Impact of Euro Adoption on Emerging European Countries

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We study the impact of the euro on emerging European countries by investigating three country groups: (1) seventeen Eurozone countries, (2) seven EU Eastern and Central European (ECE) members using local currencies, and (3) six EU Candidates. We analyze macroeconomic indicators and propose models to investigate whether similar or different indicators influence *sovereign debt* for each group. We find that exports and unemployment are positively related to *sovereign debt* while market *capitalization* shows negative relation with *sovereign debt*. We argue that the recent European sovereign debt crisis has raised serious challenges for the Eurozone, and propose that EU ECE members and EU candidates delay the adoption of the euro.

Key words: euro adoption, economic and monetary union, emerging european countries, economic convergence

Introduction

The creation of the European economic and monetary union had been a long and carefully planned process intended to embrace the historically fragmented European countries and, among other benefits, increase their international productivity and trade competitiveness. Not a small task in itself, the creation of the euro has brought some positive and some challenging developments for the European Union (EU).

The EU has been instrumental in promoting peace, prosperity, productivity, economic integration, free movement of factors of production and economies of scale amongst its member states (Chang 2010). However, the recent financial crisis and the possible impact it might have on the stronger members of the union and on the world economy has raised concerns of whether the unique social, economic and political partnership earlier envisaged is indeed sustainable.

In this work we study the relationships between macroeconomic indicators for three different groups of countries: (1) seventeen Eurozone countries, (2) seven EU ECE members that still use their local currencies, and (3) six EU candidate countries. We investigate

TABLE 1 Illustration of significant changes in selected macroeconomic indicators for EU ECE members currently in the pipeline for adoption of the euro, and EU candidate countries

Indicators	Groups	Countries	1999–2000	2010–2011
Sovereign Debt (% of GDP)	EU ECE countries	Bulgaria	74	15
		Hungary	60	80
	EU candidates	Macedonia	47	28
		Iceland	43	99
Inflation	EU ECE countries	Poland	7.3	2.7
		Romania	45	6
	EU candidates	Serbia	42	6
		Croatia	4	1
		Turkey	65	8.5
Market Capitalization	EU ECE members	Romania	2	20
		Bulgaria	5	15
	EU candidates	Croatia	11	41
		Macedonia	0.2	29
GDP per capita growth	EU ECE members	Lithuania	−0.4	3
		Romania	−1	1.1
	EU candidates	Montenegro	−9	2.2
		Serbia	−11	1.4
		Turkey	−4.8	1.4

fourteen macroeconomic indicators: research and development, government debt, imports, exports, inflation, foreign direct investment, market capitalization of exchange-listed companies, gross domestic product per capita growth, unemployment, tertiary education, and representation of women in national parliaments, use of electricity, energy consumption, and CO_2 emissions. We develop three multiple regression models, to understand which macroeconomic indicators lead to sovereign debt for each group of countries that we study.

We test the following hypotheses: (1) that market capitalization of exchange-listed companies leads to sovereign debt, (2) electricity use leads to sovereign debt, (3) exports lead to sovereign debt, and (4) unemployment leads to sovereign debt.

Our results show that there are convergences among the three groups of countries analyzed here in sense that similar macroeconomic indicators are significant for explaining the sovereign debt for different country groups. This shows that the European Union has achieved an important cohesion level, which also can be used as an argument that imminent joining of the monetary union may not be necessary for the EU ECE members that still use their local currency

and for the EU candidate countries. We argue that delaying of the euro adoption may be beneficial for all three groups of countries analyzed in this study. Upholding the local currencies could give monetary flexibility to the EU ECE and EU candidate countries and position them better to curb the current global financial and sovereign debt crisis, and it may give the Eurozone breathing space to focus on the current euro problems instead of adding new countries into the monetary union and increasing the probability of new emerging problems.

The questions that we are tackling in this study are whether and when should EU ECE countries that still use their local currencies and the EU candidate countries adopt the euro.

In the next section we provide background literature review addressing the advantages and disadvantages of common currency, and the challenges for the EU ECE and EU candidate countries. In the third section we describe the data and methodology including regression analysis and hypothesis testing results for the three different groups of European countries investigated in this study, in the fourth section we discuss policy implications, and in the fifth section we offer brief concluding remarks.

Literature Review

COMMON CURRENCY: A PANACEA OR A PANDORA'S BOX

Research studies have shown many benefits of monetary integration and use of common currency. Among the benefits, increased trade, measured as combined imports and exports among the countries that use common currency has been prominently studied (Frankel and Rose 2002; Micco, Stein, and Ordonez 2003; Bun and Klaasen 2007). Inter-country trade of goods and services significantly enhances overall economic performance of a country and it is an important determinant of growth in GDP as well as real income growth. Another benefit of joining a monetary union is the prospect of price stabilization, which is quite desirable after turbulent periods of structural price changes that countries experience during the transitional pre-EU accession period. Also, joining a common currency is beneficial if EU candidate countries have experienced high inflationary periods and seek stability for their currencies (Frankel 2004; Wdowinski 2005). However, while the common currency can provide a safety harbor, it is also the one to be blamed for precipitating financial crisis. For example, within a monetary union, when investors expect any member country to not meet its sovereign debt obliga-

tions, they will be motivated to sell-off that country's government bonds and invest the proceeds in securities of other countries using the same currency. As a result, the country in trouble will further be pushed into economic downfall since it will experience difficulties in rolling over its debt obligations. On the other hand, if the country uses its own currency, not all lenders would pull out their investments at the first sign of trouble, since the country's Central Bank could offer interim solutions by repurchasing the government bonds or restructuring the sovereign debt. In addition, if the investors sell the bonds, they will either have to sell the country's currency in the foreign exchange market or invest in other parts of the same country's economy. As such, the crisis could be contained to a certain extent. In a monetary union, however, member nations relinquish control over the currency of their borrowing and hence are more vulnerable to economic distress (De Grauwe 2011; Kopf 2011).

FINANCIAL AND ECONOMIC INTEGRATION

Deeper financial integration was one of the main reasons why European countries have joined and continue to join the Eurozone. However, financial integration is considered as one of the main culprits behind the Eurozone Sovereign debt crisis. Adoption of the euro led to opening up of the financial and banking sectors in the EU countries. Hence, the developed nations of the region, that were flush with funds, could invest in the emerging and developing Eurozone members. Interest rates and inflation were low throughout the euro region. Capital and factors of production could potentially move freely. More developed countries like Germany invested significantly in Greece, Spain and other developing members of the EU. However, with Greece at the brink of default, German balance sheet was severely impacted by being populated with almost worthless investments. This spillover effect could have fatal consequences for the entire Eurozone. (Arezki, Candelon, and Sy 2011). As an extension of the Sovereign debt crisis spillover effect, it would not be surprising if in the future, when investors forecast economic difficulties in one Eurozone country, they flee not only the troubled country, but also other countries that have stakes in this country's Sovereign debt or are involved in significant business relations with the troubled country. This will have an effect of catalyzing and exacerbating the crisis.

One of the reasons for the members of the Eurozone to adopt a common currency was to strive to increase productivity and to not use the currency as a competitive tool. While this is a very noble

cause to adopt the euro, it is fraught with its own problems (Chang 2010). For a developing economy that experiences slowdown, giving up control of its currency means that it cannot use currency devaluation to stay competitive in the world market. Rather, the country will need to adopt deflationary measures or renegotiate labor contracts, which can be very difficult socially and politically. This can lead a nation to a downward economic spiral, making the recovery from the trough even more painful (Krugman 2012).

Furthermore, while deeper integration of the factors of production provides for free factor migration to any region where production factors can be most useful (Chang 2010), in crisis situations such as the most recent 2008 global economic downturn, the free movement of production factors also contributes to a greater outflow of labor to countries that potentially have more opportunities for employment. This can temporarily ease the problem of unemployment in the troubled nations but in the long run, it will result in lower tax revenue for the troubled governments. In addition, the working age population that remains in the distressed developing countries will probably not be very productive, further reducing the competitiveness of these nations and making austerity measures even more difficult to implement.

Thus, despite the benefits of using common currency such as eliminating foreign exchange risks and promoting significant economic growth and development, there are important advantages for some countries to maintain local currencies and to retain the monetary policy flexibility when needed. For example, in times of significant downturns, if a country uses its local currency, the government can reduce the real interest rate to encourage investments in domestic businesses or to depreciate its currency to boost the exports towards the countries with stronger currencies. This is only beneficial if the domestic economy is not correlated with the economies of the countries in the prospective common currency area. Otherwise, similar monetary policies will be pursued for the specific country and the monetary union (Frankel 2004). On the other hand, while a common currency area is expected to bring further relative price and wage convergence, there would still be incidences of asymmetric economic shocks throughout the union due to country-specific events. A common currency would implore on the stronger economies to bear the burden of the shocks in their weaker counterparts. For the weaker members, common currency also comes at a high cost of not being able to adjust relative prices and wages by depreciating their local currency. Thus, due to asymmetric shocks requiring compensat-

ing transfers within the common currency area, and reducing member flexibility to adjust their local economies, monetary unions, besides the advantages, have potentially high costs as well (Barro 2012; Krugman 2012). Furthermore, a relatively strong economy might have to deal with the moral hazard issues arising from less fiscally responsible countries, and be asked to pay for the negligent financial behaviors of other countries in the monetary union.

CHALLENGES FOR EU ECE MEMBERS USING LOCAL CURRENCIES AND EU CANDIDATE COUNTRIES

The member states that have joined the EU since 2004 are on the path of adopting the euro as part of their accession plan. The timing of adopting the euro will depend primarily on satisfying the Copenhagen criteria, the Maastricht core economic requirements, and whether the economic convergence process could be more successful while outside or inside the Eurozone (Allam 2009; Lee 2012). The EU ECE member countries have emerged as market economies from former Eastern European communist regimes, and are progressing towards the euro in a very different environment, taking into consideration the globalization pace and the faster financial market integration in the last 10–15 years (Darvas and Szapary 2008b). The challenges to joining the EU for the former communist countries are at least two-fold. Besides the required changes in the economic environments and the conversions of property rights from centralized to private, the accession to the EU also represents an important cultural, societal and political transformation for most EU ECE member countries.

Until recently, before experiencing the severity of the sovereign debt crisis propagation in the Eurozone, the euro was very desirable and the public expectations were that almost all of Europe will adopt the common currency. This sentiment has since changed, and none of the seven EU ECE countries that are required to adopt the euro is enthused by the prospect of relinquishing their local currencies. Instead, the EU ECE countries are seriously reexamining their requirement to adopt the euro. United Kingdom and Denmark, on the other hand, have an explicit option not to adopt the euro which they can readily exercise. In addition, even though Sweden does not have a specific provision for not adopting the euro, the country has purposefully been delaying satisfaction of one of the requirements necessary to join the monetary union (Barro 2012).

Darvas and Szapary (2008a) have shown that after the privatization and development of the banking sectors in the EU ECE countries,

the lending capacity of the banks as well as the competition among the banks has greatly increased. Along with these trends, and the decreased interest rate margins, the banks have offered more and larger loans to not only the commercial but also the retail sector in order to stay profitable. Mortgages and other household loans have been the fastest growing products in the lending market, with the highest growth rates achieved in Lithuania, Latvia, Bulgaria, and Romania. It is worth noting that most of the credit expansion was denominated in euro since the interest rates were lower in the Eurozone (Allam 2009). Also, Germany and other Eurozone countries with stronger balance sheets were the ones infusing most of the capital in the developing Europe.

Financial liberalization studies have examined the credit extension and growth for European emerging countries and the results have demonstrated that in general credit levels are below equilibrium indicating further expansion capabilities. However, the credit growth rate, rather than the credit level, is the important trend to follow in order to maintain low inflation and high macroeconomic stability (Egert, Halpern, and MacDonald 2006; Sirtaine and Skamnelos 2007).

Generally, high inflation negatively affects the currencies, so keeping it in check is extremely important for currency stability and a country's economic prosperity. A weak domestic currency worsens the problems of the country when much of its credit expansion is funded in euro. Inflation can be exacerbated by high non-FDI (Foreign Direct Investment) capital inflows in the European emerging countries, originally attracted by significant growth prospects, higher nominal interest rates, and expectations of yield convergence in anticipation of euro adoption. In addition, the non-FDI capital inflows can place upward pressure on the currencies of countries with floating rate regimes, could erode the competitiveness of these countries, and force the policymakers to lower interest rates to levels that create price instabilities (Darvas and Szapary 2008b). This trend could potentially create an aftershock bubble in the real estate market and in the emerging European financial markets, which could increase the severity of the current economic situation in the euro area. Financial market integration usually means integration of financial markets, inter-relations of different countries' banking systems, and uniformity of rules for investment market access for different market participants (Baele 2004).

Table 2 shows that between 1989 and 2006, the European Union has allocated significant funds to support its members' development

TABLE 2 Distribution of structural and cohesion funds, 1989–2006

Group	Country	(1)	(2)
Cohesion countries	Spain	111,564.0 (6,198.5)	1.10
	Portugal	46,283.4 (2,571.3)	2.50
	Ireland	16,000.8 (895.1)	1.60
	Greece	50,922.0 (2,829.3)	3.10
Other EU countries	Austria	3,096.0 (258.1)	0.11
	Belgium	4,753.8 (264.1)	0.10
	Denmark	1,818.0 (101.0)	0.06
	Finland	3,459.6 (288.3)	0.26
	France	36,275.0 (2,015.3)	0.13
	Germany	58,181.0 (3,232.3)	0.14
	Italy	61,905.6 (3,439.2)	0.30
	Luxembourg	255.0 (14.2)	0.08
	Netherlands	6,035.4 (335.3)	0.09
	Sweden	3,153.6 (262.8)	0.12
	United Kingdom	33,827.4 (1,879.3)	0.16

NOTES Column headings are as follows: (1) total funds – annual average, millions of ECUS (European currency unit), (2) funds as a percent of GDP (for 1996). Adapted from Pastor (2001).

efforts of poor regions in form of structural and cohesion funds. Spain, Portugal, Greece, Italy and Germany are among the largest recipients of structural and cohesion funds, closely followed by France and the United Kingdom.

FINANCIAL STABILITY IN EUROPE

More recently, in light of the 2008 financial crisis and 2010 sovereign debt crisis, the European Union established support and stabilization mechanisms such as the European Financial Stabilization Mechanism (EFSM) and the European Financial Stability Facility (EFSF) to contribute towards financial stability in the midst of the European sovereign debt crisis. Moreover, in October 2012, the European Stability Mechanism (ESM) was created to focus on Eurozone sovereign debt sustainability and prevention of a future crisis emergence. These mechanisms offered financial assistance funds to help European troubled countries such as Greece, Portugal, and Ireland. While these are smaller economies, the real upcoming threat for Europe could be the significant indebtedness of Italy and Spain as significantly larger economies compared to Greece, Portugal and Ireland. Spain has already asked for 100 billion Euros through EFSF, and will receive the funds contingent upon specific policy implemen-

tations in the realm of its financial sector (European Commission 2013; IMF 2012). Possibly, Italy will be the next country to require assistance from these newly formed Eurozone mechanisms. Furthermore, we argue that the European sovereign problems are not contained to the GIPSI (Greece, Ireland, Portugal, Spain, and Italy) countries, but rather could extend to countries such as Germany and France as well, given that the trend of sovereign debt levels as percentage of GDP (Gross Domestic Product) for these countries continues to increase as shown in table 3.

If the observed upward trend of sovereign debt as percentage of GDP continues, especially for the larger economies such as Italy, Spain, Germany and France, this could prolong the current sovereign debt crisis and prove more troublesome for Europe. This possibility is explored in scenario analysis and forecasting of the Spanish and Italian debt for the period of 2012 to 2020 (Cline 2012) showing that under certain scenarios, the debt levels may continue to increase. The other groups that we study, EU ECE countries that use their local currencies and EU candidates, have significantly lower sovereign debt levels compared to the Eurozone average, with exception of Iceland (EU candidate) with sovereign debt at 99 percent of GDP and Hungary (ECE country that uses local currency) with 80 percent of GDP. We argue that if the countries from these two groups join the European Monetary Union, they will be adversely affected by the increasing European debt and will have to participate in resolving the debt issue as donor countries, which might increase their sovereign debt to unsustainable levels. On the other hand, the EU ECE countries that use local currencies such as Latvia, Hungary, and Romania have already benefited from the newly formed European Mechanisms for Financial Stability and a counter argument can be made that they could benefit even further by becoming members of the European Monetary Union.

Table 4 shows high volatility in Irish growth from positive 10 percent in 1999 down to negative 8 percent in 2009. Greece has experienced relatively stable positive growth prior to the 2008 financial crisis, and has not shown signs of recovery afterwards, but rather has hovered in the negative growth region, which could continue to further depress the Greek economy. While European countries in general experienced negative GDP growth after 2008, Germany, France, Belgium, Portugal, and Italy show faster growth recovery and have already moved towards positive growth in 2010 compared to Greece, Ireland, and Spain, which still show negative growth in 2010.

In light of the current challenges faced by the Eurozone network

TABLE 3 Sovereign debt as percentage of GDP for selected Eurozone countries showing universal upward trend in the range between 68 percent for Spain and 165 percent for Greece in 2011 (%)

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	113.78	107.88	106.64	103.55	98.55	94.33	92.02	88.03	84.19	89.78	96.25	96.67	97.81
France	58.89	57.33	56.89	58.98	63.14	65.13	66.73	63.89	64.19	68.27	79.00	82.39	86.01
Germany	60.90	59.74	58.83	60.44	63.94	65.75	67.97	67.56	64.90	66.25	73.44	83.23	80.56
Greece	102.51	103.44	103.72	101.45	97.27	98.84	100.29	106.11	105.41	110.72	127.10	142.76	165.41
Ireland	48.50	37.78	35.50	32.12	30.94	29.63	27.35	24.81	25.01	44.34	65.10	94.84	106.46
Italy	113.70	109.17	108.79	105.69	104.42	103.90	105.94	106.65	103.62	106.30	116.07	119.00	120.11
Portugal	49.55	48.48	51.20	53.84	55.88	57.65	62.75	63.92	68.27	71.58	83.01	92.92	107.76
Spain	62.34	59.26	55.50	52.55	48.74	46.22	43.03	39.56	36.12	39.85	53.26	60.11	68.47

TABLE 4 GDP per capita growth for selected Eurozone countries (%)

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Belgium	3.30	3.42	0.46	0.91	0.39	2.82	1.17	2.03	2.15	0.16	-3.62	1.33
France	2.97	2.98	1.10	0.20	0.19	1.80	1.07	1.76	1.66	-0.64	-3.26	0.93
Germany	1.81	2.92	1.34	-0.16	-0.43	1.18	0.74	3.82	3.41	1.28	-4.89	3.85
Greece	2.97	4.14	3.89	3.09	5.60	4.01	1.89	5.12	2.59	-0.55	-3.64	-3.80
Ireland	9.48	7.79	3.14	4.10	2.48	2.61	3.07	2.83	2.85	-4.48	-7.69	-0.79
Italy	1.43	3.61	1.80	0.13	-0.82	0.73	0.19	1.62	0.94	-1.91	-5.62	1.05
Portugal	3.64	3.37	1.31	0.03	-1.60	0.97	0.32	1.11	2.13	-0.14	-3.00	1.33
Spain	4.21	4.17	2.48	1.23	1.40	1.60	1.93	2.33	1.81	-0.64	-4.46	-0.50

of financial institutions, in December 2011, the European Central Bank has committed to provide €1 trillion of funds for the European banks for up to three years in an attempt to stem the effects of the most recent financial crisis. This injection of liquidity intends to give the European governments three years to make necessary fiscal adjustments, and only time could tell whether this added liquidity into the European banking system will end the European sovereign debt crisis. However, for a longer-term solution to this crisis, the liquidity infusion needs to be in the form of recapitalization of the struggling banks instead of getting into the vicious cycle of increasing the sovereign debt of the faltering economies.

The above mentioned difficulties that currently plague the EU are becoming more relevant as additional countries are considering or will be required to adopt the euro. We discuss these questions based on regression analyses of economic indicators on one hand and sovereign debt as percentage of GDP on the other for the EU ECE members and EU candidate countries compared to the Eurozone and we test the following 4 hypothesis.

HYPOTHESIS TESTING

H1 *Market capitalization of exchange-listed companies leads to increase in government debt.*
H2 *Electricity use leads to increased government debt.*
H3 *Exports lead to increase in government debt.*
H4 *Unemployment leads to increase in government debt.*

Data, Models, and Methodology

DATA

This section describes the data and outlines the methodology used in the selection of the macroeconomic indicators. In this study we use the World Bank Development Indicator (WDI) database, containing approximately one thousand macroeconomic indicators reported annually from 1960s until present for approximately 200 countries. In addition, since the government debt data was incomplete in the WDI database, we use the International Monetary Fund Fiscal Affairs Department Public Debt Database containing annual public debt data for approximately 180 countries since 1960s until present. The definitions of the data below are taken from the WDI database indicator description.

Sovereign Debt. Central government debt, total (% of GDP), is the entire stock of direct government fixed-term contractual obligations to

others outstanding on a particular date. It includes domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans. It is the gross amount of government liabilities reduced by the amount of equity and financial derivatives held by the government.

Inflation. Measured by the consumer price index, inflation reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.

Unemployment. Refers to the share of the labor force (% of total labor force) that is without work but available for and seeking employment.

Imports. Refers to a total of imports of goods and services (% of GDP). Imports of goods and services represent the value of all goods and other market services received from the rest of the world.

Exports . Represents the value of all goods and other market services provided to the rest of the world (% of GDP). Exports include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. Exports exclude compensation of employees and investment income (formerly called factor services) and transfer payments.

Market Capitalization. Represents total market capitalization (share price times the number of shares outstanding) of listed companies (% of GDP). Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year. Listed companies do not include investment companies, mutual funds, or other collective investment vehicles. The sample is restricted to the period for which annual data are available: from 1961 to 2010 (50 observations for country). The above time series data are collected and retrieved from the World Growth Indicator database published by the World Bank.

Gross Domestic Product (GDP) Per Capita Growth. Annual percentage growth rate of GDP per capita based on constant local currency. GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

Foreign Direct Investments represent net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP.

Research and Development. Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development. Research and development is expressed as percentage of GDP.

Electric Power Consumption. Expressed as kWh per capita, it measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants.

CO_2

Emissions. Expressed as metric tons per capita, carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring.

Energy Use (kg of oil equivalent per capita). Refers to the use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport.

Education. School enrollment, tertiary (% gross) or gross enrolment ratio in tertiary education (ISCED 5 and 6), regardless of age, expressed as a percentage of the total population of the five-year age group following secondary school (ISCED is International Standard Classification of Education. Level 5 is first stage of tertiary education and level 6 is second stage of tertiary education including active research involvement).

Women Representation in National Parliaments. Indicates the percentage of parliamentary seats in a single or lower chamber held by women.

MODELS AND METHODOLOGY

In this study we examine fourteen macroeconomic indicators de-scribed in the previous section to determine which factors might be most importantly related to increase in government debt, which was the main culprit for the precipitous financial crisis in the Eurozone. We divide the countries in three analytical groups, Eurozone, EU ECE members that use local currencies, and EU candidate countries. We obtain the regressors for different groups by starting with the origi-nal fourteen macroeconomic indicators and by using a stepwise re-gression approach with backward elimination of variables until we reach the optimal model with fewer independent variables to avoid over-fitting. We first check for variable significance and methodi-cally exclude the non-significant variables to continue the model se-lection process with only effective variables. We eliminate variables with large AIC values and test whether after variable elimination the model has improved (lower) AIC value. AIC is the Akaike Informa-tion Criterion test that measures relative goodness of fit of a sta-tistical model. The lower the AIC, the better the goodness of model fit. We test for multicollinearity by checking VIF (Variance Inflation Factor) values for each variable and we exclude the variables with $VIF > 10$. As a rule of thumb, VIF larger than 10 signifies existence of muilticollinearity. We then perform the t-test for individual coef-ficient significance and the F-test for joint coefficient significance. We analyze the ANOVA table to compare the quality of the original and the resulting simplified model and accept the simplified model if there is insufficient evidence to reject it. Lastly, we plot the resid-uals to check the fitting and to ensure no serial correlation exists in the residuals.

Using the above methodology, we develop the following models for the three different groups that we study:

Group 1 includes seventeen Eurozone countries of the European Union: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovak Republic, Slovenia, and Spain.

The model for Group 1:

$$SD = \alpha + \beta_1 \cdot Inf + \beta_2 \cdot Cap + \beta_3 \cdot Unemp + \beta_4 \cdot Elc. \tag{1}$$

Group 2 includes seven Eastern European countries of the European Union that still use their respective local currencies: Bulgaria, Czech Republic, Hungary, Latvia, Lithuania, Poland, and Romania.

The model for Group 2:

$$\text{SD} = \alpha + \beta_1 \cdot Exp + \beta_2 \cdot \text{FDI} + \beta_3 \cdot Unemp + \beta_4 \cdot \text{WIP} \qquad (2)$$

Group 3 includes six European Union candidate countries: Croatia, Iceland, Macedonia, Montenegro, Serbia, and Turkey.
The model for Group 3:

$$\text{SD} = \alpha + \beta_1 \cdot Exp + \beta_2 \cdot Cap + \beta_3 \cdot Elc + \beta_4 \cdot \text{CO}_2. \qquad (3)$$

Where, SD – Sovereign Debt as percentage of GDP, α – intercept, $\beta_{(1,n)}$ – regressors' coefficients, *Inf* – inflation, *Cap* – market capitalization of exchange-listed companies, *Unemp* – unemployment, *Elc* – electricity consumption, *Exp* – exports, FDI – Foreign Direct Investments, WIP – women representation in National Parliaments, CO_2 – Carbon Dioxide emissions.

REGRESSION ANALYSIS AND HYPOTHESIS TESTING RESULTS

In table 5 we report the coefficients of the regressors in the models, the *t*-statistics for the coefficients, standard errors, and the *p*-values for the three different groups of countries. The regression models have Sovereign debt as percentage of GDP as a regressand and a set of macroeconomic indicators as regressors obtained as explained in the Models and Methodology section.

In testing hypothesis 1, which states that market capitalization of exchange-listed companies leads to government debt, table 5 shows that market capitalization has a negative direct effect on the increase of government debt and is statistically significant at the 0.001 level for the Eurozone and the EU candidate countries.

In testing hypothesis 2, which states that increased use of electricity leads to government debt, table 5 shows that use of electricity has negative relation with increase of government debt and is statistically significant at the 0.05 level for the Eurozone and at 0.001 level for the EU candidate countries.

In testing hypothesis 3, which states that higher exports lead to government debt, table 5 shows that exports are positively related to government debt and is statistically significant at the 0.001 level for EU ECE countries that still use their local currencies and is also positively related to government debt for the EU candidate countries with statistical significance of 0.05.

In testing hypothesis 4, which states that unemployment leads to government debt, table 5 shows that unemployment has positive direct effect on an increase of government debt and is statistically sig-

TABLE 5 Sovereign debt as percentage of gross domestic product

Item	Group 1	Group 2	Group 3
Intercept	−0.02811	0.002018	−0.05455
t-value	(−0.480)	(0.028)	(−0.744)
Std. Error	0.05861	0.073129	0.07335
p-value	0.6321	0.978056	0.461491
Inflation	−0.30205***		
t-value	(−4.486)		
Std. Error	0.06733		
p-value	$1.36e^{-5}$		
Market cap	−0.26449***		−0.37375***
t-value	(−4.358)		(−4.207)
Std. Error	0.06069		0.08884
p-value	$2.31e^{-5}$		0.000129
Unemployment	0.27323***	0.309432***	
t-value	(4.025)	(3.906)	
Std. Error	0.06788	0.079218	
p-value	$8.69e_{-5}$	0.000198	
Electricity use	−0.15221*		−0.41441***
t-value	(−2.45)	(−4.14)	
Std. Error	0.06213	0.10009	
p-value	0.0153	0.000159***	
Exports		0.327971***	0.19505*
t-value		(3.94)	(2.253)
Std. Error		0.083251	0.08657
p-value		0.000177	0.029401

Continued on the next page

nificant at the 0.001 level for the Eurozone and for the EU ECE countries that still use their local currencies.

Discussion and Policy Implications

Previous studies show that it is questionable whether it is better to encourage economic convergence given the possibility of future economic shocks, and the relatively high probability of being swept by the crisis contagion phenomenon as experienced in some past instances if the economies are highly correlated. Examples of recent crises contagions include Western Europe during 1992–1993, Latin America in 1982, 1994–1995, and 1998–1999, East Asia in 1997–1998, and the Russian default crisis of 1998 (Frankel 2004). With high mutual economic convergence, even if the EU candidate countries or the EU ECE countries that still use their local currencies can escape

TABLE 5 *Continued from the previous page*

Item	Group 1	Group 2	Group 3
FDI		−0.466379***	
t-value		(−5.908)	
Std. Error		0.078944	
p-value		$8.6e{-8}$	
Women in Parliament		0.175091*	
t-value		(2.070)	
Std. Error		0.0846	
p-value		0.041797	
CO_2 emissions			−0.24089**
t–value			(−2.697)
Std. Error			0.0893
p-value			0.009939
N	169	82	47
Multiple R^2	0.344	0.545	0.6689
Adjusted $R^2$0.328	0.521	0.6381	
F21.62	23.33	21.72	
RSE	0.7599	0.6661	0.5243

NOTES *Group 1* includes seventeen Eurozone countries of the European Union: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovak Republic, Slovenia, and Spain. *Group 2* includes seven Eastern European countries of the European Union that still use their respective local currencies: Bulgaria, Czech Republic, Hungary, Latvia, Lithuania, Poland, and Romania. *Group 3* includes six European Union candidate countries: Croatia, Iceland, Macedonia, Montenegro, Serbia, and Turkey. Significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$).

the direct impact of e. g. the European sovereign debt crisis, they will most likely be affected indirectly. For example, while the European Commission, the European Central Bank, and the International Monetary Fund (the Troika) currently support Greece, a new Greek government may reject the bailout agreement and the Troika may withdraw the support. If Greece exits the Eurozone, as hypothesized by Citigroup and Morgan Stanley's economic teams (Elliott 2012), among others, this will adversely affect not only Europe, but also the United States and China. Europe may enter severe recession, the US may be pushed into a milder recession, and the growth of China will slow down significantly.

To that effect, it is important that besides the Treaty of Rome of 1957, The Maastricht Treaty of 1992, and the Stability and Growth Pact of 1997, which define the criteria for a country to become a member of the EU and EMU, a well-defined process should be in

place for situations when a country ought to exit the Eurozone. Another missing part of these treaties is the fact that even though European countries have to move in the right direction to meet required economic criteria while they are in the process of negotiation to enter the EMU, once they become part of the Eurozone, their fiscal discipline tends to disappear. Under these circumstances, the EMU and the euro may encounter more and larger crisis in the future, so a question remains whether the EU ECE and EU candidate countries should advocate for use of their local currency.

Some Eurozone countries, once part of the EMU, considerably increased their borrowing to unsustainable national government debt to GDP ratios. The Greek and the Irish debt crisis were merely a wake-up call for the EU as these economies are relatively small, with GDPS of €215 billion and €156 billion respectively, and combined, smaller than the GDP of Pennsylvania. The bigger problems are luring from debt issues of much larger economies such as Italy and Spain. Italy has close to €2 trillion debt outstanding, of which, 50 percent is financed externally. Spain has over €700 billion of public debt outstanding combined with its dire unemployment rate of 22 percent (Federal Reserve Bank of St. Loius 2011).

The European integration is intended to stabilize the use and allocation of resources, to make the job market more efficient, to streamline investment opportunities, and to pool the opportunities and risks of the common marketplace. Financial integration allows investors to improve their capital allocation decisions and benefit from improved liquidity and efficient asset allocation. While the prices of tradable goods are usually determined by international competition, it is more difficult to achieve price convergence for non-tradable goods that are only traded and consumed in one country's local economy. This can cause big price differentials in different economies and contribute to devaluation of domestic currencies, distortion of prices, or reduced competition during the country's transformation process. Even though price arbitrage can accelerate the price convergence, in an environment where there are obstacles, such as restrictions on movement of labor, high transportation costs that restrict tradability, regulations, or quotas, price differentials can last for prolonged periods of time (Zdarek 2008). These considerations are especially important when analyzing the timing and benefits or difficulties of euro adoption for the EU ECE countries that use local currencies and EU candidate countries.

Previous studies show that openness and increased trade among countries is one of the main attributes of economic convergence (Fa-

tas 1997; Clark and van Wincoop 2001; Calderon, Chong, and Stein 2007). In the case of EU ECE countries, Fidrmuc and Iikka (2004), using data through 2001, reports that correlations for Poland and Hungary with the German economy have increased throughout the 1990s. Darvas and Szapary (2008b) have reported that the Slovenian economy exhibits high degree of synchronization with the economy of the European Monetary Union (EMU), while examples of countries with lower historical correlations with the EMU economy include the Baltic countries, and the Czech and Slovak Republics.

It is arguable that sometimes countries should join the EMU even if they have not reached the desired economic convergence. By joining the EMU, the country will naturally increase the trade with the other members, and will reach economic convergence, which means not only convergence in business cycles, but also narrowing the gaps in productivity, real income, and other macroeconomic indicators (Frankel 2004). This is only desirable if countries that have not satisfied the economic criteria for EU accession are steering the required macroeconomic indicators in the right direction. Otherwise, not having satisfied the economic requirements for EU accession and having wrong directional movement of the same, signalizes no economic, monetary or fiscal discipline and could later create a potential problem for the Eurozone like in the case of Greece (Federal Reserve Bank of St. Loius 2011).

Conclusion: To Adopt Or Not to Adopt the Euro, That Is the Question Now

In this paper we analyzed three groups of countries (1) the seventeen Eurozone countries that have adopted the euro, (2) the seven EU ECE member countries that still use their local currencies, and (3) the EU candidate countries. We studied temporal dynamics of selected macroeconomic indicators such as central government debt, inflation, market capitalization of exchange-listed companies, and GDP per capita growth for selected EU ECE members and EU candidate countries to understand significant changes that occurred between 1999, at the beginning of the euro era, up to 2011.

We investigated the relationships between a group of macroeconomic indicators on one hand and sovereign debt as percentage of GDP on the other, for the three groups of countries that we study. By analyzing the regression results we studied potential benefits or difficulties stemming from adopting the euro for the EU ECE countries and EU candidates. We conclude that even though the European Monetary Union is strategically, politically and economically impor-

tant, and its enlargement is well intended, the most recent European sovereign debt crisis has created additional challenges that need to be taken in consideration by the EU ECE member countries and EU candidate countries when considering the replacement of their local currencies with the euro. Improving the economic stability of the European Union may be achieved more rapidly if no new members are added to the European Monetary Union for the time being. We believe that it could be advantageous for both, the EU ECE countries still using their local currencies and the EU candidate countries to consider delaying the replacement of their local currencies with the euro. To defer adopting the euro may be mutually beneficial for all, the Eurozone, the EU ECE and EU Candidate countries. Once the sovereign debt crisis is subdued, the adoption of the common currency may be reconsidered based on the economic parameters and framework at the future time.

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