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*Rumen Dobrinsky*

# What is Happening to Growth in Europe?

Rumen Dobrinsky is senior research associate of the Vienna Institute for International Economic Studies (wiiw).

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***Summary***

*The paper undertakes an empirical analytical assessment of some of the determinants of economic growth in the EU during the past decade, with a specific focus on the Central and Eastern European (CEE) members of the EU. The methodology is based on a combination of different statistical methods and techniques including descriptive statistics and stylised facts as well as some widely used empirical models of growth, including the testing of convergence hypotheses and running panel growth regressions.*

*During the decade prior to the global economic and financial crisis, the growth model in the EU was disproportionately skewed towards the attraction and mobilisation of additional resources as compared to the reliance on structural supply-side factors. In particular, EU growth on average was extremely finance-dependent and debt-intensive. The ensuing debt crisis in the euro area rejected this growth model on the grounds of its unsustainability. The current debt overhang implies that countries (both governments and businesses) will have to learn to live with less resources (in the first place financial) at their disposal. Thus one of the key factors for invigorating future growth could be raising the efficiency of resource utilisation, including the utilisation of public funds.*

*Growth in the CEE countries was also finance-dependent and debt-intensive but, on average, not to the extent observed in the older EU Member States. CEE economies relied on improvements in structural supply-side factors such as productivity, innovation and competitiveness to a larger degree than was the case in the older EU members. Thus CEE countries may have a larger degree of policy freedom to deal with the implications of the crisis.*

*The paper also addresses some policy issues related to the possible invigoration of economic growth in the EU and, in particular, in CEE. It suggests that one of the areas of policy reforms that could invigorate growth is that targeting improvements in the efficiency of financial intermediation and more efficient allocation of financial resources. The paper also discusses some supply-side structural measures that appear to be especially pertinent to the CEE economies.*

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*Rumen Dobrinsky*

# What is happening to growth in Europe?

## 1 Introduction

Economic growth in Europe is facing unprecedented challenges. The financial crisis that started in 2007-2008 in the United States as a banking crisis, originating in excessive subprime mortgage lending by US banks, and later escalated into a global economic and financial turmoil has been a turning point as regards the economic performance of EU Member States and will likely have a profound effect on the institutional evolution of the European Union. Within the EU, the crisis evolved into a multifaceted turmoil that initially hit the financial sector, later the sovereign debt of indebted countries and, through monetary transmission and trade repercussions subsequently hitting the real economy, turned into a prolonged recession with significant negative implications for the labour markets.

No country in Europe escaped the negative effects of the crisis, one way or the other. The Central and Eastern European (CEE) EU member states (hereafter EU-10[1]) were among the worst hit by the crisis. The susceptibility of an economy to disturbing influences generated elsewhere, i.e. their vulnerability to contagion effects, depends on a myriad of factors.[2] Ceteris paribus, emerging economies – and all EU-10 countries are still considered as such – are generally regarded to be more prone to contagion. This is related both to the higher risks that financial markets assign to emerging economies (making them more susceptible to 'herd behaviour' of investors) and to the fact that many institutions in emerging markets are still immature and not always well prepared to react adequately to emerging threats.

Since the start of the crisis, economic growth in many parts of Europe has come to a halt with a number of economies experiencing prolonged or double-dip recessions. The whole of Europe seems to have entered a period of protracted economic sluggishness, with no clear prospects of a positive change at present. The EU-10 countries have not been spared the negative setback on their growth performance. Being highly open and dependent on trade with the core EU economies, some EU-10 countries, in particular, the Baltic states, experienced severe double-digit economic plunges comparable to those seen at the start of their post-communist economic transformation some two decades ago.

This paper seeks to provide some analytical insights into the process of economic growth and convergence within the EU during the past decade or so, with a specific focus on the EU-10 economies and their growth and convergence patterns. The paper attempts to present a systemic picture of the model of growth in the region based on both stylised patterns of recent EU growth performance and on empirical assessment of some of the determi-

[1] Namely, Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia.

[2] See, e.g., Claessens and Forbes (2001) and Dornbusch, Park and Claessens (2000).

nants of growth, and seeks to typify the changes therein resulting from the current crisis. In addition, the paper has a specific focus on the financing of growth in Europe, including the EU-10. The results of the empirical analysis serve to draw some policy conclusions on the prospects of growth and economic convergence within the EU.

Despite the fact that economic growth is probably one of the most widely researched topics – both theoretically and empirically – in economics, it still largely remains a puzzle both for economists and for policy makers. Suffice it to recall the deadlock – both at the level of applied economic discussion and at the level of economic policy – as to how to invigorate growth and employment during the current crisis. In view of the above it is not the objective of this paper to open a new debate on the merits of different theoretical and empirical approaches to growth issues which are abundantly discussed in the literature.

Economic growth is an extremely complex phenomenon. It is the outcome of the interaction of a myriad of supply- and demand-side factors, the mobilisation of resources, the functioning of markets, the business, policy and institutional environment and many others. Thus it is no surprise that so far there do not exist structural models that capture all actors and interactions. For the purpose of practical applied research, economists are compelled to confine themselves with simplified approaches that make their task feasible – of course at the expense of the depth and comprehensiveness of the analysis.

In view of the above, I employ in this paper some of the widely used analytical approaches that draw on well-established avenues in economic theory and applied analysis. These start from the simplest univariate growth regressions and then move on to multivariate econometric analysis, including the testing of convergence models and running different growth regressions. Each of these approaches has its strengths and weaknesses as well as limits to its analytical potential and it would be naïve to expect that any of them alone would provide a realistic picture of these complex processes. Rather my approach is to look at different aspects of the process by using different approaches and then, by putting them together, to seek the keys to the puzzle.

The paper is mostly empirical and macroeconomic in nature. In that it seeks to provide a broad macroeconomic picture of the growth patterns prevailing in Europe during the past decade in a cross-country comparative perspective, mostly comparing the performance of the EU-10 economies with that of the rest of the EU (hereafter EU-17). The funding of growth is also mostly addressed at the macro level, including the macro sources of funding and the key parameters of the macroeconomic framework that facilitates – or hinders – the channelling of finance into growth-enhancing investment opportunities. Firm-level data are occasionally used to substantiate some of the arguments. Another specific focus of the paper is on the identification of growth characteristics that are specific for the group of EU-10 countries as a whole (and, for that matter, the EU as a whole) rather than country-specific features.

The paper is organised as follows. Section 2 presents an empirical assessment of the recent patterns of economic growth in the EU and of some of the main determinants of growth in the EU in the past decade using different analytical approaches (including descriptive statistics, stylised facts as well as a range of empirical growth models). Section 3 looks into the financing of economic growth in the EU with a special focus of the changes therein during the crisis. Section 4 contains a policy discussion of the empirical assessment presented in the previous two sections and presents some considerations on what policy could do to invigorate growth in the EU and in the CEE countries. Section 5 concludes.

## 2 Empirical assessment of the recent patterns of economic growth in the EU

### *2.1 EU macroeconomic performance, 2000-2011: a brief overview*

I start with a brief general overview of EU macroeconomic performance before and during the crisis (Table 1). The macroeconomic indicators that I have put together in this table are among the key ones used in applied macroeconomic analysis; most of them will also be used in my own analytical assessment later on.

The GDP growth figures in the table support the key conclusion that since 2008 the EU as a whole has entered a prolonged and unprecedented recessionary period. The change from the years that preceded the crisis was dramatic: the average EU-27 GDP growth rate in 2008-2011 dropped by 2.4 percentage points compared to 2001-2007. The EU-10 countries fared better in so far as the recession (in the sense of negative annual growth rates) in most of them only lasted for one year. But their average annual GDP growth rate during the crisis period also dropped by 3.2 percentage points compared to the pre-crisis period.

The GDP growth figures in the table provide support to the inference that there has been an ongoing process of catching up between the EU-10 and the EU-17, both before and during the crisis. Despite the fact that on average EU-10 growth also slowed down considerably during the crisis, a positive growth differential of some 2 percentage points vis-à-vis the EU-17 was preserved in the period 2008-2011. Importantly, as seen in the table, EU-10 GDP growth in this period was almost entirely underpinned by growth in labour productivity.

Concomitantly, there was a positive differential of a similar magnitude as regards inflation performance (here measured by the GDP deflator). For the most part this differential can be associated with what came to be known as 'catch-up inflation'.[3] In fact, the observed levels of inflation differentials in the EU-10 economies compared to the EU-17 in this period

[3] Catch-up in per capita income levels and fast productivity growth are as a rule associated with fundamental structural changes in the catching up economy that lead to permanent shifts in the relative positioning of some important macroeconomic variables. In particular, there is a link between changes in relative per capita incomes and productivity across economies, on the one hand, and relative changes in their general price levels, on the other hand. It has been established both theoretically and empirically that a fast and sustained catch-up process will be accompanied by relatively high catch-up inflation. For more details see Dobrinsky (2006).

are fully consistent with the theoretically predicted values of catch-up inflation at such rates of real per capita GDP growth (Dobrinsky, 2006).

The next part of Table 1 (lines 4-12) reflects some supply- and demand-side factors that are usually considered as determining or affecting economic growth.

Throughout the whole period 2000-2011 the EU-10 maintained a positive differential vis-à-vis the EU-17 also in terms of gross fixed capital formation relative to GDP and, similarly, as regards the annual net inflow of FDI as a percentage of GDP. These differentials can be to a large extent associated with their accession to the EU during the past decade. The (expected and then actual) joining by these economies of the single market opened up considerable investment opportunities and boosted investor confidence (both local and attracted from abroad), resulting in higher shares of GDP being channelled into fixed investment and relatively larger inflows of FDI.

Related to the above, during the period 2000-2011, the EU-10 expanded considerably their export capacity. In terms of the average share of their total exports in GDP, these economies are by now much more open than the EU-17. They also achieved an impressive increase in their world export share which grew on average by some 75% over the period 2001-2011. What is also quite impressive is the fact that EU-10 economies continued to improve their export performance (as measured by domestic export shares and shares in world exports) during the crisis years as well while the EU-17 suffered a setback on both these accounts. An interesting related feature is the fact that in terms of their share in intra-EU trade, CEE economies are at present more integrated within EU trade that EU-17 economies.

Another factor (in addition to productive investment) that contributed to the favourable export performance has been competitiveness. In Table 1, I provide just one indicator that can be associated with competitiveness, namely, real unit labour costs (ULC). In terms of the dynamics of real ULC the EU-10 also maintained a favourable differential vis-à-vis the EU-17 although of a smaller magnitude as compared to the GDP and productivity growth differentials.

Table 1 also presents aggregate figures on innovation performance in the EU based on the Summary Innovation Index (SII) used in the EU's innovation scoreboard.[4] Innovation in the modern economy is considered as one of the key factors generating growth and employment. In terms of the overall innovation performance as reflected in the absolute level of the SII, the EU-10 economies on average still lag considerably behind the EU-17.

[4] See Innovation Union Scoreboard (previously European Innovation Scoreboard), various editions (http://www.proinno-europe.eu/). The Summary Innovation Index is based on a list of 25 indicators (their number has been changing over the years) which seek to capture the performance of national research and innovation systems.

Table 1

## Descriptive statistics on EU economic performance in 2001-2011

| | | EU-10 (CEE) | | | EU-17 (the rest) | | | EU-27 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2001-2007 | 2008-2011 | 2001-2011 | 2001-2007 | 2008-2011 | 2001-2011 | 2001-2007 | 2008-2011 | 2001-2011 |
| 1 | Annual rate of GDP growth, % | 4.8 | 1.6 | 3.6 | 2.2 | -0.2 | 1.3 | 2.3 | -0.1 | 1.4 |
| 2 | Annual rate of growth of hourly labour productivity, % | 4.6 | 1.8 | 3.5 | 1.5 | 0.2 | 1.0 | 1.7 | 0.3 | 1.2 |
| 3 | Annual rate of growth of the GDP deflator, % | 5.1 | 3.1 | 4.3 | 2.2 | 1.5 | 1.9 | 2.3 | 1.6 | 2.0 |
| 4 | Gross fixed capital formation, % of GDP | 22.6 | 22.3 | 22.4 | 19.8 | 18.7 | 19.4 | 19.9 | 18.9 | 19.5 |
| 5 | Annual net inflow of FDI, % of GDP | 6.2 | 2.4 | 4.8 | 3.2 | 1.3 | 2.5 | 3.3 | 1.3 | 2.6 |
| 6 | Total exports, % of GDP | 48.6 | 54.3 | 50.6 | 36.1 | 39.3 | 37.3 | 36.8 | 40.1 | 38.0 |
| 7 | Share of intra-EU trade, % of total | 79.1 | 77.1 | 78.4 | 65.2 | 61.5 | 63.9 | 66.0 | 62.4 | 64.7 |
| 8 | Change in world export share, index, beginning of period =100 | 166.8 | 104.1 | 174.6 | 96.5 | 87.4 | 84.5 | 100.0 | 88.3 | 89.3 |
| 9 | Annual rate of growth of nominal ULC, % | 3.6 | 3.3 | 3.4 | 1.7 | 2.1 | 1.8 | 1.8 | 2.1 | 1.9 |
| 10 | Annual rate of growth of real ULC, % | -1.4 | 0.2 | -0.9 | -0.5 | 0.6 | -0.1 | -0.5 | 0.5 | -0.1 |
| 11 | Average summary innovation index (SII) (PRO INNO) | 0.282 | 0.318 | 0.298 | 0.562 | 0.578 | 0.569 | 0.548 | 0.563 | 0.555 |
| 12 | Change in SII, index, beginning of period =100 | 112.7 | 109.4 | 123.4 | 99.1 | 105.1 | 104.3 | 99.8 | 105.4 | 105.3 |
| 13 | Gross domestic savings, % of GDP | 20.4 | 22.2 | 21.0 | 21.4 | 19.9 | 20.8 | 21.3 | 20.0 | 20.9 |
| 14 | Balance of trade of goods and services (current account, national accounts definition), % of GDP | -3.6 | -0.9 | -2.6 | 1.2 | 1.0 | 1.2 | 1.0 | 0.9 | 1.0 |
| 15 | Annual general government balance, % of GDP | -3.9 | -5.1 | -4.3 | -2.1 | -5.1 | -3.2 | -2.2 | -5.1 | -3.3 |
| 16 | Total taxes and social contributions, % of GDP | 39.0 | 38.6 | 38.9 | 42.7 | 41.3 | 42.3 | 42.5 | 41.2 | 42.1 |
| 17 | Government consolidated gross debt, % of GDP | 37.6 | 45.0 | 40.3 | 62.5 | 77.6 | 68.0 | 61.3 | 75.7 | 66.5 |
| 18 | Private sector annual credit flow as % of GDP | 9.1 | 6.0 | 7.9 | 11.1 | 3.8 | 8.3 | 11.0 | 3.9 | 8.3 |
| 19 | Annual rate of growth of total banking sector liabilities, % | 18.1 | 7.0 | 14.6 | 8.8 | 6.0 | 8.0 | 9.3 | 6.1 | 8.3 |
| 20 | Private consolidated gross debt, % of GDP | 103.3 | 121.2 | 109.8 | 102.4[1)] | 120.3[1)] | 108.9[1)] | 100.0[1)] | 118.3[1)] | 106.6[1)] |

*Notes.* The figures in the table are period averages. The regional aggregates are weighted averages based on GDP shares at market prices and exchange rates.

1) Excluding Luxembourg, Malta and the United Kingdom.

*Source:* Eurostat; PRO INNO Innovation Scoreboard, author's calculations.

However, in terms of the SII dynamics which mirrors progress in innovation performance, the EU-10 economies performed considerably better than the EU-17. One interesting feature regarding the EU-17 economies, however, is the comparison of the SII dynamics before (2001-2007) and during (2008-2011) the crisis: while in the first sub-period SII on average remained flat, during the crisis it moved upwards, indicating an increasing emphasis on innovation, as a driving mechanism out of the crisis.

The lower part of Table 1 (lines 13-20) presents statistics on factors that reflect some of the resources countries mobilised for the growth of their economies.

The overall levels of gross domestic savings[5] have been more or less comparable on average in the EU-10 and EU-17. However, the crisis has triggered reverse changes in the level of savings: while domestic savings in the EU-10 increased during the crisis, they dropped, albeit slightly, in the EU-17.

By contrast, as regards the current account balance[6], EU-10 performance has been markedly different from that of the EU-17: on average, the current account balance has been systematically negative in the former and systematically positive in the latter. In terms of the savings-investment balance, this is another indication of the above-mentioned feature that during the past decade EU-10 economies have been an attractive location for the channelling of foreign resources.[7]

Turning to the general government balance, in the lead-up to the crisis governments in EU-10 economies on average incurred larger deficits than those of EU-17 economies. In the period 2008-2011 on average deficits were high in the whole EU. This said, EU-10 economies have 'smaller governments' than the EU-17 as measured by the overall tax burden (total tax and social security revenue).

Despite the higher deficits, government debt in EU-10 economies increased (relative to GDP) by a smaller margin than it did in EU-17 economies. The reason for this is the higher inflation in the EU-10 which reduced the speed of indebtedness relative to GDP.[8] On aver-

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[5] Throughout the paper 'savings' are used in the sense of the national savings/investment balance: S – I = X – M, where S denotes total gross domestic savings, I stands for gross capital formation; and M and X denote imports and exports of goods and services. As both savings and investment have two components (private sector and government) the above can be rewritten as: (Sp + Sg) – (Ip + Ig) = (Sp – Ip) + (Sg – Ig) = X – M, where subscripts p and g denote private sector and government, respectively.

[6] In this paper we use the national accounts definition of the current account balance, measured as the balance of trade of goods and services.

[7] In the national saving-investment balance, a negative external balance is interpreted as foreign savings attracted to finance domestic investment.

[8] The dynamics of the economy-wide debt burden (measured as a proportion of GDP) depends on the rate of change of nominal GDP (and hence inflation) relative to the rate of change of nominal debt.

age governments in EU-10 economies remain much less indebted than those in the EU-17 even several years into the crisis.

The dynamics of the banks' credit exposure to the private sector also different between EU-10 and EU-17. EU-17 banks had more aggressive lending policies before the crisis which, however, changed to the reverse in the period 2008-2011. Annual credit flows in the EU-10 also dropped during the crisis but by a lower margin than they did in the EU-17. Nevertheless, private sector debt in the EU-10 increased more in relative terms than it did in the EU-17 but this was only due to the fact that at the beginning of the decade EU-10 economies were on average less indebted with private debt than EU-17 economies.

At the same time, the dynamics of banking sector liabilities in the two subsets of countries followed the opposite pattern: banks in EU-10 countries were increasing their liabilities in the years prior to the crisis much faster than those in the EU-17. However, this reflects the fact that EU-10 banks rely to a greater extent on mobilising financial resources through borrowing than through raising equity funds than is the case in the EU-17.

### *2.2 Some stylised facts about the patterns of growth in the EU: univariate analysis*

In this section I present some stylised facts about the patterns of growth in the EU before and during the crisis based on simple statistical techniques. I apply univariate cross-country regressions relating GDP growth in different sub-periods to a number of key indicators of economic performance. Admittedly, this is a somewhat simplistic approach but it still provides interesting and useful insights about the patterns of economic performance. Moreover, it is only one of the analytical approaches used in the paper and will be complemented in the following parts of the paper with the results from applying other, more sophisticated techniques.

The choice of indicators used for the univariate analysis was by no means arbitrary: the indicators have been carefully selected as factors that are widely considered as growth drivers or determinants of economic growth. Most of them are among the indicators already discussed in the previous section and presented with descriptive statistics in Table 1. As noted above, they can be broken down into two main categories: a) supply- and demand-side factors and b) resources mobilised in support of growth. The choice of such 'growth determinants' is also limited by the availability of consistent and comparable data for the countries that we analyse.

Some additional remarks on the empirical approach applied in this section follow.

Although this paper mostly focuses on the growth patterns and prospects of the EU-10, the analysis presented below covers the whole EU-27. Being part of the same integration body, all 27 economies are subject to a number of common, overarching policies and therefore, when analysing the patterns of growth it does make sense to take into account the whole set of countries: restricting the analysis to one subset of countries only will inevitably reduce cross-country variation – an important analytical aspect – and, therefore, the analytical depth. Moreover, as the EU-10 are generally catching up to the EU-17, the performance patterns of the EU-17 can serve, at least to some extent, as prediction benchmarks, indicating the possible future performance path of the CEE countries. Notwithstanding the above, the analysis does attempt to compare the performance patterns of the two main subsets of countries (EU-10 and EU-17), identify performance features that are specific for each of the two groups of countries and some of the determinants of these differences.

Another specific feature of the univariate growth assessment reported in this section is the fact that the analysis is not based on annual figures for growth and growth determinants but on the average performance of individual economies over selected periods of time. This is equivalent to ignoring country-specific and time-variant effects (or the assumption of the absence of idiosyncratic, time-variant components of the error term) and focusing on between-country variation in the observations for the identification of possible relationships. The reason for this choice is the above-mentioned focus of the paper on the identification of growth characteristics that are specific for groups of countries as a whole (EU-10, EU-17 and the EU as a whole) rather than country-specific features.

Admittedly, such an approach only provides an incomplete representation of the actual relationships between the variables that take part in the regressions. In addition, the issue of the direction of causality remains an open one. In most cases these correlations are part of complex simultaneous relationships with causality links often going in both directions. Therefore we shall not imply simple causality relations but in most cases will leave this issue open while discussing the implications.

As can be seen from the descriptive statistics in Table 1, the crisis triggered profound changes in the patterns of economic performance throughout the EU. This is equivalent to a structural break in the underlying fundamental relationships as compared to those that prevailed during the crisis. For this reason, while the regressions were run for the whole period 2001-2011, they were also run for each of the two sub-periods: 2001-2007 and 2008-2011.

In what follows I provide some stylised facts about the patterns of growth and economic performance in the EU prior to and during the crisis based on the approach outlined above. A large number of cross-country regressions relating GDP growth to indicators of economic performance (both supply-side factors and indicators of growth resources) were run

with a view to identifying relations that have a statistically stable character. Some of these results, as illustrated by scatter diagrams, are presented in the Annex, Figures A1 to A13.

One general observation before I go to the interpretation of these results: The visual inspections of the scatters strongly suggests that, while being part of the EU and of an EU-wide economic pattern, the CEE economies still very much remain a 'club' of their own. This is illustrated by the fact that the EU-10 and EU-17 groups of countries are in most cases distinctly separated on the scatters presented in these charts. I emphasise this feature by showing graphically these two domains in the charts.

Another general comment is that for each of the relationships that are assessed, I have run the regressions for three periods and sub-periods: 1) 2001-2007; 2) 2008-2011; 3) 2001-2011. I selected to show in Figures A3 to A13 only one chart per relationship, namely, the regression for the period/sub-period that had the best fit. To complement the charts, Table 2 presents a summary of the outcomes of all regressions.

As can be seen in Table 2, the outcomes for the sub-period 2001-2007 are very similar to those for the whole period 2001-2011 and therefore they can be taken as reflecting long-run relationships that have prevailed in this period.

Table 2

**The model of growth in the EU, 2001-2011: summary of stylised facts**

| **Factors** | **EU-27** | | |
|---|---|---|---|
| | 2001-2007 | 2008-2011 | 2001-2011 |
| Productivity of labour | ++ | .. | ++ |
| Fixed investment | ++ | .. | + |
| FDI | + | .. | ++ |
| Exports | ++ | .. | ++ |
| Real ULC / Competitiveness | - | .. | - |
| Innovation | ++ | .. | ++ |
| Gross domestic savings | .. | .. | .. |
| Attracted foreign savings (current account balance) | ++ | .. | + |
| Domestic and foreign savings | ++ | .. | ++ |
| General government balance | .. | - | .. |
| Total tax burden | .. | .. | .. |
| Total banking sector liabilities | ++ | .. | ++ |
| Private sector credit flow | + | + | + |
| Private sector debt | ++ | .. | ++ |
| Government debt | - | - | .. |
| Government + private debt | ++ | .. | + |
| Memo: Real ULC -> Exports | - | - | - - |

*Notes:* The signs in the table indicate the type of correlation between the average rate of GDP growth over the respective period and the respective factor: '++' – strong positive correlation; '+' – positive correlation; '- -' – strong negative correlation; '-' – negative correlation; '..' – no correlation; 'n.a.' – data not available. For the definition of the factors used in this table see Figures A3 to A13.

*Source:* Eurostat; PRO INNO Innovation Scoreboard, author's calculations.

Table 3

**Specific features of the patterns of GDP growth in EU-10 and EU-17 countries, 2001-2007**

| Growth determinants | **EU-10 (CEE)** | **EU-17 (the rest)** |
|---|---|---|
| Productivity of labour | Strong growth<br>Strong correlation | Moderate growth<br>Strong correlation |
| Fixed investment | High investment ratio<br>Strong correlation | Moderate investment ratio<br>Weak correlation |
| FDI | Strong flows<br>Moderate correlation | Moderate flows<br>Strong correlation |
| Exports | Strong growth<br>Strong correlation | Moderate growth<br>Weak correlation |
| Real ULC/ Competitiveness | Moderate improvement<br>Moderate correlation | No improvement<br>No correlation |
| Innovation | Strong improvement<br>Moderate correlation | Moderate improvement<br>Strong correlation |
| Gross domestic savings | No correlation | No correlation |
| Attracted foreign savings<br>(current account balance) | Moderate to large inflows<br>Moderate correlation | Outflows or inflows<br>No correlation |
| Domestic and foreign savings | Moderate to high levels<br>Strong correlation | Moderate levels<br>Strong correlation |
| General government balance | No correlation | No correlation |
| Total tax burden | No correlation | No correlation |
| Total banking sector liabilities | Moderate to high growth<br>Moderate correlation | Moderate growth<br>Strong correlation |
| Private sector credit flow | Moderate to high growth<br>Moderate correlation | Moderate to high growth<br>Moderate correlation |
| Private sector debt | Moderate to high growth<br>Weak correlation | Weak to moderate growth<br>Strong correlation |
| Government debt | Increasing or decreasing<br>No correlation | Weak to moderate growth<br>Weak negative correlation |
| Government + private debt | Moderate to high growth<br>Strong correlation *) | Weak to moderate growth<br>Strong correlation |

*Notes.* The regional aggregates are weighted averages based on GDP shares at market prices and exchange rates. EU-17 data for private debt exclude Luxembourg, Malta and the United Kingdom.

*) One outlier - Slovakia

*Source:* Eurostat; author's calculations

From these results, one could concur that, what concerns supply- and demand-side factors, growth in the EU as a whole has been supported by fixed investment, FDI, export growth (which in turn was boosted by competitiveness), rising labour productivity, and innovation. In terms of resources mobilised for growth, there was no correlation between gross domestic savings per se and GDP growth. However, savings attracted from abroad

and the sum of foreign and domestic savings are strongly positively correlated with long-run GDP growth. Attracted financial resources by the banking sector and private borrowing (reflected in credit flows and the growth in private indebtedness) have also been positively associated with growth.

By contrast, the general government balance, government debt and overall tax burden display no correlation with long-run GDP growth

As can also be seen from the results presented in Table 2, the period of the crisis 2008-2011 features a complete collapse of this model of growth. In fact I have not been able to identify any growth determinant that would be strongly correlated with growth performance across EU Member States in this period. The possible exceptions to such a pattern are private credit flows (positively but weakly associated with growth) and the weak negative association between the government balance and government debt and economic growth (but in this case, the likely direction of causality is from weak growth to increased deficits and public borrowing).

The first conclusion that could be made from this result is that while there were common growth determinants across the EU as a whole before the crisis, the growth performance in individual economies during the crisis was largely determined by idiosyncratic factors.

Returning to the patterns of growth in the lead-up to the crisis, from the visual inspection of the scatter diagrams and the descriptive statistics presented in Table 1, one could also identify some specific features that distinguish the growth performance of the EU-10 from that of the EU-17. These are summarised in Table 3.

I shall return to a more in-depth assessment of these results in Section 4.

### *2.3 Real economic convergence within the EU*

Economic convergence – both real and nominal – is among the fundamental principles of the EU and cornerstone of its economic policy. The analysis of the process of real economic convergence within the EU (which is the aspect I am addressing in the paper) and its driving forces is a specific focus of this paper as it helps cast additional light on the patterns of growth in the EU and its determinants.

Real economic convergence is one of the most intensively researched areas in the growth literature. It includes strands that differ both in terms of the concept of convergence (unconditional [absolute] convergence and conditional convergence; global convergence and local or club-convergence; deterministic convergence and stochastic convergence) and in terms of the research methodology (e.g. informal vs. formal approaches; cross-section

approaches vs. panel approaches vs. time-series approach, etc.).[9] From within this broad range of approaches and methods, I have chosen to test two of the most widely used ones: 1) the unconditional (absolute) convergence hypothesis and 2) a conditional convergence applying informal cross-section Barro-type regression (Barro, 1991).

Absolute real economic convergence[10] within the EU has been a well-established fact which is documented and empirically verified in the economic literature. As a general trend, it has continued uninterrupted since the inception of the Community and has endured every new round of EU enlargement, including the biggest ever eastern enlargement of 2004-2007, which brought the number of member states from 15 to 27. [11]

Prior to joining the EU, the countries of Central and Eastern Europe went through a painful process of economic transformation from centrally planned to market economies. In all these countries, the start of transition was marked by a deep and prolonged transformational recession which in some cases wiped out the results of years and even decades of growth and catching up. The period of the transformational recession, its causes and the determinants of its duration and depth have been widely studied and reflected in the economic literature.[12] Joining the EU was a strong push for economic convergence to strengthen in this part of the continent.

In this paper we understand absolute real economic convergence in the sense of the existence of a tendency of narrowing the differences in real per capita income between richer and poorer countries over the long run (see note 10 above). Testing the absolute convergence hypothesis in fact implies applying the same univariate statistical methods as those illustrated in the previous sections; however on different sets of variables.

Staring from the seminal works of Barro and Sala-i-Martin (1991, 1992), there has been considerable empirical research seeking to test various convergence hypotheses within various groups of countries. Among more recent empirical research on convergence in Europe, ESE (2000) finds evidence of a tendency for absolute (unconditional) long-run convergence in post-war Europe both concerning Western and Eastern Europe. Wagner and Hlouskova (2001), Matkowski and Próchniak (2004), and Borys, Polgár and Zlate (2008) analyse real convergence in CEE countries prior to EU accession and the pros-

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9 For a comprehensive overview of the convergence literature see Islam (2003).

10 The absolute convergence hypothesis implies a systematic tendency for poorer countries to grow faster than rich ones. It is estimated on the basis of a univariate cross-country regression of per capita income growth between year t and 0, $[y(t)-y(0)]$, on the initial level of per capita income $y(0)$, i.e. $[y(t)-y(0)] = \alpha+\beta y(0)+\varepsilon$, where $\varepsilon$ denotes an error term. A negative sign of the estimated $\beta$ indicates absolute ('beta') convergence. Another widely used indicator is 'sigma' convergence, which measures the tendency of per capita incomes across a group of countries to become more homogenous (in terms of declining standard deviation) over time. See Barro and Sala-i-Martin (1992) and ESE (2000).

11 For an overview see Rapacki and Próchniak (2009) and ESE (2000).

12 See, among others, Bennett, Estrin and Urga (2007), Godoy and Stiglitz (2006), Falcetti, Lysenko and Sanfey (2006), Fidrmuc and Tichit (2009), Hare and Turley (2013), Kornai (2006), Rusinova (2007).

pects thereafter. Rapacki and Próchniak (2009) and Szeles and Marinescu (2010 study empirically the process of real convergence of CEE countries after accession and the role of EU integration for the acceleration of this process. Halmai and Vásáry (2010) analyse the interplay of real and nominal convergence in the new EU Member States during the catch-up process. All these studies do find evidence of an ongoing process of real economic convergence in Europe. In particular, Rapacki and Próchniak (2009) conclude that EU enlargement contributed to speeding-up of economic growth of the CEE countries and their real convergence to the richer EU countries. In turn, Szeles and Marinescu (2010) find evidence of both absolute and conditional convergence in CEE countries.

I present in Figures 1 and 2 empirical results on the incidence of beta- and sigma-convergence within the EU, for the period 1995-2001, based on the most recent available data. In the main this most recent assessment supports the findings of earlier related studies.

The scatter diagram presented in Figure 1 and the fitted trend line indicate a strong inverse relationship and between starting per capita GDP levels and subsequent growth for the period 1995-2011 and a good fit to the observed data. These results can be taken as providing evidence which supports the absolute unconditional convergence within the EU-27 in this period. In accordance with the parameters of the fitted regression, the implied average rate of absolute convergence among the 27 economies in this period has been about 2 per cent per annum.[13] This result is entirely in line with the so-called '2% rule' of convergence, detected already in the very first tests of the convergence hypothesis (see Mankiw, Romer and Weil, 1992). Respectively, the time necessary to move half way to the balanced growth path corresponding to this speed of convergence is around 35 years.

Figure 1 also illustrates a characteristic that will feature throughout this paper, namely, that the EU-10 are (still) a 'club' of their own: on average this group of countries still lags considerably behind the EU-17 in terms of the level of their per capita incomes. This feature, as will be shown further in the paper, is associated with a number of specific features in their growth – more generally, economic – performance.[14]

Importantly, as can be seen from the historic statistics presented in Table 1, the process of catching up between the EU-10 and the EU-17 (and hence absolute real convergence within the EU-27) has continued also during the years of the current crisis, albeit at generally lower rates of GDP growth.

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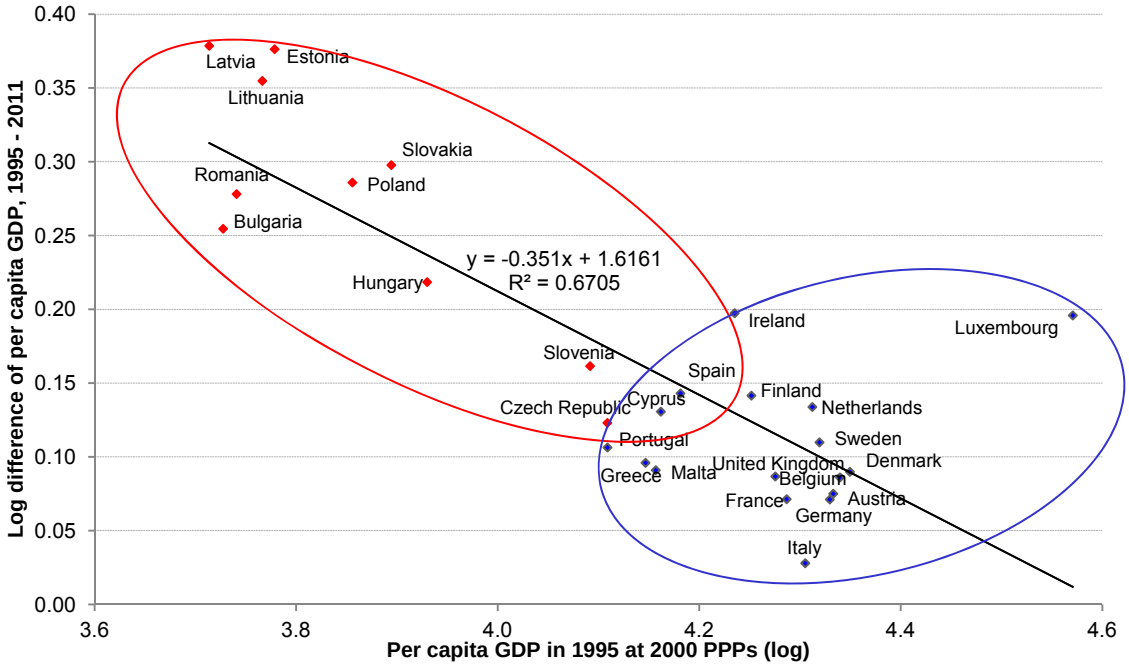
[13] The implied speed of convergence (β) is calculated from the identity: $1 - e^{-\beta T} = b$, where T stands for the duration of the period covered by the regression. Note that in the framework of the Solow growth model β refers to the speed of convergence to steady state and not necessarily to the speed of convergence in per capita incomes (see below). The interpretation of β is as follows: each year the economy moves β% of the remaining distance towards the steady state. E.g., the time τ it takes to move half way to the balanced growth path is calculated as: $\tau = - \ln(0.5)/\beta$.

[14] According to estimates by Rapacki and Próchniak (2009), the actual process of catching up between individual CEE economies and the rest of the EU may take between 8 and 33 years.

Figure 1

**Beta convergence in Europe 1995 – 2011**

(Logarithms of per capita GDP in euro, 2000 prices and PPPs)

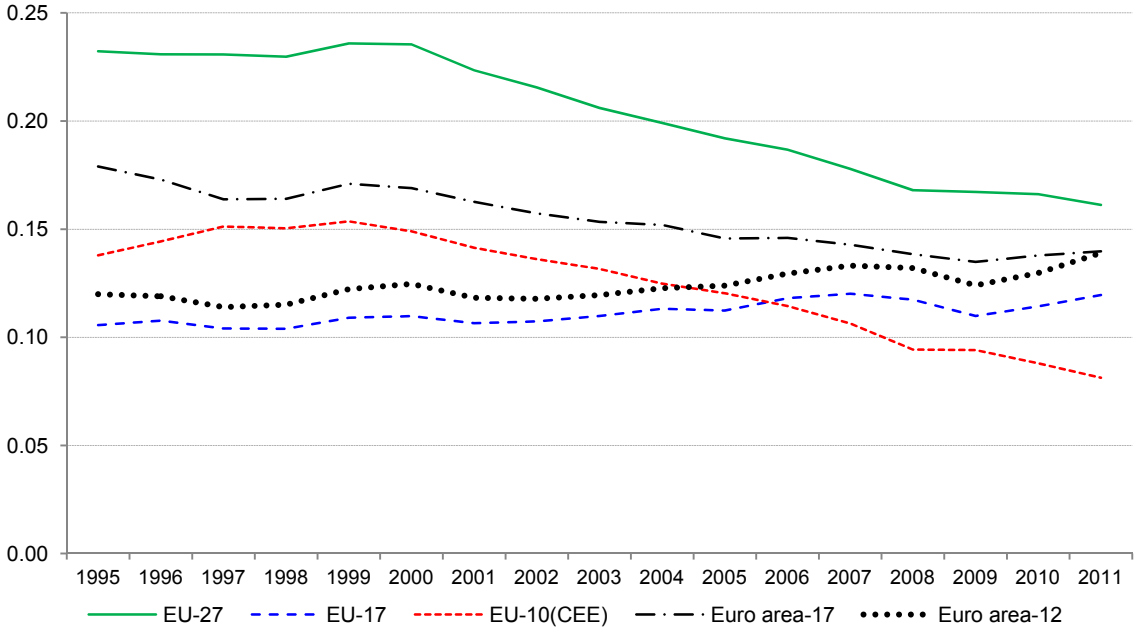



*Source:* Eurostat; author's calculations.

Figure 2

**Sigma convergence in the EU, 1995-2011**

(Standard deviations of logarithms of per capita GDP)




*Source:* Eurostat; author's calculations.

Figure 2 illustrates the evolution of sigma-convergence within the EU-27 since 1995 for five subsets of countries. Overall, the main trend during this period has been towards a declining standard deviation of per capita incomes within the EU-27, especially in the period after 2000. Within the CEE (EU-10) economies, the pattern of the dispersion of per capita incomes has been uneven: an initial rise in the second half of the 1990s was reversed in the following decade with a steady decline ever since. Within the current euro area (17 countries), the general trend towards narrowing of differences in per capita GDP persisted but there has been a slight reversal since the start of the current crisis. At present the EU-10 is the subset of countries within the EU that features the most pronounced sigma-convergence.

The subsets of countries that do not fully fit into this pattern are the group of the 12 euro area countries (founding states plus Greece) and the group that we denote as EU-17 in this paper (current EU members less CEE). In both these subsets of countries the general trend – somewhat paradoxically – has been towards a growing dispersion of per capita incomes and this has been especially pronounced since the start of the current crisis. This outcome is an indirect indication that despite the proclaimed objectives, the institutional arrangements within the euro area did not always promote convergence among the participating countries.

In a next step I expand the scope of this assessment by looking into conditional convergence within the EU. The initial neoclassical interpretation of absolute convergence is rather restricted. Besides, as pointed out by Mankiw, Romer and Weil (1992), 'the Solow model does not predict convergence; it predicts only that income per capita in a given country converges to that country's steady-state value. In other words, the Solow model predicts convergence only after controlling for the determinants of the steady state, a phenomenon that might be called "conditional convergence".' To this end, the conditional convergence hypothesis implies that for countries to converge to the same growth path, they have to be similar. In the general case when they are not, one needs to control for structural differences among countries in order to observe the negative relationship between actual growth rates and the initial level of per capita income.

With the advance of economic theory, the concept of real convergence has also been enriched with the hypothesis that the closing of the technological gap between the poor and richer countries is among the key factors for a catch-up process. This idea is embodied in the models of conditional real convergence which relate the process of reduction in per capita income differentials across a group of countries with a set of 'conditioning variables' (Mankiw, Romer and Weil, 1992). In contrast to the absolute convergence hypothesis, which is strictly derived from the neoclassical growth model, conditional convergence can be embedded within a broader class of theoretical models including both neoclassical but also endogenous growth models. In the framework of the later, a sustained catch-up proc-

ess is conditional to the closing of the technology gap between less and more developed countries.

Conditional real convergence is usually tested with different versions of the following basic regression:

$$[y(t)-y(0)] = \alpha + \beta y(0) + \gamma X + \varepsilon \quad (1)$$

where – in the neoclassical theoretical framework – X is a vector of variables that sustain the economy in a steady state. In the context of new growth theories, the set of conditioning variables X should reflect technological progress, both *strictu sensu* but also in the sense of the existence of an enabling macroeconomic and institutional environment which supports the closing of the technological gap. The regression is tested on a dataset covering a group of countries which are subject to the convergence test.

Equation (1) is in principle derived from different formal growth models. To the extent that the actual specification of equation (1) follows such a derivation from a model embedding the hypothesis of conditional convergence, the regressions of the type (1) are sometimes divided into 'formal models' (which strictly follow a formal derivation) or 'informal models', if they contain *ad hoc* terms which do not follow directly from a formal derivation.

The assumptions regarding the structure of the error term give rise to other classes of models. Thus the assumption of the absence of idiosyncratic, time-variant components of the error term (which is equivalent to ignoring both country-specific and time-variant effects as done in the univariate analysis presented in the previous section) leads to the application of formal or informal cross-section techniques. By contrast, the assumption of an idiosyncratic, time-variant component of the error term entails a switch to time series or panel approaches.

As noted (for details see Islam, 2003), the literature abounds with many different approaches to testing conditional convergence. I have chosen for this study (for the same reasons as those spelled out in the previous section) the so-called informal cross-section growth regressions. These models refer to different specifications, not necessarily formally derived from a growth model, but which include explanatory variables associated with technological progress. Such growth regressions are often referred to as 'Barro regressions' after Barro (1991), who was the first to apply such a technique.

In practical terms, the choice of both the model and the set of conditioning variables depends on the key assumptions regarding the nature of the economic processes in the group of economies we analyse and on the availability of statistical data to analyse these processes. As noted above, the conditioning variables should reflect the presence of an environment supporting the closing of the technological gap. This set typically includes variables such as capital accumulation, financial system development, FDI, imports of

technological products, educational attainment, measures of macroeconomic stability, trade openness, measures of institutional development, etc.

My choice of such a more informal specification was to a large degree determined by the available statistical data for the testing of the model. The equation was estimated as a cross section over the period 2000-2011. In view of ensuring consistency with other parts of this paper, I used the following set of conditioning variables:[15] log percentage difference of real ULC; log difference of gross domestic savings (in % of GDP);log difference of gross domestic plus foreign savings (in % of GDP); log percentage difference in share in world exports.[16] The dependent variable [y(t)-y(0)] is the log difference of per capita GDP at 2000 PPS. This regression should test to what extent the observed convergence within the EU was related to the effect of these conditioning variables.

The estimation results covering the period 2000-2011 are shown in Table 4. Admittedly, the number of observations is very low, undermining to some extent the reliability of the results.

The estimation results indicate that within the set of the selected conditioning variables, real convergence within the EU-27 was mostly conditional on the international competitiveness of the catching-up countries. The two conditioning variables which appear to be most closely associated with the catch-up process are the changes in real ULC and in export performance, both of which are indicative of rising international competitiveness.

Domestic savings (as well as the sum of domestic plus foreign savings) and labour input were estimated with the correct (expected) signs but their coefficients in most cases were not statistically significant. The coefficient on domestic savings was only estimated as significant in versions of the equation which exclude export performance (4 and 5). Somewhat surprisingly (and in contrast to similar studies for other groups of countries), in none of the equation versions that were tested, FDI was estimated to be a statistically significant conditioning variable.

In accordance with the parameters of the estimated equations, the implied average rate of conditional convergence among the 27 economies in this period in the different versions of the equation range from 1.6 to 3.0 per cent per annum but in most cases is around 2 per cent. It is not much different from the estimated speed of absolute convergence as indicated above. Moreover, values close to 3 per cent refer to the equation versions excluding export performance, one of the key variables conditioning the catch-up process. Note that

[15] A much wider set of conditioning variables has been tested for the equation but in most cases the estimated coefficients were not statistically significant. The final selection reflects independent variables that were estimated with statistically significant coefficients or at least with signs that correspond to the theoretically expected ones.

[16] Here, as well as in the subsequent econometric exercises, it was not possible to include in the estimated equations the innovation performance variable discussed in the previous section as the data only cover part of the period under consideration.

in the case of the tested model of conditional convergence the speed of convergence β refers both to the speed of convergence to steady state (in the framework of the Solow growth model) and to the speed of real convergence. Put differently, according to our empirical estimations, convergence to steady state would at the same time be accompanied by convergence in per capita incomes.

Summing up the outcomes of the absolute and conditional convergence tests, one could conclude that convergence has been underway within the EU-27 during the past decade. The average speed of convergence has been in the order of 2 percentage points per annum. International competitiveness has been one of the factors bolstering convergence but it has not been a key determinant. It appears that – at least during the period we test – a conventional catch-up process associated with significant differences in the starting levels of per capita incomes has dominated real convergence within the EU.

Table 4

**Estimation results for conditional real convergence within the EU-27, 2000-2011 (OLS estimations)**

Dependent variable: Log difference of per capita GDP at 2000 PPS, 2000 – 2011.

| Variables | Equations | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Logarithm of GDP per capita in 2000 in 2000 PPS | | -0.215*** | -0.381*** | -0.193*** | -0.261*** |
| | | (-3.263) | (-11.266) | (-2.869) | (-5.124) |
| Log percentage difference of real ULC, 2000-2011 | | -0.388* | -0.630*** | | -0.628** |
| | | (-1.727) | (-2.653) | | (-1.955) |
| Log difference of gross domestic savings as % of GDP, 2000-2011 | | 0.111 | 0.258*** | 0.068 | |
| | | (1.566) | (4.735) | (0.980) | |
| Log difference of gross domestic plus foreign savings as % of GDP, 2000-2011 | | | | | 0.276* |
| | | | | | (1.705) |
| Log percentage difference in share in world exports, 2000-2011 | | 0.244*** | | 0.301*** | |
| | | (2.816) | | (3.604) | |
| Constant | | 1.059*** | 1.862*** | 0.940*** | 1.367*** |
| | | (3.326) | (11.539) | (2.902) | (7.885) |
| Observations | | 27 | 27 | 27 | 27 |
| R2 | | 0.919 | 0.889 | 0.908 | 0.806 |
| R2 adjusted | | 0.904 | 0.875 | 0.896 | 0.781 |
| Implied speed of convergence (β) | | 1.77 | 2.93 | 1.61 | 2.11 |
| Implied time to move half way to the balanced growth path (τ), years | | 39 | 24 | 43 | 33 |

t-statistic in parentheses.

In Table 5, I present the estimation results of another informal cross-section growth regression of the sort often applied in empirical studies. In this regression, I *de facto* step aside from the conditional convergence hypothesis and regress the average rate of real GDP per capita on a set of variables that are among the 'usual suspects' as regards the potential determinants of growth.

Table 5

## Cross-section growth regressions for the EU-27 based on period average figures for 2000-2011 (OLS estimations)

Dependent variable: average annual rate of growth of GDP per capita in 2000 PPS.

| Variables (period averages) | Equations | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| Annual net inflow of FDI, % of GDP | | 0.093 | 0.179** | 0.043 | 0.119 | 0.293*** | 0.419*** | 0.309*** | 0.345*** |
| | | 1.451 | 2.636 | (0.613) | (1.616) | (2.761) | (4.564) | (3.330) | (4.027) |
| Annual % change in real ULC | | -0.579** | -0.652** | | | -1.363*** | -1.436*** | -0.741* | -0.784* |
| | | -2.633 | -2.671 | | | (-3.870) | (-4.172) | (-1.910) | (-1.979) |
| Annual % change in the share in world exports | | 0.362*** | 0.355*** | 0.433*** | 0.441*** | | | | |
| | | 6.943 | 5.938 | (8.439) | (7.626) | | | | |
| Annual % change in (private debt as % of GDP) | | 0.152*** | | 0.148*** | | 0.248*** | | 0.067 | |
| | | 3.558 | | (3.037) | | (3.302) | | (0.703) | |
| Annual % change in total (government + private) debt as % of GDP) | | | 0.155** | | 0.133* | | 0.298*** | | 0.094 |
| | | | 2.713 | | (2.040) | | (3.427) | | (0.851) |
| Annual % change in total liabilities of the banking sector | | | | | | | | 0.159** | 0.153** |
| | | | | | | | | (2.631) | (2.557) |
| Constant | | 0.414 | 0.200 | 0.659* | 0.563 | -0.595 | -1.084* | -1.362** | -1.500*** |
| | | 1.382 | 0.508 | (2.020) | (1.323) | (-1.215) | (-1.965) | (-2.633) | (-2.929) |
| Observations | | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 |
| R2 | | 0.932 | 0.918 | 0.906 | 0.886 | 0.751 | 0.758 | 0.820 | 0.822 |
| R2 adjusted | | 0.917 | 0.900 | 0.891 | 0.868 | 0.712 | 0.719 | 0.780 | 0.783 |

t-statistic in parentheses.

This type of specification can be obtained starting from growth models defined with a conventional production function, takings logs, linearizing around the steady state and applying assumptions on the error term. In this case the assumptions regarding the error term are the same as when applying cross-section models to test conditional convergence, namely, the absence of country-specific and time-variant effects.

The specification includes variables (taken as period averages) such as: the inflow of FDI, the change in real ULC, the change in the share in world exports; annual change in private debt; annual change in total (government + private) debt; annual change in total liabilities of the banking sector. Note that the definitions of all variables in this regression are different from those when testing the conditional convergence hypothesis: instead of taking log differences for the period we take the period averages of these variables. The estimations cover the same period (2000-2011) and, obviously, they suffer from the same problem of low number of observations.

With these caveats in mind, the estimation results shown in Table 5 provide some additional insights into the patterns of growth in the EU in this period. In the first place, the results do confirm the importance of international competitiveness (in the sense as defined above) for the growth of individual EU countries. In addition to that, these growth regressions provide evidence of the role of FDI as a determinant of growth in this period. Importantly, they also highlight the association between economic growth in the EU economies and the rise in their indebtedness. The latter is evidenced in the estimates with three different measures of debt: private debt; total (government + private) debt; and total liabilities of the banking sector.

### *2.4 Empirical assessment of EU growth with multifactor panel growth regressions*

Cross-section growth regressions suffer from a number of methodological problems. Mankiw (1995) points to three main types of problems: simultaneity problem (difficulties in separating causes and effects); multicollinearity problem (the correlation among the determinants of growth); and degrees-of-freedom problem (there can be many plausible hypotheses, which can exceed the number data points). In view of the assumptions regarding the error term, in particular, the neglect of time-specific effects, cross-section approaches fail to capture the effect of periods of abnormal performance such as boom or bust cycles that may occur during the period covered by the regression. In turn, the disregard of country-specific effects may lead to a bias in the estimations due to the failure to take into account unobserved heterogeneity in the data. Besides, OLS yields consistent estimates of cross-section specifications only under quite restrictive conditions.

Some of these problems can be addressed by switching from a cross-section approach (cross-country growth regressions averaging growth over a period of time) to panel approaches based on annual data. Panel growth regressions can also be derived from conventional production functions in log form and linearising around the steady state. These models are also widely applied in the literature and can take different forms but in the main they are all variations of the following basic equation:

$$g_{it} = \lambda Z_{it} + [\mu_i + v_t +] \varepsilon_{it} , \quad (2)$$

where $g_{it}$ is a measure of economic growth (usually taken as the growth rate of per capita real GDP) and Z is a vector of explanatory variables. The main difference compared to the growth regressions estimated in Table 5 is related to the assumptions regarding the error term. These specifications typically include both country-specific ($\mu_i$) and time-specific ($v_t$) effects. Unlike the cross-section approaches (which ignore both these effects), such models make it possible to take into account the effect of periods of abnormal performance (e.g. by introducing time dummies) and to avoid an estimation bias due to unobserved heterogeneity (e.g. by using fixed effects techniques to account for unobserved country-specific effects). Switching to annual observations helps increase by a multiple factor the number of observations for estimating the regressions, thereby relieving the 'degrees-of-freedom problem' mentioned above.

More generally, panel estimations of equation (2) based on annual (rather than period average) data help address a number of the problems encountered in cross-section approaches. While none of the existing econometric techniques allows addressing all these problems at the same time, different techniques can deal with some problems on their own. Thus two-stage least squares (2SLS) or generalised least square (GLS) techniques with fixed effects take due care of country-specific effects. Applying instrumental variables can to some extent deal with endogeneity among the regressors. The generalised method of moments (GMM) technique applied to dynamic panel data models (Arellano and Bond, 1991) is considered even superior in dealing with endogeneity problems by instrumenting the first-differenced regressors with their corresponding values in levels, taking lags of two periods or more. However, when applied in first differences of the estimable dynamic panel model the latter eliminates time-invariant country-specific effects.

I present in Tables 6 and 7 estimation results of panel growth regressions for the EU, based on annual figures for the period 2000-2011 as follows: GLS estimations (Table 6) and GMM estimations (Table 7).

Before going to the interpretation of the results, some methodological comments are in order. As in previous estimates, the vector of explanatory variables has been selected carefully to allow meaningful economic interpretation. As the specification of the growth regression is derived from a production function, I have included in the first place variables

that reflect the two main factor inputs: labour and capital. Labour input is represented by the number of employees while, for the lack of a better proxy, capital input is proxied by the level of gross fixed capital formation as a share in GDP.

Table 6

**Panel growth regressions for the EU, 2000-2011, GLS estimations**

Dependent variables: 1) annual rate of growth of real GDP (dY), %
2) annual rate of growth of real GDP per capita (dYpc), %

| | | dY | | | dYpc | |
|---|---|---|---|---|---|---|
| Variables Equations | **EU-27** | **EU-10** | **EU-17** | **EU-27** | **EU-10** | **EU-17** |
| Annual change in total employment, % | 0.703*** | 0.556*** | 0.586*** | 0.693*** | 0.539*** | 0.606*** |
| | 10.956 | 6.105 | 8.085 | 9.776 | 5.732 | 8.060 |
| Gross fixed capital formation, % of GDP | 0.140*** | 0.100 | 0.091* | 0.090* | 0.088 | -0.032 |
| | 2.967 | 1.252 | 1.702 | 1.683 | 1.012 | -0.578 |
| Annual % change in real ULC | -0.277*** | -0.114* | -0.399*** | -0.284*** | -0.163*** | -0.402*** |
| | -7.234 | -1.918 | -10.472 | -7.260 | -2.646 | -10.246 |
| Private credit flow, % of GDP | 0.016*** | 0.062** | 0.016*** | 0.016*** | 0.064** | 0.017*** |
| | 5.793 | 2.047 | 6.259 | 6.297 | 2.011 | 6.383 |
| General government balance, % of GDP | -0.023 | 0.239*** | 0.030 | -0.053 | 0.190** | 0.010 |
| | -0.582 | 2.708 | 0.926 | -1.281 | 2.141 | 0.305 |
| Dummy, year 2008 | -1.831*** | -2.855*** | -1.318*** | -1.966*** | -2.969*** | -1.234*** |
| | -6.981 | -5.431 | -5.725 | -7.358 | -5.398 | -5.186 |
| Dummy, year 2009 | -4.435*** | -8.535*** | -2.790*** | -4.699*** | -9.156*** | -2.924*** |
| | -11.957 | -12.959 | -8.093 | -12.116 | -13.337 | -8.316 |
| Dummy, year 2010 | 0.054 | 0.432 | 0.027 | -0.285 | 0.109 | -0.284 |
| | 0.185 | 0.717 | 0.102 | -0.951 | 0.172 | -1.062 |
| Dummy, year 2011 | -0.612** | -1.060* | -0.190 | -0.853*** | -1.333** | -0.438* |
| | -2.115 | -1.877 | -0.776 | -2.792 | -2.214 | -1.729 |
| Constant | -0.671 | 2.397 | -0.458 | 0.121 | 2.966 | 1.310 |
| | -0.645 | 1.346 | -0.421 | 0.103 | 1.522 | 1.175 |
| Observations | 285 | 109 | 176 | 285 | 109 | 176 |
| R2 (weighted) | 0.873 | 0.912 | 0.918 | 0.878 | 0.911 | 0.906 |
| R2 adjusted (weighted) | 0.855 | 0.895 | 0.904 | 0.861 | 0.893 | 0.891 |

Estimation method: GLS with fixed effects and cross-section weights. t-statistics are shown in parentheses. Significance levels: *** – significant at the 1 per cent significance level; ** – significant at the 5 per cent significance level; * – significant at the 10 per cent significance level.

The rest of the variables entering the growth regression are those that should in principle emulate the effect of technological progress or, in technical terms, the residual not explained by the variation in factor inputs. This aspect of the empirical analysis is in my view of greatest interest as it can provide insights into the driving forces of productive efficiency (in this case, total factor productivity) as a source of GDP growth. A wide range of variables were tested in these growth regressions and those selected to be shown in Tables 6 and 7 are the ones that tended to be estimated as statistically significant.

Table 7

**Panel growth regressions for the EU, 2000-2011, GMM estimations**

Dependent variables: 1) annual rate of growth of real GDP (dY), %
2) annual rate of growth of real GDP per capita (dYpc), %

| | | dY | | | dYpc | |
|---|---|---|---|---|---|---|
| Variables Equations | **EU-27** | **EU-10** | **EU-17** | **EU-27** | **EU-10** | **EU-17** |
| Annual change in total employment, % | 0.678*** | 0.442*** | 0.587*** | 0.677*** | 0.444*** | 0.595*** |
| | 9.091 | 4.092 | 7.979 | 8.318 | 4.013 | 7.738 |
| Gross fixed capital formation, % of GDP | 0.218*** | 0.271** | 0.110** | 0.167*** | 0.268** | -0.009 |
| | 3.851 | 2.214 | 1.936 | 2.712 | 2.061 | -0.161 |
| Annual % change in real ULC | -0.250*** | -0.148* | -0.383*** | -0.243*** | -0.200*** | -0.374*** |
| | -5.101 | -1.929 | -11.265 | -4.672 | -2.539 | -10.278 |
| Private credit flow, % of GDP | 0.021*** | 0.035 | 0.017*** | 0.023*** | 0.042 | 0.019*** |
| | 5.234 | 0.898 | 13.817 | 5.216 | 1.030 | 12.785 |
| General government balance, % of GDP | -0.078** | 0.331*** | 0.008 | -0.095** | 0.214* | 0.007 |
| | -1.978 | 2.605 | 0.236 | -2.196 | 1.719 | 0.219 |
| Dummy, year 2008 | -1.972*** | -3.363*** | -1.405*** | -2.048*** | -3.264*** | -1.320*** |
| | -7.275 | -5.695 | -7.298 | -7.172 | -5.640 | -6.335 |
| Dummy, year 2009 | -4.688*** | -8.664*** | -2.982*** | -4.859*** | -9.077*** | -3.048*** |
| | -12.339 | -13.727 | -8.446 | -12.085 | -14.121 | -8.307 |
| Observations | 258 | 99 | 159 | 258 | 99 | 159 |
| S.E. of regression | 1.903 | 2.075 | 1.162 | 2.005 | 2.242 | 1.241 |
| J-statistic | 189.817 | 80.851 | 119.873 | 190.702 | 82.420 | 119.179 |

Estimator: GMM estimator in first differences: Cross-section weights instrument weighting matrix; Cross-section weights standard errors and covariance. Instruments are second lags of independent variables. t-statistics are shown in parentheses. Significance levels: *** – significant at the 1 per cent significance level; ** – significant at the 5 per cent significance level; * – significant at the 10 per cent significance level.

The results presented in the tables were preceded by a number of tests. I tested hypotheses regarding the possibility of behavioural differences in the growth regression between different subsets of EU Member States, in particular, EU-10 and EU-17. For this purpose I estimated an equation in which, in addition to the basic specification, all variables are also interacted with a dummy for one of the sub-regions and checked the joint significance of the coefficients of these interacted variables through the Wald test (the null hypothesis in this case is that all coefficients of the interacted variables are jointly equal to zero). According to the results of this test, there is sufficient evidence to reject the null hypothesis of all the coefficients on the interacting variables being jointly equal to zero. Put in other words, this test suggests that there are considerable behavioural differences between the two sub-regions, justifying the estimation of separate growth regressions for EU-10 and EU-17.

As discussed above and as seen in Tables 6 and 7, I deal with time-specific effects by including year dummies for years/periods of abnormal growth performance. The obvious candidates for such dummies are the years of the crisis, starting in 2008. As can be seen

in Table 6, with the exception of the year 2009, the coefficients of these dummies are estimated as highly statistically significant. In fact the tests for structural break do suggest that the year 2008 marks a break in the behavioural relation therefore meriting the estimation of separate equations for the years of the crisis. However, the length of this period is not sufficient for such panel estimations (especially as regards GMM which makes use of two-year lags). In fact, in the case of GMM, even when taking the whole period 2000-2011 (which is reduced to 2002-2011 due to the lagged instruments) the number of observations is not sufficient to include even the four year dummies applied in the case of GLS. I have therefore limited their number to two, only for the years 2008 and 2009.

In the main, the GLS and GMM estimation results are not much different from each other, pointing to the same main directions of effects. There are, however, a couple of instances where there are some differences that need some attention in interpretation. Applying robust instrumental variables in the case of GMM to address endogeneity aspects provides more confidence in interpreting causal relationships in the regressions. Therefore I tend to give preference to the GMM estimates in cases their results differ from GLS.

Turning to the interpretation of these estimation results, and in line with the comments above, the panel growth regressions provide further insights into the growth performance of the EU in the past decade, in particular, allowing to disentangle, at least partly, the effects of the crisis. These results confirm that the crisis did take a heavy toll on the EU's growth performance: judging from the estimated values of the coefficients of the year dummies for the EU as a whole (EU-27), some 2 percentage points of foregone GDP growth in 2008 and some 4.5 percentage points in 2009 can be directly associated with the effects of the crisis.

The coefficients on 'factor inputs' are generally in line with the priors with the value of the coefficient on labour inputs even estimated in a range close to the theoretical prior. For obvious reasons, the capital coefficient is less reliable, gross fixed capital formation being only a remote proxy for capital input.

But for the purpose of our analysis, it is the coefficients of the remaining explanatory variables that provide more interesting insights. Two of these variables – the annual change in real ULC (international competitiveness) and private credit flow – were systematically estimated with statistically significant coefficients, suggesting that these two variables exerted a steady effect on the growth performance in the EU. These results re-confirm the conclusions already drawn in the previous econometric assessments, namely, that increased international competitiveness and rising private debt have been positively associated with GDP growth in the EU. The fiscal balance variable was more volatile in the panel regressions: it was not always statistically significant and in different versions of the regressions was estimated with different signs. I shall return to this below.

Importantly, the panel growth regressions presented in Tables 6 and 7 also appear as the only analytical tool (from those tested so far) that make it possible to clearly distinguish the differences in the growth behaviour between the subsets of EU Member States, namely, EU-10 and EU-17. There were several distinctive differences in the patterns of growth of EU-10 and EU17:

- The one-off direct negative effects of the crisis on GDP growth were considerably stronger in the case of the EU-10: some 3 and 9 percentage points in 2008 and 2009 respectively in the EU-10 compared to 1.5 and 3 percentage points, respectively, in the case of the EU-17.
- In the period under consideration, international competitiveness (as reflected in the change in real ULC) was a more important factor driving productive efficiency in the subset of the EU-17 countries as compared to the EU-10 countries.[17]
- GLS and GMM estimates regarding the effect of private credit are not identical but, as I mentioned before, I tend to give preference to GMM. In this sense, the panel regression tends to suggest that in the period under consideration, private credit was likely a more important productivity and growth driver in the case of the EU-17 as compared to the EU-10.
- The relationship between the *de facto* fiscal stance and GDP growth was notably different in the two subsets of countries. In particular, the panel regressions for the EU-10 suggest a statistically significant positive association, whereas I did not identify any statistically significant association in the case of the EU-17. As noted, the direction of causality in this case is ambiguous which calls for a more cautions reading of the results. A plausible interpretation of the above outcome is that EU-10 countries tended to adhere to a countercyclical fiscal policy stance whereas this was not the case for the EU-17.

## 3 Financing EU economic growth and the impact of the crisis

We now turn to issues related to the financing of growth, especially since the start of the global economic and financial crisis. Of course, financing of growth as such is in itself a very broad topic so I shall only touch upon several selected aspects. Besides, the empirical component of the analysis in this section only covers the period of the crisis which is related to the availability of relevant comparable data.

It is a well-established fact that the current crisis in Europe is mostly a debt crisis, the hangover of a credit boom resulting in excessive private or/and government debt. The bottom line is that in the past decade a number of economies, including EU Member States,

[17] As a word of caution, this conclusion need not be interpreted in the sense of understating the role of international competitiveness for productive efficiency in the EU-10. The above statement just indicates that the variation in productive efficiency in the EU-17 was to a higher degree associated with the variation in their international competitiveness.

experienced an unprecedented credit boom which was followed by a 'sudden stop' in the private capital flows (Gros, 2012). The recession and the associated job losses undermined the ability of the private sector to service past credit while the banks, facing a liquidity crunch themselves, were not willing and able to roll over past debt. In a number of economies governments were forced to intervene and bail out failing banks, *de facto* converting private debt into public.

In view of the above, the focus of this section will be on debt financing and I will look at some of the implications of the model of 'debt financing of economic growth'.

### *3.1 The 'financial cost' of EU growth during the past decade*

I have already discussed on several occasions how growth in the EU was related to credit flows and looked at the overall dynamics of private and government debt. The results of our empirical analysis suggest that economic growth in the EU (both EU-10 and EU-17) was strongly associated with the level of private credit flows, the growth in private indebtedness and the growth of the total (government + private) indebtedness of the economies as well as with the growth of the indebtedness of the banking sector itself. These findings already indicate that EU growth in this period has been very 'credit-intensive' and 'debt-intensive'.

While finance is undoubtedly a vital resource supporting economic growth, it is also useful to consider the effectiveness of debt financing. As an illustration of this, I compare in Table 8 the outcomes – in terms of cumulative GDP growth – with the amounts of financial resources mobilised in this process – in terms of cumulative public and private debt.

Table 8

**GDP growth and growth of indebtedness in the EU, 2001-2011**

| | EU-10 (CEE) | | | EU-17 (the rest) | | | EU-27 | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2001-2007 | 2008-2011 | 2001-2011 | 2001-2007 | 2008-2011 | 2001-2011 | 2001-2007 | 2008-2011 | 2001-2011 |
| Cumulative growth of GDP, % | 39.3 | 6.4 | 47.6 | 16.3 | -0.8 | 15.3 | 17.5 | -0.4 | 16.9 |
| Cumulative growth of indebtedness, % of GDP *) | 31.5 | 26.3 | 57.8 | 17.5 | 32.1 | 49.7 | 18.2 | 31.9 | 50.1 |
| of which: | | | | | | | | | |
| Cumulative growth of government debt, % of GDP *) | 1.7 | 13.9 | 15.6 | -1.7 | 24.5 | 22.9 | -1.5 | 24.0 | 22.5 |
| Cumulative growth of private debt, % of GDP *) | 29.8 | 12.5 | 42.2 | 19.2 | 7.6 | 26.8 | 19.7 | 7.9 | 27.6 |

*Notes:* The regional aggregates are weighted averages based on GDP shares at market prices and exchange rates. EU-17 data for private debt exclude Luxembourg, Malta and the United Kingdom.

*) Calculated as the difference in indebtedness (taken in proportion to GDP) in the last year and in the initial year of each period.

*Source:* Eurostat; author's calculations.

The striking fact emerging from these figures is that EU growth during the past decade has been extremely 'expensive'. Although one should avoid an oversimplified interpretation of the numbers, comparing 'inputs' and 'outputs' do imply dismal effectiveness of the process of converting financial resources into economic growth in the EU. Thus while over the period 2001-2011, EU-27 aggregate GDP increased cumulatively by some 17%, EU-27 aggregate total debt (government + private) increased by 50 percentage points of EU-27 aggregate GDP.

By this token, the EU-10 economies on average performed considerably better than the EU-17: in the EU-10 as a whole, a cumulative GDP growth of 47.6% over the period 2001-2011 was achieved at the expense of an increase in aggregate total debt by 57.8 percentage points of GDP while in the EU-17 the corresponding numbers were 15.3% and 49.7 percentage points of GDP.

The figures in the table point to another important change in financing that occurred during the crisis and which also implies differences in the financial performance of the EU-10 compared to the EU-17. The growth of indebtedness in the EU-17 as a whole prior to the crisis was exclusively concentrated in the private sector whose debt increased by 19.2 percentage points of GDP in the period 2001-2007. But during the crisis, within a time span of four years (from 2008 to 2011), the EU-17 governments incurred a cumulative increase of their debt amounting to 24.5 percentage points of their aggregated GDP both to engage in countercyclical policies but, to a large extent, to bail out failing banks. In addition to the data on private credit flows presented in Table 1, the credit crunch faced by the private sector of the EU-17 is evidenced by the fact that private debt during the crisis increased by a much smaller margin than public debt.

While the dynamics of public and private debt in the EU-10 also changed direction during the crisis, there was one important difference: with the possible exception of Slovenia, the banking sector in the CEE economies has so far not experienced serious difficulties resulting from excessive borrowing by the private sector. Respectively, so far there has been no need for massive bail-outs of banks by governments. While the EU-10 economies did face increasing government deficits during the crisis, these were not exacerbated additionally by bail-out programmes. The data in Table 8 also suggest that while private sector borrowing in the EU-10 did drop during the crisis, on average it was less affected by the crisis than borrowing by the private sector in the EU-17.

### *3.2 Economic performance, indebtedness and finance: macro- and microeconomic perspectives*

I first look at the issue from the macroeconomic perspective. While debt financing has been a key determinant of EU growth performance during the past decade, the recent escalation

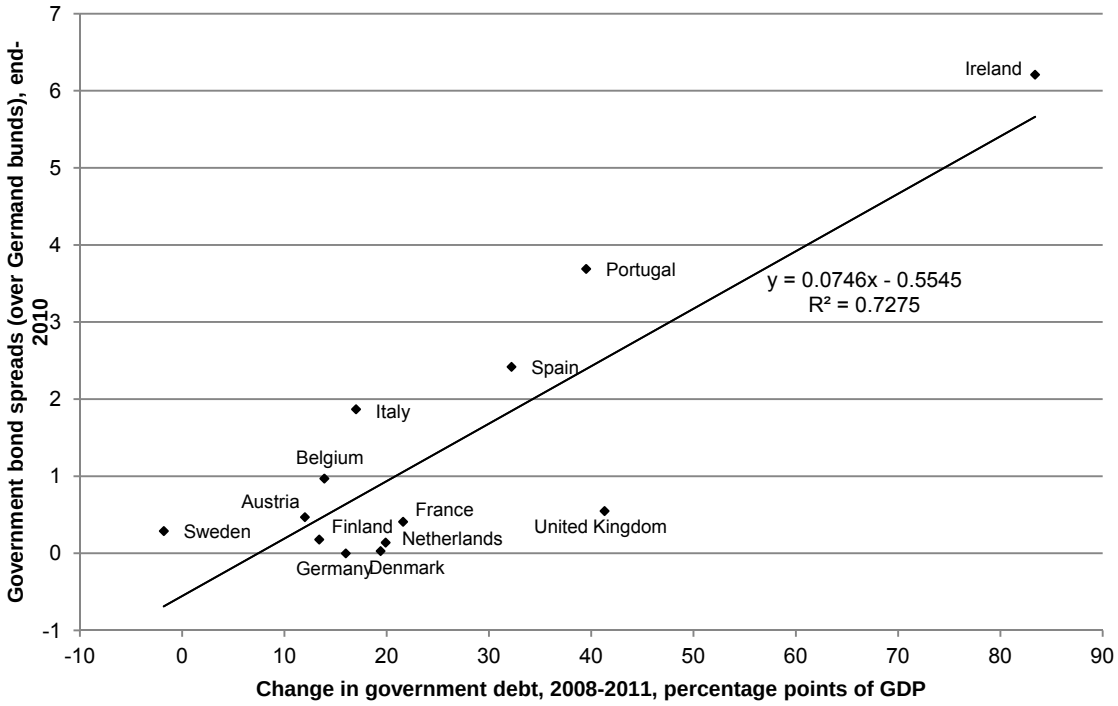
of indebtedness across the EU, in particular, by the governments, has in turn had significant implications for the EU countries' economic performance. I illustrate this in Figures 3 and 4 which depict how the general cost of finance countries are facing has been associated with the growth in their governments' debt. In view of the data constraints (available for very few CEE economies) it is not possible to distinguish in these charts between the performance of the EU-10 and the EU-17.

Both figures suggest a positive association during the years of the crisis between the growth in government debt and the general cost of finance countries are facing. In the first case (Figure 3) this is the excessive cost governments themselves are paying (the bond spread); in the second case (Figure 4) this is a broader measure, the country risk premiums, which roughly reflect the general country-specific interest spreads.[18]

These results strongly suggest that the debt-financed pattern of growth has not only been an expensive and inefficient model but that it also has lasting negative implications – the rising cost of finance being one of them – on the economies that engaged in excessive borrowing to finance their growth.

Figure 3

**Change in government debt, 2008-2011 and government bond spreads**

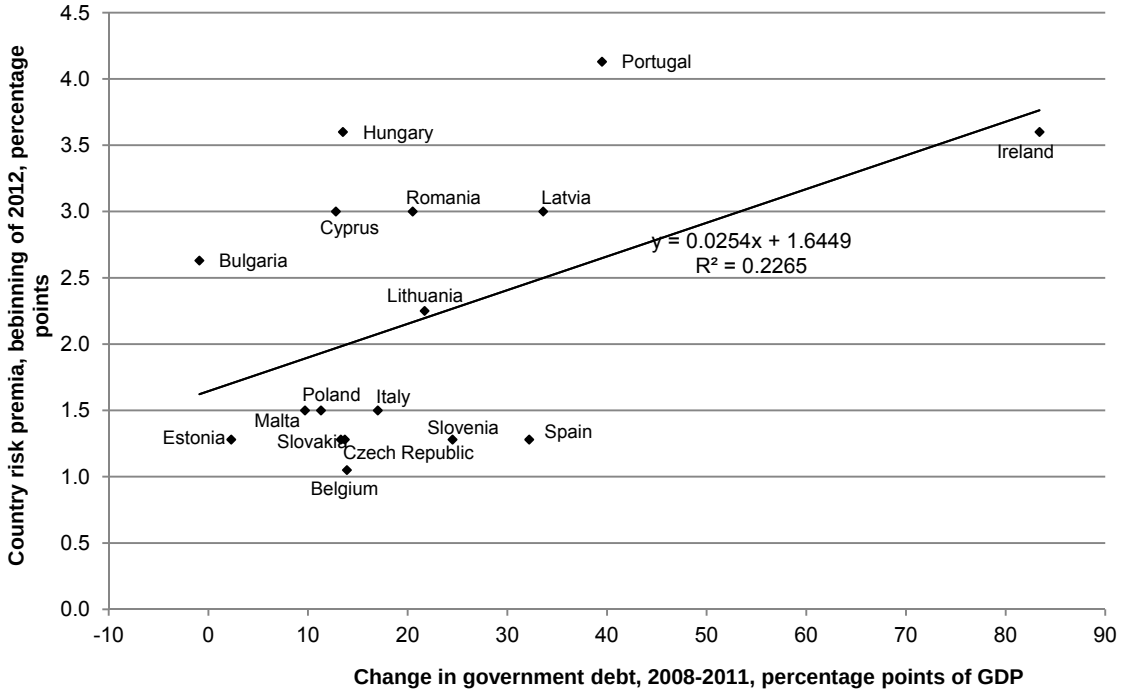



*Source:* Eurostat; Financial Times markets data archive; author's calculations.

[18] In this specific case I used country risk premiums as estimated by Damodaran (2012).

Figure 4

**Change in government debt, 2008-2011 and country risk premiums, 2012, non-Aaa EU countries**




*Source:* Eurostat; Damodaran (2012); author's calculations.

For the most part, the EU-10 economies – where governments on average are less indebted – have so far been spared some of these side effects.

Next, I look at some characteristics of the financial situation of enterprises during the crisis and how firms' perceptions of their financial situation is associated with the countries' economic performance, in particular, indebtedness.

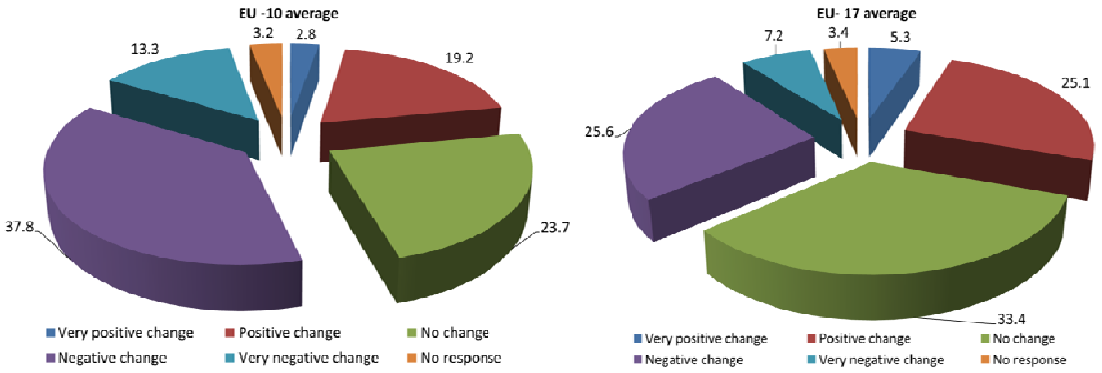
Figure 5 presents a summary of the firms' perceptions of the changes in their financial situation between 2007 and 2010 based on enterprise surveys conducted under a common methodology coordinated by Eurostat. As before, our main objective is to compare the perceptions of firms in EU-10 and EU-17 economies.[19] A first observation (Panel A in Figure 5) is that firms' perceptions in the EU-10 are in general much more negative than those in the EU-17: on average, 51.1% of respondents perceive the changes in the financial situation of the business in 2007-2010 as 'negative' or 'very negative', compared to 32.8% of respondents in the EU-17 who provided such responses.

[19] Note that the data for this exercise are not fully representative: they cover only 20 of the EU's 27 Member States and, within that, just 5 of the EU-10 countries. The regional aggregates quoted in the paper refer to these truncated subsets of countries.

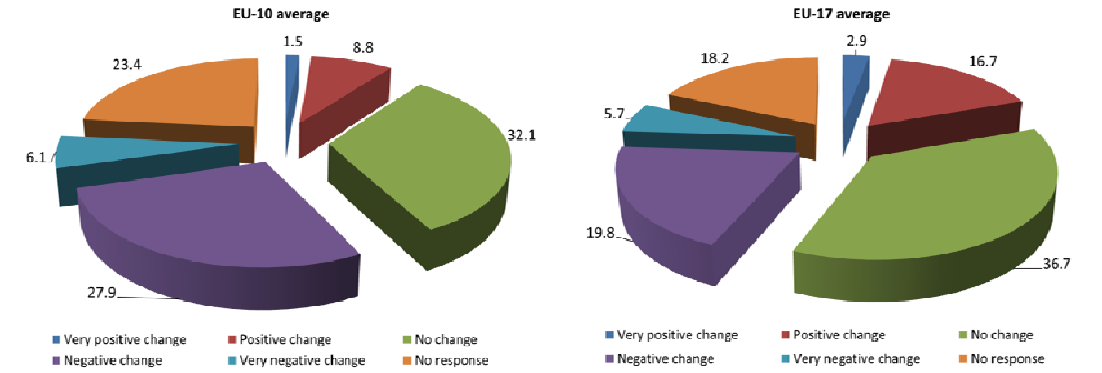
Figure 5

**Perception of the changes in the financial situation of enterprises between 2007 and 2010**

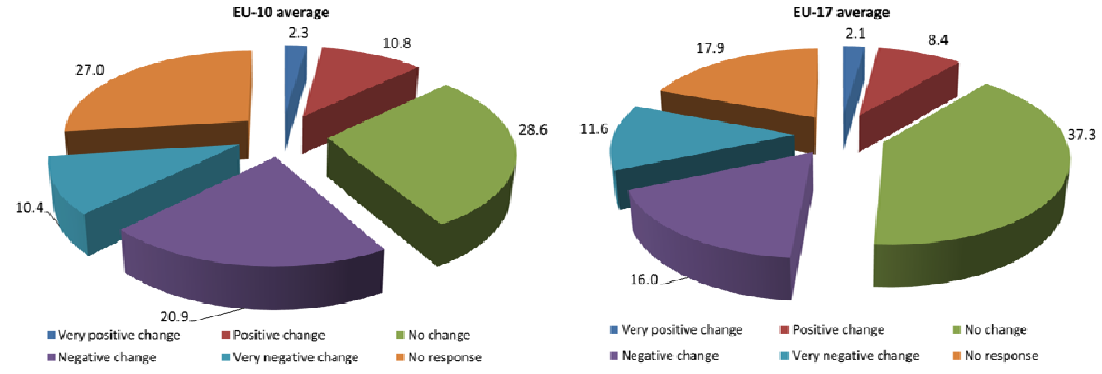
**A. Overall financial situation of the business**




**B. Cost of obtaining finance**




**C. Willingness of banks to provide finance**




*Source:* Eurostat; author's calculations.

However, Panels B and C in Figure 5 provide a more nuanced interpretation of these perceptions. Firms' perceptions of the changes in the cost of finance (Panel B) are similar to their overall perceptions of the changes in the financial situation of the business: 34% of respondents from EU-10 economies perceive the changes in the cost of obtaining finance in 2007-2010 as 'negative' or 'very negative', compared to 25.5% of respondents in the

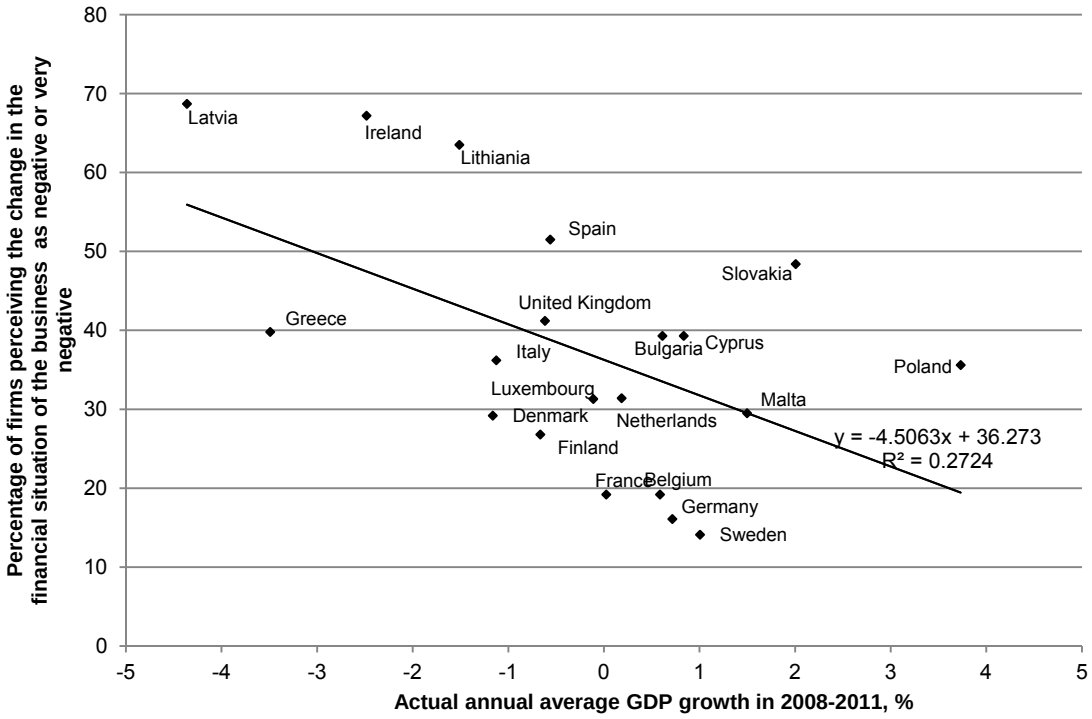
EU-17 who provided such responses. By contrast, Panel C reflects a somewhat different situation as regards the willingness of banks to provide finance: the respondents from EU-10 and EU-17 economies who perceive the changes in the willingness of banks to provide finance in 2007-2010 as 'negative' or 'very negative' is roughly the same and there are more respondents in the EU-10 than in the EU-17 who perceive this change as 'positive' or 'very positive'.

In other words, one could infer from these results that during the years of the crisis, firms in EU-10 economies were more likely to relate the perceived deterioration in the financial situation of the business to a rising cost of finance while firms in EU-17 economies were more likely to relate that to unwillingness of banks to provide finance (credit crunch).

Finally, we relate firms' perceptions of the changes in the financial situation of the business to some key characteristics of economic performance in this period (Figures 6 – 9).[20]

Figure 6

**GDP growth 2008-2011 and enterprises' perception of the changes in the financial situation of the business, 2007-2010**




*Source:* Eurostat; author's calculations.

Unsurprisingly, firms' perceptions of their financial situation are closely correlated to the growth performance (Figure 6): a recession is equivalent to a shrinking of the firms' mar-

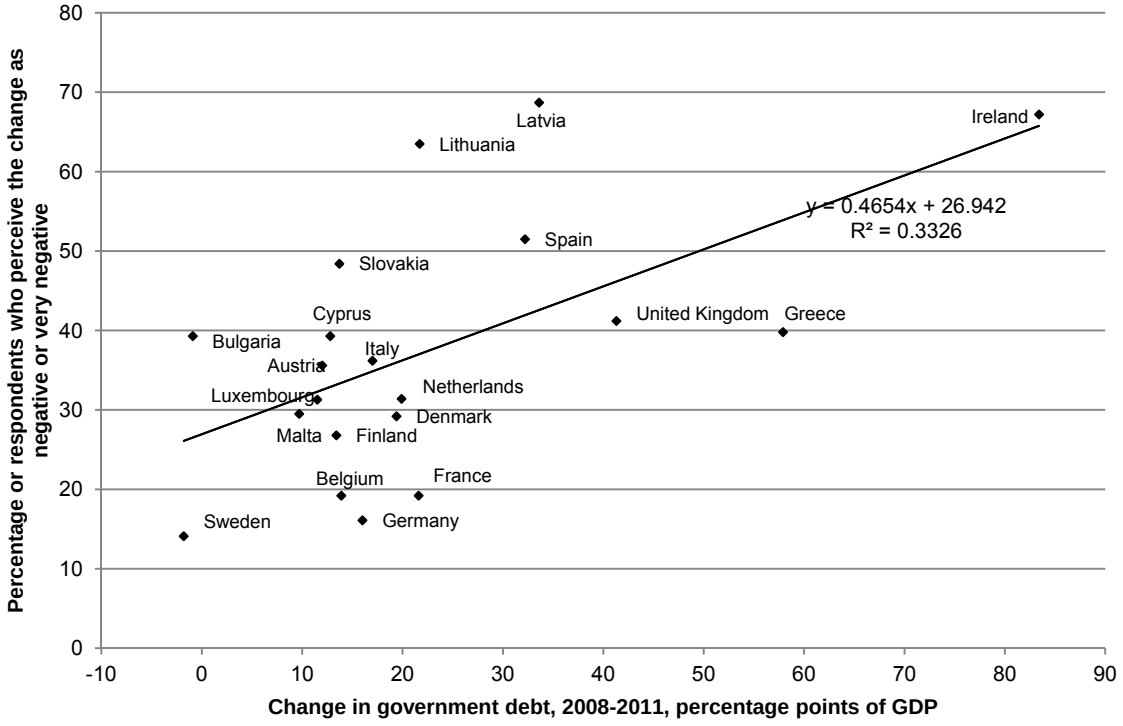
[20] Due to the truncated nature of the subsets of countries (especially, EU-10), I do not separate them in these charts.

kets and revenue which directly impacts on their financial situation. Notably, all EU-10 economies for which data on the perception of the changes in the financial situation of the business are available are located above the trend line, which is consistent with the generally larger negative shift in the firms' perceptions of their financial situation in this period.

The last three charts – Figures 7 to 9 – illustrate how the changes in firms' perception of their financial situation during the crisis relate to the changes in government debt in this period. Clearly, all three figures suggest that the negative changes in the firms' perception of the financial situation (as measured by three different indicators) are closely correlated with the increase in government indebtedness in this period.

Figure 7

**Change in government debt, 2008-2011 and perception of the changes in the financial situation of the business between 2007 and 2010**

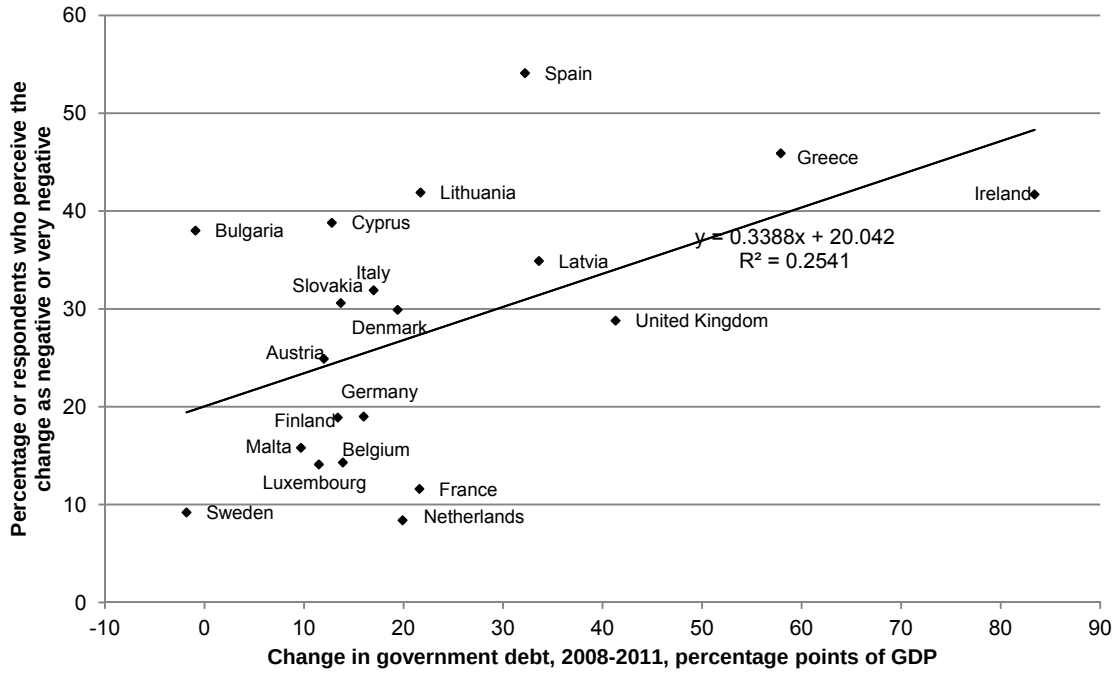



*Source:* Eurostat; author's calculations.

Obviously, as noted earlier, the change in government indebtedness itself is correlated with the depth of the recession experienced in this period, so in a way, the results shown in Figure 7 are partly a consequence of those already shown in Figure 6. Similarly, the correlation between the rising cost of finance enterprises are facing with the rising government debt (Figure 8) is fully consistent with the results already discussed in Figures 3 and 4. So probably the most interesting chart (revealing new insights) is that depicted in Figure 9: the unusually high correlation between the degree of the credit crunch firms are facing and the increase in the respective governments' indebtedness.

Figure 8

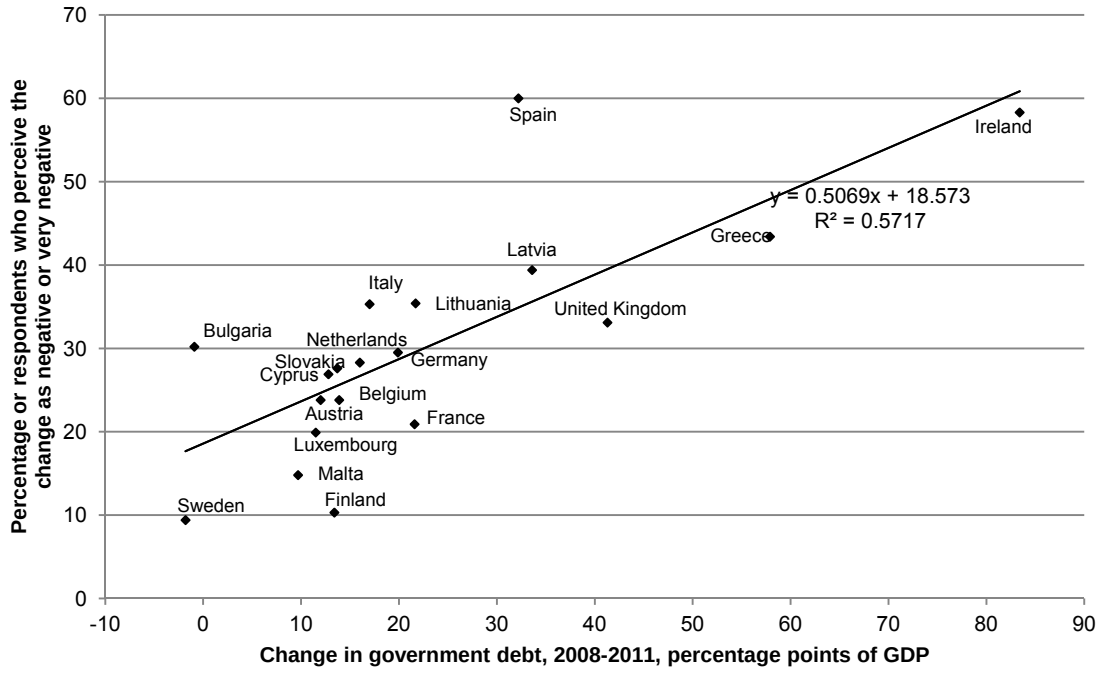
**Change in government debt, 2008-2011 and perception of the changes in the cost of finance between 2007 and 2010**




*Source:* Eurostat; author's calculations.

Figure 9

**Change in government debt, 2008-2011 and perception of the changes in the willingness of banks to provide finance between 2007 and 2010**




*Source:* Eurostat; author's calculations.

## 4 Discussion and policy implications

While performed at an aggregated macroeconomic level, the empirical assessment reported in the previous sections provides important evidence on the patterns of growth in the EU during the past decade, both in the lead-up to the current crisis and during the crisis.

As a first remark, drawing from the quantitative assessments presented above, one cannot help noticing the considerable, sometimes increasing, heterogeneity of growth, more generally economic performance across the EU. This concerns not only the existing differences between EU-10 and EU-17 economies but also significant dissimilarities between the growth patterns among countries within each of these subsets. This is clearly evidenced by the considerable within-group variation, sometimes growing over time, in performance characteristics.

As a second general remark, absolute real convergence between the EU-10 and the more developed countries has continued without interruption before and during the crisis. In fact, as also evidenced in a number of related studies, this process has been underway ever since the emergence of the EU-10 economies from the transformational recession that featured the start of their transition from plan to market at the beginning of the 1990s.

Nevertheless, within the EU, the EU-10 economies are to some extent still a club of their own. This is evidenced both by the similarities of their performance characteristics and by the existing between-group variation in economic performance and growth compared to the countries of the EU-17. The econometric analysis based on panel growth regressions reported above provides further robust evidence as to the existence of important behavioural differences between the patterns of growth of EU-10 and EU-17.

Despite the partial character of the growth determinants and factors that we consider in our empirical exercise, the latter provide important and interesting insights into the model of growth that prevailed in the EU and in the CEE countries. One clear point of departure in analysing the pattern and model of growth in the EU and in CEE in the past decade is – as evidenced in our empirical exercises – the break in the pattern of growth that occurred during the crisis.

### *4.1 The model of growth in the EU in the past decade*

There appears to exist forceful evidence suggesting that the dominant factor boosting economic growth in the boom period preceding the crisis was the mobilisation of new resources, in the first place financial resources, into the economic process. The empirical evidence presented in the previous sections (both the descriptive statistics and the econo-

metric analysis) tends to support such a conjecture: this refers to factors such as fixed investment, FDI, attracted foreign savings (current account balance), total banking sector liabilities, private sector credit flow, government and private debt. This is not to underestimate the role of structural supply-side factors positively associated with growth such as innovation, labour productivity and, to some extent, competitiveness (the latter had a more important direct role in boosting export performance). However, as also seen in the econometric part, their role in boosting overall productive efficiency in the EU has been relatively limited.

The bottom line is that the growth model was disproportionately skewed towards the attraction and mobilisation of additional financial resources as compared to the reliance on structural supply-side factors. The main outcome of such a model of growth is now well known: the accumulation of unsustainable levels of debt (government and private) in a number of countries which, in turn, pushed the whole euro area into a debt crisis.

Having such an outcome also strongly suggests that financial intermediation in this period was far from being efficient and this concerns both lending to the private sector and to governments. The credit booms experienced by several countries – often related to real estate bubbles – once again points to the absence of effective mechanisms and instruments (both nationally and within the euro area) to prevent excessive lending to the private sector that leads to the accumulation of unsustainable private debt. The existing prudential banking regulations have proved incapable of dealing with such an issue.

Another issue that emerged as a result is the absence of a systemic facility (within the EU or the euro area) to deal with failing or insolent commercial banks. This is an issue which is widely debated at present (including in the context of the proposed Banking Union) so I will not dwell further on this.

Lending to governments has also been prone to inefficiencies. This was especially manifest in the first years after the introduction of the euro, when bond spreads fell dramatically and financial markets practically did not discriminate between the national flags when lending to euro area governments. Plus, on top of all this, (existing) EU macroeconomic rules were not thoroughly enforced. Indeed, under the existing rules and regulations no euro area country would ever get into macroeconomic financial trouble – but the fact was that these rules were never systematically enforced and financial markets, at least initially, did not identify this problem. In the mean time, a number of countries were accumulating levels of government or/and private debt that would soon turn out to be unsustainable.

Fiscal policy *per se* also played a role in this process. The years 2001-2007 were a period of economic boom, and prudent fiscal policy requires that government balances be adjusted accordingly. In accordance with the Stability and Growth Pact, EU governments are

in principle required to target the structural balance and tune their actual fiscal policy to the cycle. In case of an economic boom (and this was a period of prolonged boom) this implies maintaining a surplus in the government cash balance. In fact, only a few EU economies (Bulgaria, Denmark, Estonia, Ireland, Spain, Luxembourg, Netherlands, Finland and Sweden) did maintain a fiscal surplus for two or more consecutive years in this period. This only served to exacerbate the problems during the crisis: the *de facto* followed lax fiscal stance led to deteriorating structural balances and when the cyclical factors changed direction during the crisis, actual fiscal deficits soared to unprecedented levels, further adding to the debt problems. This outcome points to another deficiency in the EU (and euro area) institutional arrangements – the absence of reliable instruments for measuring structural balances and requiring governments to maintain cash surpluses in a period of boom (in a way, requiring a symmetric treatment of the cycle by the national authorities).

The irony of the fiscal loosening experienced in this period is that it does not appear to have contributed to economic growth: on average there was no correlation between the average levels of the government balances in individual EU economies and their average growth in this period (Table 3). The ambiguous role of fiscal policy in the EU Member States (and this is especially true for the EU-17) as a growth determinant is also highlighted in the econometric part of the paper (the panel growth regressions). Such outcomes provide arguments for the introduction of symmetric fiscal treatment of the cycle by the national authorities as discussed above.

Applying panel growth regressions based on annual data (Section 2.4) makes it possible to cast some additional light as to the factors driving productive efficiency. These estimations, which provide important hints as to the actual driving forces of productive efficiency, do not reveal a very rosy picture of the patterns of growth in the EU. Among the determinants of productive efficiency that were identified through this empirical analysis of the patterns of growth in the past decade, only one factor (real ULC, reflecting international competitiveness) was of a structural nature.

Panel growth regressions (Table 7) also suggest that private credit was positively associated with productive efficiency in the EU in the past decade. While this outcome undoubtedly reflects realities, the irony is that due to the poor efficiency of financial intermediation, the ultimate outcomes were negative. As discussed in the previous section (Table 8), during the past decade the banks channelled enormous amounts of financial resources into the EU economies. There was indeed a positive impact on growth and productive efficiency, but comparing the amounts of financial resources used with growth and productivity performance, the results were dismal.

The empirical evidence on the economic performance of the EU economies in the period 2008-2011 suggests a complete collapse of the growth model that prevailed before and as

described above. As evidenced in Table 2, no common patterns of strong relationships were identified between country growth and any of the key growth determinants that were important in the boom years, with the possible exception of private credit flows. Regrettably, in purely econometric terms, the time that has elapsed since the start of the crisis is still relatively short to try and estimate separate behavioural relationships for this period alone, so I will confine my discussion to more descriptive tools.

The previous discussion highlighted a number of factors that have been a drag on growth in recent years and most of these were related to the level of indebtedness (both government and private). In other words, the crisis rejected the growth model to which the EU adhered in the previous several years on the grounds of its unsustainability.

At the same time, the question: 'What is happening to growth in the EU during the crisis?' still has no clear answer. The fact is that at present neither economists nor politicians know where EU growth is heading now and where it will be heading in the near future. The crisis appears to have destroyed important economic mechanisms and channels that existed before but new ones have not been established yet. The very pattern of present growth (if there is any growth at all) and its driving forces remains a puzzle.

One thing that we can observe in the data is that economies that are less indebted with government debt tend to fare better than more indebted economies both in terms of their growth performance but also in their access to finance. The analytical assessment reported in previous sections provides empirical evidence to this effect both at the macro-level and at the level of firms. Therefore it appears safe to conclude that at present the level of government indebtedness is turning into a key determinant of economic performance in the EU in general.

As also evidenced by one extreme case, that of Greece, euro area economies that face a severe debt problem are in a dangerous trap and once in, there are no easy ways out of it. Such economies indeed find themselves in a vicious circle: the only viable way out of the debt trap is to 'grow the economy out of it'; however, the debt burden weighs heavily on the growth prospects of these economies. Euro area economies are also denied the possibility to inflate away the debt as they do not conduct independent monetary policy. Boosting competitiveness through cuts in nominal wages is a daunting task with doubtful outcomes and reduced pay lowers worker incentives and hence productivity, so the resulting effect on real ULC is unclear.

But also economies where government debt is not a burning problem (virtually all EU-10 being in this group) have seen massive drops in GDP growth and face considerable challenges in their attempts to invigorate growth. The previous growth model is not working in such economies either and GDP growth rates have dropped across the board.

Overall, comparing resources with outcomes (Table 8), during the past decade economic growth in the EU has been highly inefficient. This concerns even the boom period prior to the crisis (2001-2007) when the accumulated increase in total (government plus private) debt in the EU-27 was larger than the accumulated increase in EU-27 GDP. At the same time, this episode has also revealed the absence of effective brakes to arrest the accumulation of unsustainable debt – both private and government – early enough, before the growing debt escalates into crisis. The current economic slowdown now increasingly appears as a lasting phenomenon which will likely be equivalent to a downward shift in trend growth within the EU in the foreseeable future.

### *4.2 Are the CEE countries different?*

The model of growth in EU-10 economies prior to the crisis was not much different from that in the EU-17. There were some specificities though which present a more benign picture for this group of countries. As seen by most of the empirical evidence presented earlier, apart from converging to per capita income levels, CEE economies were catching up to the more developed EU Member States in many important structural aspects of economic performance such as labour productivity, innovation, competitiveness, export performance, etc. In fact, the empirical evidence suggests that economic growth in EU-10 economies was to a larger degree related to improvements in structural supply-side factors than this was the case in EU-17 economies. One piece of evidence in support of this statement is the fact that aggregate EU-10 GDP in the period 2001-2007 grew more than the increase of their total indebtedness in this period (39.3% and 31.5% of GDP, respectively – Table 8).

Nevertheless, EU-10 countries also mobilised considerable amounts of resources in their catch-up process. In relative terms (as a percentage of GDP) CEE economies attracted more FDI and more foreign savings in general than EU-17 economies and had higher fixed investment shares in GDP. The total liabilities of the CEE banking sector also increased more than those in the EU-17 (Table 1). EU-10 economies also embroiled in the credit boom, in some cases (the Baltic states and Bulgaria, among others), accompanied by a real estate bubble. Indeed, private consolidated gross debt as a proportion of GDP in the EU-10 on average was roughly comparable to the EU-17 average throughout the period 2001-2011 (Table 1).

The fact that they did not get into real trouble (in none of the CEE economies has the economic turbulence accompanying the crisis escalated into a full-blown crisis so far) is mostly due to their more favourable initial conditions. At the beginning of the boom, CEE countries were less indebted than the core EU Member States both in terms of government and private debt and the financial expansion they experienced in the lead-up to the crisis did not

result in a debt overhang when they were faced with the sudden stop in credit and capital inflows.

The CEE economies as a whole experienced both direct and indirect effects of the crisis. A notable direct negative consequence was the considerable slowdown in the inflow of resources (in particular, FDI and financial resources) from the rest of the world which had numerous repercussions on their economies.

A large share of commercial banks in EU-10 countries are foreign-owned, acting as subsidiaries of larger financial institutions (the latter for the most past are EU-based). During the credit boom years, CEE banks widely practised borrowing cheap funds on international financial markets (often through their parent institutions) and then channelling these funds to the local economies in the form of credit. In this they could usually reap considerable profit due to the interest spread as they would charge country risk and other premiums on the local markets. Although there is no evidence of banks' completely withdrawing from CEE markets during the crisis[21], the flow of funds as described above was severely reduced, mostly due to the overall liquidity crunch in Europe. The drain in external funds, coupled with increased risk aversion of domestic banks, triggered a sharp drop in private credit flows even though no country has for far experienced major private debt problems. This, in turn, has given rise to numerous ripple effects, contributing in the final run to the slowdown of growth.

Trade was another important transmission channel of direct and secondary negative effects. Apart from the overall slowdown in global trade, one should take into account the fact that the level of dependence of CEE economies on trade with other EU partners (these are mostly the large EU economies) is much higher than that in EU-17 economies (Table 1). Thus the negative impact of the current slowdown in EU domestic demand on exports from other EU countries must have been relatively stronger in the EU-10 economies than that in the EU-17.

- The panel growth regressions presented in Section 2.4 cast some additional light on the behavioural differences of the CEE as compared to the other EU countries.
- The CEE countries were hit much more severely by the shocks of the crisis but these were one-off effects that were phased out soon.
- CEE countries were less reliant than the rest of the EU on private credit as a growth boosting factor.
- International competitiveness (in terms of real ULC) was to a lesser extent a determinant of productive efficiency in the CEE countries than in the EU-17 (but see the related disclaimer in Section 2.4).

[21] This was substantiated by the so-called Vienna Initiative, a coordination mechanism including foreign banks and local governments to prevent large-scale withdrawal of banks from emerging Europe.

### *4.3 Can growth in Europe be invigorated? Some reflections on future policies*

If one considers the issue of economic convergence related to CEE *per se* (in terms of reducing per capita income gaps vis-à-vis the richer EU countries), the answer can be straightforward and unequivocal: real convergence within the EU will continue as a fundamental long-term economic trend. As seen even in the recent crisis years, EU-10 economies still maintained a positive growth differential vis-à-vis the EU-17. However, this was happening against the backdrop of a major downward shift in GDP growth rates across the EU.

Thus the key question now should be how to invigorate growth in the EU as a whole. Asking such a question regarding the CEE countries alone makes no economic sense, given their high level of integration in EU markets. While real convergence may still continue, it does make a difference if the catch-up process takes place at average annual GDP growth rates close to 5% (as in the period 2001-2007) or if it happens at average annual GDP growth rates in the order of 1-2% (as in the period 2008-2011).

Given that CEE growth cannot be disentangled from that of the EU as a whole, it appears appropriate to start the discussion with some issues related to EU growth in general.

The current crisis revealed a number of deficiencies in EU (and euro area) institutional and regulatory arrangements. If this were not the case, a crisis would not have occurred in the first place. There is thus the need for institutional and regulatory reform and there is a wide ongoing debate on this. On the positive side, the crisis has contributed to building momentum in support of the need for such reforms. However, on the negative side, there is still no core majority (not to speak of consensus) – either conceptually or politically – regarding the direction and nature of reforms. It is not my objective to open a new debate so I shall limit myself to some conceptual observations related to the needed policy reform targeting the boosting of future growth prospects, drawing on issues that were already identified earlier in the paper.

One general remark is the enforceability of EU (euro area) rules and regulations. The fact is that prudential macroeconomic rules (such as those governing the Stability and Growth Pact) existed but they were not systematically enforced. If all EU governments had strictly adhered to the existing rules, government debt would not have gone out of control in any of these countries. The issue comes to the question: How to institute rules and regulations that would be enforceable at the EU/euro area level? Ultimately, it comes again to the main stumbling block in the current debates: the balance between national sovereignty and supranational authority. Enforceability at the EU (euro area) level comes to delegating an EU body with supranational power to enforce rules and regulations. In the final run it comes to EU Member States agreeing to concede elements of their sovereign decision-making authority to such a supranational body.

A second general remark is on the nature of existing rules and regulations. As already discussed, if existing rules and regulations were efficient and effective, the crisis would not have happened in the first place. The Stability and Growth Pact failed to guarantee either stability or growth in the EU. It thus calls for being reformed.

One important area where policy reforms appear to be needed at the European level is financial intermediation with a view to improving its efficiency. The crisis revealed significant flaws in the process of financial intermediation within the EU. Again, if this were not the case, the crisis would not have occurred in the first place. Among the deficiencies that surfaced in the course of the crisis that we already mentioned was the absence of effective mechanisms and instruments to prevent banks from excessive lending to the private sector and the accumulation of unsustainable private debt. This is related to the early identification of possible 'bubbles' in financial markets – an old and acute problem which still has not found an adequate solution. In any case, there is a dire need for reform in the existing prudential banking regulations.

Not less important, developments in the course of the crisis brought to the surface the still high level of fragmentation of European financial markets. The rise in financial turmoil acted as a brake on cross-border financial movements, even within the euro area itself, and this happened despite years of operation in a single market. There are many reasons for this including the lack of EU-wide harmonisaiton in banking regulations and hence the level of risk banks assign to cross-border transactions (especially in the situation of a crisis when they could be subject to discretionary treatment by national authorities). But there also still appears to be a high level of cross-border information asymmetries: despite the claims of a single market, national borders still appear to act as borders to information flows as well, limiting the access by foreign residents to important information about the national market environment. Being less informed about the market environment across national borders adds to the risk aversion of financial institutions as regards cross-border transactions.

Reducing cross-border information asymmetries is obviously an important area of reform at the EU level that could facilitate and encourage the cross-border free flow of capital within the EU. Ultimately, such reforms as well as better prudential regulation would act to improve EU-wide financial intermediation: on the one hand, it would help financial institutions to identify the best bankable projects within a much larger economic space; on the other hand, it would improve the access to finance by corporate and individual borrowers. In the final run, more efficient and effective EU-wide financial intermediation should contribute to boosting EU-wide economic growth.

As regards the growth prospects of the EU-10 economies, being part of the EU, they are subject to the same rules of the game and hence they will not be spared the constraints

that all EU economies are facing at the moment. Obviously, EU-10 economies need to put behind them the model of resource-intensive, debt-intensive growth that they enjoyed during the past decade. This model has proved both ineffective and highly risky; besides, financial markets are not likely to engage as partners in such a model any longer.

Thus from a macroeconomic perspective, each EU-10 economy needs to align its future macroeconomic trajectory in a way that would ensure long-term sustainability of debt. Importantly, sustainability refers to both government and private debt: as seen from the experience of some EU-17 countries, faced with unsustainable private debt governments find themselves compelled to intervene, ultimately transforming private debt into public. Such a re-balancing has been under way during the years of the crisis but in this case each country needs to do its own exercise in checking and testing the parameters of its own debt sustainability.

Within the limits of tolerable future debt exposure, the question is how to re-shape the model of growth – or actually, how to shape a new growth model – that would invigorate growth in the CEE countries, apart from what needs to be done at the EU level. Being still a 'club of their own', there may also exist lines of policy-making that are specific for this group of countries.

Obviously, one direction of possible policy measures is that targeting the supply side. CEE countries did fare better than EU-17 economies on this account during the past decade as structural supply-side factors played a greater role in the EU-10 growth model. Among the important factors one should mention further advances in competitiveness (as reflected in unit labour costs) and in fostering innovation, two factors that did contribute to higher growth in these economies and which are likely to continue to have such an effect, if conditions are in place.[22]

Boosting competitiveness through ULC requires achieving a national (across party lines and tri-partite mechanisms), medium- to long-term consensus on aligning the dynamics of workers' pay with that of labour productivity. Those EU-10 countries that are not euro area members are in principle better placed to implement measures of this sort as they have at their disposal also the instruments of monetary and exchange rate policy. But as also demonstrated by the example of Germany, lasting ULC-based improvement in competitiveness can also be achieved within a monetary union.

Enhancing innovation performance in the EU-10 economies is definitely a policy area which has a considerable potential and can be very promising as regards the prospects for invigorating growth. CEE countries on average still face a considerable gap vis-à-vis the

[22] For obvious reasons, the discussion in this part is limited to factors that were part of the empirical analysis undertaken in the paper. This is by no means a claim that this is an exhaustive list of growth-enhancing supply-side measures.

more advanced EU economies and fast catching up on this account can be a factor adding to the positive growth differential. No doubt, promoting innovation has been among the policy priorities of EU-10 countries all these years so there will be nothing novel in terms of assigning new priorities. The issue here is whether these countries and their governments can do more in promoting innovative performance or, for that matter, whether they can 'do more with less', given the persistent fiscal restraint they are likely to be facing.

Of course, this is easier said than done but among the possible ways to accomplish this one is related to an eventual restructuring of the policy instruments within the national innovation policy mix. Recent firm-level empirical analysis relating firms' productive efficiency to the innovation strategies they pursue, suggests that most of the factors that are associated with a 'positive performance premium' at the firm level are of a systemic nature (Dobrinsky, Markov and Nikolova, 2010). This underscores the fact that innovation activity involves a systemic process, embedded in a specific context and involving various stakeholders. Furthermore, this suggests that significant positive effects on firms' productive efficiency can be achieved through non-financial instruments promoting innovation.[23]

An important corollary is that these are relatively 'cheap' policies as they do not involve direct financial investment by the state in the innovation process. Greater emphasis within the innovation policy mix on non-financial policy instruments promoting innovation could improve the overall efficiency of the policy mix, thereby enhancing innovation, firms' productive efficiency and, ultimately, economic growth. And this would not be associated with additional claims on public funds.

Notably, apart from structural supply-side measures of the sort discussed above, CEE economies do need reforms targeting more efficient resource utilisation, including the most efficient allocation of financial resources (which will be less abundant than before). The main instruments to achieve this are not much different from those discussed for the EU as a whole. But there still are specificities, related to the still immature market and business environment in the EU-10. Despite the progress in market reforms, the level of existing market imperfections in some EU-10 economies is still considerable. Thus the relatively high (compared to the EU-17) business risk premiums charged on credit by EU-10 commercial banks reflect, among other things, still high within-country information asymmetries. Policies targeting to eliminate, or at least reduce, within-country information asymmetries, if successful, would result in a general lowering of the cost of finance which, in turn, should support the environment for invigorating economic growth.

[23] Non-financial policy instruments (Dobrinsky, 2009) rely on the coordinating capacity and convening power of the state and on its role in stimulating linkages between the potential key stakeholders of a project. They facilitate knowledge flows, promote risk sharing among stakeholders through knowledge sharing and also address systemic and network failures. Potential key stakeholders may be unaware of existing entrepreneurial opportunities and decoupled from other possible partners. A public policy intervention in systemic coordination and information sharing to reduce uncertainty and perceived risk could help in dealing with this market-cum-systemic failure.

Maintaining high economy-wide fixed investment ratios should be another area of policy attention. Economic research has consistently suggested a positive link between fixed investment ratios and the rates of GDP growth, and such a relationship was also illustrated in Section 2 for the EU economies. Empirical research on the determinants of business investment during the transition from plan to market (Dobrinsky, 2007) suggests that business investment in these economies was highly sensitive to variables such as bank credit, domestic savings and capital inflows, which *inter alia* is evidence of the importance of financing constraints. In the changing environment, the focus of policy therefore should be on encouraging high levels of domestic savings and channelling these into productive domestic investment. An efficient system of financial intermediation is an additional prerequisite for this transmission to occur. Improving the attractiveness of the domestic environment to FDI is another mechanism for boosting fixed investment ratios.

As regards the attracting of foreign savings (equivalent to maintaining a current account deficit), there is a need for a differential policy approach. If foreign capital is channelled to productive investment, it should be encouraged within the overall debt sustainability corridor. However, maintaining current account deficits driven by a disproportionate boom in private consumption is a very risky avenue that does not help to improve the growth potential of the economy but contributes to generating new private debt. Prudent policy therefore could try to prevent such developments from escalating beyond control. The real estate sector remains a grey zone which requires a special treatment in view of the potential emergence of real estate bubbles.

## 5 Concluding remarks

This paper attempts an empirical analytical assessment of some of the determinants of economic growth in the EU during the past decade, with a specific focus on the Central and Eastern European members of the EU. I seek to present an overall, albeit simplified, picture of the model of growth in the EU on the basis of empirical evidence of recent EU growth performance, including the role of finance. The methodology of the empirical analysis is based on a combination of different statistical methods and techniques including descriptive statistics and stylised facts as well as some widely used empirical models of growth, including the testing of convergence hypotheses and running panel growth regressions. The paper also looks at some of the changes in the model of growth that took place during the current economic and financial crisis.

One of the main conclusions of the analytical assessment is that during the past decade, in particular, prior to the crisis, the growth model in the EU was disproportionately skewed towards the attraction and mobilisation of additional resources as compared to the reliance on structural supply-side factors. In particular, economic growth in the EU (including CEE as well) has on average been extremely finance-dependent and debt-intensive. On the one

hand, this has resulted in inefficiencies in the allocation of financial resources and ultimately, in an inefficient economic growth model. On the other hand, the unsustainable pace of accumulation of private or/and government debt has been the root cause of the current debt crisis. This debt-driven pattern of growth which was prevalent in many of the EU-17 economies has not only been an expensive and inefficient model but it also has lasting negative implications – the rising cost of finance being one of them – on the economies that engaged in excessive borrowing to finance their growth.

The empirical evidence suggests a complete collapse of this growth model during the crisis: none of the previously existing common patterns linking country growth to key macro-level growth determinants (with the possible exception of private credit flows) were sustained during the crisis. Put differently, the crisis rejected the growth model to which the EU had adhered in the previous several years on the grounds of its unsustainability. However, no clear new pattern of growth has emerged in recent years.

While the crisis rejected the previous growth model on the grounds of its unsustainability, a new model of growth has not emerged yet in the EU. In any case, it appears safe to predict that countries (both governments and businesses) will have to learn to live with less resources (in the first place financial) at their disposal. Therefore, one of the key factors for invigorating future growth will be raising the efficiency of resource utilisation, including raising the efficiency of utilisation of public funds. Thus the policy motto for the foreseeable future is probably shaping as: 'Doing more with less'.

As regards the CEE countries (EU-10 economies), one of the empirical findings in the paper is that catching-up and absolute real convergence has been underway both before but also during the crisis. Economic growth in the CEE countries during the past decade was also finance-dependent and debt-intensive but, on average, not to the extent observed in the average EU-17. The empirical analysis provided in the paper suggests that economic growth in the EU-10 economies was to a larger degree related to improvements in structural supply-side factors such as productivity, innovation, competitiveness, etc. than was the case in the EU-17. While macroeconomic imbalances exist in CEE countries, in none of them have these escalated into a crisis so far.

Based on this empirical assessment the paper then addresses policy issues related to the possible invigoration of economic growth in the EU and, in particular, in CEE. It discusses both EU-wide and CEE-specific directions of policy reform that could possibly provide new impulses to future economic growth. One of the main areas of policy reforms aiming to invigorate growth that are discussed in the paper are those targeting improvements in the efficiency of financial intermediation. The measures discussed in the paper concern changes in the national and supranational policy framework and regulatory measures tar-

geting more efficient allocation of financial resources. The paper also discusses some supply-side structural measures that appear to be especially pertinent for the CEE economies.

Overall, the paper concludes that real convergence with the EU will continue as a fundamental long-term economic trend. The argument in the paper is, however, that while real convergence *per se* may continue even if EU growth remains sluggish, the pace at it which the catch-up process takes place makes a huge difference both for the CEE economies and for the EU as a whole. It is therefore worth the effort to search for and pursue policies seeking to invigorate growth in Europe.

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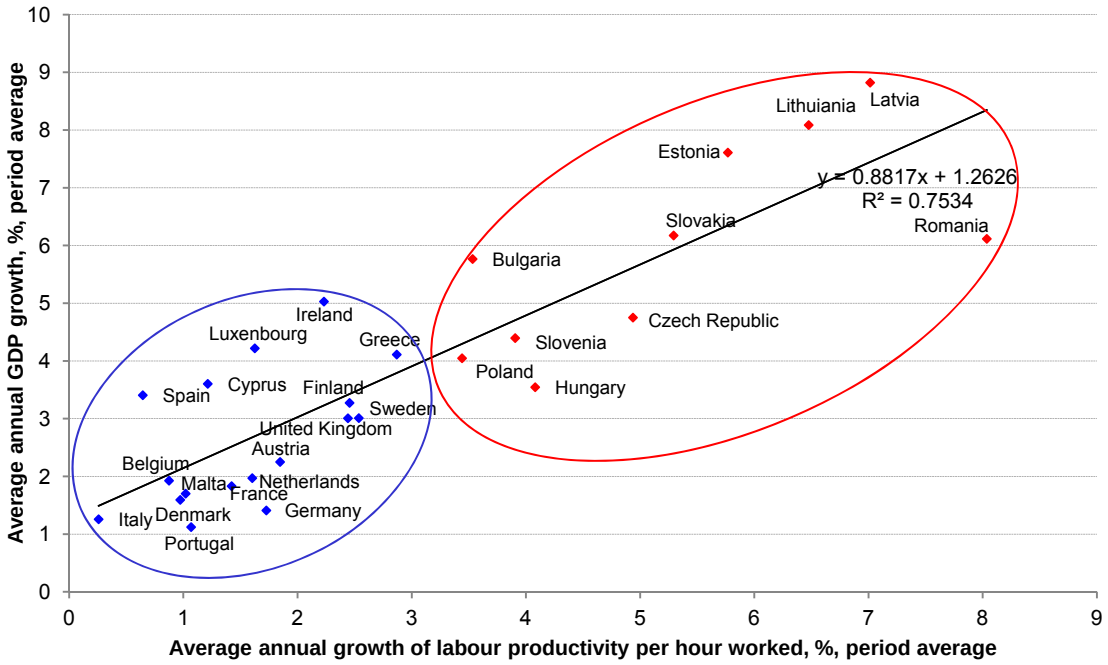
# A N N E X

## Univariate analysis of patterns of growth in the EU

Figure A1

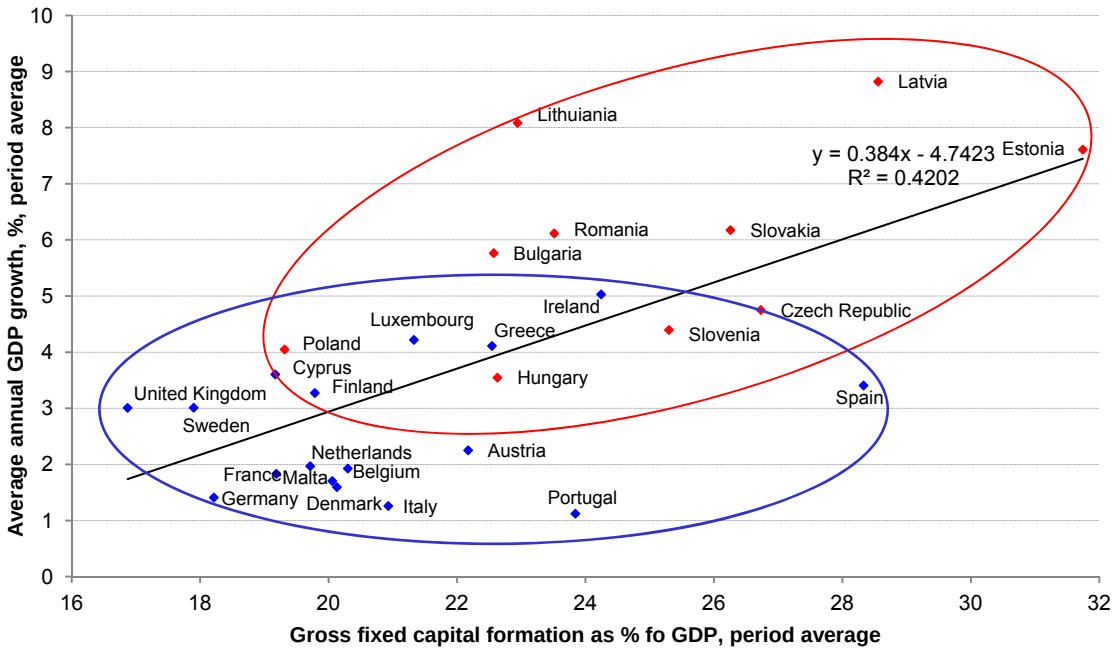
**Labour productivity and GDP growth, 2001-2007**




*Source:* Eurostat; author's calculations.

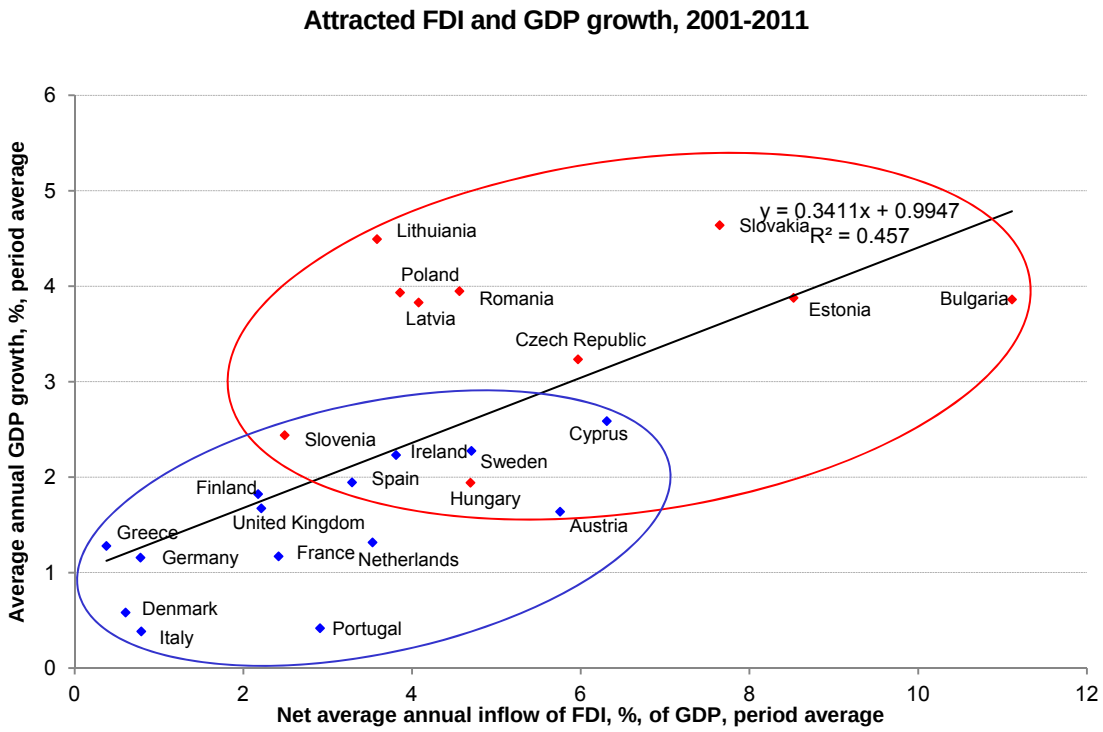
Figure A2

**Gross fixed capital formation and GDP growth in the EU-27, 2001-2007**



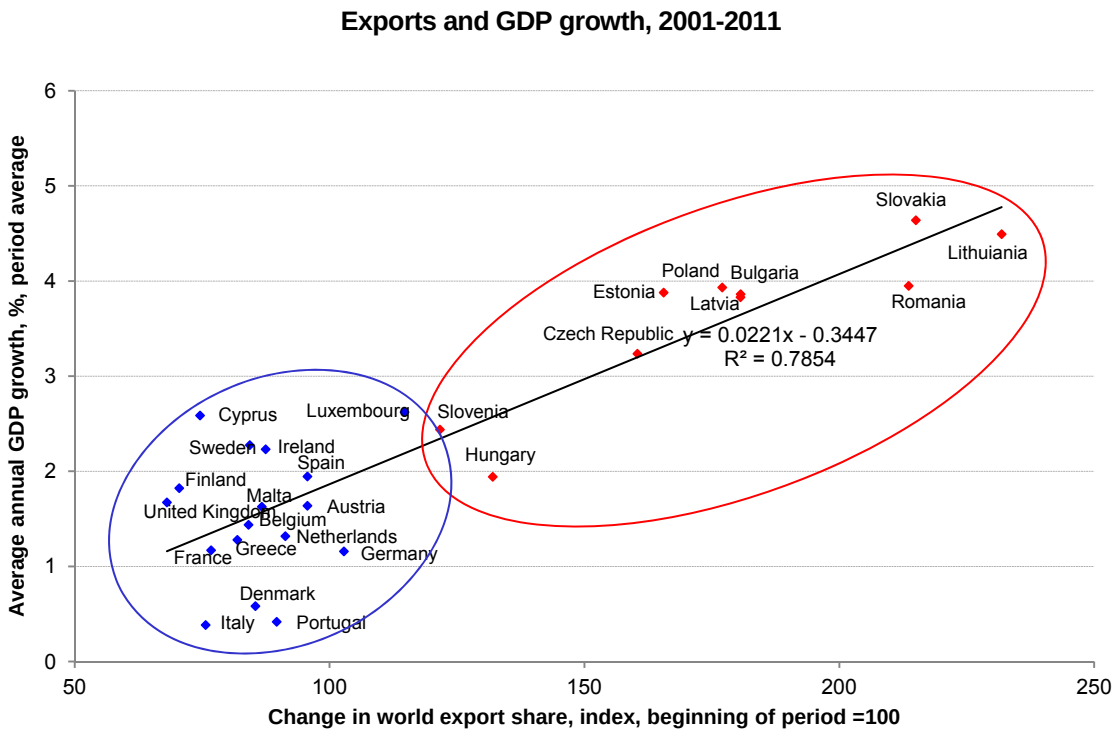

*Source:* Eurostat; author's calculations.

Figure A3




*Source:* Eurostat; author's calculations.

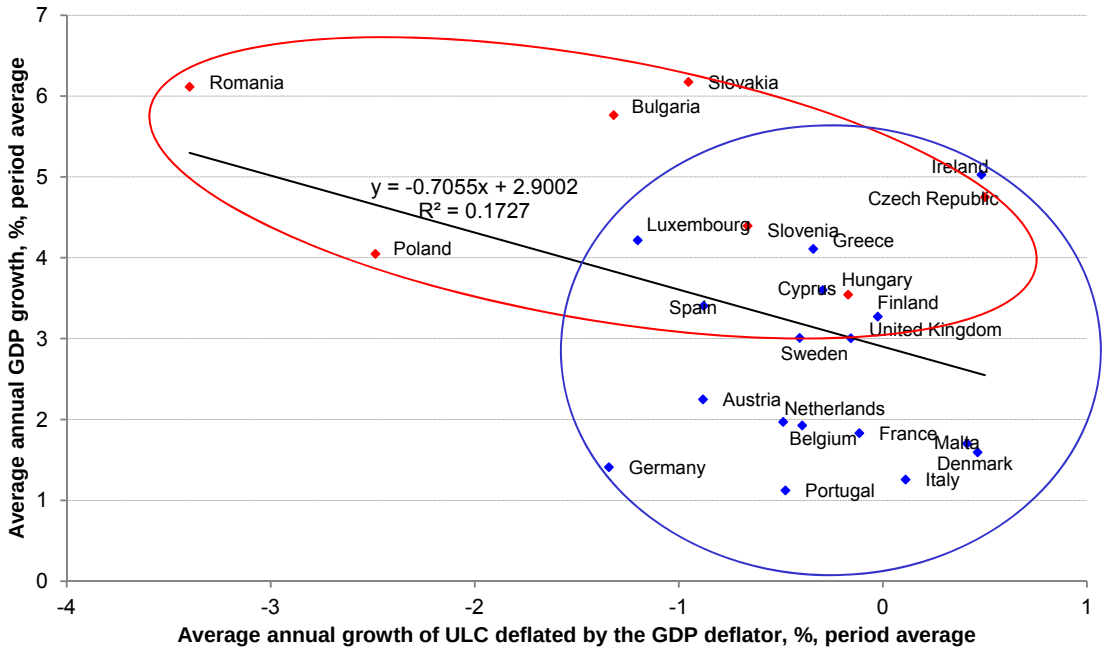
Figure A4




*Source:* Eurostat; author's calculations.

Figure A5

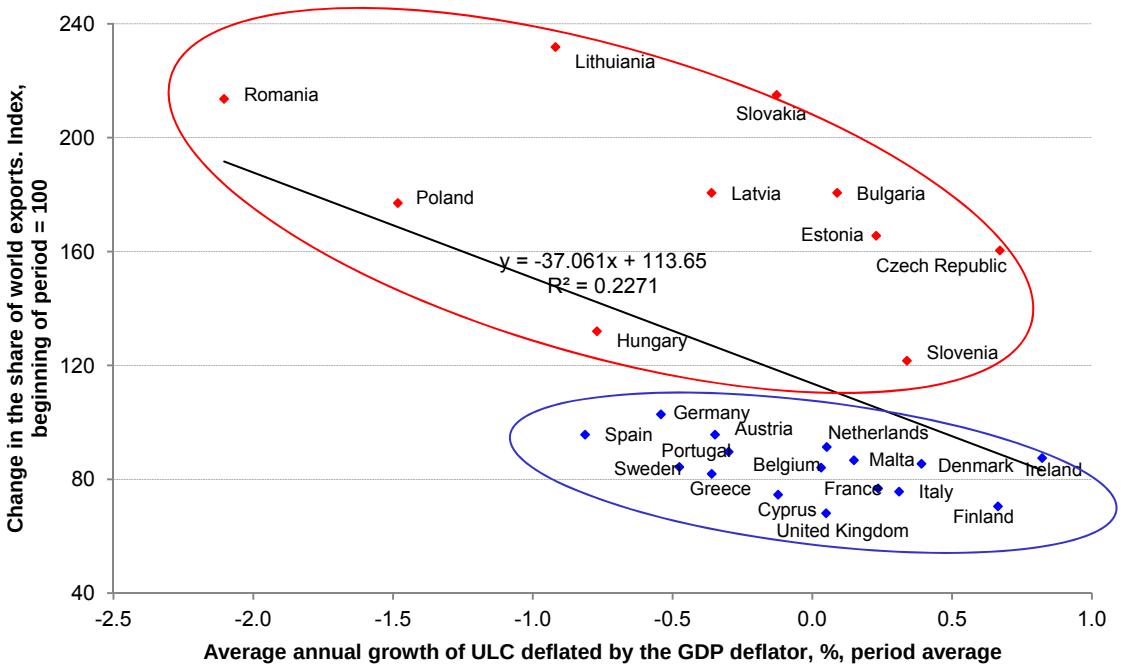
**Real unit labour costs and GDP growth, 2001-2007**




*Source:* Eurostat; author's calculations.

Figure A6

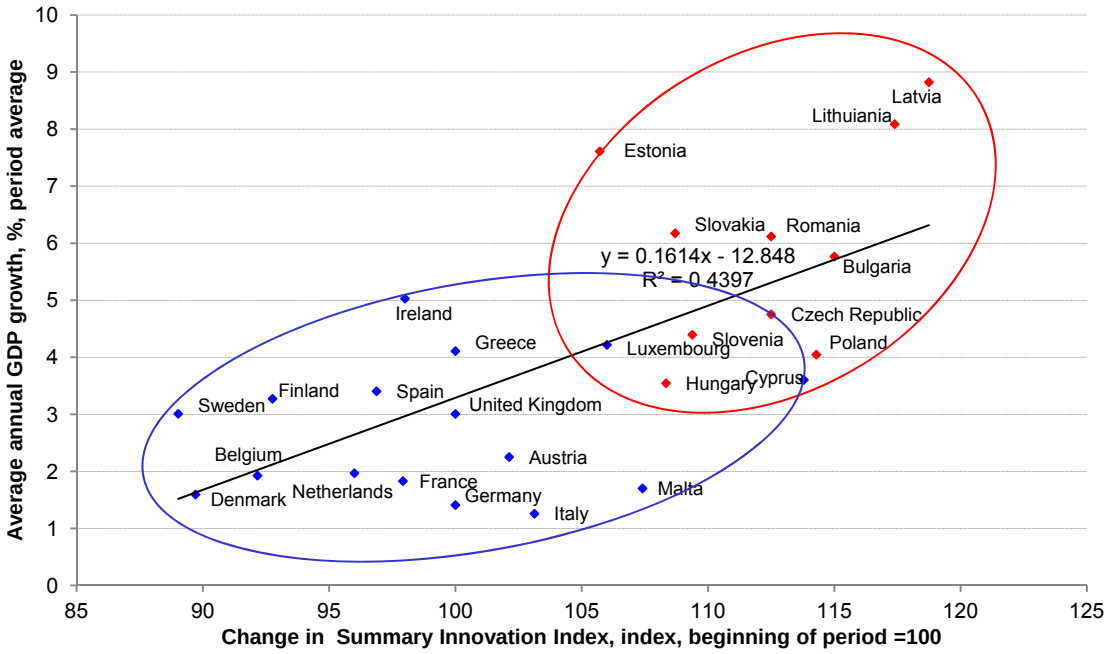
**Real unit labour costs and change in world export share, 2001-2011**




*Source:* Eurostat; author's calculations.

Figure A7

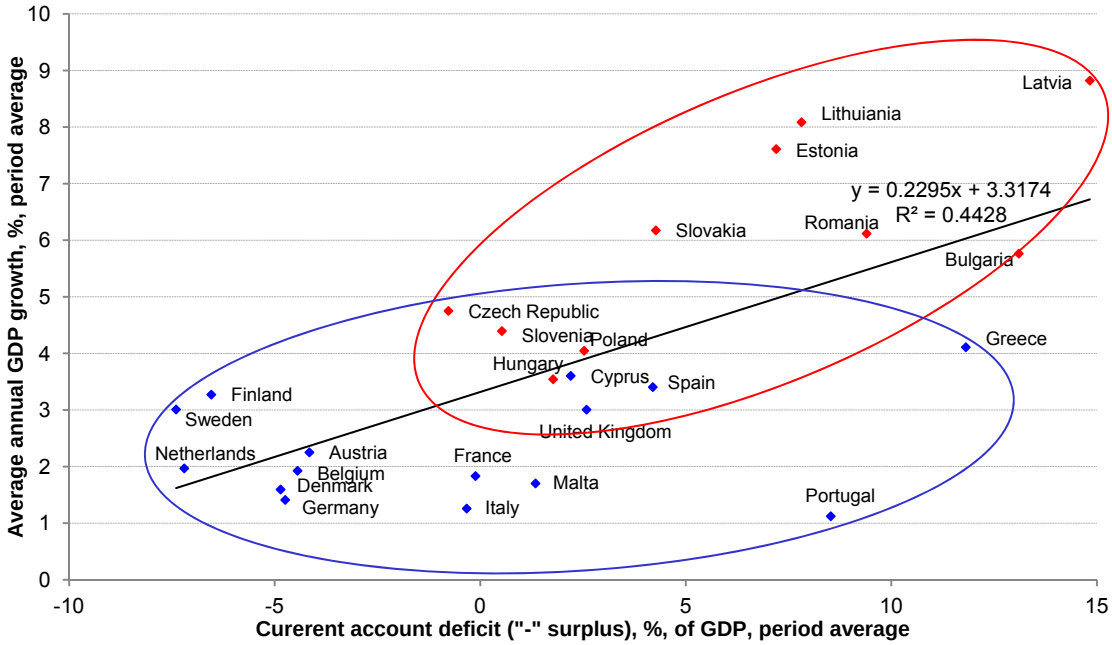
**Innovation and GDP growth, 2001-2007**




*Source:* PRO INNO Innovation Scoreboard, Eurostat; author's calculations.

Figure A8

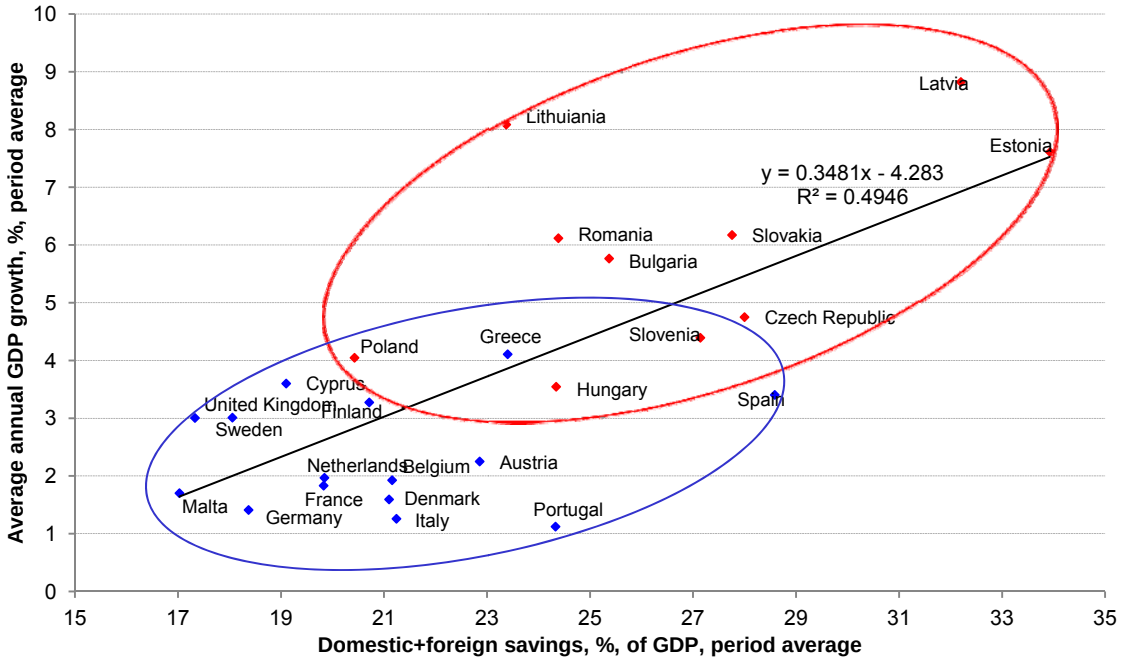
**Attracted foreign savings and GDP growth, 2001-2007**




*Source:* Eurostat; author's calculations.

Figure A9

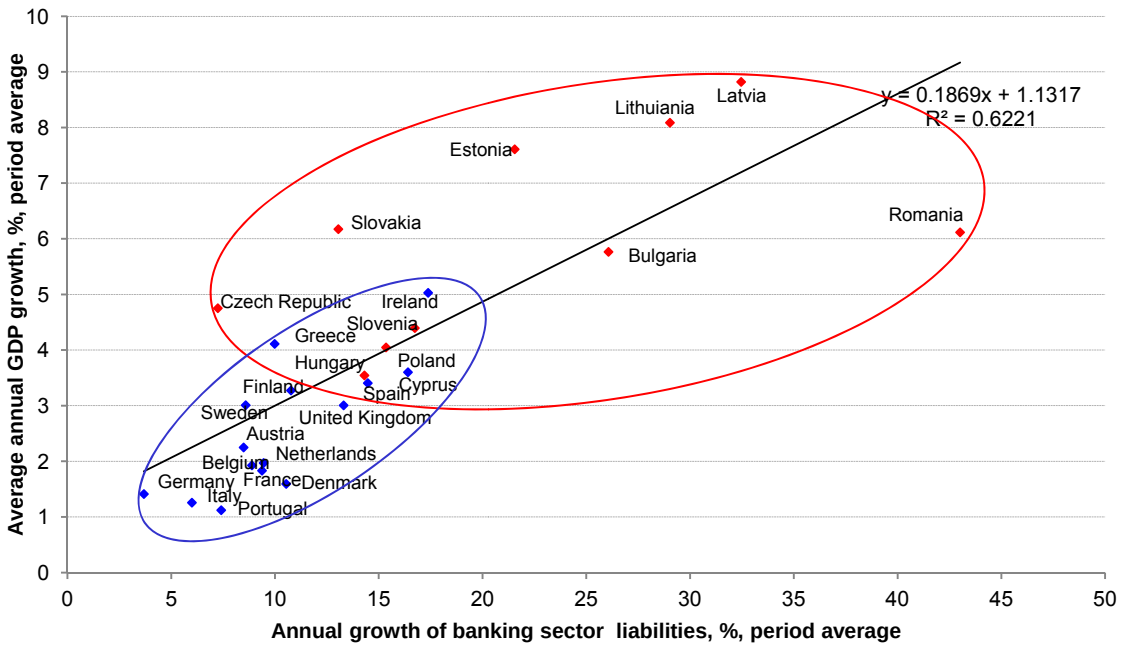
**Domestic+foreign savings and GDP growth, 2001-2007**




*Source:* Eurostat; author's calculations.

Figure A10

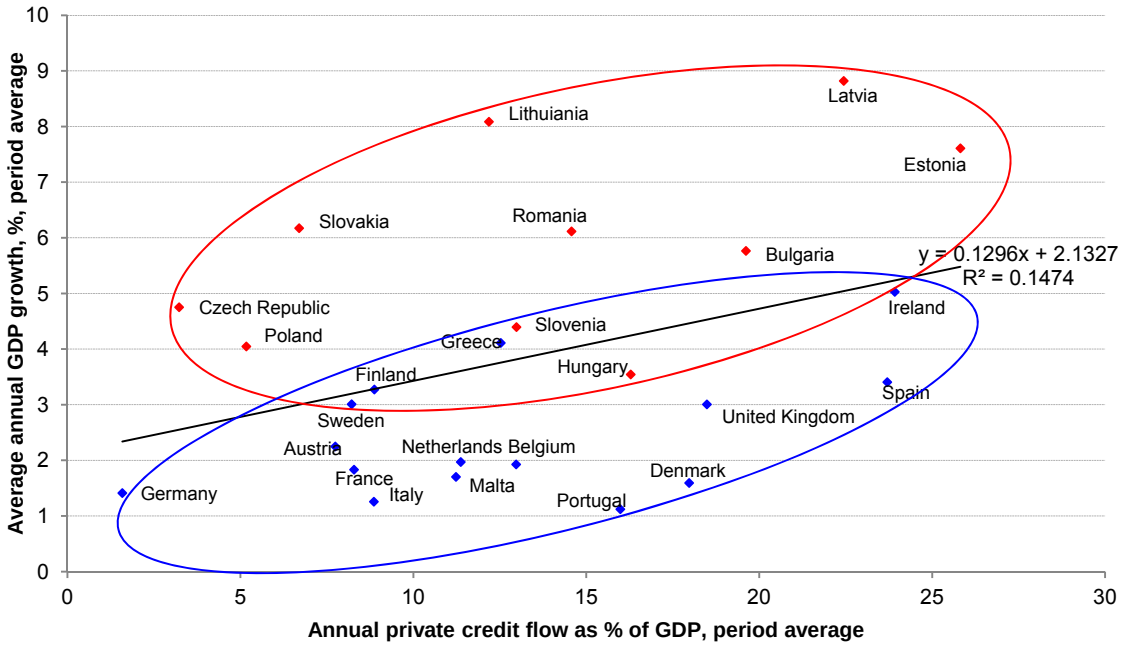
**Total liabilities of the banking sector and GDP growth, 2001-2007**




*Source:* Eurostat; author's calculations.

Figure A11

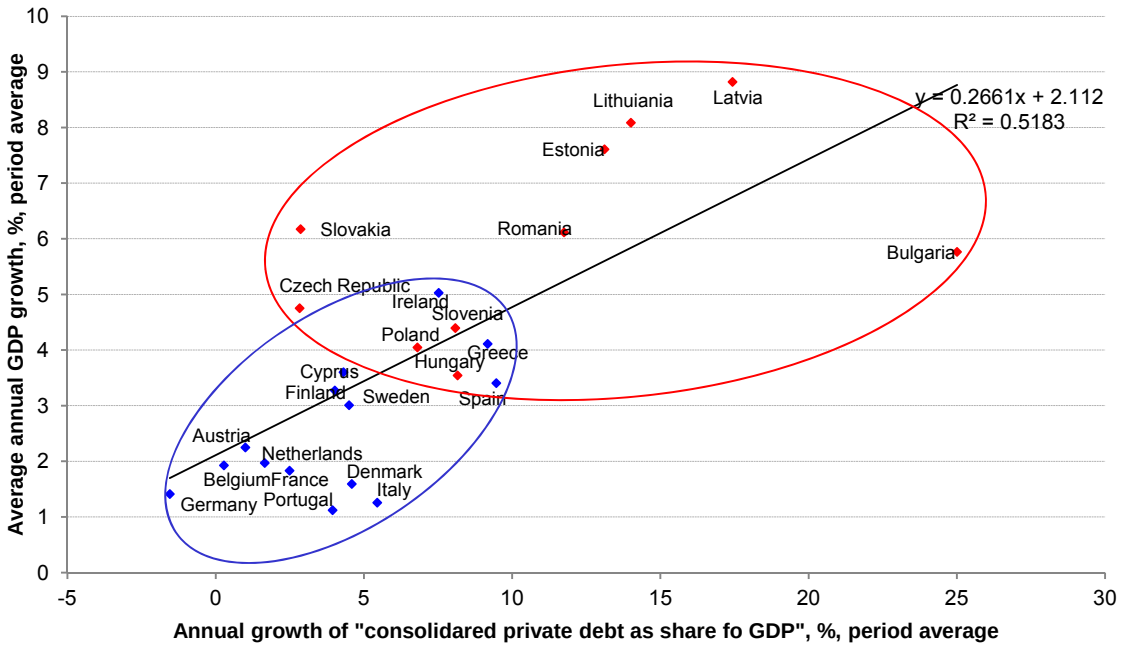
**Private credit flow and GDP growth, 2001-2007**




*Source:* Eurostat; author's calculations.

Figure A12

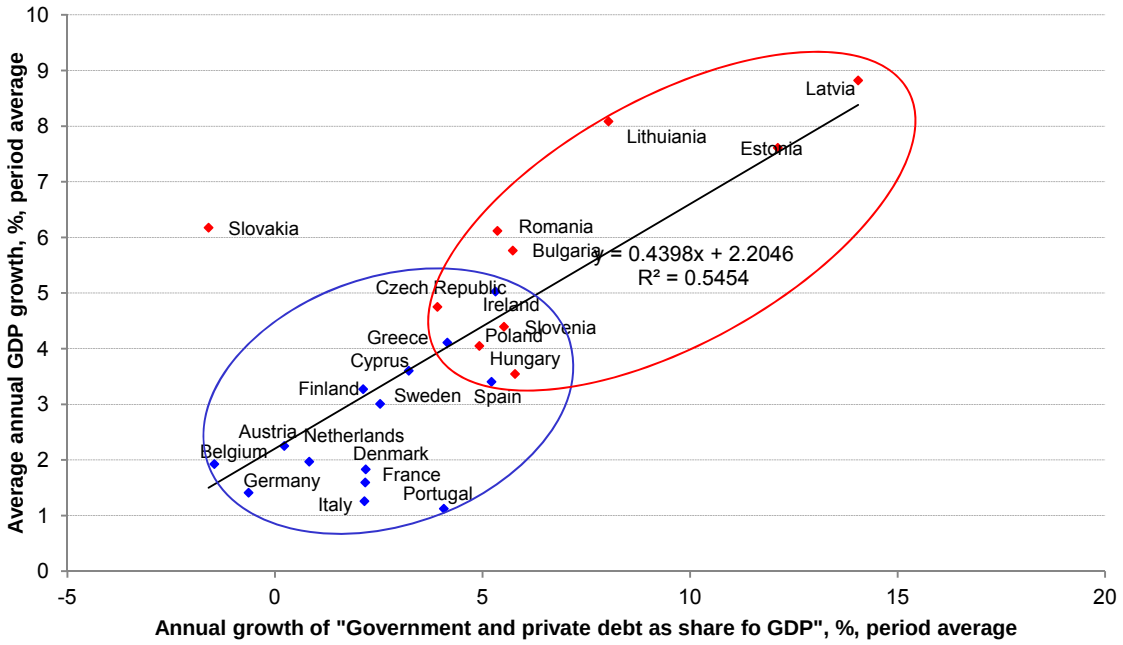
**Private debt and GDP growth, 2001-2007**




*Source:* Eurostat; author's calculations.

Figure A13

**Government and private debt and GDP growth, 2001-2007**




*Source:* Eurostat; author's calculations.

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