PILGRIMS TO THE EUROZONE: HOW FAR, HOW FAST?

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Pilgrims to the Eurozone:
How Far, How Fast?

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Abstract

In our analysis, we examine the convergence of all recent ten European Union (EU) members to EU standards. Novel features of the paper include more complete measures of convergence, in particular fiscal convergence; a broader examination of inflation convergence with respect to the Maastricht benchmark as well as the European Central Bank's inflation objective; and more appropriate tests of convergence that allow for structural breaks. The results indicate slow but steady per-capita real income convergence towards EU standards. Although evidence indicates significant inflation and interest rate convergence, fiscal convergence evidence is discouraging, indicating a lack of fiscal sustainability. An important policy implication of the results is that current fiscal practices may delay the new members' entry into the Exchange Rate Mechanism II (ERM2) and hence their adoption of the euro. Our empirical results support the following recommendations: authorities need to (1) improve their budget institutions, (2) introduce further reforms to cut down government expenditures, and (3) consider adopting fiscal rules. Therefore, the countries with serious fiscal problems should not rush to enter the Eurozone.

Keywords: convergence, European Union, integration, fiscal discipline, transition, Eurozone
JEL Classification: C23, E42, E61, F02, H60, P50

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Abstrakt

V této studii analyzujeme konvergenci deseti nových členů Evropské Unie (EU) k jejím standardům. Naše analýza přináší obsáhlejší způsoby měření konvergence než dřívější studie: soustřeďujeme se na fiskální konvergenci; šířeji zkoumáme inflační konvergenci z pohledu Maastrichtského kritéria i cílů Evropské centrální banky; používáme vhodnější testy konvergence zohledňující strukturální změny. Naše výsledky dokumentují pomalé ale trvalé sbližování reálné výkonnosti na jednoho obyvatele s vývojem v EU. Dochází rovněž k výraznému sbližování inflace a úrokových sazeb. Na druhé straně, vývoj fiskální konvergence je nedobrý a ukazuje na nízkou fiskální udržitelnost. Důležitou skutečností praktického významu je to, že současné vedení fiskální politiky může zpozdit vstup některých nových členských zemí do režimu Mechanismu měnových kurzů II (ERM2) a tím zpozdit i jejich přijetí eura. Naše empirické výsledky tvoří základ následujících doporučení: je třeba, aby odpovědné orgány (1) zlepšily instituce nutné k tvorbě rozpočtů, (2) zavedly další reformy vedoucí k snížení vládních výdajů, (3) zvážily přijetí fiskálních pravidel (vedoucích k omezení fiskální nedisciplíny). Země s vážnými fiskálními problémy by proto neměly uspěchat svůj vstup do Eurozóny.

Introduction and Motivation

In May 2004, ten new members joined the European Union (EU). Eight of them were Central and Eastern European countries (hereafter the CEE8), namely the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia. The other new members were Cyprus and Malta. All of these countries must join the Eurozone once they satisfy the Maastricht criteria. More recently, the new EU fiscal framework under the Stability and Growth Pact has further emphasized the importance of fiscal discipline for all of its 25 members. Although EU accession leaves new members some freedom to select how to link their national currencies to the euro, policymakers in the new member countries appear to be inclined to adopt the euro sooner rather than later (McKinnon 1999, Buiter and Grafe 2002, and Buiter 2004). The sooner that the new EU countries complete their restructuring process and become more like the core EU members in terms of a broad range of macroeconomic indicators, the more likely and faster they are to unilaterally adopt the euro (e.g., Salvatore 2004). This paper quantifies where the new members stand in terms of the convergence process with respect to official Maastricht criteria as well as comparable performance in the Eurozone. Based on a comprehensive analysis of all new EU countries, we outline specific risks that policymakers must overcome in the process of joining the Eurozone with public finance management issues receiving the most attention.

One of the ways to test for the convergence of the new members towards the EU is to compare their level of economic development in terms of real GDP per capita relative to EU standards, as well as their distance from convergence criteria as set in the Maastricht Treaty. Real per-capita income convergence is the ultimate objective of economic integration. In the spirit of the neoclassical growth model, this paper tests the convergence of new member countries' per capita GDP towards the level of the core EU countries to see whether a significant improvement in the standard of living of citizens of the new countries has been achieved. In addition, we test for monetary convergence since it has significant implications for interim optimal exchange rate and monetary policies before a formal and permanent link to the euro.

But perhaps most importantly, we believe that prudent fiscal performance is the most important and pressing condition today for the new members to satisfy before adopting the euro. Although to the best of our knowledge there is no underlying theory

of fiscal convergence,[1] there is ample evidence that fiscal convergence is systematically associated with enhanced business cycle synchronization as it eliminates idiosyncratic fiscal shocks. Further, there is evidence that reduced primary fiscal deficits (or higher surpluses) also increase the coherence of business cycles across countries (Darvas, Rose, and Szapáry 2005). Therefore, since both the Maastricht convergence criteria and the Stability and Growth Act require both fiscal convergence and reduced deficits before entry to the Economic and Monetary Union (EMU), these institutional arrangements may have indirectly moved Europe closer to an optimum currency area in the sense of Mundell (1961). Thus, it is argued that the increased business cycle coherence due to fiscal convergence makes countries within the region better candidates for a currency union (Darvas et al. 2005).

We take an innovative and comprehensive approach to the issue of convergence by examining not only nominal and real economic convergence, but also fiscal convergence for the ten new EU members. We contribute to the related literature in several unique ways. Initially, we start by measuring real convergence in terms of an aggregate output expressed in a common currency (euro) and in local currencies. There are three good reasons for using the common currency approach. First, firms in the new EU economies are selling and will sell more and more in euro markets. As von Hagen and Hofmann (2004) argue, "it is the aggregate euro-area price level that matters for them" (p. 18). Given the large degree of market integration in the euro area, it is more appropriate to use euro-area prices, rather than a national currency, to gauge aggregate demand in the euro area, which, given a production level, directly affects real GDP. In addition, most of the new EU members already have tied their national currencies to the euro. The second reason is political: the CEE8 only recently emerged from the transition and their citizens do not share equal sentiments with respect to monetary subordination because of the fear of an increase in prices after adopting the euro. Hence, finding a faster convergence measured in a common currency relative to the one in the domestic currency would create a stronger argument in favor of entering the EMU sooner rather than later. Finally, finding convergence in both national currencies and the euro would suggest progress towards exchange rate convergence, satisfying another condition of the Maastricht Treaty.

[1] A recent exception is Skidmore, Toya and Merriman (2004). They develop a theory of government spending convergence based on Barro's (1990) dynamic model of endogenous growth with government spending.

Second, we elaborate on the inflation convergence requirement from the perspective of inflation targeting. Several new EU member states, i.e., the Czech Republic, Hungary, Poland, and Slovakia, have already adopted a regime of inflation targeting as a disinflation tool. Our empirical results allow us to infer whether the new members, at least those that adopted an inflation targeting regime, are ready to follow an inflation targeting approach that is similar to that of the ECB. Considering convergence towards the benchmark potentially affects the admission process into the Eurozone. For instance, it is frequently argued that the inflation targeting regime is incompatible with an exchange rate band arrangement (see Mishkin, 2004); ERM2 is such an arrangement, and adhering to it is one of the Maastricht conditions. Further, an individual member's inflation rate is likely to affect its entry date to the Eurozone, especially for those with fiscal indiscipline.

Third, in conjunction with the above arguments, and for the first time in the literature, we test for fiscal convergence. Previous work, which mainly focused on monetary and real convergence, has overlooked this issue. However, several observers raised concerns about the fiscal indiscipline of some new members. Indeed, many of the new EU members were included under the Excessive Deficit Program when they entered the EU in May 2004. On this issue, Berger, Kopits and Szekély (2004) point out that deteriorating fiscal performance, especially in Central European countries, may constrain these members from satisfying the Maastricht criteria successfully because continuing large fiscal deficits can create inflationary pressures. Further arguments in the same spirit are voiced by De Grauwe and Schnabl (2004b). More important and related to our findings, Buiter (2004) argues that achieving fiscal sustainability is not only a necessary but also a sufficient condition for the new EU members to achieve full EMU membership. Additionally, there is an empirically documented direct relationship between fiscal policy and macroeconomic performance. In their study of discretionary fiscal policy for 91 countries, Fatás and Mihov (2003) conclude that "governments that use fiscal policy aggressively induce significant macroeconomic instability", i.e., output volatility. In a similar spirit based on the data from the U.S. states, Fatás and Mihov (2004) state that "fiscal policy is a significant source of business cycle volatility among the U.S. states, and, as a result, constraints on politicians lead to less volatile economic fluctuations."

Fourth, we use a novel and what we consider to be the most appropriate methodology to analyze the issue of the "catching up" of the new entrants to the old EU

members. Until recently, the cross-sectional tests used in analyzing absolute convergence were criticized for over-rejection of the null hypothesis of no convergence (Bernard and Durlauf 1996), shifting the emphasis to conditional and stochastic convergence. However, the need to meet the EU criteria for full EMU membership has regenerated interest in absolute convergence. A recent test developed by Vogelsang (1998, 1999) and applied in the context of Carlino and Mills (1993) by Tomljanovich and Vogelsang (2002) is particularly suitable for analyzing absolute convergence. In addition to the flexibility of this test in being able to derive convergence estimates reliably, it also allows for possible structural breaks, which is critical in drawing correct inferences about convergence. The growing literature[2] on the presence of structural breaks in emerging economies further motivates and validates the appropriateness of this methodology. Using this methodology also allows checking the robustness of previous studies' findings of nominal and real convergence.

In assessing real convergence, we use a widely recognized measure, namely real GDP per capita, instead of industrial production, which is used as a proxy for real convergence in most previous studies.[3] Real GDP per capita convergence is measured with respect to two benchmarks: (1) the EU core represented by the average of Austria, Belgium, France, Germany and the Netherlands and (2) an average of three EU15 members' per-capita GDP as a proxy for the EU periphery, namely that of Greece, Portugal, and Spain. Further, the real GDP per capita is measured in euros as well as in a local currency to analyze the impact of exchange rate effects on convergence and to provide inferences on exchange rate convergence.

For nominal convergence, we use benchmarks based on the Maastricht criteria.[4] We first test for monetary convergence, measured in terms of inflation and interest rates. Aside from the benchmark derived from the Maastricht criterion (that we define in the Section 4.2), we test for inflation convergence with respect to inflation in the EU

[2] Dibooglu and Kutan (2001), Fidrmuc and Tichit (2004), and Kočenda (2005), among others.
[3] Real GDP per capita is a better measure of living standards because industrial production represents a narrow measure of economic activity and changes in industrial production are more cyclical than GDP. Kočenda (2001), Kutan and Yigit (2004, 2005), and Brada, Kutan and Zhou (2005) use industrial production to test for real convergence.
[4] The Maastricht criteria require that: the national central bank of the country should be independent, the country's currency should have participated without stress in the Exchange Rate Mechanism for at least two years, the country's inflation rate should have been below a reference value given by a range of 1½ percentage points above that of the best three inflation performers, the country's long-term interest rate should have been within two percentage points of that of the three best inflation performers, the ratio of the budget deficit to gross domestic product (GDP) should not exceed 3%, and the country's debt-to-GDP ratio should not exceed 60%. In our analysis we use two monetary and two fiscal criteria and leave the question of exchange rate stability and central bank independence aside.

core and the average inflation in the EU periphery. Due to the lack of comparable long-term interest rates for the new EU countries and the short sample available,[5] we provide only a graphical treatment of the interest rate convergence for 10-year bond data as much as it is available. Next, we investigate fiscal convergence with respect to the benchmarks of (1) fiscal deficit up to 3% of GDP and (2) national debt up to 60% of GDP. In addition, in the sprit of the Stability and Growth Act, we test whether any of the accession countries are performing like the EU countries by comparing their debt and deficit performance against those of the EU core and periphery. This tells us whether the accession countries are as fiscally disciplined as the EU15 countries.

In the next section, we provide a review of the literature. Section 3 describes our methodology and data. Empirical results are reported in Section 4. The last section concludes with policy implications of the results.

2. A Brief Review of the Literature

The convergence of the new EU members towards the core EU has been studied from two major angles. One strand of the convergence literature is based on the concept of the optimal currency area (for a recent survey, see Horvath 2003 and Fidrmuc and Korhonen 2004a). The seminal paper by Bayoumi and Eichengreen (1993) forms the methodological basis of much of the work on this issue. These authors test whether EU members displayed a sufficient correlation of their supply (real) and demand (monetary) shocks over the period 1960-1988. Many follow-up studies report considerably more business cycle convergence to EU standards than found in Bayoumi and Eichengreen (1993) (see Boone and Maurel 1998 and 1999, Korhonen and Fidrmuc, 2001 and Fidrmuc and Korhonen, 2004b). However, more recent studies display conflicting results. Babetskii, Boone and Maurel (2004) report significant convergence of demand shocks, but divergence of supply shocks. Horvath and Rátfai (2004) show that shocks among the core and candidate EU countries tend to be uncorrelated. Sayek and Selover (2002) find that EU-wide shocks have a relatively small influence on business cycles in Turkey.

A second strand of the literature focuses on the nominal and real convergence of the candidate countries and the existing EU members. Brada and Kutan (2001) examine monetary-policy convergence, while Janáčková (2000), Richards and Tersman (1996),

[5] For many new EU members comparable long-term instruments (10-year maturity) exist only from 2000.

and Backé et al. (2003) investigate price-level convergence between the EU and the transition-economy candidates. These studies find weak monetary- and price-level convergence. Kočenda (2001), Kutan and Yigit (2004, 2005), and Brada, Kutan, and Zhou (2005) study not only nominal level convergence, but also real convergence. While Kočenda (2001) reports considerable real and monetary convergence, Kutan and Yigit (2004) find less convergence than Kočenda does. Kutan and Yigit (2005) observe that price and monetary convergence of the new EU members to the core EU standards is quite idiosyncratic. Brada et al. (2005) conclude that a peg to the euro soon after accession is feasible for the East European countries, but the benefits of joining the Eurozone are as yet limited.

Overall, the results on nominal and real convergence are mixed. Besides different sample periods and country coverage, the divergences in results appear to be driven by different methodologies. In addition, structural breaks in series may further distort the findings. We already mentioned that there exist empirical evidence of structural breaks in many economic indicators portraying the landscape of the transition and pre-accession process in the CEE countries, not to mention the fact that the transition alone represented a massive structural shift by definition. Hence, a comprehensive study based on a longer sample period, supplemented by structural break tests, is necessary.

There are also only a small number of empirical studies on fiscal convergence. Sanz and Velázquez (2003) test whether the convergence of the composition of government expenditures is greater for EU member states than in the non-EU countries of the OECD. Using data from 1970 to 1997, they find that EU member states are converging towards a different steady state composition of government expenditures and their convergence is faster than the non-EU countries of the OECD. However, they report that the margin for future convergence seems to be limited because the functional distribution of government expenditures appears to be close to the steady state. Finding different steady states for each country suggests that each country has its own individual functional distribution of public expenditure in the long term, driven by preferences and historical and institutional factors of countries. This indicates limited future fiscal convergence. Given limited empirical studies on fiscal convergence and its importance for EU policymakers, a comprehensive study on fiscal convergence of the new EU members is also warranted.

3. Methodology and data

3.1 Convergence methodology

The analysis of convergence has been an active as well as challenging field of interest since the late 1980s.[6] A variety of methods have been used to analyze different measures of convergence, namely absolute or conditional β-convergence, sigma convergence, and stochastic convergence. While the former two types analyzed the issue of catching up, the latter and more recent focused on the synchronization of shocks and cross-sectional units moving together in time. The enlargement of the EU has motivated researchers and policymakers to revisit the issue of the "catching up" of the new entrants to the core EU members. Carlino and Mills's (1993) argument that both β- and stochastic convergence are necessary for real convergence further motivated the literature on β-convergence. Cross-sectional tests used to analyze β-convergence were criticized on the grounds of over-rejecting the null hypothesis of no convergence until only recently (Quah 1996, Bernard and Durlauf 1996).

A new test by Vogelsang (1998, 1999) and Tomljanovich and Vogelsang (2002) deals with the β-convergence issue by relying on a time-series methodology. Following this literature, we consider a simple model of convergence towards a benchmark as

$$y_t = \mu + \delta t + u_t \qquad (1)$$

where y_t is the difference of the natural logarithm of a variable minus a benchmark, in our case for example, the per capita GDP of country *i* minus the European benchmark at time *t* would be the y_t variable, while μ is an intercept to capture the initial level of the deviation, *t* is a deterministic time trend, and u_t is the residual term. In such a set-up, β-convergence requires that for countries where μ is initially significantly negative, so the country is lagging behind, the trend coefficient δ should be positive and statistically significant. Carlino and Mills (1993) developed this test with a very restricted form of serial correlation for the residual term, namely AR(2). Vogelsang (1998) extended the analysis of this specification to u_t with an unknown form of serial correlation by allowing a span of stationary and non-stationary serial correlation specifications for the error term ranging from order of zero, $I(0)$, to order of one, $I(1)$. Since the possibility of no convergence implies nonstationarity of the error terms, one can draw a false

[6] For recent discussions, see Taylor (1999) and de la Fuente (2002).

inference on the trend coefficient when the errors are assumed to be stationary AR(2).[7] Vogelsang (1998) corrects for this problem by developing a trend function hypothesis test with an undetermined degree of serial correlation. To explain his methodology in the spirit of Equation 1, consider two specifications

$$\begin{aligned} y_t &= X_{yt}\beta + u_t \\ z_t &= X_{zt}\beta + S_t \end{aligned} \tag{2}$$

where z_t is $\sum_t y_j$ and $S_t = \sum_{j=1}^{t} u_j$, while X_{yt} and X_{zt} consist of $\begin{bmatrix} 1 & t \end{bmatrix}$ and $\begin{bmatrix} t & \sum_t j \end{bmatrix}$, respectively. For more than one coefficient restriction, the tests can be summarized as:[8]

$$T^{-1}W_T = T^{-1}\left(R\hat{\beta} - r\right)'\left[R\left(X_y'X_y\right)^{-1}R'\right]^{-1}\left(R\hat{\beta} - r\right)\Big/ s_y^2 \tag{3.1}$$

$$PS_T = T^{-1}\left(R\hat{\beta} - r\right)'\left[R\left(X_z'X_z\right)^{-1}R'\right]^{-1}\left(R\hat{\beta} - r\right)\Big/\left(s_z^2 \exp\left(bJ_T(m)\right)\right) \tag{3.2}$$

$$PSW_T = T^{-1}\left(R\hat{\beta} - r\right)'\left[R\left(X_y'X_y\right)^{-1}R'\right]^{-1}\left(R\hat{\beta} - r\right)\Big/\left(100T^{-1}s_z^2 \exp\left(bJ_T(m)\right)\right) \tag{3.3}$$

where J_T is the Park and Choi (1988) unit root test statistic obtained from the following regression

$$\begin{aligned} y_t &= X_{yt}\beta + \sum_{i=2}^{m} c_i t^i + u_t \\ J_T(m) &= \left(RSS_y - RSS_J\right)\Big/ RSS_J \end{aligned} \quad . \tag{4}$$

J_T is the Wald statistic that tests the joint hypothesis of $c_2 = c_3 = \cdots = c_m = 0$. In Monte Carlo simulations, Vogelsang (1998) finds the values of b and m for which the above tests would be comparable and valid for every type of serial correlation form, including unit roots.

Despite the great flexibility of these tests in deriving the mean and trend coefficient estimates in time series with varying stationarity properties, one needs to be careful in using this methodology in the analysis of transition economies. The reason stems from the volatile nature of these economies and the presence of structural shifts that are documented in the empirical literature. The problem of structural breaks during the transition process is given serious empirical consideration in Fidrmuc and Tichit

[7] When u_t is $I(1)$, the estimate of β obtained from the above regression is not related to the true trend, and information on β must be obtained from the estimate of the intercept in the autoregressive representation of y_t.

[8] See Vogelsang (1998) for a deeper elaboration of the tests.

(2004) who provide evidence of significant breaks for macroeconomic data. They argue that empirical analyses of transition economies must account for the possibility of structural changes, otherwise inferences are misleading. However, only a few papers consider the structural breaks on transition issues (see for example Dibooglu and Kutan 2001, and Kočenda 2005).

We obtain robust results by using Vogelsang's (1999) extension of Vogelsang (1998) allowing for structural breaks in the modification of the statistics by including the possibility of shifts in the trend function. Spanning the standard set of breaks introduced by Perron (1989), namely the mean, trend, and the mean and trend, Vogelsang (1999) derives asymptotic critical values using 10,000 replications in cases of both known and unknown break dates.[9] We prefer not to impose a break date for our sample countries, favoring the second approach that endogenously determines a break date. In these tests, the break date is first estimated by using the optimal break tests of Andrews and Ploberger (1994) for a break date $T_b \in \Lambda$, where Λ is the trimmed sample (from both ends). Second, using the estimated break date, normalized critical values are obtained using the altered versions of Equation (2) as follows (only the y_t version is displayed):

$$y_t = \mu_1 DU_{1t} + \mu_2 DU_{2t} + \delta_1 DT_{1t} + \delta_2 DT_{2t} + u_t \qquad (5)$$

where $DU_{1t} = 1$ if $t \le T_b$ (the break date) and zero otherwise, $DU_{2t} = 1$ if $t > T_b$ and zero otherwise, $DT_{1t} = t$ if $t \le T_b$ and zero otherwise, and finally $DT_{2t} = t - T_b$ if $t > T_b$ and zero otherwise. Analysis of Vogelsang (1999), using data from Maddison (1991), and a later application by Tomljanovich and Vogelsang (2002)[10] that focuses mainly on convergence issues, provides an interesting exploitation of this methodology.

3.2 Data

We analyze the performance of the CEE8, Cyprus, and Malta in satisfying the convergence criterion of the Maastricht Treaty. For monetary convergence, we use data on inflation (based on the twelve month average of the year-on-year inflation rates as set out in the Treaty and practiced by the ECB) and interest rates (10-year government bond yield), while deficit-to-GDP and debt-to-GDP ratios are used for fiscal convergence.

[9] Interestingly, one of the supremum statistics he suggests performs better than some popular statistics in identifying shifts in slope.

[10] We are grateful to the authors for providing us with the Gauss routine used in this paper.

Specifically, we use the lowest three inflation rates of the EU15 plus 1.5%, the same three countries' average 10-year government bond yield plus 2%, the fiscal deficit ratio below 3%, and debt ratio below 60% as our measures.[11]

We analyze real convergence using real GDP-per-capita figures, both in local currency and euros, to draw implications as to how long it would take for the new EU countries to catch up to the standards of their Western counterparts. For this purpose, we examine two benchmarks: the core of the EU, represented by the average of Austria, Belgium, France, Germany and the Netherlands, and the periphery represented by average values from Greece, Portugal and Spain.

We use quarterly data from 1995:1 through 2003:4 for all variables; an exception is inflation and interest rates for which we use monthly data, starting from 1996:01 for inflation and 2000:01 for bond yields. This time span was chosen because: 1) official EU membership applications started in 1995, and 2) EuroStat began using the harmonized time series on prices and other macroeconomic variables at that time. In addition, the post-1995 period excludes the major transition-related shocks observed in the early 1990s. Table 1 documents the major milestones in the pre-accession process: the date when an application to join the EU was submitted and the beginning and end of the admission negotiations. The data are obtained primarily from the EuroStat database and checked for consistency against the International Financial Statistics of the IMF. In case of missing or incomplete observations, data are gathered from the individual central banks and finance ministries. In some cases, quadratic interpolation of annual data was necessary to fill some missing data points because the empirical methodology we use relies on uninterrupted data.[12] Seasonality in GDP data is eliminated by using a moving average GDP (g_t) of the four quarters ($g_t = \sum_{s=1}^{4} \frac{1}{4} GDP_{t-s}$), while inflation rates (π_t) are average rates of inflation (hence de-seasonalized) based on a twelve month average of the year-on-year rates.[13] We also annualize the quarterly debt and deficit data by summing the four quarters and then using this sum to obtain the debt-to-GDP and deficit-to-GDP ratios. Real GDP per capita data in euros is given in Figure 1. We should

[11] For both inflation and interest rate benchmarks we use data from the EU15 since the 10 new members joined the EU only on May 1, 2004.

[12] Quadratic interpolation of annual data was used for debt in the case of Austria, Estonia, France, Germany, and the Netherlands, and for the Portuguese deficit and second half of the Greek deficit.

[13] Our methodology helps alleviate the potential problem of the error term in de-seasonalized variables being polluted by leading and lagged errors. The error term will not be correlated with the explanatory variables since we only have deterministic regressors (the mean and the trend). The serial correlation also does not matter since the Vogelsang test is robust against any form of serial dependence.

reiterate at this point that the serial correlation generated by the methodology used for de-seasonalizing the data is of little concern here since the Vogelsang test is able to handle broad forms of serial correlation. The euro-denominated variables, when not available, are generated by multiplying the local currency values by the euro (for the 1999-2003 period) and ECU (for the 1995-1998 period) exchange rates. Finally, we create a real-GDP, per-capita index, using 1996 as the base year to be able compare real GDP per capita data measured in different local currencies to each other (see Figure 2). Since the recent ten members should grow faster in real terms to "catch up" with the benchmarks, observing divergence in the indexes away from the benchmark would indicate convergence.

4. Estimation and Results

The results are displayed in Tables 2 through 5. They display the results for both *TW* (*T* inverse Wald test) and *PSW* (Partial Sums with *J* correction) tests, given by the specification in Equations 3.1 and 3.3, respectively. Despite the better power performance of the *TW* test, one should note that our limited sample size may limit the inferences from this specific test. Due to the very conservative nature of the *TW* test, we base our inferences about convergence more on the *PSW* test results. However, we report both test results to check the sensitivity of results to different specifications.

Vogelsang (1999) emphasizes that interpretation of the coefficients should always be done using the *y*-regression with *PSW* and *TW* statistics (note the matrices in Equation 3) since the *z*-regression in *PS* is merely a way to get useful estimates of the parameters. The last column in each table contains the estimated break date using the maximum $T^{-1}W_T$ statistic. Following the theoretical grounds of the methodology employed, we apply a 10% trimming from each end of the sample since the break dates close to the endpoints are unreliable and should mostly be disregarded. We display the asymptotic critical values for the endogenous break option of the *PSW* and *TW* tests at the bottom rows of each table, respectively. When interpreting results, the readers should note that positive trend coefficients represent improvements of position in comparison to the Union. For instance, while a positive trend coefficient shows new members' GDP per capita approaching EU levels, a positive trend in inflation will indicate a decline in inflation toward the best EU performance. In short, a positive trend coefficient is always good. We supplement this brief explanation at the bottom of each

table by indicating the dependent variable and providing a brief guideline to interpret the results easily.

4.1 Real convergence

We report the results of real convergence measured by the developments of real per-capita GDP in several panels of Table 2. Significance levels reported in Table 2 are for the null hypothesis that the difference between the per-capita GDP of each new member and that of the core or the periphery average is zero. As described earlier in section 3.2, we use the average of the GDP per capita of Austria, Belgium, France, Germany and the Netherlands as the benchmark for the EU core and the average of Greece, Portugal and Spain as a proxy for the EU periphery since these countries are closer to the new EU member countries in many respects and such a comparison is frequent in the literature. Thus, our dependent variable is the difference between per-capita GDP of each new member and the core or the periphery average. Due to a lower initial level of per-capita GDP in the new EU members, such a difference is inevitably a negative number. Further, the real per-capita GDP is expressed in euros as well as in the local currency. To avoid the problem associated with local currency incompatibilities, we equalize the absolute numbers at an arbitrarily chosen base year (1996:1 = 100). Since all the new member countries begin the sample with a per-capita GDP level lower than the benchmark countries, we expect the mean to be negative in euro levels; convergence to a higher per-capita GDP level would be reflected in a positive and significant trend. In the case of local currency comparisons, we expect all countries to start from the same level (hence a zero mean), and to have a faster growth rate than the benchmark countries (positive trend).

The results in Table 2a and 2b confirm that all new EU members start below the per-capita GDP level of the core and the periphery in euros, and the difference is understandably larger with respect to the core. There are few endogenously detected break dates, and the significant ones are around 2000, in the middle of the accession talks as sufficient progress was made toward the outcome of the negotiations. Since the GDP per capita levels of the new members are below those of the core and the periphery (indicated by the negative μ coefficients), statistically significant trends imply convergence toward the core or the periphery. Finding a negative trend does not suggest a decline in the real per-capita GDP; it indicates that the distance from the core or the periphery is widening. During the pre- or post-break period, the trends are positive for

most countries. We find evidence that strong convergence is taking place towards the core (Table 2a), but it is weaker with respect to the periphery (Table 2b), as suggested by fewer significant trend coefficients. This is likely caused by the strong growth performance of the periphery countries when compared to the core.

In short, our results suggest that new EU members have a higher per-capita GDP growth rate than do the EU15 countries, and the difference in growth rates will have to continue for decades for full convergence to occur. This phenomenon can be illustrated on a real-life example: a simple linear approximation shows that a per-capita GDP difference of, say, 18,000 euros between a "rich" and a "poor" EU country will be closed in 81 years if the poor country per-capita GDP grows at 5% and the rich country grows at a constant rate of 2%. Using a different set of assumptions and methodology, Fischer et al. (1998, see Table 11) claim that the time needed to close the per-capita GDP gap in accession countries and other transition economies is between 17 and 75 years with an average of 31 years.

Tables 2c and 2d report the results when the per-capita real GDP is measured in local currency. Similar to the euro-based results, we find negative intercept coefficients, indicating a lower initial level of GDP in the new EU members. However, the positive trend coefficient implies (except for Malta and the Czech Republic) convergence during both pre-break and post-break periods both towards the core and the periphery. The positive post-break mean is also in accord with the observed development. Since we scale nominal values in various currencies and observe a higher growth rate in new EU members, we essentially look for divergence in such a case (see again Figure 2). Divergence should be understood in a positive sense, however. This result basically means that all countries, including the core, start from the same point (1996 = 100) and begin growing. Those who grow faster, the new EU members, will naturally have a higher trend value than the core or the periphery. These findings in Tables 2c and 2d look quite encouraging. A summary of all four tables show that the Baltic countries progress quite fast both in Euros and local currency to the EU standards while countries like the Czech Republic, Poland and Malta tend to slow down their progress. These results suggest that exchange rate convergence is also achieved for the Baltic countries, while the currencies of the other currencies have not been as stable against the euro. The Baltic countries seem to be ready to peg their currencies officially to the euro.

4.2 Convergence related to Maastricht criteria

Monetary convergence

According to the Maastricht Treaty criterion of price stability, "a Member State has a price performance that is sustainable and an average rate of inflation, observed over a period of one year before the examination that does not exceed by more than 1½ percentage points that of the three best performing Member States in terms of price stability" (Art. 109j(1) of the EC Treaty and the respective protocol, Art. 1; see The Treaty (1999) for additional details on other criteria). To construct the benchmark, the common practice is to use an arithmetic average of the three lowest (non-negative) inflation rates over the period plus 1.5%. This is the approach common for both the European Commission and the European Central Bank.[14]

Inflation convergence towards the Maastricht benchmark, the lowest 3 non-negative inflation rates plus 1.5%, is clearly observed for most of the new member countries (Table 3a). A significant finding is a fast disinflation rate at the beginning of our sample period. The large negative values are indicative of not only inflation levels above the benchmark levels, but they also point toward a fast decline in the inflation rates. We also note that in the second half of the sample period many countries have insignificant trend coefficients, implying that the downward movement of their inflation halts. A more careful inspection of the countries who do not display any positive coefficients show mean values that are also not significantly different than zero. These results imply that countries that decrease their inflation to EU levels stop monetary tightening and maintain low inflation levels comparable to those of the EU15. In summary, our results indicate that inflation convergence is a feature of the present development of the EU.

A reduction of inflation rates is observed also with respect to inflation in the core (Table 3b) and average inflation in the periphery (Table 3c). New EU countries start with a much higher inflation rate and reduce it over time[15] (Figure 5). This is

[14] It should be noted that the concept of the "outlier" was already included in earlier convergence reports. It does not imply any mechanical approach to the exclusion of certain inflation rates, but it was introduced in the 1998 EMI (European Monetary Institute) Convergence Report to appropriately deal with potential significant distortions in individual countries' inflation developments. Yet another benchmark is possible if the "three best-performing Member States in terms of price stability" are considered as those nearest to the ECB's inflation objective, which is inflation rate close but below 2 percent. In our analysis, we concentrate on the official definition of the benchmark. Further, Buiter and Grafe (2002) suggest interpreting inflation criteria in terms of only the inflation rate of traded goods prices due to Balassa-Samuelson effects. This approach would require a change in the Maastricht Treaty or derogation, and it is therefore beyond the scope of this paper. For assessment of Balassa-Samualeson effect in the Central and Eastern Europe see Égert et al. (2003).

[15] Malta is an exception with respect to the criterion benchmark.

documented on a dramatically larger post-break mean and positive trend coefficient in both pre-break and post-break periods. Such a decrease in inflation is understandably more pronounced during the pre-break period when inflation was still quite high in many countries and economic development was still much affected by the ongoing transition process. In addition, financial problems, if not crises, were not uncommon. These findings on inflation convergence are also consistent with recent studies (e.g., Kočenda 2001; Kutan and Yigit 2004a, 2004b; Brada et. al. 2005).

The process of inflation convergence should be confronted with disinflation strategies in several new member states that adopted distinct forms of inflation targeting.[16] The problem lies in the fact that the combination of convergence criteria creates a constraint affecting the compatibility of inflation targeting with the exchange rate convergence criterion embodied in the ERM2 arrangement. Arguments on this issue were voiced from various angles by Natalucci and Ravenna (2002), Buiter (2004), and de Grauwe and Schnabl (2004a), among others. New EU members who currently operate under flexible exchange rate regimes and pursue inflation targeting may be confronted with an unpleasant policy shift in favor of exchange rate targeting when entering ERM2. When leaving ERM2, the reverse shift towards an inflation-targeting-like regime under the euro is an imperative. This double shift may be avoided at some cost. However, the viability of such conduct is underlined by specific conditions.[17] Jonáš and Mishkin (2005) address the future perspective of monetary policy in the transition economies and conclude that even after EU accession, inflation targeting can remain the main pillar of monetary strategy during the time before the Czech Republic, Hungary and Poland join the EMU. Our results indicate that satisfying the inflation

[16] Orlowski (2001) proposed a sequence of monetary convergence to the Eurozone, based on autonomous monetary policy rather than on an early application of the euro peg. The gradual adjustment process begins with a relatively strict variant of inflation targeting, followed by flexible inflation targeting, and ends with exchange rate targeting. Orlowski (2004) proposed the adoption of money growth rules as indicator variables of monetary policies by the countries converging to a common currency system, in particular, by the Eurozone candidate countries. The analytical framework assumes an inflation target as the ultimate policy goal. The converging countries act in essence as "takers" of the inflation target (the Eurozone's inflation forecast). The feasibility of adopting money growth rules depends on stable relationships between money and target variables, which are low inflation and a stable exchange rate.

[17] A dual targeting strategy assumes entering the ERM2 at a central parity close to equilibrium level only for the shortest possible period. The country should have low inflation (and subdued pressures), sustainable external balance, sound fiscal policy and a credible program for long-term fiscal consolidation as the most important characteristics. For more details see Frait (2004). Slovakia entered the ERM2 mechanism on November 27, 2005 and official numbers of economic performance seem to support the above conditions.

criterion should not pose a problem for the majority of new EU member states.[18] The reality of potential dual-targeting or the need for policy shifts in the future remains an open question, though.

As mentioned earlier, due to the lack of adequate data in the new EU countries, we are not able to perform an analysis with respect to the interest rate criterion.[19] Figure 6 illustrates the general trend calculated based on the government bond yield data. It reveals varying convergence towards the required benchmark, the long-term interest rate in the three lowest inflation countries plus 2%. While countries like the Czech Republic, Latvia and Malta come close to meeting the interest rate criterion, countries such as Estonia, Hungary and Poland show slower progress. Actually, since 2002 the interest rates have been declining further in most of the countries, reflecting lower inflation, except Hungary and Poland where the inflation rate has recently been picking up.

Fiscal convergence

No matter how successful the new members are in complying with the two monetary criteria, fiscal prudence remains the key issue. First, governments are conducive to deficits even at the time of the Growth and Stability Pact, which is in accord with classical arguments by Kydland and Prescott (1977) or Buchanan and Wagner (1977). Second, the economic theory along with the actual developments show that permanent and high deficits lead to excesses in public debt, crowd out private investments, tend to increase interest rates and to an extent disable the macroeconomic policies of governments. Thus, inflationary fiscal deficits may adversely affect the dynamics of inflation and interest rates in the future. Third, available data indeed show that the largest scope for improvement exists in terms of fiscal criteria.

As mentioned earlier, theoretical work on fiscal convergence promises an interesting research avenue. The only paper we are aware of that develops a theory on this issue is the work by Skidmore et al. (2004). They develop a theory of government spending convergence based on Barro's (1990) dynamic model of

[18] Chen (2004) examines whether purchasing power parity holds among EU members. Even for the core countries, he finds that relative PPP does not hold. In this regard, new EU members are less likely to worry about inflation convergence problems. On other hand, the recent increase in inflation in Lithuania has provoked the IMF to urge that prompt efforts are needed to "insure" against a possible breach of the Maastricht inflation limit.

[19] With the exception of the Czech Republic and Slovenia, 2001 is the first year for which data are available on the reference long-term interest rate. For the Czech Republic, data are available from April 2000, and for Slovenia from March 2002 (ECB 2004).

endogenous growth with government spending. Their convergence model indicates that nations with lower levels of government spending will experience rapid government growth while those that have higher initial levels of government spending will experience lower spending growth rates, so that government spending will tend to converge over time. The empirical test of the convergence theory requires that the ratio of government spending to lagged GDP per capita is not systematically related to government spending per capita. Their cross-country evidence, including the OECD countries, suggests that per capita government spending is converging. However, their model is not directly applicable to our case because of the Maastricht criteria requiring convergence in fiscal deficit, not in budget spending. Nonetheless, their theoretical model provides insights for testing fiscal convergence empirically.

The outlook for fiscal convergence is not as bright as nominal convergence when we examine the performance of the new EU members. The results reported in Table 4 show that there is more work to be done in reaching fiscal discipline. The dependent variables in the analyses are the ratio of the budget deficit (surplus) to GDP and total debt to GDP in a new member country minus the benchmarks, 3% for deficit and 60% for total debt. Since all deficits (debt) are indicated by a negative number (e.g., minus 2% stands for two percent deficit), all mean values that are positive indicate surplus or deficit (debt) ratios below (less negative) 3% (60%), values that are zero indicate deficit (debt) of exactly 3% (60%), and values that are negative indicate deficit (debt) ratios greater than 3% (60%). Accordingly, negative trend coefficients depict deficit (debt) increases (or declining budget surpluses) with respect to the benchmark, and positive coefficients suggest just the opposite.

Although many coefficients in Table 4a lack statistical significance in the deficit analysis, which precludes unambiguous judgment (see also Figure 7), the following pattern emerges for the Maastricht benchmark: most of the countries start with surplus or low deficit ratios and more than half of them reduce the surplus during the pre-break period; in fact six countries with statistically significant surplus coefficients proceeded with a reduction in surplus. In the post-break period, the statistically insignificant coefficients preclude a qualified judgment, but countries that start with a higher deficit ratio or lower surplus ratio decrease their deficit ratio or maintain the status quo. The ones with better fiscal records behave more slack in their fiscal stance. A pattern that emerges entails two different groups of countries: those that improved their deficit (or surplus) compared to the pre-break period and those whose deficit situation became

worse. The former countries tend to relax a bit but start spending after the break period, whereas the latter countries start disciplining their fiscal position, and their deficit ratio shows a positive trend as the deficit ratio declines. In any event, the results suggest that the deficit-to-GDP ratio condition seems to be a challenging criterion to meet.

The deficit-to-GDP ratio with respect to the benchmark of the core shows in essence a similar development as the 3% benchmark in the pre-break period (Table 4b). Despite the post-break period being characterized by primarily negative and large means, observing half positive and half negative trend coefficients indicates that most new EU members start the post-break period with much larger deficit-to-GDP ratios than the core and do not do too much to improve it. Albeit less pronounced, this tendency is also observed when we compare the new members with the periphery (Table 4c). Another difference between the benchmark regressions versus the core and the periphery concerns the number of endogenous breaks. Since the benchmark regressions display a lower amount of breaks, we deduce that the core and the periphery go through a change in fiscal behavior. One can claim that the higher number of positive post-break trend coefficients in the core and periphery regressions point towards slack fiscal discipline in the EU15 rather than discipline in the ten new members.

Convergence of the general government debt-to-GDP ratio towards the Maastricht benchmark of 60% is displayed in Table 5a and Figure 8. Further, Tables 5b and 5c show the test results in comparison with the core and the periphery (in a similar fashion as with the budget deficit). The dependent variable in Table 5a is the consolidated debt–to-GDP ratio in a new member country minus the 60% benchmark. A positive number indicates a debt ratio below 60% since the negative 60% benchmark subtracted from a less negative debt ratio yields positive values; thus, for example, a mean value of 40 means a 20% debt-to-GDP ratio. All countries, except Hungary, start with a debt-to-GDP ratio lower than the Maastricht benchmark of 60% since the mean coefficients are all positive. Many positive trend coefficients observed in the pre-break period suggest that a member country is actually not converging to the 60% benchmark but rather further decreasing its debt-to-GDP ratio. However, countries like Cyprus, Malta and Slovenia increase their indebtedness towards the benchmark prior to the break period.

The increase in the debt-to-GDP ratio is a common feature of the post-break period, especially in the case of the three countries mentioned above. A similar tendency, with even a higher number of negative trend coefficients, is observed when

the 60% benchmark is replaced by the actual debt-to-GDP ratio in the periphery. As Figure 8 clearly displays, the continuous decline in the periphery's debt to GDP ratio is the underlying reason behind the results in Table 5c. Core benchmark results in Table 5b display a more promising picture because of a higher number of positive (yet insignificant) trend coefficients, which is indicative of better fiscal prudence. However, another quick glance at Figure 8 shows that the slight decline in the core's debt situation is the culprit behind this result. Such results keep the new members within acceptable debt positions for the time being, but we can hardly call it a success story because their indebtedness increases in general and its dynamics are discomforting.

Fiscal convergence criteria may be understood as a proxy to guarantee a sound fiscal state of the economy. In the absence of excessive deficits, inflationary pressures are less likely to materialize and tension between the inflation and exchange rate convergence criteria during the ERM2 period is more likely to decline.[20] Our empirical results are supportive of the arguments that fiscal sustainability is not only a necessary but also a sufficient condition for the new EU members to enter the Eurozone (e.g. Buiter 2004).

Our results, however, indicate that ongoing reform of the public finance systems in the whole EU25 is an agenda that is not to be underestimated. In the new EU members it is even more important since a neglect of public finance reforms and lack of fiscal discipline could lead to serious consequences for these countries, well beyond the satisfaction of the Maastricht criteria and the consideration of entry into the Eurozone. Our results have other important implications regarding the ongoing reforms of the fiscal framework of the EU. One implication is for the authorities in the new EU members to better coordinate fiscal and monetary policies to improve fiscal discipline.[21] Such a claim is supported by our empirical evidence as well as that presented by Gleich (2003) who shows that countries having institutional structures that are more conducive to strengthening coordination and cooperation in budget decision-making have been associated with lower budget deficits and reduced debt levels.

[20] Our findings are in line with argument of de Grauwe and Schnabl (2004b, p.16) that "while a restrictive fiscal policy helps to simultaneously achieve the Maastricht monetary and exchange rate criteria, it also contributes to fiscal stability as budget deficits are constrained and the stock of public debt are reduced. This could be crucial for these countries whose budgets deficits have increased considerably recently".

[21] For a review of the literature on the interaction of monetary and fiscal policies in a monetary union, see Dixit (2001) and Dixit and Lambertin (2001). For supporting empirical evidence, see Darnaut and Kutos (2005).

To further see the importance of institutional design on fiscal policy outcomes, Table 6 reports the institutional indexes of the budget process in the CEE8 plus Bulgaria and Romania, the latter two being candidate countries. The indexes are reported in detail in Gleich (2003). It is based on the sum of the scores on budget preparation, legislation (authority) and implementation, each having between zero and four points, with the cumulative index ranging from zero to 12. Higher index scores indicate higher fiscal discipline. We report the indexes for the years 1997 to 2001 to see the progress on the budget process (if any). The results in Table 6 show that two of the Baltic countries, Estonia and Latvia, have the highest scores, indicating better fiscal performance than the rest of the countries. In terms of worst performance, (besides Bulgaria and Romania), we observe Hungary and Lithuania. Over time, we see an improvement in budget institutions in the Czech Republic and Poland, while other countries did not seem to attempt to improve their budget designs. This is despite the room for improvement as the maximum value of the index is 12, while the highest score is 8.32 (Estonia), indicating that the member EU states have reached only 60-70 percent of their full-capacity institutional design. Our results support those of Gleich (2003) in that they indicate countries with weak budget institutions tend to have a lower level of fiscal discipline, and even less inflation and interest rate convergence (see interest rate convergence results for Poland and Hungary).

How can the new member states improve fiscal performance and achieve fiscal discipline? Table 7 reports the sub-indexes of the cumulative budget institutional index reported in Table 6. The sub-indexes include scores for budget preparation, legislation and implementation. Each sub-index ranges from zero to four and higher scores indicate a higher level of fiscal discipline. The results are reported for 2001 and are obtained from Gleich (2003). Although all countries tend to do better in term of the implementation side, empirical evidence suggests that this is not as important as the preparation and authority (legislation) stages of the budget to lower budget deficit and fiscal debt (Gleich 2003). Unfortunately, the scores for preparation and legislation are poor across all the countries. The best performers in the preparation stage are Latvia, Slovenia, Poland, the Czech Republic and Estonia, in that order, while Hungary is the worst performer, receiving a score even lower than that of Bulgaria and equal to that of Romania. In terms of legislation scores, the Czech Republic, Estonia and Poland do the best, while Hungary, Latvia and Lithuania perform the worst, but they do better than Romania and Bulgaria. Overall, the results suggest that the new EU member states have

poor budget preparation and legislation scores (reaching a maximum score of 3 and 2.69, respectively), indicating significant room for further improvement (up to a score of 4). Hence, reforms in the areas of budget preparation and legislation would be required to improve the fiscal discipline of the new member states.

The second policy implication of our results is to implement polices to improve fiscal consolidation.[22] In this respect, von Hagen et. al. (2002) study the experience of the European countries. They find that successful experiences leading to budget surpluses include policies that focus on expenditure reductions rather than on revenue-raising polices such as higher taxes. To further improve fiscal balances, they also suggest supply-side measures in the labor market, such as cutting wages and improving competitiveness. To shed further light on this issue, Table 8 reports the current federal expenditures and revenues for 2000 and 2004 to see the developments in the budget. In terms of expenditures (Table 8a), all countries have been able to lower their subsidies and interest payments; however, they face significant outlays in social benefits, including in-kind transfers. Together, these social benefits expenditures reach close to 30% of GDP for some countries (Slovenia, etc.), with the least expenditure to GDP ratio being 20% or so (Cyprus, Estonia, Latvia). Following von Hagen et al. (2002), our results suggest that a reduction in social benefit expenditures would be desirable for improving fiscal performance in the future. However, this is a politically sensitive area and progress may be difficult to achieve quickly. Other areas of expenditures that could be cut down is collective consumption and employee compensation expenditures, each eating up close to or more than 10 % of GDP. However, we observe that most of the countries increased their spending in these areas in 2004 relative to 2000. In sum, the new member states need to make significant cuts in the areas of social benefits, collective consumption and employee compensation in the future to balance their budget and improve their fiscal performance. Of course, the other option is to raise taxes. However, the results in Table 8b suggest that most countries have been lowering both direct and indirect taxes in 2004 relative to 2000. This is widely suggested in the literature and although such trends are sensitive to the economic cycles experienced by the countries, lowering taxes is consistent with the recommendations of many observers (e.g. von Hagen et al. 2002).

[22] Daviddi and Ilzkovitz (1997) provide a discussion of this and other related issues.

A third policy implication that follows from our results is that EU policymakers may consider adopting fiscal policy rules, rather than a counter-cyclical fiscal policy. Some countries (Poland and the Netherlands) have already introduced fiscal rules into the laws and constitutions (Tanzi 2005). Of course, the fact that the member states have different fiscal positions certainly creates implementation problems initially. For example, some countries have high deficits, while other countries have high debt and vice versa. Tanzi (2005) therefore suggests that "flexibility is required as to time needed to conform to the rule, but the rule should not be relaxed to the point of making sinning more acceptable for everyone" (p. 63).

5. Conclusion and Policy Implications

We have examined real, nominal and fiscal convergence of the recent EU member states towards EU standards. Our paper contributes to the convergence literature in several significant methodological and conceptual ways. Compared to earlier studies, our study provides a more comprehensive look at the convergence performance and prospects of the new members, not only because it includes measures of fiscal convergence and broader measures of inflation convergence, but also uses vastly flexible tests of convergence, allowing for structural breaks, hence, providing improved inferences. Instead of using industrial production as a measure of real convergence, we also employ data on real GDP per capita. We also measure real convergence using not only local currencies but also euros to capture the impact of euro-area aggregate demand changes and to make inferences about exchange rate convergence.

Our results regarding real convergence are promising for the new EU members. Despite the observed widening of the gap between GDP per capita levels in euros, closer inspection of the growth rates show that the faster growth rate of the new members will help narrow this gap, leading to the "catching-up" of new members in the next few decades. Especially the stronger growth rates after the beginning of the accession talks (post-break) are indicative of the benefits of the membership prospects or the membership itself, strengthening convergence to the Union. The outcome of the tests examining per-capita real GDP in local currencies confirms convergence projections with respect to Germany as well as to the periphery. Especially, the results of the post-break period indicate that the introduction of the euro has increased the real per-capita convergence process. However, our finding of slow but steady per-capita convergence towards the EU standards suggests that it will take several decades for the

convergence to be fully completed. Policymakers can shorten this process by designing further structural reforms and encouraging more FDI and trade flows into the new members.

We also find significant nominal and monetary policy convergence, which is consistent with some of the recent studies. Results on inflation and interest rates show the significant success of the new members in achieving the criteria set by the Maastricht Treaty, as well as progress towards the ECB's interpretation of price stability. On the other hand, we observe serious deficiencies in meeting the criteria on deficit-to-GDP and debt-to-GDP ratios. Such lack of fiscal discipline raises warning signals for both the new and old members, way behind those set under the Excessive Deficit Criteria. The newcomers should try to emulate the discipline and success of the newest six members of the EU15 in reducing their deficit and debt ratios. Fiscal consolidation through expenditure-reduction policies, along with a supply-side-oriented policy, reducing unit labor costs and increasing competitiveness, are some policy choices in this regard. Otherwise, current fiscal practices may delay the entry of the new EU members to the ERM II and hence their adoption of the euro.

In conclusion, our results indicate that the new EU members have achieved significant nominal convergence and are making steady progress toward real convergence; however, their progress on fiscal convergence has been discouraging. Therefore, especially countries with significant fiscal deficits should not rush to join the Eurozone. Instead, they should improve their fiscal institutions by improving budget preparation and legislation processes and by introducing further budget reforms aimed at cutting expenditures down, especially in the areas of collective consumption, compensation, and social benefits. This is perhaps best achieved by introducing fiscal rules that are sufficiently flexible to deal with the problem of different initial fiscal positions across the old and new member states.

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Table 1: Timing of the EU Admission Process

	Application Submitted	Admission Negotiations	
		Beginning	End
Czech Republic	January 17, 1996	March 31, 1998	December 13, 2002
Cyprus	July 3, 1990	March 31, 1998	December 13, 2002
Estonia	November 24, 1995	March 31, 1998	December 13, 2002
Hungary	March 31, 1994	March 31, 1998	December 13, 2002
Latvia	October 13, 1995	October 13, 1999	December 13, 2002
Lithuania	December 8, 1995	October 13, 1999	December 13, 2002
Malta	July 16, 1990	October 13, 1999	December 13, 2002
Poland	April 5, 1994	March 31, 1998	December 13, 2002
Slovakia	June 27, 1995	October 13, 1999	December 13, 2002
Slovenia	June 10, 1996	March 31, 1998	December 13, 2002

Source: European Commission

Table 2a: Euro Real GDP Per Capita Convergence (to the EU15 core)

	PSW test with endogenous break selection (regression of y_t with J_T correction)				*TW test with endogenous break selection (using y_t regression and $T^{-1/2}t_y$)*				*Break date*
Countries	μ_1	δ_1	μ_2	δ_2	μ_1	δ_1	μ_2	δ_2	
Cyprus	**-0.853****	0.002	**-0.857****	**0.003****	**-0.853****	0.002	**-0.857****	**0.003****	1997Q1
Czech Rep	**-1.765****	**0.014****	**-1.703****	0.002	**-1.765****	0.014	**-1.703****	0.002	1997Q3
Estonia	**-2.457****	**0.014****	**-2.267****	**0.015****	**-2.457****	**0.014****	**-2.267****	**0.015****	1999Q2
Hungary	**-1.875****	0.003	**-1.868****	**0.006****	**-1.875****	0.003	**-1.868****	**0.006****	1996Q2
Latvia	**-2.695****	**0.009****	**-2.526****	**0.018****	**-2.695****	**0.009****	**-2.526****	**0.018****	2000Q1**
Lithuania	**-2.858****	**0.012****	**-2.723****	**0.016****	**-2.858****	**0.012****	**-2.723****	**0.016****	1999Q3
Malta	**-1.172****	**0.002***	**-1.093****	-0.002	**-1.172****	0.002	**-1.093****	-0.002	2000Q2
Poland	**-2.186****	**0.011****	**-2.054****	**0.003****	**-2.186****	**0.011****	**-2.054****	**0.003****	1997Q4**
Slovak Rep.	**-2.071****	**0.007****	**-2.021****	**0.007****	**-2.071****	**0.007***	**-2.021****	**0.007***	1999Q2
Slovenia	**-1.112****	**0.005****	**-0.958****	**0.008****	**-1.112****	**0.005****	**-0.958****	**0.008****	2000Q2**
Table 2b: Euro Real GDP Per Capita Convergence (to the EU15 periphery)									
Cyprus	**-0.116****	0.039	**-0.049****	0.000	**-0.116****	0.039	-0.049	0.000	1995Q3
Czech Rep	**-0.947****	**0.012****	**-0.912****	-0.001	**-0.947****	0.012	**-0.912****	-0.001	1997Q3
Estonia	**-1.643****	**0.011****	**-1.495****	**0.011****	**-1.643****	**0.011****	**-1.495****	**0.011****	1999Q1
Hungary	**-1.070****	0.005	**-1.069****	**0.003****	**-1.07****	0.005	**-1.069****	**0.003****	1996Q1
Latvia	**-1.879****	**0.007****	**-1.737****	**0.014****	**-1.879****	**0.007****	**-1.737****	**0.014****	2000Q2**
Lithuania	**-2.040****	**0.009****	**-1.942****	**0.012****	**-2.04****	**0.009****	**-1.942****	**0.012****	1999Q3
Malta	**-0.357****	0.000	**-0.320****	**-0.006****	**-0.357****	0.000	**-0.320****	-0.006	2000Q2
Poland	**-1.367****	**0.008****	**-1.265****	0.001	**-1.367****	**0.008****	**-1.265****	0.001	1998Q2**
Slovak Rep.	**-1.261****	**0.005****	**-1.234****	0.002	**-1.261****	0.005	**-1.234****	0.002	1998Q4
Slovenia	**-0.295****	**0.003****	**-0.195****	**0.004****	**-0.295****	**0.003***	**-0.195****	**0.004***	2000Q1**
Crit. Value at 5%	1.51	1.88	1.92	1.81	0.88	2.00	3.00	2.01	
Crit. Value at 10%	1.21	1.58	1.65	1.54	0.67	1.47	2.37	1.48	

Note: Each number represents the natural log of thousands of Euros. The dependent variable is the per/capita output level in country *i* minus the core (or periphery) output per capita. Therefore, a negative mean coefficient indicates lower mean GDP per capita than the benchmark, and a positive trend indicates a narrowing down of this difference. ****(*****)** indicates 95%(90%) significance. Significance levels of breaks are determined using the critical values in Andrews and Ploberger (1994).

Table 2c: Local Currency Real GDP Per Capita Convergence (to EU15 core)

	PSW test with endogenous break selection (regression of y_t with J_T correction)				*TW test with endogenous break selection (using y_t regression and $T^{-1/2}t_y$)*				*Break date*
Countries	μ_1	δ_1	μ_2	δ_2	μ_1	δ_1	μ_2	δ_2	
Cyprus	2.10	0.25	1.70*	**0.35****	2.10	0.25	1.70	**0.35****	1997Q1
Czech Rep	**-11.90****	**1.44****	-5.70**	0.15	**-11.90****	1.44	-5.70	0.15	1997Q3
Estonia	**-6.80****	**1.36****	12.20**	**1.50****	**-6.80****	**1.36****	**12.20****	**1.50****	1999Q2
Hungary	-0.20	0.30	0.50	**0.56****	-0.20	0.30	0.50	**0.56****	1996Q2
Latvia	**-5.90****	**0.93****	**10.90****	**1.80****	**-5.90****	**0.93****	**10.90****	**1.80****	2000Q1**
Lithuania	-0.40	**1.19****	**13.00****	**1.56****	-0.40	**1.19****	**13.00****	**1.56****	1999Q3
Malta	-0.50	-0.04	**4.30****	0.10	-0.50	-0.04	4.30	0.10	1996Q2
Poland	**-3.90****	**1.12****	**9.60****	**0.30****	**-3.90****	**1.12****	**9.60****	**0.30****	1997Q4**
Slovak Rep.	**-2.50***	**0.68****	2.40	**0.66****	-2.50	**0.68***	2.40	**0.66***	1999Q2
Slovenia	**-2.60****	**0.54****	**12.70****	**0.77****	**-2.60****	**0.54****	**12.70****	**0.77****	2000Q2**
Table 2d: Local Currency Real GDP Per Capita Convergence (to the EU15 periphery)									
Cyprus	**4.40****	0.15	1.20	0.08	**4.40***	0.15	1.20	0.08	1996Q4
Czech Rep	**-8.60****	**1.07****	**-6.80****	-0.10	**-8.60****	1.07	-6.80	-0.10	1997Q3
Estonia	**-3.80****	**1.01****	**9.30****	**1.15****	**-3.80****	**1.01****	**9.30****	**1.15****	1999Q1
Hungary	**2.70****	0.02	**1.20****	**0.30****	**2.70****	0.02	1.20	**0.30****	1996Q4
Latvia	**-2.90****	**0.58****	**9.60****	**1.43****	**-2.90****	**0.58****	**9.60****	**1.43****	2000Q2**
Lithuania	**2.80***	**0.80****	**10.80****	**1.21****	2.80	0.80	10.80	**1.21****	1999Q3
Malta	**2.50****	-0.01	**5.80****	**-0.63****	**2.50***	-0.01	5.80	-0.63	2000Q2
Poland	-0.70	**0.75****	**8.10****	0.04	-0.70	**0.75***	**8.10****	0.04	1997Q3**
Slovak Rep.	0.80	0.29	0.30	**0.34***	0.80	0.29	0.30	0.34	1999Q2
Slovenia	0.60	**0.17****	**8.90****	**0.44****	0.60	0.17	**8.90****	**0.44***	2000Q1**
Crit. Value at 5%	1.51	1.88	1.92	1.81	0.88	2.00	3.00	2.01	
Crit. Value at 10%	1.21	1.58	1.65	1.54	0.67	1.47	2.37	1.48	

Note: All real GDP figures have been equalized at the base year 1996 (beginning period for Maltese data). The dependent variable is the per-capita output level in country *i* minus benchmark output per capita. Therefore, convergence would be reflected with a significant positive trend. Positive mean levels (e.g., post-break) means that new members have grown more since 1996, and positive trends mean that they continue to do so. ****(*****)** indicates 95%(90%) significance.

Table 3a: Inflation Convergence (to benchmark = lowest 3 non-negative inflation rates plus 1.5%)

	PSW test with endogenous break selection (regression of y_t with J_T correction)				*TW test with endogenous break selection (using y_t regression and $T^{-1/2}t_y$)*				
Countries	μ_1	δ_1	μ_2	δ_2	μ_1	δ_1	μ_2	δ_2	*Break date*
Cyprus	0.260	-0.023	1.576	-0.089	0.260	-0.023	1.576	-0.089	2000M12
Czech Rep	**-5.737****	-0.055	-2.115	0.072	**-5.737****	-0.055	-2.115	0.072	1998M10
Estonia	**-24.129****	1.018	**-6.899****	**0.102****	**-24.129****	1.018	-6.899	0.102	1996M11*
Hungary	**-23.799****	**0.403****	**-9.188****	**0.156****	**-23.799****	**0.403****	**-9.188****	**0.156***	1999M6
Latvia	**-10.627****	**0.274****	0.210	0.001	**-10.627****	**0.274****	0.210	0.001	1999M4**
Lithuania	**-34.576****	**1.853****	-3.870	**0.111****	**-34.576****	**1.853****	-3.870	0.111	1997M4**
Malta	**-2.061****	**0.029****	0.729	-0.010	**-2.061****	0.029	0.729	-0.010	2000M10
Poland	**-17.109****	**0.272****	**-8.285****	**0.249****	**-17.109****	**0.272***	-8.285	**0.249****	1999M10
Slovak Rep.	-0.672	**-0.189***	-3.937	0.003	-0.672	-0.189	-3.937	0.003	2000M6
Slovenia	**-7.677****	**0.077****	**-7.040****	**0.088****	**-7.677****	0.077	**-7.040****	0.088	1999M11
Crit. Value at 5%	1.51	1.88	1.92	1.81	0.88	2.00	3.00	2.01	
Crit. Value at 10%	1.21	1.58	1.65	1.54	0.67	1.47	2.37	1.48	

Note: The dependent variable is the benchmark inflation level minus the inflation in country *i*. Therefore, a negative mean will indicate higher inflation levels than the benchmark, and a positive coefficient indicates an improvement or narrowing of this gap. ****(*)** indicates 95%(90%) significance. Significance levels of breaks are determined using the critical values in Andrews and Ploberger (1994).

Table 3b: Inflation Convergence (to the core inflation)

Countries	*PSW test with endogenous break selection (regression of y_t with J_T correction)*				*TW test with endogenous break selection (using y_t regression and $T^{-1/2}t_y$)*				*Break date*
	μ_1	δ_1	μ_2	δ_2	μ_1	δ_1	μ_2	δ_2	
Cyprus	-0.815	-0.019	1.324	**-0.113***	-0.815	-0.019	1.324	-0.113	2000M12
Czech Rep	**-6.690****	-0.054	-2.610	0.067	**-6.690****	-0.054	-2.610	0.067	1998M11
Estonia	**-24.980****	1.022	**-7.965****	**0.107****	**-24.980****	1.022	-7.965	0.107	1996M12*
Hungary	**-24.663****	**0.396****	**-9.797****	**0.152****	**-24.663****	**0.396****	**-9.797****	**0.152***	1999M6
Latvia	**-11.452****	**0.264****	-0.442	-0.002	**-11.452****	**0.264****	-0.442	-0.002	1999M3**
Lithuania	**-35.297****	**1.833****	**-4.907***	**0.116****	**-35.297****	**1.833****	-4.907	**0.116***	1997M4**
Malta	**-3.110****	**0.033***	0.482	-0.033	**-3.110****	0.033	0.482	-0.033	2000M10
Poland	**-18.065****	**0.271****	**-8.886****	**0.237****	**-18.065****	**0.271***	**-8.886****	**0.237***	1999M9
Slovak Rep.	-1.636	**-0.190***	-4.153	-0.018	-1.636	-0.190	-4.153	-0.018	2000M6
Slovenia	**-8.811****	**0.087****	**-7.390****	**0.067****	**-8.811****	0.087	**-7.390****	0.067	1999M8
Table 3c: Inflation Convergence (to the periphery inflation)									
Cyprus	**2.134****	-0.058	2.265	-0.089	**2.134***	-0.058	2.265	-0.089	2000M12
Czech Rep	-2.885	-0.160	-2.348	**0.089***	-2.885	-0.160	-2.348	0.089	1998M8
Estonia	**-22.488****	**1.167****	**-6.335****	**0.110****	**-22.488****	1.167	-6.335	**0.110***	1997M4
Hungary	**-21.608****	**0.353****	**-9.086****	**0.171****	**-21.608****	**0.353****	**-9.086****	**0.171***	1999M6
Latvia	**-8.012****	**0.188****	0.053	0.018	**-8.012****	0.188	0.053	0.018	1998M7
Lithuania	**-31.666****	**1.748****	-3.544	**0.116****	**-31.666****	**1.748****	-3.544	**0.116***	1997M4**
Malta	-0.061	-0.011	1.386	-0.008	-0.061	-0.011	1.386	-0.008	2000M9
Poland	**-14.983****	**0.226****	**-8.160****	**0.258****	**-14.983****	0.226	-8.160	**0.258***	1999M9
Slovak Rep.	1.456	**-0.236****	-3.175	0.001	1.456	-0.236	-3.175	0.001	2000M6
Slovenia	**-5.738****	0.042	**-6.675****	**0.087****	**-5.738****	0.042	**-6.675****	0.087	1999M8
Crit. Value at 5%	1.51	1.88	1.92	1.81	0.88	2.00	3.00	2.01	
Crit. Value at 10%	1.21	1.58	1.65	1.54	0.67	1.47	2.37	1.48	

Note: Values are in percentages. The dependent variable is the inflation level in the core (or periphery) minus the inflation rate of country *i*. Therefore, a negative mean will indicate higher inflation levels than the benchmark, and a positive coefficient indicates an improvement or the narrowing down of this gap.

Table 4a: Budget Deficit Convergence (to 3% of GDP)

	PSW test with endogenous break selection (regression of y_t with J_T correction)				*TW test with endogenous break selection (using y_t regression and $T^{-1/2}t_y$)*				
Countries	μ_1	δ_1	μ_2	δ_2	μ_1	δ_1	μ_2	δ_2	*Break date*
Cyprus	**2.144****	**-0.281****	0.880	-0.190	**2.144***	-0.281	0.880	-0.190	1999Q3
Czech Rep	**3.948****	**-0.141****	**2.007***	**-0.529****	**3.948****	**-0.141***	2.007	-0.529	2002Q1
Estonia	1.281	0.148	**-6.049***	**0.809****	1.281	0.148	-6.049	0.809	1999Q1
Hungary	2.415	**-0.312***	2.262	**-0.458****	2.415	-0.312	2.262	-0.458	1999Q3
Latvia	0.459	**0.251****	-0.424	**0.132****	0.459	0.251	-0.424	0.132	1998Q4*
Lithuania	**3.700****	**-0.295***	1.466	0.048	**3.700****	-0.295	1.466	0.048	2000Q1
Malta	**-8.517****	**0.174***	-0.009	**-0.370****	**-8.517****	0.174	-0.009	-0.370	1999Q3*
Poland	-0.074	**0.127****	**-1.416****	0.004	-0.074	**0.127***	-1.416	0.004	2001Q3**
Slovak Rep.	**2.969***	**-0.781****	-0.459	0.154	2.969	-0.781	-0.459	0.154	1998Q2*
Slovenia	**3.022****	**-0.066****	**3.243****	-0.013	**3.022****	-0.066	3.243	-0.013	2002Q1
Critical Values									
5%	1.51	1.88	1.92	1.81	0.88	2.00	3.00	2.01	
10%	1.21	1.58	1.65	1.54	0.67	1.47	2.37	1.48	

Note: The dependent variable is the budget deficit (surplus) to GDP ratio in country *i* minus the 3% deficit benchmark (a positive number indicates a surplus or a deficit ratio below 3% since the negative 3% benchmark subtracted from a less negative deficit ratio yields positive values). Therefore, a positive trend coefficient indicates improving comparative fiscal stance. ****(*****)** indicates 95%(90%) significance. Significance levels of breaks are determined using the critical values in Andrews and Ploberger (1994).

Table 4b: Budget Deficit Convergence (to the core level)

	PSW test with endogenous break selection (regression of y_t with J_T correction)				*TW test with endogenous break selection (using y_t regression and $T^{-1/2}t_y$)*				*Break date*
Countries	μ_1	δ_1	μ_2	δ_2	μ_1	δ_1	μ_2	δ_2	
Cyprus	**3.176****	-0.337	**-2.752****	0.002	**3.176****	-0.337	-2.752	0.002	1996Q4*
Czech Rep	**4.715****	**-0.259****	0.630	**-0.431***	**4.715****	**-0.259****	0.630	-0.431	2002Q1
Estonia	2.070	0.026	**-8.160****	**0.857****	2.070	0.026	-8.160	**0.857***	1999Q1*
Hungary	**3.196****	**-0.432****	-0.077	**-0.382****	**3.196***	-0.432	-0.077	-0.382	1999Q3
Latvia	**1.581****	0.073	**-2.900****	**0.218****	1.581	0.073	-2.900	0.218	1999Q1
Lithuania	**3.351****	-0.246	**-4.607****	**0.365****	**3.351****	-0.246	-4.607	**0.365***	1999Q1**
Malta	**-7.736****	0.053	-2.348	**-0.293****	**-7.736****	0.053	-2.348	-0.293	1999Q3
Poland	**0.778****	0.000	**-3.586****	0.190	0.778	0.000	-3.586	0.190	2001Q3**
Slovak Rep.	**3.693****	**-0.891****	-2.265	0.173	**3.693***	**-0.891***	-2.265	0.173	1998Q2*
Slovenia	**3.696****	-0.175**	2.072	0.060	**3.696****	**-0.175****	2.072	0.060	2002Q2**
Table 4c: Budget Deficit Convergence (to the EU15 periphery level)									
Cyprus	**7.446****	**-0.652****	-0.030	-0.212	**7.446****	**-0.652****	-0.030	-0.212	1999Q3**
Czech Rep	**9.206****	**-0.511****	0.723	**-0.171****	**9.206****	**-0.511****	0.723	-0.171	1999Q3*
Estonia	**6.748****	-0.248	**-6.970****	**0.791****	**6.748****	-0.248	-6.970	0.791	1999Q1
Hungary	**7.717****	**-0.683****	1.353	**-0.480****	**7.717****	**-0.683***	1.353	-0.480	1999Q3
Latvia	**5.955****	**-0.151***	-1.357*	**0.116****	**5.955****	-0.151	-1.357	0.116	1998Q4**
Lithuania	**8.768****	**-0.633****	0.553	0.022	**8.768****	**-0.633****	0.553	0.022	2000Q1**
Malta	**-3.216****	**-0.197****	-0.918	**-0.392****	**-3.216****	-0.197	-0.918	-0.392	1999Q3
Poland	**4.231****	-0.122	-2.379	-0.043	**4.231****	-0.122	-2.379	-0.043	2001Q3
Slovak Rep.	**8.438****	**-1.177****	-1.316	0.135	**8.438****	**-1.177***	-1.316	0.135	1998Q2**
Slovenia	**8.190****	**-0.384***	0.907	0.010	**8.190****	-0.384	0.907	0.010	1997Q3**
Crit. Value at 5%	1.51	1.88	1.92	1.81	0.88	2.00	3.00	2.01	
Crit. Value at 10%	1.21	1.58	1.65	1.54	0.67	1.47	2.37	1.48	

Note: The dependent variable is the budget deficit (surplus) to GDP ratio in country *i* minus the core (or periphery) budget deficit ratio (a positive number indicates a surplus or a deficit below benchmark levels and a positive trend indicates better fiscal performance).

Table 5a: Consolidated Debt/GDP Convergence (to 60%)

	PSW test with endogenous break selection (regression of y_t with J_T correction)				*TW test with endogenous break selection (using y_t regression and $T^{-1/2}t_y$)*				
Countries	μ_1	δ_1	μ_2	δ_2	μ_1	δ_1	μ_2	δ_2	*Break date*
Cyprus	**8.050****	**-0.333****	**6.191****	**-1.048****	**8.050****	-0.333	6.191	-1.048	1999Q4
Czech Rep	**47.044****	**0.276****	**51.144****	**-0.520****	**47.044****	0.276	**51.144****	**-0.520****	1998Q2**
Estonia	**50.252****	**0.195****	**54.479****	-0.044	**50.252****	**0.195****	**54.479****	-0.044	2001Q3**
Hungary	**-22.508****	**1.563****	-0.759	**0.324****	**-22.508****	1.563	-0.759	0.324	1997Q3*
Latvia	**49.115****	0.002	**46.542****	**-0.062****	**49.115****	0.002	**46.542****	-0.062	1999Q1**
Lithuania	**36.682****	0.007	**28.102****	**0.416****	**36.682****	0.007	**28.102****	0.416	1999Q3*
Malta	**24.969****	**-1.190****	3.022	**-1.202****	**24.969****	**-1.190****	3.022	-1.202	2000Q4
Poland	**8.927****	**0.807****	**20.691****	-0.203	**8.927****	0.807*	**20.691****	-0.203	1998Q4*
Slovak Rep.	**40.377****	-0.159	**23.642****	0.016	**40.377****	-0.159	**23.642****	0.016	2000Q4**
Slovenia	**49.055****	**-0.831****	**36.288****	**-0.147****	**49.055****	**-0.831****	**36.288****	-0.147	1998Q2**
Critical Values									
5%	1.51	1.88	1.92	1.81	0.88	2.00	3.00	2.01	
10%	1.21	1.58	1.65	1.54	0.67	1.47	2.37	1.48	

Note: Values are in percentages. The dependent variable is the consolidated debt to GDP ratio in country *i* minus the 60% benchmark (a positive number indicates a debt ratio below 60% since the negative 60% benchmark subtracted form a less negative debt ratio yields positive values). Therefore, a positive trend coefficient indicates improving comparative debt position. ****(*****)** indicates 95%(90%) significance. Significance levels of breaks are determined using the critical values in Andrews and Ploberger (1994).

Table 5b: Consolidated Debt/GDP Convergence (to the core debt to GDP ratio)

	PSW test with endogenous break selection (regression of y_t with J_T correction)				*TW test with endogenous break selection (using y_t regression and $T^{-1/2}t_y$)*				*Break date*
Countries	μ_1	δ_1	μ_2	δ_2	μ_1	δ_1	μ_2	δ_2	
Cyprus	**4.048****	**-0.638****	-1.128	**-0.866****	4.048	-0.638	-1.128	-0.866	1998Q4
Czech Rep	**42.968****	-0.012	**38.947****	**-0.450****	**42.968****	-0.012	**38.947****	-0.450	1999Q3
Estonia	**45.685****	0.004	**44.057****	0.304	**45.685****	0.004	**44.057****	0.304	2001Q3
Hungary	**-27.652****	**1.501****	**-8.827****	**0.394****	**-27.652****	**1.501****	-8.827	0.394	1998Q4*
Latvia	**44.842****	**-0.244****	**36.172****	0.070	**44.842****	**-0.244***	**36.172****	0.070	1999Q4
Lithuania	**31.744****	-0.139	**18.453****	**0.492****	**31.744****	-0.139	**18.453****	0.492	1999Q3**
Malta	**20.313****	**-1.371****	**-7.614****	**-0.946****	**20.313****	**-1.371****	-7.614	-0.946	2000Q4
Poland	**4.359****	**0.602****	**11.650****	**-0.197****	**4.359****	**0.602***	**11.650****	-0.197	1999Q1**
Slovak Rep.	**35.721****	**-0.341****	**13.006****	0.272	**35.721****	-0.341	**13.006****	0.272	2000Q4**
Slovenia	**43.411****	**-0.869****	**24.959****	0.011	**43.411****	**-0.869****	**24.959****	0.011	2000Q1**
Table 5c: Consolidated Debt/GDP Convergence (to the EU15 periphery debt to GDP ratio)									
Cyprus	**30.423****	-1.347	**32.245****	**-0.971****	**30.423****	-1.347	**32.245****	**-0.971****	1995Q3
Czech Rep	**66.826****	**0.971***	**73.663****	**-0.849****	**66.826****	0.971	**73.663****	**-0.849****	1996Q2**
Estonia	**71.992****	0.224	**70.694****	**-0.308****	**71.992****	0.224	**70.694****	**-0.308****	1997Q3
Hungary	0.234	**1.423****	**14.883****	0.067	0.234	**1.423***	**14.883***	0.067	1998Q2
Latvia	**73.679****	**-0.506****	**60.602****	**-0.334****	**73.679****	**-0.506***	**60.602****	-0.334	1999Q1
Lithuania	**60.240****	**-0.347***	**43.599****	-0.024	**60.240****	-0.347	**43.599****	-0.024	1999Q1*
Malta	**49.874****	**-1.751****	**15.609****	**-1.527****	**49.874****	**-1.751****	15.609	-1.527	2000Q4
Poland	**31.921****	0.554	**39.934****	**-0.501****	**31.921****	0.554	**39.934****	**-0.501****	1996Q3
Slovak Rep.	**65.282****	**-0.720****	**36.229****	-0.309	**65.282****	**-0.720****	**36.229****	-0.309	2000Q4
Slovenia	**72.274****	**-1.092****	**52.395****	**-0.469****	**72.274****	**-1.092****	**52.395****	**-0.469****	1998Q1**
Crit. Value at 5%	1.51	1.88	1.92	1.81	0.88	2.00	3.00	2.01	
Crit. Value at 10%	1.21	1.58	1.65	1.54	0.67	1.47	2.37	1.48	

Note: The dependent variable is the consolidated debt to GDP ratio in country *i* minus the core (or periphery) debt ratio (hence a negative number indicates a debt ratio worse than that of the core or the periphery and a positive trend indicates lowering comparative debt ratios).

Table 6 – Institutional Indexes of Budget Process

Countries	1997	1998	1999	2001
Bulgaria	5.33	6.08	6.08	6.08
Czech Rep.	6.43	7.42	7.42	7.19
Estonia	8.32	8.32	8.32	8.32
Hungary	5.46	5.46	5.46	5.46
Latvia	8.00	8.00	8.00	8.00
Lithuania	6.20	6.20	6.95	6.29
Poland	5.43	7.53	7.78	7.78
Romania	5.19	5.19	5.19	5.19
Slovakia	6.29	6.29	6.29	6.29
Slovenia	7.69	7.69	7.69	7.69

Source: Table 2, Gleich (2003) and authors' calculations.
Note: The index is based on a cumulative score for preparation, legislation, and implementation. See Table 7 for details. Maximum score is 12. A higher score indicates a higher level of institutional quality of The budget process and hence better fiscal discipline.

Table 7 – Sub-indexes of the Budget Institutional Index (2001)

Countries	Preparation	Legislation	Implementation
Bulgaria	1.75	1.33	3.00
Czech Republic	2.50	2.69	2.00
Estonia	2.25	2.40	3.67
Hungary	1.25	1.87	2.34
Latvia	3.00	1.33	3.67
Lithuania	1.75	1.87	2.67
Poland	2.53	2.25	3.00
Romania	1.25	0.27	3.67
Slovakia	1.75	1.87	2.67
Slovenia	2.75	2.27	2.67

Source: Table 2, Gleich (2003) and authors' calculations.
Note: Maximum score for each category is 4. A higher score indicates a higher degree of quality of budget design and hence better fiscal outcome.

Table 8a: Current Federal Expenditures and Components (% of GDP; 2000/2004 figures)

Countries	*Total*	*Subsidies*	*Interest Payments*	*Social Benefits*	*Social Transfers in kind*	*Collective Consumption*	*Employee Compensation*
Cyprus	33.5/44.1	1.4/1.1	3.5/3.4	9.4/11.6	8.2/8.3	8.6/10.2	14.2/14.8
C. Republic	42.1/51.3	2.8/3.0	0.9/1.3	12.3/12.6	10.5/10.3	11.3/9.8	7.2/8.0
Estonia	43.5/37.1	1.1/1.4	0.3/0.3	10.4/14.6	11.0/9.6	10.1/9.5	11.5/9.9
Hungary	47.7/45.5	1.3/1.5	5.6/ 4.3	12.9/13.4	11.1/13.1	9.7/11.6	10.7/13.5
Latvia	40.0/38.8	1.1/0.8	1.1/0.8	13.5/11.0	10.4/9.2	9.3/9.1	11.8/9.7
Lithuania	35.8/35.5	0.8/2.1	1.8/1.4	10.9/10.1	12.3/12.6	9.7/7.7	13.1/11.5
Malta	42.1/48.7	1.4/ 1.7	3.8/ 4.1	12.1/ 13.1	10.5/12	9.2/10.5	13.3/ 15.0
Poland	39.4/42.4	0.7/0.1	3.2/3.2	16.6/17.3	8.9/8.2	9.1/9.0	11.1/11.3
Slovakia	48.9/39.0	2.5/1.4	4.1/2.7	12.3/11.1	8.9/8.6	10.9/10.9	8.8/8.8
Slovenia	48.0/47.4	1.5/ 1.6	2.4/ 1.9	17.2/ 17.1	11.4/11.8	7.9/7.7	11.8/ 11.8
EU15	43.0/43.8	1.3/1.2	3.8/3.1	16.1/16.5	11.9/12.8	8.0/8.2	10.3/10.5
Euro Area	43.7/44.2	1.4/1.2	4.1/3.4	16.6/17.1	11.7/12.3	8.2/8.3	10.6/10.7

Source: Public Finance in the EMU 2004 Statistical Annex and EuroStat, ESA95 definition.
Note: The components do not sum to 100 because of "other expenditures" or "other revenues" that are not included in the table.

Table 8b: Current Federal Revenues and Components (% of GDP; 2000/2004 figures)

Countries	*Total*	*Direct Taxes*	*Indirect Taxes*	*Social Contributions*
Cyprus	35.3/ 39.4	11.1/ 9.2	12.7/ 16.1	6.7/ 8.4
C. Republic	38.5/ 42.7	8.4/ 9.4	11.5/ 11.9	14.5/ 14.8
Estonia	37.7/ 40.9	8.1/ 8.7	12.9/ 12.7	11.4/ 11.2
Hungary	45.3/ 47.5	9.9/ 9.7	16.4/ 16.3	13.9/ 13.6
Latvia	35.1/ 35.2	8.3/ 8.4	11.7/ 11.3	10.2/ 8.8
Lithuania	35.8/ 31.8	8.5/ 7.9	12.5/ 11.1	9.4/ 8.4
Malta	36.0/ 49.0	9.3/ 11.9	12.9/ 15.3	7.7/ 8.3
Poland	42.5/ 43.8	7.4/ 7.0	14.8/ 15.1	14.0/ 13.14
Slovakia	47.6/ 35.2	7.6/ 5.7	13.0/ 11.8	13.8/ 12.4
Slovenia	44.7/ 45.8	7.6/ 8.4	16.5/ 16.7	15.1/ 14.8
EU15	45.6/44.1	13.7/13.7	14.3/12.8	14.3/14.4
Euro Area	46.1/44.5	13.6/13.5	13.0/11.6	16.2/16.1

Source: Public Finance in EMU 2004 Statistical Annex and EuroStat, ESA95 definition.
Note: The components do not sum to 100 because of "other expenditures" or "other revenues" that are not included in the table.

Figure 1 : Quarterly GDP per capita in euros

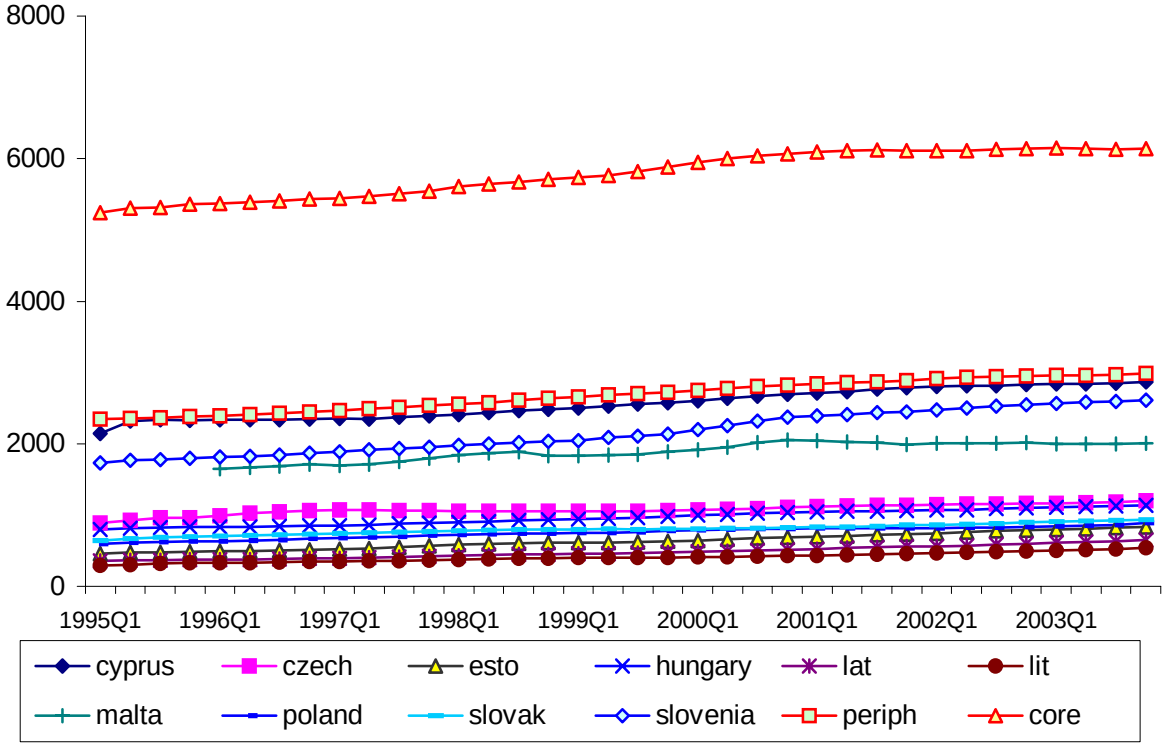


Figure 2: Real GDP per capita comparison (base=1996)

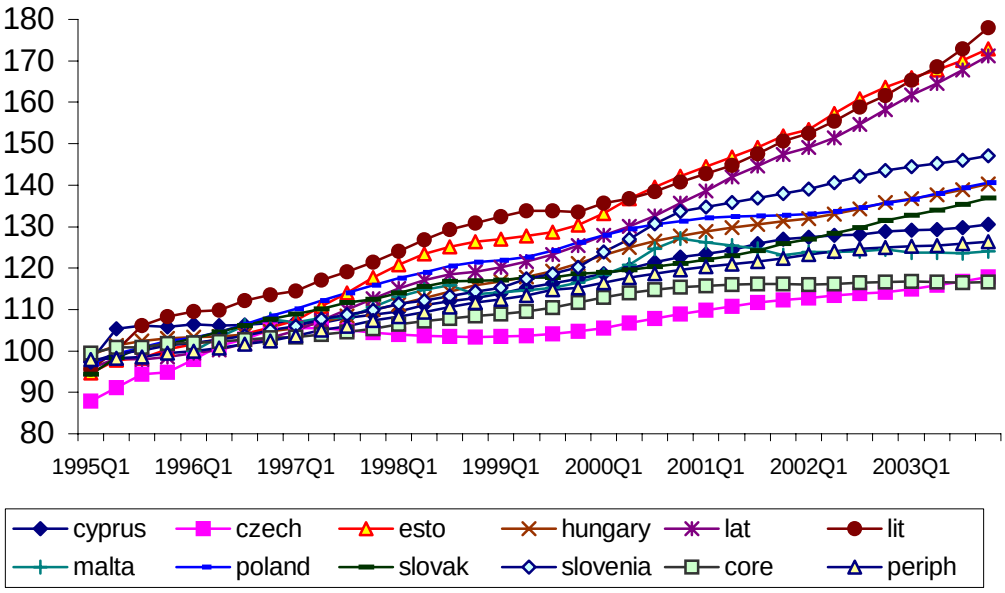


Figure 3: Convergence to core (in logs)

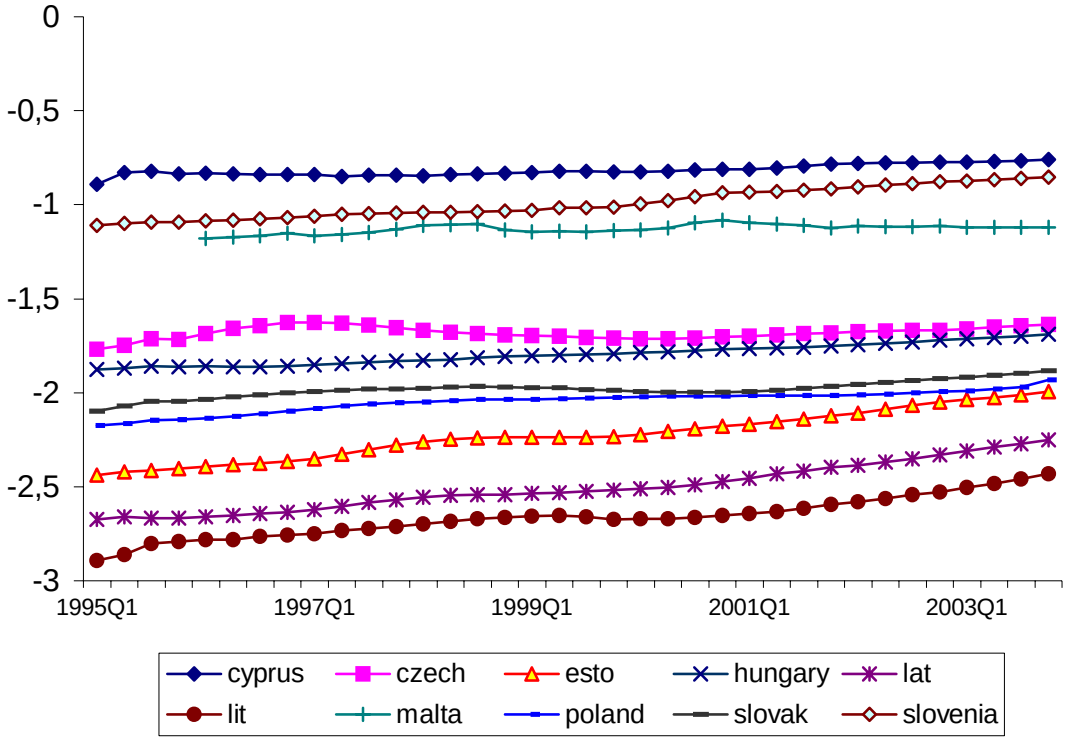


Figure 4: Convergence to periphery (in logs)

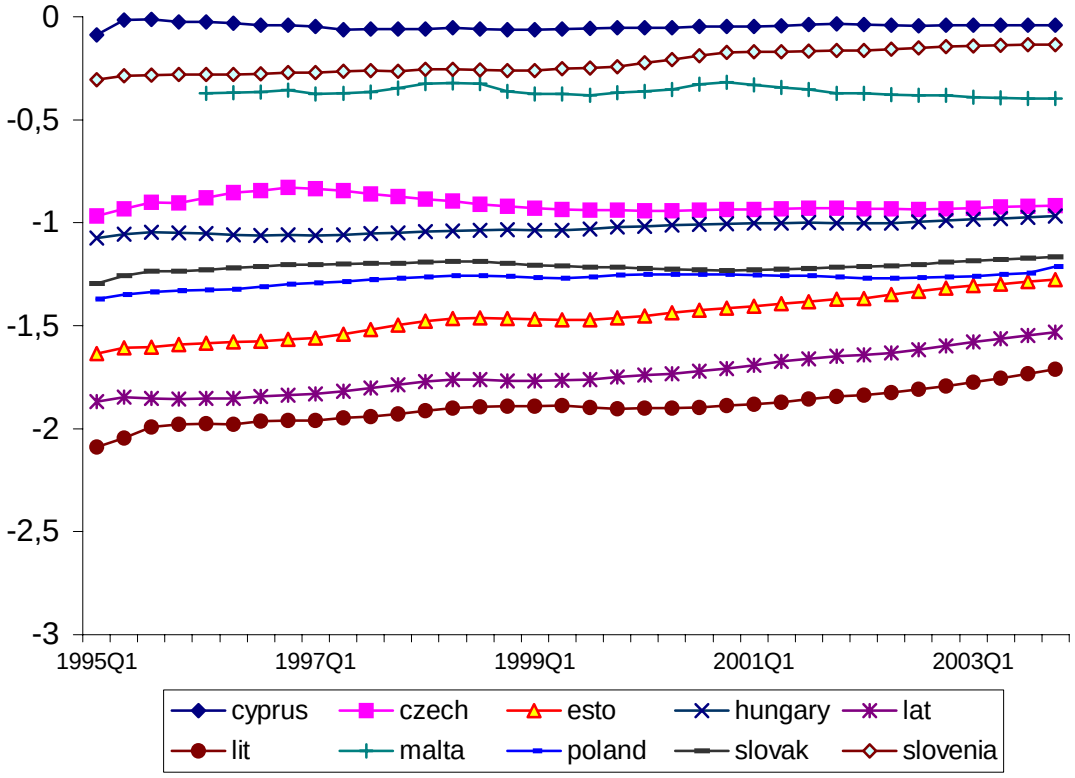


Figure 5: Inflation convergence to benchmark

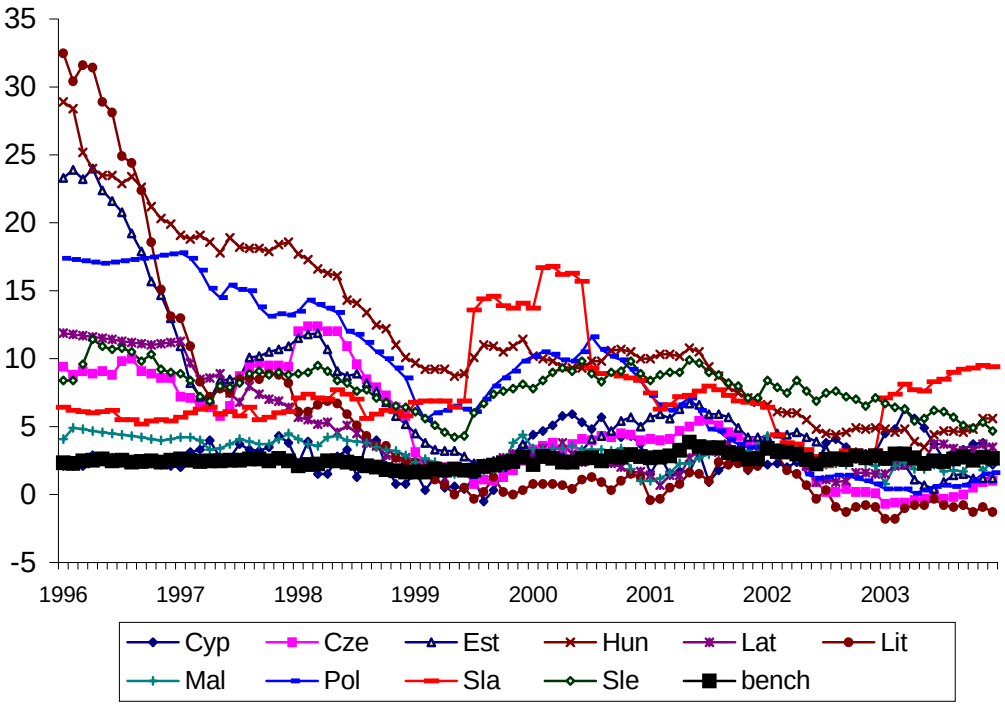


Figure 6: Interest Rate Convergence (to benchmark)

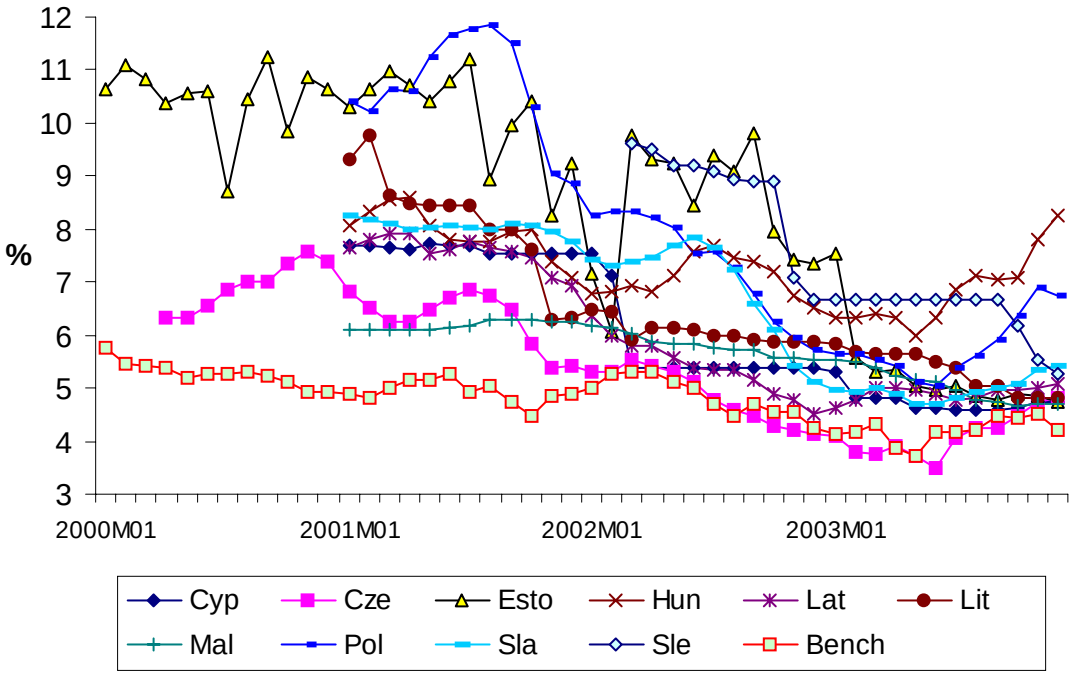


Figure 7: Budget deficit to GDP ratios

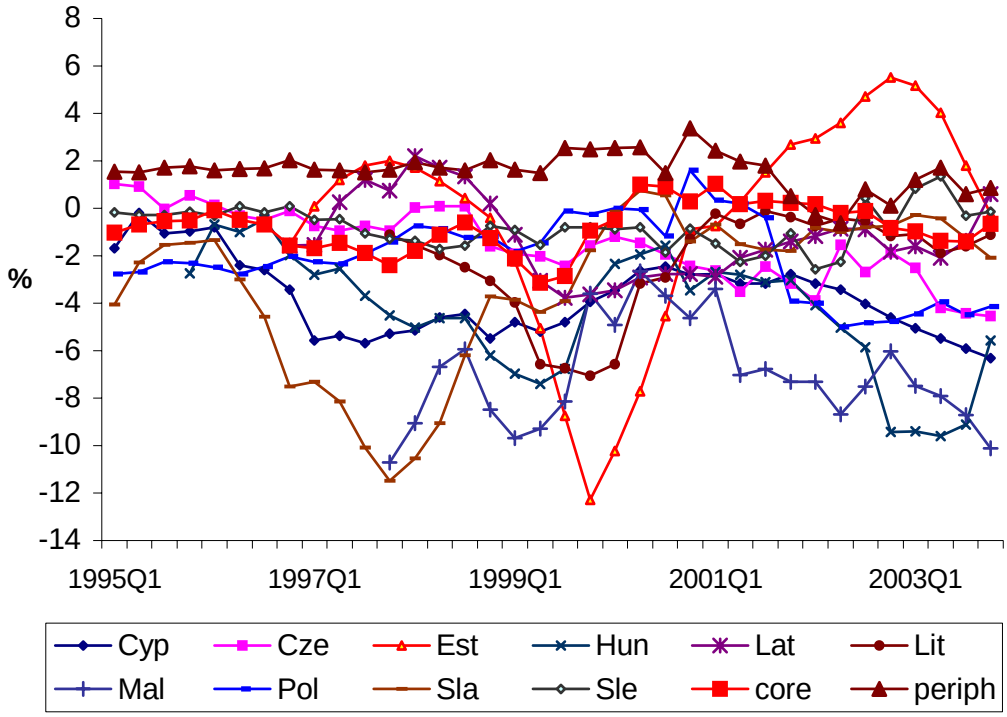
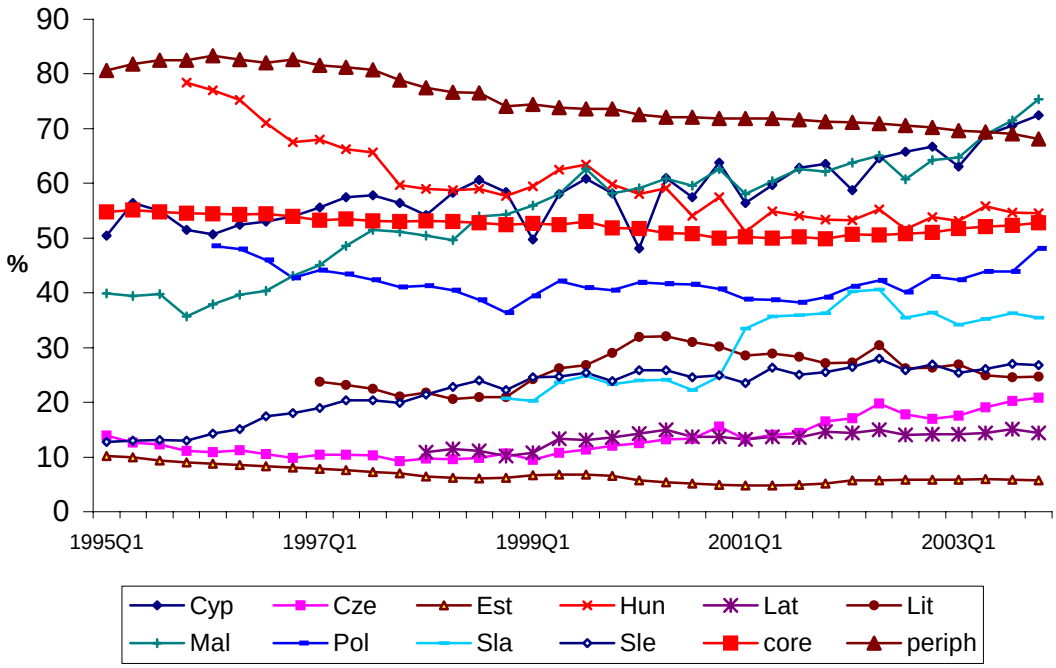


Figure 8: Debt to GDP ratio



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