEFINITION

MDS is a computational and statistical technique that produces a spatial representation of similarity between objects through factors of relatedness. [11] The term similarity denotes the degree of "likeness" between two objects, while dissimilarity or distance indicates the opposite. [12]

For a given set of time windows a vector of values of the economic variables is considered, and an MDS representation is obtained by feeding the algorithm with a symmetrical matrix R that measures the cross similarity between all objects. The objects are points to be represented in the MDS map and consist of vectors of data representing economic variables during a time window. Therefore, different periods of time yield different objects (and MDS points).

For example, when the correlation between two objects is one (zero), the distance between them is zero (infinite), and we cannot (can) distinguish between the two in the MDS map. Inversely, if two points are located closely (far apart) via the MDS procedure, this means that there is a high (small) correlation between the vectors that produced them. [13]

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[11] [Cox (2001)].
[12] [Kruskal (1978)].
[13] [Borg (2005)].

MDS executes numerical iterations to estimate the coordinates of the points based on a symmetric matrix R containing the correlation between all pairs of objects. [14] In this paper the objects are the correlation between economic variables evaluated during specific sampling time periods. Consecutive time periods are adopted as a compromise between capturing the dynamic evolution (possible only with small values of h), and producing a limited number of points in the MDS map (which is appealing for large values of h). Available data allows us to consider time series along the period T = [1970, 2009] that are subdivided into four windows of h = 10 years each, for a universe of nc = 13 euro-currency countries, namely the set {At, Be, Fi, Fr, De, Gr, Ie, It, Lu, Mt, Nl, Pt, Es} ≡ {Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, and Spain}, from the universe of 17 EMU members. We therefore obtain 4 "time slices" and the total number of objects to be evaluated in the MDS procedure is p = 13 (4 = 52 objects with a length of 10 years each. In the chart, points labeled as "Be70" or "Gr00" mean Belgium during the period 1970-1979 and Greece during 2000-2009, respectively.

For the comparison of objects i and j two indices are adopted, namely the Cosine correlation, r_{ij}^C, and the relative correlation, r_{ij}^R, defined as:

$$r_{ij}^C = \frac{\sum_{t=1}^{h}\sum_{k=1}^{k_{\max}} x_i(k,t)x_j(k,t)}{\sqrt{\sum_{t=1}^{h}\sum_{k=1}^{k_{\max}} x_i^2(k,t) \cdot \sum_{t=1}^{h}\sum_{k=1}^{k_{\max}} x_j^2(k,t)}}, \quad i,j = 1,\ldots,p \qquad (1)$$

$$d_{ij}^R = \sum_{t=1}^{h}\sum_{k=1}^{k_{\max}} \left| \frac{x_i(k,t) - x_j(k,t)}{x_i(k,t) + x_j(k,t)} \right|, \quad i,j = 1,\ldots,p \qquad (2a)$$

$$r_{ij}^R = 1 - \frac{d_{ij}^R}{\max(d_{ij}^R)}, \quad i,j = 1,\ldots,p \qquad (2b)$$

where x_i and x_j are two $k_{\max}$-dimensional signals, t represents time, h the sampling period, and p denotes the total number of objects under comparison. Equation (1) is the normalized inner product and is often called the Cosine coefficient because it measures the angle between two vectors, denoting an angular metric. [15] Equation (2) converts to a

[14] [Cha (2008)].

[15] [Deza and Deza, (2006)]; [Cha (2008)].

normalized similarity index a value we can consider as a relative City distance, since $\max(r_{ij}^{E})$ consists of the maximum value calculated over the entire set of signals.

The initial time series corresponds to the vector {consumption, GDP, imports, exports} of economic variables (*i.e.*, $k_{\max} = 4$) together with the {population} along time T on a yearly basis. Nevertheless, the signals $x_i(k,t)$ include two normalization steps before the calculation of (1) and (2). A first step of normalization is to dilute the population size of each country, through the transformation $x_i(k,t) \longleftarrow x_i(k,t)/population(t)$. The second normalization step consists of converting all vector components to the interval [0, 1] by calculating, for each component $k = \{1, 2, 3, 4\}$, the ratio $x_i(k,t) \longleftarrow / \max_t[x_i(k,t)]$, that is, by dividing each component value and its maximum value along the period T. This methodology guarantees that all k components have a similar weight upon the r_{ij}^{C}.

MDS is a mathematical tool that represents, in a low dimensional map, a set of data points whose similarities are defined in a higher dimensional space. For that purpose, MDS requires the symmetric matrix of similarities $\mathbf{R} = [r_{ij}]$ whose main diagonal is composed of ones, while the rest of the matrix elements must obey the restriction, $0 \leqslant r_{ij} \leqslant 1,\ i,j = 1,\ldots,p$. Furthermore, MDS works with relative measurements and, consequently, MDS maps are not sensitive to translations or rotations. The axes have only the meaning and units (if any) of the measuring index, and packages usually apply a heuristic procedure to center the chart. MDS rearranges objects in order to arrive at a configuration that best approximates the observed similarities. [16] A measure for evaluating how accurately an MDS solution reproduces the initial matrix information is the raw stress. The smaller the stress value, the better is the fit. Plotting the stress versus the number of dimensions m of the MDS map produces a monotonic decreasing chart. We can choose the "best dimension" as a compromise between stress reduction and number of dimensions for the map representation. We can also analyze the goodness-of-fit by means of the Shepard diagram, which depicts the reproduced distances against the input data for a given number of dimensions. [17] Therefore, a close scatter around the 45 degree line indicates a good fit. In the present case each element of matrix $\mathbf{R}$ is obtained with expressions (1)-(2) yielding a matrix of $p \times p$ similarities. The representation consists of an m-dimensional

[16] Tzeng [2008] applies it to genomic datasets.
[17] [Shepard (1962)].

plot whose quality is verified by means of the stress or the Shepard diagrams.

The decennial approach seems to be appropriate for capturing a picture of the relative similarities among countries. Shorter periods would allow for more detail, but the number of points in the plots would increase, making them more difficult to read. The decennial approach also respects any Juglar business-cycle effects that may influence the countries' achievements.

Data were collected from the World Bank national development indicators, and OECD national data files. They are reliable and available for all European partners, but from different moments. Taxes were not considered because time series are available for only the 1995-2009 period, [18] and MDS requires complete databases. Because there is no information for Germany before 1970, it was necessary to choose between beginning in 1970 and excluding Germany. As Germany is a key partner (a founding member of the European Union, and a large economy) the first option was followed. The 1970-2009 span still allows for a long-run view, and includes the analysis of the Western and Eastern German integration process. (Data availability for the four missing EMU members, Estonia, Slovakia, Slovenia, and Cyprus, begins in 1987, 1985, 1990, and 1975, respectively. To include them would require shortening the time-span sample). General final government consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including employee compensation). It also includes most expenditure on national defense and security, but excludes government military expenditures that are part of government capital formation. Imports (exports) of goods and services represents the value of all goods and other market services received from (provided to) the rest of the world, and includes the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. These expenditure figures exclude employee compensation and investment income (formerly called factor services) and transfer payments. Total population is based on the *de facto* definition of population, which counts all residents regardless of legal status or citizenship, except for refugees not permanently settled in the country of asylum, who are generally consi-

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[18] And still miss values for Luxembourg before 1999, Malta before 2003, Belgium 2009, and Finland 2009.

dered part of the population of their country of origin. The values are midyear estimates:

II. – THE MDS VISUALIZATION

In this section we develop a set of MDS experiments for the set of objects and conditions defined above. Figures 1 and 2 depict the two- and three-dimensional MDS maps for the Monetary Union partners, in the perspective of the Cosine correlation, r^C, for the 1970-2009 period, and decennials. Points are labeled by email-address-extensions of countries and decades (*i.e.*, 70 covers the 1970-79, 80 the 1980-89, 90 the 1990-99, and 00 covers the 2000-09 period).

The adjustment quality of the MDS fit with these plots is excellent, as can be seen in the Shepard diagrams and stress plot represented in Figures 3 and 4, respectively.

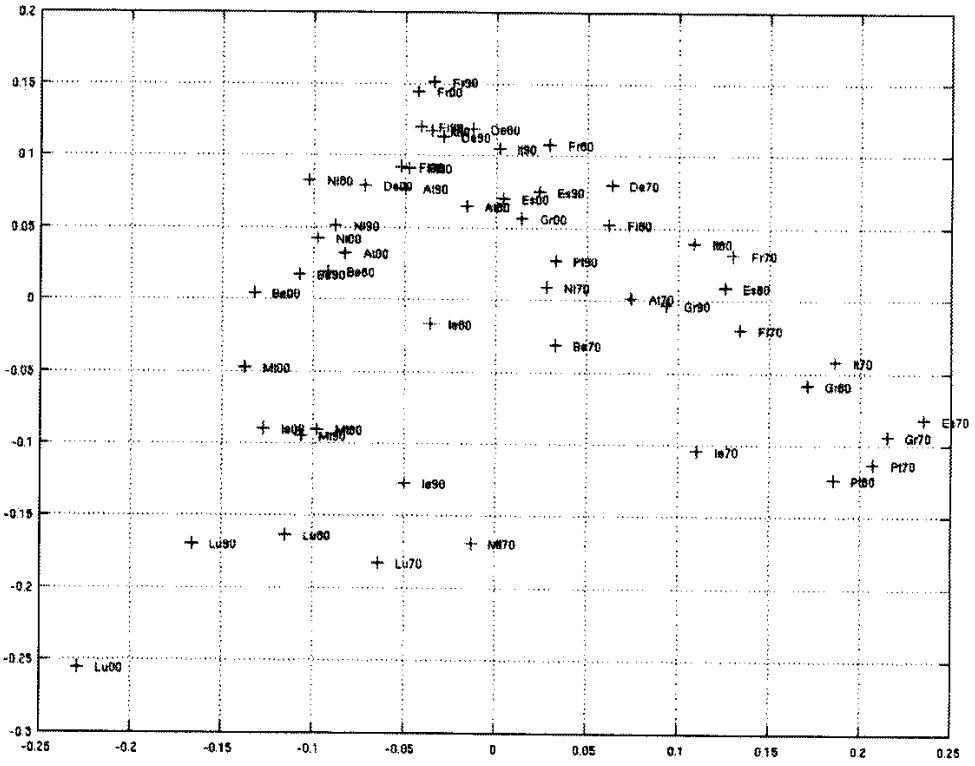


FIGURE 1

Two-dimensional MDS map for the 13 Monetary Union partners, in the perspective of the Cosine correlation r^C, for the period T = [1970, 2009], h = 10 years

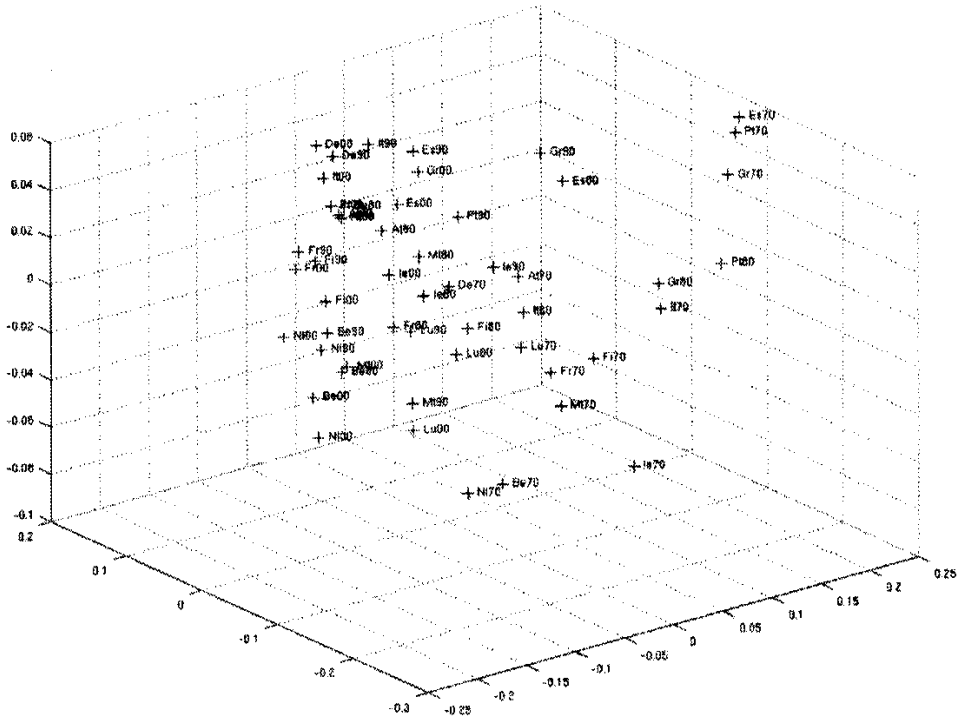
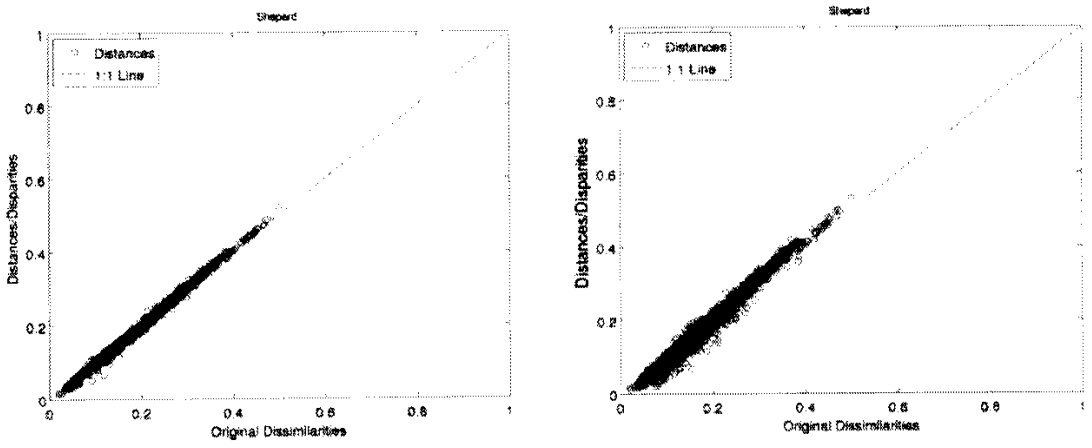


FIGURE 2

Three-dimensional MDS map for the 13 Monetary Union partners, in the perspective of the Cosine correlation, r^C, for the period T = [1970, 2009], h = 10 years



a) *b)*

Figure 3

Shepard diagrams of the: a) 2-dimensional, b) 3-dimensional, MDS map for 13 countries, r^C, T = [1970, 2009], h = 10 years

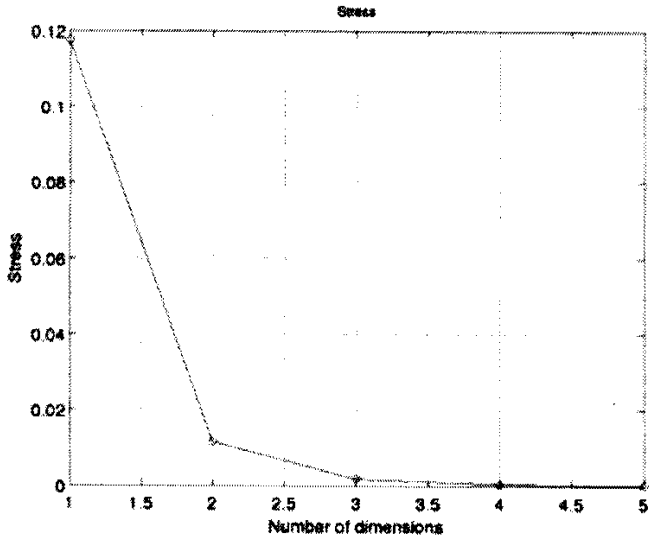


FIGURE 4
Stress plot of the MDS representation of the 13 countries, r^C, T = [1970, 2009], h = 10 years

The exercise is repeated using the Euclidean distance r^E. The plots are different from the graphical point of view, but the conclusions are identical. This result is common when varying the measuring index and analyzing the resulting MDS maps, since they call for comparing relative positions and clustering evaluation. In any case, it is important to stress this feature to confirm the robustness of the method in order to draw conclusions. For limitations of space, Figure 5 shows only the three-dimensional plot for the relative correlation, r^R.

MDS is a visualization method that interprets matrix R. In fact, there are several other methods for rendering the information into some type of map. Bearing this in mind, and for exploring alternative visualization tools, Figure 6 depicts the two-dimensional charts produced by the program PHYLIP [19] often employed in phylogenetics using the packages {NEIGNJ, NEIGUP, FITCH, KITSCH}. These useful packages provide users with the following description:

i) NEIGNJ: Neighbor constructs a tree by successive clustering of lineages, setting branch lengths as the lineages join. The tree is not rearranged thereafter. The tree does not assume an evolutionary clock, so that it is in effect an unrooted tree;

ii) NEIGUP: Constructs a tree by successive (agglomerative) clustering using an average-linkage method of clustering;

[19] http://evolution.genetics.washington.edu/phylip.html

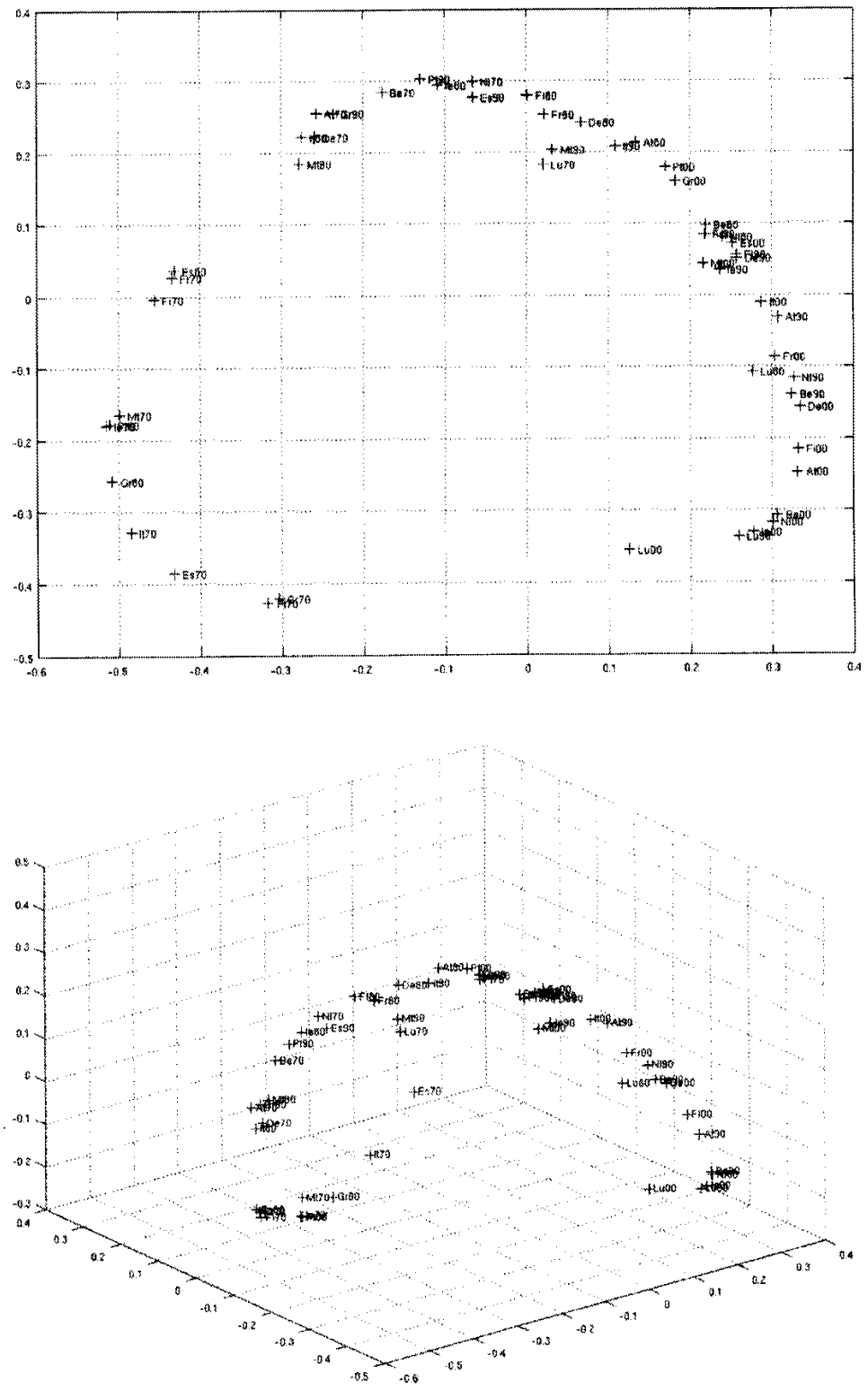


FIGURE 5

Two and three-dimensional MDS maps for the thirteen Monetary Union partners, in the perspective of the relative correlation, r^R, for the period T = [1970, 2009], h = 10 years

iii) FITCH: This program carries out Fitch-Margoliash, Least Squares, and a number of similar methods. It allows choice between the Fitch-Margoliash criterion and the Minimum Evolution method. Minimum Evolution (not to be confused with parsimony) uses the Fitch-Margoliash criterion to fit branch lengths to each topology, but then chooses topologies based on their total branch length (rather than the goodness of fit sum of squares);

iv) KITSCH: carries out the Fitch-Margoliash and Least Squares methods, plus a variety of others of the same family, with the assumption that all tip species are contemporaneous, and that there is an evolutionary clock. This means that branches of the tree cannot be of arbitrary length, but are constrained so that the total length from the root of the tree to any species is the same. The quantity minimized is the weighted sum of squares.

The following maps provide the four approaches.

We observe intricate two-dimensional graphical representations of different natures, all of which reflect the same quantitative information embedded in matrix R. These charts are simply different vehicles for representing the conclusions illustrated by the MDS plots.

III. – INTERPRETING THE RESULTS

Even if one agrees with the voices in the literature claiming that the European Union and the adoption of common currency were useless in fostering the Continent's average GDP per capita, conclusions drawn from the MDS plots demonstrate that strong transmittable effects have occurred in the European Union thanks to its economic and cultural integration. [20]

The results presented show that a considerable number of the less-developed countries are now much more similar to the core European countries regarding the evolution of per capita imports, exports, government spending, (and GDP). This is the case of Mediterranean partners, for example, which were a club of their own in the 1970s and '80s. It is a fact that the Mediterranean basin had a considerable similarity versus a large dissimilarity toward all other European partners, in

[20] Sources for GDP are the same, and it is calculated without making deductions for depreciation of fabricated assets, or for depletion and degradation of natural resources. GDP at purchaser prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.

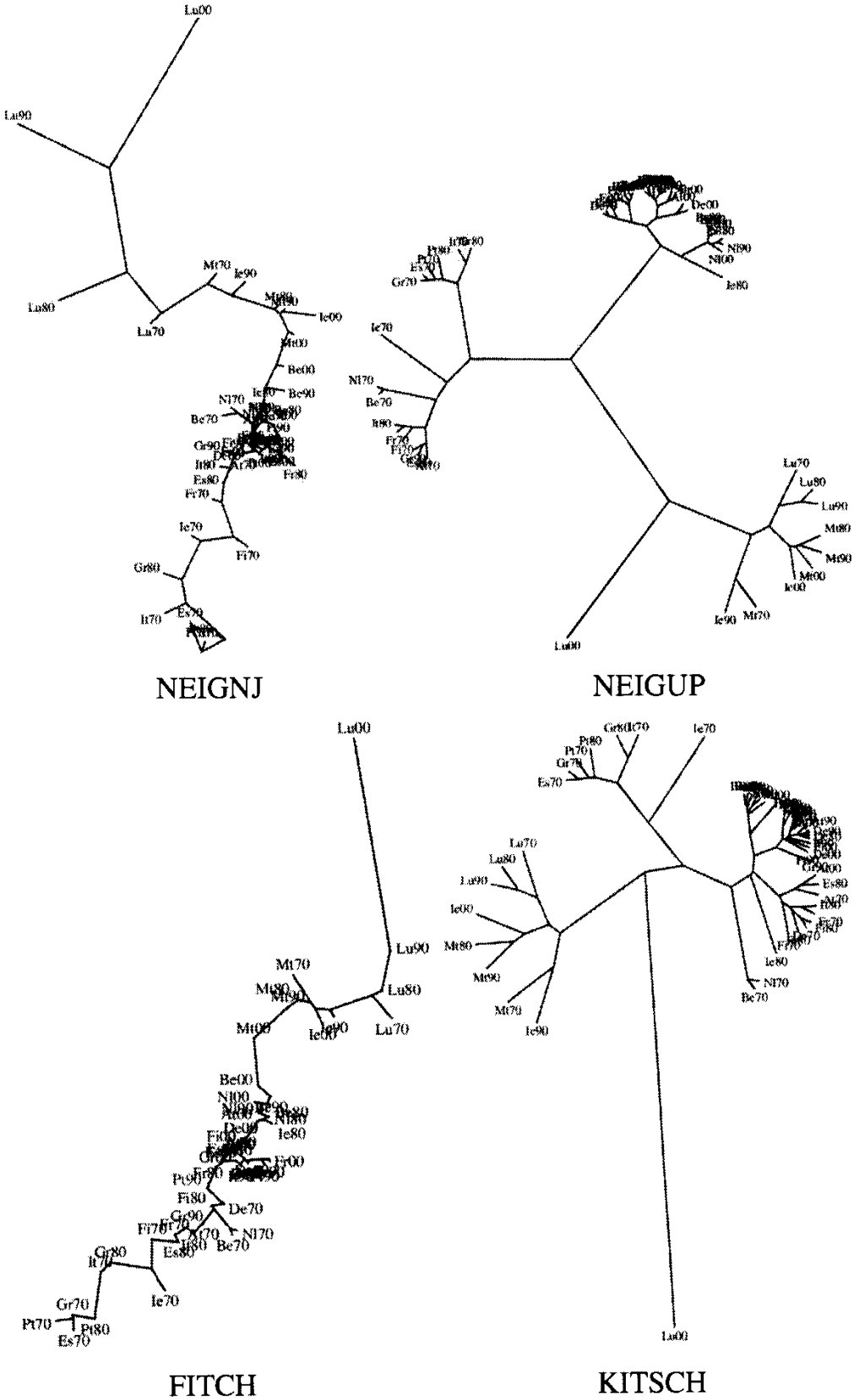


FIGURE 6

Representation of the information in matrix R for 13 countries, r^C, T = [1970, 2009], h = 10 years using program PHYLIP and packages {NEIGNJ, NEIGUP, FITCH, KITSCH}

spite of the different relationship of each one of them with the European Union. [21] In the 1970s Italy, Spain, Greece, and Portugal, had index positions that were quite dissimilar from those of their EU partners, which were quite similar, and similar to the Irish ones, as well - Ireland and Portugal being EFTA members. [22] So, the acronym PIIGS (for Portugal, Italy, Ireland, Greece, and Spain) to label the group made up of these countries makes more sense than the more disparaging PIGS (for Portugal, Italy, Greece, and Spain).

It may be important to note the geographical localization of all these countries in the broad European ring that surrounds the core European countries. With the integration of all of them in the European Union in the 1980s, similarities began to appear and are reflected in their close positions. Both the Spanish and Italian evolution in the '80s were similar to the French '70s, while Portugal and Greece preserved their relative position of the '70s. One decade later, PIGS were moving to positions closer to France and Germany. After the German re-unification, the PIIMGS (including Malta) form the largest cloud of partners during the last two decades in the plots presented. In 2000-09, under the Monetary Union and the single currency, they have positions closer to Germany and France. From East to West, Greece-Italy-Spain-Portugal-Ireland form the arch of the successful move toward positions close to the core European partners.

Another set of similarities is seen in three Northern countries (Belgium, the Netherlands, and Denmark). By the 1970s they formed a cloud of points that were close, and did not mix with France, Germany, and Austria. Their evolutions very soon moved, in the '80s and '90s toward the cluster made up of these other countries, and have almost coincident positions in the decade 2000-09.

The similarity path velocity is an important matter to mention. From this perspective, Finland is the happy story. Quite different from any other partner(s) in the '70s, its location in the '80s shifted to a position closer to the German '70s, and to a position closer to the German and Italian '90s positions, in this same decade, as well as in the new millennium 2000-09.

According to Borneman and Fowler [1997] Europeanization also has an anthropological perspective, and is based on discrete European nation-making processes "to enforce pan-European standards on dis-

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[21] Italy was a plain member of the Union since the beginning, Ireland joined in 1973, Greece in 1981, and the Iberian partners in 1986.

[22] [Mata and Valério (2011)].

parate parts" (p. 489). Free intra-European migration flows stimulated broad similarities through acculturation, and consumption imitation effects. This is much more than an important aspect for technical diffusion. [23] Labor free circulation demonstrated the superior character of some partners' institutions, and spread better information on practices within organizations, knowledge on better local policies, and financial education. [24] Openness to the Balkans and the East brought the enriching possibility of extending business capacities to customers in the emerging markets. [25] Corporate rationality gained new opportunities to implement cross-border competition. These were important institutional adjustments for international business, profitability, and scale spillovers resulting from the larger dimension of markets, to be sure. Moreover, it should be stressed that redistributive mechanisms among European nations could occur, thanks to higher efficiency, stimulating catching-up similarities regarding per capita exports and imports, as well as per capita consumption of public good indexes, thanks to similarities among government spending per capita ratios that were typical of the most developed European nations. Such effects were especially important in the last two decades, the period when the common currency was proposed and adopted.

The two cases of non-similarity are Luxembourg and Malta, especially in the 2000-09 decade. From the MDS perspective, they are outliers. Luxembourg proves to be a special case to be considered, as it represents a cluster of positions that always reveals a special behavior. The distance between Luxembourg and any other partner was never cancelled, and holds for both the MDS Cosine correlation and the MDS Euclidean distance options, in MDS maps. As a financial center, it presents the highest GDP/capita levels throughout the sampled years, highly comfortable trade flow indexes, the highest government spending per capita among the 13 sampled countries, and it cannot be regarded as a common partner. Size (smallness) cannot be the explanation, as Malta, on the contrary, did not improve similarities, consistently having very isolated positions in the MDS plots. Luxembourg's financial center role should be borne in mind, a factor that is not considered in the variables chosen for the MDS plots presented. [26]

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[23] Which the European Union strongly supported in providing incentives, easing the IT revolution in all countries, moving forward personal skills, R&D, and modernization, even according to Boltho's and Eichengreen's pessimistic opinions [Acemoglu (2002)].

[24] [Fishlow (1985) ; Ekinci *et al.*(2007)].

[25] [Mishkin, in Feldstein ed. (2003)].

[26] This may be a useful exercise for future research.

The EMU partners' positions may represent an optimum in a long-run perspective. The positions corresponding to the last decade are quite close for all the Monetary Union countries sampled. This means that there are common Monetary Union competitiveness difficulties to be understood in the overall global market today.

In fact, the 2008-09 global crisis strongly affects almost all of the EMU members. [27] Curiously, the countries that are experiencing the greatest difficulties are those that show a move toward similarity with the core partners. [28] Accusations against the geographically-peripheral arch made up of Greece-Italy-Spain-Portugal-Ireland include the twin problems in government budget discipline and balance of payments. [29] If not resolved, these problems may lead to expulsion from the EMU, as high capital market interest rates greatly threaten these countries' sovereign debts. [30] As for government budget discipline, in the absence of constitutional dictums [31] among the Monetary Union countries sampled, these partners do not exhibit the highest government spending/GDP ratios. Violent protests, political chaos, massive unemployment demonstrations on streets, incidents, government downturns, and general strikes, have all been seen in many European cities in the last two years. IMF and European Fund interventions bring confidence in reducing uncertainty, but the literature already warns us "that austerity measures may be less expansionary than previously thought; they may well have the standard negative Keynesian effects as a result of lower demand". [32]

Of course, government budget discipline requires adjusted tax collection. This variable was not used for the MDS exercise because of information shortage for the purpose. It may be used now, as it is available for the 1995-2009 period, although lacunae remain and Ireland is not included. From this perspective, the Spanish tax collection/GDP ratio is amazingly low, raising doubts on the quality of data homogeneity. All other PIIGS countries are presenting ratios higher than those of Germany. [33]

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[27] [Reinhart and Rogoff (2010)]. For cycle Synchronization, see Bordo and Helbling [2010].

[28] Confirming Reinhart and Rogoff [2008b].

[29] These have been historically-recurring problems in these countries. [Flandreau and Sussman, in Eichengreen and Hausmann eds. (2005)].

[30] [Reinhart, Rogoff, and Savastano (2003) ; Suter (1992)].

[31] [Persson and Tabellini (2003)].

[32] [Ponticelli, and Voth (2011), p. 6].

[33] See Betrán, Aceña and Pons [2011], for a long-run Spanish analysis.

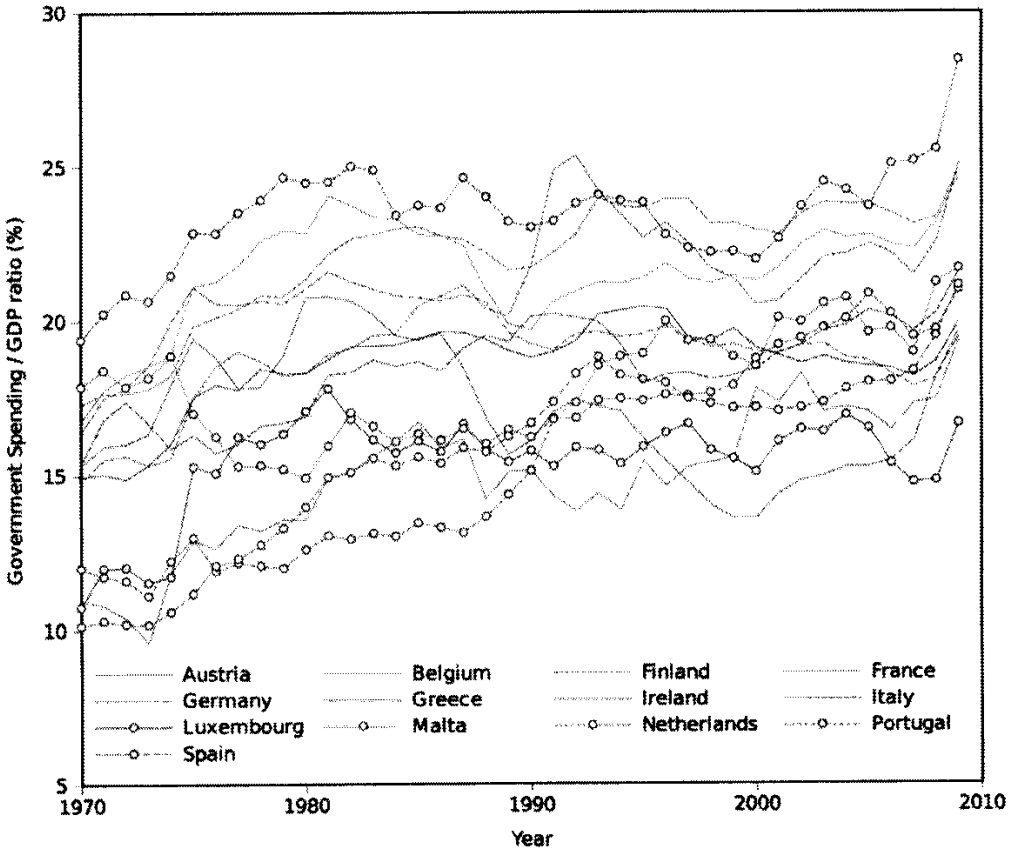

FIGURE 7

Evolution of the Government spending/GDP ratio (%) for the 13 countries during the period 1970-2009. Sources: World Bank national development indicators and OECD national data files

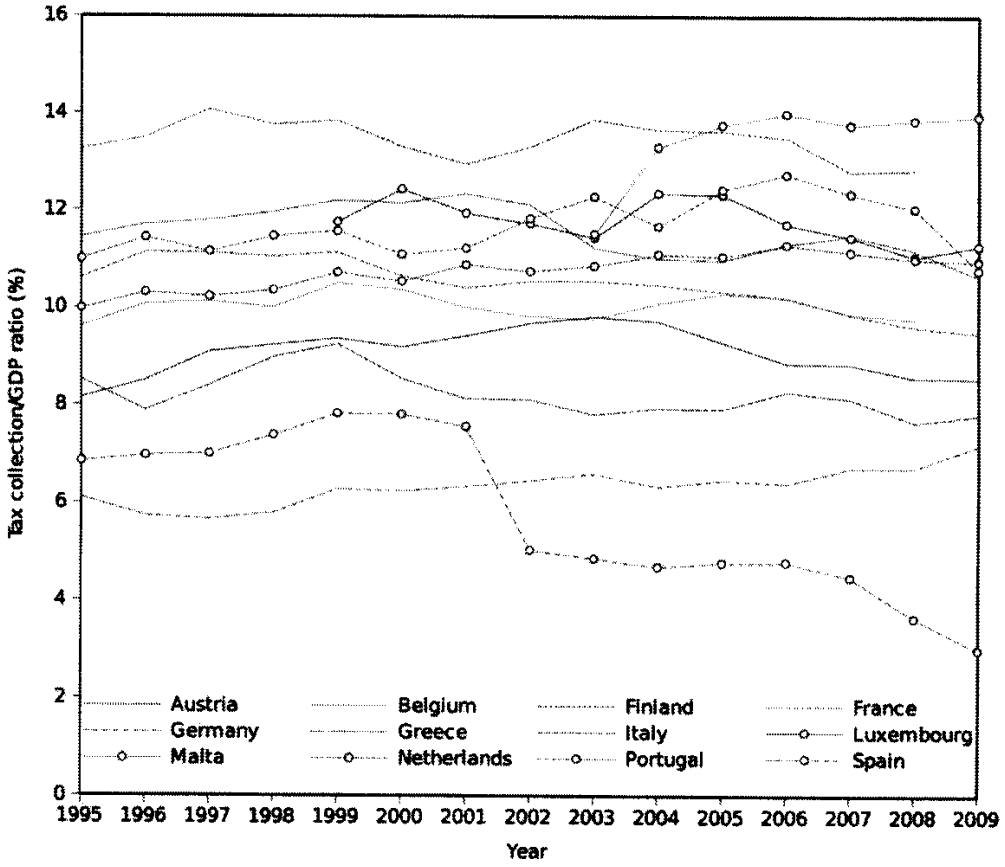

FIGURE 8

The Tax collection/GDP ratio (%) during the period 1995-2009. Sources: World Bank national development indicators and OECD National data files. Values are lacking for the period before 1995, for Ireland and Luxembourg before 1999, Malta before 2003, Belgium before 2009, and Finland before 2009

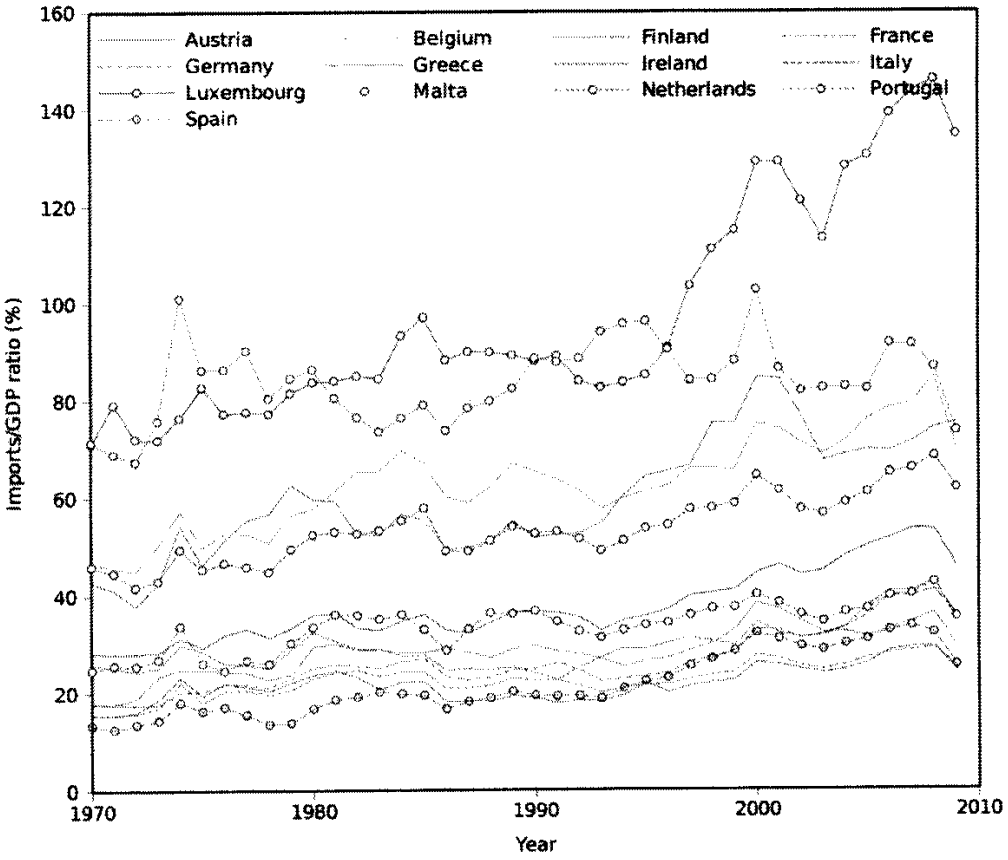

FIGURE 9

Evolution of Imports/GDP ratio (%) for the 13 countries during the period 1970-2009. Sources: World Bank national development indicators and OECD national data files

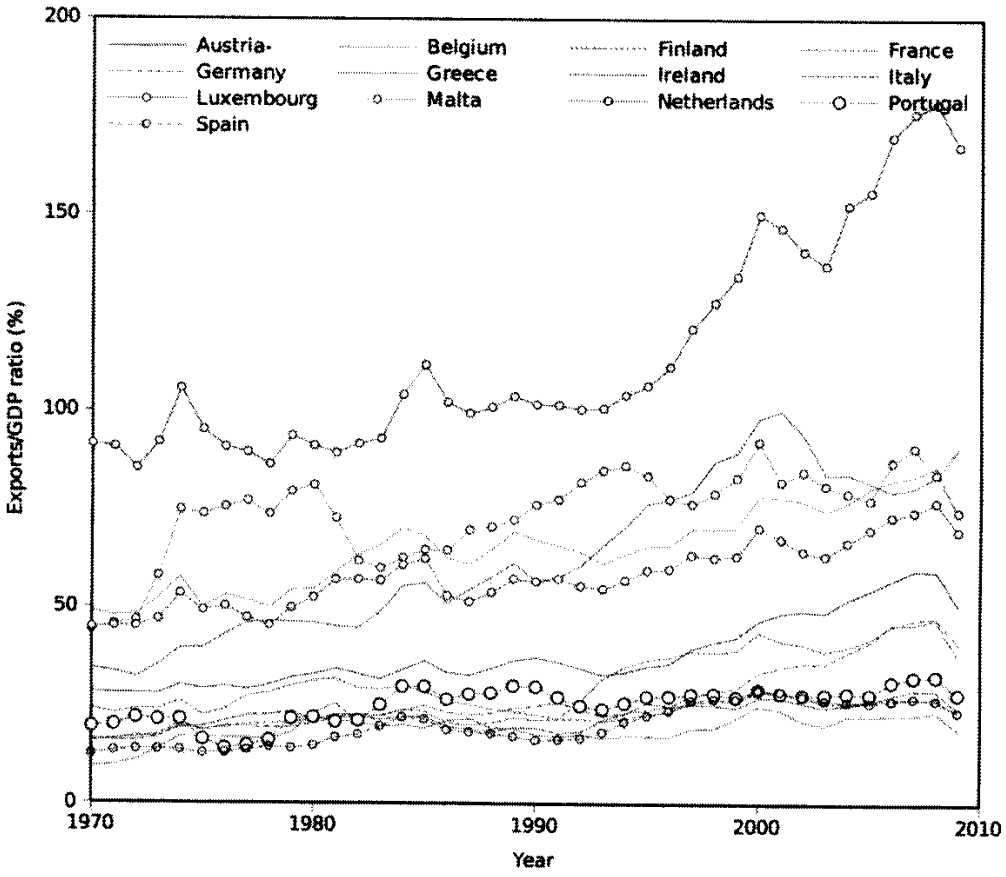

FIGURE 10

Evolution of the Exports/GDP ratio (%) for the 13 countries during the period 1970-2009. Sources: World Bank national development indicators and OECD national data files

As for balance of payments problems, among the Monetary Union countries sampled, these countries also do not exhibit the highest imports/GDP ratios.

The real problem with all countries is exports. Greece, Italy, and Portugal have the lowest exports/GDP ratios in the Monetary Union countries sampled. Ireland, on the contrary, performs well, which may explain, in part, the different nature of the Irish problems. [34] This means that these countries need to compensate low exports with other ledger items, such as emigrants' remittances or foreign direct investment flows, in order to achieve balance of payments equilibrium.

Figure 10 also reveals market competition problems. With the exception of Ireland, all the countries show decreasing Exports/GDP ratios in the current crisis. Moreover, the less a country exports, the less there is that can be taxed, exacerbating the government's budget equilibrium problems. As partners in a Monetary Union, countries may persevere for some time, but a correction is necessary, sooner or later. The special character of these problems in all of the Mediterranean partners reveals generalized market competition difficulties, both in the intra-European context, and in the global world scene.

IV. – CONCLUSIONS

The application of the MDS methodology to a database made of vectors for four dimensional variables, for 13 members of the EMU, shows how similarity was progressing from 1970 to 2009. Some countries were systematically prodigious in terms of export and import capacity, and prodigal in government spending throughout the four decades analyzed. The fruitful and successful process of economic integration may be interrupted at any moment, because, as this exercise demonstrates, similarity within the EMU was achieved, and the inability to deal with sovereign debt problems demonstrates common Monetary Union competitiveness difficulties in today's generalized global market.

The observation of government spending/GDP, tax revenues/GDP, and imports and exports/GDP ratios, shows that current difficulties are a common problem in recent years. This conclusion should be kept well in mind when formulating a generalized recovery plan, given the similarities among all countries. This brings the discussion to a new and lar-

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[34] [Reinhart and Rogoff (2008a)].

ger point, and is an important step to further new perspectives on common policies for the whole Monetary Union, from a global world perspective, in order to keep the hopes of the European project alive.

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