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BEYOND THE CRISIS:
PROSPECTS FOR EMERGING EUROPE

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Beyond the crisis: prospects for emerging Europe

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Abstract

This paper assesses the impact of the 2008-09 global financial and economic crisis on the medium-term growth prospects of the countries of central and eastern Europe, the Caucasus and Central Asia, which began an economic transition about two decades ago. We use cross-country growth regressions, putting special emphasis on a proper consideration of the crisis and robustness. We find that the crisis has had a major impact on the within-sample fit of the models used and that the positive impact of EU enlargement on growth is smaller than previous research has shown. The crisis has also altered the future growth prospects of the countries studied, even in the optimistic but unrealistic case of a return to pre-crisis capital inflows and credit booms.

JEL: C31; C33; O47

Keywords: crisis; economic growth; growth regressions; transition countries

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1. Introduction

Before the crisis, the countries of central and eastern Europe, the Caucasus and Central Asia (CEECCA)[1] seemed to be making rapid and reasonably smooth economic progress, following an extraordinary deep recession after the collapse of the communist regimes. The development model of most CEECCA countries had many common features, such as deep political, institutional, trade and financial integration with the EU and significant labour mobility to EU15 countries. However, there were also substantial differences between countries, which became more notable in the run-up to the global crisis: in a few CEECCA countries catching up was generally accompanied by macroeconomic stability, but most countries of the region became increasingly vulnerable due to huge credit, housing and consumption booms, high current-account deficits and quickly rising external debt. It was widely expected even before the crisis that these vulnerabilities must be corrected at some point, but the magnitude of the corrections when they did happen were amplified by the global financial and economic crisis.

Beyond the crisis, a major question is if the crisis is likely to have lasting economic effects. This paper assesses pre-crisis growth drivers and the medium term prospects of the CEECCA region using cross-country growth regressions, which estimate – in cross-section and panel regression frameworks – empirical relationships between growth and a number of potential growth drivers.

Many papers have adopted cross-country growth regressions for CEECCA countries; see for example Schadler et al (2006), Falcetti, Lysenko and Sanfey (2006), Abiad et al (2007), Vamvakidis (2008), Cihak and Fonteyne (2009), Iradian (2009), European Commission (2009), and Böwer and Turrini (2010), just to mention a few more recent papers. However, all of these papers used sample periods that ended before the crisis and covered only the boom years of the 2000s, this boom proving unsustainable in many CEECCA countries. It should be emphasised that CEECCA countries have been hit harder by the crisis than other countries in

[1] The CEECCA countries that formerly belonged to the political and economic sphere of the Soviet Union have a common historical root but are rather diverse. Ten countries are members of the European Union (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia); seven countries in the western Balkan are either EU accession candidates or potential candidates (Albania, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia, Montenegro, Serbia, and Kosovo under UNSC Resolution 1244/99, though we do not include Kosovo in our study due to lack of data); and twelve countries form the Commonwealth of Independent States (CIS), of which five are major hydrocarbon exporters (Azerbaijan, Kazakhstan, Russia, Turkmenistan and Uzbekistan) while the other seven are not (Armenia, Belarus, Georgia, Kyrgyz Republic, Moldova, Tajikistan and Ukraine). Mongolia is also a transition country, while Turkey – another EU candidate – is not, but we also include it in our study due to its geographical closeness.

the world, and post-crisis recovery is also generally slower for CEECCA countries than in other emerging and developing economies (Bruegel and wiiw, 2010). Making estimates for a sample period that proved to be unsustainable will obviously bias the results toward the finding of higher growth. When the sample includes mostly booming countries, the estimated relationships between growth and fundamentals are distorted. When the sample includes a large cross section of countries over a long time horizon, and the booming countries are in a minority, but are differentiated with a dummy (which is done in most of the literature), then the estimate of this dummy is likely upward biased. Therefore, even though the crisis-period data are also hardly representative of standard conditions and in most, if not all, countries the output gap turned to negative, including the bust phase of the economic cycle in the sample is inevitable.

In our paper, we attempt a comprehensive consideration of the crisis and perform extensive robustness checks of cross-country growth regressions. To this end, we extend the sample period up to 2010, using more recent data up to 2009 and forecasts for 2010; the forecasts are primarily taken from the IMF's April 2010 World Economic Outlook and the July 2010 forecasts of the Economist Intelligence Unit. The use of forecasts brings uncertainty to the estimates, but perhaps the possible errors in 2010 forecasts made in April and July 2010 are not so large, and since we use time-averaged data (eg five year averages for 2006-10), the impact of the use of forecasts may be small[2]. We perform the calculations both for the pre-crisis sample and for this extended sample period, studying the results for different country groups, different sample periods and a number of possible explanatory variables. We aim to answer the following three questions:

- How much does the crisis alter the within-sample fit of cross-country growth regressions? We answer this question by presenting estimates for both the pre-crisis period and for the full period that also includes the crisis.
- Has growth in CEECCA countries (or some sub-groups within this region) been different from the rest of world in the sense that these countries grew more quickly than what would have been implied by their fundamental growth determinants? The literature has approached this question by studying the parameters of a dummy variable representing certain country groups in the growth regression. We perform two main tasks in examining this

[2] We should highlight that forecasts for many explanatory variables are not necessary because these explanatory variables represent initial conditions that lag some years compared to growth, though there are some contemporaneous correlates as well. When it is only the regressand, the growth rate of GDP contains a measurement error due to the adoption of forecasts, it boosts the standard error of the estimate but does not distort the unbiasedness of the regression.

question: (1) We study the robustness of the estimated parameter of country group dummies in the context of the crisis. (2) For the ten central and eastern European countries (CEE10) that joined the EU in 2004 and 2007 we set up a counterfactual scenario for the fundamentals (eg capital inflows, trade integration, institutional development) under which no EU enlargement occurred, basing the scenario on the developments in non-EU middle income countries. We then use our estimated models to simulate the growth effects of the incremental improvement of fundamentals due to prospective and actual EU membership.

- How much has the crisis altered future GDP growth scenarios? The change in projections can be traced back to two factors: (1) change in the model and (2) change in the assumed path of explanatory variables. The econometric estimates provide an explanation for the first factor, and we shall formulate different scenarios for the second factor, drawing on the experience of previous crises.

To preamble our results, we find that

- the crisis has altered the within-sample fit of cross-country growth regressions: the downward revision of fitted values of GDP growth from the regressions is between one and three percent per year for most countries;
- the positive impact of EU enlargement on growth is smaller than previous research has shown: the dummy variable approach indicated that in the 2000s overall, the CEE10 countries seemed to growth only by about 0.3-0.4 percent per year more than what would have implied by their fundamentals, while the counterfactual simulation indicated about 0.15 percent per year extra growth in the second half of the 2000s because of the incremental improvement of fundamentals due to EU enlargement, though these results are generally not statistically significant;
- the crisis has also altered future GDP growth scenarios: even in the optimistic scenario that assumes a return to the pre-crisis development of fundamentals, medium-term outlooks are below pre-crisis actual growth, especially in those countries that experienced substantial credit and consumption booms before the crisis.

The rest of the paper is organised as follows. Section 2 discusses our methodology and model selection issues. The results of the growth regressions are presented in section 3. We also answer our first research question in this section. Section 4 discusses the effect of EU enlargement on the growth of new EU member states and presents a discussion of the second research question. The third research question is analysed in section 5. Section 6 presents a summary.

2. Methodology and model selection issues

The execution of cross-country growth regressions typically involves a large degree of discretion. One issue is related to the length of the sample period: the longer the sample, the more precise the estimate, provided that there are no structural breaks. However, the pre-transition developments (when CEECCA countries operated under different economic systems) and the first years of transition (when these countries introduced market-oriented reforms and experienced extensive structural change) are not informative for current growth prospects because of significant structural breaks. Consequently, it is rather difficult to set an appropriate start date for the sample period. *Figure 1* shows GDP per capita at purchasing power parity compared to the EU15 for the countries we study, in comparison to some Latin American and Asian countries from 1980-2010 (where available). *Figure 1* clearly shows the extraordinarily deep recession that accompanied the first years of transition[3], but also the quick catching-up that followed in most countries, which can partly be regarded as a kind of 'reconstruction' after the deep recession. The recession lasted just for a few years in the case of CEE10 and some south-eastern European countries, but in most Commonwealth of Independent States (CIS) countries, it lasted longer. Both the recession and the reconstruction period complicate the selection of a start date for the sample period.

Another issue is whether or not the sample should include panel data at a yearly frequency, time-averaged data over non-overlapping intervals, or time-averaged pure cross-section data. The advantage of a cross-section setup is that issues related to dynamic panels do not arise and endogeneity is less of a concern, though causality cannot be claimed, unless suitable instruments are found. It is very difficult to find suitable instruments. For example, Iradian (2009) uses a set of instruments for the reform indexes, such as the distance to Brussels, the share of commodity exports as percent of total export, and some others, but for other endogenous variables, such as fiscal balance, investment rate or inflation, he could not assemble suitable instruments.

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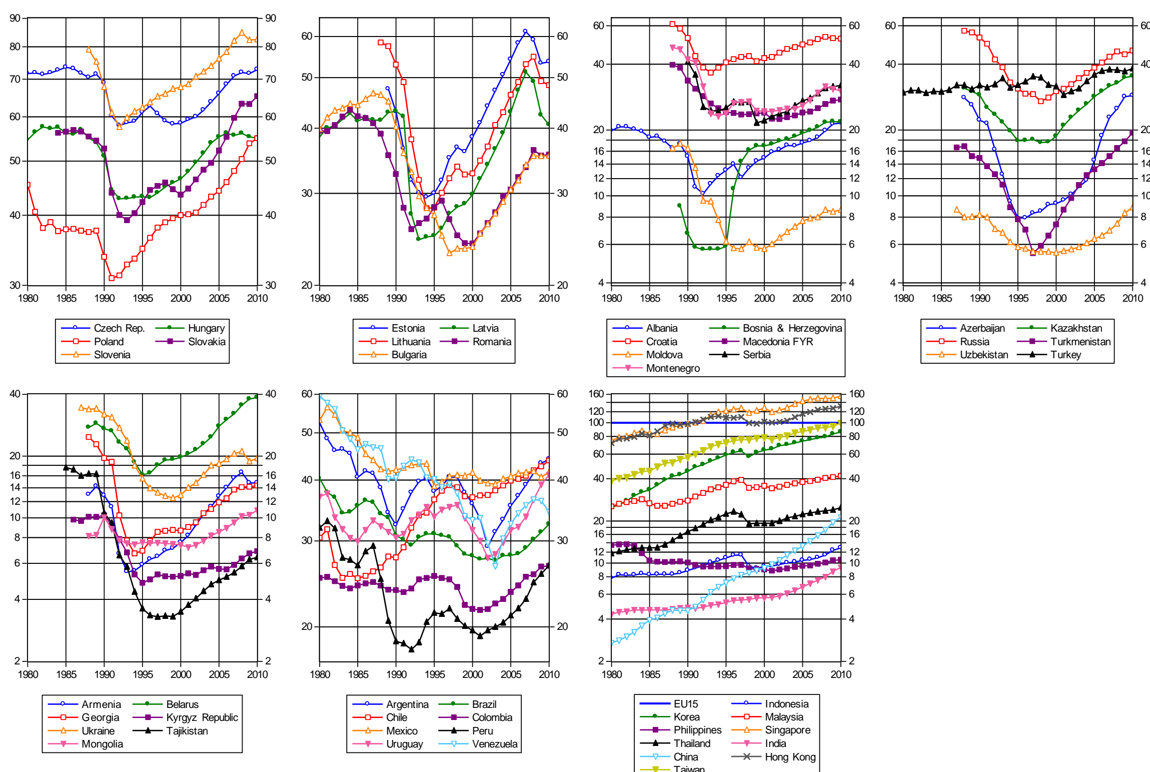
[3] It was widely expected that countries undergoing transition would experience an initial decline in output and employment, but the depth and the length of the post-communist recession were unexpected (Fischer, 2002; Svejnar 2006). The literature has proposed various explanations for this phenomenon. Svejnar (2006) categorises them into six main themes. First, a disorganisation among suppliers, producers and consumers associated with the central planning; second, the dissolution in 1990 of Comecon (Council for Mutual Economic Assistance), which governed trade relations across the Soviet bloc; third, difficulties of sectoral shifts in the presence of labour market imperfections; fourth, a switch from controlled to uncontrolled monopolistic structures in these economies; fifth, a credit crunch stemming from the reduction in state subsidies to firms and rise in real interest rates; and finally, tight macroeconomic policies may have played a role in the depth and length of the recession.

Figure 1: GDP per capita at purchasing power parity (EU15=100), 1980-2010



Source: Author's calculation based on data from IMF World Economic Outlook April 2010 and EBRD.

The selection of the country sample is another key issue. The very reason behind cross-country regressions is that the countries in the sample share similar characteristics; when many countries are included, the country-specific factors or the effects of randomness on the results could be lessened. However, certain countries may have significantly different characteristics, eg the same factors may have different effects on growth in very small countries compared to major developed economies. The level of a country's development also has an important bearing on growth drivers[4].

A further issue is the selection of variables. This can also be subject to a large degree of discretion, because there are many indicators that can be used to measure a certain factor that are more or less correlated. The actual results may be sensitive to the selection of the variables used[5]. In a seminal article Levine and Renelt (1992) find in a growth regression framework

[4] See Veugelers (2010) for a discussion of the different role of various factors for technological progress along the development path.

[5] Few authors acknowledge as honestly as Berg et al (1999) that results could be sensitive to model selection: "*In other words, the same dataset could be used to make contradictory claims about the significance or lack of significance of various policy variables. Ad-hoc regressions of growth on a small number of policy variables, abundant as they are in the literature, thus deserve skepticism.*" (p52).

that very few economic variables are robustly correlated with economic growth rates. They could only detect positive and robust correlation between average growth rates and two variables: the investment rate (share of investment in GDP) and trade openness (the share of trade in GDP). But they could not detect robust correlation for a broad array of other potential explanatory variables. The extensive survey presented in Durlauf, Johnson and Temple (2005) broadly confirm these findings and conclude that "*growth econometrics is an area of research that is still in its infancy*" (p. 651).

When we have looked for a single best model, we have indeed found considerable sensitivity to the time period, the country sample and the set of variables, which is in line with the findings of Levine and Renelt (1992) and the literature survey of Durlauf, Johnson and Temple (2005)[6]. We try to overcome these issues by concentrating on sample periods that start well after the collapse of the communism, studying different country samples and using various explanatory variables to form different models and study a number of combinations of them.

We use three different time periods:

1. Cross section data for 2000-07;
2. Cross section data for 2000-10;
3. Panel data with three non-overlapping five-year periods between 1995-2010[7].

We use four different country samples (constrained by data availability only):

(1) all countries of the world;
(2) countries with population above 1 million;
(3) middle-income countries with population above 1 million (ie GDP per capita at PPP compared to the US between 12.5 percent and 67.4 percent, though we also add those CEECCA countries that have lower income);
(4) CEECCA countries only.

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[6] Multicollinearity among some variables may also explain the difficulties in finding a single best model. Note that multicollinearity affects the parameter estimates and their standard errors, but it does not reduce the predictive power or reliability of the model as a whole.

[7] The sample period 2000-07 includes GDP growth from 2000 to 2007, ie the average annualised growth from 2000 until 2007, that is, during seven years. In the regressions, initial conditions from the year 2000 will be used, while contemporaneous correlates will be averaged for the same period as GDP growth, ie the average between 2001 and 2007. The 2000-10 sample should be interpreted similarly, as should the panel sample, which consists of three five-year periods: 1995-2000, 2000-05 and 2005-10.

Exclusion of very small countries can be justified on the basis that their economies could be less diversified and hence could strongly be affected by particular shocks related to their main business activity. The exclusion of both poor and rich countries can be justified on the basis that economic growth in countries with reasonably similar levels of development might show more similarity to one other than to much richer or poorer countries. The cut-off values indicated above were determined on the basis of CEE10 countries: we calculated their minimum (23.0 percent for Bulgaria) and maximum (56.9 percent for Slovenia) and the standard deviation, which was subtracted from the minimum and added to the maximum to determine a possible range[8]. However, we also include in this middle-income country group those seven CIS countries that have lower per capita income, as well as Mongolia, in order to be able to analyse all CEECCA countries using the same model.

Considering the variables to be analysed, initial GDP per capita at purchasing power parity (PPP) was found in the literature to be the most robust explanatory variable and we of course also include it, having found that it is indeed a robust explanatory variable. We have also considered variables that are frequently used in the empirical growth literature, such as the investment rate, trade openness, educational indicators, the dependency ratio, inflation, fiscal balance, research and development expenditures and patents.

The four key pillars of the development model of most CEECCA countries were financial, trade and institutional integration with the western world and labour mobility[9]. We have therefore employed the following variables related to these factors:

- Capital flows: inward FDI per GDP (both stock and inflow); investment rate (gross fixed capital formation over GDP); stock and change in private sector credit/GDP.
- Foreign trade: trade openness (exports plus imports over GDP); change in the terms of trade; share of fuel and food in total exports.
- Institutional development: governance indicators complied by the World Bank; Transparency International's corruption perception index; Economic Freedom Network indicators.
- Migration: remittances over GDP[10].

[8] We used the average GDP per capita at PPP compared to the US in the 2000-10 period.
[9] There are clear differences within the CEECCA region, however. The CEE10 have reached the highest level of integration, followed by the countries of the western Balkans that have either EU ‘candidate’ or ‘potential candidate’ status. The six ‘Eastern Partnership’ countries, which were part of the Soviet Union, have reached a varying degree of integration with the EU15, while integration was generally minor for most of the other former Soviet Union countries.

We also introduced a new variable that we have termed 'GDP historical gap' to measure the ratio of a country's comparative output, measured by its current GDP per capita at PPP compared to the US, to the country's maximum comparative output in the past. The intuition is that countries that were closer to the US at a point in time in the past may have a better chance to catch up than other countries with similar fundamentals, because catching-up in this case implies reaching a level that has already been reached in the past. This variable has a low value after a crisis, such as the economic collapse during the first years of transition. This variable is applied to all countries in the sample, not just to CEECCA countries, and is calculated for every year starting in 1980[11]. Among our main country groups, the CIS countries still score low in this measure as they have not yet reached their pre-transition levels compared to the US[12].

Because of the difficulties in finding a single best model, we adopt the pragmatic approach of running many regressions, each of which are 'acceptable' in a sense that we will discuss shortly. We then combine them. The combination of many regressions also serves as a robustness check.

We first identified potential growth drivers and correlates in the following way. We adopted the three temporal samples and four country samples discussed thus far (ie 12 samples altogether) and estimated cross-section and panel regressions, including constant and initial GDP per capita at PPP, as well as period fixed effects for the panels. We always controlled for initial GDP per capita at PPP because this variable proved to be the most robust variable in practically all cross-country growth regressions. We chose from a large number of variables and we have of course included the two variables that were found by Levine and Renelt (1992): the investment rate and trade openness. We then added only one other possible growth determinant at a time. When a variable had a correctly signed (judged from economic principles) and significant parameter estimate in most of the 12 samples – controlling for the

[10] Unfortunately, it is difficult to collect reliable data on migration for a wide range of countries and time periods.

[11] For most CEECCA countries the available data starts in 1989 with the exception of a few, for which data for earlier years is also available.

[12] Falcetti et al (2006) and Iradian (2009) use a discrete dummy variable to measure the same phenomenon. The dummy takes a value of 1 if output in a given year is below 70 percent of its 1989 value. Böwer and Turrini (2010) adopt a continuous variable to capture this effect and hence it is the closest to our variable: they define an 'output loss' variable as the ratio of current output to the average output during 1990-95.

initial GDP per capita and period fixed effects – we regarded it as a useful candidate for the growth regressions.

The results of this exercise are shown in *Table 1*. Among the 33 variables considered we have selected 13 candidates for the growth regressions. When selecting the variables we aimed for balance; that is, we do not want to over-represent any particular kind of indicator, such as institutional quality, for which many variants tend to correlate well with GDP growth. We selected seven initial conditions: GDP historical gap, secondary school enrolment, dependency rate, legal system and property rights, freedom of trade, share of fuel exports, and the stock of inward FDI. We also selected six contemporaneous correlates: fiscal balance/GDP, investment/GDP, exports plus imports/GDP, change in the terms of trade, growth in credit to private sector/GDP, and FDI inflow/GDP. The inclusion of contemporaneous correlates obviously raises the issue of endogeneity, which could be handled, for example, by properly-selected instruments. However, as we have already argued, the selection of good instruments is rather difficult if not impossible. We have reviewed many papers in the literature that could not find proper instruments. Stock, Wright and Yogo (2002) demonstrated that the possible adoption of weak instruments renders conventional instrumental-variable inferences misleading. Hauk and Wacziarg (2009) studied bias properties of estimators commonly used to estimate growth regressions with Monte Carlo simulations and concluded that the simple OLS estimator applied to a single cross-section of variables averaged over time performed the best. For all these reasons we do not use instrumental variables, but apply OLS. This implies that we cannot interpret our results in a causal way (eg higher investment *leads* to higher growth); rather, the interpretation of the relationship as a correlation is sufficient for our purposes.

Having selected 13 potential variables, we run growth regressions with all possible quartets (ie 4-element subsets) of the 13 variables. There are 715 such quartets (13!/(4!*9!)). Our initial conditioning variable (GDP per capita compared to the US) is always included, as well as time-period fixed effects for the panels.[13] In the next sections, which show our results, we report the whole distribution of the growth estimates from the 715 regressions. If the 'true model' is among our estimated models and the distribution of the growth fits is reasonably dense, we may regard our result as robust.

[13] We note that either the investment rate or trade openness (the two robust variables in Levine and Renelt, 1992) are included in 385 of 715 regressions (and of these 385 regressions they are jointly included in 55 ones).

Table 1: Partial correlation with growth

	All countries			Countries with population above 1 million			Middle income countries with population above 1 million			CEECCA countries		
	CS 2000-2007	CS 2000-2010	P 1995-2010	CS 2000-2007	CS 2000-2010	P 1995-2010	CS 2000-2007	CS 2000-2010	P 1995-2010	CS 2000-2007	CS 2000-2010	P 1995-2010
initial conditions												
GDP historical gap (compared to previous maximum relative to US)	-2.33	-2.36	-1.52	-2.31	-1.55	-0.78	-4.04	-3.05	-2.63	-4.57	-2.27	-4.10
t	-1.54	-1.71	-1.40	-1.66	-1.38	-0.73	-2.75	-2.62	-1.60	-1.50	-0.86	-1.05
Nobs.	178	177	531	146	145	435	66	66	198	30	30	90
Secondary enrolment (net)	0.00	-0.02	-0.02	0.03	0.01	0.01	0.07	0.03	0.04	0.05	-0.02	0.04
t	-0.10	-1.45	-1.52	2.28	0.90	1.20	3.68	2.17	2.95	1.00	-0.37	1.19
Nobs.	141	140	332	113	112	267	56	56	132	26	26	57
Tertiary enrolment	-0.02	-0.04	-0.04	0.01	-0.01	-0.02	0.04	0.01	-0.02	0.02	-0.03	-0.05
t	-1.03	-2.35	-3.58	0.74	-0.90	-2.72	1.99	0.68	-1.56	0.49	-0.99	-1.83
Nobs.	132	131	372	117	116	336	57	57	169	25	25	75
Dependency rate	-2.80	0.07	-0.89	-5.46	-2.17	-2.85	-4.87	-0.36	-4.07	3.82	7.10	-6.74
t	-1.67	0.05	-0.70	-3.48	-1.80	-2.14	-1.86	-0.17	-1.25	0.67	1.51	-0.74
Nobs.	173	172	516	145	144	432	65	65	195	30	30	90
Corruption perception	-0.49	-0.36	-0.70	-0.41	-0.23	-0.30	-0.45	-0.27	-0.30	-0.33	-0.63	-0.53
t	-2.52	-2.04	-2.80	-2.09	-1.44	-2.73	-1.69	-1.19	-2.18	-0.42	-0.91	-1.33
Nobs.	87	86	238	86	85	225	45	45	111	20	20	49
Voice & Accountability	-1.21	-1.32	-1.31	-0.69	-0.85	-0.75	-0.64	-0.89	-0.93	-0.75	-1.25	-1.36
t	-3.51	-4.30	-4.74	-2.05	-3.39	-3.18	-1.55	-2.77	-3.36	-0.89	-1.98	-2.42
Nobs.	176	175	352	145	144	290	66	66	132	29	29	58
Political stability	-0.42	-0.61	-0.52	-0.14	-0.29	-0.10	0.03	-0.15	-0.24	0.72	0.29	0.20
t	-1.34	-2.16	-2.06	-0.42	-1.17	-0.38	0.07	-0.52	-0.86	0.95	0.54	0.32
Nobs.	173	172	349	145	144	290	66	66	132	29	29	58
Government effectiveness	-0.87	-1.19	-1.09	-0.16	-0.46	-0.20	-0.54	-0.77	-0.85	-0.10	-1.28	-1.20
t	-1.56	-2.23	-2.37	-0.29	-1.11	-0.49	-0.94	-1.79	-2.39	-0.06	-1.15	-1.28
Nobs.	175	174	351	144	143	289	66	66	132	29	29	58
Regulatory quality	-1.18	-1.39	-1.46	-0.77	-0.95	-0.94	-0.85	-1.03	-1.08	-0.73	-1.34	-1.25
t	-2.33	-3.17	-3.61	-1.66	-2.80	-2.88	-1.67	-2.73	-3.10	-0.79	-2.05	-1.97
Nobs.	176	175	352	145	144	290	66	66	132	29	29	58
Rule of law	-0.93	-1.13	-0.99	-0.23	-0.38	-0.06	-0.36	-0.46	-0.59	-0.16	-0.71	-1.11
t	-1.94	-2.40	-2.40	-0.48	-1.04	-0.16	-0.76	-1.30	-1.86	-0.16	-1.05	-1.54
Nobs.	175	174	351	144	143	289	66	66	132	29	29	58
Control of corruption	-1.38	-1.46	-1.29	-0.84	-0.76	-0.54	-0.73	-0.66	-0.82	-0.65	-1.27	-1.91
t	-2.60	-2.94	-2.93	-1.78	-2.08	-1.37	-1.52	-1.79	-2.42	-0.50	-1.29	-1.96
Nobs.	175	174	351	144	143	289	66	66	132	29	29	58
Size of government	0.08	0.07	0.07	0.07	0.06	0.05	-0.25	-0.10	-0.08	0.01	-0.18	-0.05
t	0.71	0.70	0.90	0.57	0.57	0.65	-2.22	-1.09	-0.62	0.02	-1.41	-0.15
Nobs.	121	120	376	112	111	348	49	49	157	15	15	56
Legal system & property rights	-0.14	-0.20	0.06	-0.01	-0.07	0.21	0.11	0.04	0.24	0.83	0.21	0.47
t	-0.89	-1.46	0.52	-0.03	-0.45	1.55	0.49	0.30	1.94	0.85	0.29	1.29
Nobs.	127	126	392	118	117	364	55	55	169	21	21	68
Freedom of trade	0.06	-0.09	0.00	0.05	-0.16	-0.01	0.83	0.26	0.39	0.77	0.19	0.51
t	0.18	-0.35	0.03	0.11	-0.57	-0.04	2.52	1.20	2.16	1.85	0.65	1.45
Nobs.	126	125	385	117	116	358	55	55	169	21	21	68
Labour market regulations	0.20	0.20	0.16	0.17	0.20	0.18	-0.30	-0.10	0.03	-0.99	-0.52	0.05
t	1.11	1.43	1.62	0.95	1.41	1.82	-0.69	-0.29	0.18	-1.35	-0.73	0.19
Nobs.	77	76	265	77	76	256	45	45	133	18	18	56
Business regulations	0.10	-0.01	-0.04	0.07	-0.02	0.13	-0.24	-0.14	0.07	0.11	-0.65	0.36
t	0.42	-0.03	-0.25	0.29	-0.10	0.71	-0.78	-0.68	0.33	0.15	-1.76	0.75
Nobs.	72	71	256	72	71	247	40	40	124	13	13	47
Economic freedom index	-0.19	-0.25	0.17	-0.14	-0.19	0.23	-0.17	-0.05	0.34	0.83	-0.24	0.87
t	-0.62	-1.03	0.87	-0.44	-0.76	1.16	-0.60	-0.28	1.67	1.33	-1.23	1.88
Nobs.	121	120	380	112	111	352	49	49	157	15	15	56

Mean tariff rate		-0.03	-0.15	-0.02	-0.08	-0.21	-0.02	0.27	0.00	0.12	0.94	-0.19	0.49
	t	-0.26	-1.39	-0.22	-0.70	-2.34	-0.21	1.41	-0.02	0.89	1.78	-1.02	0.85
	Nobs.	109	108	343	102	101	322	48	48	150	14	14	50
Hidden barriers		-0.16	-0.22	0.10	-0.06	-0.13	0.14	-0.06	-0.08	0.00	0.10	-0.24	-0.05
	t	-1.18	-2.03	1.05	-0.49	-1.39	1.40	-0.37	-1.07	0.01	0.21	-1.07	-0.17
	Nobs.	75	74	248	74	73	238	41	41	127	13	13	47
Share of fuel exports		0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.02	0.09	0.08	0.08
	t	3.42	3.82	4.12	2.59	3.02	2.92	1.66	2.17	2.10	5.76	5.21	3.33
	Nobs.	159	158	405	131	130	341	64	64	167	28	28	69
Share of food exports		-0.03	-0.02	-0.01	-0.03	-0.02	-0.02	-0.05	-0.03	-0.03	-0.09	-0.08	-0.08
	t	-4.12	-3.14	-2.26	-3.44	-2.27	-2.21	-2.34	-1.66	-1.88	-2.17	-2.16	-2.73
	Nobs.	152	151	409	127	126	342	61	61	164	27	27	68
Stock of private sector credit/GDP		-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.06
	t	-1.88	-1.49	-1.94	-1.63	-1.42	-2.45	-1.88	-1.49	-1.94	-1.21	-0.88	-2.80
	Nobs.	63	63	182	137	136	399	63	63	182	27	27	76
Stock of FDI/GDP		0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.03	0.09	0.07	0.07
	t	-0.95	-1.38	-0.09	-0.44	-0.34	-0.15	1.54	1.15	2.11	3.12	1.96	2.28
	Nobs.	173	172	514	144	143	428	65	65	194	29	29	85
Contemporaneous correlates													
Inflation		0.04	0.09	0.00	0.03	0.06	0.00	0.01	0.01	-0.02	-0.03	-0.01	-0.02
	t	1.39	2.30	-0.56	1.10	1.73	-0.53	0.17	0.19	-2.51	-0.67	-0.12	-2.01
	Nobs.	178	177	530	146	145	435	66	66	198	30	30	89
Fiscal balance/GDP		0.19	0.17	0.15	0.08	0.10	0.09	0.07	0.09	0.11	0.36	0.18	0.20
	t	1.97	2.56	2.93	1.73	2.42	3.38	1.39	1.87	2.94	2.38	1.11	1.97
	Nobs.	159	158	456	141	140	409	66	66	195	30	30	90
Investment/GDP		0.15	0.09	0.21	0.16	0.08	0.12	0.21	0.09	0.11	0.38	0.18	0.16
	t	2.51	2.28	2.80	2.74	1.75	3.75	2.39	1.10	2.47	3.70	1.46	2.13
	Nobs.	172	173	501	144	144	427	66	66	198	30	30	90
Trade opennes		0.01	0.00	0.01	0.01	0.00	0.01	0.02	0.01	0.01	0.01	0.01	0.01
	t	1.84	0.96	1.71	2.72	1.56	2.34	2.81	1.81	2.44	1.22	0.93	1.06
	Nobs.	173	172	515	144	143	429	66	66	198	29	29	87
Terms of trade		0.21	0.29	0.27	0.13	0.22	0.07	0.07	0.17	0.05	0.48	0.53	0.15
	t	2.85	3.60	1.83	2.14	2.97	1.90	0.92	1.74	0.75	2.98	2.54	0.65
	Nobs.	161	160	451	140	139	403	66	66	191	30	30	90
Growth in credit to private sector/GDP		0.09	0.04	0.04	0.11	0.06	0.06	0.09	0.04	0.04	0.02	-0.02	0.00
	t	3.59	1.73	1.51	5.02	2.23	2.81	3.59	1.73	1.51	0.43	-0.47	0.01
	Nobs.	58	62	180	116	135	390	58	62	180	26	27	76
FDI inflows/GDP		0.17	0.09	0.16	0.30	0.19	0.13	0.33	0.23	0.04	0.36	0.28	-0.05
	t	1.98	1.64	1.86	5.17	4.07	2.74	2.28	1.79	0.42	1.72	1.57	-0.36
	Nobs.	177	176	526	146	145	434	66	66	198	29	29	87
Remmittances inflows/GDP		-0.01	-0.01	-0.01	-0.06	-0.04	-0.01	-0.06	-0.04	0.10	-0.12	-0.07	0.17
	t	-2.53	-3.55	-1.61	-5.01	-4.70	-0.23	-1.22	-0.96	0.94	-1.73	-1.09	1.03
	Nobs.	158	156	464	132	130	389	62	62	185	27	27	81
R&D expenditures/GDP		-0.12	-0.12	-0.07	-0.12	-0.11	-0.07	-0.12	-0.10	-0.06	-0.18	-0.14	-0.08
	t	-6.05	-4.64	-2.68	-6.49	-5.39	-2.62	-5.76	-4.94	-1.86	-7.98	-6.74	-1.54
	Nobs.	105	104	292	98	97	275	52	52	152	24	24	72
Patents/population		-0.38	-0.42	-0.48	-0.16	-0.19	-0.29	0.94	0.61	0.60	9.02	8.11	-5.53
	t	-1.10	-1.42	-2.49	-0.51	-0.79	-1.50	2.11	2.22	1.85	1.04	1.23	-0.60
	Nobs.	95	89	267	89	83	254	51	49	148	27	27	80

Note. CS: cross section. P: panel with three non-overlapping 5-year long periods between 1995 and 2010. Dependent variable: average annualised (compounded) real GDP growth. Constant and initial GDP per capita at PPP are always included, as well as period fixed effects for the panels.

3. How much does the crisis alter the within-sample fit of cross-country growth regressions?

Following the model specification steps discussed in the previous section, we ran the 715 cross-country growth regressions for our third country sample (66 middle-income countries with population above 1 million). *Figure 2* shows actual average GDP growth and the distribution of the in-sample fit derived from the 715 regressions. The distribution is presented in the form of a box-plot (see the note to the figure for details). Two sample periods

are shown: the sample covering the pre-crisis ‘boom years’ only (2000-07) and the sample which also includes the bust (2000-10).

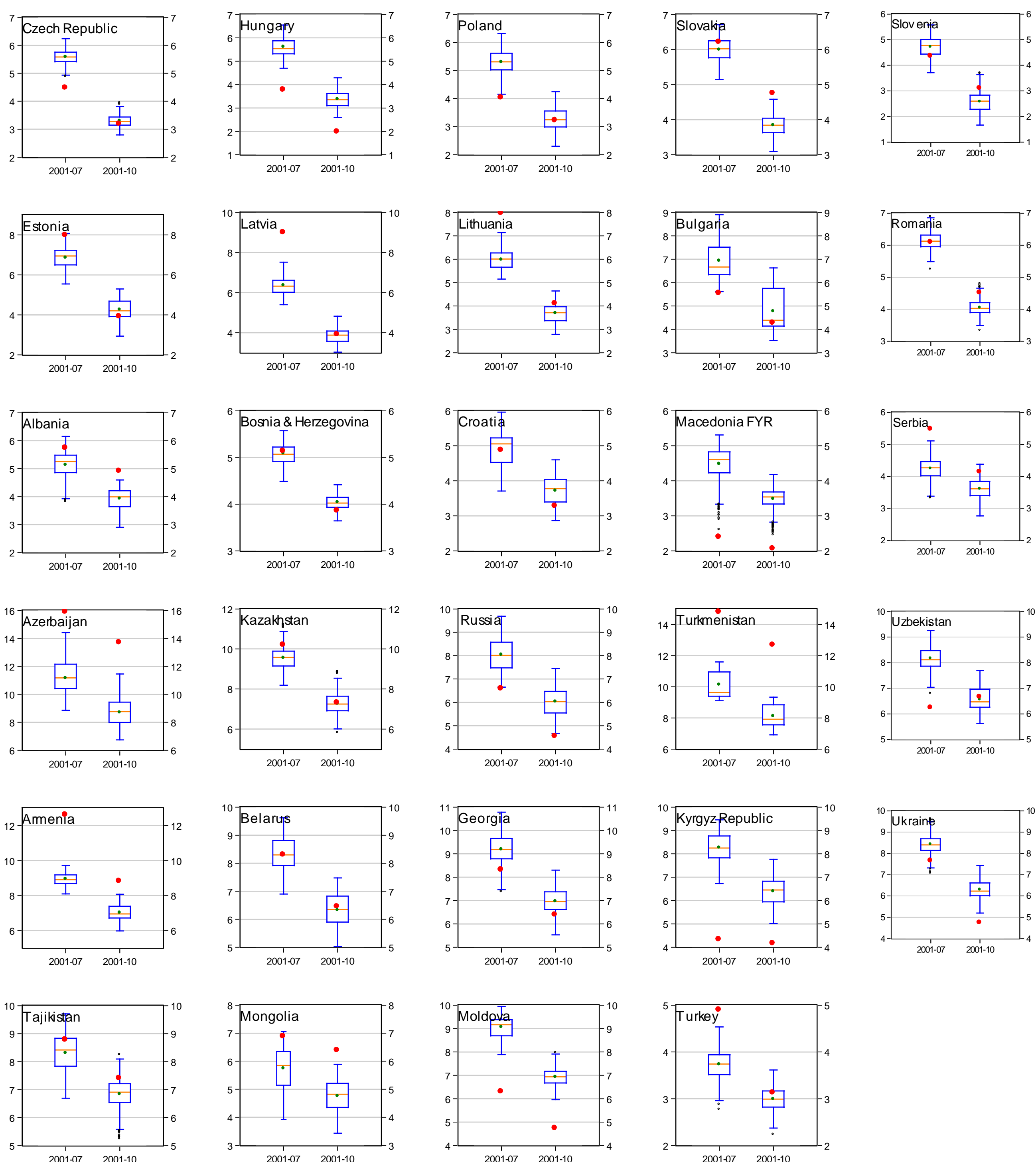
The main message of the figure is the downward revision of both actual growth and fitted values of growth from the regressions. For most countries the downward revision is between one and three percent per year. In some cases, actual growth fits well with the distribution of the 715 estimates, but there are outliers. We would like to highlight, however, that the goal was not find a perfect fit for all countries but to estimate models that can be used to assess the ‘potential’ rate of growth.

For example, in the cases of Estonia, Latvia and Lithuania, actual growth was well above the distribution of estimates in the 2000-07 period. When extending the sample, however, the actual growth of Estonia and Latvia fall within the interquartile range of the distribution of 715 fitted values of growth from the regressions and is close to the range in the case of Lithuania. Consequently, our calculations indicate that the three Baltic countries grew above potential in the pre-crisis period (this has likely contributed to the huge current-account deficits of these countries), but considering the whole 2000s, average growth may not have been far from potential.

Azerbaijan, Turkmenistan and, to a lesser extent, Armenia provide a different example. For these countries, actual growth was above the fitted values of growth from all models, not just in the pre-crisis period but in the whole 2000s as well. The first two of these countries are major hydrocarbon exporters. Even though our models controlled for the terms of trade and the share of fuel exports in total exports, our models do not match the reality in these countries.

Hungary presents a different picture since actual growth is below the level of growth predicted by the model in both sample periods. This finding could be explained by the fact that GDP growth had already slowed down in the mid-2000s partly due to domestic policies (fiscal austerity to eliminate the nearly double digit – as a percentage of GDP – budget deficit of 2002-06), and partly due to structural weaknesses. The country may have therefore grown below potential already before the crisis.

Figure 2: The effect of the crisis on in-sample fit from 715 growth regressions: cross section estimates for 2001-07 and for 2001-10



Note. Red dots: actual annualised (compounded) GDP growth over the five-year period. The box-plots show the empirical distribution of the in-sample fit of 715 regressions. The dependent variable is the average (annualised) real GDP growth (in percent) during the period shown on the horizontal axis. All regressions include the initial GDP per capita at PPP compared to the US and three regional dummies (10 new EU member states; six western Balkan countries; 12 CIS countries) as explanatory variables. The 715 regressions comprise all possible quartets of the remaining thirteen explanatory variables.

The box-plot represents the distribution of the fits (point estimates) derived from the regressions. The box portion of a box-plot represents the first and third quartiles (middle 50 percent of the estimates), the median is depicted using an orange line through the centre of the box, while the mean is drawn using a green circle. The whiskers and staples ('error bars') show the values that are outside the first and third quartiles, but within 1.5 times the interquartile range (ie 1.5 times the difference between first and third quartiles). Outliers, if any, are indicated with separate symbols outside the staples. Box widths are proportional to the sample size (number of available regression).

4. How large is the EU accession 'growth dividend'?

EU accession can (1) directly improve the fundamentals that drive economic growth, such as higher capital inflows, higher trade flows, a better legal environment, etc, but (2) can also have a 'growth dividend' beyond the effects of enlargement on the fundamental determinants of growth. This dividend can be due to, for example, enhanced credibility, which is not captured by any other variable included in the model. To our knowledge, earlier papers that have adopted growth regressions have only considered this second factor using dummy variable approaches, which we also use in Section 4.1. But in Section 4.2 we consider as well the first factor using a counterfactual simulation.

4.1 Dummy variable approach

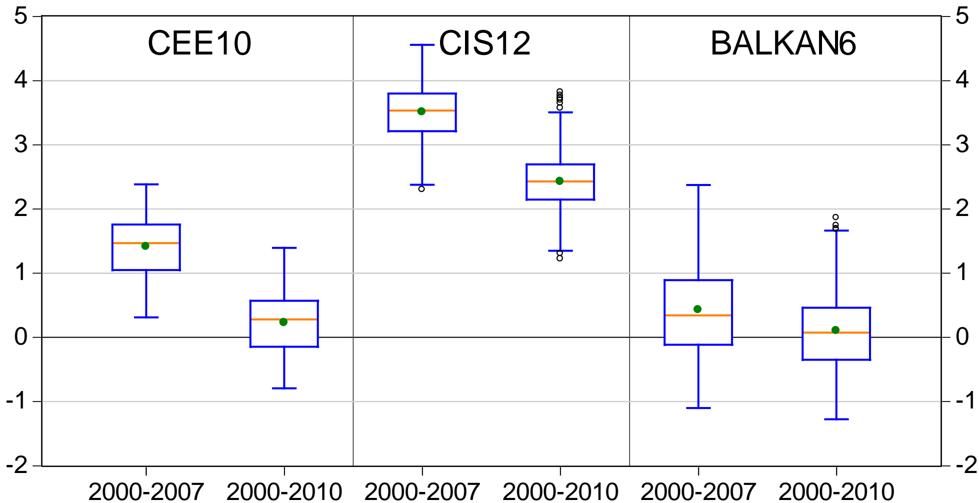
It is a common practice to include regional dummies in cross-country growth regressions. When the estimated parameter of such a dummy is significantly larger then zero, one may argue that the country group under consideration grew faster than what would have been implied by the countries' fundamental growth determinants, ie the country group is different from the rest of world in a sense. For example, the European Commission (2009) reports the result, based on the detailed analysis of Böwer and Turrini (2010), that EU enlargement contributed to 1.75 percent excess annual growth (in every year between 2000 and 2008) of CEE10 countries beyond the effects of enlargement on the fundamental determinants of growth. This result was achieved with a panel regression in which a dummy variable was added to the growth performance of the CEE10 states for the 2000-08 period[14]. Regarding CIS countries, Åslund and Jenish (2006) found that these countries had exhibited extraordinary growth performances since 2000. As we have argued, these and all other estimates for sample periods ending before the crisis are likely biased upwards, because they were based on the period of fast growth covering only the boom part of the 2000s, which proved to be unsustainable for many CEECCA countries. We now study the impact of the sample period on the results.

[14] The sample period of Böwer and Turrini (2010) covers actual data till 2007 and the spring 2008 forecast for 2008.

To start, we estimated our 715 regressions as pure cross-section models for growth from 2000 till 2007 (ie pre-crisis sample) and for a longer period ending in 2010 that also includes the impact of the crisis. *Figure 3* plots the distribution of the parameter estimates of three regional dummies of CEECCA countries. The estimated parameter of the dummy for the new EU member states is found to be positive in the pre-crisis period (and even the 1.75 percentage point estimate of the European Commission (2009) and Böwer and Turrini (2010) fits well within the distribution), but considering the whole 2000s, the parameter estimates of the dummy are much lower. Both the mean and the median of the 715 estimates are positive and correspond to a 0.3-0.4 percent annual 'growth dividend', but zero is included in the interquartile range.

Regarding the CIS countries, the figure suggests that their growth rate was indeed higher than what would have predicted by fundamentals, considering both the pre-crisis period and the full sample, though the estimates are somewhat lower in the full period. The dummy representing western Balkan countries has mostly positive parameter estimates but zero lies within the distribution.

Figure 3: Distribution of the parameter estimates of the regional dummies from 715 cross section regressions: comparison of the 2000-07 and 2000-10 samples

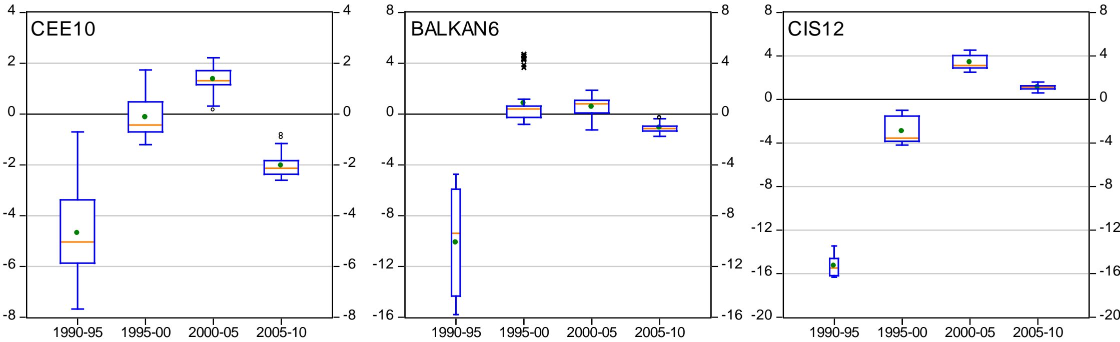


Note. The figure shows the empirical distribution of the parameter estimates of the three regional dummies from 715 different regressions in the form of box-plots. See the note to *Figure 2* on the interpretation of the box-plot.

To further test the time profile of country group dummies, we estimated the models in a panel setup (with five-year non-overlapping periods) and allowed the parameter of the country group dummy to change over time. Results are shown in *Figure 4*. The new EU member

states grew above their fundamentals from 2000 to 2005 and below from 2005 to 2010. The magnitudes are similar to our previous estimates: the excess growth in 2001-05 was estimated to be around 1.5-1.8 percent per year (considering the interquartile range of the distribution of the estimated parameters), which is again very much in line with the findings of the European Commission (2009). During the second half of the 2000s, however, the growth performance of this country group is worse than in other countries of the world (controlling for fundamentals); hence, during the 2000s overall, the new member states do not differ from other countries. Similar conclusions can be drawn for the western Balkan countries, while the CIS countries still grew faster than what was explained by the models during the 2000s, though their advantage has declined.

Figure 4: Distribution of the parameter estimates of the region dummies in four time periods



Note. The figure shows the empirical distribution of the parameter estimates of the three regional dummies (included as four separate dummy variables for the four sample periods). See the note to *Figure 2* on the interpretation of the box-plot.

5.2 Counterfactual simulation

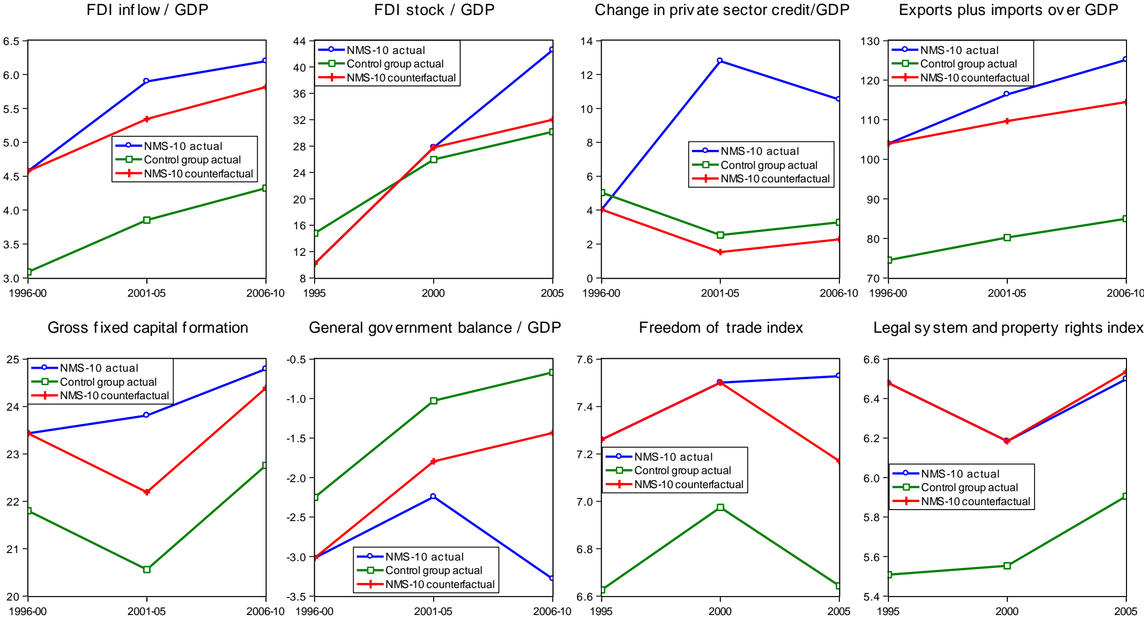
We use another different approach to assess the growth dividend of EU accession. We set up a counterfactual scenario for the fundamentals under which no EU enlargement occurred, basing the scenario on the development of non-EU middle income countries. Among the 13 variables selected in Section 3, eight have likely been affected by EU accession: inflow of FDI, stock of FDI, credit to the private sector, foreign trade, investment, fiscal balance, freedom-of-trade index and the index for legal systems and property rights. We assume that EU accession did not have an effect on four variables: secondary school enrolment, dependency rate, share of fuel exports and the terms of trade. The thirteenth variable, GDP historical gap, is affected indirectly by GDP growth.

We have set up the counterfactual scenario for the fundamentals based on the development of 44 non-EU middle income countries[15]. To this end, we calculated the country-group average of the eight variables for the CEE10 and for the control group and assumed under the hypothesis of no EU enlargement that the change in the variables of the CEE10 compared to their pre-2000 values would have been identical to the change in the same variables of the control group. *Figure 5* shows, for the group averages, the actual developments in CEE10 (blue line), the actual developments in the control group (green line), and the counterfactual scenario for the CEE10 (red line). The assumed impact of EU enlargement on these fundamentals is shown by the difference between the blue and red lines. We applied these average impacts to each individual CEE10 countries.

For example, in the counterfactual scenario under which no EU enlargement occurred, FDI inflow/GDP would have been 5.3 percent instead of 5.9 percent in 2001-05 and 5.8 percent instead of 6.2 percent in 2006-10. The figure suggests that for five of the eight variables, EU accession has clearly led to growth-enhancing development of the fundamentals (ie the blue line is above the red line). The index for legal systems and property rights would have been broadly similar under the counterfactual scenario. It is only the fiscal balance that would have been better under the counterfactual scenario.

[15] The income thresholds we applied were defined in Section 2. We did not include the four EU15 countries falling within the thresholds (Greece, Italy, Portugal and Spain). The 44 countries are: Albania, Algeria, Argentina, Azerbaijan, Belarus, Bosnia/Herzegovina, Botswana, Brazil, Chile, Colombia, Costa Rica, Croatia, Dominican Republic, Ecuador, El Salvador, Gabon, Iran, Israel, Jamaica, Kazakhstan, South Korea, Lebanon, Libya, Macedonia, Malaysia, Mauritius, Mexico, Namibia, New Zealand, Oman, Panama, Peru, Russia, Saudi Arabia, Serbia, South Africa, Taiwan, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, Uruguay, and Venezuela.

Figure 5: Counterfactual scenario for eight variables of the CEE10 countries under no EU accession



Source: Author's calculations. See details in the main text.

Note. We assumed that EU accession had an impact on the development of variables after 2000. Consequently, for contemporaneous correlates the counterfactual scenario differs from the actual data during 2001-05 and 2006-10, while for initial conditions the 2005 values are different.

We then use the estimated models to simulate the growth effects of the incremental improvement of fundamentals due to EU enlargement. To this end, we run two simulations for all 715 models and calculated the difference between the two simulations. The first simulation uses actual data for all variables, while the second simulation uses the counterfactual values of the eight variables, as discussed above, and actual data for the other variables. We used the models estimated in the form of panel regressions, covering three non-overlapping five-year periods between 1995 and 2010. As the estimated parameter of the CEE10 dummy for 2000-10 did not prove to be significant, we did not include it in the model. *Table 2* shows the distribution of the results. Both the mean and the median are 0.11 percentage point for 2001-05 and 0.15 percentage point for 2006-10, but zero is included in the interquartile range, though close to its boundary.

Table 2: The growth effects of the incremental improvement of fundamentals in the CEE10 states due to EU enlargement (percent)

	2001-2005	2006-2010
Max	0.68	0.88
Upper 25%	0.21	0.33
Mean	0.11	0.15
Median	0.11	0.15
Lower 25%	-0.01	-0.01
Min	-0.26	-0.52

Note. Values show the distribution of 715 estimates for the effects of the incremental improvement of fundamentals due to EU enlargement on annual real GDP growth, which were derived as the difference between two scenarios: one using actual data and one using counterfactual values for eight variables under the hypothesis of no EU enlargement for the CEE10 states. See details in the main text.

Taken together, the results of the dummy variable approach and the counterfactual simulation approach show a positive impact of EU enlargement on growth in the CEE10 states, considering even the full decade of the 2000s, but the results are much smaller than previous research has found for the pre-crisis sample and are generally not significant. The dummy variable approach (which measures the impact of EU enlargement above the impact of EU enlargement on fundaments) suggested a point estimate around 0.3-0.4 percent per year, while the counterfactual simulation (which measures the impact of EU enlargement through better fundamentals) suggested 0.15 percent per year in the second half of the 2000s.

5. Post-crisis growth prospects

Finally, we study prospects for post-crisis growth using our estimated models and by setting up hypothetical scenarios for the future development of growth drivers. To this end, we use the models estimated in a panel regression form, consisting of non-overlapping five-year intervals between 1995 and 2010 in order to include all major emerging-market crisis episodes of recent years. The models are estimated for the country sample comprising middle income countries with population of more than 1 million.

Based on the findings discussed in the previous section, we allow a country group dummy variable only for the CIS group in our estimated models. Since the parameter of the period CIS dummy declined in the second half of the 2000s and we do not want to pick this last estimate (because it may be sensitive to the effects of the crisis), we include a single CIS dummy for the whole 1995-2010 period.

For the projections, we have set up three scenarios (optimistic, pessimistic and an interim) for 2011-15, and we analyse possible growth trajectories. For the optimistic scenario, we assume

that pre-crisis developments will resume, ie for most variables the average changes from 2000 to 2007 are extrapolated using the 2010 starting values. For the pessimistic scenario, we assume that capital inflows will be permanently reduced, foreign trade and domestic credit will expand only in line with GDP, the investment rate will stabilise at a low level and the budget balance will not improve after 2010. *Table 3* details the assumptions behind these two scenarios. For the interim scenario, we assume that the key variables take the simple average of their values in the optimistic and pessimistic scenarios. The period fixed effects (which are included in the panel regression) are assumed to be zero for 2011-15.

It is important to note that for different countries the suggested scenarios may have specific upside and downside risks. For example, for the Czech Republic, Poland or Slovakia, there seem to be upside risks in the interim scenario, given that these countries did not experience unsustainable bubbles before the crisis and therefore the optimistic scenario seems to be the realistic one. However, for some other countries, especially for the fixed exchange rate regime countries and Romania, there are downside risks in the interim scenario, because it would be unrealistic to expect that unsustainable pre-crisis developments could return, particularly as regards credit growth and the related inflows of foreign capital. In fact, given these countries' weak competitive positions, high private debt, and low policy credibility (with perhaps the exception of Estonia, which joins the euro area in 2011), the pessimistic scenario may be the realistic one with perhaps even further downside risks.

Table 3. **Detailed assumptions of the scenarios**

	Optimistic scenario	**Pessimistic scenario**
Initial conditions (same for all scenarios)		
GDP per capita at PPP compared to the US in 2010	IMF WEO April 2010 forecast	
GDP historical gap in 2010	Calculated on the basis of IMF WEO April 2010 forecast	
Dependency rate in 2010	Linear projection from the latest actual data (2008) assuming that the trend of the previous three years continues	
Secondary school enrolment in 2010	Latest available data (typically 2007 or 2008)	
Share of fuel exports in total exports in 2010	Latest available data (2008)	
Stock of inward FDI relative to GDP in 2010	Calculated on the basis of IMF WEO April 2010 forecast	
Freedom of trade index in 2010	Latest available data (2008)	
Index for legal system & property rights in 2010	Latest available data (2008)	
Contemporaneous correlates		
fiscal balance/GDP in 2011-2015	Budget balance is achieved by 2020 with the same improvement in every year till then	The ratio stays constant at 2010 forecast level
investment/GDP	Average ratio between 2001 and 2007 (or 2010 level if higher)	The ratio stays constant at 2010 forecast level
exports plus imports/GDP	Average annual increase between 2001 and 2007 resumes from 2011*	The ratio stays constant at 2010 forecast level
terms of trade	No change	No change
credit to private sector/GDP	Average annual increase between 2001 and 2007 is resumed from 2011	The ratio stays constant at 2010 forecast level
FDI inflow/GDP	Average ratio between 2001 and 2007	The ratio stays constant at 2010 forecast level

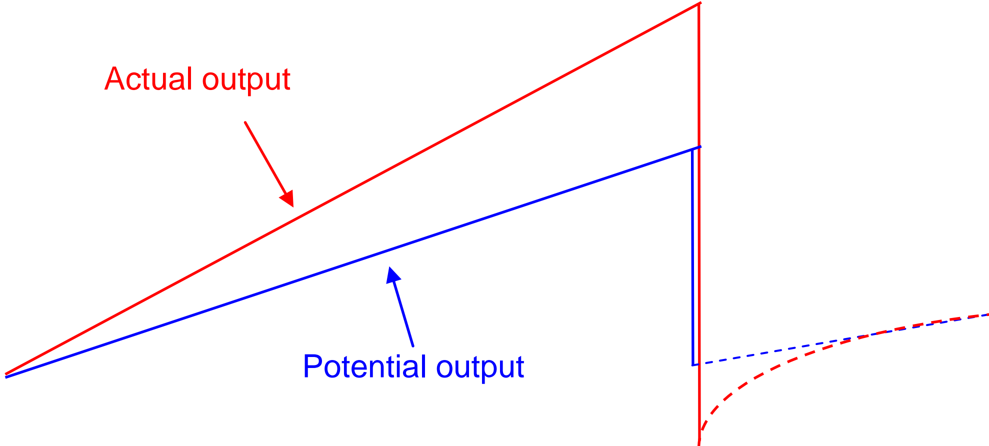
Note. The interim scenario assumes the average of the values for the optimistic and pessimistic scenarios.
* Average annual increase between 2001 and 2006 for Estonia, Latvia, Lithuania, since the trade/GDP ratio already fell in these countries in 2007.

Before presenting the results of the scenarios, it is important to highlight the potential implications of the recent negative output gaps. *Figure 6* provides a schematic picture of actual and potential output before, during and after the crisis. The overheated economies in many CEECCA countries (see, eg Bruegel and WIIW, 2010) have led to faster actual output growth than potential growth before the crisis, and hence the actual output level has become greater than potential output. Cerra and Saxena (2008) have demonstrated that crises tend to generate a sizeable permanent loss in the level of output compared with the pre-crisis trend, and therefore the level of potential output in CEECCA countries is likely to have fallen during the recent crisis. As OECD (2010) emphasizes a crisis can impact all three major factors of production (capital, labour, productivity) and thereby can lead to a fall in potential output. First, lower capital stock is expected due to foregone investment and the higher cost of capital can negatively affect capital deepening and hence output per employee. Second, unemployment hysteresis can affect both equilibrium unemployment and labour force

participation. Third, reductions in total factor productivity (TFP) can result from sectoral reallocations from high-to low-productivity sectors, skill mismatches and lower research and development expenditures.

But it is also likely, in line with theory and empirical research, that actual output falls below potential GDP, ie the output gap becomes negative after the crisis. European Commission (2010) estimates that the 2010 output gap in the new EU member states ranges from -10.7 in Latvia to -2.1 in Poland. The growth scenarios we present consider the slope of potential output, but do not consider the possible growth-enhancing impact of closing the negative output gaps.

Figure 6: Schematic depiction of actual and potential output



We also note that variables related to vulnerabilities, such as the current account balance, external debt, or inflation, are not included in the regression because of the difficulties in addressing modeling issues related to causality, time profile and functional form[16]. Instead, our models can be interpreted as being conditioned on the average macroeconomic stability of the countries included in the panel. Since our panel regression includes 66 middle income countries, which on average had better macroeconomic stability than those CEECCA countries that experienced unsustainable developments, our projections can also be interpreted as being conditional on the achievement of this average macroeconomic stability. This factor provides an additional downside risk (even compared to our pessimistic scenario) for countries such as Bulgaria and Latvia.

[16] For example, during the pre-crisis boom, rapid economic growth was accompanied by growing internal and external vulnerabilities in several CEECCA countries, which would suggest a perverse relationship between vulnerabilities and economic growth.

Figure 7 shows the distribution of fitted values of growth rates from the regressions for 1996-2010 and the results of the interim scenario projections for 2011-15[17]. When interpreting the figure, note that, similar to the in-sample fit presented in section 3, the aim was not to find a perfect fit to historical growth, but to estimate models that can capture potential growth. Note also that these countries experienced very sharp GDP contractions in the first half of the 1990s, and some above-potential growth after this period therefore may be regarded as a natural development. For example, according to our results, the three Baltic countries had already experienced above-potential growth rates in 1996-2000, but especially in 2001-05. As we know, this period (and also the first two years of the next five-year period as well) resulted in huge current-account imbalances and the build-up of massive external debt that proved to be unsustainable, and a deep recession followed. The cumulative growth rates from 2005 to 2010 fell close to zero in the Baltics[18].

Our results are easily explained for most of the countries. The key exceptions are Azerbaijan and Turkmenistan, two oil exporters, for which actual growth before the crisis turned out to be much higher than fitted by our model. Although the terms of trade and the share of fuel exports in total exports are included in our models, it seems that none of the models could capture the past growth processes in Azerbaijan and Turkmenistan. Armenia also had extremely rapid growth in 2001-05 that our models cannot explain. Macedonia (Former Yugoslav Republic) had a disappointing growth performance in 2001-05, which was not just below the fitted values of growth from our regressions, but was also below the growth rates of all other countries of the region. Therefore domestic factors, which are not included in our model, were presumably responsible for this. Considering the 2006-10 period, there are four countries (apart from some oil exporting CIS countries) that grew faster than our model predictions: Albania, Mongolia, Poland and Slovakia. These countries were generally less impacted by the crisis. For most of the other countries, actual growth is either in line with our model, or the boom of the early 2000s and the bust of the late 2000s are well interpretable.

Table 4 shows, for three scenarios, the mean growth projection of the 715 models and their 95 percent range. The results suggest that even in the optimistic scenario – which assumes a return to the pre-crisis development of fundamentals and, in particular, to country-specific pre-crisis capital inflows, credit growth and trade deepening – medium-term outlooks are well

[17] Note also that each individual fit and projection has its own confidence band.

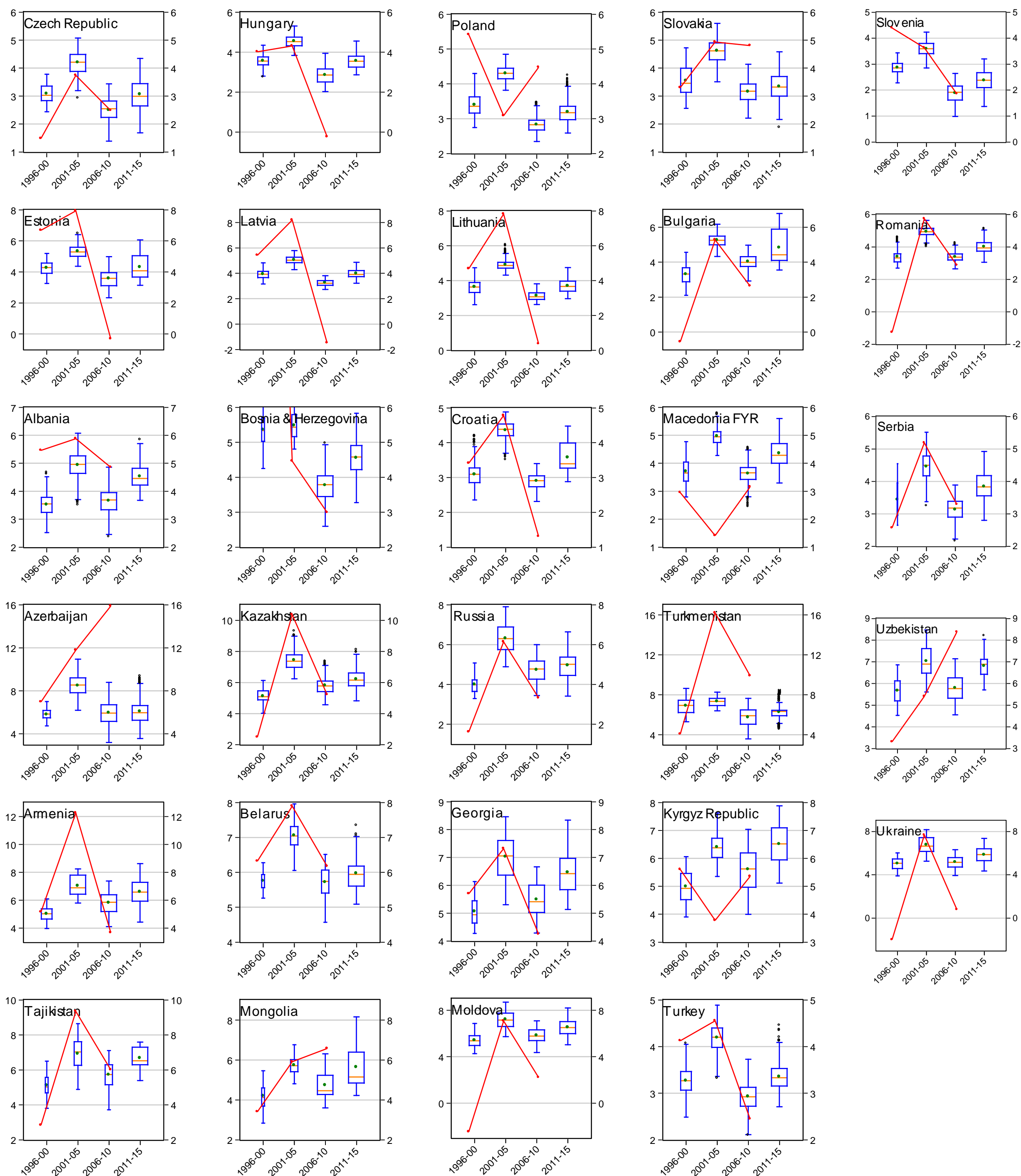
[18] Note that this close to zero cumulative growth from 2005 to 2010 is the product of high growth in 2006 and 2007 and a deep contraction from 2007 to 2010.

below pre-crisis actual growth, especially in those countries that experienced substantial credit and consumption booms. But medium term outlook is also below (with the sole exception of the Kyrgyz Republic) potential growth in 2000-05.

This finding is mainly the result of three effects. First, part of pre-crisis economic growth has likely led to the development of positive output gaps, while our models project potential growth and implicitly assume that the output gap will be zero. Second, the crisis has altered the estimated parameters of the models, and the full-sample estimate associates less benign effects with capital inflows. Third, all countries could achieve economic catching up toward the EU15 level considering the full period of 2001-10, which reduces conditional convergence-driven future growth. However, actual growth rates might exceed potential growth rates in the coming years, as negative output gaps are diminishing. This effect could, at least in part, compensate for the reduction in potential growth in the next few years.

There are only a few exceptions, where projected growth broadly equals average actual growth in 2001-05 or it is even higher: Bosnia and Herzegovina, the Kyrgyz Republic, Macedonia (Former Yugoslav Republic), Mongolia, Poland and Uzbekistan. Regarding Poland, actual growth may have been below potential growth in 2001-05, partly due to the aggressive anti-inflationary monetary policy that was adopted around that time. Actual growth has indeed accelerated in 2006-10, and therefore the relatively slow projected growth rate (on average, 3.27 percent per year in the optimistic scenario, which we argue is realistic for Poland among our three scenarios) may seem surprising. But Poland's fundamentals are not outstanding. For example, the investment rate is considerably lower than in most other CEE10 countries and the budget deficit is quite large in 2010 (more than seven percent of GDP), which will require more serious efforts to consolidate than in most other countries. Also, as Veugelers (2010) and Darvas (2010) highlight Poland has some low scores in some important indicators corresponding to framework conditions of growth, such as infrastructure or the quality of the educational system.

Figure 7: Actual GDP growth and fitted values of growth from 715 regressions for 1996-2010 and projections (interim scenario) for 2011-15



Note. Red colour line: actual annualised (compounded) GDP growth over the five-year period. The box-plot shows the distribution of the 715 fits; see the note to *Figure 2* on the interpretation of the box-plot. Montenegro is not included due to a lack of sufficient data for estimation. Note that the projections for 2011-15 consider the growth rate of potential output, but not the correction of the negative output gap that likely characterised all countries in 2010 (see Figure 6 and the discussion around it).

Table 4: Average annual actual and potential growth: in-sample fit and projections

Group	Country	1990-95 Actual	1995-00 Fit	1995-00 Actual	2000-05 Fit	2000-05 Actual	2005-10 Fit	2005-10 Actual	Scenarios for 2010-15 pessimistic	Scenarios for 2010-15 interim	Scenarios for 2010-15 optimistic	Revision of 2011-15 projection (interim scenario) compared to 2001-05 fit
EU member states	Bulgaria		2.24		4.65		3.33		3.68	3.76	3.82	-0.89
		-7.30	3.31	-0.56	5.26	5.28	4.03	2.63	4.74	4.83	4.91	-0.43
			4.33		5.87		4.74		6.45	6.55	6.63	0.68
	Czech Republic		2.57		3.41		1.59		1.99	2.03	2.06	-1.38
		-1.13	3.09	1.48	4.20	3.74	2.50	2.48	2.96	3.06	3.17	-1.13
			3.67		4.94		3.19		4.11	4.16	4.29	-0.78
	Estonia		3.49		4.55		2.50		3.17	3.27	3.32	-1.28
		-7.44	4.26	6.68	5.32	7.93	3.58	-0.31	4.15	4.30	4.45	-1.02
			5.06		6.24		4.76		5.63	5.77	5.98	-0.47
	Hungary		3.03		3.91		2.16		2.87	2.98	3.05	-0.93
		-1.99	3.56	4.02	4.55	4.30	2.85	-0.24	3.47	3.56	3.64	-0.99
			4.11		5.17		3.65		4.22	4.27	4.30	-0.91
	Latvia		3.36		4.52		2.85		3.04	3.40	3.64	-1.12
		-12.06	3.93	5.42	5.06	8.19	3.26	-1.49	3.76	3.99	4.21	-1.07
			4.57		5.62		3.75		4.64	4.71	5.12	-0.92
	Lithuania		2.93		4.46		2.72		2.66	3.09	3.41	-1.36
		-10.68	3.64	4.68	4.90	7.82	3.13	0.36	3.51	3.69	3.88	-1.21
			4.47		5.69		3.72		4.31	4.37	4.50	-1.31
	Poland		2.87		3.91		2.47		2.57	2.69	2.75	-1.21
		2.14	3.40	5.41	4.30	3.08	2.83	4.47	3.12	3.19	3.27	-1.11
			4.04		4.70		3.24		3.83	3.89	3.97	-0.81
	Romania		2.79		4.39		2.87		3.15	3.40	3.51	-0.98
		-2.13	3.39	-1.26	4.95	5.74	3.38	2.87	3.92	4.02	4.11	-0.93
			4.33		5.47		3.96		4.73	4.76	4.97	-0.70
	Slovakia		2.70		3.88		2.45		2.28	2.39	2.48	-1.50
		-2.91	3.55	3.30	4.62	4.93	3.15	4.80	3.23	3.34	3.44	-1.28
			4.46		5.38		3.86		4.18	4.23	4.30	-1.15
	Slovenia		2.46		3.05		1.16		1.51	1.60	1.65	-1.45
		-0.60	2.87	4.39	3.59	3.63	1.89	1.85	2.26	2.38	2.50	-1.21
			3.32		4.04		2.51		3.01	3.08	3.21	-0.96
EU candidates and potential candidates	Albania		2.62		3.85		2.66		3.72	3.88	3.96	0.03
		-2.69	3.52	5.46	4.94	5.88	3.65	4.86	4.46	4.53	4.60	-0.41
			4.44		5.78		4.53		5.43	5.44	5.50	-0.34
	Bosnia & Herzegovina		4.33		4.91		2.96		3.35	3.47	3.52	-1.44
		-26.65	5.36	29.52	5.48	4.46	3.77	2.99	4.48	4.56	4.63	-0.93
			6.22		6.26		4.58		5.58	5.64	5.66	-0.62
	Croatia		2.49		3.80		2.53		3.00	3.07	3.12	-0.73
		-6.26	3.09	3.41	4.36	4.78	2.90	1.30	3.52	3.58	3.63	-0.78
			3.85		4.77		3.30		4.32	4.37	4.42	-0.41
	Macedonia FYR		2.95		4.42		2.82		3.55	3.60	3.64	-0.82
		-4.67	3.71	2.95	4.97	1.41	3.63	3.15	4.30	4.35	4.40	-0.61
			4.66		5.66		4.35		5.29	5.31	5.32	-0.35
	Montenegro	-10.76		3.06		2.81		3.27				
	Serbia		2.67		3.55		2.40		2.90	2.97	3.03	-0.58
		-13.67	3.44	2.57	4.46	5.19	3.13	3.29	3.78	3.84	3.91	-0.62
			4.54		5.23		3.68		4.63	4.64	4.68	-0.59
	Turkey		2.67		3.51		2.31		2.76	2.85	2.95	-0.66
		3.21	3.27	4.12	4.19	4.55	2.93	2.45	3.28	3.35	3.43	-0.84
			3.88		4.75		3.58		3.94	3.96	4.07	-0.78
Non-EU former Soviet Union countries and Mongolia	Armenia		4.18		6.01		4.50		4.92	4.99	5.04	-1.02
		-13.03	5.03	5.15	7.03	12.25	5.82	3.68	6.55	6.60	6.65	-0.44
			5.89		8.12		7.07		8.16	8.17	8.23	0.05
	Azerbaijan		4.85		6.40		4.06		3.34	4.14	4.67	-2.27
		-16.21	5.80	6.97	8.49	11.78	5.96	15.89	5.65	6.09	6.53	-2.40
			6.72		10.28		7.98		8.68	8.72	8.91	-1.55
	Belarus		5.38		6.33		4.91		5.47	5.51	5.51	-0.83
		-8.36	5.75	6.32	7.05	7.89	5.72	6.17	5.94	5.97	6.00	-1.08
			6.19		7.76		6.42		6.82	6.82	6.84	-0.94
	Georgia		4.42		5.64		4.45		5.13	5.39	5.55	-0.25
		-22.34	5.06	5.70	7.02	7.32	5.49	4.25	6.33	6.46	6.60	-0.56
			6.02		8.26		6.50		7.96	8.01	8.06	-0.25
	Kazakhstan		4.10		6.46		4.81		4.80	4.98	5.17	-1.48
		-9.30	5.12	2.48	7.43	10.37	5.80	5.21	6.15	6.21	6.28	-1.22
			5.93		8.82		7.07		7.49	7.52	7.59	-1.30
	Kyrgyz Republic		4.09		5.48		4.33		5.09	5.36	5.59	-0.12
		-12.20	4.99	5.60	6.40	3.78	5.60	5.35	6.41	6.51	6.61	0.11
			5.97		7.39		6.86		7.58	7.61	7.71	0.22
	Moldova		4.46		6.02		4.78		5.13	5.34	5.45	-0.69
		-16.71	5.42	-2.48	7.21	7.08	5.83	2.20	6.41	6.52	6.64	-0.69
			6.48		8.52		6.80		7.79	7.84	7.90	-0.68
	Mongolia		2.92		5.05		3.86		4.14	4.43	4.64	-0.62
		-2.80	4.20	3.40	5.74	5.91	4.73	6.57	5.55	5.64	5.74	-0.10
			5.38		6.59		6.20		7.87	7.87	7.88	1.28
	Russia		3.36		5.12		3.56		3.57	3.66	3.74	-1.46
		-9.11	4.00	1.62	6.31	6.13	4.74	3.31	4.91	4.96	5.02	-1.35
			4.89		7.57		5.73		6.25	6.27	6.31	-1.30
	Tajikistan		3.90		5.23		4.18		5.65	5.63	5.63	0.40
		-16.61	5.12	2.84	6.93	9.35	5.71	6.00	6.61	6.67	6.74	-0.25
			6.37		8.36		6.96		7.45	7.51	7.57	-0.85
	Turkmenistan		5.50		6.49		3.85		4.88	4.72	4.72	-1.77
		-9.02	6.88	4.06	7.32	16.17	5.74	9.89	6.26	6.27	6.23	-1.05
			8.49		8.10		7.36		7.78	8.04	8.27	-0.06
	Ukraine		4.15		5.65		4.21		4.28	4.63	4.84	-1.01
		-13.64	5.04	-2.00	6.79	7.69	5.17	0.80	5.72	5.86	6.01	-0.92
			5.88		8.08		6.17		7.06	7.08	7.13	-1.01
	Uzbekistan		4.69		5.85		4.84		5.91	5.75	5.81	-0.10
		-4.11	5.68	3.31	7.03	5.41	5.80	8.38	6.72	6.81	6.84	-0.22
			6.74		8.19		6.85		7.66	7.94	7.94	-0.25

Note: the mean (numbers in bold) and the 95 percent range are shown for the fitted values and the projections.

7. Conclusions

In this paper, we used cross country growth regressions to study the impact of the 2008/09 global financial and economic crisis on economic growth in Central and Eastern Europe, the Caucasus and Central Asia (CEECCA). We argued that results of previous related works that used sample periods that ended before the crisis might be misleading, because these papers obviously did not cover the bust phase of the economic cycle of the 2000s. However, using data only from the boom years, which led to unsustainable credit, housing and consumption booms in many CEECCA countries (but not in most other emerging and developing countries), might not be useful for forming longer-term perspectives. We extended the sample period until 2010, relying mostly on the April 2010 forecast of the IMF and the July 2010 forecast of the EIU, and used this extended sample for estimation in order to better capture both phases of the economic cycle. Even though forecasts for 2010 are uncertain and the crisis-period hardly represents a standard bust phase of a business cycle, including it in the sample period is inevitable and the addition of forecasts for 2010 might not distort the results much.

We ran cross-country growth regressions on the post-1995 sample period to minimise the chance of structural breaks and adopted three different sample periods (1995-2010, 2000-07, 2000-10). To analyse the robustness of the results, we studied four different country samples and used various explanatory variables. We selected those possible growth determinants and correlates that significantly correlated with growth, controlling for the initial GDP per capita level and period-fixed effects, and checked that the results were robust both to the different time periods and to the different country groups used to estimate the panels. Among the variables that had a significant and correctly-signed partial correlation coefficient with growth, we selected 13 that represented different kinds of growth drivers and correlates. Due to the difficulties of selecting a single model, we estimated many models and combined them. We estimated models with all 715 possible quartets (ie four-element subsets) of the 13 indicators and added initial the GDP per capita level and period-fixed effects to all regressions. We have used the estimated models to answer three questions:

- First, we studied the impact of the crisis on the within-sample fit of cross-country growth regressions by presenting estimates both for the pre-crisis period and for an extended sample that also includes the crisis. The fitted values lead to easily-

interpretable results within sample. Comparing the 2000-07 sample to the 2000-10 sample, the downward revision of fitted values of GDP growth from the regressions is between one and three percent per year for most countries.

- Second, while previous research has found a substantial ‘growth dividend’ from EU enlargement in the sense that new EU members grew faster than their fundamentals implied, we could confirm this finding only for the first half of the 2000s. In contrast, in the second half of the 2000s, the CEE10 states grew less than implied by their fundamentals. In the 2000s overall, the CEE10 states’ growth process seemed mostly in line with their fundamentals, ie these countries seemed to growth by about 0.3-0.4 percent more than what would have implied by their fundamentals, though this result is not statistically significant. This finding does not at all mean that EU membership was neutral for the growth process of these countries, since the many positive effects discussed in European Commission (2009) have helped the development of fundamental growth drivers. In particular, EU membership has contributed to financial and trade integration, which boosted growth. We have also measured the effect of EU enlargement by comparing the baseline simulation from our models to a counterfactual simulation of ‘no enlargement’, in which we have set up hypothetical paths for the growth drivers based on the developments of non-EU middle income countries. We have indeed found that the incremental improvement of fundamentals due to EU enlargement likely had a positive impact on growth by about 0.15 percent per year in the second half of the 2000s. Among the other countries in the CEECCA region, the CIS countries were found to have a better growth performance that what would have implied by the fundamental growth drivers (though their advantage has declined from the first to the second half of the 2000s), while, on average, countries in the Balkans seemed to grow according to their fundamentals.

- Third, we studied prospects for post-crisis growth using our estimated models and by setting up hypothetical scenarios for the future development of growth drivers. We have set up some scenarios and analysed possible growth trajectories. Even in the optimistic scenario that assumes a return to the pre-crisis development of fundamentals and, in particular, to country-specific pre-crisis capital inflows and credit growth, medium-term outlooks are below pre-crisis actual growth, especially in those countries that experienced substantial credit and consumption booms before the crisis. There are three main effects behind this finding. First, part of the pre-crisis

economic growth has likely led to the development of positive output gaps, while our models obviously project potential growth and implicitly assume that the output gap will be zero. Second, the crisis has altered the estimated parameters of the models and the full-sample estimate associates less benign effects with capital inflows. And third, CEECCA countries achieved economic catching up toward the EU15 level when the full period of 2001-10 is considered, which reduces conditional convergence-driven future growth. Even though actual growth rates might exceed potential growth rates in the coming years, as negative output gaps are diminishing, policymakers have to take into account reduced potential growth rates, and focus even more on growth-enhancing economic and structural policies.

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