Why Growth Performance Differed across Countries in the Recent Crisis: the Impact of Pre-crisis Conditions

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Abstract: The growth performance of countries proved to be very different during the recent financial crisis. The objective of the paper is to investigate why, despite the fact that the crisis hit countries simultaneously, the length and depth of the crisis turned out to be very different across countries. We apply principal component analysis to derive a single indicator for growth performance which includes different aspects of GDP dynamics before and after the crisis. Then we apply multivariate regressions analysis to analyze whether pre-crisis economic conditions and/or structural characteristics can explain the differences in growth performance in a sample of 37 countries. We focus primarily on industrialized countries but also include dynamic emerging economies. The pre-crisis conditions we investigate include the fiscal situation, trade competitiveness, output and credit growth; the structural characteristics we selected were country size, openness, the share of specific sectors and per capita income. The three indicators which proved to explain most robustly the cross country differences in the recent crisis and thus could also be used as predictors for future crises are the current account position, credit growth and GDP growth in the run-up period. Trade competitiveness improved the performance in the crisis. Past credit and GDP growth impaired country performance.

JEL **Classifications:** E20; E30; E32; E44; E60; G18; G28

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1. Motivation and Outline

The recent crisis has been the deepest crisis industrialised economies have experienced since the Great Depression in the nineteen thirties. At the outset it appeared to progress in a rather synchronized fashion across countries (*Eichengreen - O'Rourke*, 2009, *Aiginger*, 2010). However, three years after the start we know that countries were actually affected very differently. Even within the European Union some countries didn't face any or only a very small decline in output, whilst others experienced double digit losses and are still not recovering in 2011. We investigate which economic, financial and structural factors may explain these differences.

While there are some papers available which try to explain these differences, most of them focus on financial indicators. We, to some extent, complement these approaches by looking specifically at fiscal conditions and trade competitiveness indicators at the start of the crisis and at structural features of the countries like size, sector composition and GDP per capita.

A serious drawback in previous attempts to analyze performance differences is that economic performance in general, and even growth performance in particular, cannot easily be described using a single indicator. Some countries had a large drop in GDP in one year, but grew before and after the crisis. Others had a rather small decline over a longer period. Furthermore, any growth rate during the crisis has to be seen against the background of the level of trend growth in each country. We overcome this problem by using a principal component approach, which extracts one comprehensive quantitative

indicator, building on different indicators of length, steepness and trend change in GDP during the crisis period from 2007 to 2009.

The goal of this paper is to find evidence as to why the growth performance of countries differed in the recent crisis. This is not the place to give an overview of the causes of the crisis. There are abundant papers and books written today about the causes of the recent crisis[1]. Maybe the causes could be divided into three main categories: group one is macro-financial issues (including lending, housing and asset boom and underestimating systemic risks), group two is macroeconomic imbalances (trade disequilibria, savings glut, loose monetary policy) and group three is regulatory failures and incorrect incentive structures. Out of all the causes of the crisis we concentrate on macroeconomic and macro financial imbalances in the run-up period. This is an explicit choice as we want to look at the underlying economic causes and separate them from government policy and regulation.

Existing studies differ as to (i) the range of countries involved (developed countries vs. emerging economies), (ii) the indicator for the severity of the crisis (single indicator, real and financial indicators), (iii) the explanatory factors tested and finally (iv) the statistical technique used (correlations, multivariate regressions, MIMIC models, robust regressions). Most of the studies come from the think tanks of National Banks; therefore financial variables dominate.

Rose and Spiegel (2009) use a set of performance indicators ranging from GDP growth to stock market performance, from credit rankings to exchange rates for 107 countries, and investigate sixty potential causes for the crisis. They essentially find only one robust predictor, namely the size of the equity market run ups prior to the crisis. They conclude that they are unable to link most of the commonly cited causes of the crisis to its incidence across countries[2]. *Lane - Milesi-Ferretti* (2010) explain in-crisis growth (in fact the two years growth in 2008 and 2009) for a large sample of countries dominated by non-industrial countries. The main conclusion of this study is that the crisis was less severe in countries with low GDP per head, while openness, trade deficits, higher pre-crisis growth of GDP and credits aggravated performance.

Berkmen et al. (2009) use revisions of GDP forecasts as indicators to measure the severity of the crisis. The rational is that revisions - in contrast to growth rates or rates of decline - are not affected by cyclical positions and anticipated growth. The main conclusion is that a relatively small set of variables can explain many of the differences in country performance, namely leverage, cumulative credit growth and exchange rate pegs. Specifically, leverage explains virtually all growth revisions for the least affected countries; it explains two thirds of the revisions of averagely affected countries and slightly more than half of the revisions for those countries most affected by the crisis. The primary budget position is also significant, leading to the policy conclusion that a solid fiscal position during good times creates buffers for shocks.[3]

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[1] See Aiginger, 2009; Borio, 2011; Cooper, 2008; Darius – Bayoumi, 2011; Diamond - Rajan, 2011; Krugman, 1994; Reinhart - Rogoff, 2009, 2010; Taylor, 2009).

[2] Current accounts are investigated as determinants; they prove significant in bilateral regressions, but are insignificant in multi-regressions. In Rose and Spiegel (2010) a somewhat different method is used, inter alia three different performance aspects are investigated separately. The main result is that house prices, credit growth and government current accounts are significant for all three performance indicators.

[3] Forty three emerging markets are investigated (and extended in a robustness test for 126 low-income plus emerging countries). Lower current account deficits prior to a crisis are associated with better growth outcomes in some equations, but in the final regressions they are insignificant due to their strong correlation with credit growth.

Claessens et al. (2010) try to explain different performance indicators (duration, drop of GDP, and change in growth vs. trend growth); only three variables are significant for all measures of the depth of the crisis, namely house price appreciation, bank credit growth and the national current account. Countries with close links to the US financial system or direct exposure to asset backed securities were the first affected. Home-grown vulnerabilities (leverage, asset price bubbles etc.) are seen in the economies most severely hurt.

Summarizing, studies on country performance in the recent crisis up to now focus mainly on emerging economies and financial variables. None of the papers cited combined financial data with imbalances in fiscal positions. Budget position and government debt at the start of the crisis has not usually been included. Neither have the policy reactions implemented as a reaction to the shock. Results differ widely from the pessimistic assessment of a "sad state of knowledge" to the optimistic one, that a small set of variables explains a lot of variance. Credit growth, leverage, country size, GDP per capita, stock market booms, and past GDP growth are the variables which have been suggested as being able to explain some of the divergence.

The remainder of the paper is structured as follows: in section 2 we explain our own research approach. Section 3 presents the main evidence as to what extent and why performance differed in the recent crisis. The robustness of the results and some caveats are discussed in section 4. In section 5 we draw our conclusions.

2. Research Approach

As dependant variable ("growth performance") we choose a single, comprehensive variable which will be derived from different indicators of real GDP during the crisis. We then classify the predictors into those addressing the development of the economies in the run-up phase of the crisis ("pre-crisis conditions") and those characterizing more time-invariant characteristics of the countries ("structural characteristics"). We try to incorporate indicators for those conditions which are seen as responsible for the crisis and those indicators found significant in existing empirical literature. The econometric approach is cross sectional, since we explain a single crisis.

2.1 Measuring growth performance using a composite indicator

In order to obtain a performance measure of the economic dynamics for the 37 countries during the crisis we combine four indicators on the development of real GDP:

- The *rate of change* of GDP in 2009 ("in crisis decline"); in 32 countries real GDP was lower in 2009 relative to 2008. An increase in GDP in the year 2009 occurred in China, India, Poland, Australia, and Korea.

- The *cumulated change* over the three years from 2008 to 2010 to demonstrate the status of the economy several quarters before the climax of the crisis and the speed of recovery after it ("three years performance"). This measure yields a decrease for 24 counties and an increase in 13 countries.

- The *decrease of quarterly* GDP from the pre-crisis peak to its trough: this indicator should describe the potential severity of the crisis not revealed by annual figures ("steepness of the crisis").

- The actual growth in the three years 2008, 2009, 2010 ("three years performance") relative to the "pre-crisis" trend growth from 2000 to 2007 ("trend change")[4].

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[4] Additionally we could measure the length of the crisis by counting the number of quarters in which GDP decreased; in rare cases these were one to two quarters, on average five quarters. In a few countries we cannot say yet how many quarters the crisis lasted since GDP is still declining.

Out of these four variables we construct a single indicator on "growth performance" by principal component analysis. This yields a dependant variable (PC-value) which makes the best use of the specific information contained in the different GDP figures. The ordinal indicator can also be used for ranking the countries according to the impact of the crisis on GDP (PC-rank).

2.2 Pre-crisis conditions (PCC)

Our research focus is on macroeconomic and financial imbalances in the run-up period to the crisis, which could have contributed to differences in in-crisis performance. We divide the pre-crisis conditions into fiscal position, trade competitiveness and macro financial imbalances and examine variables for the period from 2000 to 2007.

2.2.1 Fiscal position

The first group of variables we test reflect fiscal prudence at the start of the crisis. Economic policy in most countries aims for a balanced budget (over the long run, for a full cycle).[5] A good fiscal position is interpreted by financial markets as a sign of prudent policy and leads ceteris paribus to low interest rates for government loans. This is because in general a good fiscal position acts as a cushion against risk increases from any new shocks and specifically against the damage when the problems in the US financial sector spilled over into the world economy. When added to the debts of consumers, the housing sector and industry, large government deficits were seen as risks, by rating agencies and analysts increasing the "financial risk" of a country. Furthermore, deficits limit the ability to implement stimulus packages and in fact several countries with large deficits in 2007 had to consolidate budgets in the middle of the crisis. Finally 2007 was a year with growing demand and inflation was increasing due to the prices of energy, food and raw materials. Actual budget situations are known to be seen more favourably than they are after a period of credit boom (*Jaeger - Schuknecht*, 2004). In line with this finding and in contrast to the advice of standard fiscal textbooks, most governments had structural budget deficits in 2007.

Due to the arguments above we expect a negative correlation between performance in the crisis and pre-crisis debt and a positive correlation with the pre-crisis fiscal position. We tested the fiscal position in 2007, changes in budget position between 2000 and 2007, public debt relative to GDP as well as its changes.

2.2.2. Trade competitiveness

The second set of disequilibria that has been mentioned as cause of the crisis is external surpluses or deficits, be it in trade or in the current accounts. A causal link between performance in the crisis and pre-crisis current accounts may exist along four lines. The first could be that the debts of government and private firms are seen as an interrelated problem by the financial markets when rating "country risk". A second might be that weak trade competitiveness is seen by the financial markets as a barrier to further growth and therefore makes borrowing more expensive. A third could be that losing currency reserves via current account deficits increases the risk premium for a country if either the government or firms want to raise money. A fourth reason could be that countries with a weak external position in good times might be marginal suppliers able to sell on the world markets if demand is strong but squeezed out of the markets if more competitive producers have free capacities.[6]

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[5] In practice the targets are often less ambitious, like the target of a maximum deficit of 3% in the European Union. There are also more ambitious targets like generating a surplus on average over a cycle to be able to cut down accumulated debt or to provide for an ageing society (Sweden, Finland).

[6] Literature on "economic" integration decries the importance of trade deficits; they should be as irrelevant as deficits between intra-country regions (States in the US, countries or regions in Europe). Competitiveness literature in parallel abandoned concepts on competiveness or emphasizing trade balances (at least since the *Krugman's* (1994) critique that looking at trade figures is meaningless, dangerous, obsessive etc.). New concepts of competiveness start from a broad vision of performance

2.2.3 Macro-financial imbalances

The literature has stressed the role of innovations on the financial markets, of overleveraging, credit and asset booms and underestimation of systemic risks as causes of the crisis. We therefore include variables on pre-crisis credit growth, price dynamics and changes of foreign capital reserves to capture these effects. The first two of these variables should to some extent also correlate with the property and asset market bubbles. Finally we test the impact of pre-crisis growth of real GDP. This could be a proxy for the consequences of asset bubbles: if credits and assets boomed and the financial sector was inflated (so credit growth and GDP growth in the run-up period might be correlated). Past growth can on the one hand signal an exceptional and successful catching-up process of emerging economies but on the other hand indicate an unbalanced overheating. This might make it advisable to use regional dummies (e.g. a dummy for Asia) to capture the high and stable growth in China and India.

2.3 Structural characteristics (STR)

Among the structural characteristics of countries, we test whether ceteris paribus open economies performed worse. This could be the case since the crisis had been transmitted via trade and capital flows. Furthermore we could expect that a larger government sector would limit the crisis and that a large manufacturing or financial sector would contribute to the depth of a crisis. The size of the economy could limit the effect of the crisis (due to smaller export and import shares or less leakages from stimulus packages), while high per capita income could contribute to the depth of the crisis via a more sophisticated and innovative financial sector or higher income elasticity of demand and exports.

2.4 Synthesis of the research approach

Summarizing, our basic regression therefore relates growth performance to one bloc of variables for pre-crisis conditions (PCC) and to another bloc for structural indicators (STR).

$$Growth\ performance = f\ (PCC,\ STR) \qquad (1)$$

Growth performance is measured by the ordinal variable, generated by the principal component analysis (PC-value) using several indicators on economic growth. The set of pre-crisis conditions (PCC) contains the budget situation and public debt ("fiscal prudence"), the balance of trade and the balance of the current account ("revealed competitiveness"), financial variables (inflation, credit growth, liabilities) plus the average growth of GDP from 2000 to 2007 ("past growth dynamics"). The set of structural characteristics (STR) includes trade openness ("globalisation and interconnectedness"), the size of government, the share of manufacturing and finance, country size and GDP per capita and a country rating on the financial sector.

3. Main Empirical Results

This chapter presents the main empirical results. First we show to which extent growth performance across countries differed, according to our composite indicator. Then we show how these differences can be explained by pre-crisis conditions and structural characteristics.

3.1 Best and worst performing countries

Table 1 shows the performance of countries according to the composite indicator derived by principal components analysis and its four components.[7]

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incorporating growth, social inclusion, environmental stability (and constraints like budgetary prudence and balanced trade; see *Aiginger,* 2006).

[7] The weights used to derive the composite indicator are the factor loadings on the first component of the principal component analysis. The first component explains 90% of the common variance across the

The crisis was mildest in China and India with annual growth at 8.7% and 6.5% respectively over three years. Australia and Korea, Canada and the US performed well, too. In Europe the positive outliers were completely different countries such as Switzerland and Poland. Switzerland is an export oriented, financially globalised country and is not a member of the EU, Poland is a large economy with a rather traditional banking system.

The crisis was deep in some new member countries of the EU, namely the Baltic countries, and in Hungary and Romania. Additionally it hit the high-income economies of Ireland and Iceland. Finland and Japan are among the countries with a large drop in GDP due to their large manufacturing sectors. According to the GDP indicators chosen the Southern European countries with Greece, Spain and Portugal are not among the low 10. This assessment might need to be revised if recovery comes later, since budget deficits are to be cut dramatically. France, the Netherlands and Austria had the best performance within the Euro area.

Table 1. Growth performance differences during the crisis: top 10 vs. low 10 countries

	2009	2010-2007	Trough 2009-peak 2008	2010-2007 minus 2000-2007	Composite indicator (Principal component)	
		p.a.	Percentage change	Trend change	PC-value	PC-rank
			Quarterly data			
Top 10						
China	7.7	8.7	7.7	−1.7	99	1
India	5.9	6.5	5.9	−0.7	93	2
Poland	1.7	3.1	1.7	−0.9	80	3
Australia	1.3	1.9	1.3	−1.6	77	4
Korea	0.2	2.5	0.2	−2.2	75	5
Switzerland	−1.5	0.6	−2.4	−1.3	70	6
Canada	−2.6	0.2	1.4	−2.4	70	7
Norway	−1.5	0.6	−2.4	−1.7	69	8
New Zealand	−1.6	0.0	−1.6	−3.5	66	9
USA	−2.4	0.2	−3.8	−2.2	66	10
Low 10						
Romania	−7.1	0.2	−7.1	−5.9	56	28
Japan	−5.2	−1.5	−8.4	−3.0	54	29
Hungary	−6.3	−2.0	−7.9	−5.7	50	30
Iceland	−6.5	−2.3	−6.3	−6.8	50	31
Slovenia	−7.8	−1.2	−9.5	−5.6	50	32
Finland	−7.8	−1.8	−9.1	−5.0	50	33
Ireland	−7.1	−3.7	−12.5	−9.3	40	34
Lithuania	−15.0	−4.6	−18.1	−12.7	22	35
Estonia	−14.1	−5.8	−19.6	−13.9	18	36
Latvia	−18.0	−8.9	−26.1	−17.9	0	37

Remark: GDP at real terms.
Source: Eurostat (AMECO).

While country differences regarding the depth of the crisis can be seen independently of the specific indicator chosen, the individual indicators do draw attention to some differences.[8] The crisis

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indicators. The resulting ordinal indicator (PC-value) is the performance indicator we will use in the econometric analysis.

[8] The correlation coefficients between the four sub indicators for growth performance in the crisis lie between 0.7 and 0.9. Nevertheless each of the sub-indicators contains some element of "the depth of a crisis". Therefore extracting a principal component (PC) seems preferable as compared to choosing one of the sub-indicators as a variable to be explained.

was deeper in Greece, France, and Italy if we rank these countries according to their relative dynamics over all three years together, rather than if we only look at 2009 (since growth had been meagre in 2008 and/or recovered less in 2010). On the other hand the crisis looks less severe if performance in 2008 is included for Bulgaria, Romania, Slovakia and Czech Republic since growth was rather high in Central and Eastern European countries in 2008.

3.2 Growth performance versus pre-crisis conditions (correlations)

3.2.1 Weak impact of fiscal positions

The growth performance of countries is unrelated to fiscal prudence; the correlation coefficient has the expected positive sign for the budget position in 2007 and an unexpected positive one with public debt (both are insignificant and very low, see table 2). Government budgets were in surplus in 2007 in 19 out of the 37 countries.[9] Some countries with good performance during the crisis had a budget surplus prior to the crisis, namely Norway, China, India, Australia and New Zealand. Finland, Sweden and Denmark enjoyed a surplus, but the crisis was at least as strong as it was in other European countries, thus weakening the correlation (see also figure1).

The inability to predict in crisis performance by looking at the budget situation is extremely robust. This truth holds for both variables on all transformations.
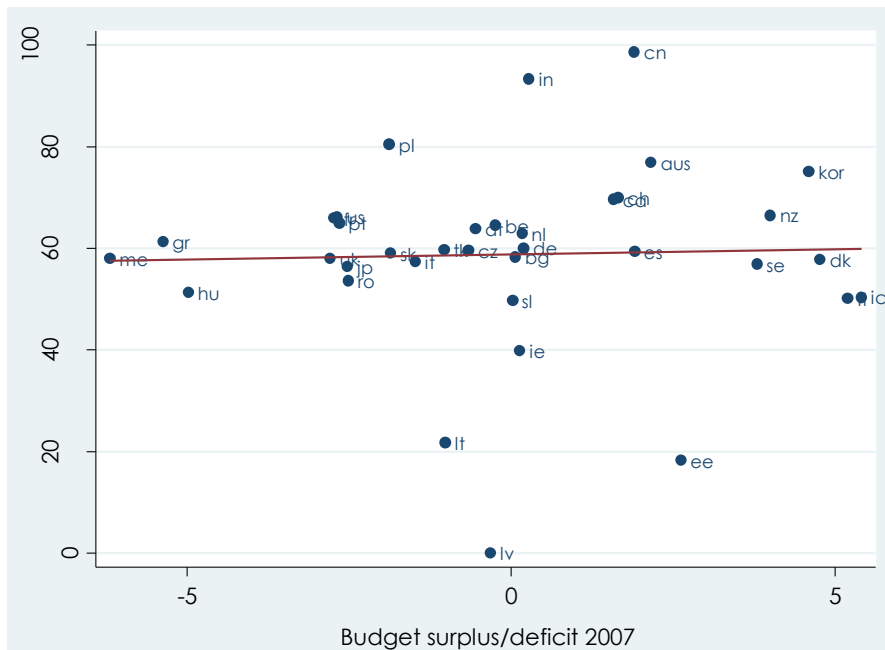

Figure 1. Growth performance (PC-value) and budget surplus/deficit 2007 (R = 0.09)

3.2.2 Strong impact of trade competitiveness (current account position)

Growth performance is significantly related to trade competiveness before the crisis. This holds true for trade balances and even more so for the position of the current accounts in 2007. It also holds

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[9] Among these countries the five Nordic European countries (Norway, Denmark, Sweden, Finland and Iceland) as well as Korea enjoyed a rather large surplus of about 4% of GDP. Smaller but still considerable surpluses occurred in Canada, Switzerland, Spain and Australia. High deficits (about 5%) were already seen in Greece and Hungary and deficits of more than 2% were present in France, Portugal, the USA and the United Kingdom.

true for current account positions in the longer run (average 2000-2007) and to the change in current accounts between 2000 and 2007.

Trade deficits of about ten percent of GDP existed in 2007 in Greece, Portugal, Bulgaria and Latvia; the United Kingdom and Spain also had deficits nearing 10%. The deficits are translated into current account deficits for all countries with one small and one large exception. The deficit in the current account for Greece is somewhat lower due to tourism (15% instead of 18% of GDP) and that for the United Kingdom decreased to 3% (from 9½% for trade of goods) due to the financial sector's surplus.

High surpluses and good performance are shown by Norway, China, India, Belgium, the Netherlands and Austria. Deficits and an ensuing deep crisis occurred in the Baltic States, Bulgaria, Ireland and Spain. Outliers in this correlation are Sweden and Finland which both had good trade positions and medium sized or larger crises and Australia, Poland and the US which had a negative trade position but a rather mild crisis. Overall, the correlation is rather robust (see also figure2 following).
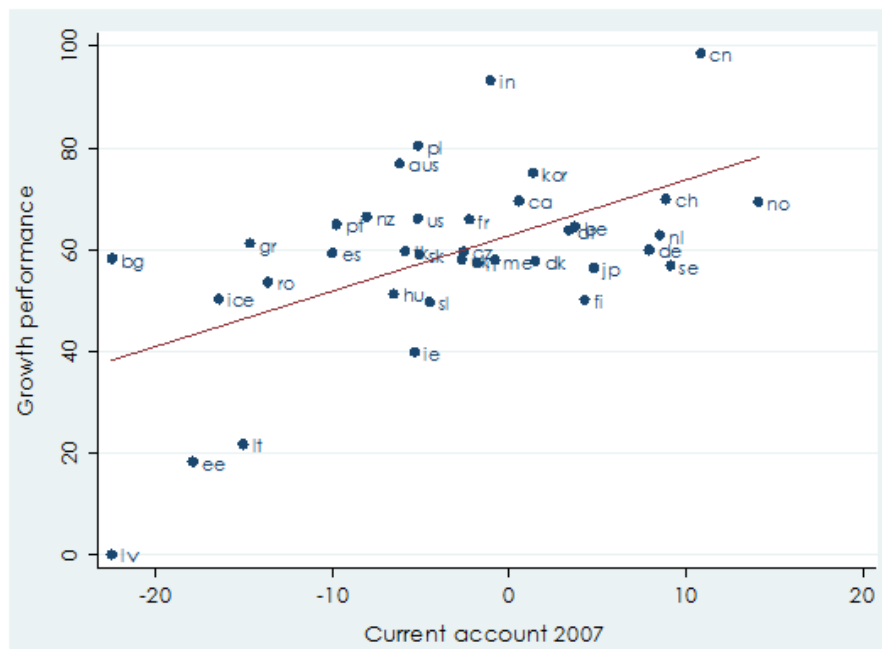

Figure 2. Growth performance (PC-value) and current account 2007 (R = 0.56)

3.2.3 Pre-crisis dynamics of credit, inflation and output

The first significant result is that performance is negatively related to credit growth between 2001 and 2007. In Romania, Iceland, Latvia and Bulgaria credits in 2007 were more than four times as high as in 2000. Credit growth was also very high in China and India, but here it was more in line with a quickly expanding real sector. If we do not use quantitative credit growth, then the rankings of countries for credit dynamics the correlation are no longer significant. The relationship between performance and the credit/GDP ratio in 2007 is not significant, but in-crisis performance is related to the change in the credit/GDP ratio.

Table 2. The relation between growth performance and pre-crisis conditions

	Growth performance PC-value	
	R^2	*t*-value
Budget surplus/deficit (relative to GDP) 2007	0.01	0.55
Budget surplus/deficit (relative to GDP) 2000-2007; absolute change	0.00	0.11
Budget surplus/deficit (relative to GDP) 2000-2007; average	0.00	0.21
Public debt (relative to GDP) 2007	0.04	1.17
Public debt (relative to GDP) 2010-2007; absolute change	0.00	0.39
Public debt (relative to GDP) 2010-2007; average	0.01	0.55
Current account (relative to GDP) 2007	0.31	3.96
Current account (relative to GDP) 2007; rank	**0.26**	**3.49**
Current account (relative to GDP) 2000-2007; absolute change	0.39	4.75
Current account (relative to GDP) 2000-2007; average	0.20	2.96
Domestic credits; growth 2001-2007	0.39	− 4.73
Domestic credits; growth 2001-2007; rank	**0.16**	**− 2.58**
Domestic credits (relative to GDP) 2007	0.04	− 1.20
Domestic credits (relative to GDP) 2001-2007; absolute change	0.26	− 3.48
Domestic credits (relative to GDP) 2001-2007; absolute change; rank	**0.23**	**− 3.28**
GDP growth 2000-2007	0.09	− 1.89
GDP growth 2000-2007; rank	**0.06**	**− 1.48**
Inflation (consumer prices)	0.01	− 0.56

Remark: The critical value for significance at the 5% level is 2.03 (1.69 at 10% level; n=37).
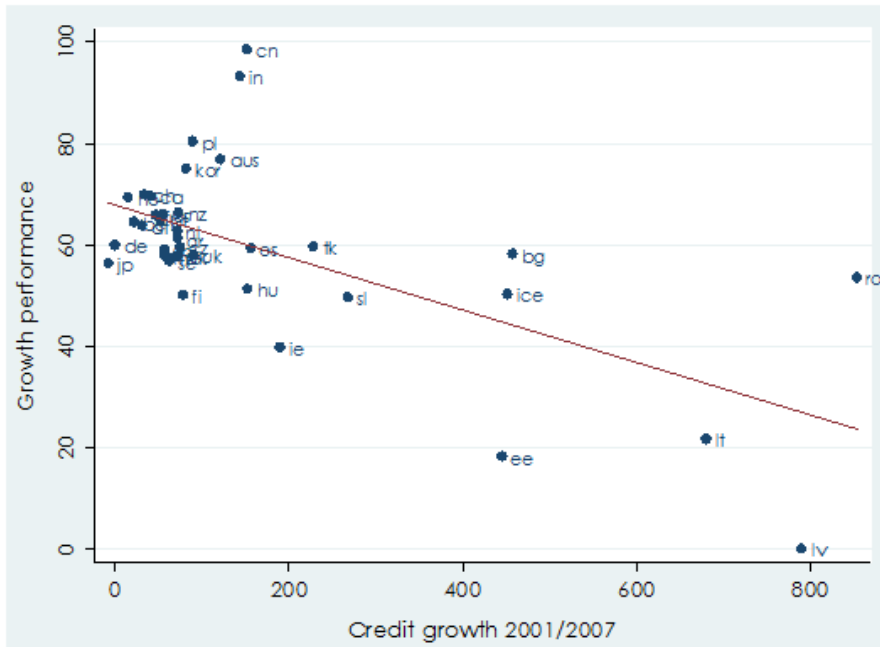**Source:** Eurostat (AMECO).

Figure 3. Growth performance (PC-value) and credit growth 2000/2007 (R = -0.62)

Secondly, performance is negatively correlated to pre-crisis growth (t = -1.89), the correlation is significant at the 10 % level.[10] Low growth before and good performance during the crisis occurred in very rich countries (Switzerland, Norway, Canada). High growth and weak performance in the crisis occurred in several eastern European countries and specifically the Baltic countries. These two groups contribute to the negative correlation; China and India combine high pre-crisis growth and good performance; Italy, the United Kingdom and Mexico combine low growth and a deep crisis.

Performance proved unrelated to changes in the currency reserves and to consumer price inflation.
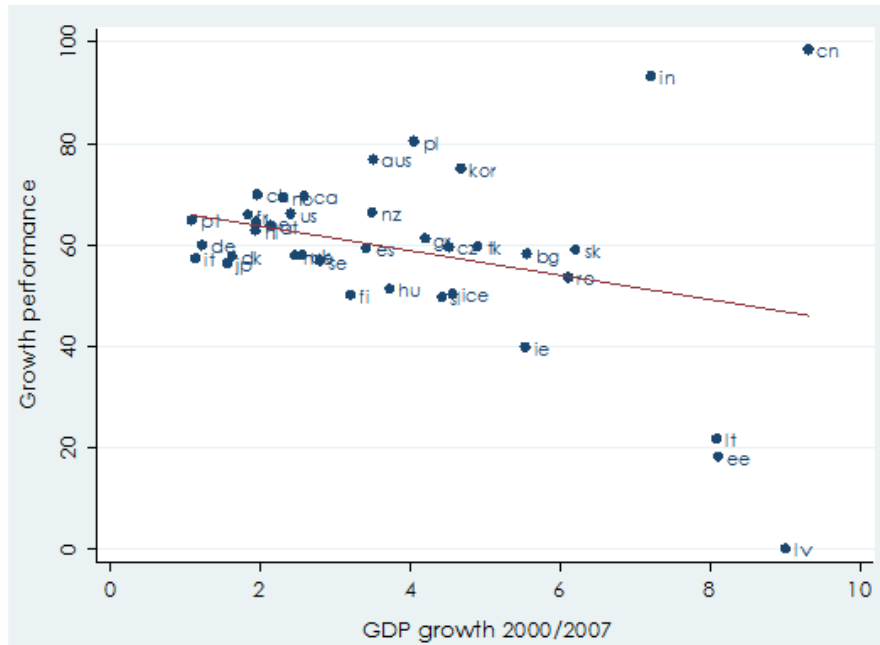

Figure 4. Growth performance (PC-value) and growth of GDP 2000/2007 (R = -0.30)

3.3 Growth performance versus structural characteristics (correlations)

Structural characteristics are less able to explain the country differences in the crisis. Neither variable tested in table 3 is significant at the 5% level (except the Asia dummy). Openness and government size are - if anything - slightly negatively related to performance. The first correlation indicates the international character of the crisis, the second comes as a small surprise, since larger governments could have enacted larger stimulus packages.

The share of manufacturing is slightly positive related to in-crisis performance. This had been open for the empirical evaluation, since on the one hand output loss in manufacturing was much stronger than the drop in total GDP. On the other hand a strong manufacturing sector could imply positive trade balances. The latter component seems to dominate, thus mitigating the crisis.

The size of the economy as measured by absolute GDP is weakly positively related to performance; this is the mirror image of the impact of openness. It could also indicate the ability of large economies to enact stimulus packages with smaller leakages. Performance is unrelated to per-capita income, but this could be due to the focus on industrialized countries.[11]

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[10] If we look at the rankings for the past growth variable (which reduces the impact of outliers), the correlation is not significant.

[11] *Lane - Milesi-Ferretti*, 2010, finds a negative relation in a sample focusing on developing countries.

A regional dummy for Asia is significant; this indicates the greater resistance of Asia to the spillovers of the crisis originating from the financial centres in North America and Europe. Other regional dummies tested are insignificant.

Table 3. The relation between growth performance and structural characteristics

	Growth performance PC-value	
	R^2	t-value
Openness 2007	0.07	−1.66
Government size 2007	0.06	−1.53
Share of manufacturing 2007	0.08	1.77
Share of financial sector 2007	0.02	0.92
GDP 2007	0.05	1.39
GDP per capita 2007	0.00	−0.27
Country risk evaluation (financial risk)[1]	0.00	0.08
Asia dummy	0.18	2.80

Remark: The critical value for significance at the 5% level is 2.03 (1.69 at 10% level; n=37).
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Source: Eurostat (AMECO).

3.4 Multivariate regressions

Combining the variables on pre-crisis conditions (PCC) with those on structural characteristics (STC) in multivariate regressions by and large confirm the picture drawn by bilateral correlations.

Budget variables are never significant, neither are current account balances or debt/GDP ratio, be it in the short run (2007) or in the longer run (average 2000 to 2007). No combination with other pre-crisis conditions or structural characteristics yields a significant result.

Out of the structural variables government size has a stable negative coefficient (in some cases near to significance). An Asian dummy is significant; it specifically lowers somewhat the significance of the current account variable. The share of manufacturing loses significance if the current account position is included. But clearly structural variables turn out to be far less important than "pre-crisis conditions".

The highest explanatory power is given by those equations which combine the three pre-crisis conditions of current accounts, credit growth and past GDP growth. Together with the Asia proxy 46% of the performance differences can be explained. The t-values of the three variables however are unstable and in some cases insignificant indicating multi-collinearity between these three variables.

It is difficult to say which of the three variables (current accounts, credit growth and past GDP growth) is the "strongest". If we combine (i) the current account with credit growth, the coefficient of the latter remains significant. (ii) If we try to downgrade the influence of outliers (by using ranks instead of ordinal values), current accounts remains significant, while credit growth loses significance. (iii) If we combine current accounts and past growth the current account variable is the only significant variable. (iv) If all three variables are used in the same regression, the *credit growth variable* is the only significant indicator when applied to *quantitative* data; if we use ranked variables the current account variable is the only significant variable.

Our interpretation of this finding is that all three variables capture some elements of the economic and financial turmoil leading to the crisis. All three may characterize a climate of overheating in the real as well as in the financial sector. The common thread linking credit growth and pre-crisis real growth is easy to entwine. High growth of GDP - and specifically high growth incurred by over-optimism, by cheap credit and high leverages in the private and financial sector -generated a high downward potential. The relationship between real growth and credit growth on the one side and the

current account position on the other side is less clear. High growth in the real sector and cheap credit could have reduced cyclical current account surpluses and increased deficits (which would establish a negative correlation), but high growth could also be the result of increased competitiveness and gains in market shares (as shown in China and Sweden). The positive correlation between the current accounts and growth indicates that the long-run impact of competitiveness was stronger than the cyclical effect. A surprise is that inflation does not itself contribute to the explanation. This may be due to the price reducing effect of stronger competition via globalisation, or the fact that asset price inflation was not reflected in consumer prices. Finally a combination of exchange rate appreciation plus productivity catching-up could have lowered inflation temporarily.

4. Robustness and Caveats

In this section we first try to tackle the problem of multi-collinearity between the three best predictors (the current account, credit growth and previous GDP growth). We apply principle component analysis again to extract a common factor from the set of pre-crisis conditions (as well as of the set of structural conditions). Then we discuss caveats relevant because of the point of time at which the paper is written, the possible impact of fiscal policy, and due to countries covered.

4.1 Extracting principal components out of PCC and STR

The three variables which explain the performance differences best (the current account, credit growth and previous GDP growth) are highly multi-collinear. This result in instable t-values, the regression coefficients of the current account variable as well as that of past growth and credit growth change from equation to equation and in some cases even lose significance if one of the other two variables is added. The problem of multi-collinearity was also found in other papers. It was to be expected specifically between credit growth and past GDP growth (positive correlation).

We try to cope with the problem of multi-collinearity using principal component analysis again. We extract a principal component (i) out of the whole set of pre-crisis conditions, (ii) out of the subset of the three most successful predictors, and (iii) out of all structural variables. The first principal components drawn out of the full sample and that out of the best three is rather similar (we report results for the principal component drawn out of the best three; table 5). The three variables - current account, credit growth and past GDP growth - are jointly able to explain 30% of cross-country variance, the significance of the regression coefficient of the new composite variable is higher than that of any of its components in Table 4 on the next page. The principal component indicator of the pre-crisis conditions is loaded nearly equally by the three variables, showing that all three contain important orthogonal information. The coefficient of determination increases to 45% if the Asia dummy is added. The coefficient of the principal component of the structural variables is significant at the 10% level; if this variable is used together with pre-crisis conditions and the Asian dummy this weak significance is lost.

4.2 Caveats

Finally we want to acknowledge that it may be too early to make a final assessment of the performance differences between countries during the recent crisis. Some countries have still not recovered, and production is still falling or predicted to fall e.g. in Greece and Portugal for 2011. Thus the fiscal deficits at the start of the crisis may finally prove more important than currently seen. Recent data also indicate that growth is resuming at great speed in Sweden, a country which had a large budget surplus in 2007. Overall we can currently only use a very simple lag structure, and a cross section approach; panel analyses and more sophisticated lag structures have to be applied in future research.

Table 4. The regression between growth performance, pre-crisis conditions and structural characteristics

Budget surplus 2007	Current account 2007	GDP growth 2000-2007	Credit growth 2000-2007	Dummy Asia	Government size 2007	Share of manufacture 2007	R^2-adj.
0.40 *(0.55)*							−0.02
	1.09 *(3.96)*						0.29
	0.84 *(3.49)*						**0.24**
		−2.41 *(−1.89)*					0.07
		−0.40 *(−1.48)*					**0.03**
			−0.05 *(−4.73)*				0.37
			−0.66 *(−2.58)*				**0.14**
				24.46 *(2.80)*			0.16
					−0.38 *(−1.53)*		0.04
						0.79 *(1.77)*	0.06
	1.05 *(3.28)*	−0.33 *(−0.25)*					0.27
	0.86 *(3.02)*	**0.03** *(0.11)*					**0.21**
	0.45 *(1.23)*		−0.04 *(−2.49)*				0.38
	0.74 *(2.18)*		**−0.15** *(−0.46)*				**0.22**
		1.95 *(1.36)*	−0.07 *(−4.40)*				0.39
	0.60 *(1.76)*	−2.12 *(−1.53)*		23.62 *(2.61)*			0.38
	0.52 *(1.64)*	**−0.26** *(−0.87)*		**20.53** *(2.16)*			**0.29**
	0.19 *(0.54)*		−0.04 *(−2.98)*	19.14 *(2.64)*			0.47
	0.40 *(1.13)*		**−0.37** *(−1.12)*	**19.67** *(2.23)*			**0.30**
	0.45 *(1.25)*	1.95 *(1.37)*	−0.05 *(−2.86)*				0.40
	0.72 *(2.08)*	**0.26** *(0.63)*	**−0.38** *(−0.76)*				**0.21**
	0.20 *(0.54)*	0.14 *(0.09)*	−0.04 *(−2.43)*	18.73 *(2.16)*			0.46
	0.40 *(1.10)*	**−0.06** *(−0.15)*	**−0.33** *(−0.69)*	**20.19** *(2.10)*			**0.28**
−0.10 *(−0.36)*	**0.60** *(1.18)*	**−0.24** *(−0.50)*	**−0.15** *(−0.29)*	14.12 *(1.30)*	**−0.43** *(−1.57)*	**−0.13** *(−0.22)*	**0.24**
−0.11 *(−0.16)*	0.44 *(0.82)*	0.21 *(0.10)*	−0.04 *(−2.20)*		−0.44 *(−1.95)*	0.09 *(0.16)*	0.41
−0.12 *(−0.43)*	**0.75** *(1.51)*	**−0.18** *(−0.37)*	**−0.13** *(−0.26)*		−0.56 *(−2.17)*	−0.04 *(−0.06)*	**0.18**

Remarks: Dependent variable is performance (PC-value); bold letters indicate that ranks are used; regression coefficients plus t-value in parenthesis, n = 37.

In line with other papers our regressions do not capture the influence of economic policy during the crisis. This might not be a large problem, since monetary policy worked in a rather simultaneous and coordinated way. Fiscal packages were however rather different. To include stimulus packages is

possible only if we have better data and can model their time impact carefully, since stimulus packages have by definition a simultaneous and direct impact on measured GDP[12]. For a discussion of the effectiveness of fiscal policy during the crisis see *Aiginger* (2009, 2010B), *Drautzburg - Uhlig* (2011), *Crespo Cuaresma et al.* (2009), *Perotti* (2011).

Table 5. Robustness test with principal components of top 3 pre-crisis conditions and all structural characteristics

PC-Pre-crisis Conditions Top 3	PC-Structural Characteristics	Asia Dummy	R^2 -adj.
	Dependent variable PC-value		
0.45			0.30
(4.08)			
0.44		23.01	0.45
(4.46)		*(3.27)*	
0.58	−0.68		0.34
(4.49)	*(−1.77)*		
0.53	−0.48	21.16	0.47
(4.51)	*(−1.36)*	*(2.98)*	

Remark: Top 3 Pre-crisis Conditions: Current account 2007, past GDP growth (2000/2007), credit growth (2000/2007).

A further caveat is that our sample is constrained to 37 countries. We intentionally wanted to focus on industrialized countries plus emerging economies with strong trade relations with industrialized countries. We know from studies which focussed on a large set of emerging economies, that the results can be different. Specifically the lack of significance of some structural variables (size of economy, per capita income) or the result of a positive impact of the size of manufacturing which we have found in some equations might be different in samples dominated by emerging economies. We see that a dummy for Asia is significant; this indicates that the regional distribution of countries in the sample and that between developing and developed countries is important.

5. Summary

The objective of this paper is to investigate why the performance of countries during the recent crisis differed. "Performance" is defined by the change of real GDP in the crisis, using four alternative measures of economic dynamics, and combining them in a single indicator derived by principal component analysis. This performance indicator is then related to a set of pre-crisis conditions prevailing in the build-up phase of the crisis and to a set of structural characteristics of the economies. This is done with single correlations, multiple regressions and finally a regression using principal component analysis also for both sets of determinants. Our sample contains mainly industrialized countries but also China, India, Turkey and Eastern European countries (37 countries in total).

The best performers according to our growth indicator are India, China, Australia and Korea. In Europe completely differing economies such as Poland, Switzerland and Norway performed relatively well. The worst performers were the three Baltic economies, as well as Ireland and Iceland, two economies which had actually progressed taking the top position as regards per capita income. A rather deep crisis also occurred in Slovenia and Finland which were top ranking countries as far as the transition process to a market economy and the transformation into a knowledge-based society is

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[12] This works via the equation GDP = C + I + X-M + G-T, where G-T is the budget deficit, of which stimulus packages are part. C, I, X, M are consumption, investment, imports and exports. Stimulus packages are not lagged, unlike the other sets of variables.

concerned. A brief evaluation of the top and poor performers in the crisis reveals that it is not actually a straight forward task to explain why countries were hit differently by the crisis.

The robust empirical result is that a cluster of three variables can explain about one third of the actual country variance (and together with an Asian proxy up to nearly one half):

- the current account balance in 2007 is positively related to growth performance, as is the change of the current account balance between 2000 and 2007 and its average for this longer period;

- countries which experienced a very high growth of real GDP between 2000 and 2007 were more severely hit by the crisis; a significant proxy for Asia indicates that high pre-crisis growth did not necessarily lead to low in-crisis performance here;

- high credit growth between 2000 and 2007 correlates with worse performance during the crisis; this holds true for credit growth as such as well as credit growth relative to GDP, but not for a high share of domestic credit to GDP in 2007.

One very robust result is a negative one, namely that performance differences across countries are not related to the fiscal position in 2007. This negative result still holds true if we take the budget position over a longer pre-crisis period, the change in the position between 2000 and 2007 or the debt/GDP relationship. It is possible that the impact of the budget position at the start of the crisis on a country's economic performance might ultimately be more significant than visible today, since some of the countries with large deficits have still not yet started to grow again.

Performance is weakly related to the openness and to the size of an economy (better performance for less open and larger economies). Economies with a larger manufacturing sector and a smaller government sector tended to fare better in the recent crisis. Both findings seem to point towards the importance of the competiveness of a strong private sector. In general the structural characteristics of the economies have a lower and less robust impact as compared to pre-crisis economic conditions and specifically overheating of the economy in the run-up period. This highlights the importance of sound macroeconomic policy and prudential macro financial regulation.

The impact of trade competitiveness on country performance, as compared to the insignificance of the fiscal situation, is food for thought for economic policy. Specifically with regards to intra EU policy, budget and debt criteria have always been on top of the European agenda (even if the monitoring of the "Growth and Stability Pact" was weak), while trade disequilibria within the Union has not been considered an important issue for European economic policy. On a global scale inflation was higher on the agenda of monetary authorities as compared to current account positions.[13] Tentative economic explanations for the importance of current accounts for the depth of the crisis, as revealed by our analysis, might be that (i) government debt and private debt are seen as an interrelated problem by financial markets, (ii) that weak trade competitiveness is seen as a problem for further growth and therefore makes borrowing more expensive, or (iii) that losing currency reserves via current account deficits increases the risk premium for a country if either the government or firms want to raise money and (iv) that some fast-growing economies are "marginal" suppliers in the sense that they are able to export if high-income countries are running at full speed, but lose market share if there are idle capacities in sophisticated economies. In general, economists in the past downgraded the importance of a balanced trade account for growth. Specifically literature on integration areas as well as those on country performance ("competitiveness") concluded that trade deficits were relatively meaningless (*Krugman*, 1994). Therefore, a main policy conclusion of this paper is to pay greater attention to trade disequilibria, specifically if a deficit in the current account concurs with fiscal deficits. Another policy conclusion might be that monetary policy should not focus on consumer inflation alone, but should also monitor asset inflation, asset bubbles and signs of overheating, thus taking a more systemic approach to macro-finance.

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[13] This holds at least for Central Banks, but also on meetings of G4, G8, G20 and for analysis of the IMF.

Tentative overall policy conclusions in a nutshell which can be derived from the results of this paper are: (i) countries which are growing very fast, whose credits are booming and whose current accounts are negative, should be aware that the risks in their economies might increase rapidly if new shocks spill over from other regions. (ii) On the other hand countries with slow output and credit growth and a positive current account could engage in a more proactive growth policy without being afraid of downside risks. (iii) Macroeconomic policy should pay greater attention to structural trade deficits and credit booms. (iv)Financial regulation should also pay greater attention to macroeconomic issues and systemic risks (macro-prudential regulation); regulatory regimes solely concentrating on banking and financial market regulation on a microeconomic level might lead to an underestimation of overall macroeconomic vulnerabilities.

The extent to which the budget situation at the start of the crisis lacked relevance (and that of debt and fiscal prudence for a longer period) is striking and needs and indeed merits further investigation.

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Description of variables

Country risk evaluation: International Country Risk Guide, Copyright, The PRS Group, Inc.

Current account: Balance on current transactions with the rest of the world as a percentage of GDP at market prices; Eurostat (AMECO).

Domestic credits: Domestic Credit (Consolidated balance sheet of the banking sector); IFS.

Fiscal position: Net lending or net borrowing of general government as a percentage of GDP at market prices (excessive deficit procedure); Eurostat (AMECO).

GDP: Gross Domestic Product at 2000 market prices: Eurostat (AMECO).

GDP per capita: Gross domestic product at current market prices per head of population; Eurostat (AMECO).

Government size: Total expenditure: general government:- ESA 1995 (including one-off proceeds) as a percentage of GDP at market prices (excessive deficit procedure; Eurostat (AMECO).

Growth performance: first principle component using the four indicators presented in table 1; (PC value is the quantitative value derived by Principle Component Analysis, ranging between 0 and 100, PC rank indicates the best performance as 1 and the lowest PC-value as 37.

Inflation: Harmonised consumer price index: Eurostat (AMECO).

Openness: Exports plus imports of goods and services, national accounts as percentage of GDP; Eurostat (AMECO).

Public debt: General government consolidated gross debt as a percentage of GDP at market prices; Eurostat (AMECO).

Share of manufacturing: Gross value added at current prices: manufacturing industry as a percentage of GDP; Eurostat (AMECO).

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The Data Set Used Is Available on Request.