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THE CURRENT CRISIS AND EUROZONE ACCESSION POSSIBILITIES

Working Title

"WHY EUROZONE AND WHO IS THE BEST CANDIDATE?"

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TABLE OF CONTENTS

1. INTRODUCTION

European Monetary Union[1], currently consisting of 16 members, has been under continuous criticism ever since it has been established. There are economists who mostly consider EMU to be a "political project" without sound economic rationale. Others think of EA16 as of pioneering project but with short lived future. Some argue that even though partial "success" has been achieved, the costs by far outweigh the benefits of the common European currency. US economic performance is often used as a benchmark and it is indeed considered to be an optimum currency area. Moreover, OCA criteria became the most common tool for the cost-benefit analysis of the monetary integration in Europe resulting in predominantly adverse implications for the member countries.

The aim of this paper is not to judge all the existing literature in the context of the monetary integration in Europe up to date but to shed perhaps different perspective on the performance of EMU as opposed to frequently used approaches. Therefore number of arguments for the existence and success of the Eurozone will be given and reference to the numerous arguments against the monetary integration in Europe shall be subsequently made. This discussion seems to be the necessary prerequisite in order to explain why any of the potential candidates for EMU membership are or perhaps should be interested in taking part in the monetary integration in Europe. This leads to the main goal of the paper and thus to the analysis of the most suitable candidate for joining the Eurozone in terms of fulfillment of the OCA criteria. Even though some assumptions of OCA criteria will be questioned, it still remains the most accurate tool for the cost-benefit analysis of the monetary integration as Bayoumi and Eichengreen (1997) argue.

The paper is structured into two separate parts. The first part, referred to as descriptive, is rather facts based discussion which outlines the rationale behind the monetary integration in Europe in broader and more expressive manner, specifically in the context of the global financial crisis. The second part of the paper is strictly empirical and it describes the procedures and outcomes of the specific econometric OCA based analysis. The model and its specifications are fully described in this part as well. The use of number of papers by Bayoumi and Eichengreen is made in order to develop specific econometric model. However, number of important modifications and different estimation technique are introduced into the analysis. These modifications make the model somehow different to the one of Bayoumi and Eichengreen (1996) and thus quite interesting results have been achieved.

The first section of the first part of the paper entails a brief description of the evidence on economic performance of US and EA16 in the past decade while discussing the global financial and economic crisis and its devastating worldwide impact. Some important areas in which EA16 is perceived to lag behind US will be further discussed. Surprisingly, data seem to contradict the assumption that monetary union in Europe is doomed and suggest that even though US is general seen to be outperforming EMU in every aspect, this perception must not be necessarily a correct one. Further attention will also be paid to the probably most severely

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[1] From now on EMU, representing the current 16 members or equivalently EA 16 as used by Eurostat

hit region in the world, to CEE and particularly to EU8, as the crisis has and will have serious implications for their potential EMU membership. The second section describes the relevance of the Maastricht criteria and their potential implications for the current as well as future members of the monetary union. Furthermore, possible potential flaws shall be outlined specifically with respect to EU8[2]. Potential costs resulting from adherence to these criteria shall be briefly outlined as well in this section in order to support the main goal of this paper. That is, to identify the best potential candidate for entry into the monetary union among new accession countries. To do so makes only sense if such a membership is desirable or if it would be at least beneficial for the candidate countries. As this assumption often seems to be questioned, its relevance will be discussed in the third chapter and the major reasons for or against membership in the monetary union will be highlighted in this chapter as well. In the last section of the first part of the paper, the often predicted failure of the Eurozone will be discussed and some frequently used paradigms about monetary union in Europe shall be questioned.

Then, the empirical part of the paper shall begin with the brief empirical literature review of OCA theory. Potential caveats of this approach are presented as well and further determinants of OCA are briefly suggested. Subsequently the data and the model description will be outlined with the detailed description of the computations and the data sources. Furthermore, the estimation of the model and the specific econometric technique shall be described. Moreover, the outcome and the main implications of the model will be introduced. Finally, careful conclusions about the major issues identified in the paper are to be drawn and all the questions will be attempted and hopefully answered.

The author realizes that the interpretation of the resulting implications is heavily dependent on the lenses being looked through and that the ones utilized in this paper may not be the best ones. However, the same might be true for other lenses as well. What is though undisputable is the fact that the criticism of EMU has been rather aggressive and even perhaps misleading is some aspects. Therefore, hopefully this paper will provide slightly different perspective onto the heavily discussed topic of monetary integration in Europe as opposed to often negative perceptions.

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[2] EU 8 consists of Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland and Romania

2. DESCRIPTIVE PART

In order to give an objective view of the importance and current stance of EMU in the world economy and its performance, one should take into account the most relevant and crucial aspects and utilize them accordingly. Jonung and Drea (2010) argue that such an objective view is sometimes missing in the prevailing literature and that's why a significant effort will be devoted to this issue in the following section and its subsections.

Baring the above mentioned in mind, global financial and economic crisis (crisis) with respect to EMU, EU 8 and other major players in the world economy, especially US, will be dealt with in the first subsection. Consequently, the resulting macroeconomic position of EMU will be outlined and implications, for both the current members and the potential candidates as well, will be discussed. Description of the perceived relevance of the Maastricht criteria and their implications for the acceding countries will follow shortly afterwards. Then, number of positive as well as negative aspects resulting from the participation in EMU shall be discussed. Finally, the so often predicted unsustainability and failure of EMU will be questioned. Throughout analysis of the crisis and its evolution has been discussed heavily and repeating numerous arguments would be of no use. Therefore only major points and the most important evidence of the implications of the crisis on EMU, EU8 and US shall be suggested.

2.1   GLOBAL FINANCIAL CRISIS AND ITS IMPACT ON EMU, EU8 AND US

At CERAweek (2009) Roubini, Rogoff and Behravesh agreed that world is currently in the middle of the worst financial crisis since the Great Depression. Furthermore, Rogoff, formerly chief economist at the International Monetary Fund, described the current recession as "a once in a 50-year event."
This argument is further supported by the article from Kanna, Scott and Terrones (2009) where they argue that recessions associated with financial crises tend to be severe and recoveries from such recessions are usually sluggish. It takes almost 3 years to return to the pre-recession output level, that is twice the time it takes to recover from other recessions.

Furthermore, globally synchronized recessions are longer and deeper than others, and their recoveries are slow as well. The current recession is a direct consequence of the global financial crisis and it is unprecedentedly synchronized across continents as Blankenburg and Palma (2009) argue. Past experiences therefore imply severe decline in economic activity and prolonged period of sluggish economic growth as suggested by Reinhart and Rogoff (2009).

The evidence on real GDP growth rates across the major developed countries in 2007, 2008 and 2009 clearly demonstrates the tremendous decline in their economic activity. In 2007, the last year before the subprime mortgage crisis fully evolved, real GDP grew by 2.8% in EA16 and by 2.1% in US. The last quarter of the following year was already marked by the beginning of the financial crisis which led to subsequent significant slowdown. In EA16, the real GDP grew only by 0.6% and in US by 0.4% in 2008.

In 2009, the global financial crisis sprang fully into global economic crisis with a fall of real GDP of 4.1% in EMU and 2.4% in US.

Although the magnitude of decline in output is striking both in US and EMU, it rather seems that US will bounce back quicker than EMU as proclaimed by number of economists. Haass(2010) proclaimed: "Europe's recovery will be anemic in absolute and relative terms. Europe is now the world's largest economy, slightly larger than the US, but will not be for long."

However, looking at the evolution of the last business cycle both in US and EMU one cannot be so sure about the economic superiority of US anymore. In fact, quite the opposite seems to be true. EMU's real GDP growth rate peaked in 2006 at 3% whereas that of US already peaked in 2004 at 3.6%. Both economies reached the bottom in 2009 suggesting that it took US significantly longer to get halfway through the cycle.

Furthermore, during the period of 2004-2010, US GDP per capita in PPS decreased by 9 percentage points whereas that of EA16 decreased only by 1 percentage point in the same respective period.[3] These figures suggest that EMU has been rather catching up with US in the last years and that its economy became relatively stronger than that of US during the first part of the ongoing business cycle. So far nothing seems to confirm the proclaimed European anemia in terms of GDP evolution during the last years.

Furthermore, the evolution of unemployment rate in EA16 and US signals the magnitude of the crisis. US unemployment rate prior to the crisis was at its lowest level in the second quarter of 2007 when it reached 4.5%. It subsequently peaked in the fourth quarter of 2009 at 10.0%. EA16 unemployment rate began to rise in the first quarter of 2008, when it stood at 7.2% and peaked in the second quarter of 2010 at 10% as well.[4] Two main implications can be drawn based on the labor market evolution in both areas. Firstly, the crisis stroke upon Europe later than US which is logical since the financial crisis originated in US. Secondly, it might seem that Europe suffered from rigid labor market prior to the crisis since its unemployment rate stood quite high at the time. In order to confirm this hypothesis the employment rate will be further consulted.

The evidence suggests that perhaps the employment rate evolution is more objective measure since Eurostat follows the ILO's recommendations on measuring unemployment rate whereas US follows its own method. These data are therefore not comparable as unemployment rate in US is significantly undervalued with respect to EMU as Engel (2010) suggests. Furthermore, U.S. Bureau of Labor Statistics adjusts unemployment rates of several EU countries based on US concepts (2010) and those rates are significantly lower than under ILO's specifications.

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[3] All the data on GDP taken from Eurostat, for further details see literature
[4] All the data on unemployment rates are taken from Eurostat, for further details see literature

Moreover, employment rate over period 2000 to 2008 was steadily declining in US. It dropped from 74.1% in 2000 to 70.9 in 2008. In EA16 there was an opposite trend, where employment rate was steadily increasing from 61.4% in 2000 to 66% in 2008.[5]

These numbers suggest two major points. Firstly, the proponents of the US supremacy in its economic structure and thus its ability to respond quickly to various shocks may not be necessarily objective. The data[6] shows that EMU has been able to reach the peak of the recession in the labor market slightly quicker than US. This fact is contradicting the general wisdom of "doomed Europe". Furthermore, EMU has been catching up with US also in terms of growing employment rate.

Also sharper and slightly longer increase in the official and probably underestimated unemployment rate in US with respect to EA16 suggest that perhaps EA16 labor market is in better shape than that of US. Numerous arguments against US economic supremacy were also suggested by De Grauwe (2008).

One could argue that US was the epicenter of the financial crisis but we should also take into account the Eurozone crisis initiated by Greek debt problems and its subsequent implications on EA16 economy.

When considering the evolving existential problems of EMU even more convincing arguments about union's experience of more challenging problems than those of US throughout the whole recession could be probably found. Secondly, relatively high and long lasting prosperity of US economy associated with official lower unemployment rates than in EMU, was probably mainly due to the expansionary monetary policy of FED rather than due to the sound performance of US economy as Faber (2009) suggests.

FED's prolonged period of extremely low interest rates, Sheehan (2010), enabled rapid expansion of credit in US and made China the biggest owner of dollar reserves in history. The largest part of 2.4 trillion of Chinese reserves in 2009 consists of US dollar.[7]

This monetary policy supported by extraordinary prolonged period of economic growth resulted in the global financial crisis and subsequently into the worst economic crisis since the Great Depression. ECB on the other hand has been frequently criticized for its restrictive monetary policy and for keeping higher interest rates than necessary. This criticism seems irrelevant as Goodhart (2006) suggests.

Another significant aspect determining country's macroeconomic position and structural characteristics is the general government gross debt to GDP ratio. This indicator triggered the ongoing Eurozone crisis. The so called "market sentiment" is an important ingredient determining the final outcome of the current problems in EMU. Surprisingly, this "market sentiment" seems to be quite favorable to US even though US economic situation seems to be substantially worse than that of EMU as data show.

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[5] Data for 2009 are not yet available for US

[6] It took US 30 month to reach to the bottom in the labor market whereas EU16 was able to do so in 28 month.

[7] World Bank, Quarterly Update, June 2010

US general government gross debt to GDP ratio has increased from 62.2% in 2004 to 83.3% in 2009, thus by over 20 percentage points. On the other hand, the identical indicator for EA16 increased from 69.5% in 2004 to 78.7% for the respective period, making it less than 10 percentage point increase. Furthermore, IMF projects that US government gross debt to GDP ratio will increase to 92, 6% in 2010.[8]These numbers have again at least two major implications.

Firstly, EMU needed both less expansionary monetary as well as fiscal policy than US in order to approach halfway through the ongoing business cycle. This is again in contrast with the argument of superior structural character and higher flexibility of US economy. Secondly, markets seem to be positively biased towards US economy. They significantly contributed to the ongoing Eurozone crisis based mainly, as publicly proclaimed, on the government gross debt to GDP ratio criteria in which EMU performs undoubtedly better than US. One could argue that US dollar and its stability, so called "safe haven", is the main reason for this bias. However before the markets triggered the Eurozone crisis, it was dollar's massive depreciation against Euro we have witnessed, not vice versa. Even Paul Krugman (2009) confirms that dollar is no longer stable currency.

Moreover, Greek's GDP constitutes only about 3% of the whole EA16 economy which makes its economic significance in EMU rather miniscule. However, the pace at which the US debt is increasing suggests that there is a lot to worry about when taking into account large current account deficits and again extremely expansionary monetary policy of FED.

Even, renowned US analyst, Whitney (2010), proclaimed: "Municipal debt has doubled since 2000, spending has grown way faster than revenues. States, such as California and Michigan, will burden the entire country should the federal government decide to step in with a bailout." This current situation in US in conjunction with ongoing close to zero interest rate which is not expected to change in the near future, as Federal Open Market Committee's statement (2010) implies, further confirms serious issues arising for US economy.
In fact, FED's aggressive monetary policy substantially contributed to the evolution of the financial crisis in US and subsequently in the whole world as Meeusen (2009) argues. This evolution further led into the current severe worldwide recession.
As Walter (2010) said on behalf of EMU: "Financial markets worry in a very biased way."

Nevertheless EA16 and the whole EU27 have their own structural problems and those need to be resolved in the near future if they want to recover from the global financial and economic crisis more rapidly than US. As European Commission President Jose Manuel Barroso (2010) said: "Growth will only return to Europe if serious budget plans and structural reforms are undertaken."

So far the impact of the crisis on EU8, Denmark, Sweden and UK has not been discussed. The reason is that EU8 countries differ considerably in their economic structure with respect to the

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[8] Data taken from IMF and Eurostat, for further details see literature

most of the EMU member countries and they also have a disadvantage of not having the "Euro shield" when fighting the global financial crisis.[9] Especially, Hungary is the most shining example. Speculations on Hungarian currency led to the IMF loan and subsequent severe economic problems in Hungary. Moreover, the previous comparative analysis of US and EA16 performance during the booming period and during the subsequent financial crisis should give an additional insight onto the perceived attractiveness of joining or not joining the EMU. Further inside on this topic will be given later on in the section considering pros and cons of joining EMU.

The remaining three countries of EU27 will not be discussed heavily because they expressed the attitude for not joining EMU[10], at least not in the near future, and thus are not of interest when assessing the potential of membership for future acceding countries. Holden (2009) however suggests that the membership of Denmark would be most likely beneficial whereas UK and Sweden would incur fairly low overall gains, if any, from membership in European monetary union.

Before discussing the impact of the global financial crisis on EU8 one should note that Estonia will probably become member of EMU on January 1st 2011 as Jean-Claude Juncker(2010), Eurozone chairman, officially confirmed. Nevertheless, it is included in the group of potential candidates because its entry is not yet definite.[11]

Furthermore, EU8 and its overall economic performance during the last decade in the context of the financial crisis will be discussed mainly due to subsequent implications for the results of the empirical part of the paper. In order to understand substantial changes in the values of OCA criteria for individual countries in the last decade, it seems necessary to describe the economic environment in the respective period first. Then, reader may easily refer to the subsequent section when following the arguments in the later empirical part.

EU8 countries were hit particularly severely by the global financial crisis and perhaps the hardest as Darvas (2009b) suggests. He uses the GDP forecasts data from IMF to claim that in October 2009, the weighted average 2010 GDP level of 30 CEE[12] countries was forecasted to be 15.8 percent lower than it was expected in October 2007. This downward revision is the sharpest among all the other regions or groups of countries in the world. However, even within group of CEE there are major differences. Particularly, severity of the crisis in EU8 is considered in the following table.

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[9] The term "Euro shield" stands for the relatively better ability of EA 16 to resist financial speculations because of the size of the currency union.
[10] UK and Denmark opted-out from membership in EMU and Sweden can decide unilaterally when to join
[11] Approval by EU leaders will be needed as a final decision making step towards EMU membership
[12] All EU8 countries are included in this sample of 30 central and eastern European countries and most of them were hit even harder than the average value suggests where Poland is an exception

Table 1 - Basic economic indicators for EU8

	Country	Annual real GDP growth rate (%) 2000 –2007	Annual real GDP growth rate (%) 2008	Annual real GDP growth rate (%) 2009	Revision of IMF[13]	Unemployment rate (%)	
						3rd quarter 2008	1st quarter 2010
Group 1	**Estonia**	8,4	-3,6	-14,1	-32,0	4,2	19,0
	Latvia	8,8	-4,2	-18,0	-38,0	6,0	20,0
	Lithuania	7,5	2,8	-14,8	-34,0	4,9	17,4
Group 2	**Romania**	5,7	7,3	-7,1	-17,0	5,8	7,4
	Bulgaria	5,5	6,0	-5,0	-16,8	5,4	9,3
Group 3	**Czech Republic**	4,4	2,5	-4,1	-14,6	4,3	7,8
	Hungary	3,9	0,8	-6,3	-14,9	7,8	11,2
	Poland	4,2	5,0	1,7	-7,0	7,0	9,7

Source: Eurostat Statistics Database

As can be seen, Baltic countries were hit the hardest among EU8. They experienced rapid and unprecedented decline in real GDP growth rate accompanied by steep increase in unemployment rate. This increase was even sharper than economic theory would suggest.[14] What seems however striking is the fact that despite the tragic economic situation, Estonia was able to keep its deficit in 2009 under 3% of GDP as Maastricht treaty requires. Furthermore, Estonia fulfilled all the Maastricht criteria and qualified for EMU membership in the middle of the worst economic crisis since the Great Depression and particularly in situation when this crisis hit Estonia extremely severally. The situation suggests that if Estonia was able to meet the Maastricht criteria taking into account current circumstances, then every single country from EU8 can meet them if it really wishes to do so. The costs accompanying such a wish will be discussed later on.

Another two subsamples of EU8 countries can be further identified with respect to the global economic crisis. One comprises Bulgaria and Romania and the other consists of the Czech Republic, Hungary and Poland. Hungary however, might become structurally closer with Bulgaria and Romania in the future. The ongoing serious economic problems and unwillingness of political elites to solve them suggests rather gloomy future for Hungary. Going back to Bulgaria and Romania, one should note an important difference between these two countries and Baltic subsample. Bulgaria and Romania were fully hit by the crisis one year later than the Baltic group and they experienced relatively lower growth prior to crisis followed by less steep decline in 2009.

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[13]Downward revisions of forecasted level of GDP: Calculations acquired from Darvas (2009b) based on IMF and DG ECFIN forecasts published in October 2007 and October 2009

[14] Decline in GDP of 2 pp. should induce only 1 pp. increase in unemployment rate.

This evidence suggests that Bulgaria and Romania were relatively better structurally prepared than Baltic group and their macroeconomic imbalances tended to be less pronounced enabling them to resist the crisis more successfully as Gardo and Martin (2010) argue. However, they still experienced worse than average CEE revision of GDP levels implying that crisis hit them particularly severely as well.

The estimates for Hungary and Czech Republic were revised relatively less by IMF. These numbers are already below the average weighted revision of 15.8%. The interesting case is Poland where its GDP level estimate was revised the least dramatically. Poland's GDP revision was even lower than that of EU15 or US. It amounted to 7% making Poland the sole exception in the whole EU27. This phenomenon can be explained by the extreme openness of Hungary and Czech Republic and their prevalent share of exports flowing to EMU. Thus their catching up process was mitigated by the recession in EMU whereas Poland is relatively large and closed economy whose GDP is mainly driven by the domestic consumption and FDI. This advantage softened the negative effects of recessions in the rest of EU27 on Poland's economic performance.

Substantial economic slowdown in Hungary in 2008 was mainly due to the Hungarian fiscal problems and its previous overconsumption leading to the IMF loan and restrictive fiscal policy in the respective years. Steep decrease in GDP in 2009 was however the impact of the global economic crisis rather than the consequence of the previous fiscal restrictions. The Czech Republic on the other hand experienced rather prolonged period of growth prior to the crisis. However, towards the end of 2008 the global economic crisis hit the country as well resulting in the slowdown of the previous long term growth. Subsequently, in 2009 when crisis fully evolved, real GDP declined substantially as in the rest of EMU.
Poland experienced even longer period of high economic growth than Czech Republic, starting in 2000 and ending in 2008. Even in 2009 its economy still grew by 1.7% making the Poland the only country not falling into the recession in EU27 as a consequence of the global financial crisis.

GDP growth and its levels are only a part of the story but perhaps the most significant one. General government debt to GDP ratio doesn't represent a problem for EU8 in general, though this ratio has increased substantially in 2009 for some countries. Particularly Latvia and Lithuania experienced the most rapid increase in this ratio. All EU8 countries, except Hungary, fulfill the Maastricht criteria of 60% threshold. Most of the countries have the lowest ratios among EU27.
On the contrary, the evolution of unemployment rate in EU8 seems to be a major problem. Especially, Baltic countries have experienced the sharpest increase in the unemployment rate in EU27 in 2009. This steep increase is unprecedented and it further documents serious situation in Baltic countries.

The remaining countries of EU8 experienced significantly lower increases in their unemployment rates than Baltic subsample and their magnitude was similar to EA16 labor market performance.

Analysis of overall economic performance of the EU8 under global economic crisis would be extensive and again it has been done by Darvas (2009c) and others. The main point of this section was to highlight the impact of the crisis on EMU, US and EU8 in order to shed a light on the reasons for or against entry to EMU. Furthermore, previous description of the economic situation in EU8 in the context of the last decade will be build upon in the empirical part of the paper in order to explain the evolution of OCA indices of Eurozone candidate countries.

From the point of view of the attractiveness of the monetary integration in Europe, it seems to be the case that Eurozone was catching up with US in the last decade and this pattern shouldn't change in the near future. Furthermore, "Euro shield" helped some weaker members of EMU to endeavor speculative power of financial markets for a bit longer than it would be otherwise possible. However, some would argue that more rapid depreciation of Euro would be more beneficial due to competitive effect. Hungary is a good example of the possible adverse effects of such a situation. Moreover, the proponents of rapid deprecation seem to forget that the EA16 is also heavily dependent on imports of resources from Russia and other countries outside EMU. The potential gain of depreciation can thus be lower than expected.

Furthermore, nominal exchange rate flexibility seemed to be rather harmful than helpful in CEE countries. Moreover, when the world manages to bounce off the current recession, there will be tendency for long term appreciation of the currencies in EU8 countries implying loss of competitiveness for those countries with respect to EMU. This appreciation will be fed by the catching up process in CEE countries with respect to EMU.

These are only few implications for EU8 countries resulting from the global economic crisis but perhaps some of the most striking ones.

2.2   THE MAASTRICHT CRITERIA AND THEIR IMPLICATIONS

The purpose of this section is to discuss briefly the main implications of the Maastricht criteria on the potential candidates considering joining EMU. Thorough analysis of each criterion would require separate paper on each criterion and it would not be useful for the purpose of this paper. Instead, the main arguments considering the overall necessity of the criteria and the reasoning behind them shall be outlined.

As discussed by Sandholtz (1993), the existence of the Maastricht criteria was desirable by all the countries now participating in EMU. He argues that the main reason was the conversion to macroeconomic discipline in 1980s and 1990s which was necessary in the world where capital began to flow across borders as widely as never before. Some countries[15] would face

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[15] Particularly France, Italy, Spain or Greece.

great difficulties when trying to push through the change in conducting the macroeconomic policies individually. Moreover, complete capital liberalization (undertaken in 1990) and exchange rate stability (in EMS) were incompatible with divergent national monetary policies at the time. As Delors report (1989) stated: "If the move to EMU were not to take place it is quite likely that either the EMS would become less stable arrangement or capital market liberalization would not be fully achieved or maintained."

It is perhaps undisputable that monetary integration and institutional foundations preceding such integration were desirable at the time. However, the question on how the criteria[16] for this membership should be designed still needs to be answered. The answer will be discussed shortly as the criteria are to be outlined.

Out of five criteria, two are concentrating on the fiscal discipline of the member states. The first criterion states that general government deficit must remain below 3% of GDP of the respective country. The second one requires that the general government debt must be less than 60% of GDP of the respective country or approaching the required level at a satisfactory speed.

These two criteria have been probably the most questioned ones so far. Critics propose that these threshold values were chosen arbitrarily without any reference to economic fundamentals of the countries joining the monetary union. Furthermore, debt to GDP ratio is often to be thought of as being defined too loosely since satisfactory speed is quite a broad term.

However, going back to the existence of these criteria, it rather seems that those who criticize them do not realize their ultimate purpose. Even though Maastricht criteria are labeled convergence criteria it doesn't imply that their ultimate goal is to acquire absolute real economic convergence among member countries. That would be impossible to achieve in two years period for any of the new EU members. Rather, it seems more realistic to assume that they were designed to acquire macroeconomic policy convergence among the countries in order to establish smooth functioning of the monetary union. This goal seems to be more realistic one given the vast differences in economic structures of some of the EU27 member states.

Of course, real economic convergence of the members of EMU is desirable as well, as it enables to conduct common monetary and fiscal policies with substantially lower costs incurred. However, it is not necessary prerequisite for joining a monetary union. Each country can compare the costs associated with adherence to the common macroeconomic policies and benefits from such integration on its own.[17] Especially when assessing these costs in the long term perspective it might seem that even a country with quite different economic structure with comparison to the rest of the members may gain from the membership. The reason is that real economic convergence seems to be more rapid once the country is in the monetary union as opposed to remaining outside as Frankel and Rose (1998) suggest.

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[16] These criteria are listed in the Article 109j (1) of the Maastricht Treaty (February 7, 1992, Maastricht).
[17] Indeed those might be very different depending on the country under consideration.

From the point of view of coordination of fiscal policy, 3% and 60% thresholds might seem arbitrary at the first glance. However, the reality may be quite different. As Afxentiou (2000) suggested, the 60% threshold was based on the average debt to GDP ratio among the countries entering the monetary union. Such step seems reasonable if this common threshold didn't cause unsustainable financial markets pressures for all the joining countries at the time. As Afxentiou and and Serletis (2000) argue, this was not the case. Of course, it would be more suitable to have country specific thresholds since financial markets perceive each country differently. However, the problem is how to determine what is acceptable by markets. Let's recall once again what Walter (2010) said on behalf of EMU: "Financial markets worry in a very biased way." Thus, setting the threshold at 60% of GDP doesn't seem to be such a bad idea after all. It seems more reasonable to be rather on the safe side than risking the possibility of the painful restructuring which Greece is currently undergoing due to constant breach of the criterion.

Furthermore, the part that requires countries being above the 60% threshold to approach the criterion at satisfactory speed implies that as soon as a country is on the right track, given the circumstances, it shouldn't be facing the pressure of the financial markets. Thus, it would not threaten the stability of the monetary union and its own.

Criterion of 3% for general government deficit seems to be rather a tool to be used in order to acquire the 60% threshold. Furthermore, 3% should leave enough space for a country to make a decision on how quickly it wishes to approach the given target. Again, more country specific approach could be tailored here but then the specific measurement technique could be questioned as well. If the criterion was set e.g. at 5%, some countries like Greece or Portugal would probably never converge to the 60% threshold. Thus, it seems reasonable to be on the safe side once more. Taking the example of US and its recent high government deficits into account, one can easily see that even the most powerful economy in the world cannot afford to run such deficits forever.

Overall, the use of both fiscal criteria in order to acquire convergence among individual fiscal policies of the current and potential member countries doesn't seem to be arbitrary at all. Potential EMU members, especially EU8, do mostly satisfy 60% threshold by far but 3% deficit criterion might be more of a challenge. Nonetheless, it forces the newcomers to stay under 60% threshold in the long run and it further signals to the financial markets that a country's fiscal discipline is more than satisfactory.

The remaining three Maastricht criteria also known as monetary criteria seem to be less heavily questioned than the previous fiscal ones as Lipinska (2008) suggests.

These comprise nominal exchange rate criterion stating that a member state must participate in the ERM II (where it is not allowed to devalue its currency) for at least two years prior entering EMU.

Price stability criterion states that a member state's inflation rate must not exceed the average of the three member states which have achieved the best results by more than 1.5 percentage points.

Finally, the nominal long-term interest rate must not exceed the average of the three Member states which have achieved the best results in terms of price stability by more than 2 percentage points. The last two criteria aim, among other things, at achieving monetary policy

convergence among the future members of the monetary union. Such convergence seems to be a logical prerequisite for membership since it requires conservative monetary policy targeting low inflation and thus stable economic environment. This was the ultimate goal of the European countries since 1980s and 1990s and it further continues to be through EMU membership.

Critics suggest that such policy appears to be too conservative implying long periods of weak economic growth. Again, US with its aggressive expansionary monetary policy might be a good example. Indeed, US enjoyed extraordinary economic growth for some time. However, this growth subsequently led to the worst financial and economical crisis since the Great Depression.

ERM II criterion aims at stabilizing the central parity with which a country will eventually enter EMU. Moreover, devaluation condition naturally prohibits excessive competitive advantage acquired through currency devaluation prior entering EMU. The period of two years might be questioned, especially since the financial markets dispose of significant power with respect to fairly economically small candidate countries. The well known "run up to Euro" effect is another phenomenon causing problems. However, these issues are partially covered by the catching up effect of the candidate countries since these are mainly central and eastern European countries. Furthermore, overvalued currency can subsequently mitigate inflationary pressures arising from further catching up process. Overall effect on the accession country depends on many circumstances and to arrive at the best decision in terms of whether attempt entering the monetary union might seem difficult.

Lipinska (2008) attempted to compute the effect of the three monetary criteria on the optimal monetary policy for the specific case of Czech Republic. She discovered that once the optimal monetary policy is constrained by the three Maastricht criteria, additional welfare costs amounting to 30% of the optimal monetary policy loss can arise. She further comments that the credibility related to the compliance with the Maastricht criteria was neglected in her model. These gains may be however quite large as previously discussed.

However, from the point of view of the monetary union, it seems natural to require monetary policy convergence from the future union members, prior acceptance into EMU.

Bearing the ultimate goal of the Maastricht convergence criteria in mind, there shouldn't be much to question on the existence of the criteria. However, what seems to be malfunctioning is the adherence to the criteria by the member countries. Even though the criteria serve as fairly good prerequisite for the membership, once the country is in, it seems that sanctions for breaching the "rules" do not function efficiently. This flaw of the system caused the Greek debt crisis and subsequent Eurozone crisis. If no appropriate measures are to be taken in the near future, further problems may potentially arise.

2.3 PROS AND CONS OF BEING A EUROZONE MEMBER

Without a necessity to go into any details or to thorough analysis of OCA literature and all the relevant studies about EMU, one can reasonably claim that the main arguments against existence of any monetary union are the potential loss of individual monetary policy of the member states and the loss of the previous nominal exchange rate adjustments of the members. First of all, individual monetary policy, especially in countries forming EMU, is rather a fiction as Archer in Artis (2002) suggests. The same argument is even more convincing for EU8. The reason is that most of these countries are extremely small and open economies with strong economic ties with EA16. Furthermore, EMU is an economic giant whose monetary policy influences not only the whole Europe but more or less intensively the rest of the world as well. Also, any Euro exchange rate deviations have sound implications on other European currencies. Secondly, nominal exchange rate adjustments may be harmful rather than positive as often claimed. Recent example is the current crisis where Eurozone membership offered an initial anti speculative "cushion" for countries like Greece, Spain and Portugal or for some small economies with sound economic performance such as Slovakia, Slovenia or Cyprus. Without Euro these countries would most probably experience the same unprecedented depreciations such as Czech Republic, Poland or Hungary resulting in substantial macroeconomic imbalances. It seems to be the case that such imbalances have a greater effect on the economy than possible positive competitive effects.

Good example is the case of Slovakia and the Czech Republic. Both countries have very similar economic structures. Both are extremely open, with strong economic ties within EU. The structure of trade and fiscal policy are similar as well. The major difference is however, that Slovakia joined EMU in 2009 whereas the Czech Republic still keeps its own currency and thus "independent" monetary policy. According to the competitive depreciation argument, the Czech Republic should be able to adjust to the severe economic downturn more efficiently than Slovakia. Indeed, Czech koruna has depreciated substantially since the crisis fully evolved in Europe whereas Slovakia was stuck with strong Euro eventually.
However, steep and very rapid depreciation of Czech koruna caused rather pressures between the fiscal and monetary policy.
On one hand, there was an urgent need to support the falling economy by expansionary fiscal and monetary policy. On the other hand, severe depreciation of currency, expansionary policies and increasing financial market pressures in conjunction with adverse reaction of investors began to cause problems. In Slovakia, extremely expansionary fiscal policy in order to support the economy could be afforded as there was no speculative pressure on the currency.
Despite the Czech koruna's massive depreciation, Czech economy fell by 4.1% in 2009[18] and exporters didn't seem to benefit as expected. Even though Slovakia experienced slightly higher downturn of 4.7% in 2009, subsequently in the first half of 2010 Slovak economy returned back to the prior highest economic growth rate in EU27 with 4.6% and 5% growth rates in the first two quarters of 2010. The Czech Republic however, grew only by 0.9% and

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[18] All the data on real GDP growth rates acquired from Eurostat, statistical office of European Union.

2.2% in the same respective period. Even though there might be some additional relevant reasons that caused such situation, difference in the economic performance is remarkable and it is quite obvious that the competitive effect or independent monetary policy didn't help that much if at all. Similarly, Hungary has experienced even greater macroeconomic imbalances as previously mentioned. These were caused by speculative pressures on the currency and Hungary was even forced to negotiate a loan from IMF and EU even though its economic performance was substantially better than that of Greece.

Despite all the arguments about the magnitude of the loss of the nominal exchange rate variability there is a simple, relevant and unquestionable argument towards desirability of fixed exchange rates among not only current and potential EMU members but also among all developed and developing countries. This argument is the clear success of the post war gold-dollar standard which brought greater macroeconomic stability and extensive period of high economic growth among the participating nations. Nevertheless, it was condemned to fail as the rising speculative capital became too costly to fight against and of course the altering underlying features of the system were also contributing to its end.
Since then, the speculative power of capital has grown intensively confirming that there is no fixed currency regime unless investors and speculators decide so.
However, the past extensive experience clearly shows that fixed exchange rates are desirable among countries even though it is not viable anymore to implement the complete fixed currency regimes especially for small open economies. What is however viable, is a monetary union, enabling not only fixed exchange rates but offering further advantages resulting from membership in such union as Mayordomo, S., Peña, J. I. and Schwartz, E. S. (2009) suggest.

Since the existence of money people seemed to understand that monetary union is beneficial rather than harmful. If it weren't so we would have had thousands of currencies each for every region in every single country in order to better adjust to all kinds of shocks to the economies. If somebody believes that all the states in USA or all the cantons in Germany were structurally identical when they were politically united into a currency union or that they are identical even now is a bit naive. Comparing US and EMU from the point of OCA criteria is evenly naive.
We do not have necessary data from the period when USA became currency union but taking very different historical background of individual states at that time into account, one can easily claim that Europe is much more structurally closer than the states in USA were when they formed the monetary union.

Furthermore, as Mongelli (2002) shows, there have been four phases of OCA theory and each had very different implications for EMU. At the beginning US economists were strictly against EMU as they perceived it to be solely political project. Later on as the theory further evolved the costs of EMU appeared to be smaller whereas benefits started to show. In the final stage, EMU doesn't seem to be doomed anymore and evidence suggests that even labor mobility and labor market flexibility are rising more rapidly in EA16 than previously thought.

Critics of EMU also often seem to forget about the danger stemming from exchange rate flexibility within a free trade area or single market. This flexibility may be abused by countries pursuing competitive beggar-thy-neighbor type policies, and these policies are, at best, likely to amount to a zero sum game as MacDonald (2000) suggests. He further studied both internal and external exchange rate flexibility in Eurozone member countries and came to conclusion that irrevocably fixing internal exchange rates, and having some flexibility in the external value of the Euro, will enhance the growth prospects of the Euro area.

Another proclaimed argument about unsustainability of EMU is the economic divergence of the member countries. However, Flaig and Wollmershaeuser (2007) find that there is no such tendency in EA16.

It rather seems that the relevant question to be asked should be: "How shall we design and implement the underlying structure of the monetary union in Europe in order to reap the highest possible benefits from such integration?" So often discussed question of whether monetary union in Europe is a beneficial or harmful project appears to be rather irrelevant.

2.4   WILL EMU SUCCEED OR FAIL?

Many economists such as Davies (2010) have claimed that EMU is doomed and sooner or later it will come to its end because as such it is mainly political project with no real economic fundamentals. On the contrary, it can be easily shown that such negative perception might be far from realistic and that Europe can be perceived mainly as an economic project as opposed to what some do believe.

Quite viable argument can be found in one of the first if not the first study concerning the break-up of EMU. This study was performed by ING research department which came to the conclusion that the end of Eurozone would lead to tremendous losses for all members of the union. The cumulative loss of output in the first two years would be close to 10%, making the current global and economic crisis rather negligible. Even the most passionate opponents of EMU have to agree that such losses cannot be compensated by any long term gains from termination of EMU unless those gains are extremely high as well. Such situation is rather unlikely.

As Eichengreen (2010) comments: "Once a country quits the Euro, it would have to devalue its newly-reintroduced national currency, resulting in wage inflation that would neutralize any benefits derived from external competitiveness. Moreover, the country would be forced to pay higher interest rates on its public debt." Thus, sometimes predicted break-up of the Eurozone seems to be rather a distinct delirium in light of the evidence.

Further paradigm about EMU being a political project can be questioned as well. Before doing so however, some insight into which interest groups were and which were not in favor of EMU should be given.

Bofinger (1997) suggests that there were numerous parties either favoring or refusing Euro in Germany in 1997. German public, according to opinion polls, was against Euro with 55% of inhabitants and only 45% of Germans were in favor of the new currency. Second group was the Bundesbank, whose regional central bankers would lose power should EMU occur. Third was the banking industry, which was divided into large banks that favored Euro because it raised the possibilities of expansion into other European markets and the small banks which were anti-Euro. Fourth group was the German industry federations, all of which were in favor of EMU. The press, which was mainly opposed to the Euro, was a fifth player. Finally, there were Germany's own politicians, among whom Chancellor Kohl was ready to support EMU at any cost. This simple setting can be utilized for a simple proof demonstrating rather economic reasons behind the existence of Euro as opposed to political ones as often proclaimed.

The reasoning goes as follows: First, let's assume that EMU is indeed a political project. If EMU truly is a political project then politicians must have a very strong incentive to support this project as there are such sound voices against EMU and its viability among general public. Natural question arises: What should however make politicians act in favor of EMU? Well, in general the most intense driver of politicians should be the popularity among voters. Politicians as such intend to get re-elected acting as rational utility maximizers. Of course, to get re-elected is only possible when politicians are able to convince as many voters as possible.

However, as polls show EMU is not popular among majority of voters in Germany as already suggested and similar tendencies are visible among other member countries as well. Furthermore, during the Eurozone crisis popularity of EMU among citizens of the member countries declined substantially due to expensive bail out of Greece.

These facts therefore imply that there must be some other reason for political support of EMU. Moreover, this reason must be stronger than the potential threat of not getting re-elected. The only significant source of influence on the decision making process of politicians left is lobby.

The following natural question arises subsequently: Which interest group lobbies and why do they lobby for the support of EMU? The answer seems to be straight forward. Private sector uses lobbying in order to promote its interests. This private sector comprises economically strong and profit maximizing companies with ability to protect their interests. If these companies lobby for EMU it must follow that EMU is positively influencing their profits and future economic prospects. This hypothesis is further supported by the German industry federations' attitude towards Euro. All the federations strongly supported Euro as discussed earlier. Furthermore their lobby must have been stronger than the fear of politicians of not getting re-elected. Thus it simply follows that if EMU has such positive impact on private sector then it must have a positive impact on the whole economy as well. Finally one can

conclude that EMU is rather economic project of private sector pushed through politicians which seemingly makes it look like a political project.

There is however one potential flaw in this reasoning. This possible flaw is the assumption that politicians are acting as rational utility maximizers. It is further assumed that their main interest is to get re-elected in order to maximize their utility. Thus, implicitly it is assumed that politicians do not follow their own perceptions and beliefs in order to maximize their utility.

The validity of this assumption is strongly dependent on the other explicit assumption, thus on the lobby of private sector. If this lobby exists and if it is indeed strong and influential, then the potential independent individual decision making process of politicians is rather questionable. Furthermore, lobby seems to be beneficial to politicians even in the long run and this brings us back to profit maximizing assumption. Getting re-elected implies that politicians will reap long term profits from continuous lobby.

The validity of assumptions made here can be supported by the study prepared by Lehmann (2003) on the request of European parliament. The study reports that in 2000, about 2,600 interest groups had a permanent office in downtown Brussels, of which European trade federations comprise about one third. This study further reports that lobby had a significant influence on decision-making processes in EU. It was suggested that up to 50% of lobbyists were successful in influencing various decision-making processes in EU. Since then, EU and EMU enlargements and further delegation of competencies to Brussels has led to even greater influence of lobbying groups in Brussels. Thus, the key assumptions of the simple proof seem to hold and the outcome then alters the second paradigm about political union in EMU.

Quite often even criticism on the effectiveness of monetary policy in EMU can be seen in recent literature. However, when De Grauwe and Storti (2005) analyzed the effectiveness of the monetary policy in the Eurozone, they discovered that ECB is in no way handicapped in using monetary policies for the purpose of stabilizing output compared to the US. Thus, it seems that monetary policy in EMU is at least as efficient as monetary policy conducted in US.

Once data, simple economic rationale and numerous studies conducted by number of renowned economists are taken into account, there doesn't seem to be the reason for the perceived failure of the Eurozone. Even though there are challenges ahead and the structure of functioning of EMU needs to be further modified, great success has been already achieved as Wyplozs (2006) suggests. When considering the pace at which EMU's gradual reformation is progressing, it is perhaps clear that many obstacles are to be overcome in the near future. It took well over century for US to achieve what Europe has done in 20 years.

3. EMPIRICAL PART

Descriptive part of the paper outlined some important issues concerning the entry into the European monetary union. Particular attention was paid to EU8 as this group of countries is expected to join EMU sooner or later[19]. Empirical part will attempt to deliver more rigorous assessment of the candidates for EMU membership. First section will be devoted to the brief empirical literature review of OCA theory since this theory shall be utilized as the main building block for the specifications of the model being estimated. Potential caveats of this approach will be presented as well and further determinants of OCA will be briefly suggested. Subsequently the main economic reasoning behind the model and its description will be given with the detailed description of the computations and the data sources. Furthermore, specific econometric technique being utilized and some partial results will be presented. Subsequently, the outcome and the main implications of the model will be introduced. Finally, careful conclusions about the major issues identified in the paper shall be drawn and all the questions will be attempted and hopefully answered.

3.1.   OCA EMPIRICAL LITERATURE REVIEW

The OCA theory, as it is referred to now, originated from the discussion on the advantages and disadvantages of the floating versus fixed exchange rate in the late 1950s. The theory itself stems from the Robert Mundell's[20] article where he suggested that optimum currency area can differ from the actual currency area. Such difference could arise from the inability of the floating exchange rate regime to cushion the shock and bring the countries back to equilibrium[21]. As a result, he suggested number of non-exchange rates means of adjustment, i.e. labor mobility, nominal flexibility and fiscal transfers. Since then, further interest in the theory led to the introduction of new means of adjustment by McKinnon (1963) and Kenen (1969). They additionally considered financial integration, openness and output diversification as possible sources of adjustment. Further means of adjustment such as price and wage flexibility or mobility of factors of production, specifically labor, were introduced as well.

Following Mongelli (2002), four phases of OCA theory may be identified. The first one, labeled as "pioneering phase" starts with the introduction of the properties or prerequisites for formation of optimal currency area. These are often referred to as OCA criteria and they mostly evolved in the late 1950s or subsequently throughout 1960s. Most of these have been already mentioned. Even though, this phase brought forward number of arguments for or against fixed exchange rate and subsequently single currency among the group of two or more

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[19] New members of EU obliged to join EMU whenever they will be ready to do so.
[20] See Mundell (1961).
[21] See Horwath and Komarek (2003).

countries, it failed to deliver unambiguous implications as Tavlas (1994) suggests. Moreover, Ishyama (1975) claims that some of the OCA criteria outlined earlier are possibly interdependent.

As a result, the cost-benefits phase evolved shortly afterwards. Thus, the most important benefits from a single currency such as disappearance of intra-area nominal exchange rate, reduced uncertainty resulting in greater trade and further promotion of foreign direct investments or the access to broader and transparent financial markets, have been identified. Moreover, the most obvious costs associated with the introduction of a single currency can potentially arise due to the restricted pool of policy instruments directly available to national governments as suggested by Corden (1972) in Mongelli (2002)[22].

Then, the third phase labeled as "reassessment phase" followed. Monetary integration stagnated in Europe and the theory itself lacked proper empirical foundations. OCA criteria remained inconclusive and flexible exchange rates were considered to be viable means of short run adjustments. However, rather negative view on monetary integration in Europe has shifted substantially. Some of the pronounced costs of such integration became less emphasized or even further questioned. On the other hand, additional benefits of monetary integration became apparent.

Overall cost benefit analysis began to incline towards net benefits rather than to net costs as proclaimed in early stages of OCA. Towards the end of this period new interest in monetary integration appeared to be present and thus the new phase also known as "new" OCA theory came into place. Revival of the theory mostly followed from the final steps taken by EU in order to proceed to the establishment of full monetary union in Europe. Later on, Cecchini report caused further disputes and subsequently stirred up vast interest in the subject. Several advancements subsequently followed. Issues like credibility gains, real effectiveness of exchange rate adjustments, causality between inflation, unemployment rate and growth or endogeneity of OCA criteria have been raised.

Furthermore, vast number of empirical advancements evolved as well. Those may be further classified into number of main areas based on the fields being analyzed. All the areas of interest are based on the OCA criteria and can be inferred to from the appendix as well.

Studies concentrating on the wage and price flexibility in general come to conclusion that there is significantly higher rigidity in European labor market than in US. However, on the contrary Smaghi and Vori (1992) argue that in general, the elasticity of nominal wages with respect to prices is higher in Europe than in the US. Moreover due to enhanced integration process in Europe, wage and price flexibility are most likely to further increase over a period of time as Arpaia, A. and Pichelmann, K. (2007) suggest. Nevertheless, greater degree of flexibility needs to be acquired in near future.

Labour market integration has been heavily researched as well since it is an important factor allowing for adjustment in case of permanent shocks. However, in this aspect EMU lags significantly behind US as Bertola, G. (2008) suggests. Moreover, Eichengreen (1990) came

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[22] More detailed description of the variety of potential benefits and costs is given in the appendix.

to conclusion that the variation in unemployment in Europe was approximately two times higher than in US whereas its dispersion appeared to be even more pronounced. The evidence thus suggests that cultural and language barriers still persist in the monetary union and further labor market reforms are desperately needed.

In terms of factor market integration EMU performs much better though. Empirical study conducted by Brouwer, J., Paap, R. and Viaene, J. M. (2007) concludes that FDI effects of EMU range between 18.5 percent for Poland and 30 percent for Hungary. Furthermore, Brzozowski, M. (2003) estimates that Euro adoption is likely to exert a positive influence on FDI inflows in accession countries.

Financial Market Integration is another subject that deserved attention. Jappelli, T. and Pagano, M. (2007) provide evidence on the caveats and potential flaws of such integration in EMU. On the other hand they also acknowledge acquired success in number of areas. Moreover, empirical study by Fratzscher, M. (2001) resulted in number of important findings. First of all, unification process in Europe has raised the degree of integration, especially among countries that have adopted Euro. Secondly, reduced exchange rate uncertainty and monetary policy convergence of interest rates and inflation rates were the key reason for enhanced financial integration in EMU.

Degree of economic openness, one of the OCA criteria, has been frequently scrutinized with respect to EMU as well. Overall, member countries seem to perform exceptionally well in this area. Bilateral trade among EMU member has been rising steadily since the monetary union has been founded as Micco, A., Stein, E. and Ordoñez, G. (2003) conclude. They found that the effect of EMU on bilateral trade between member countries ranges between 5 and 10 percent and additionally no evidence of trade diversion could be identified. They further suggest that monetary union increases trade not only within the member countries, but with the rest of the world as well.

Diversification of production in EMU has been analyzed by number of economists. Particularly, Frankel, J. A. and Rose, A. K. (1998) argue that economies of the member countries tend to become more structurally closer over period of time since the endogeneity of OCA criteria is present. Furthermore they find that trade linkages are positively correlated with business cycles in EMU. Thus, monetary integration in Europe seems to further enhance economic integration of the member countries.
Other aspects of monetary integration such as converging inflation rates and better coordination of fiscal policies among the member countries are natural aspects of such integration.
However, what needs to be further mentioned is previously discussed loss independent monetary policy. This loss is often regarded to as the most viable reason against monetary integration in Europe. Moreover, number of OCA criteria was introduced in order to offset this negative attribute of integration. However, discussion on relevance of this assumption appears to be less frequent in literature. First of all, once EMU came to existence, all the neighboring countries de facto lost control over their independent monetary policies to large

extent. They were either forced to shadow the policy of ECB or some deliberately decided to fix their currencies against Euro[23]. None of the European countries outside EMU is economically strong enough not to be influenced by the monetary policy in EMU. Furthermore, small economic size of countries being outside monetary union further allows greater volatility of their respective exchange rates since speculative capital disposes of greater power over their currencies as opposed to US or EMU. Thus, the argument of exchange rate adjustments serving as short term adjustment channel is rather theoretical. Extreme volatility of CEE countries' currencies during the last decade confirms the argument. None of the central banks of these countries was able to respond to this volatility appropriately. Czech national Bank tried in 1997 when it intended to support fixed exchange rate regime at the time, however unsuccessfully. Since then, Czech currency has been freely floating. Moreover, much expected net economic benefits resulting from competitive depreciations of CEE currencies during the recent crisis didn't lead to expected results so far[24]. Furthermore, beggar thy neighbor policies may develop among economically stronger accession countries that would be able to exercise individual monetary policy to a certain extent.

Thus, it seems rather important to identify the costs associated with entry to monetary union in Europe carefully, especially while taking into account that EMU constitutes such a large economic area. From this perspective it might seem that costs associated with the loss of individual monetary policy for potential accession countries may be low.

In the empirical analysis that follows shortly, these costs will not be specifically included in the model since they are potentially difficult to incorporate in the single model. Extensive research would be necessary and the scope of the paper doesn't allow for such research. However, when discussing the results of the estimation, the outcome shall be evaluated carefully. The importance of the loss of monetary policy for the respective countries will be taken into account. Moreover, it will be properly weighted with respect to the potential benefits resulting from membership in EMU, in case they occur.

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[23] See Baltic countries or Denmark for instance.
[24] Despite the fact that most of these countries are sufficiently open economies, they were unable to grow at the levels comparable to most of the EMU countries in the last two years period.

3.2. DATA AND MODEL SPECIFICATION

There has been extensive research about the OCA theory and its implications for EMU as illustrated by Artis (2002). Most of the studies analyzing EMU members differentiate between "core" and one or more "peripheral" groups of countries. Further analysis then investigates the optimality of EMU from the point of view of the OCA criteria. Usually EA12 and its members are considered in most of the studies and bilateral country pairs are created with Germany used as a benchmark.

Since EMU has been extended to 16 members by now and new EU members are expected to join sooner or later, it seems reasonable to use rather different approach as opposed to the one utilized in previous studies. Therefore, EA16 is considered to be a benchmark "country" in the analysis.

Taking the commitment of new EU member countries to join EMU as soon as they fulfill Maastricht criteria into account, these countries (in this case EU8) will be considered as the potential entrants to EMU. Furthermore, some additional European countries will be included in the analysis, particularly Croatia, Iceland, Denmark, Sweden, Switzerland and UK. Their inclusion should bring an additional insight on the optimality of monetary union in Europe. Moreover, number of studies has analyzed the suitability of this group of countries for EMU membership with fairly sound implications as Artis and Ehrmann (2000) suggest. Thus, it will be interesting to see how the situation has changed in the light of 21st century.

As a result, following countries are included in the analysis: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Croatia, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and Switzerland.

The data sample therefore contains 30 countries, 16 of them belonging to European monetary union. The time period covers years dating from 2000 to 2010. In 2010, only the first and second quarter data was available. The whole period is further divided into the three following sub periods: 2000 - 2003, 2004 - 2006, and 2007 - 2010. The reason for having three relatively short periods is that most of the countries considered in the analysis experienced rapid economic growth in the last decade followed by significant downturn due to the impact of the global financial and economic crisis as discussed in the descriptive part of the paper. Thus, the assumption is that these circumstances will most probably have strong impact on the values of the OCA criteria for the group of countries in the respective period. The model to be estimated is based upon the one introduced by Bayoumi and Eichengreen (1996) although it differs in several aspects. First of all, they work with slightly different set of countries and they cover of course more distinct period[25].

Furthermore, when compiling the data matrix they work with all the available bilateral country pairs. Here, the EA16 is always associated with one of the candidate countries and candidate countries are not compared between themselves. It seems more reasonable since the

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[25] Specifically 1960s, 1970s and 1980s.

potential of candidate countries to enter EA16 is being assessed. Whether it would be viable to establish a monetary union among some of the candidate countries only is out of the scope of this paper. Moreover, some of the calculations of variables utilized in the model of Bayoumi and Eichengreen have been substantially modified and others were substituted[26].

Furthermore, the panel structure of data has been chosen instead of the simple cross sectional structure used by Bayoumi and Eichengreen. This technique should be able to capture the time variance of the evolution of the OCA criteria values as discussed earlier. Nonetheless, in the second section specific indicators of the OCA criteria for the candidate countries will be divided into the three sub periods mentioned earlier. This is in line with the approach followed by Horvath and Komarek (2003) and it demonstrates the significant change in the OCA criteria indicators in more structured manner.

However, for the actual estimation purposes one period covering the years dating from 2000 to 2010 was chosen since the panel estimation takes time variance into account as discussed earlier. The calculations of all the variables are based on monthly, quarterly and yearly data mostly acquired from the statistical database of Eurostat. Further details on the data sources will be given once all the variables are introduced. All the data was acquired in the original currency of over half of the countries considered, thus in Euro. For the remaining countries, average period exchange rate calculation based on Eurostat approach was used. Altogether, 154 observations will be utilized for estimation purposes.

The basic assumption of the model suggests that the more the OCA criteria are fulfilled the lower the exchange rate variability among EA16 and the candidate countries should be. This assumption is based on the reasoning that more intensive trade linkages and similar economic structure of the two economies should result into lower exchange rate variability among the two countries. Moreover, asymmetric shocks among two economies, the size of the respective economies and their openness, all being utilized by OCA theory, are expected to have an effect on the variability of bilateral exchange rates as well. The following equation, considering all these factors, is being estimated:

$$SD(e_{ij}) = \alpha + \beta_1 SD(\Delta y_i \Delta y_j) + \beta_2 GL_{ij} + \beta_3 TRADE_{ij} + \beta_4 SIZE_{ij} + \beta_5 OPEN_{ij} \qquad (1)$$

$SD(e_{ij})$ measures the volatility of bilateral nominal exchange rates where Euro is the anchor currency. $SD(\Delta y_i \Delta y_j)$ represents asymmetric shocks among pairs of countries at national level. $TRADE_{ij}$ is the proxy for intensity of bilateral trade linkages. GL_{ij}[27] measures the extent of intra-industry and inter-industry trade between country pairs and $SIZE_{ij}$ represents the size of the economy for each country pair and it should presumably express the utility from maintaining own currency. $OPEN_{ij}$ is the proxy for the openness of countries.

The variables are derived in the following manner: $SD(e_{ij})$ is the standard deviation of the change in the logarithm of the bilateral nominal exchange rates between countries i and j on

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[26] See variables DISSIM and TRADE in Eichengreen and Bayoumi (1996)

[27] Grubel and Llyod index (Grubel and Llyod, 1971).

monthly basis. EA16 is always set as a benchmark "country" and thus bilateral exchange rate volatility is measured with respect to Euro. The calculation is derived as follows:

$SD(eij) = SD(\Delta \log eij) \; ; \; i = EA16$

$SD(\Delta yi\text{-}\Delta yj)$ stands for the standard deviation of the difference in the logarithm of nominal output between i and j, measured on quarterly basis. It has been calculated on the following basis:

$SD(\Delta y_i\text{-}\Delta y_j) = SD(\log NGDP_j - \log NGDP_j) \; ; \; i = EA16$

The Grubel–Lloyd index measures the extent of intra-industry and inter-industry trade among country pairs. GL_k was calculated for each country and then the difference in absolute value between the index of EA16 and each candidate country has been calculated. The following calculation illustrates the specification:

$GL_{ij} = | GL_i - GL_j | \; ; \; i = EA16$

$GL_k = 1 - \Sigma_k \; \dfrac{| X_k - M_k |}{X_k + M_k} \; ; \; 0 \leq GL_k \leq 1$

where X_k denotes exports and M_k represents the imports of good k. If $GL_k = 1$, there is only intra-industry trade and no inter-industry trade exists. Conversely, if $GL_k = 0$, there is no intra-industry trade and only inter-industry trade prevails. The smaller GL_{ij}, the greater similarity in the trade structure between each country pair. GL_{ij} calculations are computed on yearly basis from the 99-products decomposition of the International Trade Database.

TRADEij has been calculated as the simple arithmetic mean of the ratio of bilateral exports to domestic nominal GDP for the given two countries measured on monthly basis.
SIZEij is the simple arithmetic mean of the logarithm of the two nominal GDPs based on quarterly data.
The proxy for *OPENij* represents simple arithmetic mean of the ratio of i-th and j-th exports and imports divided by domestic nominal GDP based on monthly data.

Data on the last three variables (Open, Size and Trade) were acquired from the statistical database of Eurostat. Data on the Grubel–Lloyd index were consulted in the International Trade Database. Finally, the data on the volatility of bilateral nominal exchange rates and asymmetric shocks data was acquired from the statistical database of Eurostat.

Finally, the expected signs of the explanatory variables shall be shortly discussed. The exchange rate volatility is expected to be positively dependant on the business cycles alignment among EA16 and the candidate countries. Furthermore, it is assumed to be positively dependant on the similarity of the commodity structure of exports among EA16 and

the candidate countries. Moreover, it is supposed to be negatively dependant on the intensity of bilateral trade linkages among EA16 and the candidate countries. Larger countries tend to resist steep currency fluctuations more easily than smaller ones and therefore Size is expected to be negatively correlated to the exchange rate fluctuations. Last but not least, the expected sign of openness is theoretically indeterminate as Horvath and Komarek (2003) suggest.

3.3.   OCA INDICES

This section shall be devoted to the description of the acquired OCA indices. Those indices have been calculated according to the specification that had been outlined in the previous section.

Overall exchange rate volatility shall be initially presented in order to explain the evolution of the exchange rates during the three periods. As previously presented in the descriptive part, EU8 experienced extraordinary increase in economic growth during initial years of the 21st century. This could be the reason why there is slightly higher exchange rate volatility in the respective period. During the second period (2003 - 2006), their growth rates remained more or less stable and that might have mitigated the variability of the exchange rate during this period. Finally, during the third period (2007 - 2010), volatility of the exchange rates increased again due to the financial crisis and subsequent substantial depreciations of the currencies. Even though there have been different levels of variability of the exchange rates of the EU8 and the rest of the countries considered, overall volatility doesn't appear to be high. One could thus infer that fixing the currencies to Euro might not impair extensive costs in terms of giving up one of the catching up channels of the countries being considered.

Table 2 - Exchange Rate Volatility with respect to Euro, Based on Monthly Data[28]

Exchange rate volatility with respect to Euro	
2000 - 2003	0,023622
2004 - 2006	0,012117
2007 - 2010	0,028520

Source: Own calculations

Subsequently, individual countries with their respective exchange rate volatilities are presented. As can be seen from the table three, Estonia, Denmark, Latvia and Lithuania have pegged their currencies to Euro since it is required to do so prior entering ERM II. Thus naturally these countries experienced the lowest rates of exchange rate volatility. Pegging to Euro is however almost equivalent to entering monetary union. Estonia will most probably join in January 2011. Latvia and Lithuania are hoping to join EMU in the near future, i.e. as soon as they fulfill Maastricht criteria. However, Denmark decided to participate in ERM II despite the fact that it doesn't intend to join EMU. The officials argued that pegging will have

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[28] Volatility represents average of the standard deviations of the change in the logarithm of the bilateral exchange rate based on monthly data.

the similar positive effects as membership while Denmark can additionally enjoy its own monetary policy. As argued previously, this reasoning doesn't appear to be viable.

Table 3 - Exchange Rate Volatility with respect to Euro, Based on Monthly Data[29]

	2000 - 2003	2004 - 2006	2007 - 2010
Denmark	0,000773	0,000558	0,000355
Sweden	0,017137	0,006667	0,026077
United Kingdom	0,024189	0,007046	0,048880
Bulgaria	0,000790	0,000585	0,000000
Czech Republic	0,026587	0,022183	0,021599
Estonia	0,000000	0,000000	0,000000
Hungary	0,016800	0,019007	0,029581
Latvia	0,029241	0,010413	0,002966
Lithuania	0,016082	0,000005	0,000000
Poland	0,041402	0,027420	0,041841
Romania	0,103034	0,028015	0,044427
Croatia	0,007397	0,006511	0,005097
Iceland	0,035554	0,035382	0,151798
Switzerland	0,011726	0,005847	0,026661

Source: Own calculations

Looking at the rest of the countries, Iceland and Poland seemed to experience the highest levels of exchange rate volatility. In case of Iceland, its economic structure and geographic location are quite different compared to the rest of the Europe, thus both could possibly contribute to the higher volatility. Poland on the other hand is larger and more closed economy than the rest of the countries being analyzed. Also in terms of economic structure, Poland initially kept higher share of agriculture in GDP and it was the single European country that still grew during the financial crisis. Those could be the reasons for the above average volatility of polish zloty as well. The rest of the countries experienced fairly low exchange rate volatility suggesting that the costs resulting from the loss of individual monetary policy may be low for these countries.

Moving to the GLI and thus to the table four, one can clearly see the structural similarities of the individual economies with respect to EA16. The higher the index, the lower is the similarity of economic structure between EMU and relevant countries. During the initial period (2000 – 2003) Denmark, Sweden and UK seemed to have by far the most similar economic structure with respect to EA16 in comparison to the rest of the countries. However, EU8's exceptional economic performance, continuing transformation from centrally planned economies to market oriented ones with growing trade linkages with EMU and their further integration into EU heavily influenced their respective economic structures. All of them,

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[29] Volatility represents average of the standard deviations of the change in the logarithm of the bilateral exchange rate based on monthly data.

except Bulgaria substantially converged to EMU and most of them reached the levels similar to the ones of Denmark, Sweden or UK.

Table 4 - Structural similarity with EA16, Based on Yearly Data[30]

	2000 - 2003	2004 - 2006	2007 - 2010
Denmark	0,1675	0,1716	0,1660
Sweden	0,1716	0,1841	0,1906
United Kingdom	0,1620	0,1633	0,1684
Bulgaria	0,3147	0,3126	0,3495
Czech Republic	0,2067	0,1792	0,1617
Estonia	0,2925	0,2695	0,2284
Hungary	0,2709	0,2201	0,1861
Latvia	0,4165	0,3222	0,2762
Lithuania	0,3272	0,2705	0,2313
Poland	0,2638	0,2142	0,1848
Romania	0,3364	0,2860	0,2294
Croatia	0,3825	0,3789	0,3531
Iceland	0,6945	0,6877	0,6637
Switzerland	0,2520	0,2543	0,2557

Source: Own calculations

Czech Republic even surpassed these three countries. On the other hand Sweden and UK were slightly diverging during the respective period. Denmark became structurally closer with EMU during the identical period.

Iceland was steadily converging to EMU during all the sub periods. However it still remains by far the most dissimilar economy with respect to EA16 in the sample. Croatia followed similar path except it started off at lower initial level. Thus, in the respective period, it was able to reach the level of Bulgaria. Switzerland slightly diverged from EA16 whereas Bulgaria initially converged to EMU in the second period. Nevertheless, it subsequently considerably diverged from EA16 probably due to the serious impact of the crisis on the country during the third sub period.

Overall, the sample of countries being considered converged significantly to EMU in the last ten years. Even though there were few exceptions, most of the countries seem to be sufficiently structurally close to EA16 and thus the entry into EMU shouldn't impose excessive costs on these countries in terms of asymmetric shocks to the economy.

Nevertheless, the symmetry of shocks between EA16 and the sample of the countries shall be presented in table five. Denmark, Sweden, Switzerland and UK belonged to the countries with the highest symmetry of shocks with EA16 in the initial period. However, Denmark by far outperformed the rest of the four. Other countries initially experienced lower symmetry of

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[30] The Grubel–Lloyd index measures the extent of intra-industry and inter-industry trade among EA16 and the sample of countries being considered.

shocks with respect to EMU. The identical reasoning as in the case of economic structure may be utilized.

Table 5 - Symmetry of shocks with EA16, Based on Quarterly Data[31]

	2000 - 2003	2004 - 2006	2007 - 2010
Denmark	0,00471	0,00647	0,00421
Sweden	0,01984	0,00859	0,02774
United Kingdom	0,01572	0,00788	0,04933
Bulgaria	0,05155	0,05457	0,05790
Czech Republic	0,03619	0,03301	0,02533
Estonia	0,04234	0,04320	0,03098
Hungary	0,05118	0,02405	0,03167
Latvia	0,02664	0,06293	0,04839
Lithuania	0,03976	0,04875	0,04423
Poland	0,03399	0,04756	0,03639
Romania	0,07675	0,11291	0,08510
Croatia	0,03755	0,03423	0,02959
Iceland	0,02291	0,03762	0,12459
Switzerland	0,01338	0,00633	0,02467

Source: Own calculations

However, this time only few of the EU8 converged to EA16 in terms of the symmetry of shocks in the last ten years period. Specifically, Czech Republic, Estonia and Hungary managed to do so the most rapidly. All three outperformed UK and Czech Republic even managed to pass Sweden. However, some countries like Latvia, Lithuania, Romania and Poland initially diverged during the second period and subsequently converged back to previous levels of symmetry of shocks with EA16. This later convergence may be caused by the financial crisis since all the countries in Europe experienced rapid economic slowdown to certain extent. Specific case is again Iceland since it experienced the lowest symmetry of shocks with EMU out of the sample being considered. Moreover, it substantially diverged during the last period (2007 – 2010). This could be due to the serious macroeconomic problems that arouse from the banking sector fall down since the crisis fully evolved in Iceland. Finally, Croatia managed to converge to EMU as well when it reached the level similar to the one of Estonia or Hungary.

Thus, overall it seems that the symmetry of shocks between EMU and the sample of the countries is fairly high. Therefore, asymmetric shocks are less likely to occur once these countries join EMU and again the costs of doing so should not be too high as a consequence.

Furthermore, trade intensity among EA16 and the sample of countries is about to be considered.

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[31] Symmetry of shocks is measured as the standard deviation of the difference in the logarithm of nominal output between EA16 and the sample of countries being considered.

As apparent from table six, trade linkages are overall very strong for most of the countries in the sample. Thus, the countries should benefit from the entry into EMU in terms of further trade integration and growth.

Table 6 - Trade intensity with EA16, Based on Monthly Data[32]

	2000 - 2003	2004 - 2006	2007 - 2010
Denmark	0,06917	0,07161	0,07181
Sweden	0,07375	0,07855	0,08018
United Kingdom	0,07033	0,06612	0,06597
Bulgaria	0,13414	0,13663	0,12943
Czech Republic	0,17716	0,20081	0,19706
Estonia	0,17338	0,16910	0,13574
Hungary	0,18345	0,17650	0,17898
Latvia	0,09982	0,09617	0,07629
Lithuania	0,09703	0,09287	0,08903
Poland	0,08167	0,10543	0,11785
Romania	0,10993	0,11533	0,09793
Croatia	0,10393	0,12595	0,11249
Iceland	0,04511	0,05292	0,04899
Switzerland	0,11642	0,12252	0,12562

Source: Own calculations

Regarding individual countries Denmark, Sweden and UK kept their trade intensity with EMU at approximately identical levels in the last ten years. However, Sweden had the strongest ties with the monetary union while UK experienced the lowest levels out of these three. Moreover, evolution was slightly positive for Denmark and Sweden while UK experienced the opposite trend.

EU8 had generally the strongest trade linkages with EMU. These were further intensified throughout the three periods being considered. This could be due to the reorientation of trade of these countries from east to the west and due to the aforementioned economic boom that prevailed in EU8 in the last decade. As a result of the significant openness of the most of EU8, trade intensity had to naturally grow as well.

Particularly, Bulgaria, Czech Republic, Estonia, Hungary and Poland maintained the strongest trade relationships with EMU. Czech Republic scored again the highest shortly followed by Hungary.

In general, during the second period most of the countries strengthened their trade linkages with EA16, while during the third period opposite trend prevailed. The reason could be again economic slowdown and subsequent lower trade intensity as a consequence of the financial crisis. However, Switzerland managed to keep and even further strengthen its trade intensity with the monetary union during all the periods covered. Latvia, Lithuania and Romania

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[32] Trade intensity represents the mean of the ratio of bilateral exports to domestic GDP among EA16 and the sample of the countries being considered.

reached approximately similar values when they slightly outperformed Denmark, Sweden and UK. Iceland scored the last again. Its trade linkages with EMU were by far the least intense among the sample when reaching just three quarters of those attained the second last country, thus by UK.

When considering the openness of the sample countries with respect to EMU, one needs to acknowledge that most of the countries are significantly open since they constitute small pro exportly oriented economies. Therefore, the entry into monetary union should be rather beneficial for these countries since most of the costs associated with the foreign exchange operations and FDI will be eliminated upon entering.

Furthermore, due to the inclusion of both exports and imports into the specification of the index, some extremely open countries reached levels of openness surpassing the value of one[33]. This is the case of the Czech Republic, Estonia, Hungary and Lithuania. Moreover, all four experienced significant increase in exports and imports during the last ten years. This increase must have been greater than their respective GDP growth rates since they all became more open with respect to EMU during the last ten years period.

Table 7 - Openness with respect to EA16, Based on Monthly Data[34]

	2000 - 2003	**2004 - 2006**	**2007 - 2010**
Denmark	0,79037	0,84169	0,88944
Sweden	0,66253	0,70154	0,72568
United Kingdom	0,63240	0,65765	0,68327
Bulgaria	0,80681	0,92722	0,93238
Czech Republic	0,99619	1,09288	1,12231
Estonia	1,14449	1,18802	1,14363
Hungary	1,04063	1,07378	1,18367
Latvia	0,82055	0,91667	0,88040
Lithuania	0,88245	0,98153	1,00487
Poland	0,66516	0,76686	0,80328
Romania	0,47357	0,49648	0,51351
Croatia	0,80985	0,83988	0,82721
Iceland	0,72815	0,76151	0,84483
Switzerland	0,77740	0,83143	0,88088

Source: Own calculations

The rest of EU8 can still be considered to be significantly open since the values for Bulgaria, Latvia and Poland moved closer to one in the respective period. The only exception is Romania which remained the least open out of the sample throughout the whole period. However, its openness was steadily increasing implying that it might become sufficiently

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[33] Imports were included due to the potentially different results in case of import dependent countries.
[34] Openness represents simple arithmetic mean of the ratio of i-th and j-th exports and imports divided by domestic nominal GDP based on monthly data.

open in the future. Croatia, Denmark, Switzerland and Iceland followed quite similar pattern when all steadily reached the levels of openness not too far from one. Sweden and UK were slightly less successful but they still managed to become more open than previously throughout the last ten years.

The size of the countries with respect to EMU is another important factor considered by OCA. The assumption suggests that the smaller the country in terms of the size of its economy with respect to EA16, the lower the costs of giving up the monetary policy should be incurred by that country. As can be seen from table eight, most of the countries in the sample are quite small with respect to EA16, however certain differences prevail. UK appears to be the largest economy in the sample followed by Switzerland, Poland and Sweden.

Table 8 - Size with respect to EA16, Based on Quarterly Data[35]

	2000 - 2003	2004 - 2006	2007 - 2010
Denmark	5,455166	5,512761	5,554966
Sweden	5,538831	5,59456	5,629121
United Kingdom	5,934706	5,987924	6,002584
Bulgaria	4,923174	5,025991	5,126918
Czech Republic	5,255627	5,354535	5,444818
Estonia	4,758545	4,87999	4,963346
Hungary	5,226173	5,323493	5,373854
Latvia	4,812097	4,914176	5,030918
Lithuania	4,903101	5,012935	5,104105
Poland	5,475594	5,542645	5,633669
Romania	5,154306	5,295324	5,41842
Croatia	5,037517	5,130554	5,202277
Iceland	4,811300	4,899365	4,894387
Switzerland	5,553189	5,593701	5,642583

Source: Own calculations

Iceland appears to be the smallest economy in the sample where Estonia is only slightly larger. Czech Republic, Denmark, Hungary and Romania are approximately the same economies in terms of size. Croatia, Latvia and Lithuania are smaller than the previous three countries but larger than either Estonia or Iceland.

Altogether it seems that the sample countries are fairly small economies when compared to EA16 and thus their individual monetary policies are likely to be influenced by the monetary policy of EMU. Therefore, upon entering the monetary union, the costs associated with the loss of individual monetary policies of these countries might be mitigated.

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[35]Size represents the simple arithmetic mean of the logarithm of the two nominal GDPs based on quarterly data.

Prior to the presentation of the results of estimation one needs to be aware of the possible interdependency issue arising from the fact that exchange rate volatility may influence growth or volume of trade of a country.

However, this possibility should have been substantially mitigated by the specific approach used for computation of indices. As standard deviation of output and volume of bilateral trade has been applied, interdependency should not be of a major concern anymore as suggested by Horvath et al. (2003).

Initially, fixed effects method was utilized when estimating the regression function (1). The reasoning is that there are observations on a fixed and relatively small set of units. Thus fixed effects estimation method is likely to be adequate. Estimation led to the following results.

Table 9 – Results of estimation of equation (1)

	Coefficient	t-ratio
Structural similarity	0,261728	0,6436
Symmetry of shocks	0,309577	3,2863
Size	-0,006615	-0,0612
Openness	0,166894	1,487
Trade intensity	0,432366	0,6483
Number of observations	154	
R-squared	0,234337	
F statistic	2,295429	
S.E. of regression	0,167917	
Durbin-Watson	2,147697	

Source: Gretl

All the explanatory variables appeared as significant once Wald test for joint significance of explanatory variables was consulted. However, only single variable, symmetry of shocks, appeared as significant once t-ratio statistic has been taken into consideration. Furthermore, as apparent from Durbin –Watson statistic autocorrelation was not present and even White's test for heteroskedasticity didn't confirm the null hypothesis[36]. Moreover, when joint significance of differing groups means test was consulted, it appeared that pooled OLS seemed to be more appropriate method to be used. Even R^2 was quite low suggesting that OCA criteria jointly do explain only less than 23% of exchange rate variability. However, once pooled OLS was

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[36] Once robust standard errors function is used, both heteroskedasticity and autocorrelation can be eliminated if present

consulted the results didn't differ too much[37]. These results are similar to the results of Horvath and Komarek (2003).

However, due to seemingly low explanatory power of OCA criteria time dummies have been introduced in order to account specifically for time variant effects that could be potentially significant. Then, test for joint significance of differing groups means rejected the null hypothesis that OLS was adequate. Furthermore, Breusch-Pagan test statistic refused the null hypothesis that random effects alternative should be utilized. Thus, fixed effects method, with time dummies being included, led to the following results.

Table 10 – Results of estimation of equation (1) inc. time dummies

	Coefficient	t-ratio
Structural similarity	0,0189705	0,7386
Symmetry of shocks	-0,0027932	-3,2283
Size	-0,158645	-2,1108
Openness	-0,0166931	-0,5636
Trade intensity	-0,0945259	-1,2122
Number of observations	154	
R-squared	0,996632	
F statistic	1321,162	
S.E. of regression	0,011573	
Durbin-Watson	2,118516	

. Source: Gretl

Results appear to be very different to the ones obtained when time dummies were excluded. The Wald test for joint significance of explanatory variables confirmed joint significance of all the explanatory variables, including time dummies. However, only variables Symmetry of shocks and Size appeared significant once t-ratio statistic has been taken into consideration. Furthermore, explanatory power of OCA criteria increased significantly as well. Thus, the time variant effect seems to be fairly significant.

Once scrutinizing the expected signs of explanatory variables, it is rather surprising that one of the assumptions made in the model description section have been violated. Specifically, business cycles alignment (symmetry of shocks) seems to be negatively correlated with the exchange rate variability. Even though, the effect seems to be rather negligible, the higher symmetry of shocks between EMU and the sample countries should result in lower exchange rate volatility.

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[37] For estimation results see table 13 in appendix

A potential explanation for the violation of this assumption might be the lag with which financial markets operate and the low periodicity at which official national and supranational macroeconomic indicators are being announced. Since financial markets exercise substantial power over the exchange rate trend, it might be possible that ex post information received from the officials may lead to improper ex post exchange rate realignment. However, further research is necessary in order to confirm or reject the hypothesis.

It seems rather unusual that size of the economies explains the majority of the exchange rate fluctuations. One potential caveat may be present here as well. Since Eurozone economy is incomparably larger than any of the sample countries' economies, it might be possible that inclusion of the explanatory variable size led to inconsistent estimates[38]. Moreover, based on the t-ratio statistic the remaining variables appeared to be insignificant. Therefore, reduced model excluding variables Size and Trade has been further estimated. Indeed, once these two variables have been omitted, substantially better results were acquired as apparent from the following table.

Table 11 – Results of reduced estimation of equation (1) inc. time dummies

	Coefficient	t-ratio
Structural similarity	0,0824428	3,0434
Symmetry of shocks	-0,0036967	-2,7017
Openness	0,0332437	2,694
Number of observations	154	
R-squared	0,996193	
F statistic	1278,023	
S.E. of regression	0,012208	
Durbin-Watson	2,066346	

Source: Gretl

All the variables appear to be individually significant. However, variable Symmetry of shocks still remains negatively correlated with the exchange rate. Potential explanation for this phenomenon has already been suggested. Even though R-squared remained high, it was mainly due to the introduction of time dummies as suggested earlier.

Overall one might conclude that OCA criteria do explain the exchange rate variability among EMU and the sample countries to a certain extent. This is in line with the results of Komarek, Cech and Horvath, R. (2003).

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[38] Estimation results, once variable Size has been excluded, are presented in table 14 in appendix

Finally, based on the results obtained from the estimation of reduced model, predicted exchange rate variability of sample countries' currencies vis-à-vis Euro shall be calculated[39]. Even though, 11 periods were utilized for the estimation purposes, only the values for three sub periods will be presented[40]. This approach is analogical to the one utilized in the previous section.

The lower is the predicted exchange rate volatility for individual countries with respect to EMU, the lower are the costs associated with a membership in the monetary union for the individual accession countries. The same is true for the current members of the monetary union since the costs resulting from the adoption of single monetary policy should be mitigated as well. This is due to the fact that macroeconomic coordination of fully converged economies with similar economic structures is supposed to be less costly than if the opposite is true as De Grauwe (2004) suggests. Thus, accepting countries with low exchange rate variability vis-à-vis Euro into the monetary union should be beneficial for the current members of the union as well.

As a result, ranking[41] of the "best candidates" for EMU membership may be constructed. The following outcome has been obtained.

Table 12 – Ranking of the "best candidates" for EMU accession

	2000 - 2003	2004 - 2006	2007 - 2010
Lithuania	0,04318	0,03872	0,03562
Poland	0,04465	0,04052	0,04059
Czech Republic	0,04452	0,04421	0,04309
United Kingdom	0,03978	0,04161	0,04351
Denmark	0,04110	0,04524	0,04381
Latvia	0,05708	0,05285	0,05033
Switzerland	0,04726	0,04861	0,05074
Estonia	0,05364	0,05589	0,05259
Sweden	0,04788	0,05145	0,05300
Romania	0,05473	0,05414	0,05368
Croatia	0,05849	0,05910	0,05562
Hungary	0,05749	0,05347	0,05590
Bulgaria	0,06239	0,06485	0,06238
Iceland	0,08146	0,07865	0,08320

Source: Gretl and own calculations

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[39] Fitted values acquired from the estimation of the regression function (1) will be utilized as coefficients for the calculation of the predicted exchange rate variability based on previously presented OCA indices
[40] These have been calculated as the arithmetic average of the values for each respective sub period.
[41] This ranking is based on the values obtained from the last period (2007 – 2010) since these are the most up to date values acquired for the respective economies.

As apparent from table 11, predicted exchange rate variability based on OCA criteria is the lowest for Lithuania followed by Poland and Czech Republic in the last period (2007 – 2010). It is rather surprising that Lithuania scored the first, especially when taking into account that it was one of the most severally hit countries with respect to financial crisis in Europe. On the other hand, Lithuania is one of the most open economies, within the sample, with fairly similar structure of the economy and quite synchronized business cycles with respect to EA16. Thus, the result may be less surprising once these aspects are accounted for.

Furthermore, one also needs to consider monetary policy of individual countries when interpreting the respective exchange rate volatility. Since conduct of this policy shapes the economy and its performance to a certain extent, it might follow that countries such as Estonia, Denmark, Latvia and Lithuania perform considerably better than others because they have pegged their currencies to Euro. This assumption may be partially confirmed by the fact that the predicted variability of their respective exchange rates tend to diminish over the last ten years since they were maintaining pegged currencies to Euro in the respective period.

Furthermore, previously discussed power of financial markets may play an important role here as well. Quite small and open economies such as Lithuania may face great difficulty with maintaining fixed exchange rate especially in case of significant macroeconomic imbalances. Moreover, it is entirely possible that financial markets might have been biased as well. However, since most of the countries in the sample are small and open economies, it is less probable that results will be significantly biased in this respect.

Nonetheless, it would be perhaps wiser to differentiate between groups of countries rather than between individual ones. In this manner at least three groups of countries may be identified. First group consists of countries with fairly low predicted exchange rate volatility and thus these economies may incur low costs and potentially high benefits from entry into EMU. First five countries belong to this group (Lithuania, Poland, Czech Republic, United Kingdom and Denmark). However, the case of United Kingdom is questionable since variability of its exchange rate with respect to Euro has been constantly increasing in the last ten years. Thus, UK may potentially fall into the second group of countries in the future.

Latvia, Switzerland, Estonia, Sweden, Romania, Croatia and Hungary in the respective order comprise the second group of countries. These countries might still face fairly low costs associated with entry into EMU where potential benefits may outweigh these costs. However, once all the caveats of OCA criteria are accounted for, it might be less clear whether the respective individual countries will enjoy net benefits. In case of Sweden and Switzerland it is less likely since both countries experienced continuous increase in exchange rate volatility vis-à-vis Euro in the last ten years. On the other hand Latvia and Estonia might potentially fall into the first group of countries in the future, thus they are more likely to enjoy net benefits from entering the monetary union. Romania, Croatia and Hungary have all experienced decline in their respective exchange rate volatilities with respect to Euro in the last ten years. However they still lag behind the rest of the countries in the second group. Therefore, it might take slightly longer till they converge to the levels similar to Lithuania or Poland.

The third group of countries consists of Bulgaria and Iceland. These countries are less likely to enjoy net benefits from entry into EMU since their respective exchange rate volatilities with respect to Euro were significantly higher than those of the best performing countries in the sample. Moreover, Iceland seems to score significantly worse than Bulgaria. This result is in line with the actual exchange rate volatilities as presented earlier in the OCA indices section. Bulgaria might on the other hand potentially move into the second group in the future.

Overall, it might be concluded that substantial difference prevail among the sample countries even when potential caveats and further relevant factors are taken into consideration. Number of new accession countries is more likely to benefit from entering the monetary union whereas the majority of them currently fall into the gray area. However if current trend prevails in the future as well, most of these countries will more likely enjoy net benefits from integration into the monetary union. On the contrary, UK, Switzerland and Sweden experienced the opposite trend. If this trend prevails in the future as well, these countries may face excessive costs in case of entry into EMU.

Denmark and Iceland are specific cases on their own. Denmark seems to perform fairly well in terms of the predicted exchange rate volatility vis-à-vis Euro with further positive trend expected in the future. Thus, its entry into the monetary union is more likely to be beneficial as opposed to the other members of EU15. Iceland on the contrary is not expected to profit from the membership in longer run since its predicted exchange rate volatility with respect to Euro is fairly high with only slightly positive trend expected in the future. Thus results for Denmark, Sweden and UK are in line with results of Holden (2009) as discussed in the first section of the descriptive part of the paper.

Ultimate goal of this paper was the analysis of potential candidates for entry into the monetary union in Europe. However before doing so number of issues and potential caveats needed to be taken into consideration.

First and foremost, discussion on rationale and economic reasoning behind such entry was required since EMU has been rather criticized for its political background and economic anemia. Therefore, economic performance of EMU has been discussed initially where particular attention was paid to the implications of the recent financial and economic crisis. In this context US performance has been often regarded to and some frequently held beliefs about the US economic supremacy were proved to be misleading. As a consequence, EA16 economic performance in the light of the last ten years, thus including recent severe downturn, seemed to be rather vital. Indeed, in number of areas such as employment rate, GDP per capita or gross government debt to GDP ratio, EMU clearly outperformed US. However, further reforms need to be undertaken in EA16 in order to enhance this trend and potentially avoid market driven complications such as recent Eurozone crisis.

Subsequently, economic performance of EU8 was further discussed. Severity of the crisis with serious implications especially for Baltic countries has been considered as well. Moreover potential concerns and barriers with respect to EMU entry arising from the substantial downturn in economic activity in the region were closely elaborated on. It seems that the recent crisis significantly altered successful economic convergence of EU8 with respect to EA16 in the last ten years. However, this tends to be rather temporary situation since most of the new accession countries have already recovered from the crisis and they are on the best way to return to high economic growth levels typical for the pre-crisis period.

Furthermore, relevance of the Maastricht criteria and their implications for the acceding countries especially in the context of the last two years has been discussed. It was argued that all the Maastricht criteria appear to be relevant, especially when economic rationale behind their existence is being considered. Whether they are too strictly or loosely set may be more problematic to answer, however Estonia and its adherence to the criteria in the middle of the worst financial and economic crisis since great depression as Roubini, Rogoff and Behravesh (2009) proclaimed, may shed additional light onto the topic. Nonetheless, the costs of such adherence need to be inevitably accounted for when potential benefits from the membership are being considered.

Moreover, number of arguments discouraging existence of the monetary union in Europe was questioned. Once further evidence and wider perspective were applied, there seem to be convincing reasons for existence of EMU. Furthermore when discussing potential and future prospects of the union it has been argued that those certainly do not appear gloomy as sometimes suggested. Even though there are challenges ahead, foundation of the monetary union in Europe was indeed step in the right direction.

Therefore, new accession countries as well as western European economies not participating in the monetary union should consider membership as a viable path to be followed.

Moreover, the review of the literature on the performance of EMU based on the OCA criteria has led to conclusion that currently most of the economists consider monetary union in Europe more desirable than it was previously thought.

Thus, in an attempt to identify the countries which would benefit the most of such membership, OCA indices were calculated for each potentially acceding country. Subsequently, estimation of the previously defined model resulted in the ranking of the "best" candidates for entry into the monetary union. Even though, there might be potential caveats associated with the method and specification being utilized, the results seem to be in line with both the previous discussion in the descriptive part of the paper and with prior empirical studies being conducted.

As a consequence three groups of candidate countries have been identified. The first group consisting of five countries (Lithuania, Poland, Czech Republic, United Kingdom and Denmark) is likely to enjoy net benefits from membership in the monetary union.
The second group including Latvia, Switzerland, Estonia, Sweden, Romania, Croatia and Hungary falls into the gray area where net benefits are possible but cannot be guaranteed. However, once the past trend is taken into consideration number of countries from the second group may clearly benefit in the future.
The third group of countries consists of Bulgaria and Iceland. These economies are not expected to profit from the membership in the longer run since their performance based on the OCA criteria is significantly lower than performance of the rest of the countries being considered. However, due to endogeneity of OCA criteria and other potential factors such as financial markets power, these results need to be cautiously interpreted. Furthermore, potential bias towards countries with pegged exchange rate regimes with respect to Euro needs to be considered as well.

Despite careful interpretation of the estimation outcome being presented, one may conclude that number of new accession countries would most likely benefit from the membership in the monetary union. Furthermore, majority of the countries being considered as potential future members of the monetary union will most probably benefit from entering in the future.

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COSTS VS. BENEFITS OF A MONETARY UNION

5 major classes of Benefits

1, <u>Long term Microeconomic efficiency</u> resulting from growing use of money. In particular, the use of a liquid single currency in a larger area as unit of account, medium of exchange, standard for deferred payment, and store of value should enhance macroeconomic efficiency.

2, <u>Macroeconomic stability.</u> Monetary union could trigger enhanced price stability with positive impact on economic growth. Moreover, easier access to money market and greater possibilities of external financing would further contribute to macroeconomic stability. Reduced business cycle and employment fluctuations among monetary union's members could arise as well. Finally, the credibility gains for high inflation countries may be quite significant.

3, <u>Positive external effect</u> brought about by the decreasing transactional costs as a result of a more extensive use of a single currency. Furthermore, existence of income from international seignoirage, diminishing need for foreign exchange reserves and enhanced economic coordination among the member countries should further contribute to positive external effect.

4, <u>Shield against market speculations</u>**.** Membership in a monetary union generally implies lower levels of vulnerability in exchange rate fluctuations resulting from enhanced credibility of a currency.

5, <u>Other benefits</u> such as potential increase in access to foreign lending and existence of pooled reserves are expected as well.

4 major classes of Costs

1, Costs resulting from <u>initial deterioration in microeconomic efficiency</u> resulting from a change of a currency. These may include administrative costs, legal costs, psychological costs attributed to new numeraire, and other relevant costs.

2, <u>Possible competitiveness costs</u> arising from overvalued conversion rate of a new member country joining a monetary union.

3, Costs resulting from the <u>loss of independent macroeconomic policies</u> due to the single monetary policy and coordinated fiscal policies being conducted in a monetary union.

4, Potential costs arising from <u>negative externalities</u>. If one or more member countries are likely to face macroeconomic imbalances caused by excessive expansionary fiscal policies, then other members of that monetary union may suffer from more or less pronounced negative externalities.

Table 13 – Results of estimation of equation (1), Pooled OLS

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	Coefficient	t-ratio
Structural similarity	-0,0617266	-0,4131
Symmetry of shocks	0,298061	6,4334
Size	0,0235839	0,4129
Openness	0,0063108	0,0821
Trade intensity	0,0475126	0,1265
Number of observations	154	
R-squared	0,221284	
F statistic	8,411291	
S.E. of regression	0,161734	
Durbin-Watson	2,09935	

Table 14 – Results of estimation of equation (1) exc. Size

	Coefficient	t-ratio
Structural similarity	0,0830612	3,0709
Symmetry of shocks	-0,0037089	-2,7444
Openness	0,0333012	2,6361
Trade intensity	-0,0053256	-0,1269
Number of observations	154	
R-squared	0,996193	
F statistic	1221,032	
S.E. of regression	0,012257	
Durbin-Watson	2,065622	