The Determinants of Cross-Country Differences in the Severity of the Late-2000s Crisis

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> *"Excessive debt accumulation, whether it be by governments, banks, corporations, or consumers, often poses greater systemic risks that it seems during a boom. <…> Debt fuelled booms all too often provide false affirmation of a government's policies, a financial institution's ability to make outsized profits, or a country's standard of living. Most of these booms end badly. <…> Balancing the risk and opportunities of debt is always a challenge, a challenge policy markers, investors, and ordinary citizens must never forget."*
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> (Reinhart and Rogoff, 2009, p. XXV)

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Abstract

In this study I aim to assess variables which could be associated with output losses due to the late-2000s crisis in a broad global sample of countries. First, I estimate crisis severity as cumulative negative deviations of either output growth or output level from estimated potential trends, which is a method commonly used to estimate overall costs of financial crises to economies. Second, I explore a large number of pre-crisis conditions and structural indicators seeking for the ones that may be statistically significantly associated with cross-country differences in output losses. I apply heteroscedaticity robust Tobit estimations and calculate marginal effects on expected outcomes of output losses. Income per capita, pre-crisis output growth and credit expansion appear as consistently positive statistically significant indicators that marginally increase expected output losses. After controlling for these factors, marginal effects of a number of other indicators lose statistical significance or change signs. The ones that may be further associated with higher output losses for a large number of countries are current account deficits, inadequate international reserves relative to the extent of financial depth (monetary base) and relatively smaller equity markets.

Table of contents

List of figures

List of tables

1   Introduction

The late-2000s crisis is frequently noted for its historical severity, wide spread and global synchronisation. Problems in global financial markets in mid-2007 have grown to the most severe economic recession since the Great Depression in the 1930s. The crisis and the subsequent recession has affected both most industrialised and a large number of emerging economies, evoking a renewed attention for early warning systems (EWS) from policy makers and researchers. The nature of the late-2000s crisis make it well suited for conducting early warning exercises. First, the very large magnitude of the crisis helps to better test the predictive power of various leading crisis indicators. Second, uniquely wide spread and relatively high global synchronisation allows using a global sample to test for factors, which could explain cross-country differences in crisis incidence and severity. Third, in spite of notable geography and overall severity, adverse economic effects exhibit high variation across countries (Frankel and Saravelos, 2010; Giannone, Lenza, and Reichlin, 2011).

A working EWS should be able to predict both timing and cross-sectional variation of crisis incidence as well as do that out-of sample (for other crises as well). Recent literature has focussed on explaining the variation of crisis severity across countries, as explaining the timing of the crisis may be more challenging (Rose and Spiegel, 2011). Nevertheless, finding statistically (and economically) significant factors, which could explain differences in crisis impact across countries in a robust manner, has turned out to be not an easy task either. Recent cross-country studies have so far come up with inconclusive and sometimes conflicting findings.

In turn, I aim re-examine the topic of the determinants of cross-country differences in the late-2000s crisis severity. The particular aspect of crisis severity that I study is the crisis impact on output, which is likely the best proxy of overall costs of a crisis to the real economy. Although recent studies have largely focused on output effects as well, I seek to more properly account for heterogeneity in output potential and the timing of adverse effects. To this end, I adapt statistical output gap techniques, which are often used for measuring output costs associated with previous financial crises. I first estimate the deviations of actual output from potential output in a global sample of countries. To address the controversy of such estimation techniques, I develop twelve output loss measures, and perform additional sensitivity analysis of each of them. Second, I focus on the preferred proxy of output costs and explore a large number of pre-crisis conditions and structural indicators seeking for the ones that may statistically significantly explain differences in the estimated output losses across countries.

The findings of the research aim to contribute to future risk monitoring and development of EWS. The broader aim of this thesis is to serve the better understanding of the role and nature of macroeconomic vulnerability, international imbalances as well as trade and financial channels in international shock transmission.

In the next two chapters, I provide an overview of potential crisis severity determinants and selected cross-country studies on the late-2000s crisis. I then overview the methodology, data and results of my empirical study. The first chapter on an empirical study explains the approach and results of the estimation of output losses, while the second chapter discusses Tobit model estimations of potentially significant crisis severity

determinants on the expected output losses. Last, I conclude that differences in GDP per capita levels, pre-crisis output growth and private sector credit expansion appear as robust indicators that marginally increase expected output losses associated with the late-2000s crisis.

2   Potential crisis severity determinants

Selection of potential crisis incidence and severity determinants usually has some theoretical underpinning[1], but remains a largely empirical exercise, which is guided by economic intuition and limited by data availability. The aim of this exercise is to find variables which fit the data the best, and do that for a large number of crises. Frankel and Saravelos (2010) summarize early warning indicators literature, which preceded the recent crisis. In spite of heterogeneity of estimation methods, literature appeared to have converged to a list of variables which are most commonly tested as leading crisis indicators. Among them, most important ones are foreign exchange reserves and real exchange rate, followed by credit, GDP and current account variables.

For a more systematic overview, I classify the main potentially significant crisis incidence and severity determinants as (1) macroeconomic fundamentals, (2) vulnerabilities stemming from the financial and real structure of the economy, and (3) institutional environment. Additionally, potentially important variables could include proxies for contagion (crisis elsewhere) effects. According to Rose and Spiegel (2009, 2010), it is important to distinguish between the phenomena of common shocks, which hit economies differently depending on their relative vulnerability, and contagion effects, which mean that shocks from one or more countries spread contagiously to other countries via different channels of transmission (financial and real). Although observationally similar, the two phenomena may have conflicting policy implications, as "isolation" is only appropriate when witnessing contagion effects, but not in case of common shocks. The possibility of both phenomena playing a role in the late-2000s crisis raises a need to account both for national pre-crisis fundamentals, which determine relative vulnerability, as well as particular linkages to potential crisis epicentre economies. In this study I do not examine contagion effects for several reasons. First, contagion effects are difficult to estimate due to a number of potentially important contagion channels, such as trade and financial ties, as well as perceived or actual similarity to an affected economy. Second, the late-2000s crisis is a global phenomenon and this complicates finding true crisis epicentres. Third, epicentres of future crises remain largely unknown; therefore, other factors are relatively more relevant for risk monitoring. In the next sections I overview the intuition behind potentially significant crisis incidence and severity determinants.

2.1   Macroeconomic fundamentals

Stronger macroeconomic fundamentals are expected to reduce a probability of a crisis and help an economy recover in the event of one. Macroeconomic fundamentals should capture stock, flow and acceleration measures of potential internal and external imbalances. Weaker macroeconomic fundamentals can be associated

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[1] Economic theory does not provide uniform guidance on what causes crises and what determines vulnerability of countries to macro-financial shocks.

with overvalued real currency rates[2], large and sustained budget deficits and unsustainable levels of public debt[3], high (and sustained) inflation rates, low domestic savings, and low economic growth[4]. Role of real interest rates is more ambiguous. Generally, high (increasing) real interest rates might be a sign of deteriorating macroeconomic fundamentals. In the context of the late-2000s crisis, however, low pre-crisis interest rates and narrow risk spreads, especially, if prolonged, may have fuelled credit and real estate booms, which eventually turned to busts (Claessens, Klingebiel, and Laeven, 2010).

Other potentially significant indicators are large (and sustained) current account deficits, rapid expansion in private credit and monetary base (financial deepening), inflated housing prices and equity returns. As for current account, both large deficits and surpluses indicate macroeconomic imbalances, the former potentially relating to weak export performance, while the latter to weak domestic demand. Current account deficits pose more serious risks than surpluses, largely because the deficits have to be financed externally. In addition, the source of current account deficits might matter. Funding productive investment by the deficit is preferable to funding excessive levels of consumption (see Hawkins and Klau, 2000).

Widely overviewed stylised facts about the late-2000s crisis frequently include the dramatic credit growth and increased indebtedness of private agents, as well as pro-cyclical and increasingly riskier bank lending as factors which preceded the crisis. Rapid expansion of credit is expected to be associated with increased banking system vulnerability due to possibly deteriorating credit standards (see Sachs, Tornell and Velasco, 1996). At the same time, much of the credit growth may be financed internationally, which increases exposure to sudden stops in capital flows, making indebted economies face greater challenges to adjust to the reduced supply and increased costs of credit (Lane and Milesi-Ferretti, 2010). Credit growth is also expected to fuel asset price bubbles. Formation and thereof, bursting of asset price bubbles (equity or real estate) is recognised as commonplace in the run-up to banking crises (Reinhart and Rogoff, 2009).

2.2   Vulnerabilities

After controlling for macroeconomic fundamentals, countries might be differently vulnerable to internal and external shocks based on the real and financial structure of an economy. For example, trade openness is expected to expose economy to adverse trade shocks, such as unexpected declines in trading partners' growth and/or decline in demand for specific domestically produced export goods. The dramatic collapse of global

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[2] Appreciation of the Real Effective Exchange Rate (REER) prior to a crisis could signal loss of international price competitiveness due to potentially overvalued currency.
[3] Running fiscal surpluses, maintaining relatively low debt levels, borrowing at longer-term maturities (10 year plus) and not having too many off-balance sheet guarantees adds confidence in a government and, in turn, reduces the risk of a debt crisis (Reinhart and Rogoff, 2009). Lack of fiscal policy discipline in the run-up to the late-2000s crisis may have weakened the credibility of governments in dealing with the crisis, in addition to actually leaving them less fiscal room to manoeuvre in addressing the consequences of the crisis with fiscal policy tools. Lack of credibility in the governments' capacity to deal with a global crisis, in turn, may have raised long-term interest rates of the public debt, further jeopardising potential fiscal policy responses (see Buiter, 2007).
[4] Strong output growth prior to the late-2000s crisis was associated with a reduced likelihood of a crisis (Frankel and Saravelos, 2010). In the run-up to the late-2000s crisis, the most affected countries, such as the Baltic states, tend to have experienced sustained periods of strong economic growth.

trade, which went in parallel with the Great Recession[5], makes trade openness a potentially significant factor associated with the late-2000s crisis severity. Financial openness might be associated with a risk of sudden stops of capital inflows and current account reversals. At the same time, financial integration can be providing international diversification advantages against internal shocks. Deeper financial integration, on the one hand, intuitively magnifies exposure of a country to the financial channel of crisis transmission. Foreign assets of a country may decline in value, having a direct negative effect on a country's balance sheet. Opportunities to borrow in the international credit markets may shrink, while the costs of financing may rise, challenging the financing of domestic production and trade as well as current account deficits. On the other hand, especially, if a shock is less global and/or synchronous, financial development and integration may be expected to help a country smooth domestic demand declines through global risk sharing (Lane and Milesi-Ferretti, 2010).

Different types of capital and income inflows might be associated with a different degree of vulnerability. For instance, FDI inflows are generally considered as a more stable source of financing external deficits than portfolio inflows. Similarly, larger share of short-term external liabilities[6] is expected to increase vulnerability. Short-term debts have to be rolled over continuously. Therefore, larger amounts of short-term debt are expected to expose countries to higher risks of sudden crises of confidence. Debt composition may in fact matter more that the overall magnitude. Higher proportion of short-term debt was found positively associated with crisis incidence in earlier studies (see Frankel and Saravelos (2010) for a review).

Countries with larger "war chests" of foreign exchange reserves are expected to be better prepared to fight potential internal and/or external drains, such as bank deposit withdrawals and capital flight, as well as sudden stops in capital inflows. Adequacy of reserves appeared as the most frequent statistically significant early warning indicator in the literature prior to the recent crisis according to Frankel and Saravelos (2010).

Floating exchange rate regimes might be helping to regain international competitiveness and do not expose countries to attacks against their currency in the way fixed exchange regimes do. Krugman (1979) showed that governments may be unwilling to adopt fiscal and monetary policies consistent with maintaining a fixed exchange rate, which often leads to exchange rate crises. Fixed exchange rate regimes, therefore, add towards a country's fragility through the risks of speculative attacks on the currency.

Other potential vulnerabilities might stem from other characteristics of a particular financial structure. For instance, banking sector health might be relevant. More efficiently operating and profitable banks with higher shares of liquid reserves and lower nonperforming loan portfolios might be less prone to banking crises. The effect of concentration in the banking sector is more ambiguous. To some extent high concentration of banking sector might be indicating presence of institutions that are "too big too fail", which is expected to increase the

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[5] Authors, who try to explain the recent collapse in international trade, examine various reasons, such as potential inventory adjustments and deterioration in trade finance, but generally conclude that it is still hard to fully explain the magnitude of the decline in world trade during the late-2000s crisis (see Levchenko, Lewis and Tesar (2010).

[6] Short-term debt is typically defined as liabilities coming due in the following 12 months, including long-term debt with a remaining maturity of 1 year or less.

risk of systemic banking crises[7]. Relatively larger size of stock market is expected to expose economy to the volatility of equity prices, but relatively mitigate the risks of credit crunch arising from high dependence on other sources of financing, such as bank loans.

The real structure of an economy might have significant effects as well. Different sectors of an economy are differently affected by business cycles. Most manufacturing sectors, for example, are relatively more sensitive to business cycles than sectors of services. In turn, *ceteris paribus*, a country with a large share of manufacturing sector output in its GDP, is expected to experience higher output declines during a recession (Groot, Möhlmann, Garretsen and de Groot, 2011). Commodity exporters are more exposed to the volatility of commodity prices driven by global demand and other factors.

2.3   Institutional environment

Institutions may play their role in mitigating the risks of weak fundamentals and vulnerabilities. Intuition suggests that more transparent, better governance should make a country less vulnerable to a crisis of confidence (Reinhart and Rogoff, 2009). Better governance may matter in two ways. First, other things being constant, better governance may reduce the likelihood of a crisis shock. Second, for a given shock, countries with better governance may be able to implement better policy responses, which should "limit the spread of financial panic, reduce uncertainty about the future investment environment, and lower economic costs of the crisis" (Angkinand, 2008, p.1). More liberalized policies and practices might provide a country the needed market flexibility to adjust to an unfavourable economic environment and recover quicker. At the same time, especially in the context of the late-2000s crisis, inadequate regulation and supervision of credit markets, among other potential triggers, might have been the cause of the crisis in the first place. The extent of government guarantees on bank deposits might be a mitigating factor for deposit withdrawals in the event of financial panic and eventual bank-runs.

3   Recent cross-country studies on the late-2000s crisis

The first attempts to examine the determinants of cross-country resilience to the late-2000s crisis have started as early as 2009. Among the first are Obstfeld, Shambaugh and Taylor (2009, 2010), who focus on the role of international reserve holdings. In Obstfeld et al (2010) they present an empirical model, which explains demand for international reserve holdings by financial motives of an economy. The model shows that adequacy of international reserves should be judged not only relative to trade openness of an economy and/or the amount of its short-term external debt, which may be considered as traditional motives for holding international reserves, but also relative to the depth of the financial system, as measured by M2 money supply. The argument for the latter financial motive relates to the possibility of liquidity problems created by internal and external double drain, which potentially appears in the event where bank runs coincide with capital flights. In Obstfeld et al

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[7] See Giannone et al (2011); Aizenman and Pasricha (2010).

(2009), using the ratio of actual reserves to the reserves predicted by their model derived in Obstfeld et al (2010), the authors show that currencies of countries, which held larger "war chests" of international reserves, depreciated less or even appreciated against the US dollar over 2008.

Rose and Spiegel (2009, 2010) model crisis intensity as a combination of four crisis manifestations, including the 2008 changes in the real GDP, the stock market, country credit ratings and the exchange rate. Rose and Spiegel (2009) study the role of national pre-crisis fundamentals as potential determinants of cross-country variation in crisis incidence on a sample of 107 economies[8]. Rose and Spiegel (2010) additionally look at various measures of international real and financial linkages. Factors, which they consider, broadly include exposures to potential crisis epicentres- such as the United States- via trade, foreign asset holdings and international credit channels. Due to data limitations, their sample contracts to 85 countries. Rose and Spiegel (2011) add new variables that have been found significant in recent comparable studies, as well as incorporate data of 2009 in measuring crisis severity. Despite testing one of the largest lists of potential covariates in the recent literature, Rose and Spiegel (2009, 2010, 2011) fail to find evidence to back intuitive crisis severity explanations. In Rose and Spiegel (2009), the only robustly significant crisis severity determinants appear the percentage change in the stock market size between 2003 and 2006 and the natural logarithm of real GDP per capita in 2006. In Rose and Spiegel (2010), researchers additionally find weak evidence that, holding other factors constant, both export and financial exposure to the United States, if anything, helped economies to weather the late-2000s crisis, which is a rather counter-intuitive result. In Rose and Spiegel (2011), they find that countries with higher income per capita, looser credit market regulation, higher credit growth and current account deficits seem to have experienced more severe slowdowns. Short-term external debt and real housing price appreciation prior to the crisis also helps in explaining variation in crisis manifestation measures, but the data coverage of these variables is rather narrow. In general, after testing more than a hundred variables in total, Rose and Spiegel (2009, 2010, and 2011) conclude with scepticism about a possibility to link any potential national and international factors to cross-country crisis incidence in a robust manner.

Ho (2010) re-examines the dataset of Rose and Spiegel (2010) with an aim to correct for model uncertainty and data outliers. He believes that not just Rose and Spiegel (2009, 2010, 2011), but much of the recent literature on the topic, is likely determined to make incorrect inferences, because of common methodological problems it faces[9]. Most importantly, empiric models are most of the time chosen and judged as significant arbitrarily[10]. Ho (2010) uses modified Extreme Bound Analysis (EBA) to deal with the model

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[8] There are two criteria on which they include countries in their sample: a country must have had a real GDP per capita of at least $10,000 in 2003 or a real GDP per capita of at least $4,000, but then a population of at least 1 million. The same criteria are followed by Gianonne et al (2011).

[9] Ho (2010) gives examples of Berkmen et al (2009), Berglöf et al (2010), Blanchard et al (2010), Claessens et al (2010), Lane and Milesi-Ferretti (2010) as studies, which suffer from the same methodological problems as Rose and Spiegel (2009, 2010, 2011), namely, ad-hoc model specification and data outliers. Giannone et al (2011) is seen as an exception to the case.

[10] Related issues are well overviewed in Frankel and Saravelos (2010). The authors admit these issues as challenges they faced when comparing the literature on early warning indicators.

uncertainty issue[11] and robust estimation, which down weights unusual observations and this way corrects for data outliers. Using the same dataset, Ho (2010) arrives at qualitatively and quantitatively different results than Rose and Spiegel (2010). He finds 23 variables strongly associated with crisis intensity, which he measures as output growth over 2008-2009. His results suggest that output declines have been stronger in the developing Eastern Europe and Central Asia and countries with more liberal credit markets. In addition, output declines tend to increase with the bank claims to deposit ratio, more severe asset price bubbles, and larger current account deficits. On the other hand, Ho (2010) finds no positive, but negative evidence for the role of foreign bank ownership, which is found as a mitigating factor to the output decline in Berglöf, Korniyenko, Plekhanov and Zettelmeyer (2010). In contrast to Rose and Spiegel (2009, 2010, 2011), Ho (2010) concludes that late-2000s crisis intensity can be explained by macroeconomic vulnerabilities, as well as international trade and financial linkages, however not by the stock market growth in the run-up to the crisis.

Berkmen, Gelos, Rennhack, and Walsh (2009) use changes in average GDP growth forecasts for 2009 made in the spring of 2008 and the spring of 2009 to measure crisis intensity. This way they capture how the growth forecasts were revised by economists after the collapse of Lehman Brothers in September 2008. Their results of a study covering 40 emerging market economies[12] show that growth revisions were larger for countries with higher leverage of domestic financial systems (as proxied by the credit to deposits ratio) and more rapid relative credit expansion prior to the crisis. They also find strong evidence that more flexible exchange rate regimes and weaker evidence that stronger fiscal positions at the eve of the crisis helped in buffering the crisis impact. After extending the sample to a larger group of developing countries, they find that trade linkages were important for non-emerging developing countries. Countries exporting relatively more commodities (both food and overall) were associated with smaller growth revisions.

Berglöf et al (2010) study a sample of 25 transition economies (emerging Europe and some Central Asian countries) as well as wider global sample. They look at the determinants of capital flow reversals and output declines over 2008 Q4 - 2009 Q2 as crisis intensity measures. After examining 98 potential covariates, they find evidence that countries in the emerging Europe region, countries with domestic pre-crisis credit booms, larger pre-crisis external debts and fixed exchange rate regimes suffered stronger output declines, while stabilising effects on both capital reversals and output declines came with higher degree of financial integration with Western Europe, as proxied by larger shares of foreign bank ownership. To the extent that foreign bank ownership in the emerging Europe might have contributed to credit booms and accumulation of external debts, the overall effect of foreign bank ownership is concluded as mixed. Regressions on a wider global sample provide evidence for a stabilizing effect of commodity revenues.

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[11] The EBA is a method, which can test the entire set of possible econometric specifications with an aim to report robust parameter estimates, which do not suffer from an ad-hoc model specification.

[12] Berkmen at al (2009) note that despite the generally advanced-country nature of this particular crisis, some emerging economies were countries hit hardest of all. In turn, the variation of growth outcomes is by far the largest when looking the at the emerging market economies alone.

Blanchard, Faruqee, and Das (2010) examine differences in growth patterns over the crisis period across 29 emerging market economies by looking at an unexpected growth component of WEO forecasts for the crisis quarters 2008 Q2 – 2009 Q1, which corresponds to the peak semester of the crisis. The authors point to the short-term foreign debt as the most statistically and economically significant variable explaining larger output declines.

Claessens et al (2010) study 58 advanced and emerging economies over 2008-2009. They conclude that factors, which somewhat help in explaining stronger real crisis impact, are pre-crisis credit growth and real estate bubbles as well as current account deficits (factors common to other crises), however much of cross-sectional variation in crisis impact on output performance and especially on financial stress remains unexplained. Many other factors, such as the degree of financial development and dependence of wholesale funding, which they test, lack statistical significance.

Lane and Milesi-Ferretti (2010) analyse a global sample as well as sub-samples excluding commodity exporters and/or low income countries and/or financial centres and measure crisis severity as the average real growth of output and domestic demand over 2008-2009. In addition, they examine the co-movement between output and domestic demand as well at its components during the crisis, where they control for initial conditions of international financial integration and net financial vulnerability. Consumption growth is expected to follow output growth a natural benchmark. If financial integration offers beneficial risk diversification, consumption is expected to decline less than output. If credit access and costs become severely unfavourable during a crisis as a result of financial integration and initial macro-financial vulnerability, consumption is expected to deteriorate more than output. They conclude that countries with fixed exchange rate regimes were relatively more vulnerable to sudden stops in capital and trade flows than countries with more flexible exchange rate regimes. Advanced economies, countries with larger pre-crisis current account deficits and faster private sector credit growth experienced sharper declines in the growth of output and, especially, in the growth of domestic demand. Additionally, trade openness and larger manufacturing sector somewhat help explaining output and domestic demand declines, and no support is found for the benefits of international risk sharing brought by international financial integration.

Frankel and Saravelos (2010) measure crisis severity against six different crisis severity manifestations, namely, declines in output, industrial production, exchange rate, stock market, reserves as well as participation in IMF programmes[13]. Seeking to avoid an ex-post data fitting exercise, they examine only the potential crisis severity indicators that were most studied and found significant in the literature preceding the late-2000s crisis. They conclude that large reserves help predicting lower crisis impact measured in a variety of ways. Real

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[13] Frankel and Saravelos (2010) try to avoid measuring average crisis impact over 2008-2009. "Though the NBER declared December 2007 as the start of the US recession, the global economy continued growing up to the second quarter of 2008 based on a number of high frequency variables such as industrial production and the institute of supply management's global purchasing manager index (PMI). Based on these indicators, output began to recover in the second quarter of 2009" (Frankel and Saravelos, 2010, p. 12). Therefore, the authors measure the crisis impact on, for example, GDP growth over four quarters (to avoid seasonality issues) from 2008 Q2 to 2009 Q2.

exchange rate appreciation explains subsequent exchange rate depreciations and higher exchange rate market pressure during the crisis. Other leading crisis indicators, which were found significant in previous studies, are not robust to different specifications and crisis intensity measures used. To some extent, however, higher crisis incidence correlates with rapid pre-crisis credit growth, high levels of current account deficits, total as well as short-term external debts, and low national savings.

Aizenman and Pasricha (2010) concentrate on financial variables of crisis intensity across a sample of 33 to 70 countries depending on data availability. They find that high income countries on average experienced net capital as well as portfolio inflows, while developing countries suffered from net outflows during the peak quarters of the crisis despite higher banking *stress* associated with high income countries. Although general stock market effects were, on average, experienced at the same time and to a reasonably similar extent between developing and high-income countries, equity indices of banking sectors- as expected from higher banking stress indicators- were more severely affected in high income countries. Other evidence points to the positive relation between de-facto pre-crisis financial openness, measured as a sum of external assets and liabilities as a share of GDP in 2007 and net capital inflow reversals in each of the crisis quarters. Countries with larger part of external debt not covered by international reserves, relative to their GDP, experienced larger portfolio outflows in 2008 Q4 and net capital outflows in 2009 Q1. In addition, such countries saw sharper declines in banking sector equity prices, which remained stronger in countries with better banking sector supervision and bank capitalization. Banking sector concentration effects are less clear. Both more concentrated and more competitive, but better supervised banking sectors helped bank equity prices to remain stronger. In line with their findings, Aizenman and Pasricha (2010) conclude that exposure to global shocks came with financial openness, while resilience to them increased with deeper capital markets and lower balance sheet exposures. Similar factors helper in tentative recovery. Recovery of net portfolio inflows was faster in countries with better regulatory quality and stronger competition in the banking sector, while de-facto financial openness was positively associated with the recovery of banking sector equity prices.

Giannone et al (2011) contribute with a study unique in its focus on the role of institutions, such as credit market regulations, and robustness of the estimation technique[14]. They proxy crisis severity as the average GDP growth over 2008-2009 and examine a sample of 102 countries. Based on their findings, liberalization in credit markets (looser regulations) may have increased the vulnerability of countries to cyclical shocks, as evidenced by robustly significantly lower output growth in 2008 and 2009. Giannone et al (2011) conclude that as much as the later fact needs further investigation, it also calls for a re-evaluation of policies, which over the last two decades have promoted financial market liberalisation. Other results conclude that income per capita levels and banking sector efficiency indicators, such as net interest margins and overhead costs (where higher values of the indicators suggest relative bank inefficiency) correlate positively with output growth during the crisis, meaning that bank inefficiency cannot be associated with output declines.

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[14] Giannone et al (2011) employ many control variables and examine all possible combinations of the regressors by running over 130 million regressions using Bayesian Model Averaging (BMA) techniques.

Groot, Möhlmann, Garretsen and de Groot (2011) examine cross-sectional variation of crisis impact on European countries and regions in terms of output and employment performance during a subsequent recession. They measure the period of recession for each country separately and investigate several groups of factors which might correlate with the depth of the recession and size of unemployment brought by the recent recessionary shock. The authors put particular focus on the role of differences in financial markets and trade openness, institutional environment and sectoral composition of economies. In their findings, Groot et al (2011) present several stylised facts about the cross-country and cross-regional differences in crisis incidence. For example, European countries with higher unit labour costs increases and current account deficits as well as lower public debts in the run-up to the crisis seem to have suffered stronger negative output and employment consequences. At the same time, both countries and regions with higher shares of more cyclical sectors, such as manufacturing, were significantly more affected by the crisis in terms of output and employment declines.

Based on the selected cross-country studies, recent literature has identified some of the common determinants of crisis severity, but has not so far come up with conclusive and robust results. Most studies document the advanced economy nature of the crisis by finding support for negative effects of the income per capita levels on output growth, but then find little consistent and statistically robust support for the role of other variables. The main variables that have been tested as potential crisis severity indicators include much of the same variables corresponding to the broad categories of macroeconomic fundamentals, vulnerabilities of the financial and real structure, institutional environment and contagion effects. The prevalent measures of crisis intensity in the selected studies have been simple transformations of output growth, which do not account well for the heterogeneity in the output potential across countries and potential differences in the timing of adverse effects. In addition, the output effects might have been not fully covered over 2008-2009 due to a still evolving nature of the crisis.

4   Estimates of output losses

4.1   Methodology

A particular aspect of crisis severity that I examine is the crisis impact on output, which is arguably the best estimate of the overall costs of a crisis to the real economy (Hoggarth, Reis and Saporta 2002). I adapt statistical output gap techniques (as documented in Hoggarth et al (2002), Angkinand (2008) and Angkinand (2009) among others) to estimate output losses associated with the late-2000s crisis. The basic idea of the approach is to capture the cumulative deviation of actual output from a potential output trend over a period of a crisis.

I define twelve different output loss measures, first six of which are calculated using quarterly GDP data and second six of which are calculated using annual GDP data. A broad list of measures helps to address the controversy of the approach, as estimations of potential output trends are expected to be sensitive to changes in

definitions and/or parameters[15]. By and large, sensitivity of the output loss measures lies in the estimation of potential output trends. Underestimation of a trend leads to conclude a faster economic recovery and an underestimation of output costs associated with a crisis. Vice versa, unrealistically high output trends may exaggerate output losses.

Table 1 summarizes differences in estimation approaches across the measures I develop. Consensus crisis starting dates are difficult to obtain for a large sample of countries. Therefore, I mark individual crisis starting dates endogenously by checking for either potential technical recessions or slowdowns (see definitions in Table 1). I estimate output losses based on both output growth and output level deviations from their trends. *Growth-loss* approach estimates cumulated (quarterly or annual) negative difference between actual and potential (q-o-q or y-o-y, respectively) growth rates of real GDP. *Level-loss* estimates cumulated (quarterly or annual) negative difference between actual and potential levels of real GDP. Crisis effects stop being cumulated when output growth (or level, respectively) returns to a pre-crisis trend. As a benchmark, I set potential growth rate trend constant at a 3-year pre-crisis average growth rate of real GDP. This is the approach used by IMF (1998), who essentially pioneered such a method. Potential GDP level trend (in logarithms) is obtained by smoothing 10-year pre-crisis real GDP levels using Hodrick-Prescott (Hodrick and Prescott, 1997) filter (HP filter)[16]. After that, growth rates of the smoothed series are calculated, and the growth rate of last pre-crisis period is used to project potential GDP level trend by setting the real GDP level grow constantly at that extracted long-term growth rate. Using the approach of Ankinand (2009), I set estimated negative trend growth rates to zero, as a negative trend growth rate would misleadingly produce a negative slopping output level trend. I also try truncating level-loss accumulation at the period when growth-rate returns to its trend. This way I act on assumption that a consensus crisis end appears around a period when growth rate returns to its pre-crisis trend, which is a finding from Hoggarth et al (2002).

To test for sensitivity, in unreported results, I also look at the sensitivity of estimated trends to changes in parameters. For growth rate trends, I look also at 5-year and 10-year pre-crisis averages of real GDP growth rates, while for level trends, I try using HP filter to smooth real GDP levels from the beginning of the series and/or taking the average growth rate of three last pre-crisis periods to project potential GDP level trend. I also experiment with different smoothing parameters for annual data. The results are on average unaffected. However, level loss measures are particularly robust to such changes, while growth loss measures are more sensitive for some countries, increasing estimated output losses for some countries, and decreasing them for others.

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[15] Angkinand (2008) provides a good overview of the issues concerning estimation methodology used to estimate output losses associated with crises.

[16] HP filter is a smoothing method widely used to extract a long-term (trend) component of a series. The filter minimizes the variance of the smoothed series around the original series, subject to a smoothing parameter (penalty), which constraints the second difference of the smoothed series. Higher values of the smoothing parameter make the series smoother. The commonly suggested values are 6.25 or 100 for annual data and 1600 for quarterly data.

4.2 Data

Annual GDP data is from World Economic Outlook Database of International Monetary Fund [17], April 2012 and national sources for Macao, S.A.R. of China. The data used ends in 2011, which for some countries includes estimates for the last year(s). Quarterly data of real GDP is compiled from a variety of sources, such as Eurostat, OECD, Datastream and national sources, using April, 2012 vintages. For some countries, the series required additional own calculations as well as seasonal adjustment. Quarterly real GDP series that were seasonally unadjusted at source were seasonally adjusted through a commonly used X-12 Arima procedure using GRETL econometric package. Quarterly data series end in 2011q2 or q3 depending on a country.

4.3 Results

Output growth rates have already recovered, while output levels have not yet recovered for most of the affected countries [18]. Definition of a crisis start as a technical recession using quarterly data seems wrong for a number of countries. For example, in Armenia, Bulgaria and Slovak Republic a quarter of negative growth is succeeded by a quarter of marginally positive growth rate, which technically truncates automatic output loss accumulation. Those economies do not seem to have recovered at those points in time, as subsequent quarters exhibit negative output growth rates again. In turn, use of quarterly data to estimate growth-losses seems misleading without knowing exogenously defined crisis start and end dates. Quarterly level-loss estimates do not suffer in that respect.

For some economies large output losses may have accumulated due to other events than the late-2000s crisis. Even though those effects are hard to distinguish, I consider it relevant to truncate accumulation of output losses at the start of 2011 for Japan due to the potential effects of an earthquake in the spring of 2011. More importantly, I see a need to truncate accumulation of output losses at the start of 2011 for some Arab countries due to the Arab Spring. I truncate output losses for Bahrain, Egypt, Libya, Syria, Yemen, and Tunisia. Next I drop Madagascar, Mauritania and Niger from the sample due to the potentially significant deteriorations in political stability in those countries that could have caused deterioration in the output [19]. I further follow Lane and Milesi-Ferretti (2010) in dropping Equatorial Guinea from the sample due to problems with data quality and also drop Zimbabwe due to presence of extreme values on many potentially significant crisis severity indicators, such as inflation, real interest rates, equity returns and banking sector characteristics.

Figure 1 exhibits the distribution of output loss and lists 15 worst affected economies based on output loss measure loss_11, which is arguably the best proxy of the output loss extent that is available for a large sample of

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17 WEO publishes GDP in billions of national currency rounded to 3 decimal points. For some countries, GDP is small enough making the rounding error significant. Due to this fact, I take the growth rates of real GDP as correct and extrapolate real GDP levels.

18 Graphs provided in Annex 2 help to better visualise how various output loss measures fit the data across a global sample.

19 Political environment changes are indicated by significant adverse Polity 2 index changes for those countries (see Polity IV Project).

countries. It is a measure which captures output slowdowns and not only technical recessions and accounts for cumulated output level loss.

The distribution of the output loss is truncated at zero with a significant number of countries that were unaffected in terms of output loss by the crisis (28 out of 180 economies in case of loss_11). In unreported results I establish that the only economies that are among the 15 worst affected countries based on all 12 output loss measures are the three Baltic states - Estonia, Latvia and Lithuania. Latvia tops the list in all but loss_10 measure, which is a growth-loss measure estimated using annual data. Based on loss_10, output losses were larger in Azerbaijan and Angola.

All loss measures are statistically significantly correlated at 0.01 significance levels with pairwise correlation coefficients ranging from 0.64 to over 0.98 depending on how similarly the measures are defined (see Table 3).

Table 2 provides summary statistics of the measures. As indicated above, for all but loss_10, the maximum value of output loss belongs to Latvia. The estimates based on quarterly data were divided by four to make them comparable to those estimated using annual data. Use of quarterly output level loss estimates may be more precise by better dating of a crisis episode.

5 Determinants of output losses

5.1 Tobit model specification

As the observed output loss distribution is truncated at zero, a maximum likelihood method Tobit is an appropriate estimation model to apply. Application of the ordinary least squares (OLS) estimation is expected to lead to inconsistent and biased estimators due to a large number of observations with a value of zero. Tobit estimation is frequently used in studies which examine determinants of the severity (in terms of output loss) of financial crises.[20] Tobit model can be expressed as follows. Suppose the underlying continuous version of the model is given by:

$$Y_i^* = \alpha + \beta X_i^* + \varepsilon_i^*,$$

where Y^* would represent output effects continuously, including unobserved output gains. Truncating the distribution of Y^* to output losses means that the observed dependent variable output loss, denoted by Y, (expressed in positive terms for convenience) is given by:

$$Y_i = Y_i^* \qquad \text{if} \qquad Y_i^* > 0$$

$$Y_i = 0 \qquad\qquad \text{otherwise.}$$

The actual estimated equation (Tobit model) is then given by:

$$Y_i = \alpha + \beta X_i + \varepsilon_i,$$

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[20] See Angkinand (2009), Boyd et al (2001) among other.

where X represents a set of explanatory variables. Directly estimated β coefficients should be interpreted as effects of the regressors on the latent variable. They should not be interpreted as effects of the independent variables on the dependent variable for cases that are above the limit. Therefore, I calculate marginal effects of the explanatory variables on the actual outcome of output loss[21]. For a particular variable of interest X_k, the effect can be expressed as $\dfrac{\partial E(Y)}{\partial X_k}$. Marginal effects are traditionally estimated at means of explanatory variables and can be interpreted in the same way as coefficients estimated from OLS, namely as a change in the dependent variable for a given unit change in an explanatory variable.

5.2   Variables

Guided by the review of literature[22], I select variables of interest for an empirical study on the determinants of the late 2000s crisis severity. I test only for the pre-crisis dated variables, some of which are structural characteristics that change relatively little with time[23]. These indicators aim to control for the overall as well as financial level of development and proxy for macroeconomic fundamentals, vulnerabilities and institutional environment of economies. They also aim to capture stock, speed and acceleration of the accumulation of macroeconomic imbalances in the run-up to the late-2000s crisis.

It is questionable if use of indicators dated from 2007 overcomes endogeneity problems fully, since policy makers might have already responded to the first signals of the crisis. Therefore, I use indicator values from 2006 unless reported otherwise. Use of indicators dated before the crisis onset may provide more meaningful potential inputs for EWS, by giving policy makers more time to react appropriately (Rose and Spiegel, 2009).

I use the indicators expressed in relative terms (as a share of GDP etc.), which allows for cross-country comparability. In addition, I consider appropriate transformations of the indicators. To capture structural nature of indicators, I calculate various backward moving averages. To better account for underlying trends, I consider changes in indicators over a different number of years (mostly 3 and 5)[24].

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[21] I use STATA command *mfx*.

[22] Frankel and Saravelos (2010) to start with.

[23] Apart from the pre-crisis conditions and structural characteristics, crisis severity may be expected to differ based on policy responses, such as, financial support programmes and fiscal stimulus versus fiscal austerity measures, as well as monetary policy actions. Those effects are difficult to model for a large sample of countries, and, more importantly, they are expected to be endogenous. Only studies with a time series component could be able to examine the issue of endogeneity. Even then, the availability of time series since the start of the late-2000s crisis might be still too short to draw conclusions.

[24] Longer assessment period potentially better captures structural characteristics and indicates relevant developments in the fundamentals, however very long assessment periods (such as 10 years and longer) may have witnessed exceptional events, which have influenced the indicators. In addition, long backward looking assessment is less intuitive and has lower implications for policy making, which concentrates on medium-term adjustment idea. See the discussion of the methodology of the Scorecard of Macroeconomic imbalances (European Commission, 2012).

The list of tested variables and transformations is as follows[25]:

General controls

- Income level (GDP per capita in PPP (in log); dummies for high income; upper-middle income; low-middle income and low income countries as defined by the World Bank);

- Additional sample dummies (Dummies for Highly Indebted Poor Countries (HIPC); Least Developed Countries (LDC); financial centres and oil exporters as defined in Rose and Spiegel (2010) dataset);

Macroeconomic fundamentals

- Output growth (GDP growth in 2006 and in 2007; cumulative GDP growth over 2002-2006 and over 2004-2006);

- Domestic credit expansion (3-year and 5-year growth (in p.p.) in domestic credit to private sector as a share of GDP);

- Real exchange overvaluation (3-year and 5-year percentage growth in REER; percentage deviation of REER from its 10-year average);

- Money supply (M2 (alternatively, M3) as a share of GDP; 3-year and 5-year growth (in p.p.) in M2 (alternatively, M3) as a share of GDP);

- Current account balance (Current account balance as a share of GDP; 3-year and 5-year averages in current account balance as a share of GDP);

- Inflation (Consumer Price Index (CPI), annual percentage change; 3-year and 5-year averages in CPI, annual percentage change);

- Interest rates (3-year and 5-year growth (in p.p.) in real interest rate);

- Equity returns (3-year and 5-year averages in annual equity returns);

- Housing market conditions (Cumulative growth in housing prices over 2000-2006; mortgage debt as a share of GDP as defined in Rose and Spiegel (2010) dataset);

- Budget balance (Cash surplus/deficit as a share of GDP; 3-year and 5-year averages in cash surplus/deficit as a share of GDP);

- Government debt (General government gross debt as a share of GDP);

- Savings (Gross domestic savings as a share of GDP);

- Unemployment (Unemployment share; long-term unemployment share);

Vulnerabilities

- Reserves (Short-term debt as a share of total reserves; M2 to total reserves ratio; total reserves in months of imports; total reserves as a share of GDP);

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[25] Table 4 provides summary statistics of the independent variables. Annex 1 provides sources and additional notes on the independent variables.

- External debt (External debt stocks as a share of GNI; short-term debt as a share of total external debt);

- Exchange rate regimes (Dummies for de facto fixed, intermediate and floating exchange rate regimes);

- Banking sector conditions (Bank credit to bank deposits ratio; return on assets and return of equity ratios; overhead costs to assets ratio; net interest margin ratio; concentration ratio; cost to income ratio; liquid reserves to assets ratio; nonperforming loans share);

- Stock market size (Market capitalization of listed companies as a share of GDP; 3-year and 5-year growth (in p.p.) in market capitalization listed companies as a share of GDP);

- Financial openness (Net foreign assets as a share of GDP; total foreign assets plus liabilities as a share of GDP);

- Capital and income flows (FDI liabilities as a share of GDP; portfolio equity liabilities as a share of GDP; remittance inflows as a share of GDP);

- Trade openness (Exports and imports of goods and services, as well as total trade (exports plus imports) as a share of GDP);

- Sectoral composition (Oil rents as a share of GDP; insurance and financial services as a share of commercial service exports; agriculture and manufacturing value added as a share of GDP);

Institutional environment

- Institutions (Index of regulatory quality from Worldwide Governance Indicators; indexes of regulation liberalisation – on credit market, labour market, business, and overall- from the Economic Freedom of the World).

5.3   Results

Table 5 to Table 29 provide the results of Tobit estimations. The coefficients are estimated at means of explanatory variables and represent marginal effects of explanatory variables on the actual expected output loss, which is measured by output loss measure loss_11 (see above). Constant term is included but not reported. For convenience, output loss is expressed in positive terms. Therefore, a positive coefficient should be interpreted as marginally increasing the expected output loss outcome (bad).

As documented by recent studies, the late-2000s crisis is an advanced economy phenomenon. I find support for that fact as well. Table 5 reports marginal effects of income on output loss. Marginal effect of income per capita is positive and statistically significant at 0.001 level. An increase of per capita income by one per cent increases the expected output loss by 8.1 percentage points of pre-crisis GDP. Income effect is also present when output loss is regressed on income group dummies. High income countries are expected to experience larger output losses by 14.6 percentage points of pre-crisis GDP. The expected marginal effect for upper-middle income countries is positive as well, but smaller, and stands at 8.6 percentage points of pre-crisis

GDP. Effects on low-middle income and low-income are negative and statistically significant at 0.001 level. The coefficients suggest that the expected output loss is lower by about 12 to 13 percentage points of pre-crisis GDP for both low-middle income and low-income countries, indicating that there is little economic difference between effects on the two lowest income groups. Income group dummies lose statistical significance once estimations control for income per capita, indicating strong positive and consistent marginal effect of the general level of economic development (proxied by income per capita) on the expected output loss.

Table 6 reports results of marginal effects of other sub-sample dummies. Effects on dummies representing Highly Indebted Poor Countries (HIPC) and Least Developed Countries (LDC) are negative and statistically significant, with the effects slightly larger in absolute terms than those for low-middle and low income groups (see Table 5 for comparison). Financial centres and oil exporters are dummies from Rose and Spiegel (2010) dataset, where the researchers identify financial centres by a high ratio of external assets and liabilities to GDP and oil exporters as all past and present OPEC members plus Norway, Russia, Mexico and Kazakhstan, Australia, Canada, and New Zealand, and some other countries, which are identified having significantly large commodity exports[26]. Based on the estimated coefficients, financial centres are expected to experience by about 3 percentage points of GDP larger output losses, but the effect is not statistically significant. Marginal effect of being an oil exporter is neither economically, nor statistically significant. Again, controlled for income per capita, marginal effects of the dummies lose statistical significance.

I next test for marginal effects of pre-crisis output growth (see Table 7). To some extent, pre-crisis output growth might be endogenously defined, as it is used in estimating output losses themselves for generating counterfactual output growth and level trends. Studies examining determinants of the magnitude of output losses associated with crises tend to nevertheless include pre-crisis output growth rates as control variables (see Angkinand, 2009, for example). The estimated marginal effects of different pre-crisis growth rate transformations are all positive and statistically significant. In economic terms, the magnitude of the effects is large. The most both economically and statistically significant marginal effect is of GDP growth over 2002-2006. A marginal increase of one standard deviation in terms of GDP growth over 2002-2006 leads to expect by about 12 percentage points larger output loss[27]. Similarly, one standard deviation increase in GDP growth in 2006 increases expected output loss by about 6 percentage points.

Another variable of particular interest is pre-crisis credit growth. Countries with larger estimated output losses tend to have experienced credit booms in the run-up to the crisis. Table 8 reports marginal effects of different transformations of private sector credit growth. Both 3-and 5-year pre-crisis credit expansion rates lead

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[26] Commodity exporters might have been more severely hit by the crisis due to declines in commodity prices as the crisis intensified. Lane and Milesi-Ferretti (2010) note that if one looks at the output growth over 2008-2009 as a measure of crisis severity, the average prices of oil and other commodities were still rather strong. Therefore, significance of variables related to commodity exports might be sensitive to the definition of the crisis period.

[27] Result of marginal coefficient of GDP growth over 2002-2006 of 0.592 multiplied the standard deviation of GDP growth over 2002-2006, which equals 20.14 percentage points.

to expect statistically significant and positive marginal effects on output loss. The effects largely remain after controlling for differences in general economic development.

In unreported estimations I establish that the level of economic development (proxied by income per capita), pre-crisis output growth and credit expansion are largely statistically significant output loss determinants with consistently positive marginal effects in the majority of different specifications. In turn, I examine other pre-crisis conditions and structural variables controlling for GDP per capita, output growth and 3-year change in private sector credit to GDP ratio (all estimated in 2006). Controlling for income per capita levels is common to many recent studies[28] to account for general levels of economic development and quality of fundamentals of countries.

Real exchange rate overvaluation is one of the most frequently tested and found significant determinants of crisis incidence and severity (Frankel and Saravelos, 2010). I examine possible real exchange rate overvaluation proxies such as the percentage deviation of real effective exchange rate (REER) from its 10-year average, as well as 3- and 5-year pre-crisis appreciation. I use two sources for REER variables (see Table 9). Data on REER can be obtained from World Development Indicators (WDI) by the World Bank. Zsolt (2012) from Bruegel institute significantly extends REER cross-country coverage, which is useful for cross-country studies. After dropping Iraq as an outlier in terms of REER appreciation from the dataset of Zsolt (2012), the sample is left with about 170 economies, depending on the availability of time series used for a particular transformation. This is a significantly larger sample than the sample of 93 economies in case WDI data is used.[29]. Marginal effects on all three proxies of real exchange rate overvaluation are positive in all specifications, however the magnitude and statistical significance falls in the specifications controlling for income, output growth and credit expansion effects.

Money and quasi money (M2) as well as a broader money supply measure of liquid liabilities (M3) relative to GDP capture differences in financial depth, while increases in those variables suggests financial deepening. In the specifications with control variables (see Table 10), the estimated marginal effects suggest statistically significant negative role of financial depth on the expected output loss. None of the estimated marginal effects of money supply measures is statistically significant when monetary base M3 is used as a proxy.

Current account balances relative to GDP, which proxy for the extent of external imbalances, are found to have marginal effects with a consistent negative sign in line with economic intuition (see

Table 11 11). Countries with current account surpluses are expected to experience marginally smaller output losses. Statistically significant negative coefficients are found for the marginal effect of 5-year pre-crisis average of current account balance to GDP. An increase in current account surpluses of about two percentage points of GDP is expected to reduce the expected output loss by about one percentage point of GDP.

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[28] Aizenman and Pasricha (2010), Berglöf et al (2010), Claessens et al (2010), Frankel and Saravelos (2010), Giannone et al (2011), Lane and Milesi-Ferretti (2010), Rose and Spiegel (2009, 2010, 2011).
[29] Respective transformations significantly correlate between WDI database and Zsolt (2012), with the unreported pairwise correlation coefficients from 0.7 to 0.98 depending on the transformation.

Consumer price inflation (CPI) in the run-up to the crisis aims to proxy the general macroeconomic state of an economy and the quality of a country's macroeconomic policy. In all the specifications with control variables (see Table 12), marginal effects of pre-crisis annual CPI inflation are positive, indicating that countries with higher inflation rates in the run-up to the crisis are expected to experience higher output losses. The significance and magnitude of the coefficients on all of the CPI transformations diminishes with the inclusion of pre-crisis output growth as the control variable, suggesting that higher inflation and higher growth in the run-up to the crisis might be carrying much of the same information about underlying internal imbalances of economies.

Increases in the real interest rates over 3- and 5-year pre-crisis windows are associated with positive, but not statistically significant marginal effects on output losses, based on the specifications with control variables (see Table 13). Similarly, 3- and 5-year averages in annual pre-crisis equity returns are expected to marginally increase output losses associated with the crisis, but not statistically significantly (see Table 14).

As the late-2000s crisis started with the sub-prime mortgage crisis in the US, while many other countries also showed signs of real estate bubbles in the run-up to a global crisis, variables on housing market characteristics are of interest. Table 15 reports marginal effects of housing market variables from Rose and Spiegel (2010) dataset[30]. Housing price appreciation in the run-up to the crisis (estimated over 2000-2006) shows a strong, statistically significant and consistently positive marginal effect on the expected output losses. The variable is only available for 45 countries, which are generally high income economies, which makes it neutralize the statistical significance of the GDP per capita. Domestic credit expansion effects decrease in magnitude with the inclusion of housing price appreciation, but remain marginally significant, suggesting that credit might have fuelled housing prices, but also other fragilities. The share of outstanding mortgage loans relative to the size of the economy has a negative effect, which is counterintuitive. The effect is however not robust to the inclusion of credit expansion variable in the specification.

Pre-crisis fiscal deficits exhibit strongest marginal effects when averaged in a 5-year pre-crisis window. Only the latter transformation is robust in terms of positive sign to the inclusion of all three control variables. The effect is however not economically significant (see Table 16). Other variable, which aims to capture the role of the state of public finance, is the size of gross general government debt (tabulated in Table 17). In all the specifications the coefficient is negative, suggesting that in the late-2000s crisis expected output losses can not be associated with higher public debts.

Marginal effects of gross domestic savings are not statistically robust to the inclusion of control variables (see Table 18). After controlling for income, output and growth effects, marginal effect of gross domestic savings turns out negative, which is in line with economic intuition. It is reasonable to expect that countries with larger savings should be in position to weather the crisis better, but the effect is not statistically significant.

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[30] Rose and Spiegel (2010) dataset indicates that these variables are originally used in Claessens et al (2010).

Effects of pre-crisis unemployment levels consistently show a counterintuitive negative sign, but are not statistically significant. I also test for a potential role of long-term unemployment, but fail to find significant results (see Table 19).

Marginal effects of the adequacy of reserves exhibit consistent signs that are also in line with economic intuition (see Table 20), although statistical significance differs among proxies. Interpreting the consistent signs of the effects on all the proxies used, adequacy of the reserves can be judged relative to the size of the economy (using ratio to GDP), relative to the extent of external imbalances (using an estimation of a number of months that economy could sustain imports in the event of a sudden stop in capital and income flows), relative to its short-term financing needs (covering larger share of short-term debt), and well as relative to the financial depth of the economy (covering larger share of the monetary base). The latter effects of M2 to total reserves are positive and statistically significant at 0.001 level in all specifications, suggesting that adequacy of reserves could be best judged relative to the financial depth of the economy. Countries with reserves not adequately large for the financial depth of the economy are expected to experience larger output losses. Some possible explanations of such a result are suggested in IMF (2011). Reserves relative to the broad monetary base (typically M2) is not yet a well established indicator to assess reserve adequacy, but may be used to capture risk of capital flight, such as outflows of domestic deposits. In addition, it may be seen as a measure of a buffer, which could potentially be used to support banks in need in the event of a crisis.

Marginal effects of the size of external debt (tabulated in Table 21) show unexpected negative signs, however are not statistically significant. Short-term debt share in the total external debt is positively associated with expected output losses, but again the effects are not statistically significant.

Based on the estimated marginal effects associated with exchange rate regime dummies, fixed exchange rate regimes are marginally increasing expected output losses, but the effect is not statistically significant. In the specifications controlling for income, output growth and credit expansion effects, intermediate and floating exchange rate regimes are marginally lowering expected output losses, but again, the effects are not statistically significant (see Table 22).

Given that many countries in the late-2000s crisis experienced banking sector crises, it seems plausible to test for the role of banking sector characteristics on crisis severity. Marginal effects tabulated in Table 23 might suggest several interpretations. First, the marginal effects of bank credit to bank deposit ratio are positive across specifications and overall marginally statistically significant. This can have two interpretations. First, the ratio of bank credit to bank deposits can be positively associated with financial development, as the ratio proxies for efficiency of channelling deposits into credit. Second, the ratio might proxy for riskier credit provision to private sector by banks. Both explanations are feasible to explain output losses associated with the late-2000s crisis. Bank profitability, operational efficiency and liquidity proxies provide misleading effects, indicating the average profitability (higher return on assets and return on equity), efficiency (lower cost to income, lower overheads to total assets and higher net interest margin) and liquidity (higher liquid reserves to assets) leads to expect higher output losses, although the effects are not statistically significant. The effect of the concentration ratio turns

marginally positive in the specifications accounting for credit growth, while the effect of nonperforming loans ratio- a proxy for a higher level of risk that banks are operating upon- turns positive only when accounting for credit expansion and output growth effects. However both concentration and nonperforming loans' characteristics remain statistically insignificant.

Larger stock markets (as indicated by larger stock market capitalisations) tend to marginally decrease expected output losses and the effect is statistically significant at 0.05 level (see Table 24). Similarly, relative increases in the role of stock market financing in the run-up to the crisis have a positive and statistically significant negative effect, indicating that perhaps financing on equity markets was less affected than financing dependent on other sources, such as bank loans.

Results of marginal effects on the relative gross size of a country's balance sheet (total foreign assets plus liabilities) and the relative net position (foreign assets minus liabilities) seem to suggest that after controlling for other effects, financial openness marginally reduces expected output losses (see Table 25), but the effects are not statistically significant at standard levels. The role of different capital and income inflows is not robust to the inclusion of control variables (Table 26). The positive marginal effect associated with FDI liabilities and the negative marginal effect associated with portfolio equity liabilities is counterintuitive and both effects are not statistically significant. Marginal role of remittance inflows is positive, but not statistically significant (after excluding Seychelles as an outlier with a high value of relative remittance inflows).

Relative size of trade, indicating trade openness of an economy, has a positive estimated coefficient, but the effect is not economically significant. In addition, the effect is not statistically robust to the inclusion of control variables (see Table 27). Marginal effects of exports and imports taken separately are neither statistically, not economically significant in the tabulated specifications either.

Based on the marginal effects of relative size of some specific sectors (see Table 28), no consistent and significant evidence on the role of sectoral composition can be drawn from simple specifications. The only strongly significant negative effect is associated with the relative share of agriculture, but the effect is not statistically robust to the inclusion of income per capita due to high multicollinearity of the two. Similarly, marginal effects of general as well as specific types of institutions (see Table 29) show marginally positive and statistically significant coefficients that are not robust to the inclusion of per capita income effects.

6 Conclusions

The late-2000s crisis has generated renewed interest in indicators that can explain incidence and severity of financial crises, but recent topical cross-country studies have so far come up with inconclusive results. There is no uniform theoretical guidance on what causes crises and what determines relative vulnerability of economies. Selection of potential crisis incidence and severity determinants remains a largely empirical exercise, which is guided by economic intuition and limited by data availability. Intuition suggests many potential crisis incidence and severity covariates, which could be classified as macroeconomic fundamentals, vulnerabilities

stemming from real and financial structure of economy, institutional characteristics and various contagion effects. In addition, severity of crises might depend on policy responses, but the relationship can be endogenous.

I re-examine the topic of possible determinants of cross-country differences in the late-2000s crisis severity. First, I develop new crisis severity measures. I estimate crisis severity as cumulative negative deviations of either output growth or output level from estimated potential trends, which is a method commonly used to estimate overall economic costs of financial crises. Such methods allow to more properly account for underlying differences in output potential across countries and capture differences in timing of adverse effects. Based on the estimated output losses, the most affected countries have been the Baltic states. Latvia tops the list with a cumulated loss of up to 150 percentage points of its annual pre-crisis GDP. Most of the affected economies have not yet recovered in terms of closing output level gaps.

The results of output losses have to be interpreted with some caveats in mind. Estimation of output trends are based on pre-crisis output developments, which works on assumption that the period used for estimation can be considered tranquil. However some countries (the same Baltic states, for instance) may have exhibited unsustainable rates of output growth just before the crisis. This leads to possibly overestimated output losses. In addition, the crisis may have permanently reduced output potential and the previously estimated trend is no longer relevant for judging recovery. A number of other potential sensitivities of crisis cost estimations remain. I test for sensitivity in various estimation parameters and definition of crisis start, and the estimates are on average robust.

Next, I try to link a variety of pre-crisis conditions and structural indicators by estimating marginal effects from heteroscedasticity robust Tobit estimations. Income per capita, pre-crisis output growth and credit expansion appear as consistently positive statistically significant indicators that marginally increase expected output losses. After controlling for these factors, marginal effects of a number of other indicators lose statistical significance or change signs. The ones that may be further associated with higher output losses for a large number of countries are current account deficits, inadequate international reserves relative to the extent of financial depth (monetary base) and relatively smaller equity markets. Yet it is hard to conclude on any indicator as a true driver of crisis costs. Most of the a-priori plausible crisis severity determinants are expected to be related, and, therefore, correlate among each other. Presence of multicollinearity in multivariate regressions poses a challenge for finding statistically significant variables by misleadingly inflating their standard errors. Some of the indicators might indirectly cover other indicators, which could explain crisis severity. For example, the role of high inflation might be covered by real exchange rate overvaluation (and vice versa), while following the hypothesis of 'twin deficits', a large fiscal deficit might run in parallel with a large current account deficit.

An interesting result for further examination is the role of international reserves. The exact role of reserves might be difficult to interpret. Emerging market economies, most notably China, may have accumulated reserves excessive of the economic needs judged by commonly used proxies. Given that these are also economies with lower output losses associated with the late-2000s crisis, the effects of adequacy of reserves might be not robust across samples.

Table 1 Definitions of output loss measures

Output loss name	loss_1	loss_2	loss_3	loss_4	loss_5	loss_6	loss_7	loss_8	loss_9	loss_10	loss_11	loss_12
Data frequency	Quarterly						Annual					
Crisis start definition	Recession			Slowdown			Recession			Slowdown		
Crisis start definition	First quarter of negative growth followed by at least one consecutive quarter with negative growth (within 2008q1-2009q4)			First quarter of a negative gap (within 2008q1-2009q4)			First year of negative growth (within 2008-2009)			First year of a negative gap (within 2008-2009)		
Output loss definition	Growth-loss	Level-loss		Growth-loss	Level-loss		Growth-loss	Level-loss		Growth-loss	Level-loss	
Crisis end definition	Growth gap-close	Level gap-close	Growth gap-close*	Growth gap-close	Level gap-close	Growth gap-close*	Growth gap-close	Level gap-close	Growth gap-close*	Growth gap-close	Level gap-close	Growth gap-close*
Benchmark parameters	Trend: 3-year pre-crisis average	Trend: last year's growth rate from HP (1600) over 10 yr pre-crisis series		Trend: 3-year pre-crisis average	Trend: last year's growth rate from HP (1600) over 10 yr pre-crisis series		Trend: 3-year pre-crisis average	Trend: last year's growth rate from HP (100) over 10 yr pre-crisis series		Trend: 3-year pre-crisis average	Trend: last year's growth rate from HP (100) over 10 yr pre-crisis series	
Sensitivity test parameters	Trend: 5- and 10-year pre-crisis average	Trend: average of last three years' growth rates and/or HP smoothed from the beginning of the series		Trend: 5- and 10-year pre-crisis average	Trend: average of last three years' growth rates and/or HP smoothed from the beginning of the series		Trend: 5- and 10-year pre-crisis average	Trend: average of last three years' growth rates and/or HP smoothed from the beginning of the series and/or HP(6.25)		Trend: 5- and 10-year pre-crisis average	Trend: average of last three years' growth rates and/or HP smoothed from the beginning of the series and/or HP(6.25)	

*- level-loss accumulation is truncated at the period when growth rate returns to its 3-year pre-crisis average, based on the finding the period when growth rate returns to trend is close to a 'consensus' crisis definition (Hoogarth et al, 2002). Trend growth rates, which were estimated as negative, were changed to zero. Negative trend growth rates, if left untreated, would have produced misleading downwards sloping output level trends (see Ankinand, 2009).

Figure 1 Distribution of output losses and the 15 worst affected countries
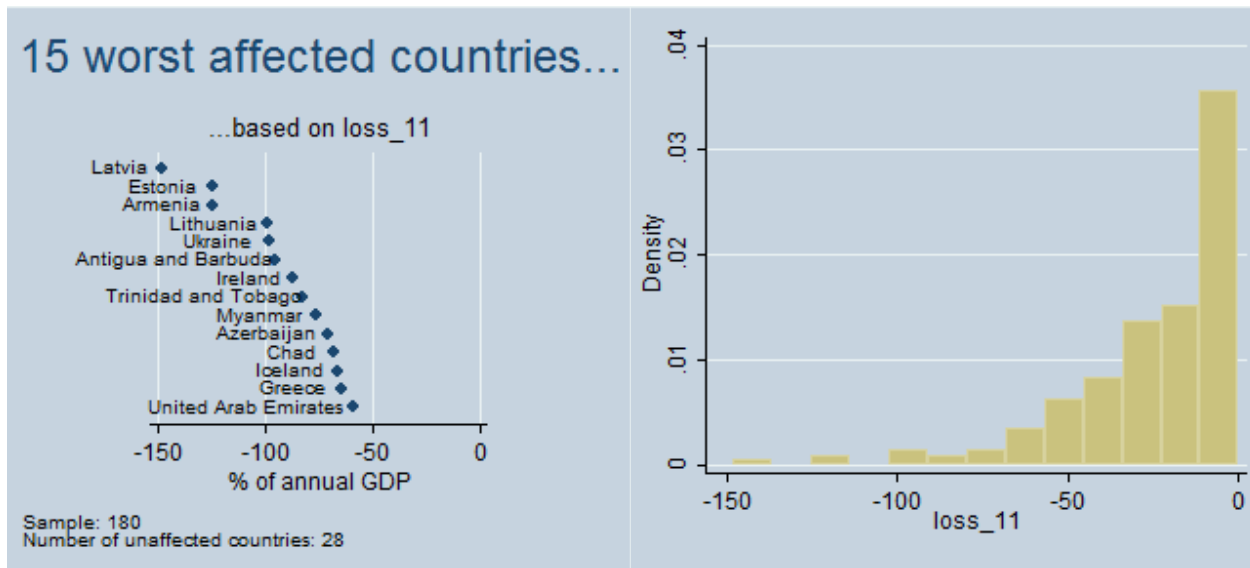
Table 2 Summary statistics of output loss measures

	Mean	St. dev.	Min	Max	Observations
loss_1	2.58	2.52	0.00	13.89	89
loss_2	26.57	26.46	0.00	152.23	89
loss_3	13.46	21.61	0.00	152.23	89
loss_4	3.47	2.49	0.40	13.89	89
loss_5	36.10	26.78	3.23	152.23	89
loss_6	17.92	23.17	0.40	152.23	89
loss_7	7.10	10.00	0.00	56.86	180
loss_8	16.78	24.59	0.00	148.17	180
loss_9	14.77	24.32	0.00	148.17	180
loss_10	12.82	12.63	0.00	89.37	179
loss_11	24.19	26.29	0.00	148.17	180
loss_12	21.65	26.31	0.00	148.17	179

Output loss measures are expressed in positive values for convenience. Losses estimated using quarterly data (loss_1 to loss_6) are expressed in terms of annual GDP for convenience.

Table 3 Pairwise correlation coefficients of output loss measures

	loss_1	loss_2	loss_3	loss_4	loss_5	loss_6	loss_7	loss_8	loss_9	loss_10	loss_11	loss_12
loss_1	1.00											
loss_2	0.95***	1.00										
loss_3	0.88***	0.85***	1.00									
loss_4	0.82***	0.79***	0.79***	1.00								
loss_5	0.74***	0.81***	0.72***	0.93***	1.00							
loss_6	0.75***	0.72***	0.90***	0.88***	0.80***	1.00						
loss_7	0.72***	0.76**	0.75***	0.88***	0.91***	0.82***	1.00					
loss_8	0.71***	0.77***	0.73***	0.85***	0.91***	0.77***	0.95***	1.00				
loss_9	0.69***	0.75***	0.74***	0.85***	0.91***	0.80***	0.94***	0.98***	1.00			
loss_10	0.69***	0.73***	0.69***	0.90***	0.96***	0.76***	0.67***	0.64***	0.66***	1.00		
loss_11	0.73***	0.79***	0.68***	0.85***	0.94***	0.71***	0.78***	0.87***	0.85***	0.79***	1.00	
loss_12	0.69***	0.76***	0.69***	0.84***	0.93***	0.73***	0.79***	0.86***	0.88***	0.82***	0.97***	1.00

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4 Summary statistics of independent variables

	Mean	St. dev.	Min	Max	Obs.
Agriculture, value added (% of GDP)	13.14	12.36	0.05	53.43	154
Annual equity returns, 3yr average	30.76	18.14	1.17	98.22	74
Annual equity returns, 5yr average	30.52	16.43	-2.84	76.46	72
Bank concentration (%)	68.28	20.11	18.68	100	145
Bank cost-income ratio (%)	66.39	24.71	26.66	191.05	145
Bank credit to bank deposits (%)	90.6	47.64	23.63	332.75	174
Bank liquid reserves to bank assets ratio (%)	0.19	0.2	0	1.02	120
Bank net interest margin (%)	4.76	2.73	0.71	15.88	143
Bank nonperforming loans to total gross loans (%)	4.82	5.47	0.1	26.8	95
Bank overhead costs to total assets (%)	4.14	2.37	0.84	11.97	145
Bank ROA (%)	1.5	1.42	-5.1	4.91	145
Bank ROE (%)	14.53	11.71	-53.09	49.23	145
Business regulations	5.77	0.97	3.07	8.05	136
Cash surplus/deficit (% of GDP), 3yr average	-0.1	4.18	-9.03	15.17	97
Cash surplus/deficit (% of GDP), 5yr average	-0.79	3.67	-10.61	12.59	82
Cash surplus/deficit(% of GDP)	0.78	5.86	-10.94	32.06	107
CPI (%)	6.08	5.85	-1.41	53.23	170
CPI (%), 3yr average	5.79	5.15	-0.61	39.05	165
CPI (%), 5yr average	6.17	6.8	-2.02	57.39	162
Credit market regulations	8.4	1.26	4.45	10	137
Current account balance (% of GDP)	-0.47	13.76	-31.34	51	179
Current account balance (% of GDP), 3yr average	-1.24	10.91	-25.76	46.56	178
Current account balance (% of GDP), 5yr average	-1.58	9.52	-30.74	44.82	177
De facto fixed	0.52	0.5	0	1	174
De facto floating	0.15	0.36	0	1	174
De facto intermediate	0.33	0.47	0	1	174
Domestic credit to private sector (% of GDP), 3yr growth	8.61	22.54	-31.57	220.62	169
Domestic credit to private sector (% of GDP), 5yr growth	8.1	18.89	-20.66	189.07	171
Exports of goods and services (% of GDP)	47.79	34.89	0.18	234.71	135
External debt stocks (% of GNI)	50.08	40.61	3.65	277.09	120
FDI liabilities (% of GDP)	48.76	58.6	0.73	525.65	171
Financial centres	0.12	0.33	0	1	100
GDP growth in 2006	5.94	4.41	-4.46	34.51	180
GDP growth in 2007	6.12	4	-2.37	25	180
GDP growth over 2002-2006	28.47	20.14	-17.03	123.82	178
GDP growth over 2004-2006	18.07	11.95	-1.56	87.35	179
GDP per capita, PPP, in log	8.72	1.3	5.63	11.16	177
General government gross debt (% of GDP)	-0.47	13.76	-31.34	51	179
Gross domestic savings (% of GDP)	19.5	18.61	-34.61	66.84	167
High income	0.27	0.45	0	1	178
HIPC	0.2	0.4	0	1	180
Housing price growth over 2000-2006	53.91	55.35	-25.64	228.05	45
Imports of goods and services (% of GDP)	54.11	37.44	0.12	238.6	135
Insurance and financial services (% of commercial service exports)	4.45	7.72	0	69.98	155
Labor market regulations	6.28	1.48	2.77	9.4	136
LDC	0.25	0.43	0	1	180
Long-term unemployment (%)	38	20.89	1.1	91.5	42
Low income	0.16	0.37	0	1	178
Low-mid income	0.28	0.45	0	1	178
M2 (% of GDP)	59.29	45.66	8.66	260.47	170
M2 (% of GDP), 3yr change	3.43	12.18	-34.67	96.47	170
M2 (% of GDP), 5yr change	5.98	15.46	-38.29	106.26	165

M2 to total reserves ratio (%)	7.15	34.27	0	421.89	156
M3 (% of GDP)	43.97	28.84	18.23	186.02	48
M3 (% of GDP), 3yr change	0.71	7.43	-26.88	12.03	42
M3 (% of GDP), 5yr change	0.79	9.62	-29.97	15.12	40
Manufacturing, value added (% of GDP)	13.86	7.36	1.81	39.17	142
Market capitalization (% of GDP)	69.6	70.31	0.63	471.35	109
Market capitalization (% of GDP), 3yr growth	29.56	34.09	-34.4	167.58	101
Market capitalization (% of GDP), 5yr growth	21.29	27.05	-55.91	132.06	108
Mortgage debt (% of GDP)	38.06	29.41	1.58	100.83	45
Net foreign assets (% of GDP)	-21.14	92.13	-294.32	454.13	171
Oil exporters	0.17	0.38	0	1	100
Oil rents (% of GDP)	7.03	16.25	0	92.61	177
Portfolio equity liabilities (% of GDP)	12.43	38.84	0	427.11	171
Private credit to GDP, 3yr growth in percentage point	5.51	17.02	-36.21	153.32	152
Private credit to GDP, 5yr growth in percentage point	6.09	21.65	-55.72	176.52	147
Real interest rate (%), 3yr change	-3.5	8.04	-41.01	20.1	137
Real interest rate (%), 5yr change	-5.45	10.39	-51.26	32.21	134
REER, 3yr growth (%)	4.04	12.91	-35.62	68.18	172
REER, 5yr growth (%)	0.93	20.2	-74.27	58.95	171
REER, deviation from 10yr average (%)	-3.26	21.99	-160.44	37.68	169
REER, WDI 3yr growth (%)	4.22	12.13	-15.31	65.47	93
REER, WDI 5yr growth (%)	1.22	17.72	-61.42	49.72	93
REER, WDI, deviation from 10yr average (%)	-0.3	12.05	-45.83	43.32	92
Regulation, EFW	6.81	0.97	4.15	8.91	137
Regulatory quality, WGI	-0.01	0.97	-2.22	1.94	179
Remittance inflows (% of GDP)	4.72	7.03	0	36.24	153
Short-term debt, % of total external debt	14.55	13.87	0	68.29	123
Short-term debt, % of total reserves	44.37	72.82	0	525.2	117
Total foreign assets plus liabilities (% of GDP)	255.96	323.4	33.74	2381.42	171
Total reserves (% of GDP)	19.78	17.44	0.37	110.17	169
Total reserves in months of imports	4.69	4.93	0.02	40.24	158
Trade (% of GDP)	95.29	53.92	0.27	438.9	170
Unemployment (%)	8.89	6.69	1.1	44.9	100
Upper-mid income	0.29	0.45	0	1	178

Summary statistics are provided based on values after removing data outliers, as used in Tobit estimations (see Table 5 - Table 29). For data sources and additional notes, see Annex 1.

Table 5 Tobit estimations: marginal effects of income on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11
GDP per capita, PPP, in log	8.160*** (0.000)					9.990*** (0.000)	7.775*** (0.000)	7.328*** (0.000)	9.356*** (0.000)
High income (d)		14.623*** (0.000)				-7.007 (0.238)			
Upper-mid income (d)			8.625* (0.032)				5.049 (0.187)		
Low-mid income (d)				-12.725*** (0.000)				-5.190 (0.210)	
Low income (d)					-13.214*** (0.001)				7.236 (0.244)
Observations	177	178	178	178	178	176	176	176	176
Pseudo R^2	0.025	0.009	0.003	0.008	0.006	0.025	0.025	0.025	0.025

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
(d) for discrete change of dummy variable from 0 to 1; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6 Tobit estimations: marginal effects on output loss across other samples

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
HIPC (d)	-16.799*** (0.000)				-2.988 (0.567)			
LDC (d)		-15.258*** (0.000)				0.907 (0.862)		
Financial centres (d)			2.966 (0.642)				-5.122 (0.434)	
Oil exporters (d)				-0.272 (0.961)				-2.441 (0.655)
GDP per capita, PPP, in log					7.548*** (0.000)	8.368*** (0.000)	8.690** (0.004)	8.073** (0.003)
Observations	180	180	100	100	177	177	99	99
Pseudo R^2	0.012	0.011	0.000	0.000	0.025	0.025	0.008	0.008

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
(d) for discrete change of dummy variable from 0 to 1
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7 Tobit estimations: marginal effects of output growth on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
GDP growth in 2006	1.450** (0.002)				1.433** (0.008)			
GDP growth in 2007		0.950* (0.026)				1.200* (0.012)		
GDP growth over 2002-2006			0.513*** (0.000)				0.592*** (0.000)	
GDP growth over 2004-2006				0.632*** (0.000)				0.692*** (0.000)
GDP per capita, PPP, in log					8.120*** (0.000)	8.493*** (0.000)	9.295*** (0.000)	8.483*** (0.000)
Observations	180	180	178	179	177	177	175	176
Pseudo R^2	0.009	0.003	0.025	0.013	0.035	0.031	0.061	0.042

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8 Tobit estimations: marginal effects of domestic credit on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11
Domestic credit to private sector (% of GDP), 3yr growth	0.410** (0.007)		0.330* (0.017)	
Domestic credit to private sector (% of GDP), 5yr growth		0.463** (0.007)		0.350* (0.016)
GDP per capita, PPP, in log			6.759*** (0.000)	6.869*** (0.000)
Observations	169	171	168	170
Pseudo R^2	0.019	0.017	0.036	0.035

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9 Tobit estimations: marginal effects of real exchange rate on output loss

PANEL (A) Source of REER variables is Zsolt (2012)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
REER, deviation from 10yr average (%)	0.230[*] (0.018)			0.202[**] (0.008)			0.132 (0.107)			0.129 (0.094)		
REER, 5yr growth (%)		0.216[*] (0.011)			0.195[*] (0.011)			0.126 (0.120)			0.135 (0.073)	
REER, 3yr growth (%)			0.121 (0.447)			0.262 (0.092)			0.240 (0.137)			0.144 (0.313)
GDP per capita, PPP, in log				8.139[***] (0.000)	8.343[***] (0.000)	8.837[***] (0.000)	6.974[***] (0.000)	7.161[***] (0.000)	7.570[***] (0.000)	7.026[***] (0.000)	7.237[***] (0.000)	7.426[***] (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.320[*] (0.025)	0.314[*] (0.031)	0.331[*] (0.023)	0.326[*] (0.019)	0.317[*] (0.024)	0.339[*] (0.017)
GDP growth in 2006										1.450[**] (0.010)	1.460[**] (0.009)	1.367[*] (0.014)
Observations	169	171	172	168	170	171	164	166	166	164	166	166
Pseudo R^2	0.005	0.004	0.001	0.029	0.030	0.029	0.041	0.042	0.042	0.052	0.053	0.052

PANEL (B) Source of REER variables is World Development Indicators

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
REER, deviation from 10yr average (%)	0.583[*] (0.039)			0.406 (0.131)			0.328 (0.210)			0.199 (0.387)		
REER, 5yr growth (%)		0.372[*] (0.013)			0.231 (0.100)			0.147 (0.286)			0.140 (0.278)	
REER, 3yr growth (%)			0.202 (0.479)			0.383 (0.176)			0.368 (0.193)			0.145 (0.540)
GDP per capita, PPP, in log				7.146[***] (0.000)	7.558[***] (0.000)	9.085[***] (0.000)	6.077[**] (0.002)	6.656[***] (0.000)	7.877[***] (0.000)	7.077[***] (0.000)	7.406[***] (0.000)	8.076[***] (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.201[*] (0.011)	0.196[*] (0.016)	0.203[*] (0.014)	0.246[*] (0.013)	0.234[*] (0.017)	0.248[*] (0.014)
GDP growth in 2006										3.339[**] (0.006)	3.422[**] (0.005)	3.283[**] (0.007)
Observations	92	93	93	92	93	93	91	92	92	91	92	92
Pseudo R^2	0.010	0.009	0.001	0.028	0.029	0.031	0.036	0.037	0.040	0.065	0.067	0.067

Marginal effects; heteroscedasticity robust p-values in parentheses. Congo, Dem. Rep. of removed as an outlier for REER, WDI, deviation from 10yr average (%). Iraq removed as an outlier for REER variables from Zsolt (2012).

The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.

[*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

Table 10 Tobit estimations: marginal effects of money supply on output loss

PANEL (A)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
M2 (% of GDP), 5yr change	0.297** (0.005)			0.225* (0.013)			-0.035 (0.799)			0.014 (0.912)		
M2 (% of GDP), 3yr change		0.460*** (0.000)			0.359*** (0.000)			0.061 (0.710)			0.117 (0.447)	
M2 (% of GDP)			0.035 (0.336)			-0.117* (0.015)			-0.117** (0.008)			-0.080* (0.040)
GDP per capita, PPP, in log				7.610*** (0.000)	7.722*** (0.000)	10.428*** (0.000)	6.679*** (0.000)	6.754*** (0.000)	8.973*** (0.000)	6.634*** (0.000)	6.726*** (0.000)	8.236*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.338 (0.051)	0.312 (0.063)	0.327* (0.021)	0.332* (0.043)	0.308 (0.052)	0.338* (0.015)
GDP growth in 2006										1.546** (0.005)	1.562** (0.005)	1.375* (0.011)
Observations	165	170	170	165	169	169	165	167	166	165	167	166
Pseudo R^2	0.005	0.007	0.001	0.025	0.029	0.029	0.035	0.036	0.041	0.048	0.049	0.050

PANEL (B)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
M3 (% of GDP), 5yr change	-0.086 (0.820)			0.126 (0.588)			-0.042 (0.865)			-0.121 (0.623)		
M3 (% of GDP), 3yr change		0.203 (0.572)			0.392 (0.142)			0.235 (0.527)			0.228 (0.534)	
M3 (% of GDP)			0.114 (0.066)			-0.097 (0.064)			-0.092 (0.100)			-0.045 (0.362)
GDP per capita, PPP, in log				7.899*** (0.000)	8.297*** (0.000)	9.731*** (0.000)	7.424*** (0.000)	8.013*** (0.000)	9.556*** (0.000)	7.119*** (0.000)	7.803*** (0.000)	8.866*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.286 (0.141)	0.213 (0.402)	0.461** (0.003)	0.386* (0.012)	0.278 (0.159)	0.363* (0.027)
GDP growth in 2006										1.954 (0.137)	2.012 (0.110)	1.585 (0.076)
Observations	40	42	48	40	42	47	40	42	47	40	42	47
Pseudo R^2	0.000	0.001	0.006	0.069	0.076	0.068	0.075	0.079	0.091	0.097	0.101	0.110

Marginal effects; heteroscedasticity robust p-values in parentheses. Luxembourg removed as an outlier for M2 (% of GDP).

The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11 Tobit estimations: marginal effects of current account balance on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
Current account balance (% of GDP)	-0.148 (0.308)			-0.330* (0.020)			-0.089 (0.583)			-0.194 (0.209)		
Current account balance (% of GDP), 5yr average		-0.229 (0.219)			-0.676*** (0.001)			-0.440* (0.047)			-0.514* (0.027)	
Current account balance (% of GDP), 3yr average			-0.146 (0.379)			-0.466** (0.005)			-0.199 (0.298)			-0.275 (0.138)
GDP per capita, PPP, in log				8.976*** (0.000)	9.838*** (0.000)	9.317*** (0.000)	7.038*** (0.000)	8.138*** (0.000)	7.400*** (0.000)	7.575*** (0.000)	8.534*** (0.000)	7.811*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.311* (0.033)	0.272* (0.041)	0.297* (0.037)	0.293* (0.031)	0.269* (0.033)	0.290* (0.031)
GDP growth in 2006										1.648** (0.004)	1.645** (0.002)	1.618** (0.004)
Observations	179	177	178	176	174	175	167	167	167	167	167	167
Pseudo R^2	0.001	0.001	0.001	0.030	0.034	0.031	0.037	0.040	0.037	0.050	0.054	0.051

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* p < 0.05, ** p < 0.01, *** p < 0.001

Table 12 Tobit estimations: marginal effects of inflation on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
CPI (%), 5yr average	-0.241 (0.465)			0.340 (0.172)			0.480* (0.030)			0.127 (0.606)		
CPI (%), 3yr average		-0.490 (0.162)			0.416 (0.340)			0.744* (0.040)			0.137 (0.721)	
CPI (%)			-0.453 (0.114)			0.342 (0.440)			0.992 (0.070)			0.392 (0.487)
GDP per capita, PPP, in log				9.236*** (0.000)	9.378*** (0.000)	9.246*** (0.000)	8.173*** (0.000)	8.459*** (0.000)	8.817*** (0.000)	7.657*** (0.000)	7.645*** (0.000)	8.050*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.314* (0.021)	0.309* (0.021)	0.306* (0.025)	0.338* (0.016)	0.337* (0.016)	0.331* (0.017)
GDP growth in 2006										1.556* (0.018)	1.570* (0.016)	1.464* (0.012)
Observations	162	165	170	162	164	169	160	161	163	160	161	163
Pseudo R^2	0.001	0.001	0.001	0.027	0.028	0.028	0.040	0.041	0.042	0.052	0.051	0.052

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* p < 0.05, ** p < 0.01, *** p < 0.001

Table 13 Tobit estimations: marginal effects of interest rates on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Real interest rate (%), 5yr change	0.365[*] (0.048)		0.340[*] (0.047)		0.232 (0.195)		0.204 (0.257)	
Real interest rate (%), 3yr change		0.223 (0.401)		0.167 (0.481)		0.085 (0.716)		0.001 (0.995)
GDP per capita, PPP, in log			8.227[***] (0.000)	8.378[***] (0.000)	7.347[***] (0.000)	7.312[***] (0.000)	7.865[***] (0.000)	7.941[***] (0.000)
Domestic credit to private sector (% of GDP), 3yr growth					0.283[*] (0.050)	0.296[*] (0.039)	0.298[*] (0.036)	0.307[*] (0.029)
GDP growth in 2006							2.027[***] (0.000)	1.941[***] (0.000)
Observations	134	137	134	137	133	135	133	135
Pseudo R^2	0.003	0.001	0.023	0.022	0.032	0.031	0.052	0.049

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
 $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

Table 14 Tobit estimations: marginal effects of equity returns on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Annual equity returns, 5yr average	0.224 (0.211)		0.473[**] (0.010)		0.319[*] (0.035)		0.186 (0.168)	
Annual equity returns, 3yr average		0.095 (0.618)		0.187 (0.321)		0.097 (0.521)		0.049 (0.724)
GDP per capita, PPP, in log			12.185[***] (0.000)	9.561[***] (0.000)	6.927[**] (0.009)	4.806[*] (0.044)	10.734[***] (0.000)	9.181[***] (0.000)
Domestic credit to private sector (% of GDP), 3yr growth					0.790[***] (0.001)	0.834[***] (0.000)	0.866[***] (0.000)	0.900[***] (0.000)
GDP growth in 2006							5.139[***] (0.000)	5.179[***] (0.000)
Observations	72	74	72	74	72	74	72	74
Pseudo R^2	0.002	0.001	0.024	0.015	0.064	0.058	0.105	0.100

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience. [*]
 $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

Table 15 Tobit estimations: marginal effects of housing market on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Housing price growth over 2000-2006	0.352*** (0.000)		0.364*** (0.000)		0.303** (0.002)		0.259** (0.004)	
Mortgage debt (% of GDP)		-0.139 (0.219)		-0.131 (0.210)		-0.356*** (0.000)		-0.203 (0.156)
GDP per capita, PPP, in log			4.173 (0.509)	-0.591 (0.941)	0.199 (0.973)	1.534 (0.811)	6.455 (0.328)	8.215 (0.264)
Domestic credit to private sector (% of GDP), 3yr growth					0.227* (0.044)	0.461* (0.035)	0.250 (0.059)	0.427* (0.044)
GDP growth in 2006							2.972 (0.078)	4.796 (0.059)
Observations	45	45	45	45	45	45	45	45
Pseudo R^2	0.057	0.002	0.058	0.002	0.070	0.039	0.077	0.057

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 16 Tobit estimations: marginal effects of budget balance on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
Cash surplus/deficit(% of GDP)	0.210 (0.553)			-0.001 (0.996)			0.018 (0.936)			-0.033 (0.886)		
Cash surplus/deficit (% of GDP), 3yr average		0.721 (0.168)			0.256 (0.606)			0.299 (0.512)			-0.122 (0.798)	
Cash surplus/deficit (% of GDP), 5yr average			1.358* (0.035)			0.728 (0.253)			0.732 (0.199)			0.400 (0.455)
GDP per capita, PPP, in log				7.758*** (0.000)	6.798*** (0.000)	7.110*** (0.000)	5.805*** (0.000)	4.637** (0.007)	4.877** (0.009)	6.176** (0.001)	5.262** (0.006)	7.472*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.360* (0.029)	0.371* (0.032)	0.373* (0.037)	0.379* (0.023)	0.394* (0.023)	0.381* (0.027)
GDP growth in 2006										1.893 (0.130)	2.105 (0.108)	3.563** (0.002)
Observations	107	97	82	107	97	82	106	97	82	106	97	82
Pseudo R^2	0.000	0.002	0.004	0.017	0.012	0.016	0.034	0.031	0.038	0.045	0.043	0.063

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 17 Tobit estimations: marginal effects of government debt on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11
General government gross debt (% of GDP)	-0.148 (0.308)	-0.330* (0.020)	-0.089 (0.583)	-0.194 (0.209)
GDP per capita, PPP, in log		8.976*** (0.000)	7.038*** (0.000)	7.575*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth			0.311* (0.033)	0.293* (0.031)
GDP growth in 2006				1.648** (0.004)
Observations	179	176	167	167
Pseudo R^2	0.001	0.030	0.037	0.050

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18 Tobit estimations: marginal effects of savings on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11
Gross domestic savings (% of GDP)	0.268*** (0.001)	-0.034 (0.740)	0.069 (0.538)	-0.161 (0.228)
GDP per capita, PPP, in log		8.076*** (0.000)	5.883*** (0.001)	7.792*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth			0.340* (0.019)	0.336* (0.018)
GDP growth in 2006				1.910** (0.008)
Observations	167	166	160	160
Pseudo R^2	0.005	0.022	0.034	0.049

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 19 Tobit estimations: marginal effects of unemployment on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Unemployment (%)	-0.650** (0.007)		-0.339 (0.227)		-0.212 (0.402)		-0.290 (0.250)	
Long-term unemployment (%)		-0.011 (0.944)		-0.051 (0.800)		0.146 (0.374)		-0.031 (0.855)
GDP per capita, PPP, in log			8.469*** (0.000)	-11.863 (0.273)	5.889*** (0.001)	-13.755 (0.157)	7.814*** (0.000)	10.053 (0.158)
Domestic credit to private sector (% of GDP), 3yr growth					0.377* (0.028)	0.416* (0.043)	0.392* (0.025)	0.284 (0.062)
GDP growth in 2006							2.218*** (0.000)	9.375*** (0.000)
Observations	100	42	99	41	98	41	98	41
Pseudo R^2	0.004	0.000	0.016	0.004	0.037	0.034	0.060	0.090

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 20 Tobit estimations: marginal effects of reserves on output loss

PANEL (A)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Short-term debt, % of total reserves	0.040 (0.328)		0.029 (0.499)		0.009 (0.783)		0.004 (0.900)	
M2 to total reserves ratio (%)		0.099*** (0.000)		0.121*** (0.000)		0.128*** (0.000)		0.114*** (0.000)
GDP per capita, PPP, in log			9.134*** (0.000)	8.586*** (0.000)	7.741*** (0.000)	7.432*** (0.000)	7.433*** (0.000)	7.107*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth					0.757*** (0.000)	0.320* (0.038)	0.674*** (0.001)	0.326* (0.027)
GDP growth in 2006							1.302** (0.004)	1.406** (0.008)
Observations	117	156	117	156	115	153	115	153
Pseudo R^2	0.002	0.003	0.022	0.028	0.046	0.039	0.057	0.050

PANEL (B)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Total reserves in months of imports	-0.567* (0.036)		-0.539* (0.014)		-0.240 (0.276)		-0.273 (0.212)	
Total reserves (% of GDP)		-0.093 (0.198)		-0.129* (0.043)		-0.011 (0.887)		-0.032 (0.660)
GDP per capita, PPP, in log			8.802*** (0.000)	8.775*** (0.000)	7.466*** (0.000)	7.253*** (0.000)	8.540*** (0.000)	7.245*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth					0.317* (0.024)	0.334* (0.026)	0.331* (0.018)	0.340* (0.020)
GDP growth in 2006							2.340*** (0.000)	1.439** (0.009)
Observations	158	169	158	169	156	165	156	165
Pseudo R^2	0.002	0.001	0.027	0.029	0.039	0.041	0.065	0.052

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 21 Tobit estimations: marginal effects of external debt on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
External debt stocks (% of GNI)	-0.030 (0.553)		0.007 (0.894)		-0.030 (0.490)		-0.019 (0.686)	
Short-term debt, % of total external debt		0.429* (0.022)		0.263 (0.092)		0.134 (0.281)		0.035 (0.775)
GDP per capita, PPP, in log			9.973*** (0.000)	8.393*** (0.000)	8.266*** (0.000)	7.550*** (0.000)	7.981*** (0.000)	7.624*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth					0.831*** (0.000)	0.730*** (0.000)	0.748*** (0.000)	0.666*** (0.001)
GDP growth in 2006							1.077* (0.014)	1.267** (0.006)
Observations	120	123	120	123	114	117	114	117
Pseudo R^2	0.000	0.009	0.025	0.026	0.057	0.049	0.065	0.059

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 22 Tobit estimations: marginal effects of exchange rate regime on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
De facto fixed (d)	6.397 (0.070)			2.492 (0.444)			2.833 (0.391)			3.761 (0.238)		
De facto intermediate (d)		-8.185* (0.014)			-0.980 (0.771)			0.795 (0.814)			-1.530 (0.648)	
De facto floating (d)			2.007 (0.672)			-3.187 (0.521)			-6.257 (0.218)			-4.657 (0.338)
GDP per capita, PPP, in log				7.990*** (0.000)	8.059*** (0.000)	8.353*** (0.000)	6.463*** (0.000)	6.795*** (0.000)	6.943*** (0.000)	6.492*** (0.000)	6.622*** (0.000)	6.983*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.334* (0.017)	0.334* (0.021)	0.348* (0.013)	0.343* (0.011)	0.337* (0.016)	0.352* (0.011)
GDP growth in 2006										1.585** (0.007)	1.582** (0.007)	1.524** (0.009)
Observations	174	174	174	174	174	174	166	166	166	166	166	166
Pseudo R^2	0.002	0.003	0.000	0.025	0.024	0.025	0.037	0.036	0.038	0.050	0.049	0.050

Marginal effects; heteroscedasticity robust p-values in parentheses. The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
(d) for discrete change of dummy variable from 0 to 1; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 23 Tobit estimations: marginal effects of banking sector characteristics on output loss

PANEL (A)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
Bank credit to bank deposits (%) (a)	0.204*** (0.000)			0.141** (0.001)			0.066 (0.103)			0.065 (0.082)		
Bank ROA (%) (b)		3.659* (0.021)			3.476* (0.025)			3.606* (0.024)			2.172 (0.115)	
Bank ROE (%) (c)			0.084 (0.622)			0.051 (0.722)			0.072 (0.617)			-0.031 (0.819)
GDP per capita, PPP, in log				6.115*** (0.000)	7.018*** (0.000)	7.173*** (0.000)	6.124*** (0.000)	4.919*** (0.001)	4.981*** (0.001)	6.153*** (0.000)	5.082** (0.001)	5.152** (0.001)
Domestic credit to private sector (% of GDP), 3yr growth							0.250 (0.067)	0.654*** (0.000)	0.662*** (0.000)	0.265 (0.052)	0.720*** (0.000)	0.730*** (0.000)
GDP growth in 2006										1.540** (0.005)	1.932** (0.006)	2.102** (0.004)
Observations	174	145	145	174	144	144	168	141	141	168	141	141
Pseudo R^2	0.021	0.005	0.000	0.034	0.022	0.017	0.038	0.046	0.040	0.050	0.063	0.061

(a) Private credit by deposit money banks as a share of demand, time and saving deposits in deposit money banks. Higher values proxy for higher intermediation efficiency. (b) Average return on assets (net income/total assets). Higher values proxy for higher bank profitability. (c) Average return on equity (net income/total equity). Higher values proxy for higher bank profitability. (a), (b), (c) Source: Financial Structure Dataset, Beck and Demirgüç-Kunt (2009).

PANEL (B)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
Bank overhead costs to total assets (%) (a)	-2.232** (0.004)			-0.585 (0.511)			-0.167 (0.849)			0.158 (0.853)		
Bank net interest margin (%) (b)		-1.316* (0.047)			0.728 (0.456)			0.895 (0.366)			0.664 (0.437)	
Bank concentration (%) (c)			-0.079 (0.470)			-0.023 (0.829)			0.022 (0.832)			0.001 (0.993)
GDP per capita, PPP, in log				6.697*** (0.000)	7.850*** (0.000)	7.152*** (0.000)	4.869** (0.004)	5.740** (0.004)	5.030*** (0.001)	5.267** (0.005)	5.618** (0.005)	5.145** (0.001)
Domestic credit to private sector (% of GDP), 3yr growth							0.660*** (0.000)	0.683*** (0.000)	0.664*** (0.000)	0.731*** (0.000)	0.743*** (0.000)	0.729*** (0.000)
GDP growth in 2006										2.097** (0.004)	1.939** (0.005)	2.091** (0.003)
Observations	145	143	145	144	142	144	141	139	141	141	139	141
Pseudo R^2	0.005	0.003	0.000	0.017	0.017	0.017	0.040	0.043	0.040	0.061	0.062	0.061

(a) Accounting value of a bank's overhead costs as a share of its total assets. Higher values proxy for lower efficiency. (b) Accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets. Higher values proxy for lower efficiency. (c) Assets of three largest banks as a share of assets of all commercial banks. Higher values proxy for higher banking sector concentration. (a), (b), (c) Source: Financial Structure Dataset, Beck and Demirgüç-Kunt (2009).

PANEL (C)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
Bank cost-income ratio (%) (a)	-0.233*** (0.001)			-0.125 (0.070)			-0.124 (0.070)			-0.061 (0.406)		
Bank liquid reserves to bank assets ratio (%) (b)		-25.238* (0.029)			-5.432 (0.567)			5.339 (0.546)			3.838 (0.644)	
Bank nonperforming loans to total gross loans (%) (b)			-0.991 (0.076)			-0.368 (0.584)			-0.154 (0.820)			0.384 (0.519)
GDP per capita, PPP, in log				6.438*** (0.000)	8.791*** (0.000)	5.363* (0.015)	4.315** (0.004)	7.264*** (0.000)	3.288 (0.125)	4.810** (0.006)	7.230*** (0.000)	8.325*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.659*** (0.000)	0.347* (0.034)	0.399* (0.033)	0.726*** (0.000)	0.350* (0.028)	0.413* (0.026)
GDP growth in 2006										2.041** (0.005)	1.438* (0.034)	4.706*** (0.001)
Observations	145	120	95	144	119	95	141	116	93	141	116	93
Pseudo R^2	0.006	0.005	0.005	0.019	0.022	0.010	0.042	0.035	0.032	0.061	0.045	0.061

(a) Total costs as a share of total income of all commercial banks. Higher values proxy for lower efficiency. (b) Source: World Development Indicators.
Marginal effects; heteroscedasticity robust p-values in parentheses The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 24 Tobit estimations: marginal effects of stock market size on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
Market capitalization (% of GDP)	0.021 (0.399)			-0.073* (0.030)			-0.085* (0.042)			-0.080* (0.029)		
Market capitalization (% of GDP), 3yr growth		0.033 (0.602)			-0.048 (0.430)			-0.125 (0.072)			-0.166* (0.018)	
Market capitalization (% of GDP), 5yr growth			0.023 (0.764)			-0.077 (0.348)			-0.243* (0.014)			-0.211* (0.013)
GDP per capita, PPP, in log				12.027*** (0.000)	10.135*** (0.000)	10.097*** (0.000)	9.932*** (0.000)	7.882*** (0.000)	8.151*** (0.000)	10.205*** (0.000)	11.486*** (0.000)	8.430*** (0.001)
Domestic credit to private sector (% of GDP), 3yr growth							0.376* (0.012)	0.395** (0.008)	0.453** (0.003)	0.391** (0.009)	0.434** (0.002)	0.456** (0.003)
GDP growth in 2006										2.150 (0.189)	5.223*** (0.000)	2.031 (0.222)
Observations	109	101	108	109	101	108	107	100	107	107	100	107
Pseudo R^2	0.000	0.000	0.000	0.025	0.020	0.022	0.045	0.039	0.047	0.057	0.084	0.058

Marginal effects; heteroscedasticity robust p-values in parentheses. The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 25 Tobit estimations: marginal effects of financial openness on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Net foreign assets (% of GDP)	0.001 (0.970)		-0.042* (0.023)		-0.024 (0.224)		-0.036 (0.094)	
Total foreign assets plus liabilities (% of GDP)		0.008 (0.129)		-0.005 (0.450)		-0.009 (0.125)		-0.007 (0.197)
GDP per capita, PPP, in log			8.988*** (0.000)	8.620*** (0.000)	7.363*** (0.000)	7.685*** (0.000)	7.702*** (0.000)	7.417*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth					0.304* (0.030)	0.343* (0.013)	0.304* (0.024)	0.351** (0.010)
GDP growth in 2006							1.665** (0.002)	1.541** (0.006)
Observations	171	171	170	170	164	164	164	164
Pseudo R^2	0.000	0.002	0.026	0.024	0.036	0.037	0.050	0.050

Marginal effects; heteroscedasticity robust p-values in parentheses. Luxembourg removed as an outlier for Net foreign assets (% of GDP) and Total foreign assets plus liabilities (% of GDP); Liberia removed as an outlier for Net foreign assets (% of GDP).
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
 (d) for discrete change of dummy variable from 0 to 1
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 26 Tobit estimations: marginal effects of capital and income flows on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
FDI liabilities (% of GDP)	0.017 (0.655)			-0.002 (0.946)			0.011 (0.701)			0.013 (0.655)		
Portfolio equity liabilities (% of GDP)		0.104*** (0.000)			0.019 (0.741)			-0.018 (0.743)			-0.001 (0.986)	
Remittance inflows (% of GDP)			-0.534 (0.065)			0.022 (0.938)			0.066 (0.813)			0.213 (0.387)
GDP per capita, PPP, in log				8.035*** (0.000)	7.828*** (0.000)	9.467*** (0.000)	6.636*** (0.000)	6.868*** (0.000)	7.981*** (0.000)	6.583*** (0.000)	6.666*** (0.000)	9.038*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.329* (0.019)	0.332* (0.023)	0.339* (0.027)	0.342* (0.013)	0.339* (0.016)	0.344* (0.020)
GDP growth in 2006										1.585** (0.004)	1.582** (0.005)	2.240*** (0.000)
Observations	171	171	153	170	170	153	164	164	150	164	164	150
Pseudo R^2	0.000	0.004	0.003	0.024	0.024	0.028	0.035	0.036	0.043	0.049	0.049	0.066

Marginal effects; heteroscedasticity robust p-values in parentheses. Luxembourg removed as an outlier for FDI liabilities (% of GDP) and Portfolio equity liabilities (% of GDP); Seychelles and Liberia removed as outliers for Remittance inflows (% of GDP). The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 27 Tobit estimations: marginal effects of trade openness on output loss

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
Trade (% of GDP)	0.065* (0.021)			0.008 (0.767)			0.025 (0.279)			0.012 (0.622)		
Exports of goods and services (% of GDP)		0.073 (0.143)			-0.013 (0.758)			0.039 (0.389)			0.001 (0.987)	
Imports of goods and services (% of GDP)			0.024 (0.661)			0.003 (0.952)			0.023 (0.635)			-0.001 (0.982)
GDP per capita, PPP, in log				7.701*** (0.000)	7.642*** (0.000)	7.519*** (0.000)	6.098*** (0.000)	5.348*** (0.000)	5.670*** (0.000)	6.293*** (0.000)	6.660*** (0.000)	6.671*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.336* (0.018)	0.366* (0.023)	0.358* (0.022)	0.350* (0.014)	0.372* (0.020)	0.372* (0.018)
GDP growth in 2006										1.589** (0.007)	2.295*** (0.001)	2.297*** (0.000)
Observations	170	135	135	169	135	135	163	132	132	163	132	132
Pseudo R^2	0.003	0.001	0.000	0.022	0.019	0.019	0.034	0.036	0.036	0.047	0.056	0.056

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 28 Tobit estimations: marginal effects of sectoral composition on output loss

PANEL (A)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Oil rents (% of GDP)	-0.013 (0.913)		-0.071 (0.576)		0.065 (0.636)		-0.045 (0.750)	
Insurance and financial services (% of commercial service exports)		0.257 (0.215)		-0.149 (0.474)		-0.162 (0.392)		-0.103 (0.549)
GDP per capita, PPP, in log			8.559*** (0.000)	9.219*** (0.000)	7.020*** (0.000)	7.903*** (0.000)	7.147*** (0.000)	8.590*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth					0.346* (0.020)	0.346* (0.026)	0.344* (0.015)	0.359* (0.019)
GDP growth in 2006							1.466* (0.013)	2.203*** (0.000)
Observations	177	155	176	155	167	152	167	152
Pseudo R^2	0.000	0.001	0.028	0.027	0.040	0.042	0.051	0.065

PANEL (B)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Agriculture, value added (% of GDP)	-0.763*** (0.000)		-0.003 (0.994)		-0.032 (0.925)		0.113 (0.718)	
Manufacturing, value added (% of GDP)		0.263 (0.268)		0.027 (0.898)		0.122 (0.588)		0.058 (0.790)
GDP per capita, PPP, in log			8.713*** (0.001)	8.573*** (0.000)	6.774** (0.009)	7.071*** (0.000)	8.879*** (0.001)	7.994*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth					0.325* (0.026)	0.311* (0.032)	0.326* (0.020)	0.311* (0.022)
GDP growth in 2006							2.320*** (0.000)	2.297*** (0.000)
Observations	154	142	153	142	147	137	147	137
Pseudo R^2	0.017	0.001	0.024	0.023	0.036	0.034	0.061	0.060

Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 29 Tobit estimations: marginal effects of regulation on output loss

PANEL (A)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11
Regulatory quality, WGI (a)	9.402*** (0.000)		2.286 (0.415)		-0.564 (0.848)		1.629 (0.573)	
Regulation, EFW (b)		6.289** (0.004)		1.289 (0.534)		-0.220 (0.911)		1.312 (0.473)
GDP per capita, PPP, in log			6.790*** (0.000)	8.021*** (0.000)	7.079*** (0.000)	6.765*** (0.000)	5.847** (0.004)	7.141*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth					0.333* (0.018)	0.335* (0.027)	0.335* (0.014)	0.353* (0.023)
GDP growth in 2006							1.578** (0.004)	2.586*** (0.000)
Observations	179	137	177	136	168	134	168	134
Pseudo R^2	0.019	0.007	0.025	0.024	0.036	0.038	0.049	0.063

(a) Scale -2.5 to 2.5, with higher values indicating better regulatory quality. Source: Worldwide Governance Indicators. (b) Composite index of credit market, labour market and business regulations. Scale of 1 to 10, with higher values indicating higher degree of liberalisation. Source: Economic Freedom of the World.

PANEL (B)

	(1) loss_11	(2) loss_11	(3) loss_11	(4) loss_11	(5) loss_11	(6) loss_11	(7) loss_11	(8) loss_11	(9) loss_11	(10) loss_11	(11) loss_11	(12) loss_11
Credit market regulations (a)	6.497** (0.003)			3.022 (0.173)			2.016 (0.361)			3.014 (0.181)		
Labor market regulations (a)		1.461 (0.162)			0.138 (0.879)			-0.310 (0.711)			-0.022 (0.977)	
Business regulations (a)			5.948** (0.007)			-0.001 (0.999)			-1.641 (0.429)			0.075 (0.970)
GDP per capita, PPP, in log				7.130*** (0.000)	8.924*** (0.000)	8.952*** (0.000)	5.887*** (0.000)	7.237*** (0.000)	7.789*** (0.000)	6.394*** (0.000)	7.878*** (0.000)	7.848*** (0.000)
Domestic credit to private sector (% of GDP), 3yr growth							0.320* (0.028)	0.343* (0.028)	0.351* (0.023)	0.341* (0.021)	0.365* (0.022)	0.364* (0.022)
GDP growth in 2006										2.642*** (0.000)	2.387*** (0.000)	2.390*** (0.000)
Observations	137	136	136	136	135	135	134	133	133	134	133	133
Pseudo R^2	0.013	0.001	0.007	0.026	0.027	0.027	0.039	0.043	0.043	0.066	0.066	0.066

(a) Scale of 1 to 10, with higher values indicating higher degree of liberalisation. Source: Economic Freedom of the World.
Marginal effects; heteroscedasticity robust p-values in parentheses.
The dependent variable is output cost measure loss_11, which is expressed in positive values for convenience.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Annex 1 Data sources and additional notes on independent variables

Variable	Source	Note(s)
Agriculture, value added (% of GDP)	World Development Indicators, The World Bank	
Annual equity returns	World Development Indicators, The World Bank	S&P Global Equity Indices (annual % change)
Bank concentration (%)	Financial Structure Dataset, Beck and Demirgüç-Kunt (2009)	Assets of three largest banks as a share of assets of all commercial banks. Higher values proxy for higher banking sector concentration.
Bank cost-income ratio (%)	Financial Structure Dataset, Beck and Demirgüç-Kunt (2009)	Total costs as a share of total income of all commercial banks. Higher values proxy for lower efficiency.
Bank credit to bank deposits (%)	Financial Structure Dataset, Beck and Demirgüç-Kunt (2009)	Private credit by deposit money banks as a share of demand, time and saving deposits in deposit money banks. Higher values proxy for higher intermediation efficiency.
Bank liquid reserves to bank assets ratio (%)	World Development Indicators, The World Bank	Defined as ratio of domestic currency holdings and deposits with the monetary authorities to claims on other governments, nonfinancial public enterprises, the private sector, and other banking institutions.
Bank net interest margin (%)	Financial Structure Dataset, Beck and Demirgüç-Kunt (2009)	Accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets. Higher values proxy for lower efficiency.
Bank nonperforming loans to total gross loans (%)	World Development Indicators, The World Bank	Defined as the value of nonperforming loans divided by the total value of the loan portfolio (including nonperforming loans before the deduction of specific loan-loss provisions).
Bank overhead costs to total assets (%)	Financial Structure Dataset, Beck and Demirgüç-Kunt (2009)	Accounting value of a bank's overhead costs as a share of its total assets. Higher values proxy for lower efficiency.
Bank ROA (%)	Financial Structure Dataset, Beck and Demirgüç-Kunt (2009)	Average return on assets (net income/total assets). Higher values proxy for higher bank profitability.
Bank ROE (%)	Financial Structure Dataset, Beck and Demirgüç-Kunt (2009)	Average return on equity (net income/total equity). Higher values proxy for higher bank profitability.
Business regulations	Economic Freedom of the World database, Gwartney, Hall, and Lawson (2010)	Composite index of regulations on price controls, administrative requirements, bureaucracy costs, starting a business, extra payments/bribes, licensing restrictions, cost of tax compliance. Scale of 1 to 10, with higher values indicating higher degree of liberalisation.
Cash surplus/deficit (% of GDP)	World Development Indicators, The World Bank	
CPI (%)	World Development Indicators, The World Bank	Inflation, consumer prices (annual %)

Credit market regulations	Economic Freedom of the World database, Gwartney, Hall, and Lawson (2010)	Composite index of regulations on ownership of banks, foreign bank competition, private sector credit and interest rate controls. Scale of 1 to 10, with higher values indicating higher degree of liberalisation.
Current account balance (% of GDP)	World Economic Outlook (April 2011), IMF	
De facto fixed	Ilzetzki, Reinhart and Rogoff (2008)	Dummy for de facto fixed exchange rate arrangement in 2007.
De facto floating	Ilzetzki, Reinhart and Rogoff (2008)	Dummy for de facto floating exchange rate arrangement in 2007.
De facto intermediate	Ilzetzki, Reinhart and Rogoff (2008)	Dummy for de facto intermediate exchange rate arrangement in 2007.
Domestic credit to private sector (% of GDP)	World Development Indicators, The World Bank	Defined as financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable that establish a claim for repayment. For some countries these claims include credit to public enterprises.
Exports of goods and services (% of GDP)	World Development Indicators, The World Bank	
External debt stocks (% of GNI)	World Development Indicators, The World Bank	Defined as debt owed to nonresidents repayable in foreign currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt.
FDI liabilities (% of GDP)	Updated and extended version of the External Wealth of Nations Mark II database, Lane and Milesi-Ferretti (2007)	
Financial centers	Rose and Spiegel (2010) dataset	Dummy for financial centres as defined by high ratio of external assets and liabilities to GDP in Rose and Spiegel (2010).
GDP growth	World Economic Outlook (April 2011), IMF	
GDP per capita, PPP, in log	World Development Indicators, The World Bank	GDP per capita, PPP (constant 2005 international $), in log-levels.
General government gross debt (% of GDP)	World Economic Outlook (April 2011), IMF	
Gross domestic savings (% of GDP)	World Development Indicators, The World Bank	
High income	The World Bank	Dummy for High-income economies.

HIPC	Catini, Panizza and Saade (2010)	Dummy for Heavily Indebted Poor Countries.
Housing price growth over 2000-2006	Rose and Spiegel (2010) dataset	
Imports of goods and services (% of GDP)	World Development Indicators, The World Bank	
Insurance and financial services (% of commercial service exports)	World Development Indicators, The World Bank	
Labour market regulations	Economic Freedom of the World database, Gwartney, Hall, and Lawson (2010)	Composite index of regulations on minimum wage, hiring and firing regulations, centralized collective bargaining, mandated cost of hiring, mandated cost of worker dismissal, conscription. Scale of 1 to 10, with higher values indicating higher degree of liberalisation.
LDC	Catini, Panizza and Saade (2010)	Dummy for Least Developed Countries.
Long-term unemployment (%)	World Development Indicators, The World Bank	Long-term unemployment (% of total unemployment)
Low income	The World Bank	Dummy for Low-income economies
Low-mid income	The World Bank	Dummy for Lower-middle-income economies
M2 (% of GDP)	World Development Indicators, The World Bank	Money and quasi money (M2) (% of GDP); money and quasi money defined as the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.
M2 to total reserves ratio (%)	World Development Indicators, The World Bank	Money and quasi money (M2) to total reserves ratio
M3 (% of GDP)	World Development Indicators, The World Bank	Liquid liabilities (M3) (% of GDP); liquid liabilities defined as the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travellers checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents.
Manufacturing, value added (% of GDP)	World Development Indicators, The World Bank	
Market capitalization (% of GDP)	World Development Indicators, The World Bank	Market capitalization of listed companies (% of GDP).

Mortgage debt (% of GDP)	Rose and Spiegel (2010) dataset	
Net foreign assets (% of GDP)	Updated and extended version of the External Wealth of Nations Mark II database, Lane and Milesi-Ferretti (2007)	Net foreign assets equal total assets minus total liabilities.
Oil exporters	Rose and Spiegel (2010) dataset	Dummy for oil exporters as defined in Rose and Spiegel (2010).
Oil rents (% of GDP)	World Development Indicators, The World Bank	Oil rents defined as the difference between the value of crude oil production at world prices and total costs of production.
Portfolio equity liabilities (% of GDP)	Updated and extended version of the External Wealth of Nations Mark II database, Lane and Milesi-Ferretti (2007)	
Real interest rate (%)	World Development Indicators, The World Bank	
REER	Darvas (2012) dataset	Real Effective Exchange Rate
REER, WDI	World Development Indicators, The World Bank	Real Effective Exchange Rate
Regulation, EFW	Economic Freedom of the World database, Gwartney, Hall, and Lawson (2010)	Composite index of credit market, labour market and business regulations. Scale of 1 to 10, with higher values indicating higher degree of liberalisation.
Regulatory quality, WGI	Worldwide Governance Indicators, The World Bank, Kaufmann, Kraay and Mastruzzi (2010)	Regulatory quality index capturing perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Scale -2.5 to 2.5, with higher values indicating better regulatory quality.
Remittance inflows (% of GDP)	Financial Structure Dataset, Beck and Demirgüç-Kunt (2009)	Net remittance inflows as a share of GDP
Short-term debt, % of total external debt	World Development Indicators, The World Bank	Short-term debt defined as all debt having an original maturity of one year or less and interest in arrears on long-term debt.
Short-term debt, % of total reserves	World Development Indicators, The World Bank	Short-term debt defined as all debt having an original maturity of one year or less and interest in arrears on long-term debt.
Total foreign assets plus liabilities (% of GDP)	Updated and extended version of the External Wealth of Nations Mark II database, Lane and Milesi-Ferretti (2007)	Total assets equal FDI assets+portfolio equity assets+debt assets+derivatives assets+FX reserves. Total liabilities equal FDI liabilities+portfolio equity liabilities+debt liabilities+derivatives liabilities.
Total reserves (% of GDP)	World Development Indicators, The World Bank	Total reserves defined as holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of monetary authorities.

Total reserves in months of imports	World Development Indicators, The World Bank	Defined as a number of months of imports of goods and services a country could pay for using its total reserves [Reserves/(Imports/12)].
Trade (% of GDP)	World Development Indicators, The World Bank	Trade equals exports plus imports of goods and services.
Unemployment (%)	World Development Indicators, The World Bank	Unemployment, total (% of total labour force)
Upper-mid income	The World Bank	Dummy for upper-middle-income economies

Annex 2 Figures of actual versus trend output developments

Graphs below help to better visualise how the twelve main output loss measures fit the data across a global sample. Blue lines mark actual GDP developments. Red lines mark individual starting points of recessions and the estimated output growth and level trends at those points in time. Green lines mark individual starting points of slowdowns and the estimated output growth and level trends at those points in time. See text and Table 1 for more information on how this data was used to generate estimates of output losses associated with the crisis.

Armenia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Australia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Austria

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Antigua and Barbuda

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Azerbaijan

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Bahamas, The

Real GDP y-o-y growth, in %
Real GDP annual level, in log
— actual — trend-rec.

Bahrain

Real GDP y-o-y growth, in %
Real GDP annual level, in log
— actual — trend-slow.

Bangladesh

Real GDP y-o-y growth, in %
Real GDP annual level, in log
— actual — trend-slow.

Barbados

Real GDP y-o-y growth, in %
Real GDP annual level, in log
— actual — trend-rec.

Belarus

Real GDP q-o-q growth, in %
Real GDP quarterly level, in log
— actual — trend-rec. — trend-slow.

Real GDP y-o-y growth, in %
Real GDP annual level, in log
— actual — trend-slow.

Belgium

Real GDP q-o-q growth, in %
Real GDP quarterly level, in log
— actual — trend-rec. — trend-slow.

Real GDP y-o-y growth, in %
Real GDP annual level, in log
— actual — trend-rec. — trend-slow.

53

Belize

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-rec. — trend-slow.   actual — trend-rec. — trend-slow.   actual — trend-slow.   actual — trend-slow.

Benin

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-slow.   actual — trend-slow.

Bhutan

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-slow.   actual — trend-slow.

Bolivia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-slow.   actual — trend-slow.   actual — trend-slow.   actual — trend-slow.

Bosnia and Herzegovina

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-rec.   actual — trend-rec.

Burkina Faso

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-slow.   actual — trend-slow.

54

Botswana

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Brazil

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Brunei Darussalam

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Bulgaria

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

55

Burundi

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Cambodia

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Canada

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Cameroon

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Cape Verde

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Central African Republic

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Chad

Real GDP y-o-y growth, in %

Real GDP annual level, in log

56

Chile

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

China,P.R.: Mainland

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Colombia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Comoros

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Congo, Dem. Rep. of

Real GDP y-o-y growth, in %

Real GDP annual level, in log

57

Congo, Republic of

Côte d'Ivoire

Costa Rica

Croatia

Cyprus

Czech Republic

Real GDP q-o-q growth, in %
Real GDP quarterly level, in log
Real GDP y-o-y growth, in %
Real GDP annual level, in log

— actual — trend-rec. — trend-slow.

Denmark

Real GDP q-o-q growth, in %
Real GDP quarterly level, in log
Real GDP y-o-y growth, in %
Real GDP annual level, in log

— actual — trend-rec.

Djibouti

Real GDP y-o-y growth, in %
Real GDP annual level, in log

— actual — trend-slow.

Dominica

Real GDP y-o-y growth, in %
Real GDP annual level, in log

— actual — trend-rec.

Dominican Republic

Real GDP y-o-y growth, in %
Real GDP annual level, in log

— actual — trend-slow.

Eritrea

Real GDP y-o-y growth, in %
Real GDP annual level, in log

— actual — trend-rec.

Ecuador

| Real GDP q-o-q growth, in % | Real GDP quarterly level, in log | Real GDP y-o-y growth, in % | Real GDP annual level, in log |

Egypt

| Real GDP q-o-q growth, in % | Real GDP quarterly level, in log | Real GDP y-o-y growth, in % | Real GDP annual level, in log |

El Salvador

| Real GDP q-o-q growth, in % | Real GDP quarterly level, in log | Real GDP y-o-y growth, in % | Real GDP annual level, in log |

Equatorial Guinea

| Real GDP y-o-y growth, in % | Real GDP annual level, in log |

Ethiopia

| Real GDP y-o-y growth, in % | Real GDP annual level, in log |

60

Estonia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Finland

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

France

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Fiji

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Gabon

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Gambia, The

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual

— actual

Ghana

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.

— actual — trend-slow.

Georgia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — trend-slow.

— actual — trend-rec. — trend-slow.

— actual — trend-rec. — trend-slow.

— actual — trend-rec. — trend-slow.

Germany

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec.

— actual — trend-rec.

— actual — trend-rec. — trend-slow.

— actual — trend-rec. — trend-slow.

Greece

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — trend-slow.

— actual — trend-rec. — trend-slow.

— actual — trend-rec.

— actual — trend-rec.

62

Guatemala

Real GDP q-o-q growth, in % · Real GDP quarterly level, in log · Real GDP y-o-y growth, in % · Real GDP annual level, in log

Grenada

Real GDP y-o-y growth, in % · Real GDP annual level, in log

Guinea

Real GDP y-o-y growth, in % · Real GDP annual level, in log

Guinea-Bissau

Real GDP y-o-y growth, in % · Real GDP annual level, in log

Guyana

Real GDP y-o-y growth, in % · Real GDP annual level, in log

Haiti

Real GDP y-o-y growth, in % · Real GDP annual level, in log

Honduras

Real GDP y-o-y growth, in % · Real GDP annual level, in log

Hong Kong S.A.R. of China

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — trend-slow.

Hungary

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — actual — trend-rec. — actual — trend-rec. — trend-slow. — actual — trend-rec. — trend-slow.

Iceland

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — actual — trend-rec. — actual — trend-rec. — trend-slow. — actual — trend-rec. — trend-slow.

India

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow. — actual — trend-slow. — actual — trend-slow. — actual — trend-slow.

64

Indonesia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-slow.

Iran, Islamic Republic of

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-slow.

Iraq

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-slow.

Ireland

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-rec.

Israel

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

actual — trend-rec. — trend-slow.

actual — trend-rec. — trend-slow.

actual — trend-slow.

actual — trend-slow.

65

Italy

Jamaica

Japan

Jordan

Kazakhstan

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec.   — actual — trend-rec.   — actual — trend-slow.   — actual — trend-slow.

Kenya

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.   — actual — trend-slow.

Kiribati

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec.   — actual — trend-rec.

Korea, Rep.

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.   — actual — trend-slow.   — actual — trend-slow.   — actual — trend-slow.

Kosovo

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.   — actual — trend-slow.

Kuwait

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — trend-slow.   — actual — trend-rec. — trend-slow.

67

Kyrgyz Republic

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — trend-slow.

Latvia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec.

Lao People's Dem.Rep

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.

Lebanon

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual

Lesotho

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.

Liberia

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.

68

Lithuania

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Luxembourg

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Libya

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Madagascar

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Macao S.A.R. of China

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Macedonia

Real GDP q-o-q growth, in %
Real GDP quarterly level, in log
Real GDP y-o-y growth, in %
Real GDP annual level, in log

Malawi

Real GDP y-o-y growth, in %
Real GDP annual level, in log

Maldives

Real GDP y-o-y growth, in %
Real GDP annual level, in log

Malaysia

Real GDP q-o-q growth, in %
Real GDP quarterly level, in log
Real GDP y-o-y growth, in %
Real GDP annual level, in log

Malta

Real GDP q-o-q growth, in %
Real GDP quarterly level, in log
Real GDP y-o-y growth, in %
Real GDP annual level, in log

70

Mali

Mauritania

Mauritius

Mexico

Moldova

Mongolia

Morocco

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Mozambique

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Montenegro

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Myanmar

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Namibia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

72

Netherlands

New Zealand

Nepal

Nicaragua

Niger

Nigeria
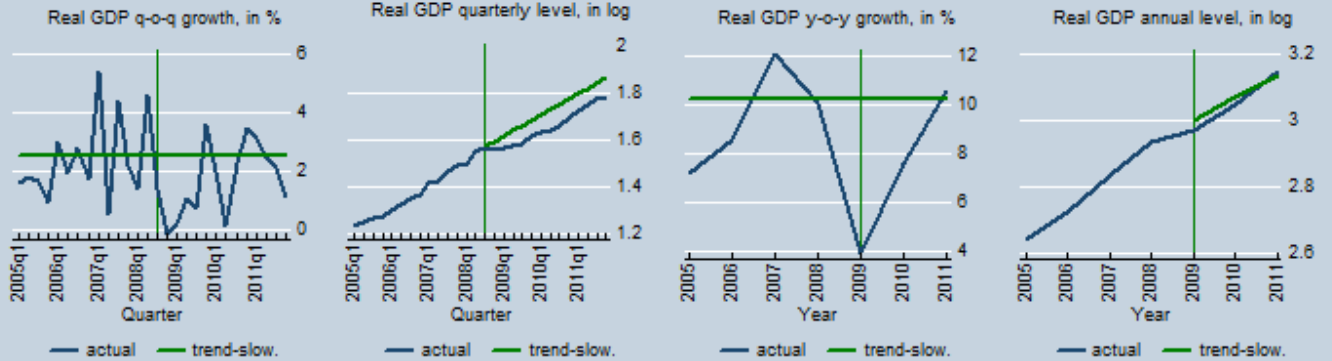
Norway
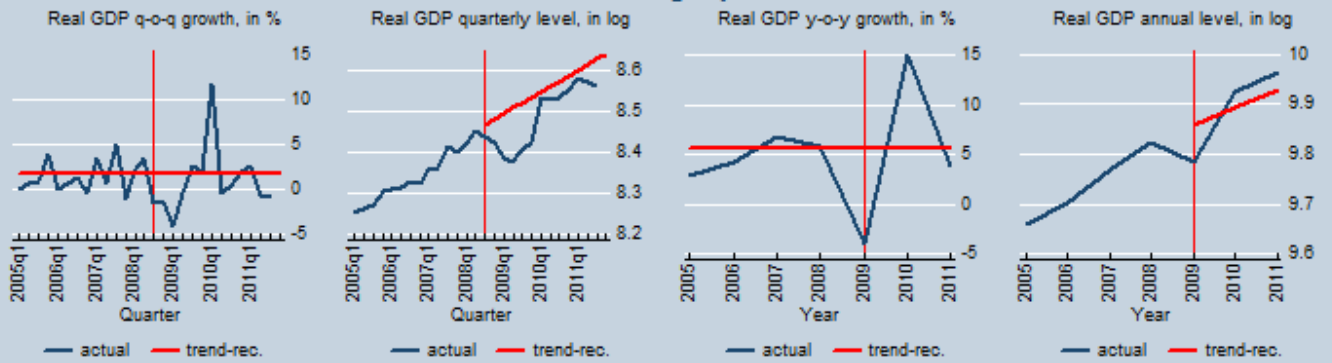
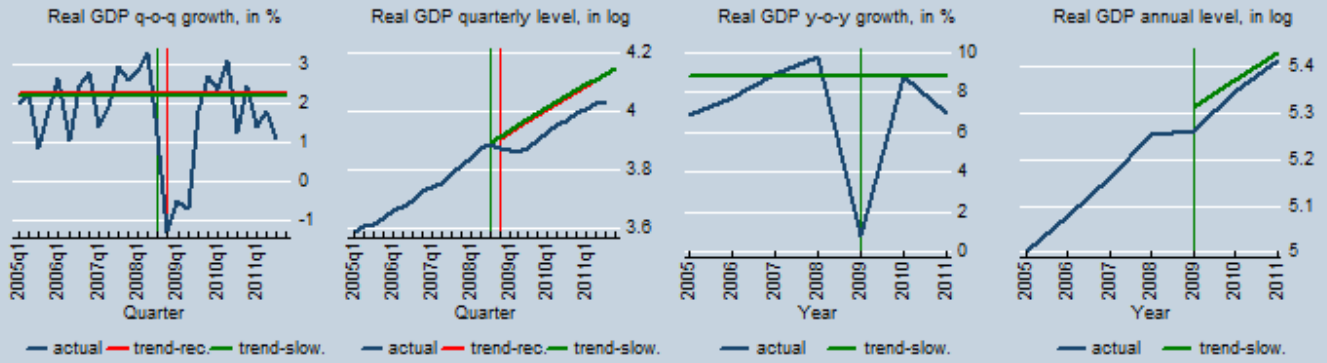| Real GDP q-o-q growth, in % | Real GDP quarterly level, in log | Real GDP y-o-y growth, in % | Real GDP annual level, in log |

Oman

| Real GDP y-o-y growth, in % | Real GDP annual level, in log |

Pakistan

| Real GDP y-o-y growth, in % | Real GDP annual level, in log |

Panama

| Real GDP q-o-q growth, in % | Real GDP quarterly level, in log | Real GDP y-o-y growth, in % | Real GDP annual level, in log |

Paraguay

| Real GDP q-o-q growth, in % | Real GDP quarterly level, in log | Real GDP y-o-y growth, in % | Real GDP annual level, in log |

Peru
- Real GDP q-o-q growth, in %
- Real GDP quarterly level, in log
- Real GDP y-o-y growth, in %
- Real GDP annual level, in log

Philippines
- Real GDP q-o-q growth, in %
- Real GDP quarterly level, in log
- Real GDP y-o-y growth, in %
- Real GDP annual level, in log

Poland
- Real GDP q-o-q growth, in %
- Real GDP quarterly level, in log
- Real GDP y-o-y growth, in %
- Real GDP annual level, in log

Portugal
- Real GDP q-o-q growth, in %
- Real GDP quarterly level, in log
- Real GDP y-o-y growth, in %
- Real GDP annual level, in log

Saudi Arabia

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.

Senegal

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.

Serbia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec.

— actual — trend-rec. — trend-slow.

Seychelles

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec.

Sierra Leone

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.

Singapore

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec.

— actual — trend-rec. — trend-slow.

Slovak Republic

Real GDP q-o-q growth, in % — actual — trend-slow.

Real GDP quarterly level, in log — actual — trend-slow.

Real GDP y-o-y growth, in % — actual — trend-rec. — trend-slow.

Real GDP annual level, in log — actual — trend-rec. — trend-slow.

Slovenia

Real GDP q-o-q growth, in % — actual — trend-rec. — trend-slow.

Real GDP quarterly level, in log — actual — trend-rec. — trend-slow.

Real GDP y-o-y growth, in % — actual — trend-rec. — trend-slow.

Real GDP annual level, in log — actual — trend-rec. — trend-slow.

South Africa

Real GDP q-o-q growth, in % — actual — trend-rec. — trend-slow.

Real GDP quarterly level, in log — actual — trend-rec. — trend-slow.

Real GDP y-o-y growth, in % — actual — trend-rec. — trend-slow.

Real GDP annual level, in log — actual — trend-rec. — trend-slow.

Spain

Real GDP q-o-q growth, in % — actual — trend-rec. — trend-slow.

Real GDP quarterly level, in log — actual — trend-rec. — trend-slow.

Real GDP y-o-y growth, in % — actual — trend-rec. — trend-slow.

Real GDP annual level, in log — actual — trend-rec. — trend-slow.

Sri Lanka

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Solomon Islands

Real GDP y-o-y growth, in %

Real GDP annual level, in log

St. Kitts and Nevis

Real GDP y-o-y growth, in %

Real GDP annual level, in log

St. Lucia

Real GDP y-o-y growth, in %

Real GDP annual level, in log

St. Vincent and the Grenadines

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Sudan

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Suriname

Real GDP y-o-y growth, in %

Real GDP annual level, in log

79

Sweden

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Switzerland

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Swaziland

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Syrian Arab Republic

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Sao Tome and Principe

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Tanzania

Real GDP y-o-y growth, in %

Real GDP annual level, in log
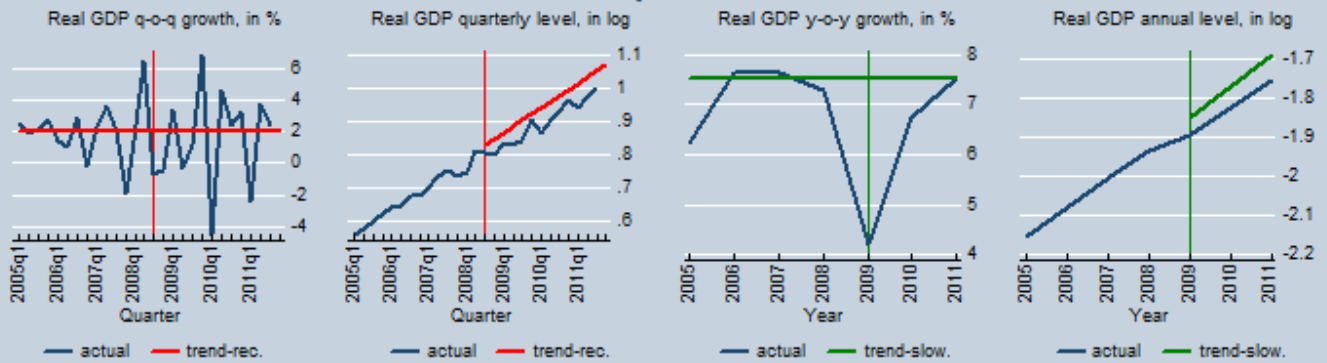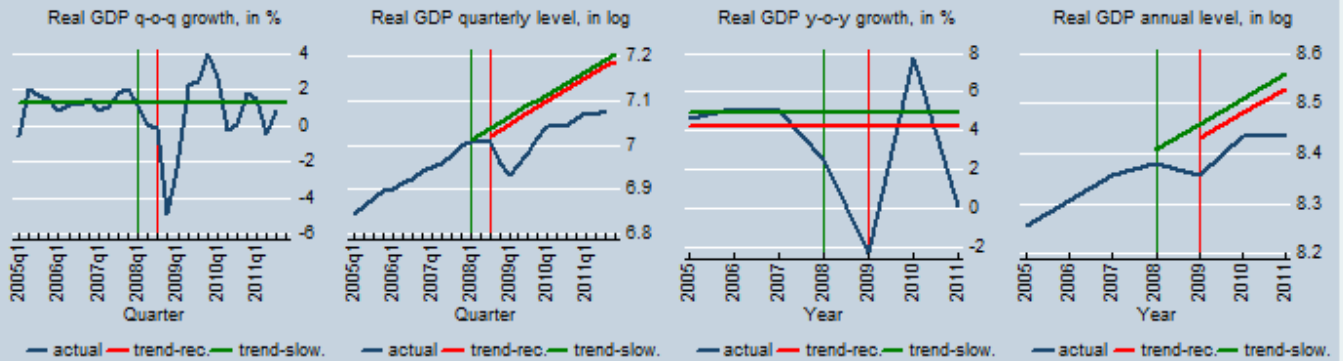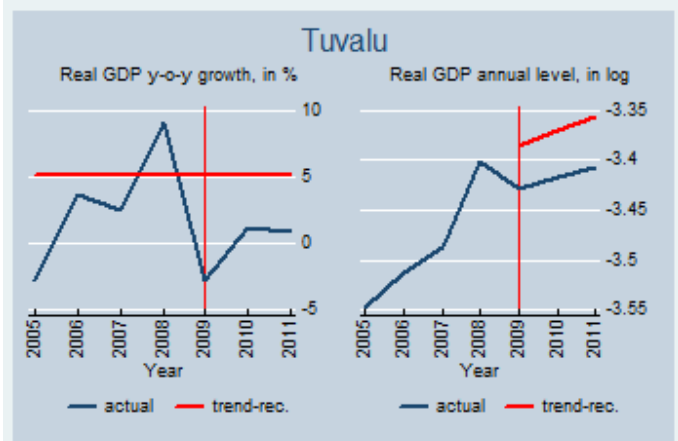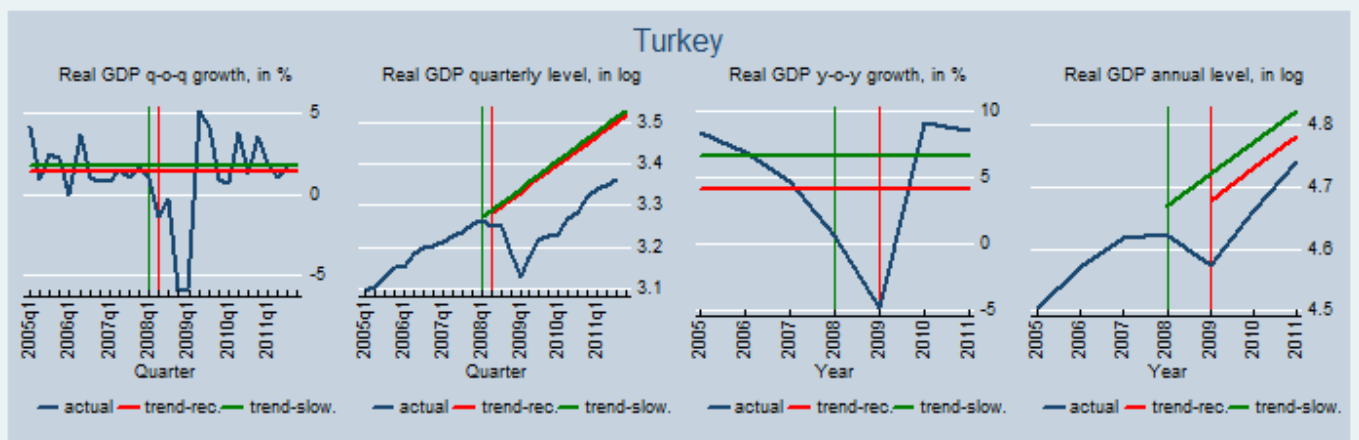
Taiwan Province of China

Tajikistan

Thailand

Timor-Leste

Togo

Tonga

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Trinidad and Tobago

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Tunisia

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Turkey

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Turkmenistan

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Tuvalu

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Uganda

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-slow.

United Arab Emirates

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — trend-slow.

Ukraine

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — trend-slow.

United Kingdom

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — trend-slow.

— actual — trend-rec.

United States

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

— actual — trend-rec. — trend-slow.

— actual — trend-rec.

83

Uruguay

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Uzbekistan

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Venezuela, Rep. Bol.

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

Vietnam

Real GDP q-o-q growth, in %

Real GDP quarterly level, in log

Real GDP y-o-y growth, in %

Real GDP annual level, in log

84

Vanuatu

Real GDP y-o-y growth, in %

actual — trend-slow.

Real GDP annual level, in log

actual — trend-slow.

Yemen, Republic of

Real GDP y-o-y growth, in %

actual — trend-slow.

Real GDP annual level, in log

actual — trend-slow.

Zambia

Real GDP y-o-y growth, in %

actual — trend-slow.

Real GDP annual level, in log

actual — trend-slow.

Zimbabwe

Real GDP y-o-y growth, in %

actual — trend-rec.

Real GDP annual level, in log

actual — trend-rec.