WAS UNOFFICIAL DOLLARISATION/EUROISATION AN AMPLIFIER OF THE 'GREAT RECESSION' OF 2007-09 IN EMERGING ECONOMIES?

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Abstract

This paper investigates whether, and if so why, the recent 'Great Recession' was more severe in unofficially dollarised/euroised economies than in other economies. To that end, the paper builds on a novel dataset on unofficial dollarisation/euroisation to test whether the latter was a determinant of the extent of the growth collapse in 2007-09 in a cross-section of around 60 emerging market economies. Both OLS and Bayesian model averaging estimates suggest that unofficial dollarisation/euroisation was an important contributor to the severity of the crisis, once other of its well-established determinants are taken into account, including fast pre-crisis credit growth, current account deficits, trade and financial openness, market regulation, international openness of the banking sector and GDP per capita. Moreover, the adverse impact of unofficial dollarisation/euroisation is found to have been transmitted through the main channels traditionally highlighted in the literature, i.e. currency mismatches, reduced monetary policy autonomy and limited lender of last resort ability, all of which became more binding constraints in the midst of the crisis. The results help to shed light on the long-standing debate regarding the conduct of monetary policy in unofficially dollarised/euroised economies in crisis times.

Non-technical summary

The rapidly growing body of literature analysing the cross-country incidence of the global financial and economic crisis of 2007-09, or "Great Recession", as it has come to be more commonly known, has identified several determinants of its severity worldwide. Factors that have been highlighted as playing an important role in explaining why certain countries were hit by the crisis harder than others include fast pre-crisis credit growth, large current account deficits, trade openness, business friendliness (i.e. the extent of market regulation), the international openness of the banking sector and the level of GDP per capita.

Somewhat paradoxically, there is one potentially important factor which these studies have not considered so far, although it was believed to have played a crucial role in previous crises, at least when it comes to emerging market economies. It is the extent to which a country has assets and liabilities denominated in foreign currencies, i.e. its so-called degree of "unofficial dollarisation/euroisation". This aspect is particularly important for emerging economies as forcefully shown in countless crises examples, such as the Latin American sovereign debt crises of the 1980s, the currency crises in emerging Asia of the 1990s, the Argentinean crisis of the early 2000s, as well as the subsequent Brazilian and Turkish financial crises.

There are three main costs associated with unofficial dollarisation/euroisation which the literature traditionally highlights, namely: reduced monetary policy autonomy, limited lender of last resort ability, and adverse currency mismatches which arise for unhedged borrowers when the domestic currency depreciates. While these costs are well-established in theory, existing empirical studies have provided mixed results as to whether they matter in practice, however. The costs associated with dollarisation/euroisation may yet be visible only when crises are sufficiently severe. The Great Recession of 2007-09, which is unrivalled in severity by any crisis since the Great Depression, can therefore be seen as an almost "natural experiment" that could have made more visible the three main theoretical costs of dollarisation/euroisation.

It is this episode that this paper seeks to exploit in investigating whether unofficial dollarisation/euroisation acted as an amplifier of the global crisis of 2007-09 and if so, though which channels. The paper builds on a novel dataset on unofficial dollarisation/euroisation, notably loan dollarisation (i.e. foreign currency lending), which has become the focus of current policy discussions, in emerging Europe notably. The paper aims to further deepen the literature on the cross-country incidence of the Great Recession of 2007-09 and enhance our understanding of the risks associated with unofficial dollarisation/euroisation. One of the paper's key contributions consists in providing the first comprehensive dataset on loan dollarisation for around 60 emerging economies from all main regions in the world,

which is constructed from a large range of primary national and international institutions sources.

Both OLS and Bayesian model averaging estimates presented in the paper suggest that unofficial dollarisation/euroisation was an important contributor to the severity of the crisis, once other of its well-established determinants are taken into account, including fast pre-crisis credit growth, current account deficits, trade and financial openness, market regulation, international openness of the banking system and GDP per capita. Real GDP growth is found to have declined on average by around 0.84 percentage point more in economies where loan dollarisation was 10 percentage points higher. Moreover, the estimates suggest that the adverse impact of dollarisation/euroisation might have been transmitted through the main traditional channels, which became more binding constraints in the midst of the crisis.

Assessing whether the Great Recession was more severe in unofficially dollarised/euroised economies than in other economies also allows revisiting a long-standing policy debate on the conduct of monetary policy in unofficially dollarised economies in crisis times. According to one view, emerging economy authorities should abstain from tightening monetary policy in crisis times, as this would only further deteriorate growth prospects and prevent the economy's recovery. According to another view, higher policy interest rates might be a temporary necessity in unofficially dollarised/euroised emerging economies. Failing to defend the currency, as the view goes, would unleash potentially destabilizing effects due to currency mismatches which would ultimately hurt growth. The paper's finding that currency mismatches were a key transmission channel of the adverse impact of dollarisation/euroisation to the real economy is rather supportive of the latter view.

1. Introduction

The rapidly growing body of literature analysing the cross-country incidence of the global financial and economic crisis of 2007-09, the "Great Recession", as it has come to be more commonly known (see e.g. IMF, 2010), has identified several determinants of its severity worldwide. Factors that have been highlighted as playing an important role in explaining why certain countries were hit by the crisis harder than others include fast pre-crisis credit growth, large current account deficits, trade openness, business friendliness (i.e. the extent of market regulation), the international openness of the banking sector and the level of GDP per capita (see, in particular, Lane and Milesi-Ferretti, 2010; Blanchard et al, 2010; Berkmen et al., 2009; Berglöf et al., 2009; Giannone et al., 2010; Rose and Spiegel, 2009a, 2009b, 2011).

Somewhat paradoxically, there is one potentially important factor which these studies have not considered so far, although it was believed to have played a crucial role in previous crises, at least when it comes to emerging market economies. It is the extent to which a country has assets and liabilities denominated in foreign currencies, i.e. its so-called degree of "unofficial dollarisation/euroisation". This aspect is particularly important for emerging economies, as forcefully shown in countless crises examples, such as the Latin American sovereign debt crises of the 1980s, the currency crises in emerging Asia of the 1990s, the Argentinean crisis of the early 2000s, as well as the subsequent Brazilian and Turkish financial crises.

For almost three decades, unofficial dollarisation/euroisation has been the focus of controversial policy debates in emerging market economies, giving rise to a body of analytical and empirical work that has looked at its causes and costs, as well as at policy measures that could help mitigate its adverse effects (see e.g. Aghion et al., 2000 and 2001; Balino et al., 1999; Cespedes et al., 2004; Reinhart et al., 2003; Eichengreen and Hausmann, 1999 and 2005; Berkmen and Cavallo, 2009; Honohan and Shi, 2001; Broda and Levy Yeyati, 2006). Empirical work on this issue has yet been severely constrained by the absence of comprehensive and systematic data on unofficial dollarisation/euroisation, however (see e.g. Arteta, 2003).

The literature traditionally highlights three main costs/risks associated with unofficial dollarisation/euroisation, namely: reduction in monetary policy autonomy/effectiveness; inability/ineffectiveness to act as a lender of last resort; and adverse currency mismatches which arise for unhedged borrowers when the domestic currency depreciates (see e.g. Levy Yeyati et al., 2003 for a survey of this literature). While these costs are well-established in theory, existing empirical studies have provided mixed results as to whether they matter in practice, however. Several studies have indeed failed to find compelling evidence that the magnitude of these costs is significant and, in particular, that unofficially dollarised/euroised economies are more crisis-prone than other economies, or that crises are more severe in unofficially

dollarised/euroised economies (see e.g. Arteta, 2003; Levy Yeyati, 2006; De Nicoló et al., 2003).

The costs associated with dollarisation/euroisation may yet be visible only when crises are sufficiently severe. Hence it could well be that past crises used in previous empirical studies might have not been of a significantly large magnitude to allow detecting these costs in the data. The Great Recession of 2007-09, which is unrivalled in severity by any crisis since the Great Depression, offers therefore a potentially unique opportunity to reveal these costs and test whether they have significant real implications or not. The Great Recession can therefore be seen as an almost "natural experiment" that could have made more visible the three main theoretical costs of dollarisation/euroisation which the literature traditionally highlights.

It is this episode that this paper seeks to exploit in investigating whether unofficial dollarisation/euroisation acted as an amplifier of the global crisis of 2007-09 and if so, though which channels. It builds on a novel dataset on unofficial dollarisation/euroisation, notably loan dollarisation (i.e. foreign-currency lending), which has become the focus of current policy discussions, in emerging Europe notably. The paper aims to further deepen the literature on the cross-country incidence of the Great Recession of 2007-09, while enhancing our understanding of the risks associated with unofficial dollarisation/euroisation. One of the paper's key contribution also consists in providing the first comprehensive dataset on loan dollarisation for around 60 emerging economies from all main regions in the world (namely Latin America, Middle East, Africa, Emerging Europe and Asia), which is constructed from a range of national and international institutions sources.

The empirical investigation is carried out in two steps. In a first step, we test whether unofficial dollarisation/euroisation acted as an amplifier of the Great Recession of 2007-09 in a cross-section of around 60 emerging economies. We regress to that end the change in the real GDP growth rate between 2009 and 2007 on pre-crisis loan dollarisation/euroisation and a large set of control variables identified in the literature as being good predictors of the severity of the Great Recession. We perform a large number of sensitivity checks to test whether these results are robust to different metrics of crisis severity, samples, set of controls or estimation methodologies. In a second step, we turn to the analysis of the channels through which the costs of unofficial dollarisation/euroisation have been transmitted to the real economy, which we proxy through interaction terms between loan dollarisation and its three standard costs on domestic balance sheets (currency mismatches) and monetary policy (changes in policy rates and liquidity provision).

The results suggest that unofficial dollarisation/euroisation was an important contributor to the severity of the crisis, once other of its well-established determinants

are taken into account. According to the estimates, real GDP growth declined on average by around 0.84 percentage point more in economies where loan dollarisation was 10 percentage points higher. These results are robust to a number of sensitivity tests on the definition of crisis severity (i.e. capital outflows and stock market correction in 2007-09), sample (i.e. including also fully dollarised economies and/or advanced economies), model specification or estimation methods (OLS, robust-to-outlier and Bayesian model averaging estimation). Moreover, we find that the adverse impact of dollarisation/euroisation has been transmitted through all the main channels traditionally highlighted in the literature, i.e. currency mismatches, reduced monetary policy autonomy and limited lender of last resort ability, all of which became more binding constraints in the midst of the crisis.

Assessing whether the Great Recession was more severe in unofficially dollarised/euroised economies than in other economies is also of relevance from a policy perspective. It helps to shed some light on ongoing discussions on macro-prudential risks associated with potentially excessive lending in foreign currency in emerging economies, notably in Emerging Europe (e.g. Rancière et al., 2010; Zettelmeyer et al., 2010). It also allows to revisit a long-standing policy debate on the conduct of monetary policy in unofficially dollarised economies in crisis times, which emerged during the Asian crisis. According to one view, emerging economy authorities should abstain from tightening monetary policy in crisis times, as this would only further deteriorate growth prospects and prevent the economy's recovery (Stiglitz, 1998 and 2002). According to another view, however, higher policy interest rates might be a temporary necessity in unofficially dollarised/euroised emerging economies in order to stabilise the exchange rate (Fischer, 1998). Failing to defend the currency, as the view goes, would unleash potentially destabilizing effects due to currency mismatches which would ultimately hurt growth. The paper's finding that currency mismatches were a key transmission channel of the adverse impact of dollarisation/euroisation to the real economy is relevant to this debate and rather supportive of the latter Fischer view.

The rest of the paper is structured as follows. Section 2 presents the theoretical motivations underlying the econometric specification. Section 3 examines the data and presents some key stylised facts. Section 4 reviews the baseline empirical results together with robustness and extensions. Section 5 concludes and draws policy implications.

2. Theoretical motivations and empirical specification

2.1. *Theoretical motivations*

Two strands of literature are relevant to our question. The first one pertains to the nascent literature on the determinants of the cross-country severity of the Great Recession, and the second one to the literature on dollarisation.

The rapidly growing body of literature analysing the cross-country incidence of the Great Recession has used various model specifications, estimations techniques, samples and definitions of crisis severity as well as different time windows to define the global economic and financial crisis.

In terms of crisis definition, the recent literature has typically focused on real measures of crisis severity, notably metrics of the decline in GDP growth (e.g. Lane and Milesi-Ferretti, 2010; Blanchard et al, 2010; Berkmen et al., 2009; Giannone et al., 2010; Rose and Spiegel, 2009a, 2009b, 2011). Financial metrics of crisis severity, including exchange rate tensions, reserve losses, credit rating downgrades, stock market corrections, widening of sovereign spreads have also been considered (e.g. Rose and Spiegel, 2009a, 2009b, 2011; IMF 2010; Claessens et al., 2010; Frankel and Saravelos, 2010; Obstfeld and Taylor, 2009).

These studies have looked at an already impressive number of potential determinants of the severity of the Great Recession. These include country-specific pre-crisis conditions (home-grown vulnerabilities), as well as global factors, including country exposure to the international environment and the US, international linkages and openness. As Rose and Spiegel (2011, p. 314) put it, a "consensus seems to be developing that it is extremely difficult to understand the intensity of the crisis across countries using simple quantitative models".[1] This said, some determinants were more systematically found than others to be relatively good predictors of the crisis severity. These include fast pre-crisis credit growth, current account deficits, trade and financial openness, market regulation (i.e. business friendliness), international openness of the banking sector and GDP per capita.

For instance, Lane and Milesi-Ferretti (2010) show that the crisis hit more severely advanced economies and highlight the importance of various measures of buoyancy of economic activity pre-crisis, such as current account deficits and credit growth rates, as well as exposure to trade and production of traded goods in explaining the decline in output and demand growth rates. Berglöf et al. (2009) also find evidence that pre-crisis credit booms, high external debt and hard pegs, all

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[1] Rose and Spiegel (2009a, 2009b, 2011) conducted an extensive investigation of more than 100 potential determinants that could help explain the cross-country crisis incidence and found few clear reliable indicators in the pre-crisis data.

predicted larger output declines during the crisis, which is further substantiated by Berkmen et al. (2010) and the IMF (2010). Berkmen et al. (2010) find that countries with more leveraged domestic financial sectors and faster credit growth tended to suffer larger downward revisions to their growth outlooks. The IMF (2010) concludes that countries with higher pre-crisis vulnerabilities, including pre-crisis credit booms, and trade and financial linkages with the global economy were more impacted by the crisis. In a related vein, Giannone et al. (2010) find that policies that favour liberalization in credit markets (regulatory quality) are negatively correlated with countries' resilience to the Great Recession.

As to other country-specific determinants, Obstfeld et al. (2009) and Frankel and Saravelos (2010) find some role that international reserve holdings are of help in understanding the currency depreciation during the crisis period, which is however not confirmed by Rose and Spiegel (2009a, 2009b, 2011) and Blanchard et al. (2010). There is also little evidence that the exchange rate regime mattered in explaining crisis incidence (Blanchard et al., 2010; IMF, 2010). Blanchard et al. (2010) conclude in this respect that the role of the exchange rate ultimately depends on the strength of balance sheet effects, and on the combination of policy rate increases and reserve decumulation to maintain the peg.

Other potential determinants relate to international real and financial linkages through trade and banking sector exposures. Both Blanchard et al. (2010) and Lane and Milesi-Ferretti (2010) find that countries whose trading partners's growth declined further during the crisis fared worse themselves. Claessens et al. (2010) look at banks' exposure to foreign claims, to capture the possibility that shocks are transmitted across borders through globally operating banks, in the spirit of the literature on financial contagion (e.g. Eichengreen et al., 1996; Kaminsky and Reinhart, 2000). Overall, they find that, while their explanatory power remains weak, some pre-crisis conditions, such as credit growth, asset price appreciation and current account balances, help explain the severity of the crisis.

This paper aims to explore the role of unofficial dollarisation/euroisation as a potential determinant of the Great Recession in emerging economies, since this is a crucial feature of many emerging market economies and potentially important omitted variable in these studies.

Dollarisation/euroisation has long been the focus of controversial debates for reasons that include its impact on inflation performance and, most prominently, the financial fragility it creates (see e.g. Levy Yeyati and Sturzenegger, 2003; Levy Yeyati, 2006). An aspect prominently stressed is the heightened vulnerability to exchange rate fluctuations created by dollarisation, both in terms of financial distress

and as limitation on monetary and exchange rate policies.[2] De Nicoló et al. (2003) and Gulde et al. (2004) look at the solvency (i.e. currency mismatches arising in case of exchange rate depreciation) and liquidity (i.e. run on bank deposits given the limited central bank's ability to lend in last resort) risks associated with dollarisation. Calvo (2006) deepens the analysis regarding the constraints faced by unofficially dollarised emerging economies to act as a lender of last resort. Berkmen and Cavallo (2009) investigate the two-way relationship between dollarisation and exchange rate policy choice. Chang and Velasco (2000) provide a detailed account of the possible interactions between bank fragility and the exchange rate and monetary regimes, including unofficial dollarisation.[3]

Whether and why dollarisation/euroisation plays a role in amplifying the real effects of financial crises is an aspect which remains, however, relatively under-researched. To our best knowledge, only a few studies have looked empirically at this issue in detail, and the evidence they find is rather mixed. On the one hand, Arteta (2003) finds little evidence that higher dollarisation heightens the probability of banking crises or currency crashes; allegedly, the severity of the latter would not be greater in highly dollarised countries and would depend rather on macroeconomic and exchange rate policies. Reinhart, Rogoff and Savastano (2003) find, inter alia, that dollarisation has limited impact on the effectiveness of monetary policy, that output fluctuations are fairly similar in countries with different degrees and varieties of dollarisation, but that exchange rate-linked government debt increases crisis vulnerability.

On the other hand, Levy Yeyati (2006) finds evidence that financially dollarised economies tend to display higher inflation rates, higher propensity to suffer from banking crises and slower and more volatile output growth. De Nicoló et al. (2003) also show that financial instability is likely higher in dollarised economies. Honohan and Shi (2001) show that greater dollarisation is associated with a higher pass-through from exchange rate changes to consumer prices, potentially increasing nominal risk in the economy. Bordo et al. (2009) look at the long run evidence of the impact of foreign currency debt on growth and find that a higher share of foreign currency debt to total debt is associated with an increased risk of currency and debt crises which themselves resulted in significant permanent output losses.

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[2] For instance, Aghion et al. (2000 and 2001), Balino et al. (1999), Cespedes et al. (2004), Reinhart et al. (2003), among many others, study how dollarisation can affect optimal monetary policy. There is also a literature that studies how monetary policy can affect the currency composition of corporate debt (see e.g. Jeanne, 2003). Eichengreen and Hausmann (1999 and 2005) analyse the external vulnerability arising from foreign currency-denominated external debt, introducing the concept of "original sin".
[3] Their analysis suggests that it was not flexible exchange rates alone that were able to rule out bank runs, but the coupling of exchange rate flexibility with a lender of last resort. This gives therefore support to the view that unofficial dollarisation (independently of the exchange rate regime) may be destabilising, as it prevents the central bank from serving as a lender of last resort, thereby wiping out the potential benefits of flexible exchange rates.

Due to its unprecedented severity in post-war history, the global economic crisis of 2007-2009 can be seen as an almost "natural experiment" that could have made more visible the three main theoretical costs of dollarisation/euroisation which the literature traditionally highlights, i.e. the reduction in monetary policy autonomy/effectiveness, the inability/ineffectiveness to act as a lender of last resort, and the existence of adverse currency mismatches which arise for unhedged borrowers when the domestic currency depreciates (see e.g. Levy Yeyati et al., 2003 for a survey of this literature). The costs associated with dollarisation/euroisation may however be visible only when crises are sufficiently severe. Hence it could well be that past crises used in previous empirical studies might have not been of a significantly large magnitude to allow detecting these costs in the data. The Great Recession, unrivalled in severity by any crisis since the Great Depression, offers therefore a potentially unique opportunity to reveal these costs and test whether they have significant real implications or not.

A considerable challenge confronting the empirical literature on unofficial dollarisation/euroisation has been the serious limitation to data availability. One of the key contributions of this paper will consist in providing the first comprehensive dataset on both loan and deposit dollarisation for around 60 emerging economies from all main regions in the world, namely Latin America, Middle East, Africa, Emerging Europe and Asia (see section 3 for further details).

2.2. *Empirical specification*

OLS estimates

Our empirical investigation is carried out in two steps. In a first step, we test whether unofficial dollarisation/euroisation acted as an amplifier of the crisis and, if this is the case, we study in a second step through which transmission channels.

We define crisis severity as the change in the real GDP growth rate between 2009 and 2007, following for e.g. Lane and Milesi-Ferretti (2010), Blanchard et al. (2010), IMF (2010). Alongside the change in real GDP growth rate, several other measures of crisis severity are considered in the robustness tests, including the magnitude of the equity market correction between July 2007 and April 2009 and the size of capital outflows between 2007 and 2009, similar for e.g. to the IMF (2010), Rose and Spiegel (2009a, 2009b, 2011).

The empirical model used in the first step is as follows:

$$(y_{i,09} - y_{i,07}) = \alpha + \beta x_{i,06} + \boldsymbol{\delta}'\mathbf{Z_{i,07}} + u_i \qquad (1)$$

where we regress *y*, the change in the real GDP growth rate between 2009 and 2007 in country *i* on: pre-crisis loan dollarisation/euroisation *x* (i.e. the ratio of foreign currency-denominated loans to total loans), and a set of control variables **Z** identified in the literature as having been good predictors of the severity of the 2007-09 global crisis, i.e. GDP per capita, trade and financial openness, private sector credit growth, current account balance, credit market regulation, international openness of the banking sector; *α*, *β*, and the *δ*s are parameters to be estimated and *u* the residual. The baseline model is estimated by OLS with robust-to-heteroscedasticity standard errors.

All explanatory variables are pre-determined to mitigate potential endogeneity with the dependent variable. The coefficient of interest in Eq. (1) is *β*. A negative coefficient estimate would suggest that more highly dollarised/euroised countries experienced larger fall in real GDP growth rates during the crisis. Our null hypothesis is therefore $H_0: \beta \geq 0$.

Bayesian model averaging

Over and beyond this standard set of controls, we also consider more than 20 other potentially relevant macroeconomic and policy controls such as inflation, financial development, various fiscal indicators, external debt, various regulatory indices, including credit market regulation, average growth in trading partners, liabilities to BIS reporting banks, trade and financial exposure to the US, dummies for IMF programs, for exchange rate regimes, for access to currency swap lines from major central banks etc.

We add these regressors one by one to the baseline equation, as well as simultaneously. In this latter case, we use the Bayesian Averaging with Classical Estimates framework (BACE) as outlined by Sala-i-Martin et al. (2004).[4] This methodology consists in attaching probabilities to all possible models, i.e. all possible combinations of the *K* regressors (i.e. a total of 2^K models), which are then used to estimate a weighted average model. The weights in the averaging are given by the posterior model probabilities *p(M|y)*, where M is the model and y represents the data. The two elements which are required to compute the posterior model probabilities using Bayes rule are the posterior distribution of the parameters in each model *M*, which is then used to obtain the marginal likelihood *p(y|M)*, as well as the prior distribution of the models *p(M)*. The model posterior probabilities are then:

$$p(M|y) \propto p(y|M)p(M)$$

A key advantage of this methodology is to consider all potential regressors jointly which helps to address potential problems of omitted variables that may occur when

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[4] See also Bussière et al. (2010) and Giannone et al. (2010) for further practical applications.

control variables are included sequentially. We consider all the possible models that can be obtained by combining the predictors. In our case, with $K = 21$, the number of models we consider is therefore over 2 million. We investigate whether loan dollarisation still remains among the most prominent correlates to the severity of the global crisis.

Similarly to Sala-i-Martin et al. (2004), Bussière et al. (2010) and Giannone et al. (2010), we report BACE outcomes in terms of posterior inclusion probabilities, as well as the mean and the standard deviation of the posterior distribution of the coefficients across models. High posterior inclusion probabilities indicate that the regressor has a strong explanatory power, irrespective of which other explanatory variables are included. Conditional on being included in the model, the posterior probability distribution of the regression coefficients is obtained as the average of the distributions of the coefficients in each model, using as weights the posterior probability of each model where the regressor is included.

Transmission channels

After testing whether unofficial dollarisation/euroisation amplified the crisis' severity in the first step, we take up the issue of the transmission channels to the real economy of the adverse impact of dollarisation/euroisation in a second step. We test whether its three main costs have had a magnifying impact on crisis severity, namely: (i) reduced monetary policy autonomy, i.e. the ability to cushion effectively the impact of a given shock through monetary policy easing; (ii) reduced ability to act as a lender of last resort, i.e. to take non-standard liquidity measures and provide liquidity to the financial system when needed and (iii) currency mismatches, i.e. heightened vulnerability of unhedged borrowers upon a large currency depreciation when their liabilities are in a currency different from their assets.

To that end, we interact loan dollarisation/euroisation with (i) the total change in the policy rate during the crisis, a proxy for the monetary policy channel, (ii) the change in the central bank balance sheet during the crisis scaled by pre-crisis GDP, a proxy for the lender of last resort channel, (iii) the difference between foreign currency-denominated loans and foreign currency-denominated deposits as a share of total loans, a proxy for the currency mismatch channel. All these proxies are scaled by their standard deviation to express them in the same unit.

Formally, the empirical model of the second step is as follows:

$$(y_{i,09} - y_{i,07}) = \alpha + \gamma(\Theta_i \times x_{i,06}) + \beta x_{i,06} + \eta\Theta_i + \boldsymbol{\delta'}\mathbf{Z_{i,07}} + u_i \qquad (2)$$

where we have added the interaction between loan dollarisation/euroisation x and transmission channel Θ (entered one by one in the regression), along with the direct effect of Θ on growth.

The coefficient of interest in Eq. (2) is γ, i.e. which of the three channels was important in transmitting the adverse effects of loan dollarisation/euroisation to the real economy in the crisis and amplified the collapse in real growth.[5] This coefficient would capture how loan dollarisation affected growth, conditional on the existing currency mismatches, on the conduct of monetary policy and on the ability to act as a lender of last resort, respectively. Our null hypothesis is therefore $H_0' : \gamma = 0$.

Arguably, potential endogeneity between the monetary policy-related transmission channels and our dependent variable is a possible concern. In other words, monetary policy could have been eased (i.e. interest rates could have been cut and liquidity could have been provided to a greater extent) in those countries where growth declined most. Such endogeneity should not be a concern for the first transmission channel (currency mismatches), however, to the extent that it is a pre-determined variable (i.e. whose values are taken pre-crisis in 2006).

3. Data and stylised facts

As aforementioned, one of the key contributions of this paper consists in its novel and, to our knowledge, currently most comprehensive, dataset on loan dollarisation/euroisation. A significant challenge in measuring the extent of dollarisation across countries is that relevant data is often sparse and not systematically collected. Most studies conducted in the early 2000s (e.g. Honohan and Shi, 2001; Broda and Levy Yeyati, 2006; De Nicoló et al., 2003; Arteta, 2003; Levy Yeyati, 2006) focused on deposit dollarisation, i.e. foreign currency deposits as a share of either broad money or total deposits, due to substantial lack of data on loan dollarisation, but also because at that time the main policy concern was that of a run on deposits.

Current concerns are also, if not more, on risks arising from the asset side of the banking system's balance sheet, i.e. from excessive lending in foreign currency (e.g. Rancière et al., 2010; Zettelmeyer, 2010; Zettelmeyer et al., 2010). There is however no global dataset on this concept. This makes the need to have reliable data on loan dollarisation/euroisation more pressing. Arteta (2003) points out in this respect to the severe limitations regarding the availability of loan dollarisation data.

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[5] It is important to stress that in this second step we are less interested in the total effect of loan dollarisation per se (already estimated in the first step) or in the total effect of each of the three channels per se. We are particularly interested in how the two play out with each other to capture the transmission of the costs of dollarisation/euroisation to the real economy. We are therefore mainly interested in their interacted effect.

We can study in this paper both deposit dollarisation (defined as foreign-currency deposits to total deposits) and loan dollarisation (i.e. foreign currency loans to total loans), thanks to a new dataset constructed by collecting manually data on loan dollarisation/euroisation from a wide array of sources. Since data on foreign-currency denominated loans and deposits are not systematically reported, we had to undergo a detailed collection exercise, examining possible data sources on a country-by-country basis.[6]

The data are sourced from those provided by international organisations, in particular the IMF, or national institutions. More specifically, we have used the IMF database on financial soundness indicators (FSI) and IMF country specific reports, such as financial stability assessment reports or Article IV reports. As regards national sources, we have used the website and/or the official publications of national central banks or national statistical institutes. For some countries, we have also used data published in the ECB report on the international role of the euro. In most cases, there was only one possible data source reporting dollarisation metrics. There were only few exceptions where multiple data sources were available. In this latter case, we have used IMF and ECB sources (both based on primary national sources), so as to have in as much as possible comparable data across countries, thereby avoiding national idiosyncrasies.

A caveat inherent to the large range of data sources that needs to be mobilised to produce such a rich dataset is obviously that data may not be necessarily fully harmonised across countries. One is bound to trade off completeness and harmonisation at this stage and our collection effort should be seen as a first step towards providing a comprehensive picture of loan/deposit dollarisation/euroisation worldwide, making use of publicly available data.

The data on loan and deposit dollarisation pertain to both advanced and emerging economies worldwide, from Europe, CIS, America, Africa, Middle East to Asia and Pacific. Data on the share of foreign currency loans to total loans are available for 76 economies worldwide, of which 60 emerging economies, and those on the share of foreign currency deposits to total deposits for 75 economies worldwide, of which 55 emerging economies. The data for most of the countries are annual. They are available on higher frequency (monthly or quarterly) only for a very small subset of countries. For the purpose of our empirical exercise, we take end-2006 data for foreign currency loans and deposit ratios. However, the data have been collected for an extended time horizon, which varies according to the countries

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[6] Arguably, the IMF has recently started to collect data on foreign currency loans in the framework of the Financial Soundness Indicators (FSI) database; the ratios of foreign currency loans to total loans are however part of the "Encouraged FSI", not of the "Core FSI", and are therefore reported only for a limited number of countries and limited time periods.

considered. For example, we have data for loan dollarisation for the period 1999 to 2008 for Albania, as opposed to Serbia where the ratio of foreign currency-denominated loans is available only since 2008. A few countries for which data was not available for 2006 (as it was the case for Serbia) were necessarily excluded from the sample. Detailed descriptions of the data on loan dollarisation and deposit dollarisation are in Appendix 2 and Appendix 3, respectively.

The literature makes a clear distinction between *de jure* (fully/ unilateral/official) dollarisation/euroisation and *de facto* (partial/financial/unofficial) dollarisation/euroisation. In line with this, we consider in the baseline sample only *de facto* dollarized/euroised emerging economies, thereby excluding fully dollarised/euroised economies and advanced economies. In the robustness tests, however, the sample is enlarged so as to include also fully dollarised/euroised economies, as well as advanced economies.

All the other variables of Eq. (1) and (2) are taken –or calculated from– the IMF's IFS and WEO databases. In this respect, as regards the standard set of controls **Z** it is to be noted that the change in the ratio of the private sector credit growth to GDP refers to the period between 2004 and 2007; the current account balance to GDP ratio is averaged out over 2005-2007; both (log) GDP per capita and trade openness are set at their 2007 values (as for e.g. in Lane and Milesi-Ferretti, 2010 and 2011). As regards the transmission channels, we proxy the monetary policy channel by the change in the key policy rate between July 2007 and April 2009, while the lender of last resort channel is captured by the changes in the central bank's total assets (scaled by GDP in 2007) between July 2007 and April 2009.[7]

Regarding the measurement of currency mismatches, it is worthwhile to bear in mind the extensive body of work on this topic that has been carried out after the Asian crisis (see e.g. Goldstein and Turner, 2004). Bussière et al. (2004) for instance link currency and maturity mismatches with real volatility in the economy. We consider a commonly used definition which estimates currency mismatches as the difference between foreign currency loans and foreign currency deposits (i.e. excess foreign currency lending) as a share of total loans. Arguably, this refers to notional currency mismatches without adjusting for foreign currency lending to unhedged borrowers.[8] A further caveat is that this aggregated measure (at the macro-level) might overlook potentially severe mismatches at the firm or household (micro) level. Going into this level of detail would however go far beyond the scope of our paper, not least due to the challenge in compiling the necessary data for our broad cross-section of countries. We therefore leave these issues for further research.

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[7] See Appendix 1 for more detailed information on the variables considered, including their precise definitions and data sources.
[8] See Rancière et al. (2010) for details on a new index of currency mismatch measurement, which takes into account unhedged borrowers.

Before turning to the model estimation results, it is worth discussing some of the insights gained from our novel dataset on dollarisation/euroisation. Chart 1 to Chart 3 show the extent of dollarisation/euroisation across regions and underscore that it is noticeably higher in Emerging Europe, the Community of Independent States (CIS) as well as in Latin America. There is significant heterogeneity in the extent of dollarisation/euroisation across countries, which can be almost negligible, like in Morocco (at around 4%), or much larger, like in Cambodia (at around 97%). Chart 4 plots deposit dollarisation/euroisation relative to loan dollarisation/euroisation, showing that generally FX lending is not always fully covered by FX deposits. This in turn would suggest prima facie that banks might take on currency risk, although a more comprehensive risk assessment would require having information on other elements of the asset side of their balance sheets or on off-balance sheet items to gauge whether they have other hedges at their disposal. Chart 5 shows the distribution across the baseline sample of the change in real GDP growth rates between 2007 and 2009. The distribution is very wide, with only a few countries seeing an acceleration in growth during the crisis period, and a large majority seeing growth declines which, in some cases, exceeded a cumulated 20-30 percentage points of GDP.

4. Estimation results and extensions

OLS results

Table 1 presents the baseline estimation results of Eq. (1) for a broad range of specifications, namely: when including only loan dollarisation/euroisation in the regression (column 1); when adding the standard set of controls **Z** (columns 2 to 5); and when adding other relevant controls one by one (columns 6 to 15).

Overall, the results suggest that loan dollarisation, once the other standard determinants are taken into account, was indeed an important predictor of the collapse in real GDP growth rates between 2007 and 2009 across our baseline sample of about 60 emerging economies. Indeed, loan dollarisation/euroisation pre-crisis is found not to be on its own a significant predictor of the severity of the crisis as measured by the fall in real GDP growth rates between 2007 and 2009 in our cross-section of countries (column 1 of Table 1). However, once the other well-established determinants of the cross-section dispersion of the growth decline during the crisis are included in the regression (columns 2 to 5 of Table 1), pre-crisis loan dollarisation/euroisation turns out to be a significant predictor of the severity of growth collapse. This result is robust to the inclusion of several other macroeconomic or policy controls in the regression, such as inflation, fiscal position, external debt, credit market regulation, financial openness, dummies for entry into IMF program, access to a currency swap line from the ECB or the Federal Reserve, the nature of the exchange rate regime, etc. (columns 6 to 15 of Table 1).

These findings suggest that high foreign currency lending contributed to amplify the global crisis in emerging economies in line with policy concerns before the crisis (see also Chart 6).[9] On average, our estimates suggest that real GDP growth rates declined by around 0.84 percentage point more in economies where loan dollarisation/euroisation was 10 percentage points higher. For instance, the predicted real GDP decline during the crisis for a country moderately dollarised/euroised like Turkey (where foreign currency loans pre-crisis represented 31% of total loans) is 12 percentage points, which is close to the actual figure of 9.4 percentage points. In a highly euroised country like Romania, where foreign currency loans are almost 20 percentage points higher than in Turkey (standing at about 47% before the onset of the crisis), predicted real GDP growth declined by a further 3 percentage points relative to Turkey.

Considering now the main controls included in the baseline regression (i.e. column 5 of Table 1), the negative sign of GDP per capita underscores the "advanced economy" nature of the global crisis, with output declining more in countries with higher GDP per capita, in line with findings in Lane and Milesi-Ferretti (2010) for instance. Consistently with results in the recent literature on the global crisis incidence as well as with countless studies on emerging market crises, the results also indicate that higher pre-crisis credit booms are associated with higher growth collapse.

Another noteworthy finding is that dollarisation/euroisation becomes significant already when adding just one variable, namely GDP per capita, i.e. a proxy for the level of development of a country. The latter may be also capturing the degree of sophistication of a country's financial system and therefore also its potential exposure to toxic assets, such as mortgage-related securitised products, and more broadly its exposure to global financial contagion, the importance of which during the crisis is intensely debated (see e.g. Bekaert et al., 2011). This intuition is supported by the growing body of theoretical literature on the international exposure of the banking system.[10] To shed empirical light on this aspect, we try to explicitly capture the international openness of the banking sector. We follow Giannone et al. (2010) as well as Rose and Spiegel (2011) in including the extent of financial liberalization

[9] The chart displays the actual values of pre-crisis loan dollarisation and the change in the real GDP growth rates during the crisis, together with their conditional relation which controls for the core variables included in the baseline regression.

[10] For instance, Dedola and Lombardo (2012) develop a model of financial integration and present simulation results that indicate that an unexpected increase in credit spreads in one country generates a similar increase in credit spreads in other financially integrated countries bringing about a global contraction, quite independently of the exposure to foreign assets in the balance sheet of leveraged investors. In a related vein, Devereux and Yetman (2010) develop a model of the international transmission of shocks due to interdependent portfolio holdings among leverage-constrained investors, while Mendoza and Quadrini (2010) suggest that financial globalization played an important role in the recent financial crisis, showing that financial integration leads to a sharp rise in net credit in the most financially developed country and to large asset price spillovers of country-specific shocks to bank capital.

(proxied by an index of credit market regulation compiled by the Frazer Institute) and international exposure of the banking sector (proxied by cross-border banking assets, obtained from the BIS, and scaled by GDP). Note however that we lose one-third of the sample when including these variables, due to data unavailability, which is why we exclude them from the baseline. Including the measures of financial liberalization and international openness of the banking sector does not affect our central result, however. The estimated effect of dollarisation/euroisation remains unaltered in terms of sign, statistical significance and economic magnitude, notwithstanding the much smaller sample, further underscoring the robustness of the previous findings. It is also interesting to note that when credit regulation and cross-border lending are included in the baseline specification, GDP per capita loses significance (a potential indication of collinearity), which may indeed confirm our prior that GDP per capita may to some extent capture the degree of sophistication of a country's financial system. For our purpose, however, what is key is that also in this case loan dollarisation remains statistically significant, with an estimated coefficient of the same magnitude and sign as in the baseline specification.

Considering now credit market regulation more specifically, the results confirm those obtained by Giannone et al. (2010), i.e. the set of policies that favor liberalization in credit markets are negatively correlated with countries' resilience to the Great Recession. The control variables for openness deliver mixed results and are sensitive to model specification. The estimated impact of trade openness, for example, is not statistically significant, while financial openness is found to be significant and positively correlated with growth. This also echoes earlier results in Lane and Milesi-Ferretti, (2010).[11] Concerning the exchange rate regime, which we measure with a dummy for countries with more flexible exchange rate regimes in 2006 as per the classification of Ilzetzki, Reinhart and Rogoff (2008), we find that this effect is not statistically significant (also in line with previous literature, see e.g. Blanchard et al., 2010; IMF, 2010), while the effect of loan dollarisation remains again unaltered.

Our main results are overall robust to a number of sensitivity tests on the definition of crisis severity, sample selection, model specification or estimation method, and econometric methodology. We ran regressions with two further estimators (simple OLS with standard errors and robust-to-outliers estimations) and found essentially the same results (see Table 2). To test for linearities (thresholds effects), we introduced squared and cubic terms of the explanatory variables and found that these terms were insignificant, confirming that the linear specification of the baseline model was not rejected. We varied the sample definition (see Table 3) by adding to the baseline sample (i) also fully (*de jure*) dollarised/euroised economies; or

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[11] They found that "once we control for GDP per capita and the current account, there is no evidence that financial openness (the size of the external balance sheet) is associated with lower growth during the crisis. Indeed, this variable is significant only in column (3) and it enters with a positive sign in that case", and that "higher trade openness is negatively correlated with output performance during the crisis, but the partial correlation is not statistically significant". (Lane and Milesi-Ferretti, (2010), p. 21)

(ii) advanced economies; or (iii) both advanced and fully dollarised economies. The results remained largely unaltered, with only some small changes in the size of the estimated impact of dollarisation/euroisation on growth.

Bayesian model averaging results

To further test the robustness of our main results, we now expand considerably the set of controls to more than 20 other macroeconomic or policy controls, which we will consider jointly using Bayesian model averaging estimation. Insofar as including controls sequentially is vulnerable to problems of omitted variables, one might indeed worry that the significance of loan dollarisation might be overestimated in the baseline specification, which may also explain why it survives all the robustness tests we have conducted so far.

Our expanded set of 21 controls includes inflation, financial development, external debt, various indicators of fiscal health, various regulatory indices, liabilities to BIS reporting banks, trade and financial exposure to the US, average growth in trading partners, dummies for IMF programs, for swap lines, for exchange rate regimes etc. [12]

Table 4 presents the results, which are based on a flat prior (as to the number of variables in the model) and the 21 regressors, using the full country sample. The importance of loan dollarisation is clearly confirmed, since it is ranked seventh among the 21 regressors, according to their posterior inclusion probability, with a probability of inclusion of over 40% (see column 2 of Table 4). There is also a strong evidence of the significantly negative effect of loan dollarisation (see Chart 8). Conditional on inclusion, the effects of loan dollarisation are also economically important, with an estimated elasticity of -0.044 (see column 3 of Table 4).[13] Results are similar when considering smaller number of variables and non-flat priors.[14]

Additional robustness checks

We also varied the definition of crisis severity using as dependent variable the magnitude of capital outflows and the extent of local equity market correction over 2007-2009. The results obtained under the baseline still held, albeit the level of statistical significance and the magnitude of the coefficients varied admittedly with the alternative measures of crisis severity considered.

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[12] See Annex 1 for detailed information on the variables considered.

[13] Bayesian estimates indicate therefore that growth declined by almost 0.5 percentage point more in countries where loan dollarisation was 10 percentage points higher. The elasticity is therefore almost identical with that obtained when using OLS and also the full country sample, further strengthening our central findings.

[14] The full set of results is not reported here, but is available upon request.

We controlled for potential regional effects, with no impact on the results. We controlled (with a dummy) for the effect of euroisation, which is potentially of most relevance for emerging Europe and found no evidence that it played a significant role, suggesting that, once key relevant determinants are taken into account, the crisis-amplifying nature of loan dollarisation played out similarly across regions.[15]

We also varied the definition of dollarisation itself by considering deposit dollarisation rather than loan dollarisation (see Table 5). The results suggest that, by contrast with loan dollarisation, deposit dollarisation is *not* a significant predictor of crisis severity. This echoes the mixed evidence found thus far in the literature on the role of dollarisation in crises (see e.g. Arteta, 2003), which had also used deposit dollarisation data. Taken together, these results open the intriguing possibility that it is more foreign currency lending that mattered for macro financial stability than foreign currency deposits.

Transmission channels

How was the adverse impact of dollarisation/euroisation transmitted to the economy? We now specifically consider the interplay between loan dollarisation and the proxies for its alleged standard costs for the real economy. Table 6 presents the baseline estimation results of Eq. (2). Overall, there is evidence that all three channels, i.e. reduced monetary policy autonomy, reduced ability/ineffectiveness to act as a lender of last resort, and currency mismatches, played a role in transmitting the adverse effect of dollarisation/euroisation to the real economy. In essence, all the main costs traditionally associated with dollarisation/euroisation became more apparent during the crisis.

Interpreting the signs of the estimated interaction coefficients is arguably not always straightforward. One key element to consider to that end is the role of the exchange rate. For instance, stronger currency mismatches, as measured by the interaction between pre-crisis loan dollarisation/euroisation and the difference between foreign currency loans and deposits in total loans, is associated with more severe growth declines during the crisis (see column 1 of Table 6).[16] This gives empirical support to the view that such currency mismatches are a key source of vulnerability at times of crises for highly dollarised/euroised economies, a vulnerability noted in numerous studies analysing the emerging market crises in the 1990's and more broadly in the vast literature on currency crisis models.[17]

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[15] The results are not reported here for the sake of conciseness, but are available upon request.

[16] A dummy for IMF programs is included in this regression to control for countries that benefited from IMF assistance, which has potentially helped them in sustaining the exchange rate.

[17] See e.g. Krugman (1999), Chang and Velasco (2000), Furman and Stiglitz (1998), Allen et al. (2002), Bordo and Meissner (2005 and 2007), Cespedes, Chang and Velasco (2004) or Rancière et al. (2010), who recall the key role played by balance sheet vulnerabilities, for instance in Mexico's crisis of 1994 or in the East Asian crisis of 1997–98.

As regards the monetary policy channel (see column 2 of Table 6), the coefficient of the interaction between the change in real policy interest rates during the crisis and pre-crisis loan dollarisation/euroisation is positively correlated with growth performance during the crisis. This in turn would suggest that dollarised countries which increased real interest rates had milder recessions. This would bring empirical support to "Fischer view" that a temporary rise in interest rates during crises in unofficially dollarised/euroised countries could in fact be growth supportive. The reason for this is that an increase in interest rates would help stabilise the exchange rate, thereby avoiding the undesirable balance sheet effects that would arise in the presence of significant currency mismatches should the exchange rate depreciate. We plot the estimated impact on real growth of a range of real interest rate changes, conditional on various levels of loan dollarisation (see Chart 7). The chart illustrates the "Fischer view" described above, in the sense that the more a country is dollarised and hikes interest rates, the more the effect on growth performance is positive. This effect gradually wanes when loan dollarisation tends towards small values.

Turning now to the lender of last resort channel, theory associates unofficial dollarisation with a limited or ineffective ability to act as a lender of last resort. The lender of last resort is defined by the capacity of the central bank to extent liquidity to banks when needed. However, in a dollarised economy, banks would need foreign currencies and not the domestic currency which the central bank can provide. In other terms, the lender of last resort function is then ineffective and can play no activity-supporting role. Our empirical findings support indeed this view (see column 3 of Table 6) and suggest that during the recent global crisis, the increase in the central bank's balance sheet, conditional on a given level of dollarisation/euroisation, did not statistically affect growth performance during the crisis. This echoes the model of Chang and Velasco (2000) in which it is the combination of exchange rate flexibility with a lender of last resort that stabilises the economy; unofficial dollarisation, independently of the exchange rate regime, constraints central banks from acting as an effective lender-of-last resort and, as they put it, wipes out potential benefits arising from exchange rate flexibility.

To shed further evidence on the key role played by the exchange rate in transmitting the standard costs of loan dollarisation to the real economy, we also considered the interaction of loan dollarisation with an index of exchange market pressures, a commonly used variable to identify currency crises (see e.g. Bussière and Fratzscher, 2006; Lindgren et al. 1999; Jeanne and Wyplosz, 2003). Exchange market pressures are measured as the average of the changes in the exchange rate during the crisis, scaled by its pre-crisis monthly volatility, and the changes in foreign-exchange reserves during the crisis, scaled by their pre-crisis monthly volatility. The results clearly indicate that unofficially dollarised countries which experienced higher

exchange market pressure (i.e. higher depreciation pressures) suffered from deeper recessions during the global crisis (see column 4 of Table 6).[18]

5. Conclusion

This paper has investigated whether, and if so why, the recent 'Great Recession' of 2007-09 was more severe in unofficially dollarised/euroised economies than in other economies using a novel and comprehensive dataset on loan dollarisation for around 60 emerging economies worldwide.

The paper has found that unofficial dollarisation/euroisation was indeed an important contributor to the severity of the crisis, once other of its well-established determinants were taken into account, including fast pre-crisis credit growth, current account deficits, trade and financial openness, market regulation, international openness of the banking sector and GDP per capita. It has presented OLS and Bayesian model averaging estimates which suggest that, on average, real GDP growth rates declined by around 0.84 percentage point more in economies where loan dollarisation was 10 percentage points higher. Moreover, it has presented evidence that the adverse impact of dollarisation/euroisation was transmitted through the main channels traditionally highlighted in the literature, i.e. currency mismatches, reduced monetary policy autonomy and limited ability to act as a lender of last resort, all of which became more binding constraints in the midst of the crisis.

The main results are robust to a number of sensitivity tests on the definition of crisis severity, sample selection, model specification and estimation methods. The key role found for currency mismatches as a transmission channel to the real economy of the adverse effects of loan dollarisation/euroisation gives support to the "Fischer view" of monetary policy conduct in crisis times for emerging economies. A temporary increase in monetary policy rates is not necessarily detrimental to growth when an emerging economy is unofficially dollarised/euroised, insofar as it can help stabilise the exchange rate, thereby preventing the materialisation of adverse balance sheet effects.

These findings contribute to the nascent literature on the determinants of the Great Recession by showing that also dollarisation/euroisation played at the margin an important role in amplifying its severity worldwide. They contribute in addition to the literature on dollarisation, which had found mixed evidence that the latter matters at

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[18] As a further robustness check, we also centered the variables entering the interactions. Expectedly, the slope of the interaction term remains the same whether or not the main effects are centered, while only the coefficients of the main effects and the intercept change. Given that for our purpose we are only interested in the coefficient of the interaction term, centering the main effects variables has no implication for the economic interpretation discussed above.

times of crisis. This might be due to the fact that the data sample used in previous studies was not as comprehensive as the one collected for this paper or did not contain a shock of a magnitude as large as the global financial and economic crisis of 2007-2009.

Chart 1: Pre-crisis loan dollarisation/euroisation
(*by region*)
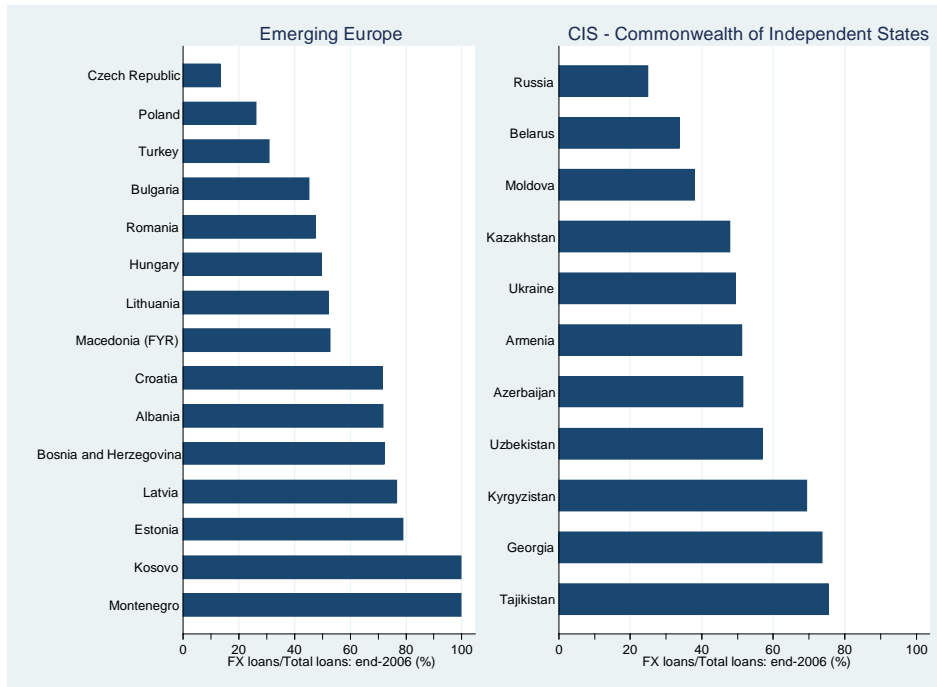
Chart 2: Pre-crisis loan dollarisation/euroisation
(*by region*)
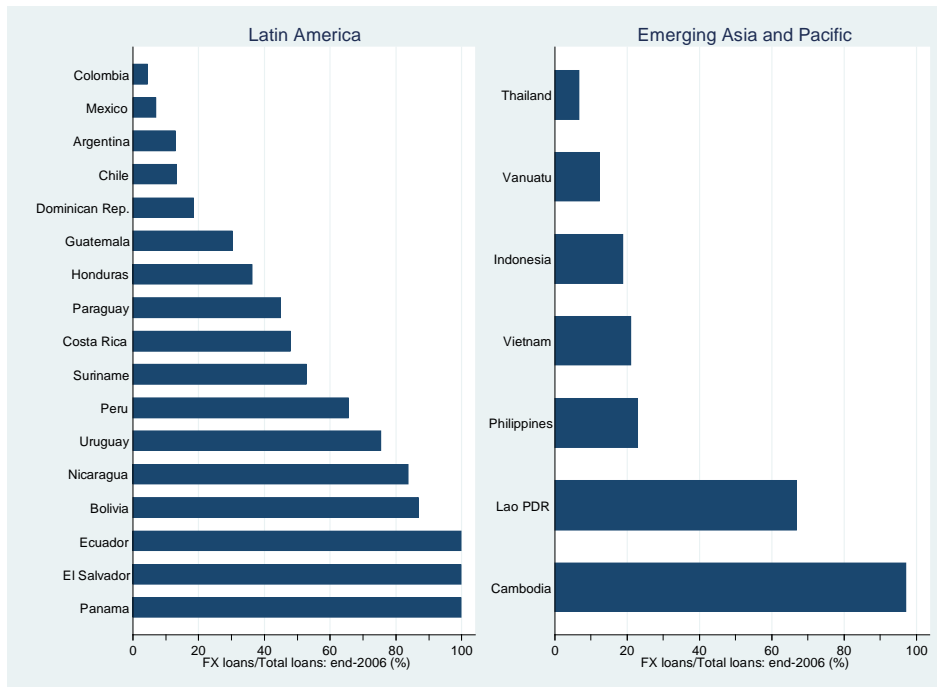
Chart 3: Pre-crisis loan dollarisation/euroisation
(*by region*)

Middle East and North Africa

Morocco
Saudi Arabia
Kuwait
Qatar
Iran
United Arab Emirates
Bahrain
Egypt
Yemen
Lebanon

0 20 40 60 80 100
FX loans/Total loans: end-2006 (%)

Africa

South Africa
Zambia
Mozambique
Angola
Sao Tome e Principe

0 20 40 60 80 100
FX loans/Total loans: end-2006 (%)
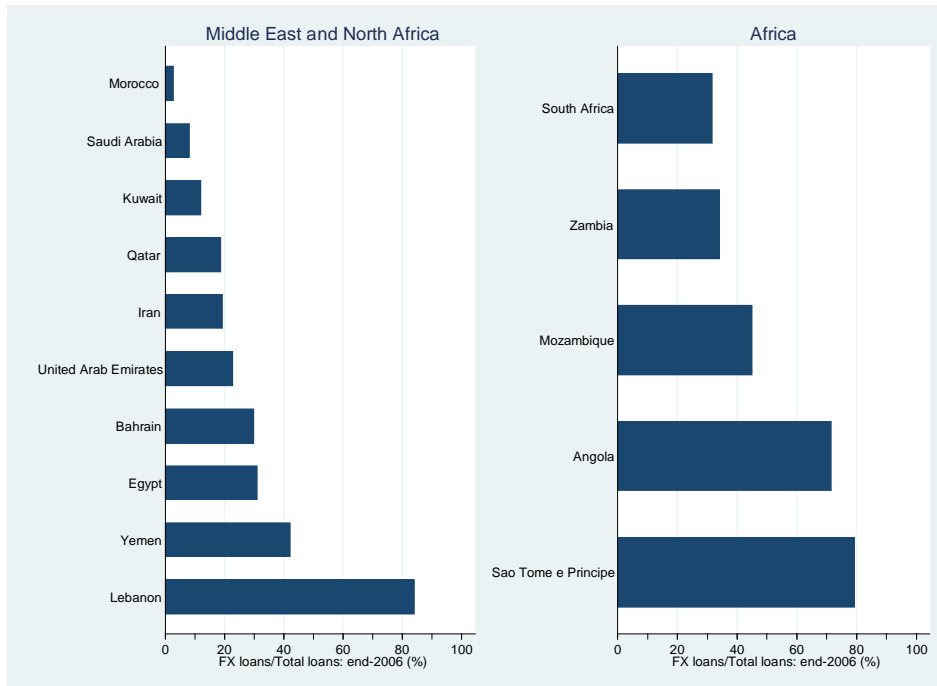
Chart 4: Loan dollarisation vs. deposit dollarisation
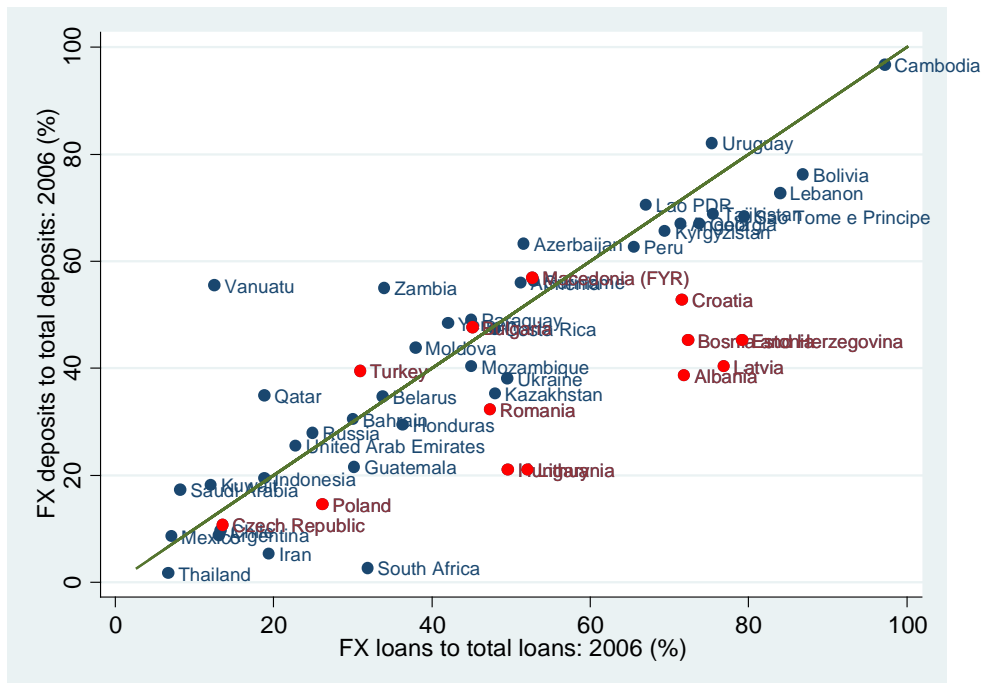
Note: Emerging European countries are highlighted in red.

Chart 5: Change in real GDP growth rate over 2007/9
(*distribution across the baseline sample*)
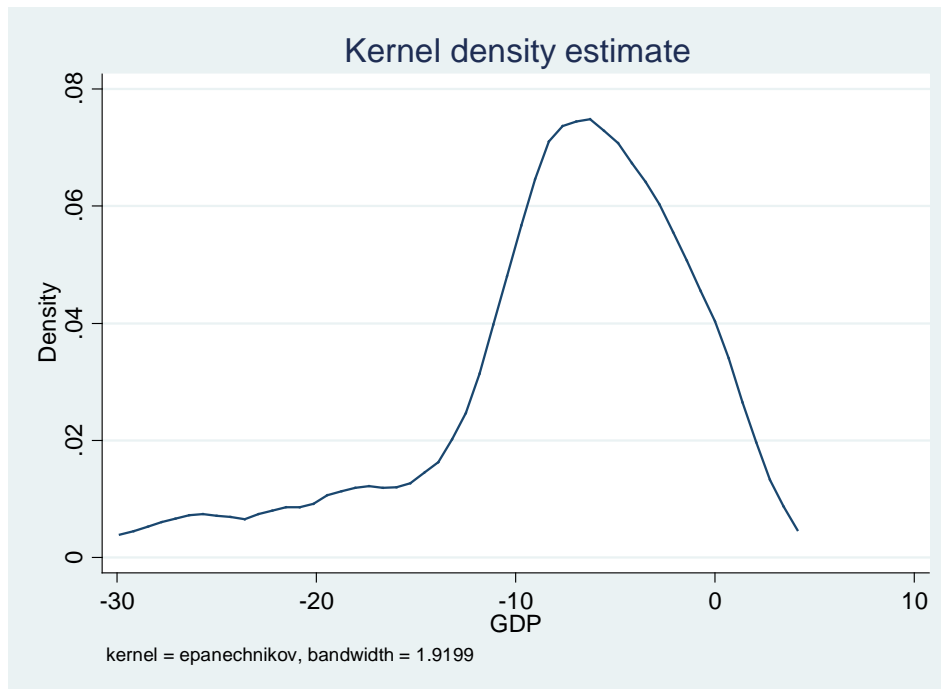
Note: Kernel density estimates (using an Epanechnikov kernel) of the distribution of the change in real GDP growth in percentage points between 2007 and 2009 across the countries included in the baseline sample.

Chart 6: Pre-crisis conditional loan dollarisation/euroisation
as a predictor of crisis severity
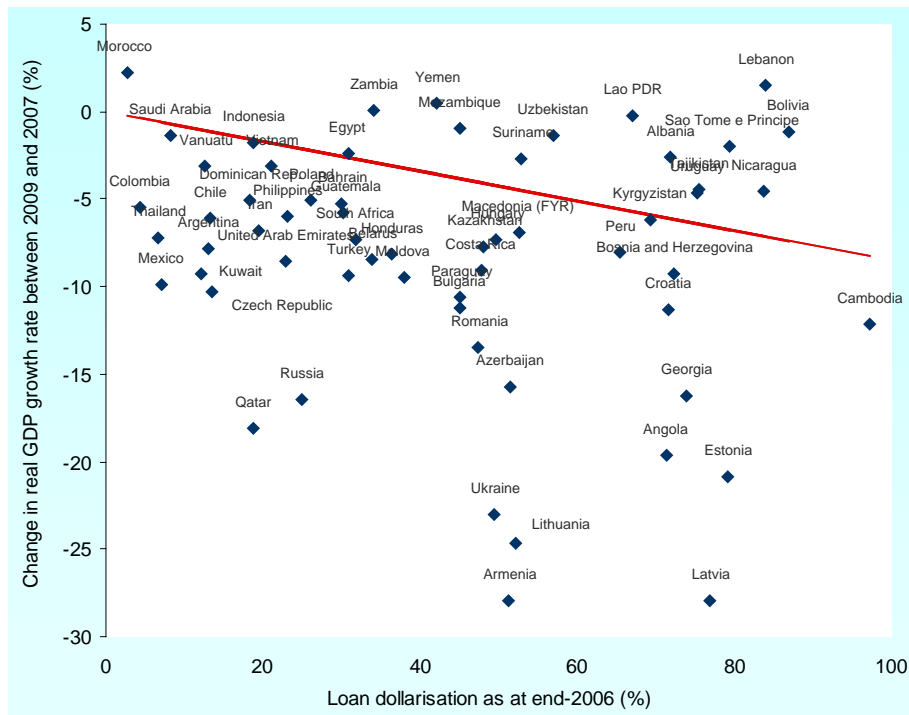
Note: Conditional loan dollarisation, partial coeff. = - 0.08, (robust) se = 0.038, t = -2.2.

Chart 7: Fischer view: Monetary policy channel in dollarised economies
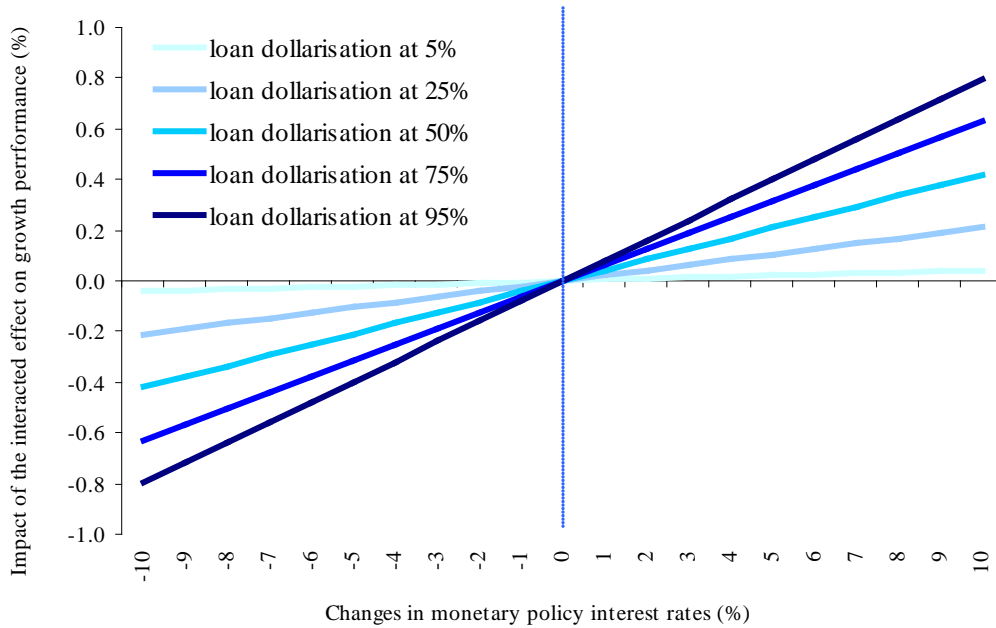
Note: The chart plots the estimated impact on real growth of a range of real interest rate changes, conditional on various levels of loan dollarisation.

Chart 8: Histogram of coefficient estimates for loan dollarisation in a Bayesian Averaging of Classical Estimate (BACE) framework
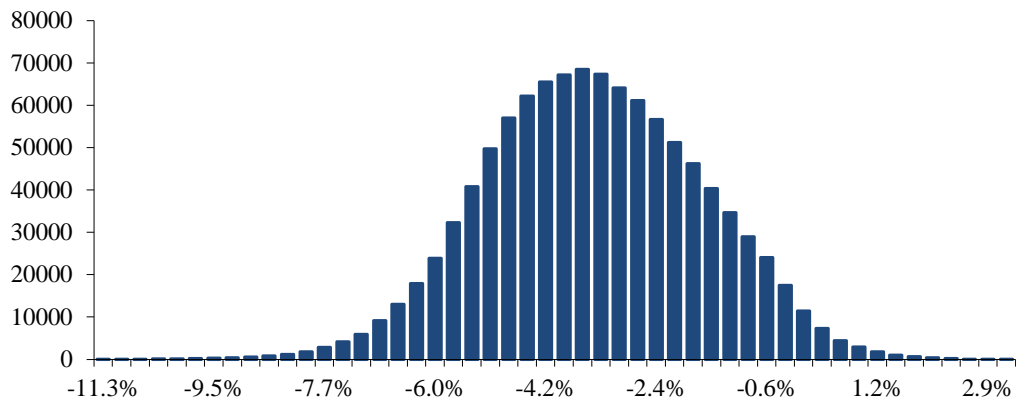
Note: The chart plots the histogram of the coefficient estimates for loan dollarisation in a 21-variable sample, as obtained under a flat prior.

Table 1: Baseline specification

Dependent variable: Changes in real GDP growth rates between 2007 and 2009
(percentage points)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Foreign currency loans to total loans	-0.048	-0.090**	-0.065*	-0.075*	-0.084**	-0.084**	-0.082*	-0.087*	-0.078**	-0.072**	-0.085*	-0.087**	-0.085**	-0.082**	-0.090**
	(0.035)	(0.036)	(0.034)	(0.036)	(0.038)	(0.042)	(0.042)	(0.043)	(0.038)	(0.033)	(0.043)	(0.039)	(0.034)	(0.039)	(0.039)
GDP per capita		-3.688***	-2.779***	-2.841***	-2.419**	-2.425*	-1.436	-2.014	-2.723**	-3.039***	-2.748**	-2.263**	-1.854**	-2.531**	-2.642**
		(0.796)	(0.788)	(0.751)	(0.955)	(1.238)	(1.664)	(1.695)	(1.019)	(0.885)	(1.039)	(0.954)	(0.922)	(1.015)	(1.043)
Growth of private sector credit to GDP			-0.228**	-0.251**	-0.289**	-0.273*	-0.168	-0.165	-0.265**	-0.329**	-0.297**	-0.278**	-0.282***	-0.284**	-0.291**
			(0.087)	(0.096)	(0.115)	(0.135)	(0.135)	(0.136)	(0.118)	(0.135)	(0.123)	(0.124)	(0.104)	(0.117)	(0.117)
Trade openness				0.030	0.033	-0.002	0.048*	0.041	0.030	0.018	0.015	0.036	0.020	0.032	0.027
				(0.024)	(0.025)	(0.028)	(0.028)	(0.028)	(0.026)	(0.022)	(0.030)	(0.025)	(0.023)	(0.025)	(0.025)
Current account to GDP					-0.079	-0.107	0.039	0.034	-0.053	-0.051	-0.170	-0.032	-0.135	-0.070	-0.102
					(0.097)	(0.111)	(0.091)	(0.094)	(0.101)	(0.085)	(0.153)	(0.131)	(0.086)	(0.102)	(0.094)
Financial openness						0.004***									
						(0.001)									
Credit market regulation							-2.391**	-2.440**							
							(1.038)	(1.027)							
Cross-border lending (BIS)								0.019*							
								(0.010)							
Inflation									-0.184						
									(0.229)						
Financial development										0.067					
										(0.054)					
External debt to GDP											0.010				
											(0.047)				
Government balance to GDP												-0.062			
												(0.141)			
IMF program (dummy)													-4.905**		
													(1.917)		
Swap line (dummy)														1.510	
														(2.367)	
Exchange rate flexibility (dummy)															-1.650
															(1.977)
Constant	-6.200***	28.498***	21.742***	19.919**	16.662*	18.141	24.113	30.037*	20.545*	20.868**	20.073**	14.917	14.052	17.478*	20.766*
	(1.370)	(7.751)	(7.460)	(7.528)	(8.960)	(12.043)	(14.732)	(14.810)	(10.504)	(8.050)	(9.891)	(8.940)	(8.618)	(9.382)	(10.639)
No. of observations	60	60	59	57	57	47	36	36	57	57	49	56	57	57	57
R^2	0.030	0.246	0.353	0.356	0.366	0.397	0.460	0.473	0.375	0.391	0.373	0.372	0.452	0.368	0.372
R^2 (adjusted)	0.0131	0.219	0.318	0.307	0.304	0.306	0.349	0.341	0.300	0.318	0.284	0.295	0.387	0.292	0.297
F-statistic	1.809	10.77	11.74	7.922	5.988	6.259	5.156	4.804	4.991	4.567	5.241	5.031	6.926	5.065	5.197

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: The table reports OLS regression estimates (with robust standard errors) for the baseline specification where the change in real GDP over 2007-2009 is used as dependent variable and dollarisation is measured as the ratio of foreign currency-denominated loans to total loans.

Table 2: Alternative estimators

Dependent variable: Changes in real GDP growth rates between 2007 and 2009

(percentage points)

	Simple OLS estimates			Robust-to-outliers estimates		
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign currency loans to total loans	-0.084**	-0.084**	-0.086*	-0.066*	-0.077**	-0.087*
	(0.035)	(0.039)	(0.053)	(0.035)	(0.037)	(0.052)
GDP per capita	-2.419**	-2.425*	-1.556	-2.454**	-2.698*	-3.827
	(1.047)	(1.381)	(2.017)	(1.046)	(1.369)	(2.248)
Growth of private sector credit to GDP	-0.289***	-0.273**	-0.147	-0.290***	-0.319***	-0.155
	(0.089)	(0.108)	(0.123)	(0.089)	(0.099)	(0.120)
Trade openness	0.033	-0.002	0.046	0.023	-0.025	-0.003
	(0.024)	(0.029)	(0.038)	(0.024)	(0.028)	(0.041)
Current account to GDP	-0.079	-0.107	0.048	-0.059	-0.113	0.071
	(0.090)	(0.108)	(0.140)	(0.090)	(0.101)	(0.137)
Financial openness		0.004	0.002		0.024	0.026
		(0.003)	(0.003)		(0.016)	(0.023)
Credit market regulation			-2.689**			-1.654
			(1.264)			(1.231)
Constant	16.662*	18.141	27.472	17.749*	20.491	41.533**
	(9.521)	(12.732)	(18.169)	(9.510)	(12.234)	(19.897)
No. of observations	57	47	34	57	46	33
R^2	0.366	0.397	0.474	0.362	0.464	0.473
R^2 (adjusted)	0.304	0.306	0.333	0.300	0.381	0.326
F-statistic	5.882	4.384	3.352	5.796	5.625	3.211

Standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: The table reports regression results for the baseline specification where the change in real GDP over 2007-2009 is used as dependent variable and dollarisation is measured as the ratio of foreign currency-denominated loans to total loans.

Table 3: Alternative sample definitions

	Dependent variable: Changes in real GDP growth rates between 2007 and 2009		
	(percentage points)		
	Baseline sample: *including fully dollarised*	Baseline sample: *including advanced economies*	Full sample: *all economies*
Foreign currency loans to total loans	-0.052*	-0.080**	-0.054*
	(0.031)	(0.037)	(0.029)
GDP per capita	-2.333**	-1.548*	-1.429
	(0.952)	(0.896)	(0.886)
Growth of private sector credit to GDP	-0.240**	-0.182*	-0.171**
	(0.091)	(0.095)	(0.074)
Trade openness	0.023	0.008	0.003
	(0.022)	(0.021)	(0.019)
Current account to GDP	-0.053	-0.043	-0.027
	(0.099)	(0.090)	(0.093)
Constant	15.221*	10.560	8.978
	(8.779)	(8.462)	(8.261)
No. of observations	61	67	71
R^2	0.332	0.230	0.224
R^2 (adjusted)	0.272	0.167	0.164
F-statistic	5.344	3.040	3.504

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: The table reports OLS regression estimates (with robust standard errors) for the baseline specification where the change in real GDP over 2007-2009 is used as dependent variable and dollarisation is measured as the ratio of foreign currency-denominated loans to total loans.

Table 4: Bayesian averaging estimates

Dependent variable: Changes in real GDP growth rates between 2007 and 2009

(percentage points)

	Posterior inclusion probabilities	Posterior mean	Posterior standard deviation
Average real GDP growth, 2005-2007	0.981	-1.3201	0.4820
Government debt to GDP	0.868	0.1490	0.0628
Government balance to GDP	0.845	0.5986	0.2662
GDP per capita	0.669	-0.0003	0.0002
Credit market regulation	0.499	-1.7615	1.2006
Inflation rate	0.480	-0.4464	0.3039
Foreign currency loans to total loans	0.414	-0.0436	0.0281
Trade partners growth	0.412	-0.8745	0.8416
Regulatory quality	0.305	-2.3070	2.0657
Business regulation	0.277	1.2121	0.7569
Labour market regulation	0.270	0.8468	0.8028

Note: The table reports Bayesian Averaging of Classical Estimates (BACE) results. The first column shows the ranking of the top ten variables according to their posterior inclusion probability, using flat prior and 21 variables. Column 2 reports the posterior inclusion probability for each variable, columns 3 and 4, the mean and the standard deviation of the posterior distribution of the coefficients, respectively. The full set of results is available upon request.

Table 5: Deposit dollarisation

	OLS with robust standard errors estimates				Simple OLS estimates				Robust-to-outliers estimates			
Dependent variable: Changes in real GDP growth rates between 2007 and 2009 (percentage points)												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Foreign currency deposits to total deposits	-0.041	-0.057*	-0.038	-0.057	-0.041	-0.057	-0.038	-0.057	-0.027	-0.044	-0.019	-0.036
	(0.033)	(0.033)	(0.047)	(0.054)	(0.038)	(0.043)	(0.055)	(0.062)	(0.036)	(0.039)	(0.054)	(0.065)
GDP per capita	-1.241	-1.709	-0.210	-1.129	-1.241	-1.709	-0.210	-1.129	-1.164	-1.865	-0.331	-2.108
	(0.884)	(1.016)	(1.845)	(2.086)	(1.202)	(1.535)	(2.042)	(2.358)	(1.135)	(1.487)	(2.001)	(2.770)
Growth of private sector credit to GDP	-0.398***	-0.369***	-0.233	-0.193	-0.398***	-0.369***	-0.233*	-0.193	-0.432***	-0.418***	-0.276**	-0.262*
	(0.119)	(0.134)	(0.144)	(0.178)	(0.098)	(0.112)	(0.127)	(0.146)	(0.092)	(0.101)	(0.124)	(0.151)
Trade openness	0.015	-0.006	0.035	0.031	0.015	-0.006	0.035	0.031	0.006	-0.027	0.024	-0.001
	(0.022)	(0.023)	(0.029)	(0.039)	(0.022)	(0.026)	(0.030)	(0.037)	(0.021)	(0.026)	(0.029)	(0.042)
Current account to GDP	-0.101	-0.136	0.048	0.047	-0.101	-0.136	0.048	0.047	-0.112	-0.153	0.038	0.030
	(0.095)	(0.117)	(0.099)	(0.128)	(0.089)	(0.110)	(0.129)	(0.148)	(0.084)	(0.103)	(0.126)	(0.155)
Financial openness		0.005***		0.003*		0.005		0.003		0.018		0.016
		(0.001)		(0.001)		(0.003)		(0.004)		(0.015)		(0.026)
Credit market regulation			-2.191*	-2.606			-2.191	-2.606			-1.641	-1.636
			(1.198)	(1.739)			(1.301)	(1.642)			(1.275)	(1.717)
Constant	6.540	11.160	10.655	22.570	6.540	11.160	10.655	22.570	7.009	13.261	8.485	25.111
	(8.097)	(9.748)	(18.699)	(22.518)	(11.029)	(14.393)	(21.225)	(25.250)	(10.411)	(13.614)	(20.801)	(29.032)
No. of observations	54	43	34	31	54	43	34	31	54	42	34	30
R^2	0.363	0.389	0.393	0.397	0.363	0.389	0.393	0.397	0.427	0.481	0.403	0.383
R^2 (adjusted)	0.297	0.287	0.259	0.213	0.297	0.287	0.259	0.213	0.367	0.392	0.270	0.187
F-statistic	4.479	6.288	2.795	4.537	5.482	3.818	2.919	2.161	7.140	5.411	3.031	1.952

(Robust) standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: The table reports regression results where the change in GDP over 2007-2009 is used as dependent variable and dollarisation is measured as the ratio of foreign currency-denominated deposits to total deposits.

Table 6: Transmission channels

	Dependent variable: Changes in real GDP growth rates bewteen 2007 and 2009 (percentage points)			
	(1)	(2)	(3)	(4)
	Currency mismatch	Monetary policy autonomy	Lender of last resort	Exchange market pressure
Loan dollarisation (FX loans to total loans)	-0.010	-0.093*	-0.144***	-0.110***
	(0.067)	(0.050)	(0.042)	(0.038)
Direct effect	2.424	-5.123*	-0.387	3.772*
	(1.879)	(2.902)	(1.795)	(2.110)
Interacted effect	-0.073*	0.084*	0.039	-0.063**
*(i.e. loan dollarisation*direct effect)*	(0.039)	(0.048)	(0.026)	(0.030)
GDP per capita	-0.716	-3.854***	-2.670***	-1.095
	(1.223)	(1.149)	(0.874)	(1.097)
Trade openness	0.006	0.004	0.023	0.031
	(0.031)	(0.033)	(0.023)	(0.028)
Growth of private sector credit to GDP	-0.311**	-0.192	-0.211*	-0.331**
	(0.140)	(0.122)	(0.118)	(0.125)
Current account to GDP	-0.180	-0.121	-0.066	-0.174**
	(0.115)	(0.119)	(0.085)	(0.077)
IMF program (dummy)	-4.005			-4.812**
	(3.030)			(2.191)
Constant	1.457	31.092***	20.259**	6.860
	(11.941)	(10.557)	(8.116)	(10.667)
No. of observations	35	37	57	51
R^2	0.513	0.474	0.453	0.502
R^2 (adjusted)	0.363	0.347	0.375	0.407
F-statistic	8.796	3.567	8.255	7.565

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: The table reports OLS regression estimates (with robust standard errors) for the baseline specification where the change in real GDP over 2007-2009 is used as dependent variable and dollarisation is measured as the ratio of foreign currency-denominated loans to total loans. The variables used as proxies for the various transmission channels are scaled by their standard deviation in order to express them in the same unit and to allow for comparability between the estimated interacted effects.

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Appendix 1: Data definitions and sources

Indicator	Definition/Description	Period	Sources
Loan dollarisation/euroisation	Ratio of foreign currency-denominated loans in total loans	End of 2006	National sources, IMF (IMF Staff Reports, FSAP, FSI, IFS), Haver Analytics, ECB (Annual report on the international role of the euro)
Deposit dollarisation/euroisation	Ratio of foreign currency-denominated deposits in total deposits	End of 2006	National sources, IMF (IMF Staff Reports, FSAP, FSI, IFS), Haver Analytics, ECB (Annual report on the international role of the euro)
Change in growth rates (Crisis severity measure)	Change in real gross domestic product growth rates	2007-2009	IMF-WEO
Equity market corrections (Alternative crisis severity measure)	Changes in stock market indexes	July 2007-April 2009	Bloomberg, ECB
Capital flows (Alternative crisis severity measure)	Changes in the financial account	2007-2009	IMF-WEO
External debt	Ratio of gross external debt to GDP	End of 2007	JEDH (Joint External Debt Hub) and national sources
Private sector credit growth	Change in the ratio of the private sector credit to GDP	2004-2007	IMF-IFS and IMF-WEO
Current account balance	Averages of the current account balance to GDP ratios	2005-2007	IMF-WEO
GDP per capita	Log of GDP per capita PPP terms	2007	IMF-WEO
Trade openness	Ratio of exports and imports of goods and services to GDP	2007	IMF-WEO
Financial openness	Ratio of external assets and liabilities to GDP	2007	Rose and Spiegel dataset (2011); IMF-IFS
Financial development	Ratio of credit to GDP	2006	IMF-IFS and IMF-WEO
Inflation	Inflation rate, annual percentage change	2007	IMF-WEO
Government balance	General government net lending/borrowing in percent of GDP	2007	IMF-WEO
IMF program	Dummy variable taking value 1 if the country had taken an IMF program (SBA, PCL, FCL etc. except PRGF) between 2007-2009 and 0 otherwise	2007-2009	IMF
Swap line	Dummy variable taking the value 1 if the country had a swap line arrangement between 2007 and 2009 and 0 otherwise	2007-2009	FED and ECB websites
Exchange rate regimes	Dummy variable taking the value 0 for countries with exchange rate regime index =1 in the Ilzetzki et al. (2008) corse exchange rate classification (i.e. hard peggers) and 1 otherwise (i.e. floaters).	2006	Ilzetzki, Reinhart and Rogoff (2008) corse classification of exchange rate regimes

Credit market regulation	Sub-component of the Frazer Institute Index of Economic Freedom, including ownership of banks (percentage of deposits held in privately owned banks), competition (the extent to which domestic banks face competition from foreign banks), extension of credit (percentage of credit extended to the private sector), and presence of interest rate controls.	2006	Giannone et al. (2010), Rose and Spiegel dataset (2011)
Labour market regulation	Sub-component of the Frazer Institute Index of Economic Freedom, including minimum wage regulation, hiring and firing practices, the share of the labor, force whose wages are set by centralized collective bargaining, unemployment benefits, use of conscription to obtain military personnel.	2006	Giannone et al. (2010), Rose and Spiegel dataset (2011)
Business sector regulation quality:	Sub-component of the Frazer Institute Index of Economic Freedom, including price controls, administrative conditions for new businesses, government bureaucracy, difficulties in starting a new business, irregular, additional payments connected with import and export permits, business licenses, exchange controls, tax assessments, police protection, or loan applications.	2006	Giannone et al. (2010), Rose and Spiegel dataset (2011)
Regulatory quality	Sub-component of the Worldwide Governance Index - World Bank, considered as a broad index of market friendliness	2002	Giannone et al. (2010), Rose and Spiegel dataset (2011)
Euromoney index	Weighted average of *(1)* market indicators (40 %) measuring access to bond markets, trade finance and so on; *(2)* credit indicators (20 %) which incorporate credit records and rescheduling difficulties; (3) analytical indicators (40 %) including political risk, economic indicators, and forecasts of economic performances.	March 2007	Giannone et al. (2010), Rose and Spiegel dataset (2011)
US financial exposure	US portfolio assets in country	2007	Rose and Spiegel dataset (2011), based on IMF-CPIS dataset
Trade exposure to the US	Share of exports to the US to total exports	2007	Rose and Spiegel dataset (2011)
Cross-border BIS lending	Liabilities vis-à-vis BIS banks in percent of GDP	2007	BIS (Locational Banking Statistics) and Rose and Spiegel (2011)
Growth in trading partners	Average over 2005-2007	2005-	Rose and Spiegel (2011)

		2007 Average	dataset
ST external debt to reserves	Ratio of short-term external debt to reserves	2006	Rose and Spiegel (2011) dataset, based on WDI
ST external debt to total external debt	Ratio of short-term external debt to total external debt	2006	Rose and Spiegel (2011) dataset, based on WDI
Pre-crisis growth	Average of pre-crisis real GDP growth	2005-2007	IMF-WEO
Long-term growth	Average of real GDP growth over 1995-2007	1995-2007	IMF-WEO
Key policy rates	Changes in (real) policy interest rates	July 2007-April 2009	Bloomberg, Haver Analytics and national sources
Lender of last resort	Changes in central bank's total assets to 2007 GDP	July 2007-April 2009	IMF-WEO, Haver Analytics and national sources
Currency mismatch	Difference between the foreign currency loans and the foreign currency deposits, over total loans	End of 2006	National sources, IMF, Haver Analytics and ECB
Exchange market pressure	The weighted average of the changes in the exchange rate during the crisis, scaled by their pre-crisis monthly volatility and the changes in the foreign exchange reserves during the crisis, scaled by their pre-crisis monthly volatility.	Crisis: July 2007 – April 2009; Pre-crisis: January 2004-June 2007	IMF-IFS and IMF-WEO

Appendix 2: Loan dollarisation – Data sources and selected descriptive statistics

	Start date	End date	Average	Median	Min	Max	Sources
Albania	1999	2008	68.64	73.14	23.47	81.68	ECB, national sources and author's calculations
Angola	2002	2010	61.08	65.30	27.80	74.80	IMF Article IV reports
Argentina	1989	2009	40.81	46.05	10.99	73.77	Haver Analytics and national sources
Armenia	2005	2009	51.10	51.20	38.20	65.20	Haver Analytics and IMF- FSI (Financial Soundness Indicators database)
Azerbaijan	2004	2007	58.45	58.25	46.80	70.50	IMF Article IV reports
Bahrain	2000	2006	31.78	34.20	20.60	37.60	IMF Article IV reports
Belarus	1995	2009	41.93	37.67	30.70	54.90	IMF Article IV reports
Bolivia	1995	2010	89.30	96.10	66.30	97.50	IMF Article IV reports
Bosnia and Herzegovina	2005	2008	72.15	72.87	69.16	73.71	ECB, national sources and author's calculations
Bulgaria	1999	2009	45.77	45.09	35.90	58.32	ECB, national sources and author's calculations
Cambodia	1996	2009	97.21	97.00	97.00	98.10	IMF Article IV reports
Chile	2001	2009	13.28	12.80	10.80	15.70	Haver Analytics and national sources
Colombia	2005	2009	5.74	6.30	4.20	7.20	Haver Analytics and IMF- FSI (Financial Soundness Indicators database)
Costa Rica	1998	2006	43.39	47.60	30.20	49.80	IMF Article IV reports
Croatia	1999	2009	76.01	76.45	62.30	85.22	ECB, national sources and author's calculations
Cyprus	2005	2007	47.18	45.78	43.83	51.93	ECB, national sources and author's calculations
Czech Republic	1999	2009	15.74	14.06	12.91	23.32	ECB, national sources and author's calculations
Denmark	2005	2009	24.56	25.40	22.50	26.30	National central bank website and author's calculations
Dominican Rep.	2006	2009	20.54	20.38	18.41	22.99	National central bank website and author's calculations
Egypt	2001	2008	28.21	28.00	23.10	34.00	IMF Article IV reports
Estonia	1999	2007	80.42	80.07	75.73	83.81	ECB, national sources and author's calculations
Georgia	1994	2010	70.69	73.80	35.10	87.70	IMF Article IV reports
Guatemala	2000	2010	27.53	28.30	18.40	33.60	Haver Analytics and national sources
Honduras	1999	2010	27.17	25.10	22.20	36.30	IMF Article IV reports
Hungary	1999	2008	41.18	36.34	28.76	65.50	ECB, national sources and author's calculations
Indonesia	1993	2010	23.30	19.72	12.90	41.37	IMF Article IV reports
Iran	1999	2009	16.19	16.00	1.64	32.76	IMF Article IV reports
Israel	1999	2009	28.60	31.26	14.80	37.41	ECB, national sources and author's calculations
Kazakhstan	2002	2010	50.34	48.00	42.00	68.50	Haver Analytics and national sources
Kuwait	1999	2009	18.30	19.10	12.10	23.50	IMF Article IV reports
Kyrgyzistan	1996	2010	62.29	62.36	38.57	72.05	National central bank website and author's calculations
Lao PDR	2002	2006	72.05	73.18	67.04	74.34	IMF Article IV reports
Latvia	1999	2009	68.30	60.85	52.30	92.08	ECB, national sources and author's calculations
Lebanon	1997	2009	84.79	84.35	81.30	88.90	IMF Article IV reports 2009
Lithuania	1999	2009	59.81	60.69	49.79	72.36	ECB, national sources and author's calculations
Macedonia (FYR)	2005	2009	53.69	54.70	45.60	58.47	ECB, national sources and author's calculations
Malta	1999	2007	49.09	46.19	34.08	72.05	ECB, national sources and author's calculations
Mexico	2005	2009	8.96	9.50	7.10	10.50	Haver Analytics and IMF- FSI (Financial Soundness Indicators database)
Moldova	1999	2009	41.54	41.49	37.49	46.31	ECB, national sources and author's calculations
Morocco	1997	2007	1.55	1.10	0.90	2.70	IMF Financial System Stability Assessment Reports
Mozambique	1997	2009	47.84	40.24	29.55	70.80	IMF Article IV reports
Nicaragua	1996	2010	81.08	83.10	52.00	88.68	National central bank website and author's calculations
Norway	1999	2009	10.99	10.46	8.46	15.62	ECB, national sources and author's calculations
Paraguay	1996	2010	45.00	45.00	30.00	58.00	IMF Article IV reports
Peru	1997	2010	70.99	76.45	52.30	82.00	IMF Article IV reports
Philippines	2001	2009	22.79	23.30	17.70	27.10	IMF Article IV Reports and IMF Financial System Stability Assessment Reports
Poland	1999	2009	25.72	24.81	19.67	32.46	ECB, national sources and author's calculations
Qatar	2006	2010	15.76	14.18	12.11	20.26	National central bank website and author's calculations (QCB: banks monthly statements)
Romania	1999	2009	57.36	57.77	47.35	62.66	ECB, national sources and author's calculations
Russia	1999	2008	31.07	29.73	21.97	49.21	ECB, national sources and author's calculations
Sao Tome e Principe	2003	2010	74.66	75.35	67.40	80.78	IMF Article IV reports
Saudi Arabia	1999	2009	17.25	14.10	8.20	28.90	IMF Article IV reports
Slovak Republic	1999	2008	22.31	20.18	18.05	29.50	ECB, national sources and author's calculations
Slovenia	2002	2006	42.18	38.60	32.60	55.90	IMF Article IV reports
South Africa	1999	2006	30.97	27.18	13.76	49.76	ECB, national sources and author's calculations
South Korea	2001	2009	2.96	1.41	0.79	8.95	Haver Analytics and national sources
Suriname	2005	2009	48.58	50.10	42.60	52.90	IMF Article IV reports
Sweden	1999	2009	15.85	13.99	11.59	24.02	ECB, national sources and author's calculations
Switzerland	1999	2009	15.76	15.48	12.62	20.95	ECB, national sources and author's calculations
Tajikistan	2000	2010	56.49	58.40	29.58	75.52	National central bank website and author's calculations
Thailand	2002	2007	7.98	8.15	6.40	9.30	IMF FSAP 2009
Turkey	2002	2009	38.94	33.81	30.40	62.25	ECB, national sources and author's calculations
Ukraine	1999	2008	47.04	45.08	41.68	60.30	ECB, national sources and author's calculations
United Arab Emirates	2003	2006	21.78	21.75	19.70	23.90	IMF FSAP 2007
United Kingdom	1999	2009	40.93	40.51	32.61	47.75	ECB, national sources and author's calculations
Uruguay	2001	2008	81.55	81.25	73.00	92.00	IMF Article IV reports
Uzbekistan	2003	2007	65.18	65.90	43.70	80.80	IMF Article IV reports
Vanuatu	1999	2006	15.29	14.70	9.40	24.80	IMF Article IV reports
Vietnam	1998	2010	21.14	21.10	16.50	26.10	IMF Article IV reports
Yemen	1997	2010	42.66	43.09	26.01	54.00	IMF Article IV reports
Zambia	2000	2010	39.26	36.90	32.50	48.30	IMF Article IV reports

Appendix 3: Deposit dollarisation – Data sources and selected descriptive statistics

	Start date	End date	Average	Median	Min	Max	Sources
Albania	1999	2008	34.30	32.86	26.31	43.07	ECB, national sources and author's calculations
Angola	1999	2009	72.36	69.00	61.00	85.00	IMF Article IV reports
Argentina	2001	2007	12.19	8.20	2.20	44.10	Haver Analytics and national sources
Armenia	2005	2009	58.76	56.00	48.30	67.60	Haver Analytics and IMF- FSI (Financial Soundness Indicators database)
Azerbaijan	2004	2007	69.05	71.70	51.40	81.40	IMF Article IV reports
Bahrain	2000	2008	29.51	30.50	25.20	33.00	IMF Article IV reports
Belarus	1995	2009	48.84	46.50	34.70	72.20	IMF Article IV reports
Bolivia	1993	2010	80.30	84.20	52.00	92.90	IMF Article IV reports
Bosnia and Herzegovina	1999	2008	51.95	49.65	45.24	63.81	ECB, national sources and author's calculations
Bulgaria	1999	2009	51.95	51.89	46.56	59.22	ECB, national sources and author's calculations
Cambodia	1996	2009	94.94	95.00	92.24	97.60	IMF Article IV reports
Chile	1986	2010	11.23	10.85	3.90	18.06	Haver Analytics and national sources
Costa Rica	1999	2006	45.68	44.75	41.30	51.20	IMF Article IV reports
Croatia	1999	2009	63.66	64.13	51.74	73.44	ECB, national sources and author's calculations
Cyprus	2005	2007	53.32	52.06	50.05	57.84	ECB, national sources and author's calculations
Czech Republic	1999	2009	11.61	10.76	8.92	15.32	ECB, national sources and author's calculations
Estonia	1999	2007	39.81	38.03	32.61	52.73	ECB, national sources and author's calculations
Georgia	1993	2010	68.62	71.30	41.00	86.10	IMF Article IV reports
Ghana	2003	2010	28.58	28.85	22.30	32.70	IMF Article IV reports
Guatemala	2006	2010	23.80	24.10	21.60	25.10	Haver Analytics and national sources
Honduras	1999	2010	30.87	30.00	28.10	34.90	IMF Article IV reports
Hungary	1999	2008	17.81	18.54	14.14	20.98	ECB, national sources and author's calculations
Indonesia	2002	2009	20.49	20.15	14.60	26.60	IMF Article IV reports 2010
Iran	1999	2009	4.62	4.26	0.99	9.01	IMF Article IV reports
Israel	1999	2009	31.80	32.49	27.23	33.70	ECB, national sources and author's calculations
Jordan	2000	2009	88.97	92.74	70.47	95.51	Haver Analytics and national sources
Kazakhstan	1997	2009	42.87	43.26	23.24	59.96	Haver Analytics and national sources
Kuwait	2003	2010	13.85	13.64	10.80	18.15	IMF Article IV reports
Kyrgyzistan	1996	2010	58.07	57.91	41.83	72.88	National central bank website and author's calculations
Lao PDR	2002	2009	67.80	68.37	61.52	75.43	IMF Article IV reports
Latvia	1999	2009	44.14	43.06	36.58	59.54	ECB, national sources and author's calculations
Lebanon	1997	2009	64.93	65.57	56.60	74.38	IMF Article IV reports 2009
Lithuania	1999	2009	31.07	26.39	21.00	45.30	ECB, national sources and author's calculations
Macedonia (FYR)	2003	2009	57.05	57.10	51.50	60.94	ECB, national sources and author's calculations
Malaysia	1996	2009	2.24	2.23	0.53	4.74	Haver Analytics and national sources
Malta	1999	2007	40.93	40.92	32.88	49.89	ECB, national sources and author's calculations
Mexico	1985	2009	5.69	5.08	2.64	9.06	Haver Analytics and IMF- FSI (Financial Soundness Indicators database)
Moldova	1999	2009	41.53	41.90	35.53	47.97	ECB, national sources and author's calculations
Mozambique	2002	2010	40.75	40.30	35.80	46.70	IMF Article IV reports
Nicaragua	1996	2002	66.71	67.80	62.10	70.30	National central bank website and author's calculations
Norway	1999	2009	19.13	17.76	15.94	27.73	ECB, national sources and author's calculations
Oman	2003	2010	18.23	16.65	13.30	28.90	IMF Article IV reports
Paraguay	1993	2010	50.27	49.25	37.40	68.60	IMF Article IV reports
Peru	1997	2010	66.92	68.45	52.60	77.20	IMF Article IV reports
Philippines	2009	2009	22.62	22.62	22.62	22.62	IMF Article IV Reports and IMF Financial System Stability Assessment Reports
Poland	1999	2009	14.27	14.93	8.81	17.09	ECB, national sources and author's calculations
Qatar	2001	2007	34.28	34.90	26.80	40.94	National central bank website and author's calculations (QCB: banks monthly statements)
Romania	1999	2008	40.18	41.87	32.08	49.30	ECB, national sources and author's calculations
Russia	1999	2008	36.25	34.19	24.28	46.40	ECB, national sources and author's calculations
Sao Tome e Principe	1994	2010	55.68	54.62	47.06	71.49	IMF Article IV reports
Saudi Arabia	1999	2009	16.34	17.30	11.90	20.10	IMF Article IV reports
Serbia	2000	2009	65.85	66.43	52.45	76.70	ECB, national sources and author's calculations
Slovak Republic	1999	2008	18.77	18.92	15.03	22.25	ECB, national sources and author's calculations
South Africa	1999	2006	3.63	3.11	2.68	6.19	ECB, national sources and author's calculations
Suriname	2005	2009	55.28	55.40	53.70	57.20	IMF Article IV reports
Sweden	1999	2009	27.11	27.28	19.46	33.42	ECB, national sources and author's calculations
Switzerland	1999	2009	20.68	17.82	16.13	33.44	ECB, national sources and author's calculations
Taiwan	1980	2009	3.07	1.70	0.33	8.59	Haver Analytics and national sources
Tajikistan	2006	2009	71.42	70.50	68.30	76.40	National central bank website and author's calculations
Thailand	2005	2008	1.30	1.30	0.90	1.70	IMF FSAP 2009
Turkey	1999	2009	44.44	44.43	33.54	59.37	ECB, national sources and author's calculations
Ukraine	1999	2007	35.47	34.31	31.91	43.82	ECB, national sources and author's calculations
United Arab Emirates	2003	2008	22.60	24.25	16.90	25.80	IMF FSAP 2007
United Kingdom	1999	2009	57.20	57.80	52.90	59.88	ECB, national sources and author's calculations
Uruguay	2001	2007	86.94	88.20	81.30	92.50	IMF Article IV reports
Vanuatu	2002	2008	59.73	59.80	54.00	66.80	IMF Article IV reports
Yemen	2000	2009	47.70	48.95	39.30	52.70	IMF Article IV reports
Zambia	1994	2006	40.72	43.99	10.73	64.64	IMF Article IV reports