Drivers of Output Loss during the 2008–09 Crisis: A Focus on Emerging Europe

Jesús Crespo Cuaresma,
Martin Feldkircher[1]

We study empirically the role that initial conditions played in the emergence of cross-country heterogeneity in real output loss during the recent global financial crisis. We use a global sample covering over 150 countries and focus on the differences in the determinants of the crisis in emerging Europe compared to those in the rest of the world. We find that the differences in crisis severity in emerging Europe can only partly be explained by the factors that appear to be important for the global sample. Our results indicate that for the European emerging economies, growth above potential before the crisis coupled with external disequilibria as well as financial openness were particularly important mechanisms that increased the severity of the crisis in terms of output loss. We also find some evidence that pre-crisis FDI inflows softened the negative real output effects of the crisis in the region.

JEL classification: C11, C15, E01, O47
Keywords: financial crisis, cross-country analysis, Bayesian model averaging

1 Introduction

In this study we assess whether the variation in cross-country output loss during the 2008–09 financial crisis is systematically related to pre-crisis country-specific vulnerabilities. Did countries that had entered the crisis with poor macro fundamentals experience, on average, larger downturns compared to their peers? If yes, what macroeconomic and financial conditions help explain the cross-country differences in the response of output to a global shock? Our regional focus is on emerging Europe, which has been hit particularly hard by the crisis relative to other emerging economies.

The early global financial crisis literature is essentially based on the contributions of Rose and Spiegel (2010a, 2010b, 2011) and Frankel and Saravelos (2010). In a series of papers, Rose and Spiegel link a large set of fundamental variables and financial market information to three different metrics of crisis severity: output loss, currency depreciation and credit rating downgradings. Using a vast set of regression equations, the authors conclude that few, if any, pre-crisis variables are helpful in explaining differences in crisis severity across countries. This result, which can be interpreted as criticism of the use of early warning mechanisms to predict crisis occurrences, is contested by the work of Frankel and Saravelos (2010), who find that a high level of central bank reserves cushioned the impact of the crisis. Other useful indicators in predicting the severity of the crisis in Frankel and Saravelos (2010) include real effective exchange rate overvaluation, current accounts and national savings. In contrast to the early 2008 crisis literature, Frankel and Saravelos (2010) extend their sample to include observations for 2009. They attribute the differences in their results precisely to the expansion of the observation period.

In the aftermath of the crisis, two strands of the literature emerged. Some studies explicitly analyze exchange rate movements after the crisis[2] (Aizenman et

[1] *Department of Economics, Vienna University of Economics and Business, Wittgenstein Centre for Demography and Human Capital (WIC), International Institute for Applied Systems Analysis (IIASA) and Austrian Institute of Economic Research (WIFO), jcrespo@wu.ac.at, and Oesterreichische Nationalbank, Foreign Research Division, martin.feldkircher@oenb.at.* *The authors would like to thank Christian Schitter, Jarka Urvová and Zoltan Walko for excellent data support. We are also indebted to Nicolás Albacete, Peter Backé, Roman Horváth, Mathias Lahnsteiner, Doris Ritzberger-Grünwald, Julia Wörz and three anonymous referees for helpful comments.*

[2] *For information on the determinants of financial stress, see Aizenman et al. (2012).*

al., 2008), while others focus on the impact of the crisis on the real economy. We follow the latter by concentrating on real output loss and the factors that help explain its cross-country variation during the "first global recession in decades" (Imbs, 2010).

Our analysis is based on assessing correlates of crisis severity for a sample covering the whole world with a regional focus on economies in Central, Eastern and Southeastern Europe (CESEE).[3] The effects of financial crises in the region have been found to have strong negative effects on output. In particular, Furceri and Zdzienicka (2011) assess the impact of financial crises on output for eleven European transition economies and conclude that long-term output during crisis episodes was reduced by around 17% (as compared to 2% in the EU advanced economies). A certain degree of heterogeneity in the impact is found across European transition economies, with dependence on external financing playing an important role as a determinant of severity. Fiscal policy and exchange rate behavior appear to be additional factors that can explain the different effects across economies in the region. Blanchard et al. (2010) give a theoretical underpinning of the adjustment channels during the crisis for emerging economies. Their short-run open economy model (which allows for imperfect capital mobility and potentially contractionary effects of a depreciation coming from foreign currency debt exposure) predicts the adjustment path of countries to adverse financial and trade shocks. The empirical analysis carried out for a sample of 33 emerging economies points to the importance of trade and financial openness as well as the growth performance of trading partners as the main explanatory factors for the heterogeneity in output growth during the crisis. In an empirical assessment, Keppel and Wörz (2010) identify export orientation, overheating and the fiscal stance as important determinants of crisis severity for the CESEE region.

Recent contributions (e.g. Berkmen et al., 2009; Lane and Milesi-Ferretti, 2010; Cecchetti et al., 2011) as well as the studies mentioned above share some key characteristics. They are based on cross-country regressions where the dependent variable is a measure of crisis severity, and a different set of potential explanatory variables is used for different sub-samples of countries. It is thus not surprising that the literature has so far not reached a consensus and that many studies do not find any determinants of crisis severity to be robust, while others identify a range of factors determining the intensity of the real effects of the crisis.

In this paper we aim to provide a detailed analysis of crisis determinants by means of a systematic approach that explicitly accounts for model uncertainty, a dimension which has hitherto been neglected in the literature. We have collected over 60 variables comprising macroeconomic and financial variables and indices measuring regulatory quality prior to the crisis for more than 150 countries. The sheer number of potential explanatory variables implies that the uncertainty about the variables which enter the empirical specification needs to be accounted for in order to conduct statistical inference about the factors determining crisis severity. We use modern Bayesian model averaging (BMA) techniques in order to assess the relative importance of explanatory channels instead of picking an arguably

[3] *We use a broad definition of the CESEE region comprising the following countries: Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, FYR Macedonia, Georgia, Hungary, Kazakhastan, Latvia, Lithuania, Moldova, Poland, Romania, Russia, Serbia, Slovakia, Slovenia and Ukraine.*

"reasonable" subset to construct the model on which we base our inference. To our knowledge, this study is the first to employ state-of-the-art BMA methodology to perform robust inference on the determinants of crisis intensity, and the dataset constructed is also the most comprehensive one used hitherto in this branch of the literature.

Our results stress the importance of the level of development, economic growth and exchange rate misalignments prior to the crisis as factors explaining differences in output loss during the crisis. However, the output loss in CESEE economies can only partly be explained by those variables that appear to be robust determinants of crisis severity in the global sample. For emerging economies in Europe, financial openness as well as overheating coupled with external misalignments are additional factors that led to a considerable exacerbation of the crisis. Furthermore, our results indicate that economies in the CESEE region whose pre-crisis growth was strongly supported by FDI flows were hit less hard by the crisis in real terms.

Section 2 of this paper introduces the data and provides a brief descriptive analysis. Section 3 lays out the econometric framework and introduces the BMA methods used for the empirical analysis. Section 4 discusses the empirical results, and section 5 concludes.

2 Crisis Severity and Its Potential Determinants

In order to investigate determinants of severity in output loss during the crisis, we construct three different proxy variables for crisis intensity. First, we compute the cumulative real output loss over the period 2007 to 2009, which is given by y_{09}/y_{07}, where y_t denotes real GDP in year t (cumLoss_0907). This measure serves as our baseline dependent variable and covers the recession period 2007 to 2009.[4] As a second measure we calculate the cumulated output loss over the period 2008–09 (cumLoss_0908). This variable will be used to check whether our results are robust to changing the period considered to measure the crisis effects. Following Lane and Milesi-Ferretti (2010), we use forecast revisions as our third measure for crisis intensity. In particular, we consider the differences between the April 2008 real GDP forecasts from the IMF World Economic Outlook for 2009 $(\hat{y}_{09})$ and the actual growth figures normalized by real GDP in 2007, that is $(y_{09}-\hat{y}_{09})/y_{07}$ (cum_rev0907). Note that these measures in general do not control for differences in the business cycle across countries.[5] All measures are calculated for a total of 153 economies covering countries in Western Europe (20), North America (2), Eastern Europe (16), the CIS (8), Africa (41), Asia and the Pacific (37) and Latin America and the Caribbean (30) and are fully described in table 4 in the appendix. Using boxplots, we graphically depict the three severity measures (cumLoss_0907, cumLoss_0908 and cum_rev0907,) in chart 1. The left-hand panel of the chart

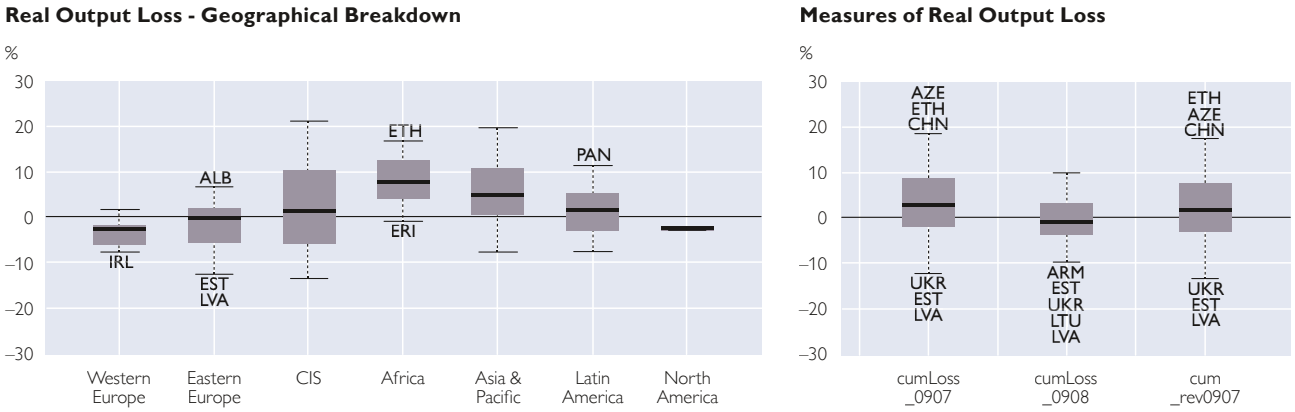
[4] *It should be noted that we are not interested in modelling the timing of the crisis, which, clearly, would call for a different empirical framework based on time series models and a detailed account of the differences in the time profile of the effects of the crisis across countries. The recent contributions of Chudik and Fratzscher (2011) on the transmission of financial stress and Babecký et al. (2011) would fall in this category of models. In a global set-up including data from developing countries, real GDP is hardly available at a quarterly frequency, thus limiting the applicability of these types of model.*

[5] *See Cecchetti et al. (2011) for a contribution constructing a measure for economic output that controls for the global business cycle by means of factor analysis.*

shows the distribution of the three measures across countries. The Baltics and Ukraine were found to have been most strongly hit by the crisis in terms of real output loss regardless of the measure used.[6] Countries that weathered the crisis relatively well include China, Ethiopia and Azerbaijan. The right-hand panel of chart 1 shows the geographical distribution of real output loss (cumLoss_0907) between and within regions. Advanced economies in Europe were hit particularly hard by the crisis, followed by emerging economies in Eastern Europe and, to a lesser extent, CIS states. That said, it should be noted that the countries covered in our analysis felt the impact of the crisis at different times. In its first phase, the crisis was confined to advanced countries, spilling to Eastern Europe at end-2008. Advanced countries showed negative GDP growth rates already in 2008, while Eastern European countries and the CIS were hit by the downturn only in 2009. In cumulative terms, countries in Western Europe felt a larger impact on average than Eastern Europe and the CIS. The distribution here, however, is more widespread, meaning that there are (few) countries in these regions that posted very large output losses during the crisis. Non-European emerging markets were rather resilient during the financial crisis. One reason for this put forward by economic analysts was that Asian and in particular Latin American countries had improved their macroeconomic fundamentals as a consequence of their past crisis experiences by, inter alia, decreasing external deficits, improving the fiscal stance and sharply reducing foreign currency borrowing (see EBRD, 2009). Whether these arguments hold empirically is tested in section 4 by creating a cross section with global coverage. A robustness analysis to see whether our empirical results change when we employ output loss over the period 2008–09 (where CESEE countries should be affected more strongly based on the arguments made above) is provided in section 4.3.

Chart 1

Distribution of Real Output Loss



Source: Authors' calculations.

Note: Left-hand panel: measures of real output loss (cumLoss_0907, cumLoss_0908 and cum_rev0907); right-hand panel: geographical breakdown of real output loss (cumLoss_0907).

[6] *Note that the first countries in emerging Europe experiencing a downturn in response to the global financial crisis were the Baltic states and Kazakhstan (Berglöf et al., 2009). While the Baltics are among the countries with the highest output losses over the full period under study, Kazakhstan managed to reduce the output loss by launching large fiscal stimulus packages (Barisitz and Lahnsteiner, 2010).*

There is a great deal of uncertainty in the literature regarding the potential determinants of crisis severity. We have collected data on more than 60 candidate variables, which are listed in table 4. However, not all variables are available with global coverage. For most variables, the missing values expressed as a percentage of the total number of observations amount to between 0% and 5%, a reasonably small number. Instead of limiting our sample to those countries with a complete set of data, we use a regression-based data imputation method so that all variables have full sample coverage.[7]

The variables that feature prominently in applied work can be summarized in the following groups:

Reserves: Countries that have accumulated large reserves are expected to suffer less from external shocks in real terms (Frankel and Saravelos, 2010; Cecchetti et al., 2011). However, as put forward by Blanchard et al. (2010), central banks are in general reluctant to use reserves as a buffer, which may lead to reserve variables not being significant determinants of crisis severity. Reserves are measured using variables based on international reserves minus gold as well as foreign exchange. These measures are normalized alternatively by total GDP or external debt.

Exchange rate regimes: In empirical studies on the effects of the global crisis, countries with flexible exchange rate regimes tend to fare better on average than those with a nominal exchange rate anchor (e.g. Berkmen et al., 2009). Adjustment through a revaluation of the exchange rate may cushion the impact of the crisis on the real economy. This view is contrasted by findings of Blanchard et al. (2010), who argue that the positive effect of having a flexible exchange rate vanishes if one controls for other factors in the framework of linear regression models.

Trade channel: In parallel with a decline in GDP growth rates, many economies experienced a collapse in trade in the aftermath of the crisis. Berkmen et al. (2009) claim that relatively open economies (in terms of trade) are expected to be more vulnerable to a global shock. This holds in particular for countries exporting advanced goods as opposed to food and commodity exporters. The variables included in our analysis comprise total trade (exports plus imports) relative to GDP, the trade balance and sectoral trade patterns (share of manufacturing, petrol, food and merchandise trade in percent of total exports). In addition, we include a range of index measures to reflect different dimensions of globalization as an additional aspect of openness.

Growth above potential: Economic growth prior to the crisis was partly fueled by excessive credit growth and accompanied by current account misalignments, large capital inflows and high inflation. In particular, some economies in emerging Europe overheated, which may lead to a boom-bust cycle in times of distress. We try to measure excessive growth either directly – by an estimate of the output gap – or indirectly, via certain combinations of economic variables capturing misaligments in the economy (the current account, domestic credit growth, capital inflows and price pressures) and pre-crisis growth. The measure of the output gap

[7] *In particular, we use the R package mice, which performs multiple imputation using fully conditional specifications. For a detailed account, see the references in the manual (R Development Core Team, 2011). To assess the robustness of our empirical results with respect to the data imputation method we use a bootstrapping-based algorithm (R package AMELIA II) as an alternative. The correlation of the PIP based on the two imputation methods for all four models estimated in section 4 is above 0.9, and we conclude that the particular choice of the imputation method does not affect our results qualitatively .*

is based on the deviation from an estimate of potential GDP using the Hodrick-Prescott filter (see the appendix for further details).

Misalignments of the real exchange rate: Countries with real exchange rates out of line with fundamentals may be strongly affected by a crisis. In particular, overvalued exchange rates indicate a severe external risk and potential challenges for competitiveness. Amid increased (global) risk aversion, this may translate into a sudden stop of capital flows triggering a collapse in economic growth. We measure misalignments of the real exchange rate by a variant of an exchange rate market pressure index (EMP) in the vein of Aizenmann et al. (2010), which is fully described in table 4 in the appendix. Alternatively, we pursue a panel regression approach based on macrofundamentals that is part of the IMF's CGER toolkit to compute mispricements of the exchange rate (Lee et al., 2008, pp. 3).[8]

Exposure to advanced countries: Economies sharing a significant part of their trade or financial links with the U.S.A., where the crisis originated, are expected to have been hit harder by the global shock than rather isolated economies (Cecchetti et al., 2011). Since the crisis was first confined to advanced countries and spilled over to emerging Europe at the end of 2008, exposure to advanced economies may play an important role in explaining the severity of the global shock for emerging Europe. We thus include various measures of trade intensity vis-à-vis the U.S.A. and the EU-15 as well as a proxy for financial exposure to advanced countries (claims of foreign banks located in advanced economies).

Financial channel:[9] Since the crisis started out as a financial crisis, countries with high external debt, large macroeconomic imbalances and open financial markets were likely to suffer under larger real effects triggered by financial stress (Berkmen et al., 2009; Cecchetti et al., 2011; Giannone et al., 2010). We include various measures to proxy for macroeconomic imbalances comprising net FDI inflows, the current account, external debt and the Chinn-Ito index of financial openness.[10]

Misalignments in the domestic credit market: International investors are more likely to withdraw funds when global risks are on the rise if a country's domestic financial system is highly leveraged and the credit growth rate is high (Berkmen et al., 2009; Caprio et al., 2010; Cecchetti et al., 2011; Giannone et al., 2010; Lane and Milesi-Ferretti, 2010). Countries in emerging Europe benefitting from credit by parent banks located in Western Europe might be more resilient to funding

[8] *Alternatively, one could directly estimate an equilibrium exchange rate by cointegration analysis. However, since the data span is typically rather short for the countries covered in this study and furthermore, a nonnegligible part of the countries are catching-up economies, a long-run equilibrium approach does not seem to be the most appropriate methodological strategy in our context.*

[9] *In a study which focuses explicitly on the financial determinants of the crisis, Caprio et al. (2010) find five factors reducing the probability of being in crisis in 2008: high net interest margins (giving banks the incentive to engage more strongly in traditional banking activities), an elevated level of banking concentration (which implies a higher charter value), a high level of private monitoring, low loan-to-deposit ratios and stringent restrictions on bank activities.*

[10] *The Chinn-Ito index is a widely used indicator to measure a country's degree of capital account openness (see e.g. Beine et al., 2011; and Yeyati and Williams, 2011, among other recent contributions). Other indicators that have been proposed in the literature are those outlined in Schindler (2009). Unfortunately, the country coverage of Schindler's data set is limited to around 90 countries, far fewer than those covered in this study. For those countries, however, the correlation of Schindler's measure with the Chinn-Ito financial openness indicator for the year 2006 is around 0.8. We thus conclude that our results would not be strongly affected by additionally considering Schindler's financial openness index.*

outflows and, eventually, real output loss than their peers. We measure misalignments in the credit market by looking at domestic credit growth, deposit rates in the banking sector and an index measuring rules affecting the scope, accessibility and quality of credit information available through public or private credit registers.

Fiscal discipline: Countries that stood on a sound fiscal footing before the crisis had more room for fiscal maneuver to buffer the impact of the crisis on the real economy by launching stimulus packages or using other fiscal policy instruments (Berkmen et al., 2009). We include government debt and the government budget balance as measures of the fiscal stance. Note that the fiscal deficit is measured as an average over the period from 2000 to 2006 (as are the other flow variables in the analysis). This should take care of cyclical variations in the fiscal stance.

Institutional quality: In the wake of the financial crisis, economic observers called for policy action to be implemented in a timely and coordinated fashion. Countries with sound institutional frameworks are expected to be more effective in implementing policy action to counter the crisis. We measure the quality of institutions by the World Bank's strength of legal rights index as well as Transparency International's Corruption Perceptions Index.

3 The Econometric Model

We investigate empirically the nature of the potential drivers of real output loss using linear regression specifications of the following form:

$$100*(y_{09} / y_{07}) = 1\alpha_s + X_s\beta_s + \varepsilon \qquad (1)$$

with y_{09}/y_{07} denoting the cumulated real output loss over the period 2007 to 2009, X_s representing an $N \times k_s$ matrix of potential covariates discussed in more detail in the next section and ε denoting an N-dimensional vector of random shocks assumed to be normally distributed, independent and homoskedastic. The use of such a parametric approach allows us to grasp the quantitative effect of potential crisis determinants, thus establishing empirically their relative importance. Since historical episodes of crises with the same scope and impact as the current one are scarce, other methods based on analyzing the individual experience of countries or decomposing variation exclusively by regional aggregates prove insufficient for our research question. In the empirical analysis we have $N=153$ countries and a set of more than 60 candidate regressors. All potential crisis determinants are measured prior to the crisis (see appendix). We apply the convention of measuring flow variables as an average over a longer period (typically 2000 to 2006), while stock variables are measured at the end of 2006.[11]

The extensive number of candidate variables implies that problems related to model uncertainty may lead to seriously flawed inference. Model averaging methods base inference on a weighted average of regressions instead of single selected models, therefore no individual specifications need to be chosen (for an introduction see Hoeting et al., 1999; or Koop, 2003, among others). In the Bayesian framework, these weights arise naturally as posterior model probabilities (PMP) of the corresponding individual specifications.

[11] *Due to data limitations, for some countries variables are measured before 2006.*

Let us denote the set of (complementary) models by $M=\{M_1,M_2,...,M_{2^K}\}$, where K stands for the total number of explanatory variables. Inference on any parameter δ in BMA takes the form:

$$p(\delta \mid y) = \sum_{j=1}^{2^K} p(\delta \mid M_j, y) p(M_j \mid y) \tag{2}$$

with $p(\cdot \mid y)$ denoting posterior distributions and $p(\cdot \mid M_j, y)$ denoting posterior distributions under the assumption that M_j is the true model. Inference on some parameter or combination of parameters δ is based on single inferences under models $M_j, j=1,...,2^K$, where the model-specific posterior densities are weighted by their respective posterior model probabilities $(p(M_j \mid y))$. These (normalized) probabilities are obtained in a Bayesian setting using the integrated likelihood $p(y \mid M_j) = \int p(y \mid M_j, \theta_j) p(\theta_j \mid M_j) d\theta_j$ and the respective model prior $\bar{p}(M_l)$,

$$p(M_j \mid y) = \frac{p(y \mid M)\bar{p}(M_j)}{\sum_{l=1}^{2^K} p(y \mid M_l)\bar{p}(M_l)} \tag{3}$$

The posterior odds of two competing models are simply given by the product of the Bayes factor $(p(y|M_i)/p(y|M_j))$ with the prior odds $(\bar{p}(M_i)/\bar{p}(M_j))$. A key quantity in BMA is the posterior inclusion probability of a covariate, defined as

$$PIP_z \equiv \sum_{M_i : m_z = 1}^{2^K} p(M_j \mid y)$$

with $m_z=1$ indicating that variable z is included in the model. Variables whose PIP is close to one are interpreted as being very robust determinants, whereas low values of PIP imply that there is little evidence concerning the fact that the variable is part of the true model. While the sum in equation 2 is not directly computable for large values of K, Markov Chain Monte Carlo (MCMC) algorithms (Madigan and York, 1995; Fernández et al., 2001) can provide a reasonably good approximation of the required statistic. Bayes factor comparisons imply that models are weighted according to their goodness of fit, with an inherent reward for model parsimony. The Bayesian framework requires the specification of prior distributions on the model parameters α, β_s and σ^2. We place improper priors on the intercept $p(\alpha) \propto 1$ and variance $p(\sigma) \propto \sigma^{-1}$, reflecting lack of prior information. BMA allows us to distinguish a priori between models by ascribing distinct a priori weights to the regression models. The sheer number of potential models, however, leads us to opt for an uninformative prior on the model space.[12] Finally, we also need to elicit priors over the slope coefficients β_s. We follow the standard convention in BMA and assume a zero-centered normal distribution scaled by Zellner's g (Zellner, 1986) hyperparameter,

$$\beta_s \mid \sigma^2, M_s, g \sim N(0, \sigma^2 g (X_s{}' X_s)^{-1}) \tag{4}$$

[12] *In the vein of Ley and Steel (2010), we elicit a binomial-beta prior for inclusion of a given variable, with a prior expected model size of K/2 regressors.*

The penalty in terms of marginal likelihood for including new variables in the model can be regulated through the hyperparameter *g*. In our application, following Feldkircher and Zeugner (2009) and Ley and Steel (2010), we abstain from fixing *g* to a particular value. Instead, we choose to make it data dependent and use a so-called hyper-*g* prior,[13] which has been shown to lead to more robust inference (Feldkircher and Zeugner, 2011). All computations carried out in section 4 were done with the R package BMS.[14]

4 The Determinants of Crisis Severity: Results

4.1 General Results

The results of the BMA exercise under the set of priors specified above are presented in table 1. We report the posterior inclusion probability (PIP) of each variable and the mean of the posterior distribution of the corresponding parameter (post mean) together with its standard deviation (post SD). The posterior moments are based on the full set of evaluated models, including those which do not include the variable scrutinized (where the corresponding parameter is thus zero). When interpreting the results, we focus first on the importance of a respective covariate as a determinant of crisis severity, where we follow the literature and label variables with a PIP above 0.5 as robust.[15] Second, we assess the precision with which a coefficient was estimated by calculating the ratio of posterior mean to posterior standard deviation. In the vein of Masanjala and Papageorgiou (2008), variables for which this ratio exceeds 1.3 in absolute terms are dubbed effective and marked by an asterisk in the estimation tables.

The results of our baseline model (model 1) are presented in the first three columns of table 1. For the sake of brevity the table provides only the subset of results for the most important determinants in terms of PIP. The full results are available from the authors upon request. Our analysis reveals that the crisis experience was very heterogeneous across countries, which can be inferred from the fact that different sets of country (group) dummy variables appear robust. The EU-15 and CESEE, in particular Ukraine and the Baltics, were hit significantly harder by the crisis than comparable economies in other parts of the world. Since the Baltics and Ukraine are part of CESEE the corresponding estimated effects are to be interpreted as "on top of" the coefficient estimate attached to the CESEE dummy. Robust regional dummy variables imply sub-sample-specific intercept terms. These fixed effects do not add to our understanding of the crisis effects beyond pointing out that region-specific characteristics that are not measured by our variables appear important. A separate treatment of the corresponding sub-samples, however, would be appropriate only if the slope coefficients in these sub-samples were different and enough observations were available to allow pure region-specific models. We explicitly test for differences in the slope coefficients for CESEE in the next section. That said, the robustness of these country group

[13] *We anchor the hyper-g prior such that the prior expected shrinkage factor (g/(1+g)) matches the one induced by the unit information prior (g/(1+g)=N/(1+N)). For more details see Feldkircher and Zeugner (2009).*

[14] *See http://bms.zeugner.eu.*

[15] *Since we have elicited a non-informative prior on the model space we refer to variables as robust if their PIP is above 0.5, a classification which can also be justified on predictive grounds (Barbieri and Berger, 2003).*

dummies comply with the descriptive analysis carried out in section 2, thus enhancing confidence in our empirical model and the data we use.

Apart from country group dummy variables, we find four other factors that help robustly explain cross-country differences in output loss: the average annual growth rate of real GDP over the period from 2000 to 2006 (real.gdp.gr_0006), the level of real GDP per capita in 2006 (rgdpcap_06) and – marginally – a measure for real exchange rate overvaluation in 2006 (reerm_06) as well as a proxy for trade exposure to the U.S.A. (imp.from.US.gdp_0006), the economy where the crisis originated. The level of real GDP per capita in 2006 is negatively associated with real output loss, while economies that entered the crisis with buoyant growth were more resilient to the global shock. This is consistent with the fact that the crisis was on average more pronounced in advanced economies that had experienced low growth prior to the crisis coupled with high levels of real GDP per capita. Note that controlling for income levels does not reduce the robustness of the CESEE dummy, which implies that emerging Europe was hit harder by the crisis than other countries with similar levels of development. We also find marginal evidence for real exchange rate misalignments increasing crisis severity: Countries whose currencies were overvalued in 2006 were less resilient to the global downturn. However, the coefficient is relatively small and not well estimated. Finally, we find marginal evidence for a stronger impact of the crisis for countries with strong trade links with the U.S.A. Again, the coefficient is not as precisely estimated as those of the more robust variables.

The empirical evidence from our model points to more severe downturns in the Baltics, Ukraine and CESEE in general. While strong economic growth fits well with the state of economic development of these countries in terms of income

Table 1

Estimation Results

	Model 1			Model 2		
	PIP	Post mean	Post SD	PIP	Post mean	Post SD
Baltics	**1.000**	**–17.213***	**3.187**	**1.000**	**–16.530***	**3.257**
rgdpcap_06	**0.926**	**–2.240***	**0.945**	**0.891**	**–2.108***	**1.020**
CESEE	**0.799**	**–4.264***	**2.702**	**0.876**	**–5.140***	**2.640**
UA	**0.885**	**–14.066***	**6.906**	**0.840**	**–12.565***	**7.135**
EU.15	**0.646**	**–3.588***	**3.167**	**0.729**	**–4.282**	**3.192**
reerm_06	0.471	–0.008	0.010	**0.606**	**–0.011**	**0.011**
tradeExp.US.gdp_0006	0.415	–0.042	0.894	0.495	–0.053	0.966
imp.from.US.gdp_0006	0.488	–0.160	0.905	0.466	–0.167	0.976
real.gdp.gr_0006	**0.666**	**0.416**	**0.346**	0.398	0.229	0.329
pop_06	0.272	0.169	0.334	0.343	0.233	0.384
real.gdp.gr_0006#net.fdi.infl_0006	–	–	–	**0.587**	**0.022**	**0.021**
real.gdp.gr_0006#ext.debt.gdp_06	–	–	–	0.152	0.000	0.001
real.gdp.gr_0006#ca.gdp_0006	–	–	–	0.136	–0.003	0.009
real.gdp.gr_0006#chg.dom.credit_0006	–	–	–	0.105	0.000	0.001
real.gdp.gr_0006#infl_0006	–	–	–	0.097	0.002	0.010

Source: Authors' calculations.

Note: Model 1: baseline model; model 2: excessive growth model. The table shows posterior results for the variables with the highest PIP based on the estimation with the full set of variables listed in table 4 in the appendix. The full results are available from the authors upon request. The results are based on 10 million posterior draws after a burn-in phase of 5 million draws. For variables marked with an asterisk (*) the standardized coefficient (posterior mean/posterior standard deviation) exceeds 1.3 in absolute terms; therefore these variables are dubbed "effective." Robust variables (PIP higher than 0.5) are in bold type.

convergence trends, growth may have been excessive (i.e. above potential) for some countries. To find out whether the fact that growth was not in line with macro fundamentals shaped crisis severity, we add extra variables to our analysis. In particular, we try to find out whether strong pre-crisis growth (real.gdp.gr_0006) coupled with either strong net FDI inflows (net.fdi.infl_0006), high external debt (ext.debt.gdp_06), unsustainable current account deficits (ca.gdp_0006), soaring credit growth (chg.dom.credit_0006) or high inflation (infl_0006) can be robustly associated with a stronger economic downturn during the financial crisis. In the empirical model we do this by including interaction terms of the aforementioned variables with pre-crisis growth. The variable names of the interaction terms are separated by # in table 1. The results for this setting shown in table 1 (columns 4 to 6) confirm the conclusions based on model 1 described above: Some regions suffered particularly strong downturns during 2008 and 2009 (Ukraine, Baltics, CESEE in general and EU-15), which cannot be explained by other variables, and overvalued currencies increased crisis severity as did trade exposure to the U.S.A. and a high level of economic development. On top of that, model 2 in table 1 reveals that countries with sound pre-crisis growth coupled with strong FDI inflows suffered less from the global shock, while the variable measuring exclusively pre-crisis growth turns out to be no longer a robust determinant of crisis severity.

4.2 What Is Different in Emerging Europe?

The robustness of the CESEE dummy points to a specific response of real output in CESEE countries during the crisis, which differed from that in other parts of the world. The question remains: What makes emerging countries in CESEE different from the rest of the sample? We use interactions of the CESEE dummy with the other potential explanatory variables to assess whether the sensitivity of output loss to certain pre-crisis disequilibria in the region differs from that in other comparable economies. We expand our set of covariates to include 13 additional candidate regressors (prefixed by cesee# in table 2), which are interaction terms of the CESEE dummy with variables capturing the various potential transmission channels outlined in section 2. We also include the interactions of the excessive growth measures used in model 2 interacted with the CESEE dummy. We can thus test whether (a) other derminants play a role in explaining crisis severity in the CESEE region and (b) whether excessive growth before the crisis coupled with external disequilibria played a particular role in CESEE during the global financial crisis.

Including these interaction terms leads to a drop of the PIP associated with the CESEE dummy from 0.8 to a mere 0.17. In other words, the additional determinants can capture variation in the data that is specific to the CESEE sub-sample and that explains the differences captured by the dummy in table 1. Model 3 in table 2 confirms the crisis determinants identified previously: a high level of real GDP per capita prior the crisis, buoyant pre-crisis growth and strong trade links with the U.S.A.; regional dummies for Ukraine, the Baltics and the EU-15 appear robustly related to a stronger loss in real output during the crisis. Surprisingly, table 2 reveals that strong trade ties with the U.S.A. turned out to be a robust determinant of crisis severity for CESEE countries. The estimated elasticity is much larger than for the global sample, which appears to imply that the U.S. trade channel was one of the main drivers of the strong negative output effects of the crisis in emerging

Europe. However, a closer look at the data reveals that this result is largely driven by the results for two countries (Armenia and Georgia), which both had relatively strong trade links with the U.S.A. prior the crisis and experienced large losses in real output during the crisis. From a policy perspective, model 3 bears some further interesting insights: CESEE economies with high external debt levels coupled with strong pre-crisis growth incurred higher losses. In other words, for CESEE countries, signs of growth above potential during the boom years appear to be robustly associated with severe losses during the crisis.

We repeat the BMA exercise excluding the interaction term of trade links with the U.S.A. (because the results for this variable were driven by a very reduced group of economies) and the CESEE regional dummy. The results are summarized in table 2 (model 4). Model 4 identifies the same variables as model 3 and reveals similar coefficients in terms of magnitude. Apart from the robust crisis determinants in model 3, however, two further variables appear as robust determinants of crisis severity. First, net FDI inflows and sound pre-crisis growth partly cushioned the impact of the crisis in CESEE economies. Second, financial openness amplified the

Table 2

Estimation Results with Interaction Variables for CESEE

	Model 3			Model 4		
	PIP	Post mean	Post SD	PIP	Post mean	Post SD
rgdpcap_06	0.929	–2.163*	0.889	0.908	–2.098*	0.937
real,gdp,gr_0006	0.651	0.428	0.363	0.655	0.415	0.350
EU,15	0.658	–3.634	3.143	0.654	–3.726	3.242
UA	0.702	–10.425	8.116	0.604	–8.890	8.478
imp,from,US,gdp_0006	0.511	–0.149	0.708	0.514	–0.152	0.697
tradeExp,US,gdp_0006	0.490	–0.074	0.699	0.478	–0.072	0.687
Baltics	0.600	–8.197	7.787	0.457	–5.340	6.654
cesee	0.169	1.390	4.273	0.103	0.302	2.726
cesee#real,gdp,gr_0006#ext,debt,gdp_06	0.564	–0.014	0.015	0.682	–0.019	0.015
cesee#real,gdp,gr_0006#net,fdi,infl_0006	0.398	0.021	0.035	0.502	0.036	0.046
cesee#real,gdp,gr_0006#chg,dom,credit_0006	0.094	0.000	0.002	0.092	0.000	0.002
cesee#real,gdp,gr_0006#infl_0006	0.069	0.000	0.009	0.066	0.000	0.009
cesee#real,gdp,gr_0006#ca,gdp_0006	0.102	0.001	0.042	0.117	0.007	0.063
cesee#real,gdp,gr_0006	0.157	–0.125	0.547	0.300	–0.428	0.795
cesee#FinOpenn_06	0.293	–2.278	4.169	0.588	–5.342	5.228
cesee#reerm_06	0.135	0.008	0.031	0.198	0.017	0.042
cesee#ca,gdp_0006	0.106	–0.047	0.267	0.149	–0.106	0.409
cesee#genGovDebt,gdp_06	0.148	0.015	0.047	0.144	0.015	0.047
cesee#net,fdi,infl_0006	0.426	0.277	0.420	0.373	0.226	0.461
cesee#tradeExposureUS_0206	0.691	–1.761	1.446	–	–	–
cesee#adv,claims,gdp_06	0.203	–0.016	0.039	0.103	–0.005	0.024
cesee#legRightsIndex_06	0.094	0.029	0.229	0.089	0.033	0.226
cesee#tradeExposureEU15,gdp_0006	0.083	–0.001	0.027	0.085	0.003	0.029
cesee#dGap_0006Exo	0.105	0.008	0.042	0.084	0.004	0.033
cesee#int,res,gdp_06	0.085	0.005	0.061	0.082	0.006	0.059
cesee#chg,dom,credit_0006	0.080	–0.001	0.012	0.073	–0.001	0.015
cesee#Floater	0.072	0.077	0.837	0.065	–0.018	0.769

Source: Authors' calculations,

Note: Model 3: crisis determinants in CESEE; model 4: crisis determinants in CESEE without trade interaction, The table shows posterior results for the variables with the highest PIP based on the estimation with the full set of variables listed in table 4 in the appendix. The full results are available from the authors upon request. The results are based on 10 million posterior draws after a burn-in phase of 5 million draws. For variables marked with an asterisk (*) the standardized coefficient (posterior mean/posterior standard deviation) exceeds 1.3 in absolute terms; thus these variables are dubbed "effective." Robust variables (PIP greater than 0,5) are in bold type.

impact of the crisis in CESEE. These two variables may be of particular interest to policymakers since capital flow management measures are currently back on the political agenda in many emerging market economies. Moreover, this finding may also support removing any remaining obstacles to FDI inflows.

Finally, we assess the overall goodness of fit of our models. The R^2 for the median model, which includes all the covariates with a PIP above 0.5, ranges from 0.58 (model 1) to 0.65 (model 3). We can assess how much of the variation in output loss can be captured by our models for the CESEE countries only. Here the R^2 ranges from 0.63 (model 1) to 0.77 (model 3). A very considerable proportion of the variation in output loss during the crisis in the region can be explained through differences in initial income, macroeconomic imbalances coupled with overheating and differences in the degree of financial openness and net FDI inflows.

4.3 Robustness Checks

In this section we assess the robustness of our results. We perform the BMA analysis using forecast revisions as well as the cumulated output loss for 2008–09 as the dependent variable. Our results are very robust to these changes in the dependent variable. Table 3 shows the correlation between the posterior inclusion probabilities based on the three BMA exercises.[16] Correlations across posterior inclusion probabilities are very high, implying that our results provided in the previous section do not appear to be sensitive to the measure we employed to capture output loss severity during the crisis.

Table 3

Correlation of Posterior Inclusion Probabilities (PIP)

	cum-Loss_0907	cum_rev0907	cum-Loss_0908
Model 1			
cumLoss_0907	1.000	0.890	1.000
cum_rev0907	0.890	1.000	0.891
cumLoss_0908	1.000	0.891	1.000
Model 2			
cumLoss_0907	1.000	0.907	1.000
cum_rev0907	0.907	1.000	0.907
cumLoss_0908	1.000	0.907	1.000
Model 3			
cumLoss_0907	1.000	0.853	1.000
cum_rev0907	0.853	1.000	0.857
cumLoss_0908	1.000	0.857	1.000
Model 4			
cumLoss_0907	1.000	0.852	1.000
cum_rev0907	0.852	1.000	0.854
cumLoss_0908	1.000	0.854	1.000

Source: Authors' calculations.

Note: Correlation of posterior inclusion probabilities and posterior means across BMA exercises based on three different dependent variables: (a) cumulated output loss 2007-09, (b) forecast revisions and (c) cumulated output loss 2008-09.

A further check concerning the robustness of crisis intensity determinants can be conducted by analyzing whether parameter estimates retain their sign when the specification is changed. This can be summarized by the ratio of the number of models where the posterior mean attached to a coefficient has been positive to the total number of regression models where the corresponding variable has been included. For each of the four model specifications we saved the best 1,000 models in terms of posterior model probabilities $(p(M_i|y))$ and calculated the ratio mentioned above. For all the variables identified as robust in the text, the ratio is smaller than 1%. This means that the robustly identified determinants do not change sign regardless of which other variables are included in the regression model. Thus their effect on crisis severity (enhancing or dampening) can be regarded as very stable.

[16] *Full results of the BMA analysis for the cumulated output loss over the period 2008–09 and the forecast revisions for 2009 are available from the authors upon request.*

5 Conclusions

In mid-2007 the financial crisis started to unfold in the U.S.A., with the American banking sector facing severe troubles on the back of systematically mispriced assets. The crisis subsequently spread to the rest of the world. However, the severity of the effects of the financial crisis on the real economy varied strongly across countries. This raised the question whether a country's macroeconomic and financial market situation at the time of the outbreak of the crisis shaped its effects on the real sector.

In this study we assess whether the variation in cross-country output loss during the 2008–09 financial crisis can be systematically related to pre-crisis country-specific vulnerabilities. We use a global sample comprising over 150 countries and more than 60 variables that capture initial macro and financial conditions that potentially help explain the distinct response of output to a global shock across countries. Using BMA techniques, we get results robust to model uncertainty. For the global sample we find that the level of income, exchange rate misalignments and the joint record of economic growth and FDI inflows prior to 2007 are robust determinants of output loss. We also find marginal evidence for economies with strong trade ties with the U.S.A. being on average less resilient to the crisis. Finally, the data clearly show a regional heterogeneity of crisis severity.

Compared to other emerging regions, CESEE economies were hit particularly hard in terms of output loss. CESEE countries have strong trade links with the EU and experienced fast pre-crisis growth fueled by strong credit growth and capital inflows. When assessing the drivers of output loss for this region we thus add measures of above-potential growth to the analysis. Our results for CESEE are threefold: First, we find that economies that experienced buoyant pre-crisis growth coupled with a high external debt level suffered more in terms of cumulated output loss. Therefore, growth financed through external funds appears as a robust source of risk for the region. Second, a measure for the country's degree of capital account openness (financial openness) turns out to be a factor amplifying the real effects of the global financial crisis, while financial deepening played a negligible role. This implies that financial openness was the dominant transmission channel of financial stress to CESEE. By contrast, we do not find empirical evidence for CESEE-specific trade links – neither with the U.S.A. nor with the Western EU countries – being determinants of crisis severity for the region. Finally, strong FDI inflows coupled with high pre-crisis growth cushioned the global shock for the CESEE region, which is in line with the results for the global sample. These results may be of particular interest to policymakers since capital flow management measures are currently back on the political agenda in many emerging market economies. Since our analysis reveals capital inflows to long-term investment as a factor improving an economy's risk-absorbing capacity, removing any remaining obstacles to FDI inflows may mitigate the effects of future global shocks to the region.

References

Aizenman, J., M. D. Chinn and H. Ito. 2008. Assessing the Emerging Global Financial Architecture: Measuring the Trilemma's Configurations over Time. NBER Working Paper No. 14533.

Aizenman, J., J. Lee and V. Sushko. 2012. From the great moderation to the global crisis: exchange market pressure in the 2000S. In: Open Economies Review. Forthcoming.

Babecký, J., T. Havránek, J. Matěju, M. Rusnák, K. Šmídková and B. Vašíček. 2011. Early Warning Indicators of Economic Crises: Evidence from a Panel of 40 Developed Countries. Technical report. Czech National Bank.

Barbieri, M. M. and J. O. Berger. 2003. Optimal Predictive Model Selection. In: Annals of Statistics Volume 32. 870–897.

Barisitz, S. and M. Lahnsteiner. 2010. From Stormy Expansion to Riding out the Storm: Banking Development in Kazakhstan. In: Financial Stability Report 19. OeNB. 64–73.

Beine, M., E. Lodigiani and R. Vermeulen. 2011. Remittances and Financial Openness. DNB Working Paper No. 317.

Berglöf, E., Y. Korniyenko, A. Plekhanov and J. Zettelmeyer. 2009. Understanding the crisis in emerging Europe. EBRD Working Paper No. 109.

Berkmen, P., G. Gelos, R. Rennhack and J. P. Walsh. 2009. The Global Financial Crisis: Explaining Cross-Country Differences in the Output Impact. IMF Working Paper No. 09/28.

Blanchard, O., H. Faruqee and M. Das. 2010. The Initial Impact of the Crisis on Emerging Market Countries. Technical report. IMF. Mimeo.

Caprio, G., V. D'Apice, G. Ferri and G. W. Puopolo. 2010. Macro Financial Determinants of the Great Financial Crisis: Implications for Financial Regulation. MPRA Paper No. 26088.

Cecchetti, S., M. King and J. Yetman. 2011. Weathering the financial crisis: good policy or good luck? BIS Working Papers No. 351.

Chudik, A. and M. Fratzscher. 2011. Identifying the global transmission of the 2007-2009 financial crisis in a gvar model. In: European Economic Review 55(3). 325–339.

EBRD. 2009. Transition report. Technical report.

Feldkircher, M. and S. Zeugner. 2009. Benchmark Priors Revisited: On Adaptive Shrinkage and the Supermodel Effect in Bayesian Model Averaging. IMF Working Paper No. 09/202.

Feldkircher, M. and S. Zeugner. 2011. The Impact of Data Revisions on the Robustness of Growth Determinants - A Note on 'Determinants of Economic Growth. Will Data Tell? ' In: Journal of Applied Econometrics. Replication Section. Forthcoming.

Fernández, C., E. Ley and M. F. Steel. 2001. Benchmark Priors for Bayesian Model Averaging. In: Journal of Econometrics 100. 381–427.

Frankel, J. A. and G. Saravelos. 2010. Are Leading Indicators of Financial Crises Useful for Assessing Country Vulnerability? NBER Working Paper 16047.

Furceri, D. and A. Zdzienicka. 2011. The real effect of financial crises in the European transition economies. In: Economics of Transition 19(1). 1–25.

Giannone, D., M. Lenza and L. Reichlin. 2010. Market Freedom and the Global Recession. ECARES Working Paper 2010-020.

Hoeting, J. A., D. Madigan, A. E. Raftery and C. T. Volinsky. 1999. Bayesian Model Averaging: A Tutorial. Statistical Science Vol. 14 No. 4. 382–417.

Imbs, J. 2010. The First Global Recession in Decades. IMF Economic Review 58. 327–354.

Keppel, C. and J. M. Wörz. 2010. The Impact of the Global Recession in Europe: The Role of International Trade. In: Backé P., E. Gnan and P. Hartmann (eds.). Contagion and Spillovers: New Insights from the Crisis. SUERF Studies 2010/5. Vienna and Brussels. Larcier.

Koop, G. 2003. Bayesian Econometrics. John Wiley & Sons.

Lane, P. R. and G. M. Milesi-Ferretti. 2010. The Cross-Country Incidence of the Global Crisis. IMF Working Paper No. 10/171.

Lee, J., G. M. Milesi-Ferretti, J. Ostry, A. Prati and L. A. Ricci. 2008. Exchange Rate Assessments: CGER Methodologies. IMF Occasional Paper No. 261.

Ley, E. and M. F. J. Steel. 2010. Mixtures of g-priors for bayesian model averaging with economic applications. MPRA Paper 26941. University Library of Munich.

Madigan, D. and J. York. 1995. Bayesian graphical models for discrete data. In: International Statistical Review 63. 215–232.

Masanjala, W. H. and C. Papageorgiou. 2008. Rough and Lonely Road to Prosperity: A Reexamination of the Sources of Growth in Africa Using Bayesian Model Averaging. In: Journal of Applied Econometrics 23. 671–682.

R Development Core Team. 2011. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. Vienna. http://www.R-project.org (retrieved on March 28, 2012).

Rose, A. K. and M. M. Spiegel. 2010a. Cross-Country Causes and Consequences of the 2008 Crisis: An Update. CEPR Discussion Paper No. 7901.

Rose, A. K. and M. M. Spiegel. 2010b. Cross-Country Causes and Consequences of the 2008 Crisis: International Linkages and American Exposure. In: Pacific Economic Review Vol. 15 No. 3. 340–363.

Rose, A. K. and M. M. Spiegel. 2011. Cross-Country Causes and Consequences of the 2008 Crisis: Early Warning. In: Global Journal of Economics. Forthcoming.

Schindler, M. 2009. Measuring Financial Integration: A New Data Set. In: IMF Staff Papers No. 56. 222–238.

Yeyati, E. L. and T. Williams. 2011. Financial globalization in emerging economies: much ado about nothing ? Policy Research Working Paper Series 5624. World Bank.

Zellner, A. 1986. Bayesian Inference and Decision Techniques: Essays in Honor of Bruno de Finetti. North-Holland. Amsterdam.

Appendix

Table 4

Data Description and Summary Statistics

Output loss	Description	Source	Minimum	Mean	Maximum	NAs in %
cumLoss_0907	Real GDP 2009 over real GDP 2007	IMF, WEO April 2011	–21.45	3.37	22.34	0
cumLoss_0908	Real GDP 2009 over real GDP 2008	IMF, WEO April 2011	–17.96	–0.56	10.03	0
cum_rev0907	Revision of real GDP forecast for 2009, normalized by real GDP in 2007	IMF, WEO April 2008 and April 2011	–22.49	2.27	21.18	0
GDP and investment rate						
rgdpcap_06	2006 GDP per capita in PPP	Penn World Tables 7.0	5.92	8.78	10.85	0.7
chg_rgdpcap0006	Percentage change in GDP per capita in PPP 2000–2006	Penn World Tables 7.0	81.75	123.1	219.4	1.3
real.gdp.gr_0006	Average annual growth rate of real GDP 2000–2006	IMF, WEO April 2011	–0.05	4.34	14.47	0
invRate.gdp_0006	Investment rate in % of GDP, 2000–2006 average	IMF, WEO April 2011	7.31	22.74	54.38	2.6
Trade and trade composition						
exp_0206	Exports of goods in % of GDP, 2000–2006 average	UN Comtrade data base	1.65	28.44	162.9	0
imp_0206	Imports of goods in % of GDP, 2000–2006 average	UN Comtrade data base	6.71	37.4	156	0
openness_0206	Exports and imports of goods in % of GDP	UN Comtrade data base	13.35	65.83	305.6	0.7
trade.balance_0206	Trade balance in % of GDP, 2000–2006 average	UN Comtrade data base	–60.28	–9.03	45.38	0
manuf.to.totExp_0006	Exports of manufactured goods in % of total exports, 2000–2006 average	UN Comtrade data base	0	13.38	78.97	0
petrol.to.Exp_0006	Exports of petroleum, petroleum products and related materials in % of total exports, 2000–2006 average	UN Comtrade data base	0	13.21	96.57	1.3
food.to.Exp_0006	Exports of food and live animals in % of total exports, 2000–2006 average	UN Comtrade data base	0.05	18.48	97.6	0
merchTrade.gdp_0006	Merchandise trade in % of GDP, 2000–2006 average	World Bank, WDI	19.39	68.51	313.8	0
Current account and savings						
ca.gdp_0006	Current account in % of GDP, 2000–2006 average	IMF, WEO April 2011	–26.53	–2.32	50.85	0
gross.savings_06	Gross savings in % of GDP, 2006	World Bank (WDI), IMF (IFS) and www.nationmaster.com	–20.24	21.54	64.72	1.3
Money and inflation						
money.gdp_06	Money and quasi money (M2) in % of GDP, 2006	World Bank, WDI	13.78	62.86	260.5	2.6
chg.money.gdp_0006	Percentage change in money and quasi money (M2) in % of GDP 2000–2006	World Bank, WDI	–100	26.81	212.3	2.6
infl_0006	Inflation, 2000–2006 average	IMF, WEO April 2011	–1.2	6.02	48.02	0
Credit and interest rate						
dom.credit_06	Domestic credit provided by banking sector in % of GDP, 2006	World Bank, WDI	–13.42	65.62	305	2
chg.dom.credit_0006	Domestic credit provided by banking sector in % of GDP, percentage change from 2000 to 2006	World Bank, WDI	–260.8	16.03	353.7	1.3
creditInfIndex_06	Credit depth of information index from 0 (low) to 6 (high)	World Bank, WDI	0	2.82	6	1.3
depRate_06	Deposit rate in % per annum, 2006	IMF, IFS database	0.57	5.49	22.3	5.2
Institutional quality						
legRightsIndex_06	Strength of legal rights index from 0 (weak) to 10 (strong)	World Bank, WDI	1	5.39	10	3.3
cpi_corruption_06	CPI (Transparency International's Corruption Perceptions Index)	Transparency International	2	4.25	9.6	9.2
Debt						
genGovDebt.gdp_06	General government debt in % of GDP, 2006	IMF, WEO April 2011	1.89	56.25	287.8	3.3
genGovBal.gdp_0006	General government budget balance in % of GDP, 2006	IMF, WEO April 2011	–22.15	–1.51	28.5	0.7
External debt						
ext.debt.gdp_06	External debt in % of GDP, 2006	IMF, IFS and IIP database	0	73.73	665.4	0
ext.debt.exp_06	External debt in % of total exports, 2006	IMF, IFS and IIP database	0	507	8000	0
adv.claims.gdp_06	Claims of foreign banks (advanced countries) in % of GDP, 2006	BIS	0.13	32.06	230.3	11.8

Source: Authors' calculations.

Note: NAs in % refers to the number of missing observations as a percentage of total observations.

Table 4 continued

Data Description and Summary Statistics

Output loss	Description	Source	Minimum	Mean	Maximum	NAs in %
Reserves						
int.res.gdp_06	International reserves (excl. gold) in % of GDP, 2006	IMF, IFS database	0.2	17.85	90.49	0
int.res.ext.debt_06	International reserves (excl. gold) in % of external debt, 2006	IMF, IFS database	0	61.17	1424	0
forEx.gdp_06	Foreign exchange in % of GDP, 2006	IMF, IFS database	0.15	17.65	90.2	0
forEx.extDebt_06	Foreign exchange in % of external debt, 2006	IMF, IFS database	0	53.29	610.3	0
Capital flows						
net.fdi.infl_0006	Net FDI inflows in % of GDP, 2000–2006 average	IMF, IFS database	–5.24	5.73	35.85	5.9
net.fdi.infl_0006# net. fdi.infl_0006	Net FDI inflows in % of GDP squared, 2000–2006 average	IMF, IFS database	0.06	65.08	1285	5.9
Trade exposure to U.S.A.						
tradeExposure-US_0206	Goods imports from and exports to the U.S.A. in % of total exports, 2002–2006 average	UN Comtrade data base	0	13.29	96.94	1.3
tradeExp.US.gdp_0006	Goods imports from and exports to the U.S.A. in % of GDP, 2000–2006 average	UN Comtrade data base	0	8.49	45.61	0
exp.to.US.gdp_0006	Goods exports to the U.S.A. in % of GDP, 2000–2006 average	UN Comtrade data base	0	4.19	30.63	0
imp.from.US.gdp_0006	Goods imports from the U.S.A. in % of GDP, 2000–2006 average	UN Comtrade data base	0	4.3	31.09	0
Trade exposure to EU-15						
tradeExposu-reEU15_0006	Goods imports from and exports to the EU-15 in % of total exports, 2000–2006 average	UN Comtrade data base	4.3	19.32	113.8	1.3
tradeExposureEU15. gdp_0006	Goods imports from and exports to the EU-15 in % of GDP, 2000–2006 average	UN Comtrade data base	0.53	111.5	1547	0
exp.to.EU15.gdp_0006	Goods exports to the EU-15 in % of GDP, 2000–2006 average	UN Comtrade data base	0.01	8.95	60.37	0
imp.from.EU15. gdp_0006	Goods imports from the EU-15 in % of total exports, 2000–2006 average	UN Comtrade data base	0.44	10.37	53.44	0
exp.to.EU15.exp _0006	Goods exports to the EU-15 in % of total exports, 2000–2006 average	UN Comtrade data base	0.06	33.79	90.98	0
Population and unemployment						
pop_06	Population in millions	IMF, WEO April 2011	–2.98	1.94	7.18	0
pop.gr_0006	Population growth, percentage change 2000–2006	IMF, WEO April 2011	–9.33	8.86	43.57	0
unempl_06	Unemployment rate, 2006	IMF, IFS and WEO	0.6	11.45	77	7.8
Monetary regime						
Floater	Dummy variable for countries with no exchange rate anchor	Authors' calculations based on	0	0.25	1	0
inflTarg	Dummy variable for inflation targeters	IMF classification (2008)	0	0.22	1	0
Exchange rate misalignment and output gap						
reerm_06	Measure for overvaluation of the real exchange rate based on a panel regression on macro fundamentals, in %, 2006	Authors' calculations based on the IMF's CGER assessment, fully described in Lee et al. (2008)	–110.6	15.5	531.2	0.1
emp_chg_06	Exchange market pressure index covering changes in the nominal exchange rate and changes in international reserves, in %, 2006; negative values indicate pressure in the exchange market.	Authors' calculations based on Aizenmann et al. (2010)	–0.76	–0.05	0.86	0
outputGap_0006Exo	Deviation from trend output in % in 2006; calculation based on yearly GDP data up to 2006 using the Hodrick-Prescott Filter with the smoothness parameter λ=100	Authors' calculations	–11.62	–2.03	3.86	0
dGap_0006Exo	Ratio of how often a country was above trend growth in the period from 2000 to 2006	Authors' calculations	0	45.94	85.71	0

Source: Authors' calculations.

Note: NAs in % refers to the number of missing observations as a percentage of total observations.

Table 4 continued

Data Description and Summary Statistics

Output loss	Description	Source	Minimum	Mean	Maximum	NAs in %
Oil producer						
oilExp		Authors' calculations	0	0.16	1	0
oilProd		Authors' calculations http://www.mongabay.com/reference/stats/rankings/2173.html	0	0.55	12.62	0
Globalization indicator						
kof_persCont_06	KOF Globalization Index, personal contact, 2006 (subcomponent of the Social Globalization Index)	KOF Globalization Index, http://globalization.kof.ethz.ch/	11.27	51.32	93.38	0.7
kof_infFlows_06	KOF Globalization Index, information flows, 2006 (subcomponent of the Social Globalization Index)		30.69	68.06	97.95	0
kof_cultProx_06	KOF Globalization Index, cultural proximity, 2006 (subcomponent of the Social Globalization Index)		1	34.82	95.43	0
kof_poltGlob_06	KOF Political Globalization Index, 2006		1.54	68.01	98.01	0
kof_overallGlob_06	KOF Overall Globalization Index (economic, political and social), 2006		28.64	59.31	92.42	0
Trilemma indicators						
monInd_06	Monetary independence index (1=most independent)		0	0.68	1	2.6
er.stab_06	Exchange rate stability index (1=most stable)	Aizenmann, Chinn and Ito, http://web.	0	0.37	0.94	2.6
FinOpenn_06	Financial Openness Index, measuring a country's degree of capital account openness (Chinn-Ito index, 1=most open)	pdx.edu/~ito/trilemma_indexes.htm	0	0.56	1	2.6
Regional dummy variables						
cesee	Regional dummy for emerging CESEE countries (ALB, ARM, AZE, BGR, BIH, CZE, EST, GEO, HRV, HUN,KAZ, LTU, LVA, MDA, MKD, POL, ROM, RUS, SRB, SVK, SVN, UKR).	Authors' calculations	0	0.15	1	0
baltics	Regional dummy for the Baltics	Authors' calculations	0	0.02	1	0
UA	Regional dummy for Ukraine	Authors' calculations	0	0.01	1	0
EU.15	Regional dummy for the EU-15 (here: GBR, AUT, BEL, DNK, FRA, DEU, ITA, NLD, SWE, FIN, GRC, IRL, PRT, ESP). Note that we excluded Luxembourg from the estimations.	Authors' calculations	0	0.09	1	0
latam	Regional dummy for Latin America	Authors' calculations	0	0.2	1	0
africa	Regional dummy for Africa	Authors' calculations	0	0.27	1	0
eastAsia	Regional dummy for east Asian countries (BRN, CHN, HKG, IDN, JPN, KHM, KOR, MYS, PHL, SGP, THA, VNM)	Authors' calculations	0	0.08	1	0

Source: Authors' calculations.

Note: NAs in % refers to the number of missing observations as a percentage of total observations.