Has the European Monetary Union stimulated labor market reforms leading Eurozone countries to converge?

The endogenous Optimum Currency Areas Theory: An empirical approach

Author: Balma Benedito Albalat
E-mail: al226153@alumail.uji.es
Degree in Economics. Group: 4th A.

I**nstructor**: Dr. Mariam Camarero

Abstract

The movement from the Original to the Endogenous Optimum Currency Areas (OCA) theory implied that candidates for a monetary union were not required to comply with a number of economic conditions before the incorporation, but they would do it once they became members. Although there are multiple endogeneity channels, this paper investigates the labor market one. According to this strand of literature, the creation of a monetary union could stimulate countries to increase flexibility in their labor markets, leading them to converge. Using thirty-three years of data for twenty-two industrialized countries, we find a positive and growing relationship between labor market reforms and income correlations. However, this positive relationship vanishes in the case of peripheral Eurozone countries as compared to Germany. In addition, their unemployment rate correlations have become negative, that is EMU has not stimulated labor market reforms in these countries: the monetary union has not endogenously generated the mechanism to activate a better functioning of the labor market.

Keywords: Labor market, endogeneity, bilateral correlations, unemployment, Optimum Currency Areas, European Monetary Union.

JEL Classification: F45, O47.

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1. Introduction

Since its inception, the Optimum Currency Areas (OCA from now on) theory, developed by Mundell in 1961, has been transformed. The Original OCA theory implied that applicant countries for a monetary union should comply with a number of economic conditions in order to guarantee the perfect operation of the monetary union, that is to say, in order to achieve an optimal currency area. However, the accession criteria were confusing and pointed in different directions. This is the reason why some authors began to interpret the criteria jointly, bringing the birth of the endogenous OCA theory. According to this reformulation, countries are not required to comply with the conditions before joining, since they will do it once they are members. Therefore, the creation of a monetary union would lay the foundations for the monetary union to be optimal.

The European Monetary Union (EMU from now on) has been, since its creation, the testing ground for the endogeinity of OCA theory. A number of authors has tested some endogeneity channels and the results show that, despite endogeneity is fulfilled in some fields, actually the EMU is not an optimum currency area. It consists of a conglomerate of heterogeneous countries with different structural conditions and growth dynamics. The current economic and financial crisis and its different impact on the EMU countries has implied the resurgence of the interest in the OCA theory.
Especially, the differences have been relevant as far as the unemployment rates are concerned. The Core countries, such as Germany, Belgium or Austria, have achieved control on their unemployment rates, while in the peripheral countries, such as Spain or Greece, unemployment rates have grown inordinately.

For that reason, this paper focuses on the area called by De Grauwe-Mongelli (2005) the 'endogeneity of labour markets. We will test if countries that implement structural reforms on their labor markets tend to converge in real terms, and whether or not the EMU has simulated Eurozone countries (especially those with major adjustment problems) to increase flexibility in their labor markets. To do that, we will use bilateral correlations along a period of thirty-three years and data from twenty-two industrialized countries, and we will base on graphical evidence.

Section 2 presents a review of the theoretical literature regarding to OCA theory, then section 3 provides a summary of the empirical literature focusing on the EMU, with tests done by a number of authors about the endogeneity of OCA theory in the Eurozone. Hereafter, section 4 explains the methodology and data used in our test. Lastly, section 4 brings the results and section 5 concludes.

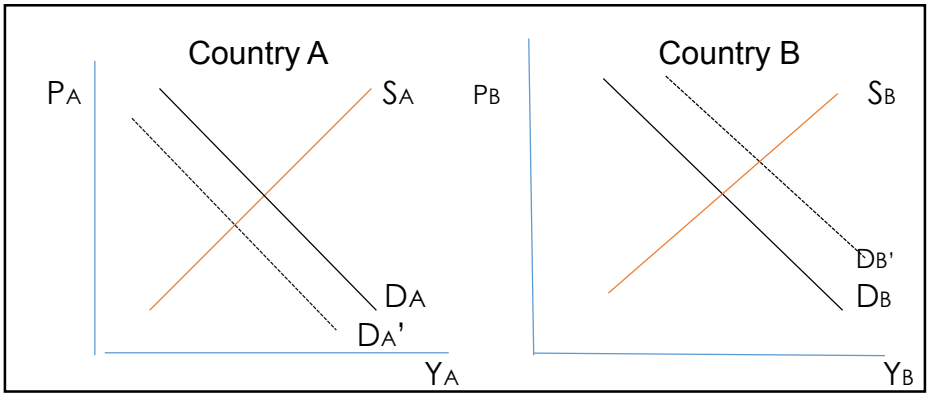
2. Review of theoretical literature

2.1 The OCA criteria

It was Robert Mundell, Nobel Prize in 1999, who introduced the well-known Optimum Currency Area (OCA) theory more than 40 years ago. An OCA could be defined as a geographical region which maximizes its economic efficiency by sharing a common

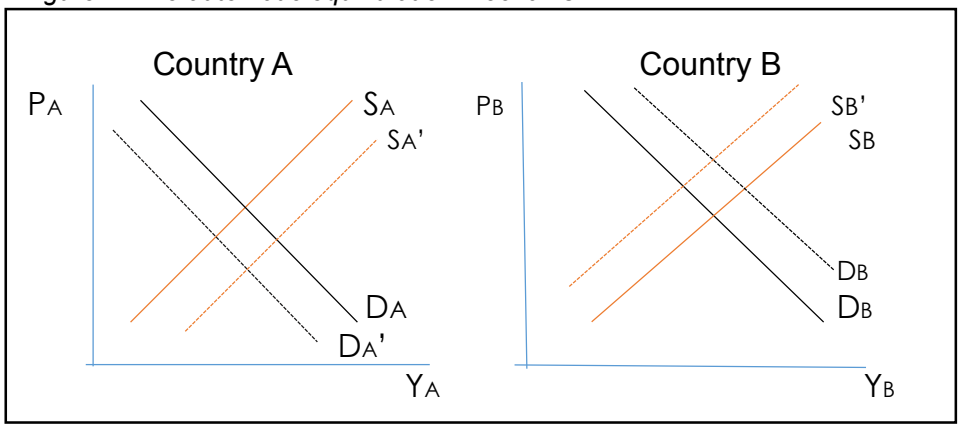
currency. Therefore, for a currency area to be optimal the benefits of monetary unification should exceed the costs. On one hand, joining a monetary union eliminates exchange rates between member countries thereby eliminating the likelihood of competitive devaluations and leading to greater trade linkages and higher investment as well, because transaction costs across borders are much lower and the exchange rate uncertainty vanishes. Furthermore, countries characterized by a little disciplined monetary policy may benefit from relinquishing its monetary autonomy to a supranational institution much more rigorous who applies a uniform monetary policy, thereby reducing the inflation bias. However, being part of a currency union implies the loss of monetary independence such that exchange rate cannot be used as an instrument of short run adjustment. According to Luca Antonio Ricci (2008) for the exchange rate between two countries to be such an effective adjustment tool, three conditions must be fulfilled: (1) the two regions face asymmetric disturbances which require an adjustment of good prices, (2) wage and price flexibility are low, such that prices do not adjust immediately to the shocks, (3) and a relative price change caused by an exchange rate change is not quickly neutralized by national price movements. Nevertheless, as it will be explained later, countries which join a monetary union are expected to converge economically, such that they will face symmetric shocks. Moreover, one of the endogenous OCA properties is that monetary unification increases wage and price flexibility of member countries. Under this conditions, it seems that if a monetary union becomes optimal, the loss of the exchange rate instrument as an adjustment tool becomes less important. Following the case of a demand shift developed by Mundell (1961) and De Grauwe (2004), imagine two member countries A and B of a monetary union. For some reasons, the demand for products of country B increases at the expenses of the demand of country A.

Figure 1: Aggregate demand shifts in country A and B.



This is reflected by an upward movement of the country B demand and a downward movement in that one of the country A, such that output and prices in country A decrease and country B experiences a higher output and an increasing price pressure. At this moment, there is an adjustment problem between countries. However, De Grauwe argues that if wages and prices are flexible or there is labour mobility, a mechanism of automatic equilibration will take place.

Figure 2: The automatic equilibration mechanism.



On one hand, if wages and prices are flexible, workers of country A who are unemployed will claim lower wages and the wage rate in that country will be lower such that the supply curve will shift downward and the equilibrium will be reached. For its part, country B will experience the opposite, and its supply curve will shift upwards due to the increasing wage pressure, achieving the old equilibrium. On the other hand, if labor is mobile across countries, workers of country A who are unemployed will move to country B to find a job. The excess of labor demand in country B will decrease wages and the lack of labor demand in country A will increase wages in that country, thereby balancing the labor market again and adjusting both economies after the demand shock. However, for a country with a low degree of wage and price flexibility before being a member country who cannot achieve higher wage flexibility after the unification, the loss of monetary autonomy could be dramatic.

Mundell (1961) postulated that in an OCA either the member countries face symmetric shocks, or if shocks are asymmetric they are able to absorb them. This is the reason why Mundell advocates flexible wages and prices and production factors mobility within the union. These conditions together with the contributions of Ingram (1962), McKinnon (1963) and Kenen (1963) built the **'original' OCA properties**, which are the characteristics considered as crucial for judging whether it's convenient for a group of countries to form a monetary union or not. According to these properties, for a country to be a suitable member of a currency union it should meet the criteria **ex-ante**:

(a) Wage and price flexibility. The higher both are, the easier the adjustment process after a shock will be.
(b) Capital and labor mobility. The grater the labor mobility is, the easier to be part of a currency union will be, since the cost of losing the exchange rate instrument will be lower.
(c) A high degree of economic openness increases the likelihood of joining a currency union.
(d) Diversification of production or exports increases the attractiveness of sharing a common currency, considering that it reduces the likelihood of specific shocks to any sector and, accordingly, the stabilization cost of joining a monetary union.
(e) Similarity of inflation rates, because differences could result in disparities in structural developments, diversities in labor markets and differences in economic policies (Mongelli, 2005).

(f) Similarity of economic structures. The more similar the countries are, the more symmetric shocks they will confront, and the more likely to join a monetary will be.
(g) Financial market integration. It can reduce the need for exchange rate adjustments (Ingram, 1969).Furthermore, if financial markets are integrated, even a small change in interest rates would imply a quick allocation of capital across countries, leading to lower differences in long-term interest rates.

However, many authors critizised the 'original' OCA theory for various reasons. Dellas and Tavlas (2009) supported that these properties point in different directions, such that they are contradictory and inconsistent:

'An economy that is small and open, suggesting the preferability of pegged exchange rates, might also possess a low degree of labor mobility, implying the desirability of flexible exchange rates. The openness characteristic suggests that small economies should adopt pegged rates since small economies are likely to be relatively open. Such economies, however, are also apt to be relatively undiversified, making them better candidates for flexible rates according to the diversification criterion'. (Dellas and Tavlas, 2009, p.1126)

In this way, the suitability for a country to be part of a currency union may depend on the criterion considered. This is the reason why some authors started to interpret them jointly and this meant the emersion of a number of weaknesses and limitations behind the pioneering OCA theory. For example, McKinnon (2004) postulated that countries which form a monetary union could reduce the likelihood of asymmetric shock by diversifying their income sources. In this way, countries would no need to accomplish with the similarity of shocks prerequisite if they were financially integrated.[1] Furthermore, as it has been said above, similarity of inflation rates was also a condition which must be taken into account in order to assess the suitability for a future member country. However, to share a common currency and to follow a uniform monetary policy is an opportunity for countries to 'tie their hands' and to gain low-inflation credibility, thereby leading to a full monetary union with a low inflation rate in each country. Therefore, the similarity of countries' inflation rate before forming a monetary union becomes a less important precondition because once a country is a member, the common and supranational monetary policy will lead its inflation rate to a low level and to converge with the best inflation rate (the lowest one) of the union.[2]

The joint interpretation of the traditional OCA criteria and the European Economic and Monetary Union (EMU) experience together with the advances in econometric techniques meant the emergence of the **'new' OCA theory** that deals with the **endogeneity** of currency areas. Such new OCA theory defends that a country's suitability to become a member of a monetary union cannot be judged on the basis of its historical data, since once a country becomes a member, drastic economic changes are expected to occur (an application of the Lucas Critique). The starting example shows us that countries who join a monetary union and thus relinquish their monetary independence, could deregulate labour mobility across country borders and increase wage and price flexibility in order to ease the adjustment

[1] For more information about the joint interpretation of OCA properties see Corden (1972), Ishiyama (1975), Tower and Willet, Tavlas (1994) and McKinnon (2004).
[2] For more detail see Gondolfo (1992).

process due to the impossibility to use monetary policy as an adjustment tool, that is a monetary union could encourage countries to undertake structural reforms. In this way, member countries are more likely to meet the OCA criteria ex post than ex ante. Therefore, the new vision of the OCA implied a reformulation of the old properties and the establishment of 4 differentiate endogeneity areas by De Grauwe-Mongelli (2005): endogeneity of economic integration, endogeneity of financial integration, endogeneity of symmetric shocks and endogeneity of product and labour market. Endogeneity of economic integration refers to the fact that monetary unification increases trade between member countries leading to a higher economic convergence[3]. Endogeneity of financial integration is less empirically proved and may imply a convergence of nominal interest rates and a significant risk-sharing. Endogeneity of symmetric shocks means that clustering forces could dominate over dispersion forces leading to more synchronized outputs, whereas endogeneity of product and labor markets implies that after the unification, countries may increase the flexibility in these markets. In section 3, some empirical analysis of the endogeneity of OCA will be explained in more detail.

2.2 The endogenous OCA theory and the EMU case

According to Eichengreen (1996), 'like it or not, the theory of Optimum Currency Areas remains the workhorse for analyses of European monetary unification. Indeed, many economists do not like it very much'.

The integration process of EU began in 1957 when The Treaty of Rome founded the European Economic Community (ECC). After that, a number of countries joined the ECC and The European Single Act (1987) consolidated the European Single market, which implied free movement of goods, services, labor and capital between member countries. It seemed that de following step for the integration process to continue was the monetary unification. However, not all the ECC member countries agreed, and those who don't had to sign an exemption clause (Denmark and United Kingdom). The Treaty of Maastricht (1992) built a foundation of monetary unification. It implied the formation of an independent European Central Bank who would apply a uniform monetary policy, and the existence of a single currency. Furthermore, it contained some requisites that those countries who wanted to join the monetary union had to accomplish with a year before the exam. These preconditions were:

- **(I)** An inflation rate not higher of 1.5 percentage points and an interest rate not higher of 2 percentage point than the average rate of the three member countries with the lowest ones, in order to reach price stability.
- **(II)** A public deficit/GDP ratio not higher than 3%
- **(III)** A public debt/GDP ratio not higher than 60%
- **(IV)** A stable exchange rate during two the two years before the exam, when currency devaluations were not allowed.

[3] Frankel and Rose (1998) found that countries who became members of the EMU increased their bilateral trade beyond the simple effect of the elimination of the exchange rate volatility. In particular, they calculated a multiplier value of three or higher, known as 'The Rose effect'.

The Maastricht criteria were actually convergence criteria. The goal of such preconditions was to get similar countries in nominal terms in order the reach similar countries in real terms. Those countries who pass the exam were the first in forming the Economic and Monetary Union (EMU), and the euro started to flow in 2002. Since then, a number of countries has joined the EMU once they accomplished with the Maastricht criteria, and nowadays the EMU is formed by 18 heterogeneous nations. But, has the EMU experience showed real convergence between member countries according to the OCA theory¿, Are the Maastricht criteria enough to assess the suitability for a country to be an EMU member¿, is there any evidence of the OCA endogeneity in EMU?, Is the EMU an optimal currency area?

The following section contains a revision of the empirical literature about the endogeneity of OCA in the EMU case.

3. Review of empirical literature: the EMU case

The interest for the EMU case as an international example of monetary unification and the advances in econometric analysis encouraged many authors to test the endogeneity of OCA theory in the European scenario.

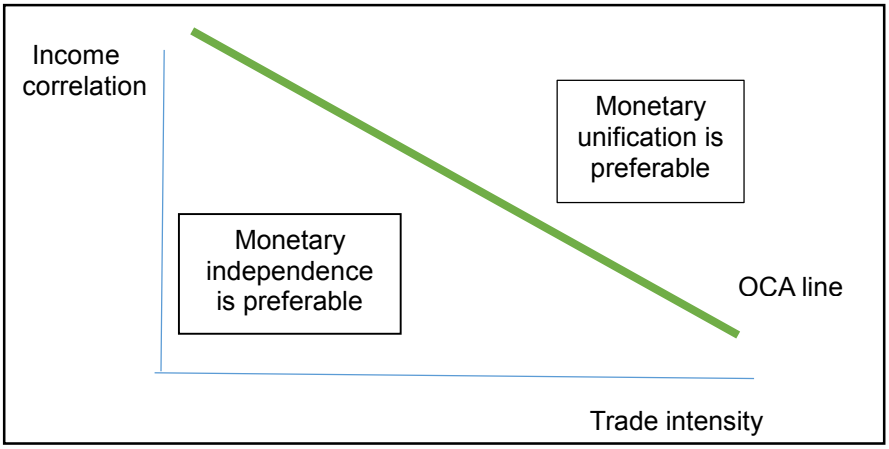
As it has been said before, one of the endogeneity areas of the new OCA theory according to De Grauwe-Mongelli (2005) is the endogeneity of economic integration referring to the fact that monetary unification strengthens trade linkages between member countries and thus it leads countries to converge. Frankel and Rose demonstrated in 1998 that monetary unification rises trade between countries three times or more than the increase which would take place if we only took into account for the fact that the exchange rate volatility has vanished ('The Rose effect')[4]. However, it has been widely discussed whether this fact would lead member countries to a higher degree of output convergence or not, that is **'the specialization paradigm'**. According to Krugman (1993), if bilateral trade between countries rises, they will specialize in those products in which production they have comparative advantage such that they will be more vulnerable to sector specific shocks and their outputs will be less correlated. In contrast, the Commission's point of view is that monetary unification raises trade between member countries thereby leading to more idiosyncratic activity and income correlation because of common demand shocks.

Graphically, it is showed in Figure 3. The OCA is downward sloping because there is a trade-off between economic openness and income correlation. It constitutes a threshold line such that countries who have a low degree of economic openness and their incomes are little

[4] Willett, Permpoon and Wihlborg (2010) consider that the endogenous trade effects of the creation of the EMU are difficult to interpret because it is necessary to develop a better understanding of the factors which have caused an increase of trade in general before one can fully link the trade effects with the creation of the euro. In this way, the effects of the common currency (reductions in transaction cost and exchange rate risk) should be distinguished from the 'EMU-effects', which can be caused by institutional and macroeconomic changes in most countries who have gain credibility with respect to inflation control after substituting their national central banks for the ECB.

correlated, the monetary independence will be preferable (right side). Contrary, countries who are widely opened will converge and monetary unification will be their best option. Frankel and Rose (1998) observed that the effect of increasing trade between member countries of a monetary union over business cycles correlations may depend on the type trade they are engaged in. If trade is inter-industry, countries will produce goods in which they have comparative advantage such that there will be a negative correlation between trade and income correlation. In this way, more integration moves countries to the left from the OCA line[5]. However, if trade is mostly within industries, the specialization effect will be small and countries will prefer the unification (right-hand side). Frankel and Rose used a sample of 21 countries and data from 1959 to 1993 to test the specialization paradigm. They concluded that countries that join a monetary union increase their reciprocal trade and that there is a positive and strong correlation between international trade and income correlation. In this way, EMU entry may encourage trade expansion and this may result in more correlated business cycles: again 'countries are more likely to satisfy the criteria for entry into a monetary union ex post than ex ante'.

Figure 3: The specialization paradigm



Source: based on Frankel and Rose (1998)

It seems that the endogeneity of the OCA theory is really optimistic since it supposes that although countries don't satisfy the criteria ex-ante, they will do it once they join the monetary union. In the first section we discussed that when a country becomes a member, it is likely to experience drastic changes so that if it had just a little wage and price flexibility before the unification, it will start a process of structural reforms afterwards. The reason is that higher flexibility would reduce the cost of losing the exchange rate as an adjustment tool in order that the unification gives countries incentives to raise flexibility. Beetsma and Giuliodori (2010) used a model constructed by Calmfors (2001) to explain the effect of monetary unification on reform efforts and the free-riding problems which could emerge. The origin of such problems is that the benefits of a structural reform done by a country affects all member countries, while costs are supported at a national level resulting in little reforms in union.

[5] Frankel and Rose (1998) also note that the OCA line could be in a different position depending on the preferences and structural features of countries. Under the same degree of economic openness and income correlation, countries who are quite diversified, have similar -preferences in terms of a low inflation and have a certain degree of price and wage flexibility could face an OCA line more at the left-and thus more easy to traverse- compared to those countries that don't.

The conclusion is that the effects of monetary unification on structural reforms is ambiguous, because reforms diminish both the natural rate of unemployment and the sacrifice ratio, and a lower sacrifice ratio is preferable under monetary independence because an exchange rate depreciation cannot cause a deflation. In contrast, monetary authorities of a union can support a supply-side reform in a member country by applying a stimulus of aggregate demand.

However, Willet, Permpoon and Wihlborg (2010) support that the magnitude of the reforms is likely to be relatively modest because their costs are highly visible and affect identifiable groups of economic agents while their benefits accustom to come later. They also argue that the lack of effective actions in the EMU is that political leaders do not really understand the need for reforms. Furthermore, the OECD (2007) finds that structural reforms have not been equally strong in all member countries, being the small countries those that have undertaken more labor market reforms[6]. Although the creation of EMU has accelerated product market deregulation, it has not occurred the same in labor market and unit labor costs, which have diverged substantially between EMU countries since 1999[7]. In particular, while Germany has experience a gain of competitiveness of 15%, Spain and Ireland have lost the same percentage.

'While there appears to have been some increase in labor mobility within the euro area, there are also mounting concerns about immigrations that suggest strong limitations on effective cross-country mobility of workers. There is, of course, higher mobility among some types of professionals, but this would seem far from sufficient to meet the labor mobility criteria for an OCA'.(Willet, Permpoon and Wihlborg, 2010)

Eichengreen (2002) also concludes that structural reforms in EMU countries remain partial and incomplete.

Moreover, there is not an explicit time horizon for the accomplishment of OCA properties after the unification (the endogenous effects of the unification), and EMU countries could be expected to undertake deeper structural reforms after major recessions in order to raise their flexibility. The problem is that to use recessions as a motivational tool is not a productive way to start reforms, because they are more difficult to implement in hard times. Even in this case, the endogeneity of labor market seems to be at a great distance. In this aspect, the accession candidates into the EMU maybe should comply with a certain degree of labor market flexibility as a requisite for entry instead of hoping structural reforms will be made once they are inside.
Warin, Wunnava and Janicki (2009) tested the endogeneity of financial market integration in EMU using the bilateral FDI (Foreign Direct Investment) flows. They wanted to measure whether the creation of a monetary union results in a better allocation of capital across member countries. The conclusions were that income correlations between member countries result in an increase in FDI flows. However, convergence in terms of interest rate has implied lower FDI flows between EMU members since 1999, suggesting that the

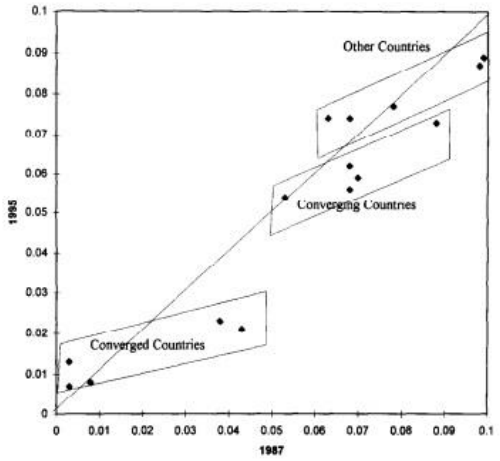
[6] The OECD attributes the more intense reform process in smaller countries to the fact that their population is more homogenous, and that they face greater costs of not having the exchange rate as an adjustment mechanism because of the increase of competitive pressures caused by their high degree of economic openness.
[7] The divergence of unit labour costs is harmful since, according to Warin, Wunnava and Janicki (2009), convergence in factor endowments (capital and labour) would lead to a rise in Foreign Direct Investment flows.

structural similarity of countries reduces the interest to invest in these countries. Despite that fact, belonging to the EMU increases FDI flows between member countries, the distance between them becomes less important and the flows tend to be higher between those countries with a greater difference in debt levels. This result supports the intuition of De Grauwe (2005) about the rise in FDI flows between EMU members.

It is evident that a number of authors have contributed to test the endogeneity of OCA theory and that there is evidence of endogeneity in some areas. But, have countries actually converged in terms of output?. Are EMU countries growing together? In 1997, Bayoumi and Eichengreen constructed an OCA index for the European countries by using exchange rate equations and extrapolating the independent variables whose aim was to predict which countries would be the best candidates to join the EMU in the future.[8] The results divided the European countries into three different groups: converged countries, converging countries and other countries (see Figure 4).

The first group of converged countries are those which were the prime candidates for EMU (Austria, Belgium, Netherlands, Ireland and Switzerland)[9]. The second group refers to those countries for whom there is a little convergence (the UK, Denmark, Finland, Norway and France) and the results support the decision of the UK and Denmark by opting out of the EMU. Finally, the last group is formed by those countries for whom there is no convergence and for whom the OCA index is declining over time. There countries are the southern EMU members (Italy, Greece, Portugal and Spain). The authors concluded that changes in the OCA index depend on bilateral trade intensity and asymmetric output movements. Thus, 'there is a symbiotic relationship between economic integration and monetary integration such that economic integration has increased countries' readiness for monetary integration'. From the results of the empirical analysis of Bayoumi and Eichengreen (1997), one may deduce that economic integration among EMU countries has not evolved homogeneously, leading some countries to converge and others to diverge.

Figure 4: The OCA index over time



Source: Bayoumi and Eichengreen (1997)

[8] For more details about methodology and data used see Bayoumi and Eichengreen (1997)

[9] Bayoumi and Eichengreen (1997) highlight the absence of France, whose participation in the EMU could be related to political reason rather than economical ones, and the presence of Ireland, since its OCA index corresponds to the convergence observed under Maastricht Criteria (De Grauwe, 1996)

For its part, Crowley, Garcia and Quah (2013) explored the different economic growth dynamics within EMU since the introduction of the euro using wavelet analysis[10] and taking its results to apply cluster analysis. The conclusions of authors were that correlations in growth are higher at low frequencies and correlations at higher frequencies have been increasing over time, although certain member states, especially Greece, have experienced divergence in dynamics of economic growth. Furthermore, the cluster analysis shows how EMU countries falls into different groupings, and Greece is not a clear member of any of them.

Figure 5: Unweight fuzzy clustering analysis

1	BEL, SPA, AUS, SLO, FIN, SWE, SWI
2	IRE, LUX, POR, SLV
3	GER, FRA, ITA, NET
4	LIT, HUN, UKM
5	BUL, GRE
6	CYP, NOR
7	EST, LAT
8	Rest single clusters

Source: Crowley, Garcia and Quah (2013)

In this way, within EMU coexist different growth dynamics and member countries do not form a homogeneous bloc which is growing jointly, but there is a core group and approximately three groupings of member states. Therefore, it seems that the results of this analysis are not a support for the endogeneity of OCA. Although it is expected the business cycles synchronization between countries which are subject of a uniform monetary policy, which form a Single Market, such that production factors flow between them (countries are more likely to satisfy OCA properties ex-post rather than ex-ante), there is evidence of a great divergence between EMU members: the endogeneity of economic activity is not a fact.

It is at this point that one may stop and think whether the EMU was an optimal currency union when it was formed, or whether the endogeneity of OCA properties has made EMU optimal. The widespread answer is no. Certainly, labor market flexibility in many EMU countries is still so low, in spite of some reforms started but incomplete. Furthermore, it is important to emphasize the lack in EMU of an adjustment mechanisms at union level to stabilize economic activity when symmetric shocks occur. Fiscal policy is set at a national level because there is absence of a fiscal authority at a union level, which may lead to a lack of coordination as monetary policy is set uniformly by the ECB. This single monetary policy is applied over a conglomerate of heterogeneous countries, which have different degrees of development and this could lead to current account imbalances between member states. We have already seen that there is endogeneity in some areas. However, EMU countries are not growing together, but there is divergence in economic activity. Either by coincidence or not, countries which in reality form an optimum monetary union (the Core), are those

[10] The wavelet analysis is divided into two types: discrete wavelet analysis and continuous wavelet analysis. The first one extracts cycles at different frequencies from the data while the second one evaluates how the relationships uncovered in the discrete analysis change over time. For a thorough comprehension see Crowley, Garcia and Quah (2013).

which started the EMU and were the first to comply with the optimality criteria ex ante[11] (Handler, 2013). This subset of countries, according to De Grauwe (2009) the Benelux countries, Germany, France and Austria, are more likely to obtain net gains from the unification than periphery countries. This could lead us to believe that it is important for future countries to comply with OCA properties before joining the EMU.

4. Empirical methodology and Data

The conclusion that one can draw from the previous sections is that although empirical evidence supports the endogeneity of OCA in some areas, there is an obvious divergence with respect to economic growth dynamics inside EMU. Due to its importance, we are going to focus on the area named by De Grauwe-Mongelli (2005) as 'the endogeneity of labor market'.

Our objective here is to find evidence supporting the following hypothesis: 'The creation of the EMU may be a stimulus for countries to rise flexibility in their labor markets, since it is a way to ease the adjustment process after a shock, under the lack of the exchange rate as an adjustment tool'. The approach we are going to use in based on Frankel and Rose (1998). They estimated the relationship between bilateral income correlations and bilateral trade intensity, and found that there is a strong positive effect of trade intensity on income correlations (Frankel and Rose, 1998), thereby supporting the idea of endogenity of OCA[12]. Instead of that, we are going to search for evidence supporting that countries who rise flexibility in their labor market tend to have a higher income correlation, and whether or not the creation of the EMU has stimulated such structural reforms. In order to do that, the indicator we will consider as a proxy of the lack of structural reforms on the labor market is a high unemployment rate. Our analysis arises from the assumption that the higher the flexibility in labor market, the lower the unemployment rate. Beetsma and Giuliodori (2010) used a model borrowed from Calmfors (2001) to explain the free-rider problems of structural reforms in a monetary union.[13] That model proofs our assumption, since it assumes that a structural labor market reform, $s_i>0$, reduces equilibrium unemployment: $u_i^* = u - \delta s_i$, $\delta>0$, being 'u' the unemployment equilibrium rate in the absence of reforms. They concluded saying that 'free-riding problems may become less severe if the structural reforms not only diminish the equilibrium unemployment rate, but also the sensitivity of unemployment to shocks' (Beetsma and Giuliodori, 2010).

However, Beetsma and Giuliodiori (2010) were not convinced of the positive effect of structural reforms in labor market on the unemployment equilibrium rate. Therefore, trying to find some supports to our assumption, we constructed graphs of the evolution of the

[11] Italy and Belgium are exceptions since their public debt was higher than the annual GDP when the EMU started.

[12] Increased integration results in more highly correlated business cycles due to common demand shocks or intra-industry trade. In this way, countries that may appear to be poor candidates for EMU entry, are more likely to satisfy the criteria *ex post* than *ex ante* (Frankel and Rose, 1998).

[13] Such free-riding problems are analogous to those in fiscal policy. In a monetary union, the benefits of an individual reform spreads to all member countries due to the common monetary policy, while the costs are supported at the national level. This results in little reforms in the union.

unemployment rate in the period time 1980-2011, and the level and evolution of four indicators of labor market flexibility in several countries of our sample. There are a multitude of indicators used to estimate the degree of such flexibility. Here, we have just considered two 'Government policy' variables (RI, and GOVIN), and two variables describing the institutional setting of the labor market (WCOOR and UD). Such four variables are the same as those used by Camarero, D'Adamo and Tamarit (2013) in their construction of the wage equation in the Euro Area[14]. As far as government policy variables are concerned, RI (routine involvement of employers and unions in wage bargaining) represents the 'concentration system' and goes from 0 (no concentration) to 2 (full concentration). GOVIN is and indicator of government intervention in wage bargaining, and goes from 0 (no intervention) to 5 (government imposes wage settlements). In relation to the 'institutional variables', WCOOR goes from 1 (full decentralization) to 5 (full coordination), and UD (union density) represents the percentage of employees who are members of a union.[15]

The graphs in the Appendix show the evolution of these four variables jointly with the unemployment rate from 1980 to 2011 in some industrialized countries[16]. The variables RI, GOVIN and WCOOR are measured in the right vertical axis, while union density and unemployment rate are measured in the left vertical one. We can see a general tendency towards a lower union density in almost all countries considered. However, it is difficult to find a link between the unemployment rate and the variables, since the countries with the lowest unemployment rate are Nordic (Norway and Sweden) and Anglo-Saxon countries (Australia, USA, UK and Canada). While the first group have a lot of rigidities in their labor markets, the second one is much more flexible (see Appendix I). Furthermore, Austria, Japan and Switzerland have remarkably low unemployment rates, and some rigidities in their labor markets. Contrary, the country with the highest unemployment rate along the period considered is Spain, characterized by an unstable labor market (the involvement of government or unions in wage bargaining vary from year to year), some rigidities and no tendency toward more flexibility. Honestly, four variables are not enough to proof if labor market reforms would have a positive effect on the unemployment rate, due to the involvement of a number of factors and its dependence on the economic cycle. Nonetheless, labor market reforms aim to reduce the structural unemployment rate. In any event, an amount of the countries with a low unemployment rate are characterized by flexible labor markets, thus labor market reforms could lead to a lower structural unemployment rate. The recent experience of the German labor market reforms (Hartz), which have been estimated to reduce the German structural unemployment rate by 1.4 percentage point (Krebs and Scheffel, 2013), are a proof of this.

Along the same lines followed by Frankel and Rose (1998), but with and objective much more modest, we will try to find graphical evidence supporting that structural reforms in labor markets (that will lead to a lower unemployment rate) lead countries to converge in real terms. In order to that, we use data from 22 industrialized countries[17] and the sample period

[14] They use four government policy variables (dEA, TWED, GOVIN and RI), and four variables describing the institutional setting of the labour market (WCOOR, EPL, UD and MWS) instead. For further details, see Camarero, d'Adamo and Tamarit (2013).

[15] The data are taken from the ICTWSS: Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts. (Amsterdam Institute for Advanced Labor Studies, AIAS)

[16] The countries are Australia, Japan, Austria, Switzerland, Germany, Belgium, France, Spain, Italy, Sweden, Norway, UK, USA and Canada.

[17] The sample countries are those used by Frankel and Rose (1998), but we add Luxembourg : Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy,

is 1980-2013[18]. First, we take series of real GDP and the unemployment rate from 1980 to 2013 of the 22 countries and take natural logarithms of the first variable. Second, we de-trend de logarithm of GDP in order to focus on business cycle fluctuations. To do that, we use the simplest method, taking differences of the (log of the) variable (log (GDP)t – log(GDP)t-1). We have therefore one year less in our sample period, from 1981 to 2013[19]. The series of unemployment rate are not transformed.

When we have done this, we are able to obtain bilateral correlations (between each country-pair *i* and *j*) of (log of) real GDP over a given span of time. In this case, we compute them for the whole sample and for three differentiated periods after splitting the sample. Consequently, we obtain bilateral correlations for the sample period 1981-2013, and for three differentiated periods: 1981-1992, 1992-2000 and 2000-2013. In the same way, we also compute correlations between each country pair using the unemployment rate variable for the same periods. Since we have 22 countries, we obtain 231 pairs. Therefore, we are left with 231 bilateral country-pair correlations for real activity and 231 for unemployment rate (over different periods of time), that is to say two data for each country-pair. Finally, we represent the bilateral correlations of (log of) GDP facing bilateral correlations of the unemployment rate for each pair in a scatter-plot, thus obtaining 4 plots: one for the whole sample period, and one for each of the 3 sub-periods (1981-1992, 1992-2000 and 2000-2013). In the following section, the results are showed and explained.

5. Empirical results

Figures 6, 7, 8 and 9 show the resulting graphs after confronting bilateral correlations of real GDP with bilateral correlations of the unemployment rate for each country-pair for the whole sample period, the 1981-1992 period, the 1992-2000 period and the 2000-2013 period, respectively.

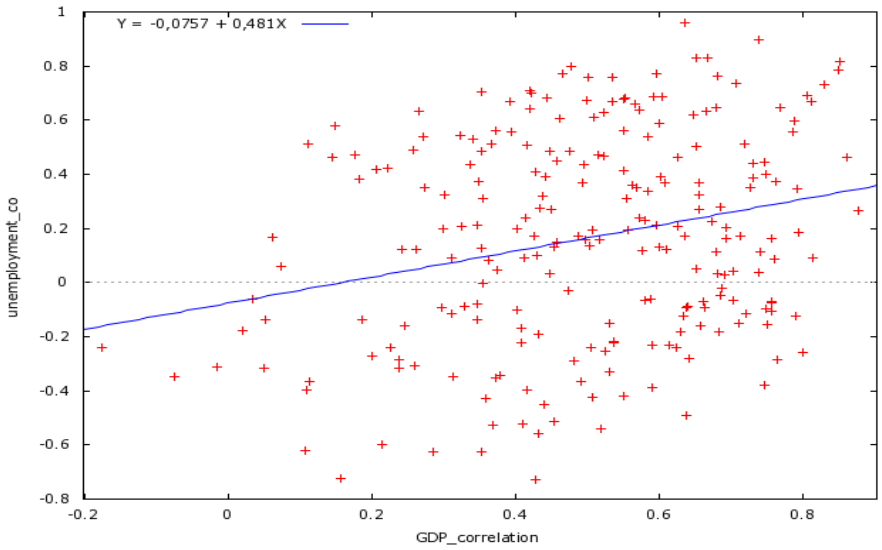
Figure 6 shows that there is a direct link between unemployment correlations and GDP correlations. What this means is that the higher the unemployment correlation, the higher the GDP correlation. Therefore, countries that implement structural reforms in their labour markets so that, according to our assumption, will have lower structural unemployment rates, will tend to have a higher income correlation.

Japan, Luxembourg, Norway, Netherlands, New Zealand, Portugal, Spain, Sweden, Switzerland, the United Kingdom (UK) and the United States (US).

[18] Series of unemployment rate and real GDP for the 22 countries along the sample period 1980-2013 are taken from the International Monetary Fund Database.

[19] This is because we obtain de-trend variable in period t subtracting his value in t-1. The first period after the de-trend procedure will be 1981, since we would need the (log of the) GDP in 1979 to obtain the GDP value de-trend in 1980.

Figure 6: Scatter-plot (GDP correlations vs Unemployment correlations (Sample period: 1981-2013)



But is after splitting our sample in three different periods that one can observe that as well as the relation between GDP correlations and unemployment correlations is positive in all 3 periods, it is growing from period to period. At the top of the figures 7, 8 and 9, it is written the regression line which would adjust to the data in each period. We can observe that the slope parameter is 0.407 in period 1981-1992, 0.487 in period 1992-2000 and 0.708 in period 2000-2013, and the dispersion of data is lower in the last period. It may prove the endongeneity of labour market: the creation of EMU has stimulated countries to increase flexibility in their labour markets, leading countries to a higher convergence in their unemployment rates and thus, in their real incomes.

Figure 7: Scatter-plot (GDP correlations vs Unemployment correlations. Sub-period: 1981-1992

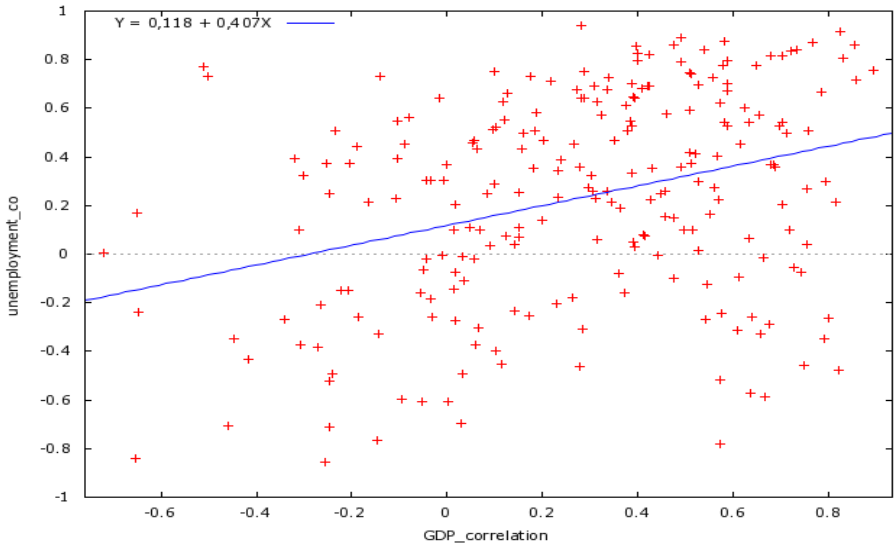


Figure 8: Scatter-plot (GDP correlations vs Unemployment correlations. Sub-period: 1992-2000

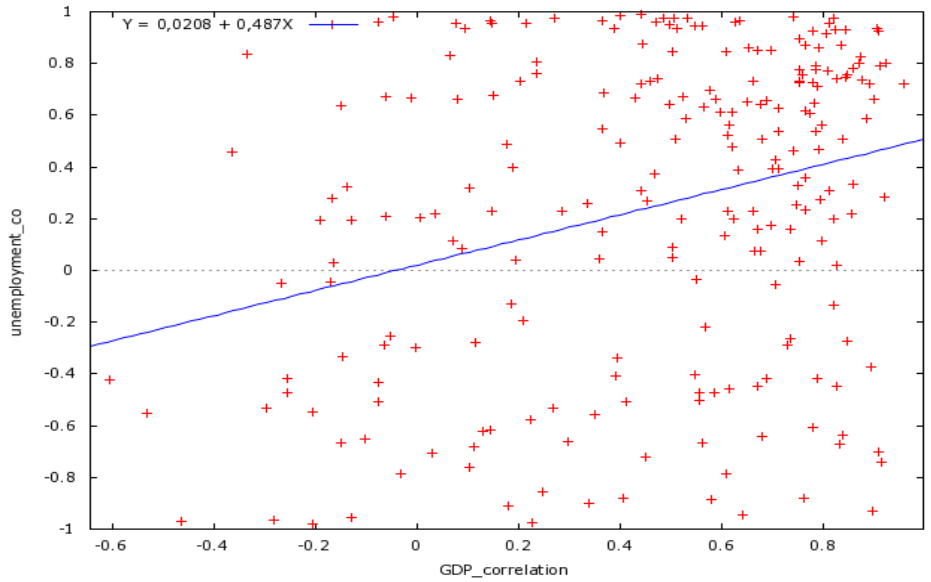
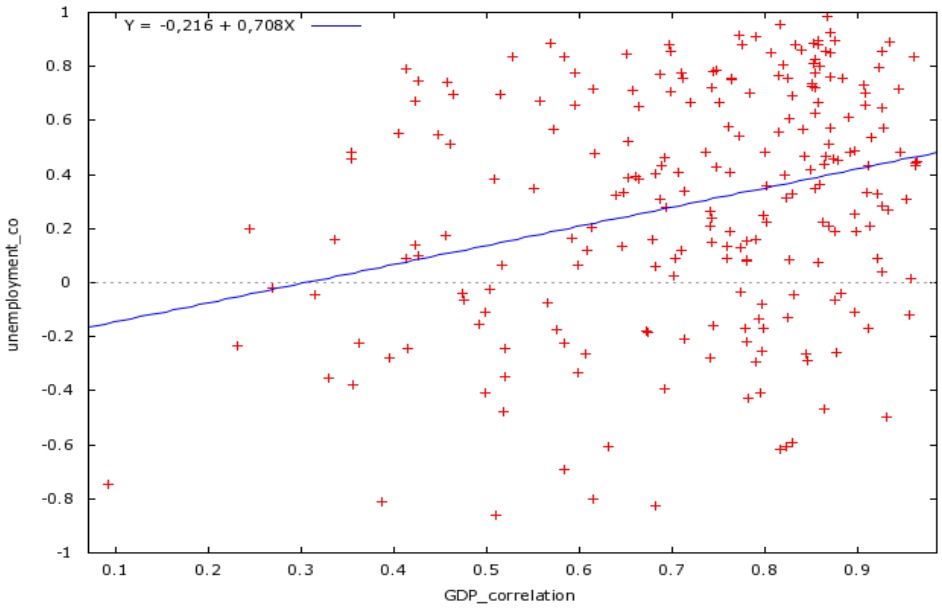


Figure 9: Scatter-plot (GDP correlations vs Unemployment correlations). Sub-period: 2000-2013



It is important to focus on the Eurozone countries, since the empirical analysis has not been done using only EMU countries, but using 22 industrialized states, inside and outside EMU. We are especially interested in studying whether or not the peripheral Eurozone countries have initiated structural reforms in their labor markets, then fostering a catching-up process with the unemployment rates of the Core countries and leading to higher real convergence. To do that, we will consider Germany as reference Core country, one of the EMU countries with the most flexible labor market. In the period 2003-2005 the German government implemented a number of labor market reforms, the so-called Hartz reforms, in view of dismal labor market performance and the tightening of the social security budget (Krebs and Scheffel, 2013). The aim of the Hartz reforms was to improve the matching efficiency of the employment agencies, to provide incentives for unemployed to search for jobs and to increase labor demand decreasing tax wedges and deregulating the labor market. The reforms consisted of, for example, the elimination of the social security tax for jobs paying up to 400 euros per month, and the reduction of the social security contributions for jobs paying up to 800 euros per month, as well as they deregulated the labor market . On the other hand, the German government adopted a more market-based approach and reduced the benefits payments for most households previously receiving Unemployment Assistance or Social Assistance[20]. Krebs and Scheffel (2013) developed a model in order to evaluate the macroeconomic effect of the Hartz reforms, especially Hartz IV, and concluded that they reduced the German long-run unemployment rate by 1.4 percentage points. This can be observed in the following graphs. Figure 10 shows that between 1992 and 2007, peripheral countries as Spain, Portugal, Greece and Ireland (particularly the last one) maintained higher real GDP growth rates than Germany because of the convergence process[21]. When the current economic and financial crisis started in 2007, all EMU countries experienced a fall in their GDP growth rates. Germany's GDP fell in more than 5% in 2009, while Spain's GDP fell in around 3 percentage points. However, the unemployment rate in Germany barely raised but followed a downward tendency, while in the Spain (which have maintained historically high unemployment rates), started to grow inordinately until 26% in 2013.

The other peripheral countries also suffered a great growth in their unemployment rates, leading them in 2013 with an unemployment rate a percentage far greater than the German rate (see Figure 11). In brief, the flexibility of German labor market, allows Germany the maintenance of workstations in hard times giving enterprises freedom to reduce temporarily working days in order to adjust production to the necessities. In other words, the weaknesses of peripheral countries' labor markets come to light when the economic conditions are not the best.

[20] The reforms were applied progressively through Hartz I and Hartz II (Jan 1st 2003), Hartz III (Jan 1st 2004) and Hartz IV (Jan 1st 2005).

[21] According to the traditional economic literature, this phenomenon in called β convergence: countries who start with a lower level of GDP per capita, will grow faster than those richer.

Figure 10: Real GDP growth rate (1992-2014): Germany vs Peripheral countries

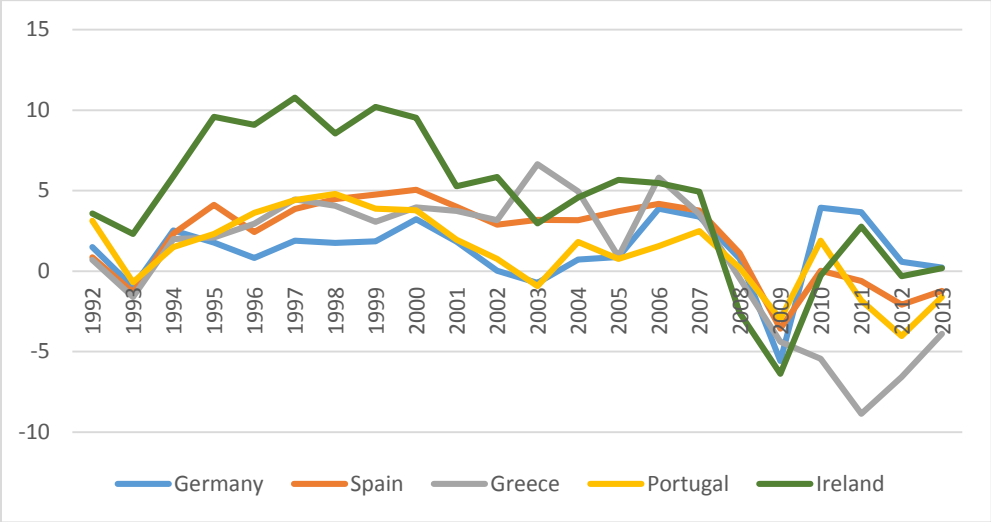
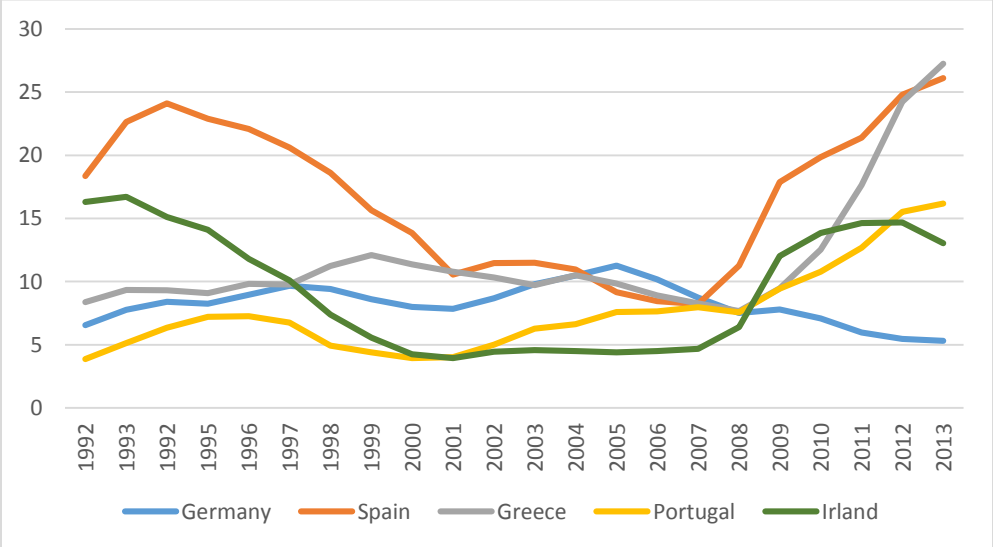


Figure 11: Unemployment rate (1992-2013): Germany vs Peripheral countries



Returning to the issue at hand, we are going to study the evolution of correlations obtained, in terms of unemployment rate and real GDP, between Germany and the peripheral countries: Spain, Greece, Portugal and Ireland.

Figure 12: Unemployment and GDP correlations: Germany vs Spain

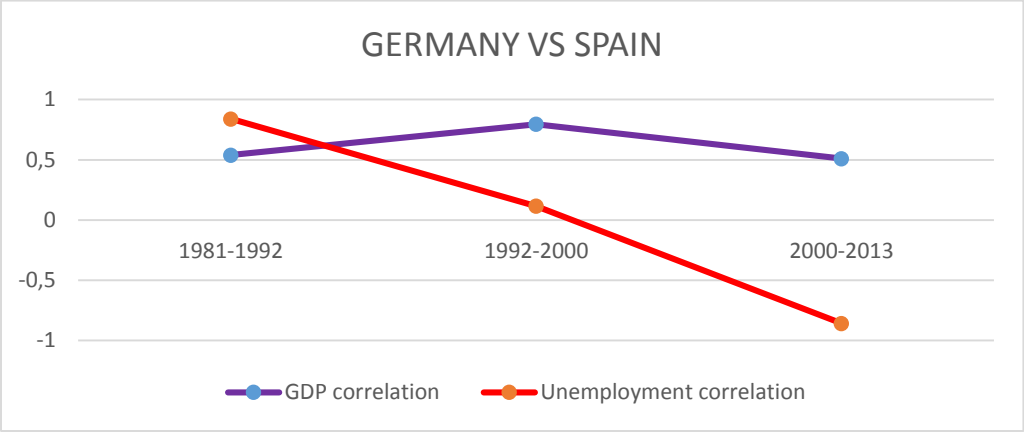


Figure 13: Unemployment and GDP correlations: Germany vs Greece

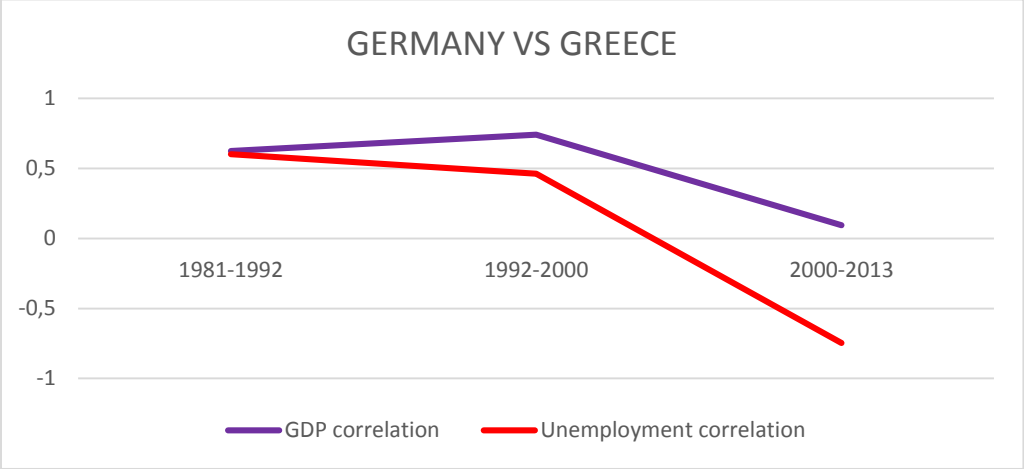


Figure 14: Unemployment and GDP correlations: Germany vs Portugal

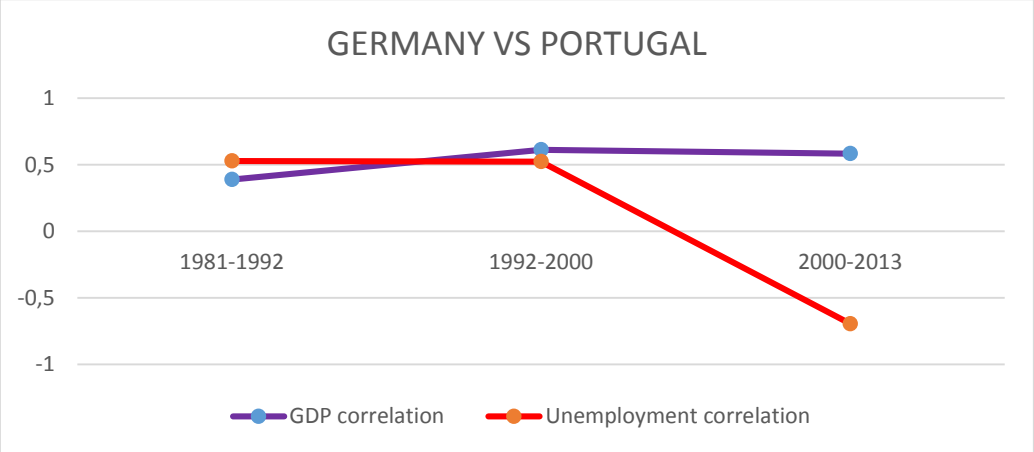
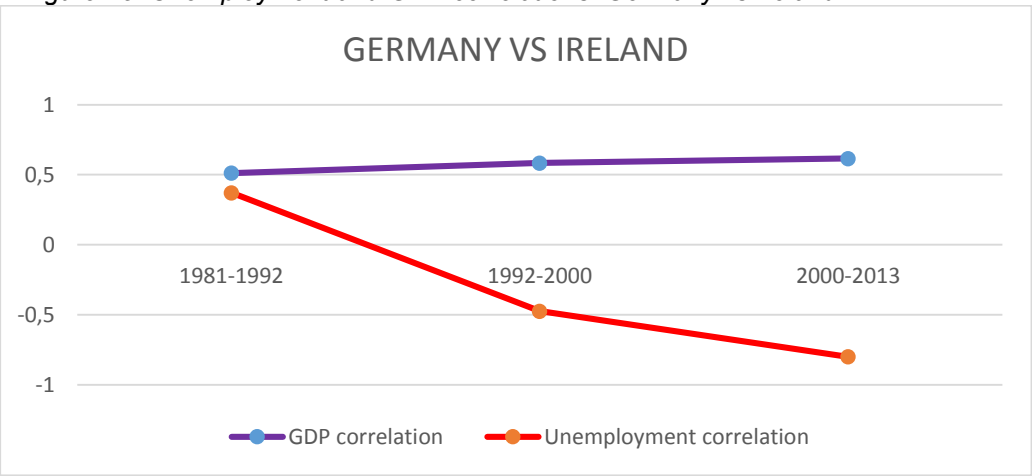


Figure 15: Unemployment and GDP correlations: Germany vs Ireland



In this case, from figures 12, 13, 14 and 15 the results are not as optimistic as before. The four peripheral countries (Spain, Greece, Portugal and Ireland) have maintained a downward tendency in their unemployment rate correlations with respect to Germany, moving from positive correlations in the first sub-period to negative correlations in the last one. Their unemployment correlations regarding Germany in 1981-1992 were around 0.5, and they have become strongly negative in 2000-2013, close to -1. What it means is that their unemployment rates has been growing, while the German unemployment rate has been decreasing (it can be observed in Figure 11). It's important to mention here that after the creation of the EMU, all member countries agreed to implement labor market reforms, being Germany the only country that actually did it. This fact could explain the divergence of the unemployment rates. For its part, GDP correlations with Germany, that have been positive in four countries in all sub-periods, has remained almost invariable in the cases of Portugal and Ireland (around 0.5), while grew in Portugal and Spain between 1981 and 1992, and fell in the last sub-period. The GDP correlation Spain-Germany in 2000-2013 returned to the level of the initial period (0.5), while the correlation Greece-Germany became near zero (see figures 12 and 13).

On the other hand, it is very hard to find here a positive linkage between unemployment correlations and GDP correlations, despite it can be observed easily in figures 6 to 9. In the case of Spain, and Greece, between de second and the third sub-period, the fall in unemployment correlation was accompanied by a fall in GDP correlation, while between the first and the second period, GDP correlation raised and unemployment correlation fell. However, in Portugal and Ireland the continuous fall in the unemployment correlation, becoming negative, was not followed by a fall in GDP correlation, but it remained almost unchangeable, with a slight growth (see figures 14 and 15).

Therefore, when we focus on the Eurozone, in particular the peripheral countries and its convergence with the Core countries as Germany, we don't find empirical evidence supporting the endogeneity of labor markets of the endogenous OCA theory. For that cluster

of countries, an increase (or decrease) in the unemployment correlation is not accompanied by a higher (lower) GDP correlation. Hence, that idea that when countries initiate structural reforms in their labor markets tend to converge in real terms is not fulfilled here. Moreover, the unemployment rate correlation of peripheral countries with respect to Germany has become strongly negative from period to period. It may prove that the creation of the EMU has not stimulated structural reforms in the peripheral Eurozone countries, which in addition are those with major adjustment problems facing asymmetric shocks. The lack of such reforms or their incompleteness has caused that the unemployment correlations with the German unemployment rate has followed a downward tendency since the first sub-period, achieving a value near -1 in period 2000-2013, in the current economic and financial crisis: while Germany has reached to maintain workstations, the unemployment rate of peripheral countries has exploded (especially in Spain and Greece). Is in this point when one could think of the necessity to require countries with rigid labor markets to increase its flexibility before joining the EMU, since a monetary union not always means a stimulus for member countries to perform structural reforms, and problems multiply in hard times.

6. Conclusions

The endogenous Optimum Currency Area theory states that the suitability for countries to be part of a currency union may not depend on the basis of their past behavior or on their efforts during the convergence period, since once a country becomes a member, drastic changes are expected to occur. In this way, countries are more able to comply with OCA criteria ex-post than ex-ante. The empirical literature has found evidence of endogeneity in some areas, for example monetary unification increases bilateral trade between member countries leading them to increase their bilateral income correlation. However, there is evidence of different growth dynamics coexisting inside EMU and a great divergence between member countries since its creation.

In this paper we have focused on the area of the endogenous OCA theory called by De Grauwe-Mongelli (2005) as 'the endogenity of the labor market', which implies that monetary unification could stimulate member countries to increase flexibility in their labor markets, in order to ease the adjustment process after a shock under the lack of the exchange rate as an adjustment tool, leading them to converge in real terms. We have tested the hypothesis of endogeneity of labor markets under the assumption that structural labor market reforms mean a lower unemployment rate. Using a sample of 22 industrialized countries, we find that there is a positive relationship between bilateral unemployment rate correlations and bilateral GDP correlations which is, in addition, growing over time. That is, labor market reforms imply higher income correlations between countries and the relationship between the variables is stronger and stronger.

However, when we study the relationship between unemployment correlations and GDP correlations of peripheral countries with respect to Germany (one of the EMU countries with more flexibility in the labor market after the Hartz reforms), we do not observe the same. Bilateral correlation of unemployment rates between peripheral countries and Germany have decreased along the sample period going from 0.5 to -1, due to the great growth of unemployment rate of the first ones (especially since the current economic and financial crisis) and the stability of the German unemployment rate, which has even decreased.

Furthermore, in some peripheral countries, this tendency has been accompanied by a decrease in the GDP bilateral correlations (Greece), while in others, this correlations have been positive and increasing over time.

Therefore, in the case of peripheral EMU countries, the endogeneity of the labor market is not fulfilled. The creation of the EMU has not stimulated countries to increase flexibility in their labor markets or the reforms have been really timid and incomplete, such that the distance of their unemployment rates with respect to the Core countries (as Germany) has increased over time and becomes higher in hard times, precisely when the reforms are more difficult to implement. In this way, it seems that the creation of a monetary union does not stimulate necessarily structural labor market reforms in member countries; that is, future candidates could be required to increase labor market flexibility as a prerequisite for becoming members because the endogeneity of the labor market is still far from being a fact. Furthermore, such structural labour market reforms would allow countries to converge in real terms and to create a sustainable and integrating growth.

This research faces a number of limitations, since the conclusions are based basically on the empirical evidence. For future investigations, it could be interesting to use further econometric techniques and deepen on the effects and duration, for example, of an output shock on the GDP and unemployment in countries with rigid and flexible labor markets, in order to measure the importance of structural labor market reforms.

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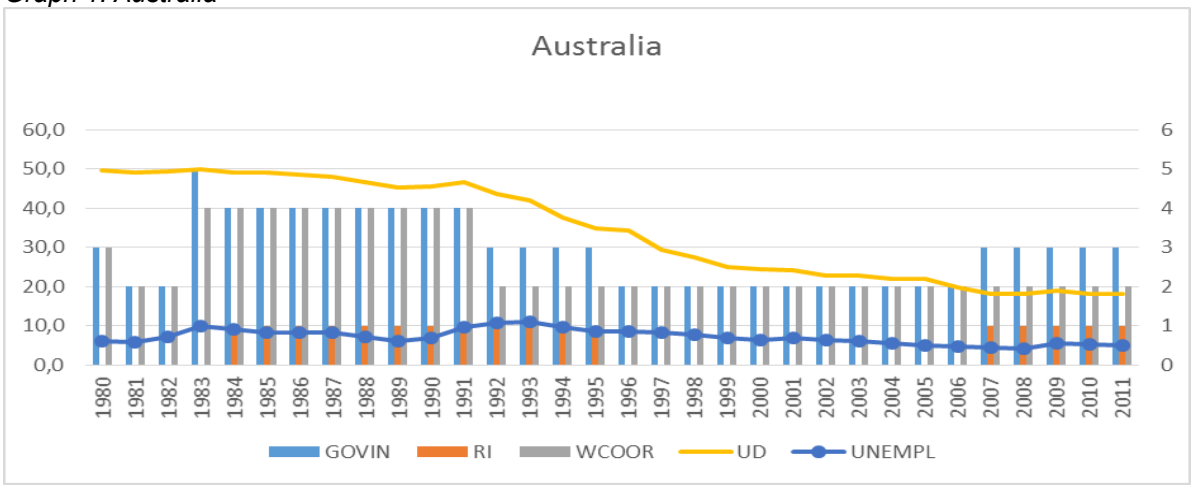
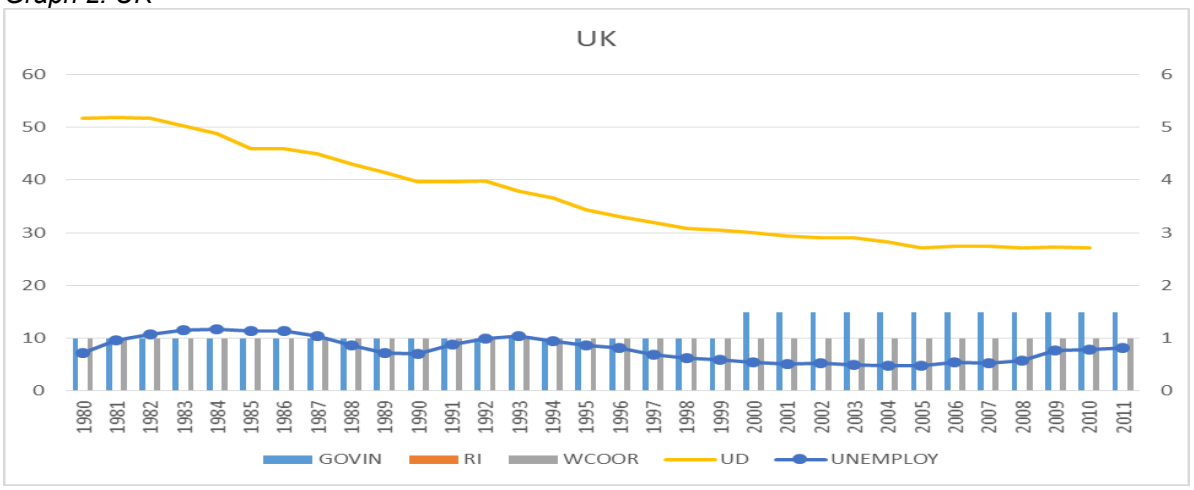
Appendix - The degree of flexibility in labour markets and the unemployment rate

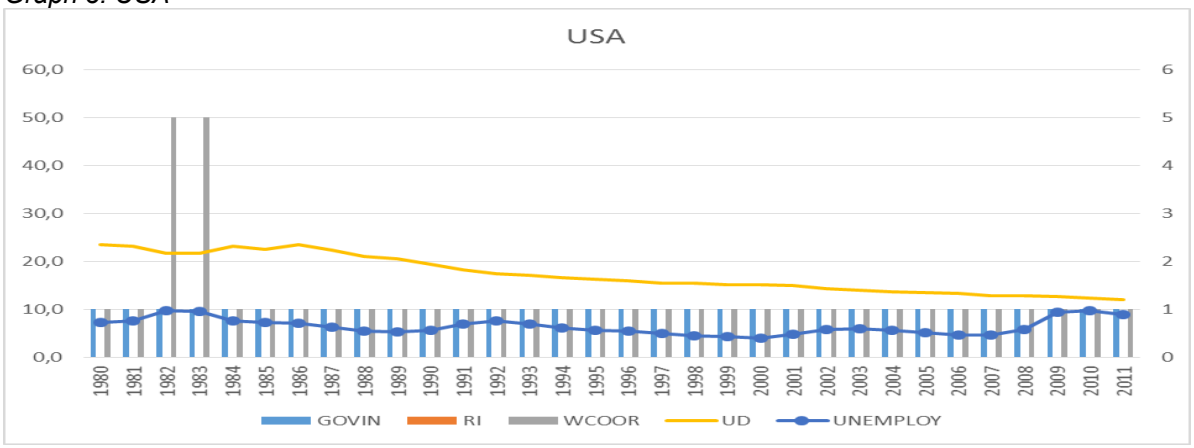
Graph 1: Australia



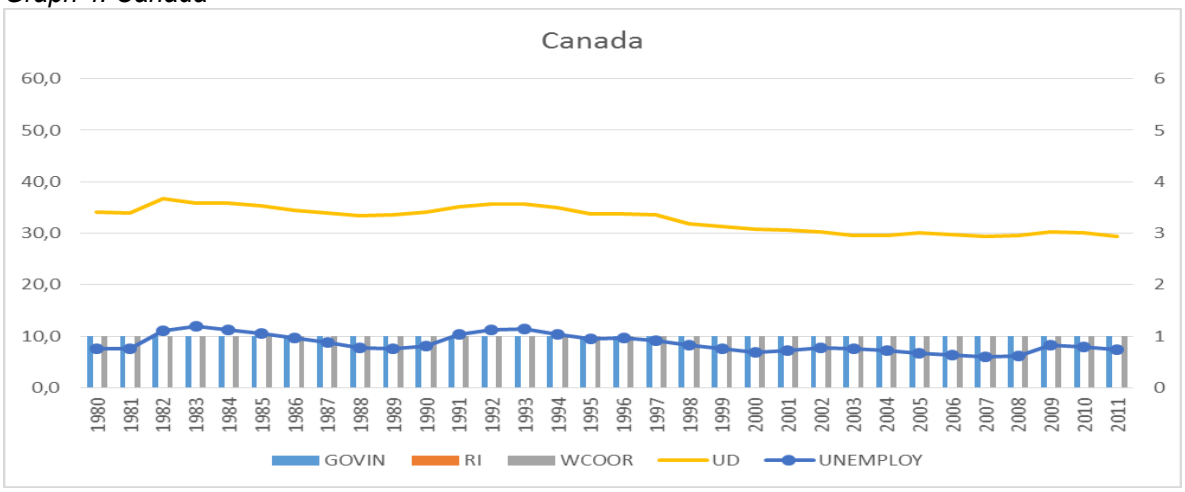
Graph 2: UK



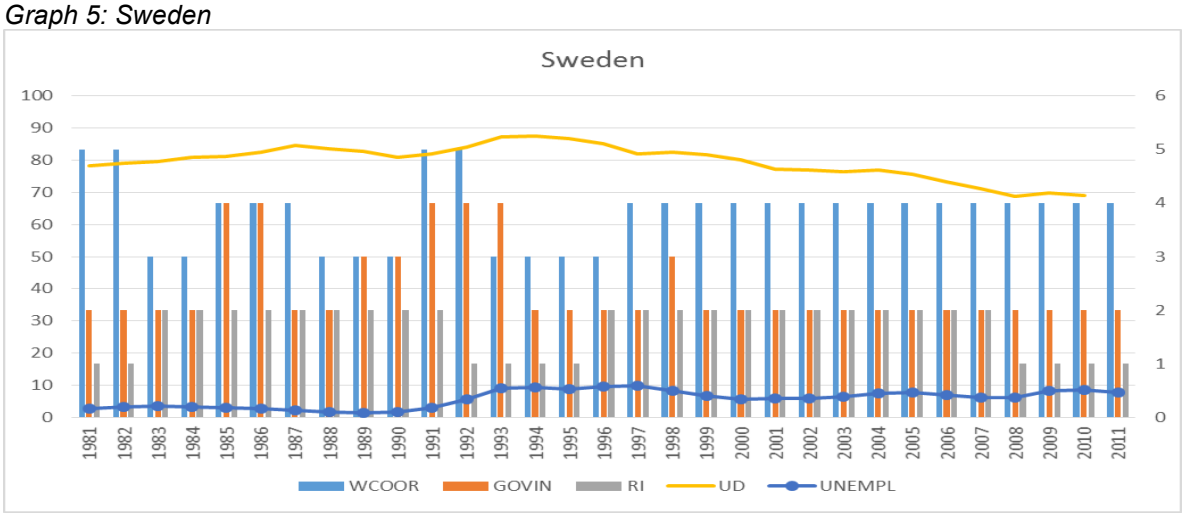
Graph 3: USA



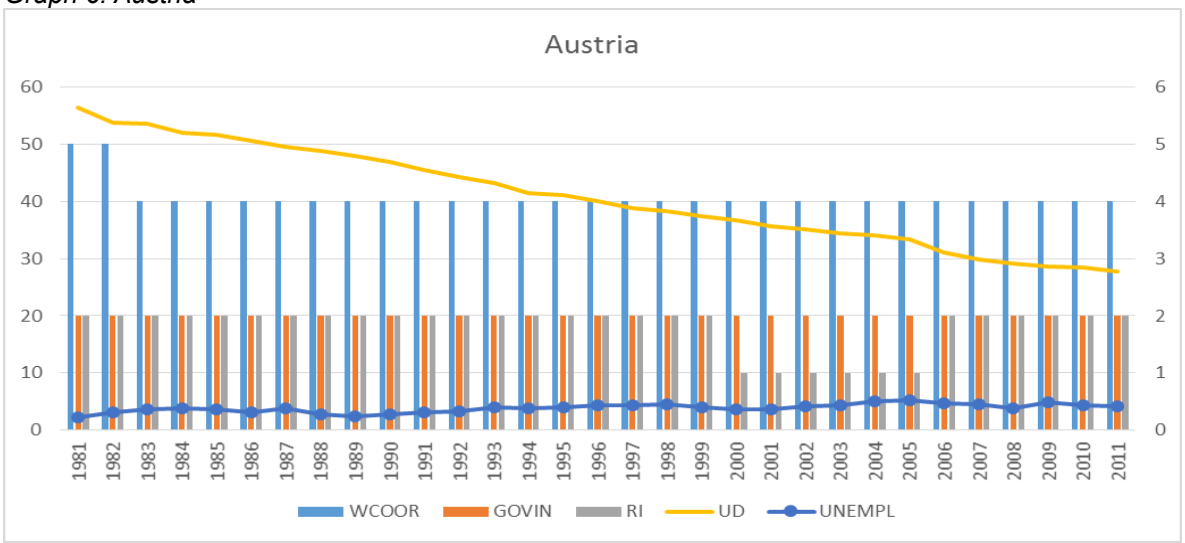
Graph 4: Canada



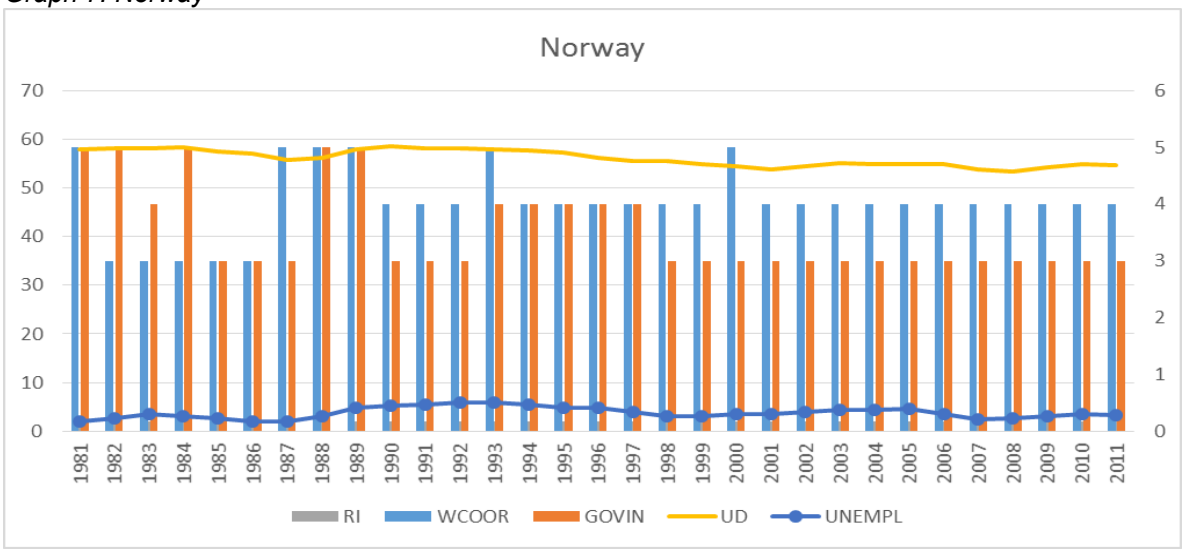
Graph 5: Sweden



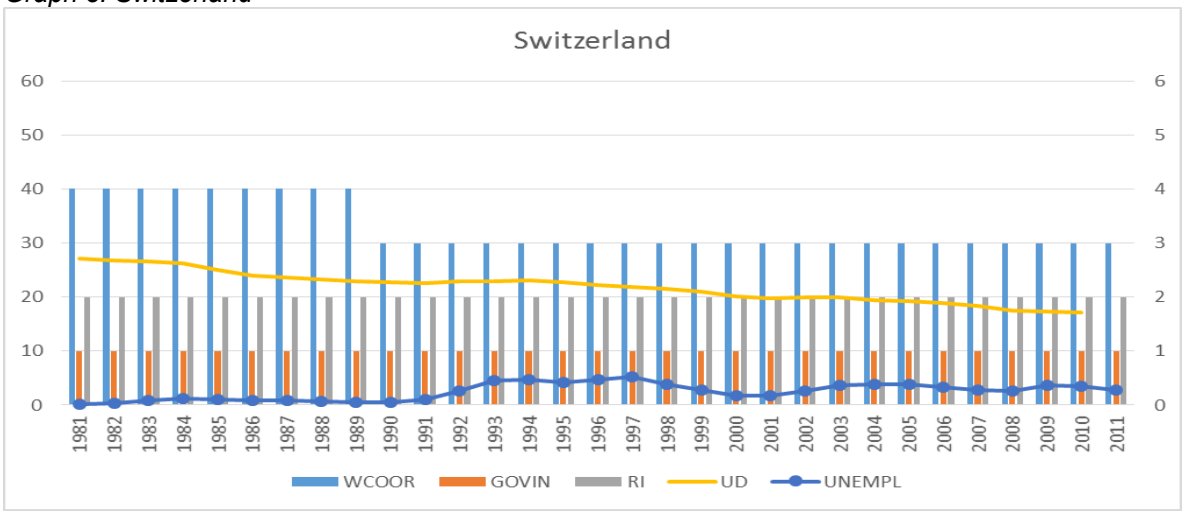
Graph 6: Austria



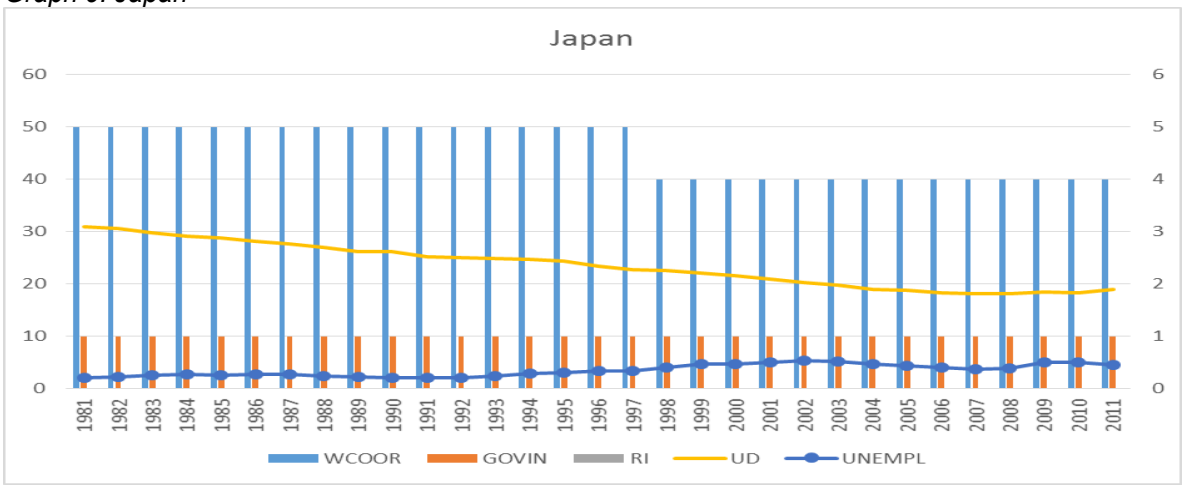
Graph 7: Norway



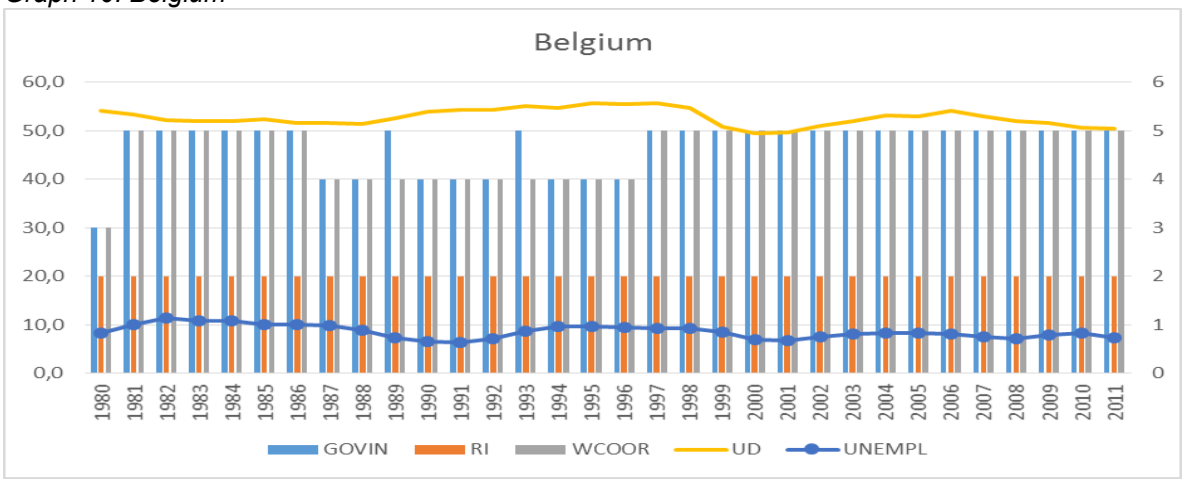
Graph 8: Switzerland



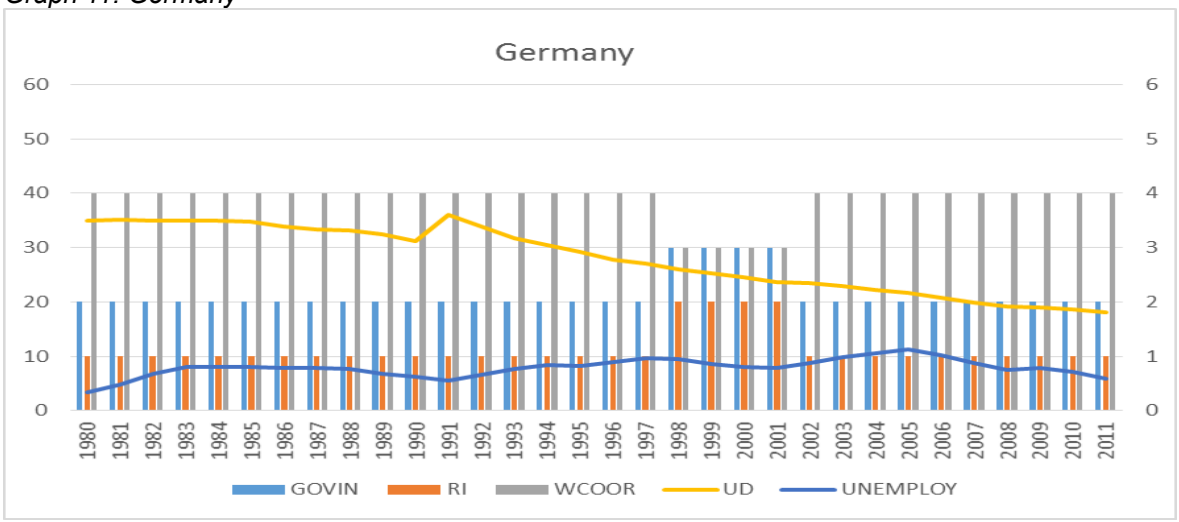
Graph 9: Japan



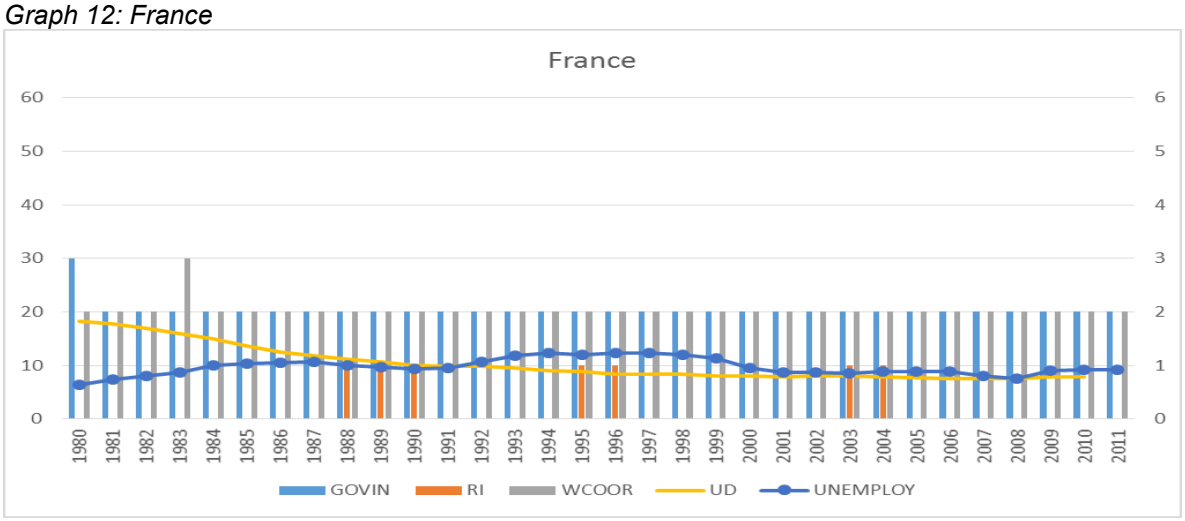
Graph 10: Belgium



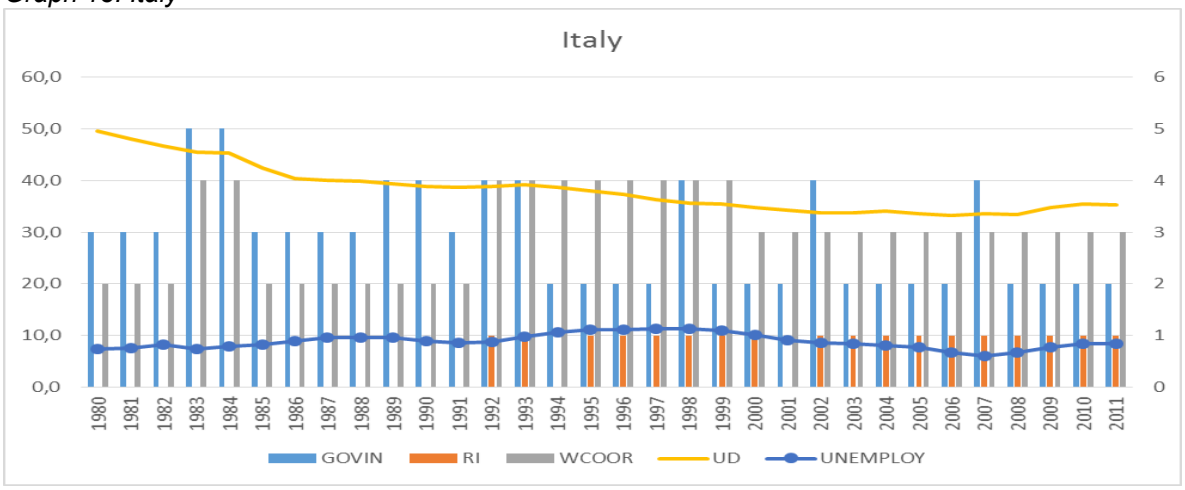
Graph 11: Germany



Graph 12: France



Graph 13: Italy



Graph 14: Spain