



THE WILLIAM DAVIDSON INSTITUTE  
AT THE UNIVERSITY OF MICHIGAN

**Public Investment and Fiscal Performance in  
New EU Member States**

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William Davidson Institute Working Paper Number 1006  
December 2010

## Public Investment and Fiscal Performance in New EU Member States

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### Abstract

In this paper we analyze the dynamics of public investment and public finance in new members of the European Union, and also how these sectors were affected by changes in economic freedom and corruption. When we assess the role of regulation and corruption on public investment, we find that improvements in economic freedom tend to be associated with decreases in public investment, while reductions in corruption produce effects going in both directions. Similarly, we show that increases in public investment are often linked with decreases as well as increases in corruption. In terms of public finance we detect mostly improvement in debt when there is less economic regulation, while results for a deficit are less conclusive. On the other hand, improvements in the corruption environment are mostly associated with decreases in the deficit as well as debt. As a general rule that follows from our results, steps aimed at reducing corruption and the degree of economic regulation should lead towards improvements in the fiscal position in most of the new EU countries.

Keywords: public finance, public investment, economic freedom, corruption, EU convergence and integration, macroeconomic policy, fiscal reforms, new EU members

JEL Classification: E61, E62, F42, H50, H60, O11

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We acknowledge helpful comments and suggestions from Chiara Fernanda Del Bo, Massimo Florio, and Ondřej Schneider. Jan Novotný provided valuable research assistance. An earlier version of this paper was presented at the University of Milan, Université Paris I Sorbonne, and Osteuropa-Institut, Regensburg; we acknowledge comments by presentation participants. The authors gratefully acknowledge GAČR grant (402/09/1595) financial support. The usual disclaimer applies.

## 1. Introduction and motivation

In this paper, we analyze the dynamics and determinants of public investment and public finance in new members of the European Union (EU). Specifically, the roles of corruption and economic regulation are assessed. Del Monte and Papagni (2001) and Croix and Delavallade (2009) theoretically motivate the distortive effects of corruption on public investment. Dawson (2006) shows that highly regulated economies tend to have high rates of public investment. Since public investment represents a non-marginal item in a country's public finances, the role of both determinants—corruption and regulation—is important.<sup>1</sup> Moreover, we decide to explore the link between both determinants and public investment as it is extremely relevant especially with the strict budget constraints that economies worldwide are facing due to the current economic situation. Our results largely show that reductions in corruption as well as improvements in economic freedom tend to be associated with decreases in public investment. Further we show that a rise in public investment often serves as an impetus for an increase in corruption.

The history of the new EU members lends itself to a critical analysis of the economies of transition, because useful lessons for other countries can be drawn. The enlargement of the European Union in 2004 was a historical event chiefly due to the sheer number of new members entering the union as well as the fact that the majority of them were completing their transition from a command to a market economy at the same time. The post-accession performance of most of the new EU members was marked by accelerated growth and economic convergence (Čihák and Fonteyne, 2009; Havlik, 2005). Continued and increased access to foreign capital and financial deepening with respect to the old EU countries have been cited as major driving forces behind this development (Lane and Milesi-Ferretti, 2007; Giannetti and Ongena, 2009). However, the post-accession boom exposed the region to new vulnerabilities, such as large current account deficits, cross-border contagion risks and currency mismatches (Halkos and Tzeremes, 2009).

Even though the overall macroeconomic environment in the region was fairly good during the early 2000s, a lack of fiscal adjustments has remained a major concern (Kočenda, Kutan and Yigit, 2008). The fiscal stance of the new EU members became critical also with respect to public investment, which under sound governance may become a major contribution to economic growth but at the same time represents a large drain on public finances (Keefer and Knack, 2007). The reason is that overly expansive public expenditures and investment without adequate economic growth would put a strain on public finance balances over time. Economic performance and growth do not materialize solely by the simple expansion of inputs and in this respect the positive effects of

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<sup>1</sup> The formal link between public finance and public investment is exhaustively analyzed by Minea and Villieu (2009) in an endogenous growth setting. They show that the “golden rule of public finance”, which allows a government to run public-investment-oriented fiscal deficits, leads to a lower balanced-growth path in the long run, and eventually in the short run, compared with balanced-budget rules.

institutions and policies have long been recognized (e.g. Nordhaus, 1990). The importance of market institutions and economic freedom as prerequisites to growth is emphasized by Gwartney, Lawson and Holcombe (1999), who also show that economic freedom is a significant determinant of economic growth. Similar findings are provided by Heckelman (2000) in a causal analysis and Doucouliagos and Ulubasoglu (2006) in a meta-analysis. The economic environment and institutions are then linked to developments in public investment.

Two widely debated characteristics of the economic environment are the degree to which an economy is controlled or regulated by the government and the extent to which corruption is spread in the economy and society. Corruption and economic regulation as determinants of public investment have been studied theoretically as well as assessed empirically. Del Monte and Papagni (2001) in a growth model study public expenditure efficiency due to bureaucratic corruption and show its direct negative effect. Croix and Delavallade (2009) built a model to study the distortion of public investment due to corruption and conclude that even the possibility of corruption distorts the allocation of public investment.<sup>2</sup> The distortive effects of corruption on public investment are empirically documented by Tanzi and Davoodi (1997), Mauro (1998) and Delavallade (2006). Corruption is also frequently found to reduce the efficiency of public investment and expenditure (e.g. Tanzi and Davoodi, 1997; Haque and Kneller, 2008; Rajkumar and Swaroop, 2008), reduce growth (e.g. Everhart, Martinez-Vasquez and McNab, 2009; Tarhan, 2010) or imply a premium on debt instruments in more corrupt states (e.g. Depken and Lafountain, 2006). In terms of economic freedom, Dawson (2006) finds that highly regulated economies tend to have high rates of public investment and that regulation negatively impacts private investment and growth. Rahim (2007) shows that economic freedom is a significant determinant of foreign direct investment (FDI) in East Asia. Of course, FDI is frequently linked to public investment into industrial zones.

An assessment of the development in public finances is also important with respect to the recent global financial crisis that commenced in late 2008. Both macroeconomic and public finance conditions have drastically changed. The European Union economy has been hit particularly hard as most of its member states have built up strong export dependence, extensive integration with global capital markets and large macroeconomic imbalances. In this recessionary period, public finances play a more crucial role than ever before as governments launched numerous fiscally demanding projects to support economic recovery. Given the depth and scope of the recession, public finances in the EU are taking on a particular burden in responding to the crisis through meeting three objectives: (i) addressing the decline in demand through fiscal stimulus and automatic stabilizers, (ii)

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<sup>2</sup> Ellis and Fender (2006) extend Ramsey growth model to include corruption. The prediction of the model is the following: the Communist era was characterized by overinvestment in capital stock. After the change of the regime the capital stock (both physical and human) sharply falls but consumption increases as the transition country sets on the saddle path. The authors argue that the model fits quite well into the experience of the Czech Republic and Poland.

restoring the financial sector's health and supporting the intermediation function of financial markets and (iii) contributing to long-term growth prospects ensuring sustainable budgetary developments (EC 2009, "Public Finances in EMU").

Hanousek and Kočenda (2011) present the major economic developments and recent trends in macroeconomic policy design of the new EU members and discuss the overall macroeconomic situation, fiscal reforms and public finance developments for each member state with emphasis on developments in public investment. The sectors that benefited the most are transport systems, general government services, housing and education. Earlier favorable developments in the new EU members have been hampered by the recent crisis as external demand for exports fell and capital inflows into the region were reduced, coupled with lower domestic demand. The crisis has affected all new EU members to varying degrees due to the different magnitudes of earlier macroeconomic imbalances as well as differences in the degree of economic integration with the rest of the EU. The future convergence and economic development of the new EU members will mainly depend on maintaining financial stability to regain the credibility of foreign investors, having rational fiscal policies with the support of growth-enhancing public investment and the social network, and the economic situation in the region's major economic partners.

The future development of the new EU members as well as the EU as a whole depend on fiscal development. Fiscal policy within the European Union is governed by the Growth and Stability Pact, which states that a country's deficit must not exceed 3% of GDP and public debt must not exceed 60% of GDP. In reality, many larger EU members have consistently run deficits far exceeding the 3% limit and the cumulative debt of the euro area as a whole exceeds 60% (EC 2009, "Public Finances in EMU").<sup>3</sup> Despite the fact that the new EU Members are not yet part of the euro area, they are bound by the Stability and Growth Pact and they should aim to converge towards it through the set of fiscal Maastricht criteria. However, such convergence has posed considerable challenges as quantitatively evidenced by Kočenda et al. (2008).

The state of public finances in all European Union members before the global crisis of 2008 was characterized by sharp contrasts between fiscal stance, budget revenues and expenditures (EC 2008, "Public Finances in EMU"). As such, the fiscal position of the euro area and the whole EU in 2007 was the best it had been for several decades. Specifically, cross-country differences in EU members remained large, yet the general government deficit in both the euro area and the EU as a whole fell below 1% of GDP in 2007: to 0.8% in the euro area and 0.9% in the whole EU (EC 2008, "Public Finances in EMU", p. 11). In most EU countries the reported outcome for 2007 was somewhat better than the targets defined in the stability and convergence programs accepted in

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<sup>3</sup> The case of Greece, of course, stands out in this context.

2006. The overall progress also reflected the fiscal corrections put in place by countries that were in excessive deficit (Uctum et al., 2006).

In this paper we focus on the dynamics of public investment and public finance in the new EU member states, in particular examining the effects of economic freedom and corruption. The data and methodology are described in the following section. The results are reported in section 4. Conclusions follow.

## 2. Methodology

### 2.1 Structural Breaks

Economic development in the new EU countries has been marked by the presence of structural breaks: unexpected changes in macroeconomic time series. The existing empirical evidence on structural breaks in many economic indicators during the pre-accession process has been documented by Kočenda (2005), Égert et al. (2006) and Fidrmuc and Tichit (2009). Any structural break would alter the estimates representing the long-term relation between the dependent and the independent variables. For this reason, we account for potential structural breaks prior to further estimation. When found, a break is to be incorporated into the specifications to estimate the effects of economic regulation and corruption on public investment, deficit, and debt in the countries under research.

In the first stage we test for structural breaks by employing the endogenous break test of Vogelsang (1997). The test allows the detection of a break at an unknown date in the trend function of a dynamic univariate time series and does not impose restrictions on the data since it allows for a unit root in the errors and can be applied to regressors that are functions of time.<sup>4</sup> Further, since we want to detect a single decisive shift in the trend of dependent variables, restriction to a single break is in line with Vogelsang's technique.<sup>5</sup> The specification takes the form:

$$\Delta x_t = \alpha + \beta t + \delta_1 DU_t + \delta_2 DT_t + \pi x_{t-1} + \sum_{j=1}^k c_j \Delta x_{t-j} + u_t, \quad (1)$$

where  $x_t$  is a dependent variable: the ratio of public investment expenditures or deficit or debt with respect to the GDP at time  $t$ . The dummy variables for the structural break bear the following values:  $DU_t = 1$  if  $t > T_B$  and  $0$  otherwise, and  $DT_t = (t - T_B)DU_t$ . The break date,  $T_B$ , is treated as unknown. The null hypothesis of no structural change in the trend function is given by  $\delta_1 = \delta_2 = 0$ . The specification allows for a shift in the level and time trend at the break point. For

<sup>4</sup> The procedure does not impose any parametric specifications of distribution. The existence of the fourth moment is a standard assumption for a certain asymptotic parameter and the specification of a wide class of distributions is ensured.

<sup>5</sup> We do not employ a multiple-break methodology since in our setting such multiple breaks would generally indicate less pronounced swings in data or point to minor regime adjustments, which are not germane to our research. Further, even given that testing procedures for multiple breaks exist, the short time span of our data would make a search for multiple breaks potentially problematic.

this specification we use the unit-root critical values provided in Vogelsang (1997), since a conservative structural change test is meant to use the critical values appropriate for unit-root errors.

Writing the model in the form given by (1) is advantageous because the serial correlation in the errors is handled by including enough lags of  $\Delta x_t$ . The appropriate number of lagged differences ( $k$ ) in equation (1) is determined using the parametric method proposed by Campbell and Perron (1991) and Ng and Perron (1995). The upper bound of the number of lagged differences  $k_{max}$  is initially set at an appropriate level (seven lags in our case). The regression is estimated and the significance (at 10%) of the coefficient  $c_j$  is determined. If the coefficient is not found to be significant, then  $k$  is reduced by one and equation (1) is re-estimated. This procedure is repeated with a diminishing number of lagged differences until the coefficient is found to be significant. If no coefficient is found to be significant in conjunction with the respective  $k$ , then  $k = 0$ . Exogenously detected structural breaks are then incorporated in the second stage. Specific break dates, along with the statistical significance of the test results, are reported in the Tables, which provide the results of the second stage estimation introduced in Section 2.2.

## 2.2 Effects of Economic Freedom and Corruption

In the second stage we estimate via OLS the effect of economic freedom (regulation) and corruption on developments in public investment and public finance in new EU members. Our model specification is formulated in the spirit of theoretical models that link the efficacy of public investment and growth with the level of corruption and extent of economic regulation. Further, our specification also accounts for the potentially distorting effects of structural changes identified endogenously from the data. Specifically, we model public investment dynamics as:

$$x_t = \alpha_1 DC_{1t} + \alpha_2 DC_{2t} + \beta_1 DT_{1t} + \beta_2 DT_{2t} + \gamma IEF_t + \varepsilon_{1t}, \quad (2.1)$$

$$x_t = \alpha_1 DC_{1t} + \alpha_2 DC_{2t} + \beta_1 DT_{1t} + \beta_2 DT_{2t} + \delta CPI_t + \varepsilon_{2t}, \quad (2.2)$$

In both specifications the dependent variable  $x_t$  is the ratio of public investment expenditure or deficit or debt with respect to the GDP at time  $t$ . The pre-break and post-break intercepts are represented by  $DC_1$  and  $DC_2$ , while pre- and post-break trends are represented by  $DT_1$  and  $DT_2$ . Both sets of dummies are determined endogenously and there is no collinearity between them. Formally, the pre- and post-break intercepts and trends are defined as  $DC_{1t} = 1$  if  $t \leq T_b$  ( $T_b$  is an endogenously detected break date) and zero otherwise,  $DC_{2t} = 1$  if  $t > T_b$  and zero otherwise,  $DT_{1t} = t$  if  $t \leq T_b$  and zero otherwise and finally  $DT_{2t} = t - T_b$  if  $t > T_b$  and zero otherwise. The

extent of corruption is measured by the Corruption Perception Index ( $CPI_t$ ), and the extent of the economic regulation by the modified Index of the Economic Freedom ( $IEF_t$ ). We use a modified IEF that excludes items that could cause endogeneity problems; namely we exclude government spending, fiscal freedom, and freedom from corruption components. Both indices are introduced in more detail in the data section. Because of the potential multi-collinearity between both indices we also model their effects independently.

Further, both specifications are parsimonious with respect to the control variables for two reasons. One, the length of the data is limited by the span of the period under research and we do not include other traditional control variables of public spending or public finances due to the potential collinearity. The second reason is grounded in our motivation to derive the marginal effects of both indices. Since in the first stage we isolate the potential structural changes in our dependent variables, a parsimonious second stage specification is optimal to deliver the marginal effects we are interested in.

### 2.3 Causality between Public Investment and Corruption

As a complementary analysis we assess the causal link between public investment and corruption. Following Tanzi and Davoodi (1997)'s argument that "higher corruption is associated with higher public investment", we test the hypothesis whether increases in public investment are associated with increased corruption in the countries under research. As we show in Section 4 the new EU members record high public investment, plus, after their accession, the potential for further increases in investment became evident due to intra-union fiscal transfers. Formally we test investment-corruption links by employing a Granger-causality methodology. To test the null hypothesis of public investment ( $x_t$ ) not Granger-causing corruption ( $CPI_t$ ), we estimate the following unrestricted (3.1) and restricted (3.2) model specifications:

$$CPI_t = \alpha + \sum_{i=1}^p \phi_i CPI_{t-i} + \sum_{i=1}^p \tau_i x_{t-i} + z_{1t}, \quad (3.1)$$

$$CPI_t = \alpha + \sum_{i=1}^p \phi_i CPI_{t-i} + z_{2t}. \quad (3.2)$$

Under the null hypothesis of  $x_t$  not Granger-causing  $CPI_t$ , the lagged values of  $x_t$  are assumed to have no explanatory power on the current values of  $CPI_t$ . For that we test the null hypothesis  $H_0 : \tau_i = 0$  for all  $i$  up to a lag determined by the Akaike information criterion (AIC). The validity of the null hypothesis is assessed through an  $F$ -test. Finally, for completeness we also perform a reverse causality analysis to test the null hypothesis of corruption ( $CPI_t$ ) not Granger-causing public investment ( $x_t$ ).



### 3. Data

In our analysis we primarily cover the ten countries that became members of the EU in May 2004. These are (alphabetically): Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic, and Slovenia. We also collected data for EU core and periphery countries, whose development we present in a graphical form solely for comparative purposes. As in Kočenda, Kutan, and Yigit (2009), the core and periphery groups serve as synthetic benchmarks. The first group, the EU core, is represented by Austria, Belgium, France, Germany and the Netherlands. The second group, the EU periphery, is represented by Greece, Portugal, and Spain.

We collected our data from Eurostat with a quarterly data span from 1995:1 through 2008:4. Data on public investment ratios to GDP are based on the indicator Gross Fixed Capital Formation (GFCF).<sup>6</sup> We also collected data on developments in public finances. Specifically, we obtained series on deficit and public debt ratios with respect to GDP. Since the post-1995 period excludes the major transformation-related shocks observed in the early 1990s, consistent data are available for all countries through the end of 2008. We use fiscal and investment data in the form of ratio to GDP on purpose to prevent the effect of exchange rate changes distorting our results as ratios are currency-free variables. All series are broken-trend stationary with break dates determined endogenously in the first stage (Section 2.1).<sup>7</sup>

We use quarterly data from 1995:1 through 2008:4 because official EU membership applications started in 1995, and Eurostat began using harmonized time series on macroeconomic variables at that time as well. An overview of developments in public finance and investment variables as averages in the ten new EU countries, EU core countries and EU periphery countries is shown in Figure 1. There are visible differences in the dynamics of the variables in question. The new EU members initially began with lower debt that has been slowly but steadily increasing, despite the fact that the debt position is on average better than in the old EU countries. The less-than-favorable development in the new EU10 deficits is associated with increasing pressures on public expenditures and building a social state (Hanousek and Kočenda, 2011; Keefer and Knack, 2007). In terms of the dynamics, financial stability has been decreasing in the new EU members compared to the EU core and periphery. When we analyze the pre-crisis conditions of the new EU members, the observed improvement in budgetary positions in 2007 was chiefly the result of a lower expenditure-to-GDP ratio. The decline in the ratio was due to lower social transfers and other

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<sup>6</sup> An alternative indicator of public investment would be to use the sum of GFCF and capital transfers as this indicator tends to increasingly account for a higher share in total public investment at the expense of the GFCF. Unfortunately, we cannot use the alternative indicator since data on capital transfers are not available uniformly over the whole span and for all countries. Further, data on public investment before 1999 are not always fully available in some new EU states and these gaps were filled by compiling data obtained from individual Ministries of Finance that were also checked for consistency.

<sup>7</sup> We employed the Perron (1989) broken-stationarity test with break dates derived from the Vogelsang (1997) test. The results of the stationarity test are not presented, but they are available upon request.

in-kind expenditures. On the revenue side, a major positive contribution came from taxes on income and wealth, which increased by 0.4% of GDP in the euro area and by 0.2% in the whole EU in 2007. During 2005–2007 most of the EU members managed to narrow the budgetary gap, thus ensuring the sustainability of public financing, including the budgetary costs of aging (Rahman, 2008).

Finally, we collected supplementary data on two indices: economic freedom and corruption. Both indices were collected over the period 1995–2008 from the sources detailed below.<sup>8</sup> Since the indices are reported on a yearly basis we have to solve the problem of different frequencies with respect to our quarterly dependent variables. Following Ginsburgh (1973), we linearly extrapolate the values of both indices and derive quarterly figures that are consistent with the annual data. The method used helps to smooth the data and does not introduce artificial fluctuations into the data.

The Index of Economic Freedom (IEF) measured by the *Wall Street Journal* and the Heritage Foundation has tracked the economic freedom, or the extent of state regulation, around the world since 1995. Miller and Holmes (2009) describe in detail the construction of the IEF. The index consists of ten components of economic freedom, assigning a grade to each using a scale from 0 to 100, where 100 points represents maximum freedom. The ten component scores are then averaged. The ten components of economic freedom are: Business Freedom, Trade Freedom, Fiscal Freedom, Government Spending, Monetary Freedom, Investment Freedom, Financial Freedom, Property Rights, Freedom from Corruption and Labor Freedom. The IEF uses data on government spending as an argument. This leads to a possible endogeneity issue leading to biased estimates. Therefore, we recomputed the IEF by using its disaggregated components and excluding government spending, fiscal freedom, and freedom from corruption components. For estimation purposes we then used the adjusted IEF without the three components in order to obtain unbiased coefficients. The complete database of the index can be found on the Heritage Foundation web site (<http://www.heritage.org>).<sup>9</sup> The IEF has been used by various studies to assess the effects of economic freedom on public investment (Chheng, 2005; Dawson, 2006), economic growth (Heckelman, 2000; Carlsson and Lundstrom, 2002), private investment (Aysan, Nabli and Veganzones-Varoudakis, 2007), or foreign direct investment (Rahim, 2007). According to the IEF, the new EU countries perform relatively well in terms of economic freedom when compared to the old EU. Estonia, Cyprus, Lithuania, the Czech Republic, Slovakia, Malta, and Latvia are the new EU members that rank among the 50 least regulated economies. The same group contains the following old EU members: Ireland, Denmark, the United Kingdom, Luxemburg, the Netherlands, Finland, Sweden, Austria, Germany, Belgium, and Spain.<sup>10</sup>

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<sup>8</sup> Data on neither index is available prior to 1995.

<sup>9</sup> The complete database of the IEF is also available in the yearly Heritage Foundation issues of the *Index of Economic Freedom* from 1995 to 2009, where the index construction is elaborated in detail.

<sup>10</sup> Countries are listed by decreasing ranking. For details see <http://www.heritage.org/Index/Ranking.aspx>.

The Corruption Perception Index (CPI) measured by Transparency International has been tracking the perceived level of public-sector corruption since 1995 in 180 countries and territories around the world. The CPI is a "survey of surveys", based on 13 different expert and business surveys. The index ranges on a scale from 0 to 10, where 10 represents the least corrupted environment or the most corruption-free country. The complete database of the index can be found on the Transparency International web site (<http://www.transparency.org>) or in the organization's annual reports from 1995 to 2009. The CPI has been used by various studies to assess the effects of corruption on public investment (Goldsmith, 1999), economic growth (Pellegrini and Gerlagh, 2004; Bose et al., 2008), or foreign direct investment (Habib and Zurawicki, 2002). In terms of ranking the countries according to corruption the comparison differs from that based on economic freedom. All the old EU members are among the 50 countries with the least corruption. The following new EU members belong to this group as well: Malta, Estonia, Slovenia, Cyprus, Hungary, Lithuania, the Czech Republic, and Slovakia.<sup>11</sup> There is a group of six new EU members that forms a subset, belonging to both lists indicated above. This points to generally favorable developments in the new EU countries in the area of economic regulation and corruption environment.

#### **4. Results**

In this section we provide evidence on the dynamics of public investment and public finance in the new EU countries. We also report our results on the effects of economic regulation and corruption.

##### *4.1 Public Investment*

First, we present a graphical overview of the developments in public finance in Figure 2 showing the overall trends during the 1995–2008 period. There are differences in the trends in the public investment of the new EU members but, on average in 2007, public investment as a percentage of GDP in the new EU members was higher than the average ratio of public investment to GDP (2.4%) in the EU15. We complement our graphical presentation with Table 1, in which we show the structure of public investment in the new EU members. Each category is shown as a percentage of the total public investment in 2007. During 2002–2007 the major sectors to receive government investment in new EU members were economic affairs, general public services, housing and community amenities and education (by the COFOG classification).<sup>12</sup> Along with a detailed information provided in Hanousek and Kočenda (2011) we know that the largest share of economic investment by the government is aimed at developing transport sectors. By 2006 the total public

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<sup>11</sup> Countries are listed by decreasing ranking. For details see [http://www.nationmaster.com/graph/gov\\_cor-government-corruption](http://www.nationmaster.com/graph/gov_cor-government-corruption).

<sup>12</sup> COFOG—classification of the functions of the government—is the provision by Eurostat on first- and second-level government expenditure data.

expenditure increased in all of the new members, while in 2007 there was a decline in Slovakia, Hungary, and Malta. The largest increase in public investment in 2007 was registered in the Baltic countries, with an increase of 59% in Latvia alone. Public investment has been also growing at a higher pace in the new members of the EU in comparison to the EU15 economies.

Based on the data on public investment from Eurostat, public investment in economic affairs had increased on average by about 20% in the new members by 2007. This investment had decreased only in Hungary. The major sector that benefited from the growth in public investment for economic needs was the transport sector. Public expenditure in education was growing steadily in all of the new member states. However, public investment in education in 2007 remained at the same level as in 2006 in the Czech Republic and decreased in Hungary and Slovakia. The education sector in Latvia benefited from two times higher investment expenditure by the government in 2007. The public investment for environmental protection needs increased significantly on average for all new EU members. The largest increase in 2007 was registered in Estonia. In 2007 the largest growth of public investment in general public services and defense was registered in Lithuania, followed by Cyprus. While the EU15 economies have remained on top of the list of public investment level per capita, governments in the new EU members have been rapidly increasing their investment expenditure since accession to the European Union.<sup>13</sup>

The results related to the development of public investment with respect to the extent of corruption and regulation in the new EU countries are reported in Table 2. We report the results for countries divided into three groups: Central Europe (the Czech Republic, Hungary, Poland, Slovakia, and Slovenia), Baltic (Estonia, Latvia, and Lithuania) and Islands (Cyprus and Malta). In the four columns following the country column we report pre- and post-break intercepts ( $\alpha_1$ ,  $\alpha_2$ ) and trends ( $\beta_1$ ,  $\beta_2$ ). Then we report the effect of the two indices that represent the general characteristics of each country: the extent of economic regulation ( $\gamma$ ) and corruption ( $\delta$ ). Along with the individual coefficients that capture the effect of the employed indices ( $\gamma$  and  $\delta$ ), we also report the standardized coefficients ( $\gamma^*$  and  $\delta^*$ ), also known as beta coefficients (see Wooldridge, 2000; p 182). The reason for standardization stems from the fact that the Index of Economic Freedom is measured on a scale from 0 to 100 but the Corruption Perception Index is measured on scale from 0 to 10. Since both indices are in effect measured in different units, we compute standardized beta regression coefficients. These coefficients can be directly compared to assess the relative contributions of the associated explanatory variables, since they are independent of a scale of units. It holds that the larger the magnitude of the standardized beta coefficient, the bigger the contribution of the explanatory variable to the prediction of a dependent variable. For an overall discussion of the pros and cons of standardized coefficients see Bring (1994). In our case the standardized coefficients

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<sup>13</sup> Facts and numbers related to developments in public finance are provided in Hanousek and Kočenda (2011).

provide a unit-free and direct comparison of the effects that the IEF and CPI have on the dependent variables employed in our analysis. Standardized coefficients are marked with an asterisk, e.g.  $\gamma^*$  for the IEF and  $\delta^*$  for the CPI. Finally, we report the statistically significant break date and explanatory power measured by the adjusted  $R^2$ .

In some new EU countries the extent of public investment decreased during the period after the structural break as witnessed by the decreased post-break intercepts ( $\alpha_2$ ) when compared to pre-break intercepts ( $\alpha_1$ ). This is a natural outcome of the transformation process in which the role of the state was indispensable chiefly during its early stages but somewhat faded away due to the difficult economic conditions connected with transformation. However, as economic conditions improved, in the post-break period most of the countries recorded increasing public investment as can be witnessed by the positive post-break trend coefficient ( $\beta_2$ ). If we interpret only the statistically significant coefficients, then all countries, with the exception of Malta and Hungary, recorded increases in public expenditures. As we show later, those increases, on the other hand, were likely connected with a worsening of fiscal performance. The timing of the detected breaks is correlated with an economic slowdown in some countries (Poland and Slovakia) or recession (the Czech Republic). On the other hand the timing of breaks correlates with the stage of economic improvement in Estonia, Hungary, Latvia, Lithuania, and Slovenia. In the case of Malta the break is associated with the emergence of the recent global financial crisis.

Further inferences can be made from interpreting the coefficients associated with the two indices (IEF and CPI). A positive (negative) standardized coefficient  $\gamma^*$  shows that a unit of improvement in economic freedom, or a unit decrease in economic regulation, is associated with a less-than-unitary increase (decrease) in public investment. Statistically significant coefficients associated with economic freedom show that in the Czech Republic, Hungary, and Lithuania increased economic freedom (decreased regulation) leads to a decrease in the extent of public investment. This result is not surprising when linked to the significant privatization processes observed in most new EU member states during their transformation: privatization leads *per se* to lower levels of public investment and as such it is also entered as a negative item by Eurostat. On the other hand, during the time period under research, all major privatization schemes had been concluded in the countries analyzed and the potential of privatization affecting our results is minimal. In any event, the observed decrease in the extent of public investment does not necessarily mean lower investment activity as public projects might no longer crowd out private investment, allowing more room for private investment; this possibility has been evidenced by Atukeren (2005). Our finding is in line with that of Dawson (2006), who suggests that highly regulated economies tend to have high rates of public investment. On the other hand, the opposite effect is found for

Poland Slovakia, and Estonia, where less regulation (more economic freedom) is associated with an increase in public investment.

Some of the differences described above could be attributed to the effects of public-private partnership (PPP) projects. By this we mean not only the extent of PPP projects but also the way PPP projects are recorded in governmental statistics. Despite Eurostat's new accounting rules,<sup>14</sup> it is not clear under what conditions PPPs are officially recognized as being outside of the categories of public borrowing and debts that are restricted by the Maastricht criteria. On the one hand, the governments have a tendency to argue that within a PPP, risk has been transferred to the private partner and thus the borrowing can be treated as private. However, at the same time a private company's goal is to minimize the associated risk and they drift PPPs more towards public borrowing. For example, as shown in Hall (2008; p. 10) in the case of Estonia "international reporting standards may force local governments to put projects on balance sheet, which would make it impossible for the great majority of municipalities to carry them out."

The influence of corruption can be inferred from the standardized coefficients  $\delta^*$  (CPI). Improvements in a corrupt environment, or a decrease in perceived corruption, are associated with a decrease in public investment in the Czech Republic and Lithuania. This result is consistent with the empirical evidence given in Tanzi and Davoodi (1997) or Haque and Kneller (2008), who show that higher corruption is associated with higher public investment. However, we also detect that lower corruption is linked to increased public investment in Hungary, Poland, Latvia, and Cyprus. We can only conjecture that an improved governance of public expenditure might lie behind the result. Everhart, Martinez-Vazquez and McNab (2009) argue, based on their findings, that the impact of corruption on public investment appears to be more ambiguous than it has been found in the previous literature. In this light, our results are by no mean exceptional.

We further provide complementary evidence to the above results when we assess the link between public investment and corruption. In Table 3a we present the results of the causality test for whether and how public investment Granger-causes corruption. We find a Granger-causality link in seven of the countries under research. In the Czech Republic, Poland, and Slovenia, increases in public investment are associated with increased corruption. Presumably, public investment in this group of countries serves as rich soil to cultivate corruption that feeds on investment. The result is disturbing as those countries score relatively well in terms of corruption when compared with the other countries under research (see Section 3) and much better when compared to the rest of the world. On the other hand, increases in public investment are not associated with increases in corruption in Hungary, Slovakia, Estonia, and Lithuania. We can say

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<sup>14</sup> For details on the Eurostat approach to deficit and debt treatment of public-private partnerships see for example the decision from 11/02/2004: [http://epp.eurostat.ec.europa.eu/cache/ITY\\_PUBLIC/2-11022004-AP/EN/2-11022004-AP-EN.HTML](http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/2-11022004-AP/EN/2-11022004-AP-EN.HTML) .

that in this set of countries public investment does not function as an impetus for growth in corruption. Decreases in corruption propagated by a rise in public investment are encouraging especially in the case of Hungary and Slovakia, which record unpleasant performance in terms of the deficit (Hungary also in terms of debt). In the remaining countries the  $F$ -test yields statistically insignificant results. Of course, public investment is only one element potentially affecting corruption besides other elements that have been often highlighted in the literature, for example the quality of institutions or disparities in income among citizens. Still, our findings complement the results of Tanzi and Davoodi (1997), Mauro (1998), Goldsmith (1999), and Delavallade (2006) by showing that the link to public investment materializes in a number of countries as a causal effect running from public investment to corruption.

With respect to the above analysis it can be hypothesized that causality does not need to go in one direction only. As a robustness check we also performed Granger-causality tests to examine the causality running from corruption to investment and present the results in Table 3b. Causality running in both directions with the same effect would be a sign of bidirectional causality. When we put together the results in Tables 3a and 3b, in 7 out of 10 cases we do not see bidirectional causality. We do detect it in three cases, though. In the Czech Republic and Slovenia an increase in corruption is linked to an increase in investment (Table 3b) that then prompts further corruption (Table 3a). The opposite result is found for Lithuania, where an increase in investment lowers corruption but an increase in corruption deters investment. This evidence is either just a bidirectional causality or it may point to the fact that corruption and investment move in a cycle. Specifically, in the cases of the Czech Republic and Slovenia bidirectional causality could be interpreted as a bad policy trap: higher public investment is linked to an increased level of corruption and a higher level of corruption is linked to increased public investment. In any event, evidence of bidirectional causality is only limited and it should be interpreted carefully.

With respect to the above it is important to notice that the structure of the public sector in the OECD countries as a provider of public investment is becoming more decentralized as documented by Stegarescu (2005). The major dimension of the decentralization is that sub-national governments have more freedom over determining the allocation of the finance and ability to raise their own revenue. Hence, increased discretion over where and how to allocate available revenues might tend to increase corruption. That is consistent with our causality results presented above.

#### *4.2 Deficit and Debt*

The results related to public finance in the new EU countries are reported in Tables 4 and 5. Again, we report pre- and post-break intercepts ( $\alpha_1, \alpha_2$ ) and trends ( $\beta_1, \beta_2$ ). Then we report the effects of the extent of economic regulation ( $\gamma$ ) and extent of corruption ( $\delta$ ). Since both indices are measured in

different units, an inference is made based on their standardized coefficients marked with an asterisk, e.g.  $\gamma^*$  for the IEF and  $\delta^*$  for the CPI.

A positive (negative) standardized coefficient  $\gamma^*$  shows that a unit of improvement in economic freedom (measured by the IEF), or a unit decrease of economic regulation, is associated with a less-than-unitary increase (decrease) in deficit or debt. Our results show some patterns of IEF influence on both measures of public finance discipline across countries. An improvement in economic freedom is associated with increases in the deficit in the Czech Republic, Estonia, Latvia, and Malta (Table 4) and it is not associated with increases in debt in any country (Table 5). This is a finding that might point to the ungrounded optimism of governments or plainly to their incompetence in public finance management as economic regulation loosens. Figures 3 and 4 indirectly complement our results. The deficit ratio of the Czech Republic stays above the benchmark for part of the research period and that of Latvia hovers near it (Figure 3). The Maltese deficit ratio represents an unfortunate result as it is off the limit for most of the period (Figure 4).

On the other hand, an improvement in economic freedom is linked to a decline in the deficit in Poland and Cyprus (Table 4), and a decline in debt in Hungary, Slovakia, and Cyprus (Table 5). Figures 3 and 4 complement our results as the Cyprus deficit ratio stays above the benchmark for most of the research period but at its end drops sharply while Polish progress is much less pronounced (Figure 3). The Hungarian debt ratio is by far the worst example among its fellow countries followed by Cyprus (Figure 4). Slovakia, on other hand, exhibits a substantial decrease in the debt ratio during the later period under research. However, the graphical development is only an indirect complement to our empirical analysis and does not fully correspond to the presented coefficients. Finally, Cyprus is the only country where an improvement in the IEF can be linked to a decline in both deficit and debt. This is a desired outcome from a policy perspective. A parallel with this result can be found in the example of Ireland during the 1990s when, after periods of stagnation and government mismanagement, the country achieved remarkable growth. The improvement in the economy was argued to be fueled by increased economic freedom (Powell, 2003) and was paired with improvements in public finance as well.

Qualitatively different results come from the impact of corruption on both public finance measures as evidenced by the values of coefficient  $\delta^*$  in Tables 4 and 5. A negative (positive) standardized coefficient  $\delta^*$  shows that a unit of decrease in perceived corruption (measured by CPI) is associated with a less-than-unitary decrease (increase) in deficit or debt. Lowering corruption helps to reduce the deficit in Hungary, Poland, Slovakia, Slovenia, and Cyprus (Table 4). an increase in the deficit is detected solely for Lithuania. A similar, and from the policy perspective an encouraging, pattern in outcome is found with respect to the corruption effect on debt (Table 5). Again, in almost all of the countries where a statistically significant coefficient of corruption was



found, improvements in the corruption environment are associated with a decrease in a country's indebtedness, specifically in Hungary, Poland, Slovenia, and Lithuania (Table 5). An improvement in corruption is associated with an increase in the debt ratio for Latvia and Cyprus. The countries where a decrease in corruption is linked to a decrease in both the deficit and debt are Hungary, Poland and Slovenia; the opposite is detected for Lithuania. The dynamics of debt is, without a doubt, associated with the price governments in new EU countries have to pay to finance the debt. Ciocchini, Durbin, and Ng (2003) find that countries that are perceived as more corrupt must pay a higher risk premium when issuing bonds. The cost of corruption can be quite high: for example, an improvement in the corruption score from the level of Lithuania to that of the Czech Republic lowers the bond spread by about one-fifth. This is true even after controlling for the macroeconomic effects that are correlated with corruption.

Complementary evidence on indebtedness dynamics can be inferred from Figure 4. Baltic countries show the most debt-conscious attitude and they are followed by most of the Central European countries. Several countries (Hungary, Cyprus and Malta) manage their debt poorly as it exceeds the Maastricht 60% benchmark. In this respect the Maastricht 60% debt benchmark itself could influence the dynamics of the indebtedness as in several countries debt was kept relatively low prior to accession but its growth accelerated after 2004 as a negative complement to the economic catch-up after accession. This empirical evidence is in accord with Hughes Hallett and Lewis (2007) who “find that the nominal Maastricht criteria are at best irrelevant, and may be damaging for the duration of the catch-up process and well past any likely dates for Eurozone entry.”

## **5. Conclusions**

In this paper we analyze the dynamics of public investment and public finance, and how these sectors were affected by changes in economic freedom and corruption. In terms of public investment our results show that improvements in economic freedom tend to be associated with decreases in public investment. Evidence on the effect of decreasing perceived corruption is less conclusive as lower corruption is associated with both decreases and increases in public investment. Despite of the lack of a decisive pattern, our results are broadly in line with the findings from a sampling of the empirical literature that frequently offers inconclusive outcomes as well. As a complementary analysis we also test for the opposite causal effect, e.g. that public investment affects corruption. Again, our results are less than conclusive. We find that increases in investment are often linked with decreases as well as increases in corruption. The opposite causal link also offers mixed evidence. However, we also find weak evidence of a bidirectional causality that in two cases could be interpreted as a bad policy trap: higher public investment is linked to an increased

level of corruption and a higher level of corruption is linked to increased public investment. This limited evidence should be interpreted with caution, though. We acknowledge that public investment is only one element potentially affecting corruption. The absence of other elements highlighted in the literature, such as for example the quality of institutions or population income disparities, might lie behind the inconclusiveness of our findings. Still, our results lend new insights into potential developments in specific countries as the role of the government in investing into different sectors in the new EU members has been growing over the last several years, as documented in Hanousek and Kočenda (2011). This finding is policy relevant because the volume of public investment and its share in GDP has been on average increasing steadily in the new EU members as we show in Figures 1 and 2. Based on our results potential space for the growth of corruption has been increasing, too.

Our analysis aimed at public finance (deficit and debt) shows that improvements in the corruption environment are mostly associated with decreases in deficit as well as debt. Still, in a few countries the opposite effect was identified. In terms of economic freedom we detect that its improvement can be linked to both increases and decreases in deficit but deficit decline occurrence is relatively scarce. More solid results can be found in the case of debt. An improvement in economic freedom cannot be associated with increases in debt in any country or, even better, it is linked with a decline in debt. However, differences in corruption-related and economic freedom-related results linked to debt may be rooted in the fact that government bodies in the countries under study differ in their attitude to what fiscal items are placed into the category of debt. Some items may be categorized differently, despite the fact that each of them constitute a debt in effect. We are unable to effectively account for differences in these informal accounting practices in various states and they prevent us from deriving more consistent results.

The subject we aimed to analyze and the results we presented are relevant, in particular in the context of the current global imbalances and discussions in Europe about the fiscal rules that EU members should follow. Old as well as new EU countries face hard budgetary cuts and less-than-optimal developments of public finances in general. One of the major factors that cause an increase in their deficits is a sharp rise in public expenditure. We show that an increase in public investment is associated with a potential to raise corruption in several new EU countries. As a preventive measure, a good remedial action for the public investment projects could be increasing the standards of project evaluation as urged by the European Commission. Finally, as a general rule that follows from our results, steps aimed at reducing corruption and the degree of economic regulation should lead toward improvements in the fiscal position of most of the new EU countries.

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Table 1: Structure of Public Investment (in percent of 2007 total)

Country	General public services	Defense	Public order and safety	Economic affairs	Environment protection	Housing and community amenities	Health	Recreation, culture, and religion	Education	Social protection
Czech Republic	n/a	3,78	3,43	53,53	9,52	4,54	1,33	7,91	13,45	3,20
Hungary	11,27	3,23	3,98	47,87	11,11	6,65	5,28	2,65	6,47	1,49
Poland	7,63	2,14	5,16	44,44	7,33	5,91	6,75	7,91	10,99	1,73
Slovakia	12,44	2,28	12,52	28,13	5,34	19,24	1,58	6,30	8,98	3,18
Slovenia	32,71	5,50	5,50	20,70	0,85	4,42	8,37	4,96	14,11	2,87
Estonia	9,24	3,83	6,35	30,24	3,32	5,12	10,73	7,94	21,44	1,79
Lithuania	10,80	13,41	4,59	34,73	10,72	1,32	8,33	4,36	9,08	2,66
Latvia	10,47	5,39	8,08	31,80	3,67	10,30	8,77	6,83	13,08	1,59
Cyprus	35,15	0,11	3,76	16,37	3,04	19,58	3,30	6,10	12,59	0,00
Malta	11,59	n/a	1,58	21,02	11,35	1,04	39,17	2,76	9,62	2,32

Source: Eurostat, authors' computation

Note: The structure of public investment is categorized by the classification of the functions of the government (COFOG) assembled by Eurostat on first- and second-level government expenditure data.

Table 2: Public Investment in New EU Countries.

Country	$\alpha_1$	$\beta_1$	$\alpha_2$	$\beta_2$	$\gamma$	$\gamma^*$	$\delta$	$\delta^*$	Break Date	R <sup>2</sup>
Czech Republic	11,70 (1.44)	-0,10 (-4.81) <sup>a</sup>	9,12 (1.16)	0,04 (2.7) <sup>a</sup>	-0,07 (-2.72) <sup>a</sup>	-0,23	-0,15 (-1.69) <sup>c</sup>	-0,14	1998Q4 <sup>b</sup>	0,97
Hungary	10,25 (2,01) <sup>b</sup>	0,14 (6.39) <sup>a</sup>	15,35 (2.84) <sup>a</sup>	-0,03 (-1.68) <sup>b</sup>	-0,21 (-3,47) <sup>a</sup>	-0,46	0,86 (2.15) <sup>b</sup>	0,18	2002Q4 <sup>b</sup>	0,94
Poland	-3,37 (-2.20) <sup>b</sup>	-0,07 (-2,00) <sup>b</sup>	-4,33 (-2.68) <sup>a</sup>	0,06 (6.80) <sup>a</sup>	0,08 (3,21) <sup>a</sup>	0,44	0,33 (2.99) <sup>a</sup>	0,38	1999Q4 <sup>b</sup>	0,86
Slovakia	n/a	n/a	-11,73 (-2.72) <sup>a</sup>	0,02 (2.08) <sup>b</sup>	0,17 (3.29) <sup>a</sup>	1,44	0,17 (0.64)	0,15	1998Q2 <sup>b</sup>	0,92
Slovenia	-6,95 (-1.41) <sup>a</sup>	0,040 (0.89)	-6,10 (-1.58)	0,04 (2.16) <sup>b</sup>	0,11 (2.66) <sup>b</sup>	0,34	0,34 (0.91)	0,31	2004Q4 <sup>b</sup>	0,97
Estonia	-17,36 (-1.26)	-0,07 (-2.06) <sup>b</sup>	-19,92 (-1.29)	0,07 (2.63) <sup>b</sup>	0,21 (1.85) <sup>c</sup>	0,77	1,13 (1.15)	0,79	2006Q3 <sup>b</sup>	0,91
Lithuania	4,72 (1.74) <sup>b</sup>	0,08 (4.08) <sup>a</sup>	9,05 (2.54) <sup>a</sup>	0,08 (2.92) <sup>a</sup>	-0,04 (-0.81)	-0,12	-0,41 (-1.89) <sup>c</sup>	-0,11	2000Q4 <sup>b</sup>	0,82
Latvia	-55,25 (-3.49) <sup>a</sup>	-0,21 (-4,54) <sup>a</sup>	-61,42 (-3.57) <sup>a</sup>	0,18 (5.05) <sup>a</sup>	0,89 (3.52) <sup>a</sup>	0,44	-0,11 (-0.21)	-0,05	2003Q1 <sup>b</sup>	0,89
Cyprus	-0,26 (-0.02)	0,24 (5.03) <sup>a</sup>	n/a	n/a	-0,10 (-0.91)	-0,11	0,40 (1.93) <sup>b</sup>	0,25	n/a	0,81
Malta	-12,29 (2.19) <sup>b</sup>	0,03 (0.95)	-10,69 (2.59) <sup>b</sup>	-0,34 (-11.46) <sup>a</sup>	0,28 (6.38) <sup>a</sup>	0,51	-0,83 (-1.50)	-0,42	2007Q2 <sup>b</sup>	0,96

The endogenously found and statistically significant break date is obtained from the first stage regression. The break in the dependent variable Public Investment divides the time period for which we report pre- and post-break intercepts ( $\alpha_1$ ,  $\alpha_2$ ) and trend coefficients ( $\beta_1$ ,  $\beta_2$ ). The Index of Economic Freedom (IEF) is recorded on a scale of 0-100 (0 denotes the most regulated economic environment) and its effect is captured by coefficient ( $\gamma$ ). The Corruption Perception Index (CPI) is measured on a scale of 0-10 (0 denotes the most corrupted environment) and its effect is captured by coefficient ( $\delta$ ). T-statistics are provided in parentheses. Since both indices are measured on different scales, for direct comparison of their effects we provide standardized coefficients ( $\gamma^*$  and  $\delta^*$ ). Symbols a, b and c denote statistical significance at the 1, 5, and 10% levels, respectively. The explanatory power is measured by the adjusted R<sup>2</sup>.

Table 3a. Public Investment and Corruption Causal Links:

## Public Investment Granger-causing Corruption

Country	Lags: I / C	Effect	F-Stat	p-value
Czech Republic	2 2	Increase	F(2,44) = 48,20 <sup>a</sup>	0,001
Hungary	2 2	Decrease	F(2,48) = 8,80 <sup>a</sup>	0,001
Poland	2 1	Increase	F(2,48) = 5,70 <sup>a</sup>	0,006
Slovakia	2 1	Decrease	F(2,36) = 12,20 <sup>a</sup>	0,001
Slovenia	2 2	Increase	F(2,30) = 3,47 <sup>b</sup>	0,044
Estonia	2 1	Decrease	F(2,36) = 6,25 <sup>a</sup>	0,005
Lithuania	2 1	Decrease	F(2,32) = 3,37 <sup>b</sup>	0,047
Latvia	2 2	n/a	F(2,36) = 2,23	0,123
Cyprus	2 1	n/a	F(2,16) = 0,36	0,687
Malta	2 1	n/a	F(2,12) = 0,85	0,453

Note: Lags I / C denote the number of lags on the variables Public Investment and Corruption, respectively, in Granger-causality specification. Decrease and increase effects denote a decrease or increase, respectively, in corruption caused by an increase in public investment. F-statistics are presented with the associated degrees of freedom and symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively.



Table 3b. Corruption and Public Investment Causal Links:

## Corruption Granger-causing Public Investment

Country	Lags: C/ I	Effect	F-Stat	p-value
Czech Republic	2 1	Increase	F(2,43) = 9,67 <sup>a</sup>	0,001
Hungary	2 1	n/a	F(2,47) = 0,21	0,811
Poland	1 1	n/a	F(1,45) = 0,98	0,975
Slovakia	2 1	Increase	F(2,35) = 4,51 <sup>b</sup>	0,018
Slovenia	2 1	Increase	F(2,31) = 4,27 <sup>b</sup>	0,023
Estonia	3 3	n/a	F(3,31) = 1,77	0,174
Lithuania	2 1	Decrease	F(2,31) = 2,91 <sup>c</sup>	0,070
Latvia	2 1	Decrease	F(2,35) = 4,92 <sup>b</sup>	0,013
Cyprus	3 3	n/a	F(1,11) = 0,28	0,839
Malta	1 2	Decrease	F(1,12) = 6,36 <sup>b</sup>	0,027

Note: Lags C / I denote the number of lags on the variables Corruption and Public Investment, respectively, in Granger-causality specification. Decrease and increase effects denote a decrease or increase, respectively, in public investment caused by an increase in corruption. F-statistics are presented with the associated degrees of freedom and symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively.

Table 4: Deficit in New EU Countries.

Country	$\alpha_1$	$\beta_1$	$\alpha_2$	$\beta_2$	$\gamma$	$\gamma^*$	$\delta$	$\delta^*$	Break Date	R <sup>2</sup>
Czech Republic	-155,00 (-3,3) <sup>a</sup>	0,87 (6,9) <sup>a</sup>	-123,60 (-2,9) <sup>a</sup>	0,18 (1,21)	1,24 (2,34) <sup>b</sup>	0,37	-0,20 (-0,12)	-0,02	2000Q3 <sup>b</sup>	0,95
Hungary	18,20 (0,4)	-0,91 (-5,3) <sup>a</sup>	-11,10 (-0,2)	0,67 (12,1) <sup>a</sup>	0,57 (0,64)	0,18	-7,66 (-4,24) <sup>a</sup>	-0,24	2001Q2 <sup>b</sup>	0,94
Poland	12,40 (15,7) <sup>a</sup>	0,18 (4,34) <sup>a</sup>	n/a	n/a	-0,38 (-2,05) <sup>b</sup>	-0,22	-2,59 (-2,20) <sup>b</sup>	-0,33	n/a	0,93
Slovakia	60,10 (3,28) <sup>a</sup>	-0,07 (-0,39)	56,30 (2,11) <sup>b</sup>	0,08 (0,29)	-0,49 (-1,45)	-0,28	-10,87 (-6,1) <sup>a</sup>	-0,63	2000Q1 <sup>c</sup>	0,92
Slovenia	-2,53 (-0,3)	0,11 (2,29) <sup>b</sup>	-1,40 (-0,15)	0,42 (1,06)	-0,25 (-1,44)	-0,19	-3,00 (-2,88) <sup>a</sup>	-0,66	2000Q3 <sup>b</sup>	0,96
Estonia	-88,10 (-4,8) <sup>a</sup>	-0,15 (-2,74) <sup>a</sup>	-97,10 (-4,6) <sup>a</sup>	0,28 (4,41) <sup>a</sup>	0,30 (2,14) <sup>b</sup>	0,79	2,48 (1,62)	1,28	2007Q2 <sup>b</sup>	0,88
Lithuania	n/a	n/a	-25,40 (-1,68) <sup>c</sup>	-0,21 (-2,37) <sup>b</sup>	-0,32 (-1,31)	-0,33	2,48 (2,99) <sup>a</sup>	0,25	1998Q4 <sup>b</sup>	0,92
Latvia	-145,90 (-3,8) <sup>a</sup>	0,14 (1,00)	-146,80 (-3,4) <sup>a</sup>	2,20 (5,99) <sup>a</sup>	1,58 (3,14) <sup>a</sup>	0,40	-4,33 (-1,53)	-0,92	2004Q4 <sup>b</sup>	0,93
Cyprus	210,40 (4,42) <sup>a</sup>	-0,78 (-4,08) <sup>a</sup>	156,90 (4,17) <sup>a</sup>	2,64 (1,15)	-1,35 (-3,97) <sup>a</sup>	-0,11	-11,68 (-1,74) <sup>c</sup>	-0,53	2004Q3 <sup>b</sup>	0,75
Malta	-69,90 (-0,64)	-0,32 (-0,44)	n/a	n/a	1,41 (2,1) <sup>b</sup>	0,56	-1,88 (-0,2)	-0,20	n/a	0,86

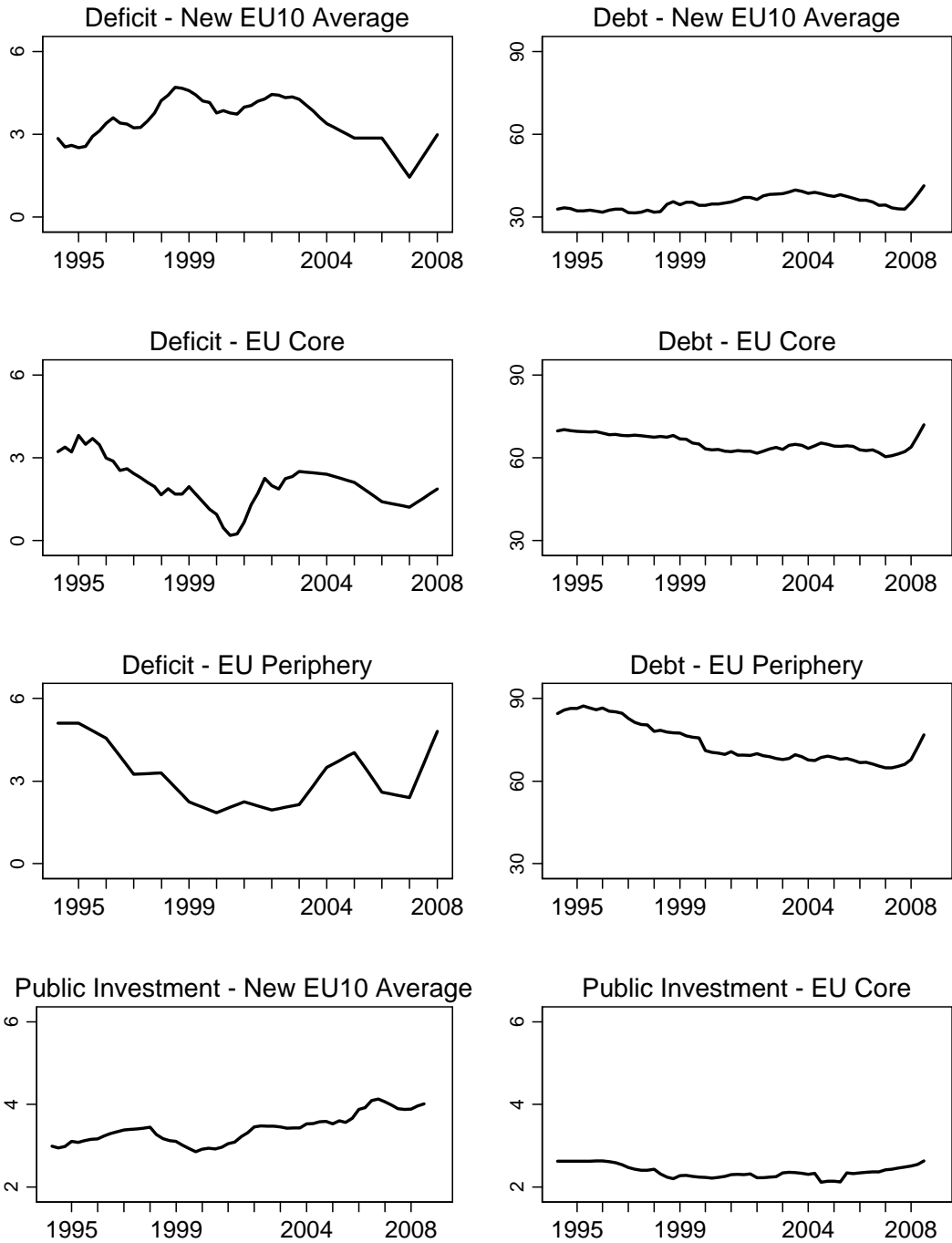
The endogenously found and statistically significant break date is obtained from the first stage regression. The break in the dependent variable Deficit divides the time period for which we report pre- and post-break intercepts ( $\alpha_1$ ,  $\alpha_2$ ) and trend coefficients ( $\beta_1$ ,  $\beta_2$ ). The Index of Economic Freedom (IEF) is recorded on a scale of 0-100 (0 denotes the most regulated economic environment) and its effect is captured by coefficient ( $\gamma$ ). The Corruption Perception Index (CPI) is measured on a scale of 0-10 (0 denotes the most corrupted environment) and its effect is captured by coefficient ( $\delta$ ). T-statistics are provided in parentheses. Since both indices are measured on different scales, for direct comparison of their effects we provide standardized coefficients ( $\gamma^*$  and  $\delta^*$ ). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The explanatory power is measured by the adjusted R<sup>2</sup>.

Table 5: Debt in New EU Countries.

Country	$\alpha_1$	$\beta_1$	$\alpha_2$	$\beta_2$	$\gamma$	$\gamma^*$	$\delta$	$\delta^*$	Break Date	$R^2$
Czech Republic	27,60 (0,75)	0,07 (0,51)	28,10 (0,85)	-0,09 (-0,8)	-0,26 (-0,66)	-0,29	-1,63 (-1,35)	-0,46	2000Q3 <sup>b</sup>	0,79
Hungary	96,20 (5,2) <sup>a</sup>	0,27 (3,97) <sup>a</sup>	102,60 (5,2) <sup>a</sup>	0,21 (3,57) <sup>a</sup>	-1,09 (-4,46) <sup>a</sup>	-1,51	-4,68 (-4,6) <sup>a</sup>	-0,70	2001Q2 <sup>b</sup>	0,88
Poland	1,80 (0,34)	-0,22 (-3,95) <sup>a</sup>	1,03 (0,16)	-0,02 (-0,72)	0,05 (0,58)	0,07	-0,75 (-2,91) <sup>b</sup>	-0,22	n/a	0,90
Slovakia	48,80 (2,59) <sup>b</sup>	0,51 (3,62) <sup>a</sup>	62,70 (3,09) <sup>a</sup>	0,14 (0,51)	-0,82 (-3,26) <sup>a</sup>	-1,39	-1,20 (-0,3)	-0,21	2000Q1 <sup>c</sup>	0,87
Slovenia	n/a	n/a	9,22 (2,95) <sup>a</sup>	-0,04 (-3,35) <sup>a</sup>	-0,01 (-0,18)	-0,01	-1,42 (-6,8) <sup>a</sup>	-0,61	2000Q3 <sup>b</sup>	0,95
Estonia	n/a	n/a	35,70 (0,77)	-0,04 (-0,25)	-0,41 (-1,12)	-0,53	-0,91 (-0,25)	-0,22	2007Q2 <sup>b</sup>	0,88
Lithuania	n/a	n/a	15,20 (3,73) <sup>a</sup>	-0,04 (-2,46) <sup>b</sup>	-0,04 (-0,77)	-0,11	-2,62 (-4,73) <sup>a</sup>	-0,58	1998Q4 <sup>b</sup>	0,92
Latvia	n/a	n/a	-14,90 (-0,79)	-0,23 (-4,31) <sup>a</sup>	-0,003 (-0,01)	-0,002	5,00 (4,54) <sup>a</sup>	3,41	2004Q4 <sup>b</sup>	0,72
Cyprus	n/a	n/a	29,50 (2,07) <sup>b</sup>	-0,42 (-12,7) <sup>a</sup>	-0,32 (-1,70) <sup>c</sup>	-0,08	2,76 (3,57) <sup>a</sup>	0,27	2004Q3 <sup>b</sup>	0,95
Malta	n/a	n/a	-10,80 (-0,33)	0,09 (0,30)	-0,001 (-0,01)	-0,003	1,60 (0,49)	0,74	n/a	0,59

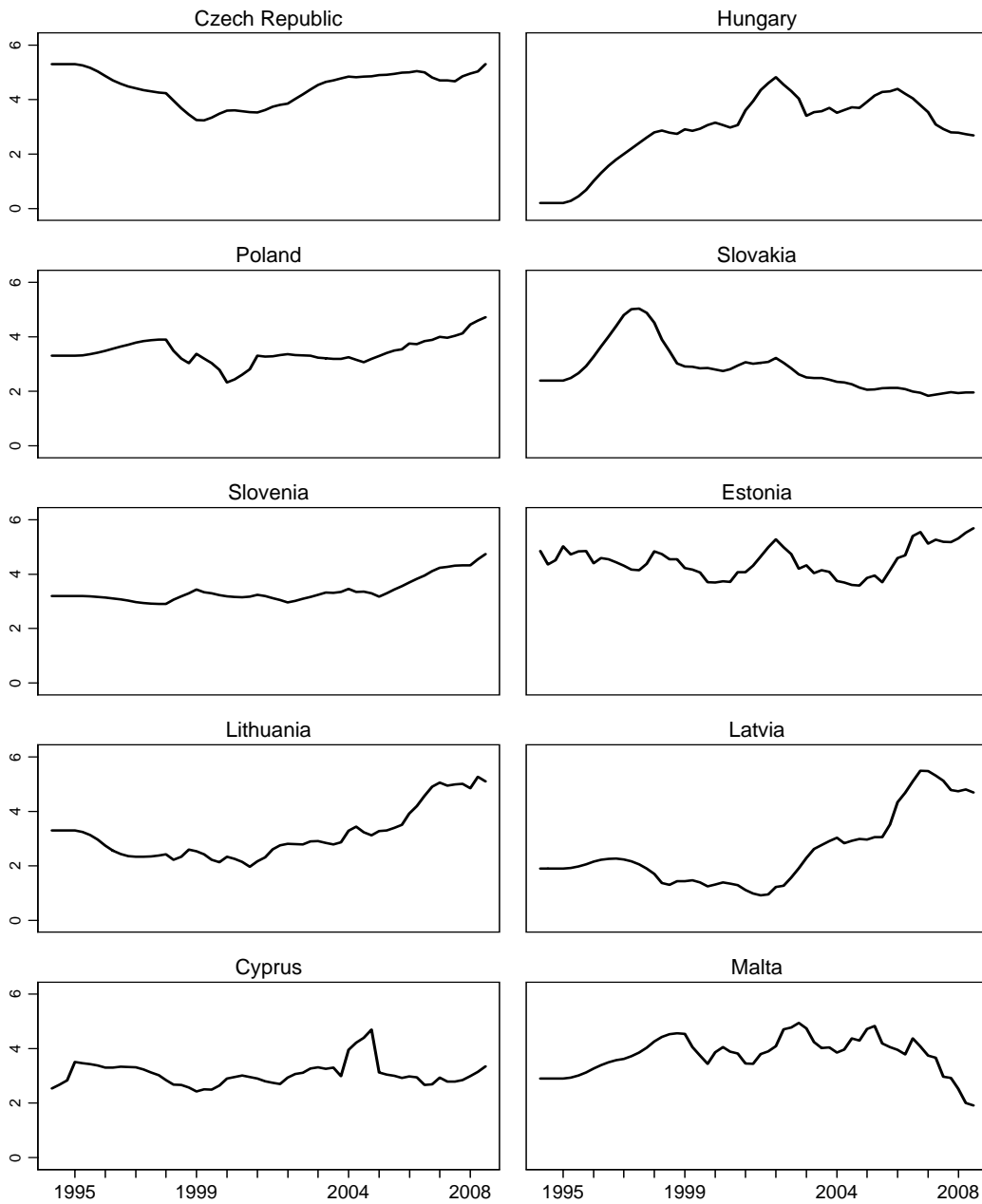
The endogenously found and statistically significant break date is obtained from the first stage regression. The break in the dependent variable Debt divides the time period for which we report pre- and post-break intercepts ( $\alpha_1$ ,  $\alpha_2$ ) and trend coefficients ( $\beta_1$ ,  $\beta_2$ ). The Index of Economic Freedom (IEF) is recorded on a scale of 0-100 (0 denotes the most regulated economic environment) and its effect is captured by coefficient ( $\gamma$ ). The Corruption Perception Index (CPI) is measured on a scale of 0-10 (0 denotes the most corrupted environment) and its effect is captured by coefficient ( $\delta$ ). T-statistics are provided in parentheses. Since both indices are measured on different scales, for direct comparison of their effects we provide standardized coefficients ( $\gamma^*$  and  $\delta^*$ ). Symbols a, b, and c denote statistical significance at the 1, 5, and 10% levels, respectively. The explanatory power is measured by the adjusted  $R^2$ .

Figure 1: Public Finance and Public Investment in the European Union: An Overview



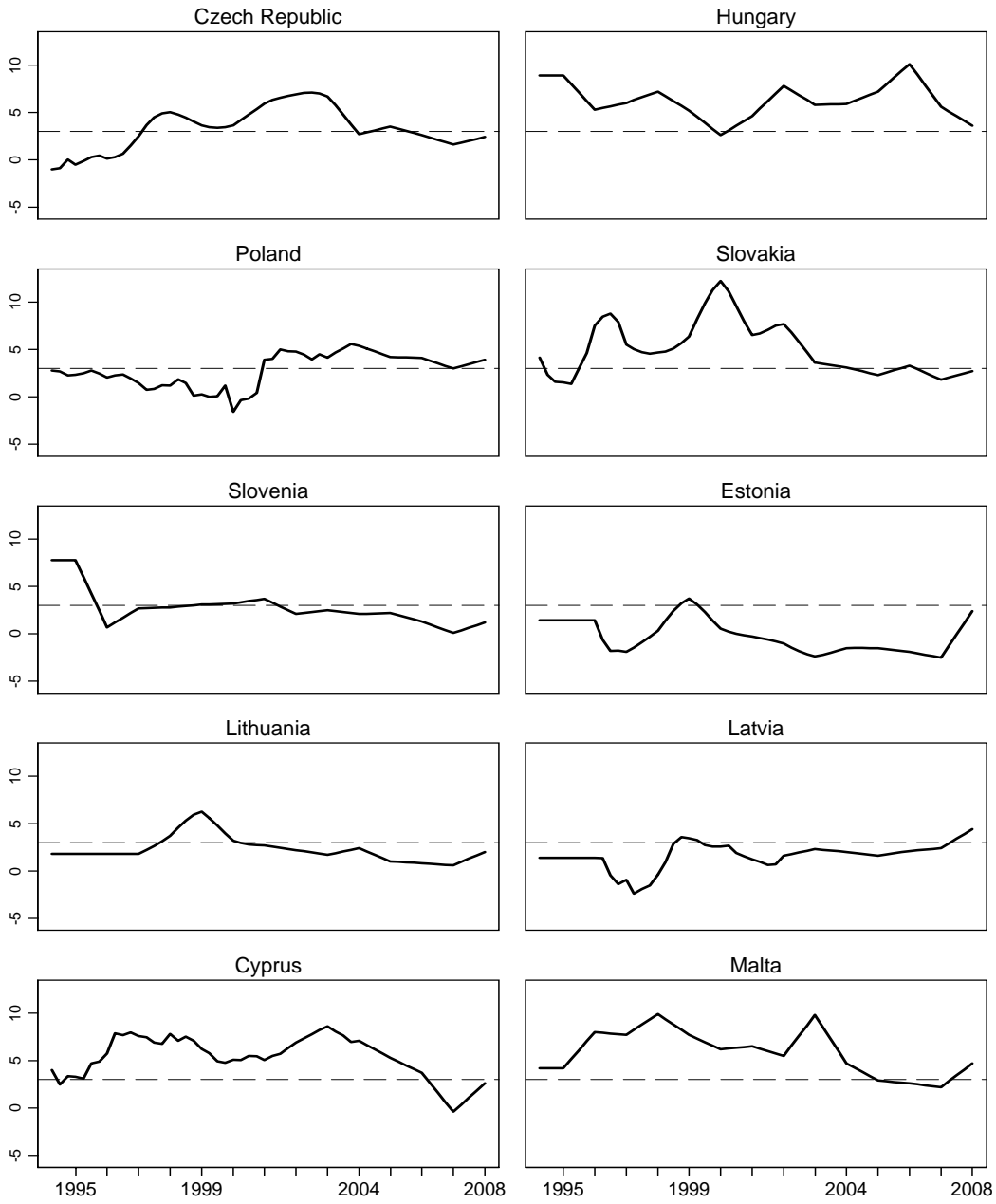
Note:  
 Public investment, deficit and debt are plotted as percentages of GDP. The “New EU10” group is comprised of the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, Slovenia, Cyprus and Malta. The EU core is represented by Austria, Belgium, France, Germany and the Netherlands. The EU periphery is represented by Greece, Portugal, and Spain.

Figure 2: Public Investment in New EU Countries



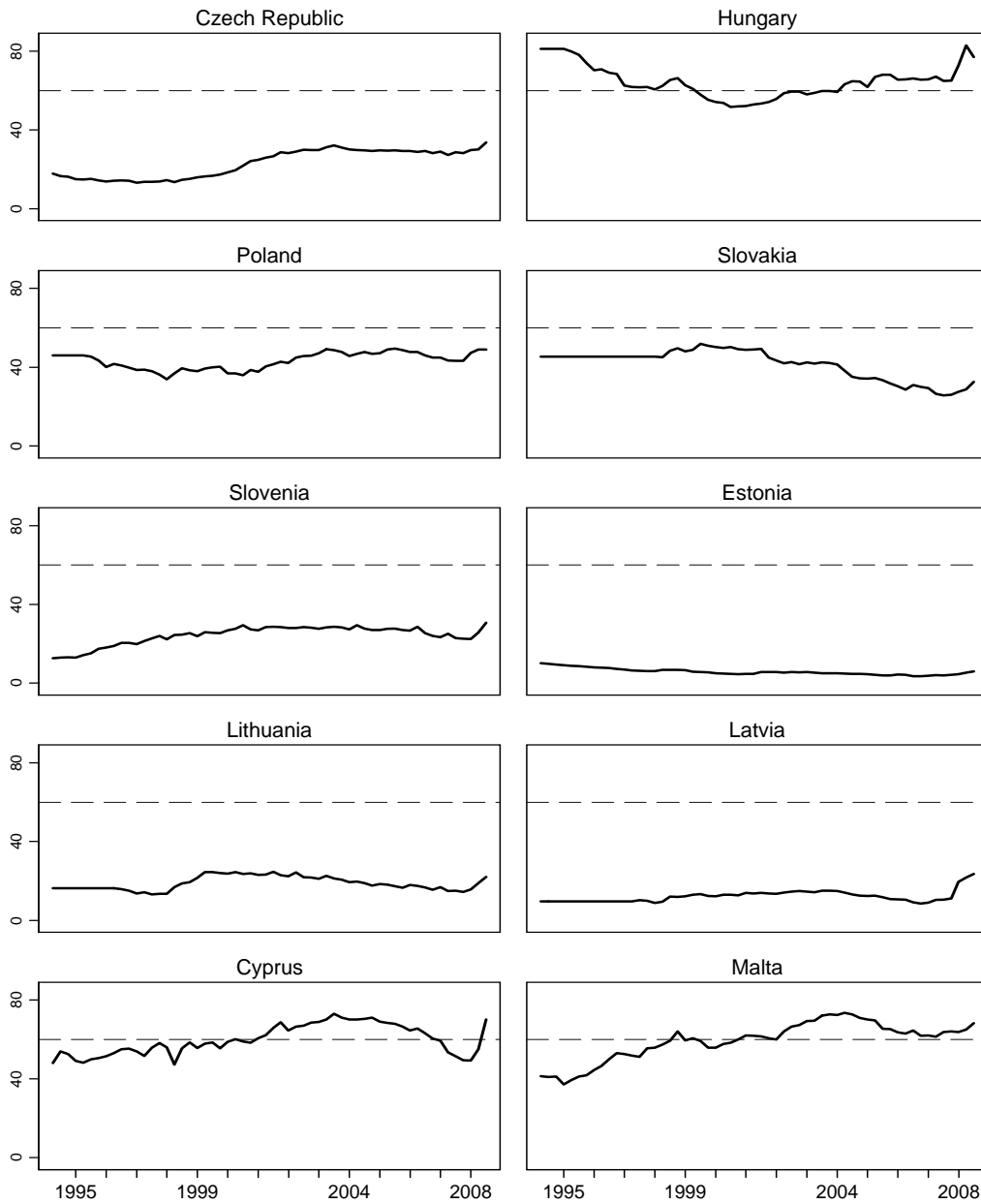
Note: Public investment is plotted as a percentage of GDP. The new EU members group is comprised of the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, Slovenia, Cyprus and Malta.

Table 3: Deficit in New EU Countries



Note: Deficit is plotted as a percentage of GDP. The dashed line shows the Maastricht benchmark, e.g. the maximum deficit equals 3% of GDP.

Figure 4: Debt in New EU Countries



Note: Debt is plotted as a percentage of GDP. The dashed line shows the Maastricht benchmark, e.g. the maximum debt equals 60% of GDP.

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