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Macroprudential Policies in Southeastern Europe

by Dilyana Dimova, Piyabha Kongsamut, Jérôme Vandenbussche

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Abstract

This paper presents a detailed account of the rich set of macroprudential measures taken in four Southeastern European countries—Bulgaria, Croatia, Romania, and Serbia—during their synchronized boom and bust cycles in 2003–12, and assesses their effectiveness. We find that only strong measures helped contain domestic credit growth, the share of foreign-currency-denominated loans provided by the domestic banking sector, or the domestic banking sector's reliance on foreign borrowing during the boom years. We also find that circumvention via direct external borrowing often fully offset the effectiveness of these strict measures, and thatmeasures taken during the bust had no discernible impact. We conclude that (i) proper calibration of macroprudential measures is of the essence; (ii) only strong, broad-based macroprudential measures can contain credit booms; (iii) econometric studies of macroprudential policy effectiveness should focus on measures rather than on instruments (i.e. classes of measures) and in so doing allow for possible non-linear and state-contingent effects.

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I. INTRODUCTION

In the wake of the global financial crisis, interest in macroprudential policies (MPPs) and their ability to manage the financial cycle has grown tremendously. Such policies, aimed at reducing the risk and the macroeconomic costs of financial instability, are gaining a much more prominent role in policy frameworks, alongside fiscal and monetary policy. Given the limited experience in their implementation, finding out whether and how they can achieve their objectives is now high on policy-makers' agenda in most advanced and emerging market countries.

In this paper, we analyze the experiences with MPPs of four neighboring Southeastern European emerging economies, Bulgaria, Croatia, Romania and Serbia, during their recent synchronized financial cycle (2003–2012). The four countries were to a large degree subject to a common external macro-financial environment and going through similar processes of economic convergence and financial deepening—even if Croatia was (and remains) more economically and financially developed than the other three countries. The four economies were at different stages of joining the European Union (EU)—Bulgaria and Romania joined in 2007, Croatia joined in 2013, and Serbia became an accession candidate in 2012. Their banking systems were dominated by subsidiaries of large Western European banks, and were euroized to a large degree (Table 1). They experienced strong capital inflows and credit growth during the boom period running up to the fourth quarter of 2008, and then a sudden stop, followed by a protracted recession. Prudential authorities in each country actively adopted macroprudential measures to try to counteract these trends. At the same time, initial conditions in these banking systems and monetary policy regimes differed, and the set of policy instruments employed often varied. We believe that the combination of many shared elements of context and heterogeneous policy responses makes it interesting to exploit synergies in a joint study of the four countries.

The boom-bust cycle in Central, Eastern and Southeastern Europe (CESEE) between the early 2000s and the early 2010s has already been well documented (e.g. in Bakker and Klingen, 2012). A detailed summary of macroeconomic developments in the four countries during the period spanning 2003–2012 is provided in Appendix 1. During the boom years, monetary policy was mostly focused on inflation and exchange rate developments and did not explicitly target credit or asset price developments. Fiscal policy was generally pro-cyclical, at best acyclical. That left MPPs in the front line to manage the financial cycle. Macroprudential policy was implemented outside of a dedicated formal macroprudential policy framework. Rather, the monetary and prudential authorities—both part of the central bank in the four countries—interpreted their mandate to include macro-financial stability objectives. The choice of instruments varied over time as conditions changed. Seen in a broader European context, the four countries were pioneers in the use of MPPs.[1]

[1] The European macroprudential framework was established only in 2011 (ESRB, 2011).

Table 1. Bulgaria, Croatia, Romania, Serbia: Selected Macro-Financial Indicators, 2002–12

	GDP per capita (EUR)		Monetary Regime	
	2002	2012	2002	2012
Bulgaria	2,164	5,489	Currency board	
Croatia	6,373	10,115	Managed floating	Crawl-like arrangement
Romania	2,196	6,052	Managed floating	Floating
Serbia	1,586	3,104	Managed floating	Floating

	Private Sector Credit (percent of GDP)		Foreign Bank Ownership (percent of banking sector assets)	
	2002 1/	2012	2004	2009
Bulgaria	19	69	72	79
Croatia	43	72	88	91
Romania	10	38	54	85
Serbia	19	51	61	75

	BIS-Reporting Banks' Exposures to Banks (percent of GDP)		BIS-Reporting Banks' Exposures to Non-banks (percent of GDP)	
	2002	2012	2002	2012
Bulgaria	6	18	6	15
Croatia	15	32	13	32
Romania	2	18	6	12
Serbia	2	14	1	11

	Share of Private Sector Foreign Currency Deposits (percent)		Share of Private Sector Foreign Currency Loans (percent)	
	2002 1/	2012 2/	2002 1/	2012
Bulgaria	54	44	42	63
Croatia	72	70	81	79
Romania	44	37	66	72
Serbia	64	77	54	88

Sources: WEO, IFS, AREAER, Claessens and van Horen (2013), and IMF staff calculations
1/ Data for Serbia is for 2003
2/ Data for Croatia is for June 2012

We follow a case study methodology, and aim to provide a useful complement to the burgeoning econometric literature on macroprudential policy effectiveness. Indeed the bulk of the econometric literature does not capture well either the diversity in design of MPP measures or the strength of the measures taken. This latter flaw often leads papers to talk in terms of instruments (i.e. policy measures removed from their calibration and implementation context) and to make categorical conclusions about *instrument effectiveness* (i.e. an instrument is, or is not, effective) whereas we suspect that an instrument's effectiveness crucially depends on its proper calibration. We therefore find it more useful to discuss *measure effectiveness* rather than instrument effectiveness. Furthermore the effect of MPPs can in principle be highly non-linear, but the econometric studies of which we are aware are all based on linear specifications and rarely attempt to capture the strength of MPP measures (they often simply use an indicator variable for tightening or easing). A case study methodology is flexible enough to address all these limitations and also allows for providing a richer context about policy motivation and implementation. Before addressing the question of measure effectiveness, we thus provide a rich discussion of the more than twenty instruments used and the more than a hundred measures implemented by the four countries, as well as their sequencing, in a cross-country comparative perspective. Furthermore, rather than analyzing indiscriminately the effect of all macroprudential

measures taken on the same variable (be it credit growth, housing price inflation, or banking sector leverage), we match each type of instrument with a subset of five possible intermediate macro-financial objectives and analyze only the effect of a measure on those objectives with which it is matched. For the most part, the matching comes from publicly stated objectives when the measures were taken. In cases where the objectives may not have been spelled out as explicitly macroprudential, we still assess those measures using the macroprudential lens[2].This approach also helps us to distinguish the effect of measures that were taken concurrently, by taking into account their design features and relative strength.

This being said, assessing the effectiveness of MPPs is a challenging task fraught with many pitfalls. Policy measures are most likely endogenous to macro-financial developments and we do not observe policy-makers' information set and/or expectations. More broadly, we cannot observe what would have happened had no measures been taken. In particular, it may be the case that the implementation of a policy measure prevents an increase in a financial stability risk metric (e.g. faster credit growth) and that as a consequence we observe no change in that metric and may conclude incorrectly that the measure was not effective. In addition, measures may have been anticipated to various extents, may work with different lags, may not be immediately binding, and may interact with each other. We note that these challenges have to be faced by econometric studies as well.

Against that background, we modestly aim to identify which measures are associated with a sign of effectiveness, i.e. that the intermediate macro-financial objective variable visibly moved in the intended direction within a window of four quarters around the implementation of the measure, taking into account the implementation of other relevant measures implemented concurrently within that same time window. Because we assess one measure at a time—rather than lump all measures of the same type together—we are easily able to discriminate across directions of policy change (tightening versus easing), conditions of implementation (e.g. boom versus bust), and strength (in levels and in changes). We acknowledge, however, that because several measures may have been taken in the same quarter or taken in consecutive quarters our inference remains tentative.

One aspect we only barely address in this paper is the choice of prudential instrument (see the Staff Supplement of IMF (2014) for a discussion of instrument choice). Rather, we take instrument choice as given and simply examine whether the implementation of a measure through the chosen prudential instrument had an effect on the intended intermediate objective. Somewhat relatedly, we do not examine how the exchange rate or monetary regime may or may not have conditioned the macroprudential response (see IMF [2013] for a discussion of the interactions between monetary and macroprudential policies).

[2] This is the case of standard reserve requirements, which may be adjusted for different purposes including for monetary and macroprudential ones.

Another important aspect we do not address is whether the MPP measures helped build sufficient capital and liquidity buffers to preserve financial stability during the bust. The banking systems of the four countries remained broadly stable during the severe recession and only a few small domestically-owned banks failed during the bust period we examine (2008:Q4–2012:Q4).[3] However, this robustness was likely partially due to the fact that many foreign-owned parent groups received capital and funding support from their own government[4] and that this support was in part needed because of the deterioration in the outlook of these groups' operations in Central and Eastern Europe. Furthermore, in the case of Romania and Serbia, macroeconomic stabilization programs with external official financing were rapidly put in place, and helped shore up confidence.

Keeping all the caveats listed above in mind, our main general findings on measure effectiveness are that only strong measures helped contain the domestic credit growth, the share of foreign-currency-denominated loans provided by the domestic banking sector, or the reliance of the domestic banking sector on foreign borrowing during the boom years, but that the impact of several of the measures was weakened because of circumvention. Turning to the specifics, our findings for the boom period are that: (1) binding marginal reserve requirements related to credit growth ("credit growth ceilings") helped contain domestic credit growth; (2) strong sectoral capital measures and (3) the introduction of meaningful loan-to-value and debt-service-to-income ceilings helped limit household credit growth; (4) targeted capital measures and (5) strong, targeted reserve requirements measures contributed to reduce the share of foreign-currency-denominated loans provided by the domestic banking sector; (6) heavy reserve requirements measures on banks' foreign borrowing helped slow it down; however, (7) circumvention via direct external borrowing largely offset the direct effect of measures (1) and (6).[5] A corollary is that the other, less strict measures (the vast majority) are not associated with a sign of effectiveness as defined by us. In a few cases, less-immediately-binding loan classification and provisioning measures were taken concurrently with the strong measures we deem effective and may have reinforced their effect. Measures taken during the bust had no discernible impact.

What do we mean when we say that only "strong" measures were effective? While calibration of optimal measures obviously depends on country circumstances, the quantitative details of a few measures we find effective can provide a sense of the magnitudes involved in the four countries we analyze, keeping in mind that the effect of some measures may have been reinforced by other measures taken concurrently or soon afterwards,. Credit growth ceilings involved marginal

[3] These banks are Credo Banka (Croatia), Nava Banka (Croatia), Agrobanka (Serbia) and Razvojna Banka Vojvodine (Serbia). The failure of the fourth largest Bulgarian bank (Corporate Commercial Bank) in July 2014 appears more related to fraud and connected lending than to poor general credit and liquidity risk management.

[4] Notable exceptions were Italian banks.

[5] For lack of publicly available data, we cannot assess the extent of the circumvention of measures (1)-(2) via borrowing from domestic nonbanks. An assessment of circumvention of (3) requires granular data, also not publicly available.

reserve requirements of 200 percent when quarterly credit growth exceeded 4 percent (Croatia, 2003:Q1). Risk-weights on mortgages with loan-to-value (LTV) ratio above 70 percent were increased from 50 percent to 100 percent (Bulgaria, 2005:Q3). An LTV ceiling of 75 percent was introduced (Romania, 2004:Q1). Risk-weights on foreign currency loans to unhedged borrowers were increased by 25 percentage points (Croatia, 2006:Q2). The rate of marginal reserve requirement (MRR) on foreign borrowing was raised to 55 percent (Croatia, 2006:Q1). The rate of reserve requirements (RR) on short-term foreign borrowing was raised to 60 percent (Serbia, 2006:Q2). These were not trivial measures by any reasonable standard.

Our study of the experience of these four countries suggests one lesson for policy-makers and two lessons for future researchers. The lesson for policy-makers is that only strong, broad-based macroprudential measures which address circumvention have a chance to truly contain credit booms. The first lesson for future researchers is that the focus of effectiveness studies should be placed on measures and their strength rather than on instruments (i.e. classes of measures) and their mere deployment. The second lesson is that the possibility of non-linear effects (e.g. the existence of thresholds or asymmetries between tightening and easing) and state-contingent effects (e.g. differences between good times and bad times) should be taken into account in econometric studies.

The rest of the paper is organized as follows. Section II contains a review of the relevant literature. Section III describes the policy instruments and objectives. Section IV describes the MPP measures taken during the boom period. Section V discusses the MPP measures taken during the bust period. Section VI analyzes the effectiveness of these measures. Section VII discusses the evidence that MPP measures were circumvented, and is followed by a summary and conclusions. Annex I provides a summary of the macroeconomic background against which the MPP measures were implemented. Annex II provides a comprehensive list of the prudential measures that were implemented in each country.

II. LITERATURE REVIEW

An analysis of the key aspects of macroprudential policy design and a review of the burgeoning literature on the subject can be found in IMF (2013b, 2013c and 2014). Our review centers on the smaller set of empirical studies devoted to the effect of macroprudential policy on bank lending and borrowing, whose focus is closest to our own. We start by reviewing econometric studies and then turn to case studies.

Econometric studies

Econometric studies covering relatively large samples of countries have focused on instrument effectiveness rather than measure effectiveness, thus largely ignoring the issue of instrument calibration. Lim et al. (2011) find that several instruments—LTV cap, debt-service-to-income cap (DSTI), credit growth ceiling, foreign currency lending ceiling, reserve requirements, dynamic provisioning, and countercyclical capital requirements—captured by a set of dummy variables, reduce the procyclicality of credit and/or bank leverage in a panel of 49 countries between 2000 and 2010. Focusing on the same countries and period and the same MPP dataset, but using bank-level data, Claessens, Ghosh and Mihet (2014) find that measures aimed at borrowers (LTV and DSTI), and at financial institutions (credit growth ceilings and foreign currency lending ceilings) are effective at reducing asset growth, and that countercyclical buffers are of little effectiveness through the cycle. Dell'Ariccia et al. (2012) find that a stricter MPP stance (measured as a count of macroprudential instruments in use or as an aggregate indicator variable) reduces the incidence of credit booms and decrease the probability that booms end badly. Zhang and Zoli (2014) find that LTV, housing-related taxes, and foreign currency-related measures have helped curb credit growth, and bank leverage in a set of 46 countries during 2000–2013. Examining MPPs in 119 countries over 2000–2013, Cerutti, Claessens and Laeven (2015) find that borrower-based policies and financial-institutions-based policies are associated with lower growth in credit to households in emerging market economies. However, they also find an association between the use of macroprudential policies and relatively greater cross-border borrowing, also documented in our paper. Exploiting data from 57 countries spanning more than three decades, Kuttner and Shim (2013) find that only changes in DSTI have a robust statistically significant effect on housing credit growth. Vandenbussche, Vogel, and Detragiache (2015) look at household credit growth in sixteen CESEE countries between the late 1990s and 2011 and find that, among a large set of instruments, only changes in the minimum capital adequacy ratio and credit growth ceilings had a significant effect. In contrast with the rest of this branch of the existing literature, their paper actually quantifies the strength of policy measures and can therefore speak to the issue of calibration.

Some studies have focused on a narrower set of instruments, or on a single instrument. Tovar Mora, Garcia-Escribano, and Vera Martin (2012) find that higher RRs lead to a modest and temporary reduction in private bank credit growth in five Latin American countries, while increased MRRs on liabilities have negligible short-run effects. Dassatti, Camors, and Peydro (2014)'s findings for Uruguay are similar, but also indicate that higher RRs leads to credit being

given to the most risky firms. Ashvin and Malhar (2013) and Igan and Kang (2012) find that tightening LTV and DSTI together slow housing credit growth in Hong-Kong and Korea, respectively. Jasova and Gersl (2012) find no evidence that tightening DSTI limits in Poland was effective against household borrowing in foreign currency. Jacome and Mitra (2015) summarize the findings of six studies of the use of LTV and DSTI in selected emerging market economies (Brazil, Hong Kong SAR, Korea, Malaysia, Poland and Romania). Among several other dimensions of policy implementation, they discuss the issue of the calibration of these policy tools and find that, with the exception of Brazil, these countries did not conduct a formal quantitative analysis to set the level or change the limits. The evidence they review suggests that LTV limits were effective in reducing loan growth and improving borrower debt-servicing, and that targeting the tools towards the loan segment most at risk, (such as speculative properties, or specific regions), was more effective than aiming at overall credit or mortgage loans.

A few studies focused on a single instrument address the issue of calibration. Duca et al. (2011) quantify the impact of a change in LTV on housing prices in the United States, while Jacome and Mitra (2015) estimate the impact of tightening the LTV ratio on mortgage credit in a set of six emerging market countries. Jiménez et al. (2014) find that dynamic provisioning smoothed the credit supply cycle in Spain during 1999–2013 and quantify the effect of a policy-induced increase in bank capital on credit supply, firm employment and survival, both before the global financial crisis and during the crisis. Aiyar, Calomiris, and Wieladek (2014) estimate the quantitative effect of an increase in the capital requirement ratio on lending growth in the United Kingdom.

Turning now to available econometric evidence for our four countries, Galac (2010) finds that credit growth ceilings, MRR on foreign borrowing, foreign currency liquidity ratio (FCLR) measures, and high capital adequacy requirements were particularly useful in building liquidity and capital buffers, but less effective in slowing down credit growth and capital inflows. He concludes that MRRs on foreign borrowing were not successful in reducing the rate of growth of banks' foreign liabilities. This is consistent with our own findings presented below: we find that this instrument was effective only once the rate had become extremely high. Finally, he finds that credit growth ceilings (the so-called credit growth reserve) were successful in reducing the rate of domestic credit growth, but were largely unsuccessful in reducing the growth of total private sector debt, particularly for corporations, due to widespread circumvention via external borrowing. This finding is broadly confirmed in our study. Kraft and Galac (2011) fine-tune Galac (2010)'s analysis and find that while the credit growth ceilings did nothing to the growth of total non-financial corporations' debt, they did slow down the growth of total household debt. Neagu, Tatarici, and Mihai (2015) discuss Romania's experience with DSTI and LTV in detail. They find, as we do, that the introduction of these instruments in 2004 slowed down household credit growth. They also discuss the circumvention of these measures via nonbank lending, and for DSTI, via low initial interest rates, and longer loan maturities.

Case studies

A range of case studies of CESEE economies during the latest boom-bust cycle argue that various types of MPPs helped build banking system resilience,[6] although Frait, Gersl, and Seidler (2011) point out that credit growth in the Czech Republic was reined in by strict monetary policy, open communication and public warnings, rather than explicit MPP measures. Kruszka and Kowalczyk (2011) explain how Poland avoided substantial economic and financial imbalances by deploying higher than the minimum Basel II capital requirements for new banks and differentiated eligibility rules by currency. Celeska, Gligorova, and Krstevska (2011) explain that a combination of MPP measures on capital, restricted foreign exchange lending, and tightened liquidity requirements, tempered the credit boom in Macedonia. Kenc, Turhan, and Yildirim (2011) document that in Turkey, lower RRs and foreign currency (FC) RRs and higher limits for export rediscount credits helped limit the severity of the financial bust. Banai, Király, and Nagy (2011) document that, in Hungary, no significant MPP measures were taken during the boom period, while strong measures in the bust mostly in response to a greater awareness of the financial stability risks associated with FC mortgage lending stifled banking activity. Sutt, Korju, and Siibak (2011) discuss how stricter capital and liquidity requirements, together with fiscal buffers, did not fully succeed in limiting credit growth in Estonia during the boom, but buttressed banking system liquidity and capitalization enough to withstand credit losses.

Similarly to these papers, our case study also analyses the use of MPPs against the background of particular macroeconomic contexts but delves into the design of the MPP measures in greater detail and discusses their effectiveness in meeting specific policy objectives.

III. Policy Instruments and Objectives

A. Policy Instruments[7]

The key prudential instruments used by the Bulgarian National Bank (BNB), the Croatian National Bank (CNB), the National Bank of Romania (NBR), and the National Bank of Serbia (NBS) can be grouped into six broad categories:

1. CAP: capital regulation, such as minimum capital adequacy ratio, risk-weights, sectoral leverage ratio, capital eligibility;

[6] See also Enoch and Ötker-Robe (2007) for experiences with MPPs in CESEE during the first half of the boom.

[7] To obtain data on MPPs for 2002-2012 and establish the list of instruments that were used, we complement data from the Vandenbussche, Vogel and Detragiache (2015) database (which covers the period 2002-2010) with data from various sources, including financial stability reports and annual reports published by the four countries' central banks, for the years 2011 and 2012.

2. LCP: loan classification and provisioning rules, including rules for specific provisions, rules for general provisions;

3. LRR: liability-based reserve requirements and liquidity ratios, such as average reserve requirements, marginal reserve requirements on foreign liabilities, foreign-currency liquidity ratio;

4. ARR: asset-based reserve requirements, for example marginal reserve requirements related to credit growth;

5. ELI: eligibility requirements, such as loan-to-value ratio, debt-service-to-income ratio;

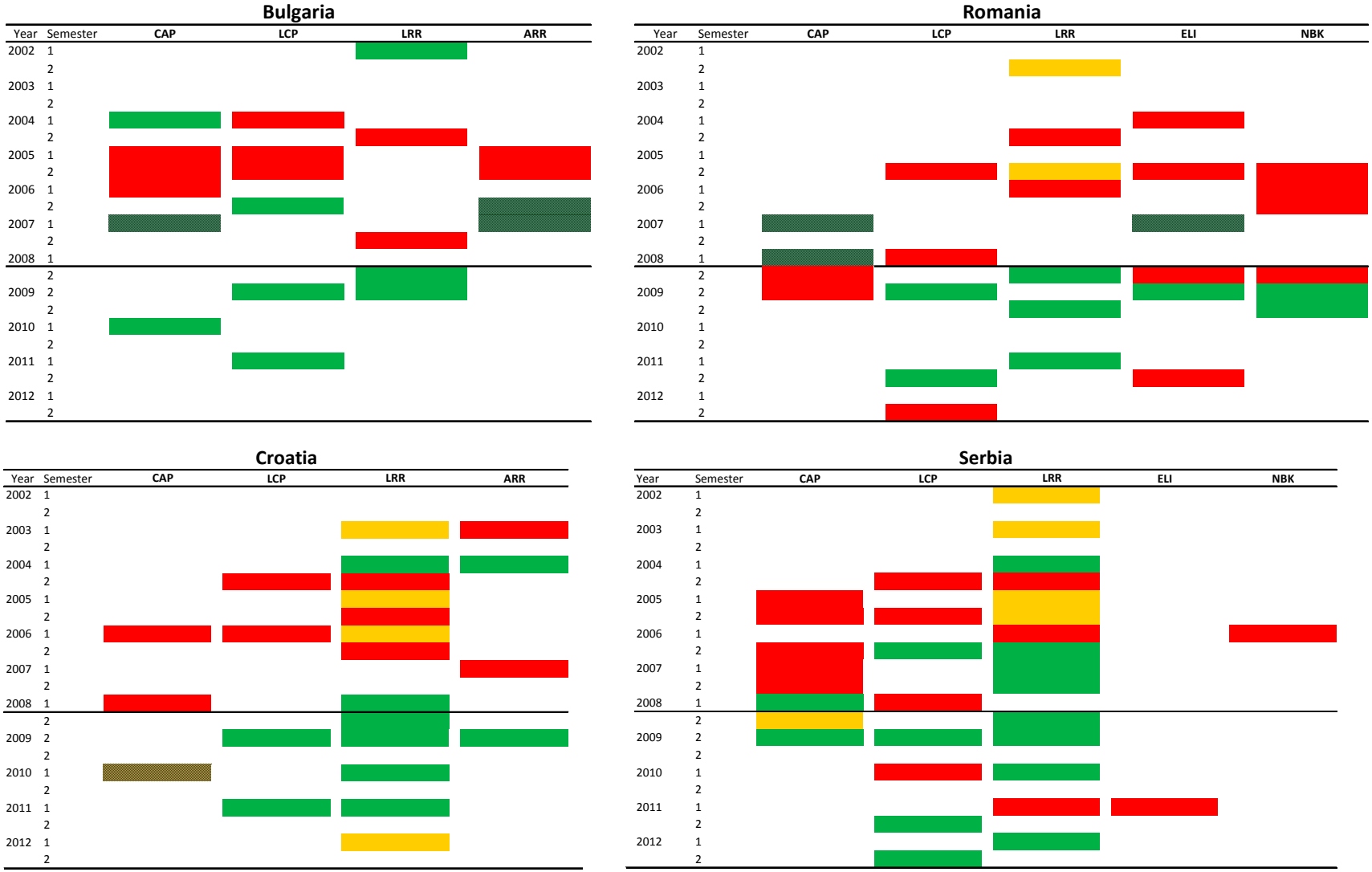
6. NBK: non-bank regulation, for example of leasing/consumer finance companies.

The first four categories of measures affect various cost margins as well as capital, provisions and liquidity buffers. They work through the supply side of credit while the fifth category affects the demand side of credit. The sixth category works by constraining the activity of nonbank credit intermediaries, which can be a channel of circumvention of measures targeting banks only. A comprehensive list of measures is provided in Appendix II.

The four countries varied in their degree of interventionism. Figure 1 shows the dynamics of policy action. Generally, countries tended to tighten (red) the macroprudential policy stance during the boom period and loosen (green) during the bust period. During the boom, policymakers at times implemented various instruments simultaneously. This approach suggests that macroprudential authorities believed in instrument complementarity. Sometimes the intended effects would move in opposite directions (yellow). The progression observed over time also seems to reflect a sequential approach where the more intrusive measures were used only after less severe measures had been first tried and found not to have the desired impact. Some easing measures were implemented to harmonize national policies with EU regulations ahead of EU accession (shaded).

During the bust, the four countries reversed some of the tightening that had taken place during the boom in order to help banks withstand the global financial crisis and the ensuing recession and thus help avoid a credit crunch. The most aggressive measures had become redundant and were dropped early. However, and perhaps surprisingly, some tightening during the bust also took place, in particular in the area of loan eligibility criteria. This may reflect the realization that banks had failed to properly assess credit risk during the boom years and therefore that further regulatory constraints should be placed on their loan decision-making process.

Figure 1. Use of Macroprudential Instruments, 2002–12



Source: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications.
Notes: A green (resp. red) cell indicates an easing (resp. tightening) meansure. A yellow cell indicates that both tightening and loosening measures were taken in the same period. Shading denotes measures taken for EU harmonization or Basel II implementation.
CAP = capital regulation, LCP= loan classification and provisioning rules, LRR= liability-based reserve requirements liquidity ratios, ARR= asset-based reserve requirements, ELI=eligibility requirements, NBK= regulation of nonbank credit institutions

B. Policy Objectives

Though all four countries were experiencing a similar financial cycle, policymakers' perception of risks varied somewhat. Therefore, while their ultimate objective was financial stability—or, more precisely, a balance between supporting economic activity and financial stability[8]—their intermediate objectives in taking action also varied. Intermediate objectives are defined by the European Systemic Risk Board as "operational specifications of the ultimate objective."[9] For example, domestic credit growth that is deemed excessive could threaten financial stability, and policy measures can be taken to rein in credit growth, with observable effects. Our study evaluates the effectiveness of MPPs against the stated (intermediate) objectives of policymakers in the four countries where these are made explicit, but also in some cases against what is a natural objective given the nature of the instrument (for example, domestic credit growth as an objective for broad-based LRR measures). These objectives are reported in public documents (press releases, annual reports, financial stability reports, etc.), and suggest that concerns were focused on five main intermediate objectives (Table 2). During the boom period, rapid credit growth was a concern in all four countries. Strong household credit growth was being particularly targeted in Bulgaria, Romania and Serbia, therefore we also discuss household credit growth in the context of overall credit growth below. In those same three countries, the relaxation of lending conditions was also a concern. Constraining the rapid rise in the share of loans denominated in foreign currency was another objective in all countries except for Bulgaria, where the country's currency board was seen as a key anchor of financial stability. Finally, concerns about the growth in foreign borrowing by banks were mostly prevalent in Croatia and Serbia.

Table 2. Macroprudential Policy Intermediate Objectives and Use of Instruments

MPP Intermediate Objectives	Domestic Credit Growth	o/w Household Credit Growth	Lending Conditions	Share of FC Lending	Share of Foreign Borrowing
MPP Instruments	**CAP, ARR, LRR, LCP, ELI, NBK**	**CAP, LCP, ELI**	**ELI, CAP, LCP**	**CAP, LCP, LRR, ELI**	**LRR**
Bulgaria	CC	CC	CC		
Croatia	CC			CC	CC
Romania	partially CC	partially CC	partially CC, then AC	partially CC	
Serbia	CC	CC	AC	partially CC	CC

Notes: AC = acyclical; CC = countercyclical; CAP = capital regulation; LCP = loan classification and provisioning rules; LRR = liability-based reserve requirements and liquidity ratios; ARR = asset-based reserve requirements; ELI = eligibility requirements; NBK = regulation of nonbank credit institutions; FC = foreign currency

As Table 2 illustrates, the same instrument category was sometimes used for different intermediate objectives. For example, CAP and LCP measures were used for almost all objectives, from domestic credit growth to lending standards to FC lending. Other types of

[8] The relative weight placed on growth considerations certainly reflected initial conditions in terms of financial sector development.

[9] *Recommendation of the European Systemic Risk Board on the macro-prudential mandate of the national authorities* (ESRB/2011/3).

measures, such as LRR, were targeted toward more specific objectives of managing the foreign borrowing of banks.

As hinted above, policymakers generally aimed for countercyclical (leaning-against-the-wind) measures. This implies that the tightening measures taken to address the concerns described above were partially or fully reversed during the bust. However, some tightening measures were acyclical in nature and presumably reflected policymakers' realization that stricter regulation was required to reduce systemic risk regardless of the position in the financial cycle. In addition, in the case of Bulgaria and Romania, some measures taken for countercyclical reasons during the boom were later reversed in the context of harmonization with EU regulation, thus limiting their overall impact.

IV. MACROPRUDENTIAL MEASURES TAKEN DURING THE BOOM

The cumulative strength of policy actions taken by each of the four countries in each of the six main categories during the boom years are summarized in Figure 2.[10] Countries differed in the strength of the implemented measures. Bulgaria's measures were relatively moderate, perhaps reflecting in part stricter initial conditions for the minimum CAR. Romania took measures to contain FC exposures by tightening loan eligibility criteria and liability-based reserve requirements but scaled back loan eligibility criteria and loosened its capital regulation upon EU accession. Croatia's measures were relatively stronger, in particular in trying to curb banks' external borrowing, mainly through raising considerably liability-based reserve requirements. The focus was on slowing down banks' external debt growth and trying to manage the indirect credit risk inherent in banks' FC/FC-indexed lending through capital requirements. Serbia was the most aggressive of the four countries, tightening policies particularly in the area of capital adequacy (after starting from relatively lower minimum requirements) and liability-based reserve requirements.

A. Capital Regulation (CAP)

The four countries resorted to somewhat different strategies when it came to using capital adequacy measures during the boom years, reflecting initial conditions of their banking regulation and of the size and composition of their banking sector's loan portfolio. Most banks operated in a situation of excess capital over minimum requirements; therefore tightening measures had the goal of maintaining sufficient buffers rather than building them, and/or affecting the allocation of credit across sectors and currencies. The following measures were adopted:

[10] These charts are constructed by using the same scoring methodology as Vandenbussche, Vogel and Detragiache (2015).

- *Changes in minimum capital adequacy ratio (CAR)*. Serbia increased it in two steps (from 8 percent to 12 percent) in 2005, as the credit boom gathered pace.[11] Romania reduced the minimum CAR from 12 percent to 8 percent as the country joined the EU in January 2007 and the authorities took steps to harmonize their capital regulation with that of the EU even though the measure was clearly procyclical. In contrast, Bulgaria kept the minimum 12 percent CAR upon EU accession, in part because of the still vivid memories of the domestic 1996–97 banking crisis.

- *Changes in specific risk-weights (RW).* In response to the fast growth of mortgage lending, Bulgaria tightened risk-weights on mortgages twice (in 2005:Q3 and 2006:Q2) by making them a function of the LTV ratio. Romania also increased risk-weights on high-LTV (75 percent and above) loans when it adopted Basel II in 2007:Q1. Croatia increased risk-weights on foreign currency loans to unhedged borrowers twice (in 2006:Q2 and 2008:Q1) by 25 percentage points each time. While the share of FC loans and FC-indexed loans had been historically high already in Croatia, these measures seem to have been motivated in part by the rise of the share of loans indexed to the Swiss franc, the exchange rate of which against the kuna was more volatile than that against the euro. Serbia increased by 25 percentage points the risk-weights on FC and FC-indexed loans to unhedged borrowers above 10 million dinars (about €100,000)—effectively mostly targeting corporate loans—in 2006:Q3, then increased risk-weights on household FC loans by 25 percentage points two years later. The presence of FC-indexed loans in Croatia and Serbia most likely reflects attempts to circumvent earlier prudential measures on FC loans.

- *Introduction of bank-specific minimum CAR that depend on credit growth*. From January 2008, Croatia required banks to hold minimum levels of capital based on their rate of credit growth and their reliance on funding sources other than core deposits. Essentially, banks growing their loan portfolio faster than 12 percent per year had to keep their CAR above 12 percent plus 150 percent of credit growth above 12 percent.

- *Introduction of specific leverage ratios*. As the boom in household loans persisted inspite of measures taken in 2005, Serbia capped household lending at 300 percent of share capital from September 2006 onward and tightened the thresholds to 150 percent a year later.[12] This instrument was fine-tuned in several instances during its first few months of existence.[13] Concerned by the fast growth of FC loans to unhedged borrowers, Romania capped the ratio of this type of loans to own funds at 300 percent

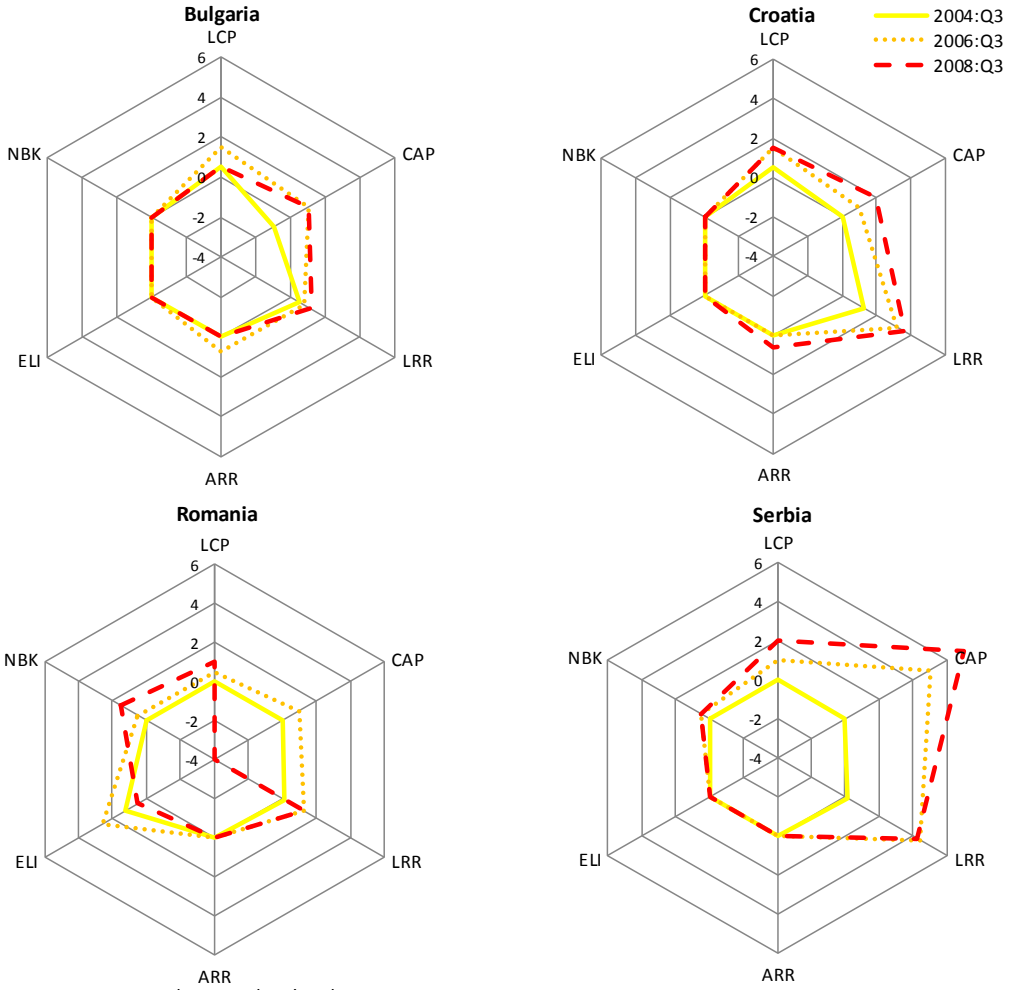
[11] The NBS explains the increase from 10 percent to 12 percent as a response to the "intensified lending activity of the banking sector" (2005 NBS Annual Report, p. 118).

[12] A bank failing to meet the requirement had to make a non-remunerated deposit of twice the gap between its household lending stock and 200 percent of share capital. At the time when the measure was introduced, four banks were not compliant (2006 NBS Annual Report, p. 73).

[13] See 2006 NBS Annual Report, p. 72.

from 2005:Q3 onward. However this measure remained in place only a little more over a year as it was dropped in January 2007 when the country joined the EU.

Figure 2. Changes in Macroprudential Policy Stance during the Boom
(changes relative to 2002:Q3)



CAP: Capital Regulations
LCP: Loan Classification/Provisioning
LRR: Liability-Based Reserve Requirements and Liquidity Ratios
ARR: Asset-Based Reserve Requirements
ELI: Loan Eligibility Requirements
NBK: Non-bank Regulation

Source: Authors' calculations based on scoring methodology of Vandenbussche, Vogel, and Detragiache (2015)

- *Exclusion of current profits from the regulatory capital base.* Bulgaria excluded interim profits from the calculation of own funds in 2005:Q3, a little more than a year after having allowed their inclusion. This measure was also implemented by Romania just before the cycle turned (in 2008:Q3).[14]

Initial conditions of bank regulation likely played a role in the use of capital-related instruments. When Serbia increased its minimum CAR to 12 percent in 2005, it merely caught up with the other three countries which had a regulation stricter than the Basel I minimum of 8 percent already: the minimum CAR had been 12 percent in Bulgaria and Romania since 1999, and 8 percent in Croatia since 1998.

Institutional factors also played a role. While still in the acute phase of the boom, Romania lowered its minimum CAR upon joining the EU by harmonizing it with the EU minimum of 8 percent. In early 2008, it also implemented the Basel II framework as embedded in the EU's Capital Requirement Directive, which led to a reduction in risk weights for household exposures relative to the previously prevailing more conservative Basel I norms. Bulgaria took a different approach—it implemented Basel II but initially kept the Basel I risk-weights. As non-EU members Croatia and Serbia did not face similar institutional pressure. Croatia implemented Basel II from the start of 2010 while Serbia implemented it in December 2011.

Finally, initial banking sector conditions also mattered. The decision by Serbia to introduce a sectoral leverage ratio in 2006, rather than increase risk-weights on household exposures, likely reflects the fact that the CAR of Serbian banks was quite high at the time (26 percent at end-2005 and 24.7 percent at end-2006) and that a constraint on credit growth through the imposition of more conservative risk-weights would not be binding enough. By emphasizing share capital (as opposed to total regulatory capital), Serbia anticipated one of the lessons of the 2008–09 global financial crisis, i.e. the importance of the quality of capital. Romania's decision to impose a similar ratio for FC exposures to unhedged borrowers also likely reflected the fact that banks had "excess" capital by the CAR metrics (20.2 percent at end-2005) and that a change in risk-weights might not have been sufficiently binding. In contrast, Bulgaria had a CAR of 16.6 percent at end-2004 and of 14.6 percent at end-2006, making an increase of risk-weights more likely to be immediately effective. Similarly, the CAR in Croatia was 13.4 percent at end-2005, just before prudential authorities increased risk-weights on FC loans for the first time.

[14] The exclusion was part of the BNB's "efforts to maintain banking system stability and create conditions for gradual credit growth in the economy" (BNB 2005 Annual Report, p.39). By contrast, the NBR explained that the measure was "aimed at removing from the calculation of Tier 1 capital […] the most volatile item".

B. Loan Classification and Provisioning (LCP)

The four countries also made their loan classification and provisioning rules stricter so as to require banks to build thicker provisioning buffers and provide greater incentives for more careful loan underwriting. All countries changed the rules governing specific provisions, i.e. those provisions made against loan exposures that do not meet the criteria to belong to the safest category. Two countries also introduced a system of general provisions, i.e. provisions that are contingent neither on the characteristics nor on the performance of the loan and have built-in countercyclical features. The following measures were adopted:

- *Loan classification and specific provisions*. Romania introduced the debtor's financial performance as a criterion for loan classification in 2003, and introduced exchange rate risk as another criterion in 2005 as part of its strategy to contain the growth of FC loans. In early 2008, it set higher provisioning rates for loans to unhedged FC borrowers. In December 2004, Serbia started requiring higher provisioning if minimum DSTI and LTV requirements were not met. It tightened loan classification further in 2005 but relaxed it in 2006 by only prescribing percentage bands for the calculation of special provisions and giving banks greater independence in credit risk measurement. Croatia introduced exchange rate risk as a criterion for loan classification in 2006. Bulgaria tightened classification rules in 2004 and 2005, but part of that tightening was reversed in late 2006.

- *General provisions*. Croatia introduced a system of dynamic provisioning in 2004 linking a bank's general provisions to its annual rate of credit growth. The threshold was 20 percent initially and was revised downward to 15 percent in 2006:Q3. Serbia introduced a system of dynamic provisioning similar to Croatia's (with a threshold of 15 percent) in mid-2008 just before the global crisis struck, before reversing course a few months later.

While tightening dynamic/general provisioning represents an immediately visible cost to banks, tightening specific provisioning rules during a boom does not necessarily do so, as in many cases the expense occurs only when the financial cycle has turned and asset quality starts deteriorating. Thus, it is likely that the former type of measure, if well calibrated, would be a more dissuasive measure than the latter.

C. Liability-Based Reserve Requirements and Liquidity Ratios (LRR)

The four countries also had different strategies with respect to the use of measures to manage the growth of liabilities. The following instruments were used:

- *Average reserve requirements (RR)*. In the two countries with a flexible exchange rate – Romania and Serbia– classical liability-based reserve requirements were a key instrument to manage credit growth but also to promote the use of the domestic currency. Both countries expanded the set of liabilities subject to reserve requirements

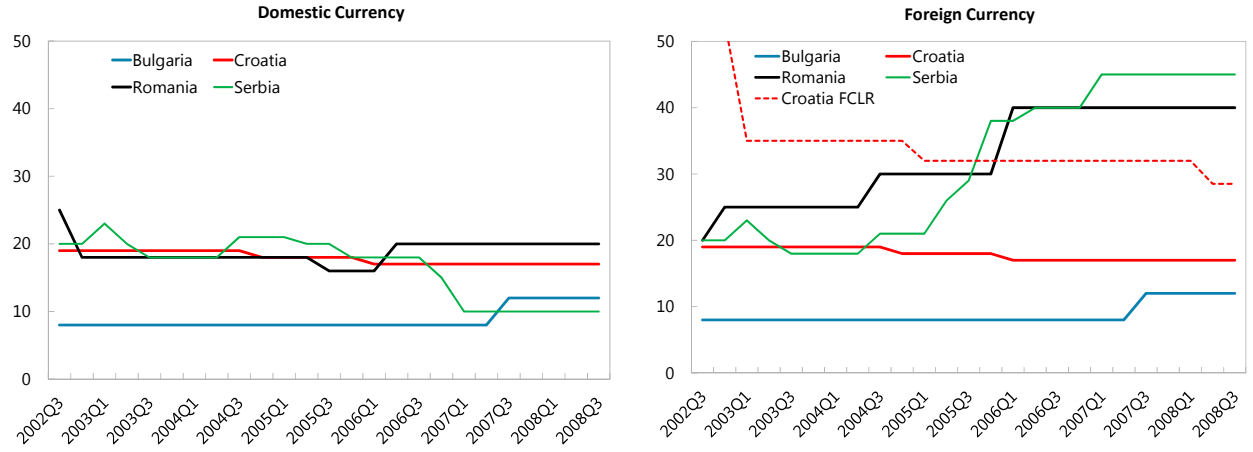
and increased significantly the rate applicable to FC-denominated liabilities while keeping the rate on domestic currency deposits stable or even lowering it. In Serbia, the rate on short-term borrowing from abroad reached a peak of 60 percent during the second half of 2006. In the other two countries with no or limited exchange rate flexibility, the use of the instrument was much more limited and had a greater focus on traditional liquidity management[15], and no differentiation by currency was ever introduced. In fact Croatia did not use the instrument for tightening purposes at all and in one instance it reduced reserve requirements rates when other instruments were tightened (Figure 3).[16]

- *Marginal reserve requirements (MRRs) on foreign borrowing.* Rather than stocks, Croatia preferred targeting specific flows. From mid-2004 until the end of the boom, it applied marginal reserve requirements on new foreign borrowing. Their rate was adjusted upwards several times, reaching 55 percent at the end of 2005 and remaining at that level until the instrument was abolished. The explicit objective was to slow down foreign borrowing of the banking sector and therefore the increase in external debt. Foreign parent banks reacted to the measure by substituting deposits and debt financing with capital injections and increasingly resorted to extending credit cross-border to Croatian corporations. A variant of MRRs on foreign borrowing called special reserve requirements (SRR) was introduced in 2006:Q1 and applied to some types of securities that banks had issued to circumvent the MRRs.

[15] The CNB October 13, 2004 press release stated that "The CNB Council decision reducing the reserve requirement rate from 19 to 18 percent, adopted at this meeting, corresponds to the attempts to stabilize the external debt balance at the present level. Total amount of reserve requirements will thus be reduced by around HRK 1.8bn: by approximately 1.1bn in the kuna component and 0.7bn in the foreign exchange component of reserve requirements. In that manner, the central bank facilitates the realization of the planned issue of government bonds, by means of which the Ministry of Finance intends to replace a portion of external debt with domestic borrowing. Reserve requirement reduction ensures a satisfactory banking system liquidity level for such a transaction. Since the government intends to use the collected kuna for an immediate purchase from the central bank of foreign exchange required for the repayment of Samurai bonds falling due in mid-December, such a purchase would offset the effect of this bond issue on the domestic monetary developments. This decision is also in accordance with the long-term policy of the Croatian National Bank, aimed at a gradual reserve requirement reduction."

[16] The CNB December 7, 2005 press release states that "It is expected that with the increased marginal reserve requirement banks will have no economic interest in additional borrowing abroad. Nevertheless, they will still have ample liquidity, since the general reserve requirement rate was at the same time reduced from 18 to 17 percent. As a result of this change, which too will be applied as from the calculation date in January, banks will have 2.1 billion kuna at their disposal (of which two thirds in kuna and the remaining share in foreign exchange). The general reserve requirement rate is planned to be further reduced to 16 percent in the coming year. In this way, banks will be given room for total placements growth of over 10 percent, which will be sufficient to support economic growth and normal market demand."

Figure 3. Reserve Requirement Rates on Demand Deposits
(Percent, 2002:Q3–2008:Q3)



Source: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications.
Note: FCLR=foreign currency liquidity requirement

- *Foreign currency liquidity ratio (FCLR)*. Entering the boom, Croatia and Serbia already had a regulation requiring that a large share of banks' short-term FC liabilities be covered by liquid FC claims. The purpose was to force banks to self-insure against the risk of a run on FC deposits. Croatia used that instrument during the boom by significantly reducing the rate while at the same time expanding its base. In particular, FC-indexed deposits were added to the base in late 2006 to close a circumvention channel that banks had been exploiting. Serbia marginally reduced the rate in 2004 and 2005 before dropping the instrument soon after the Serbian deposit insurance agency was created and depositor confidence got a boost. The FCLR instrument obviously interacted with the RR instrument as their rates and bases differed, making changes in one of the instruments not necessarily binding.

D. Asset-Based Reserve Requirements (ARR)

A more direct way to control credit growth is to target it directly. That is what Croatia and Bulgaria did when they resorted to marginal reserve requirements related to credit growth. In Croatia, a first "credit ceiling" measure (penalizing quarterly credit growth in excess of 4 percent) was implemented during 2003. A second one, with a stricter threshold but a lower penalty rate, was implemented starting in early 2007. Bulgaria instituted similar credit ceilings in early 2005. They were to be phased out after1 year initially, but were then extended until the end of 2006. Penalties were increased in late 2005, and reduced in mid-2006. In both countries, the ARR were partly circumvented through booking with parent banks and booking with nonbank affiliates. In the case of Bulgaria, circumvention also took the form of extra booking before the reference date as soon as the measure was announced, which led the BNB to change the reference date ex post.

E. Loan Eligibility Requirements (ELI)

Perhaps surprisingly, only Romania made use of instruments which constrain credit demand by placing caps on the amounts that can be borrowed. They were implemented because "the identification of possible flaws in commercial banks' management of the main banking risks was a major concern of the supervisory authority.[17]" An LTV limit of 75 percent was introduced in 2004:Q1. DSTI limits by type of loans (30 percent on consumer loans, 35 percent on mortgages) were introduced at the same time, and a DSTI limit of 40 percent covering total indebtedness was implemented in 2005:Q3. Both types of measures remained in place until the country entered the EU in January 2007 and banks were then allowed to set ceilings based on internal models. In August 2008, just before the crisis struck, Romania started requiring banks to consider interest and exchange rate risk in setting the indebtedness ceiling.

F. Regulation of Nonbank Credit Institutions (NBK)

Partly as a result of the stricter regulation imposed on banks, nonbank credit institutions (leasing companies, consumer credit companies) began to thrive. Romania and Serbia brought these institutions into the regulatory perimeter in 2006:Q1. Serbia subjected them to a 10 percent reserve requirements on foreign borrowing, while Romania subjected them to the same loan eligibility requirements as banks.

V. Macroprudential Measures Taken during the Bust

The four countries reversed some of the tightening taken during the boom in order to avoid a credit crunch during the global financial crisis and the ensuing extremely severe recession. The most aggressive tightening measures had become redundant and were dropped early. Bulgaria and Serbia eased their capital regulation; provisioning rules were softened in all four countries. Croatia, Romania and Serbia reduced or altogether removed liability-based reserve requirements. Yet, and perhaps surprisingly, some tightening also took place, in particular in the area of loan eligibility criteria and capital requirements in Romania. This may reflect the realization that banks had failed to properly assess credit risk or to keep adequate buffers during the boom years and therefore that further regulatory constraints should be placed on their loan decision-making process. Overall, Serbia eased the most during the bust, just as it had tightened the most during the boom (Figure 4).

A. Capital Regulation (CAP)

- *Changes in minimum CAR*. None of the four countries reduced its minimum CAR during the bust, although three out of the four countries technically had regulatory

[17] NBR 2003 Annual Report, page 87.

space to do so (relative to the relevant Basel minima). In fact, as the crisis struck and Romania entered an IMF-and-EC-supported program, the National Bank of Romania asked all banks to maintain capital ratios above 10 percent, i.e. 2 percentage points above the statutory minimum. This requirement was still in place at end-2012. Croatia increased its minimum CAR from 10 percent to 12 percent in 2010:Q1 to compensate for the reduction in risk-weights on certain exposures at the time it implemented Basel II and which led to a mechanical increase in CAR by 2 percentage points.[18]

- *Changes in specific risk-weights*: In 2010:Q1, Bulgaria provided capital relief to banks through a cut of risk-weights on household exposures to the minimum required by the European Capital Requirements Directive (CRD, i.e. the EU version of Basel II). A higher risk-weight for high-LTV housing loans was retained but the threshold was increased from 50 to 70 percent. Croatia and Serbia reduced risk-weights on household exposures and abandoned the risk-weight surcharges on foreign currency loans when they adopted Basel II in early 2010 and late 2011 respectively. Both countries also introduced a higher risk-weight for high-LTV loans with a threshold set at 75 percent. Therefore at the end of the period, all four countries had LTV-contingent risk-weights on mortgages, in line with the "substantial margin" requirement set in the EU's 2006 CRD.

- *Changes in bank-specific minimum CAR that depend on credit growth*. Croatia dropped this measure in 2010:Q1. The measure was far from binding at the time.

- *Changes in specific leverage ratios.* Serbia relaxed the quantitative limit on household lending by increasing the ceiling of the maximum ratio of household loans to share capital from 150 percent to 200 percent in 2009:Q1, and abandoned the measure altogether in the following quarter as "all objectives … were met … and it was no longer necessary to set a limit on bank household lending."[19]

- *Inclusion of current profits in the regulatory capital base:* Romania and Bulgaria reversed the measure taken during the boom and allowed the recognition of current profit or profit from the previous year as a capital base element in 2009:Q2 and 2010:Q1 respectively. [20]

[18] See CNB 2010 Annual Report page 2.

[19] See NBS 2009 Annual Report page 47.

[20] The BNB described this change as part of its "anticyclical policy in regulating banks' activities" (BNB 25 February 2010 press release).

B. Loan Classification and Provisioning (LCP)

Loan classification and provisioning requirements were loosened in all four countries.

- *Loan classification and specific provisions*. Bulgaria, Romania and Serbia loosened the loan classification and provisioning rules in various ways during 2009–2011. Bulgaria first slowed the rate of downgrades by increasing the number of days within each category of the loan classification, and later extended the allowed term of realization of real estate collateral. Romania allowed a fraction of the collateral to be deducted from the amount of exposures. Serbia first removed low down payments as a trigger for classification in the worst loan category, and later relaxed the DSTI thresholds triggering classification in one of the worst three categories.

- *General provisions*. Very early in the bust, Serbia and Croatia revoked the regulation requiring holding general provisions related to credit growth.

C. Liability-Based Reserve Requirements and Liquidity Ratios (LRR)

These measures were among the earliest to be loosened to help relieve liquidity pressures in banking systems.

- *Standard reserve requirements*. Countries reduced their reserve requirements both in terms of rates and in terms of base to relieve liquidity pressures in the banking system. In Bulgaria, the two-point reduction of reserve requirements early in the bust also allowed local affiliates of foreign banks to repay the liquidity support that had temporarily been provided by their parents soon after the onset of the global financial crisis. Romania and Serbia, which had increased significantly the rate on the foreign currency base during the boom, decreased it by an equivalently significant amount during the bust, although less so in the case of Serbia. At the end of the 2012, only in Serbia did the rates differ radically across currencies and reflected the explicit "dinarization" strategy pursued by the authorities in the post-crisis period (Figure 5).[21]

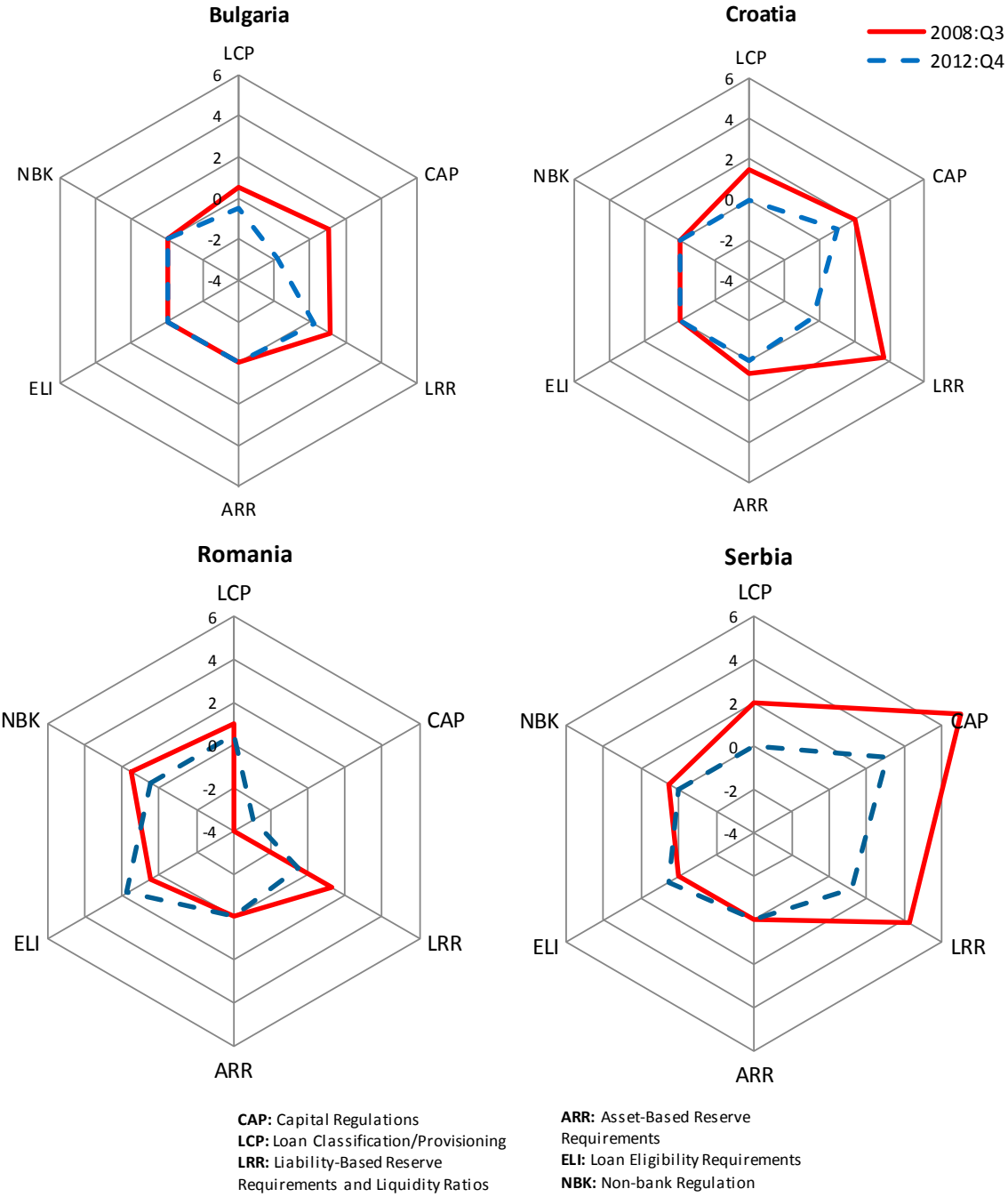
- *Marginal reserve requirements.* Croatia's MRR were completely revoked in October 2008 at the onset of the bust. SRR were lifted a few months later.

- *Foreign currency liquidity ratio.* Croatia reduced the FCLR rate from 28.5 percent to 20 percent in 2009:Q1 in the second half of 2008 at the onset of the recession. This was followed by a further reduction in 2011:Q1 to 17 percent with the aim of freeing foreign currency liquidity and stimulate investment.[22] The set of eligible assets to meet the FCLR was expanded in 2012:Q2 to include 50 percent of the amount of loans granted in the context of the "loan program for the development of the economy"

[21] See Markovic (2010)
[22] See CNB March 8, 2011 press release.

sponsored by the Croatian Bank for Reconstruction and Development (HBOR, in local spelling).[23]

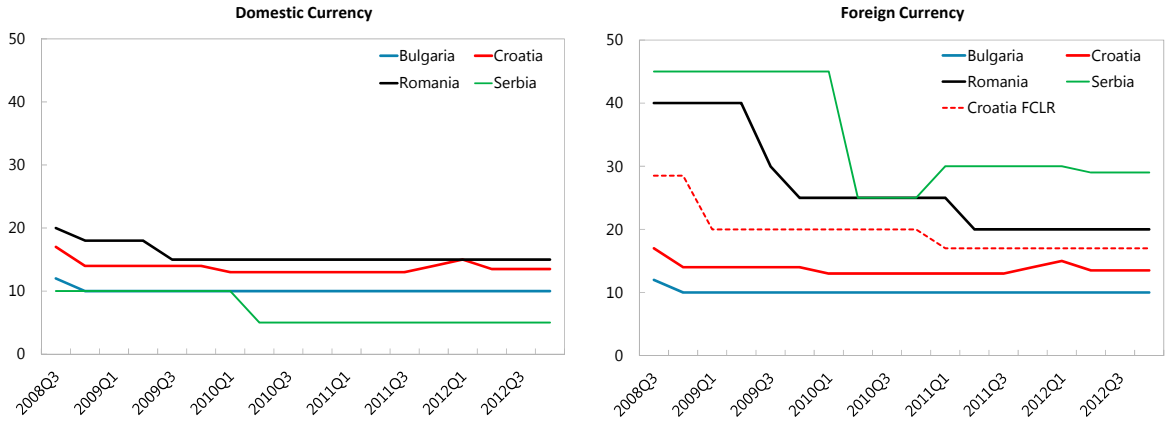
Figure 4. Changes in Macroprudential Policy Stance during the Bust
(changes relative to 2002:Q3)



Source: Authors' calculations based on scoring methodology of Vandenbussche, Vogel, and Detragiache (2015)

[23] See http://www.hbor.hr/hbor-promotes-new-investments-through-new-forms-of

Figure 5. Reserve Requirement Rates on Demand Deposits
(Percent, 2008:Q3–2012:Q4)



Source: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications.
Note: FCLR=foreign currency liquidity requirement

D. Asset-Based Reserve Requirements (ARR)

Croatia dropped the credit growth reserve at the end of 2009 in the context of anemic credit growth.

E. Loan Eligibility Requirements (ELI)

As noted, this is one of the few areas in which some requirements were actually tightened during the bust period.

- Romania amended the rule it had introduced in August 2008 only two quarters later by removing the requirement to take into calculation interest rate risk and currency risk when setting the indebtedness ratio for clients taking loans backed by mortgages within city limits. In 2011:Q4, it then introduced a maximum LTV ratio by type of loan currency denomination and required specific FC shocks to be applied to determine borrowers' maximum indebtedness levels.

- In 2011:Q2, Serbia introduced a maximum LTV for foreign-currency-denominated or foreign-currency-indexed loans. The ceiling was set at 80 percent for mortgages and 70 percent for other loans.

F. Regulation of Nonbank Credit Institutions (NBK)

- In 2009:Q4, Romania reversed the rule allowing nonbank institutions to include interim profits in the calculation of own funds. This followed a similar easing rule for banks half a year earlier.

In addition to these measures, the four countries encouraged banks to implement conservative profit retention policies in 2009 and 2010 to fight the erosion of capital cushions

because of the ongoing deterioration in asset quality. They also sought comfort letters from parent banks pledging adequate liquidity and capital support for their subsidiaries. In the case of Romania and Serbia, this was achieved in the context of the so-called Vienna Initiative (see Box 1).

Box 1. The Vienna Initiative and the IMF-EC Stabilization Programs

The Vienna Initiative was launched in early 2009 as a coordination platform for multinational banks, their home and host country supervisors, fiscal authorities, and international organizations. The goal was to safeguard a continued commitment of parent banks to their CESEE subsidiaries in the five CESEE countries with International Monetary Fund or joint International Monetary Fund—European Commission stabilization programs: Bosnia and Herzegovina, Hungary, Latvia, Romania, and Serbia. In these countries substantial amounts of external debt were maturing and external financing gaps were opening up. A significant part of this debt was held by multinational parent banks and insufficient roll-overs would have compromised the success of the stabilization programs.

A total of 17 parent banks pledged, via so-called commitment or comfort letters, to maintain their exposures and to keep their subsidiaries adequately capitalized for the duration of the programs. As the crisis subsided, the pressure to maintain cross-border exposures was reduced and in some cases roll-over commitments were lowered by early 2010.

VI. Were the Measures Effective?

This section assesses the measures' effectiveness by analyzing the evolution of the specific target variables these measures were meant to affect. By contrast with the other four targets, data on lending conditions are not publicly available, therefore we cannot assess effectiveness in that area. We find evidence that intermediate objectives moved in the intended direction according to the criteria used following the implementation of a handful of measures targeting them (see Table 3 for a summary assessment on credit growth and Table 4 on foreign borrowing and foreign currency lending). The other measures were likely too weak to have a measurable impact, or were implemented too close to the onset of the global financial crisis to be properly assessed.

A few single measures were effective across multiple intermediate objectives, as seen in Tables 3 and 4. This seems to have been the case in Croatia and Serbia, and both involved LRR measures. These will be discussed further below.

Table 3. Summary of Effective Measures on Credit Growth

(Including household credit growth)

Type	Instrument	Country	Period	Details	Reinforcing nature	Reinforcing measures soon afterwards	Change in indicator	Threshold
ARR	Credit ceiling	Bulgaria	05:Q2	Marginal reserve requirements of 200 percent if qoq credit growth is larger than 6 percent (and loan book big enough)	Yes. Increase in RR in 04:Q4 and LCP in 05:Q2	Yes. CAP measures in 05:Q3 and increase in penalties in 05:Q4	-5.7	-1.6
LCP	Loan classification	Bulgaria	05:Q2	No migration back to lower risk category category for restructured exposures before 6 months	Yes. Increase in RR in 04:Q4 and ARR in 05:Q2	Yes. CAP measures in 05:Q3 and increase in penalties in 05:Q4	-5.7	-1.6
CAP	RW HH	Bulgaria	05:Q3	Increase in risk-weights on high-LTV mortgage loans	Yes. Credit ceiling since 05:Q2, capital eligibility measure in 05:Q3	Yes. Increase in credit ceiling penalties in 05:Q4	-6.0	-3.0
CAP	Capital eligibility	Bulgaria	05:Q3	Exclusion of interim profits from capital base	Yes. Credit ceiling since 05:Q2, RW measure in 05:Q3	Yes. Increase in credit ceiling penalties in 05:Q4	-4.8	-1.6
ARR	Credit ceiling	Bulgaria	05:Q4	Increase in penalty rate (up to 400 percent)	Yes. Credit ceiling since 05:Q2, CAP measures in 05:Q3, and LCP measure in 05:Q4	Yes. RW measure in 06:Q2	-3.6	-1.6
LCP	Provisioning HH	Bulgaria	05:Q4	Increase in provisioning rates for loans to households	Yes. Credit ceiling since 05:Q2, tightened in 05:Q4, CAP measures in 05:Q3	Yes. RW measure in 06:Q2	-6.4	-3.0
ARR	Credit ceiling	Croatia	03:Q1	Requirement to buy low-yielding central bank bills if qoq credit growth is larger than 4 percent	Yes. FCLR measure in 03:Q1	No	-3.6	-0.4
ARR	Credit ceiling	Croatia	07:Q1	Requirement to buy low-yielding central bank bills if annual credit growth is larger than 12 percent	Yes. Earlier MRR and SRR measures, FCLR measure in 06:Q4, RW and LCP measures in 06	No	-2.5	-0.4
ELI	LTV, DSTI on HH	Romania	04:Q1	Introduction of LTV and DSTI	No	No	-25.8	-9.0
LRR	RR FC, RR Foreign borrowing	Serbia	06:Q2	Increase in RR FC rate and expansion of the base	Yes. Net tightening of reserve requirements in 05	Yes. Introduction of sectoral leverage ratio in 06:Q3 and higher RW FC in 06:Q4	-4.6	-0.5
CAP	Sectoral HH leverage ratio	Serbia	07:Q3	Extension of the scope of the regulation to include all housing loans	Yes. Sectoral leverage ratio introduced in 06:Q3 and penalties increased in 07:Q2, Higher RW FC in 06:Q4	Yes. Tightening of the ratio in 07:Q4	-5.1	-4.7

Source: Authors' calculations. The orange fill color indicates effectiveness across different intermediate objectives.

Table 4. Summary of Effective Measures on Foreign Borrowing and Foreign Currency Lending

Type	Instrument	Country	Period	Details	Reinforcing nature	Reinforcing measures soon afterwards	Change in indicator	Threshold
Foreign borrowing								
LRR	SRR	Croatia	06:Q1	Introduction of a special reserve requirement (SRR) of 55% on liabilities arising from issued securities.	Yes. SRR was introduced to avoid circumvention of marginal reserve requirement on foreign borrowing of 55%	Yes. FCLR in 2006:Q4	-4.8	-3.3
LRR	RR foreign borrowing	Serbia	06:Q2	Reserve requirement (RR) on foreign borrowing with maturity up to 2 years (resp. above 2 years) raised from 38 percent to 60 percent (resp. 40 percent)	Yes. RR on foreign liabilities had been raised several times in 05.	No	N/A	N/A
FC lending								
LRR	SRR	Croatia	06:Q1	Introduction of a special reserve requirement (SRR) of 55% on liabilities arising from issued securities.	Yes. SRR was introduced to avoid circumvention of marginal reserve requirement on foreign borrowing of 55%	Yes. RW FC and LCP FC in 06:Q2, FCLR in 06:Q4	-2.5	-2
CAP	RW FC	Croatia	06:Q2	Risk-weights on FC or FC-indexed loans to unhedged borrowers are increased by 25 percentage points	Yes. SRR in 06:Q1	Yes. FCLR in 06:Q4	-3.9	-2
LRR	RR LC, RR FC	Romania	02:Q4	Increase in RR FC rate, decrease in RR LC rate	No	No	-4.5	-3.9
LRR	RR FC	Romania	05:Q1	Broadening of RR base to include all FC liabilities with maturities over 2 years (gradual implementation)	Yes. Increase in RR FC rate in 04:Q3	Yes. Broadening of RR FC base, and decrease in RR LC rate in 05:Q3	-9.3	-3.9
LRR	RR LC, RR FC	Romania	05:Q3	Broadening of RR base to include all FC liabilities with maturities over 2 years (end of implementation), reduction in RR LC rate	Yes. Broadening of RR FC base in 05:Q1	Yes. Further increase in RR FC rate in 06:Q1	-8	-3.9
CAP	FC loans limits	Romania	05:Q3	FC loans to unhedged individuals and legal persons not to exceed 300 percent of own funds (new regulation)	Yes. Broadening of RR FC base in 05:Q1 and 05:Q3, LCP FC measure in 05:Q3	Yes. Further increase in RR FC rate in 06:Q1	-8	-3.9
LCP	Loan classification FC	Romania	05:Q3	Loan classification stricter for borrowers with currency mismatches	Yes. Broadening of RR FC base in 05:Q1 and 05:Q3, FC loans limits in 05:Q4	Yes. Further increase in RR FC rate in 06:Q1	-8	-3.9
LRR	RR LC	Serbia	06:Q4	Decrease in RR LC rate	Yes. Earlier increases in RR FC rate and base, increase in RW FC in 05:Q4	Yes. Further increase in RR FC rate and base, and further decrease in RR LC rate in 07:Q1	-6	-3.6
CAP	RW FC	Serbia	06:Q4	RW on unhedged FC and FC-indexed loans are increased to 125 percent for loans larger than 10 million dinars	Yes. Earlier increases in RR FC rate and base, decrease in RR in 05:Q4	Yes. Further increase in RR FC rate and base, and further decrease in RR LC rate in 07:Q1	-6	-3.6

Source: Authors' calculations. The orange fill color indicates effectiveness across different intermediate objectives.

A. Effect on Domestic Credit Growth and Domestic Household Credit Growth

As noted above, all four countries had concerns about excessive domestic credit growth, and the full range of instruments was deployed to address these concerns. Because data on credit by nonbank financial institutions is not available across the four countries for a sufficiently long period of time, and because the total amount of credit provided by nonbank financial institutions remained relatively small, we focus our discussion below on domestic bank credit, and do not assess the effectiveness of NBK measures. We simply note that regulatory arbitrage was addressed in Romania and Serbia when supervision of nonbanks was consolidated into the respective central banks. The limited available evidence for these two countries suggests that the extension of some bank regulations to nonbanks seems to have closed at least partially the regulatory arbitrage loophole before the issue could rise to systemic significance.

We deem a measure implemented in period *t* to be effective if the change in credit growth between period *t-2* and period *t+2* goes in the right direction and is significant. To reduce the impact of short-term volatility of credit, we use smoothed series when conducting the assessment. The smoothing is achieved by taking the arithmetic average of the credit growth series values across *T-1*, *T* and *T+1* for any period *T*. To measure "significance", we construct the series of changes in credit growth (2-period-ahead minus 2-period-behind), separating the periods up to 2007:Q3 (boom) and from 2009:Q3 (bust), i.e. excluding a 7-quarter window around 2008:Q3 (onset of the Global Financial Crisis (GFC), a likely structural break). We then use an iterative procedure to construct a "control period" for both the boom and the bust. For the boom, we identify the quarter *Q* when a tightening measure was implemented that had the largest decline in credit growth. We then compute the mean (*m*) and standard deviation (*sd*) of the change in credit growth (between *t-2* and *t+2*) series during the initial control period, i.e. the boom running up to 2007:Q3 excluding a window of seven periods around *Q*. The change at time *t* is significant if the change in credit growth between *t-2* and *t+2* is strong enough to be smaller than the threshold *m-1.65sd*.[24] Assuming we find that the change in *Q* is significant, we repeat the procedure with the quarter when a tightening measure was implemented that had the second largest decline in credit growth, further narrowing the control period. We stop the procedure when we have reached a measure that has an impact that is too small to be lower than the threshold in the relevant control period. We proceed in the exact same way for the bust (using the threshold *m+1.65*sd for easing measures and *m-1.65sd* for the tightening measures), and for household credit growth during the boom and the bust.

In addition, we require that measures found to have an effect on credit growth that is both in the right direction and significant are also found to have an effect on other relevant intermediate targets as the effect on total credit growth is expected to happen via the effect on

[24] Ninety percent of a normal distribution of mean *m* and standard deviation *sd* is contained within the interval [m-1.65sd, m+1.65sd].

these other intermediate targets. For example, we consider that a measure targeting foreign currency loans can't be deemed effective at curbing credit growth if it does not at the same time curb the share of foreign currency lending. For measures targeting household credit growth, we require that total credit growth does not decline more than household credit growth (so that the share of household credit in total credit does not increase).

The summary results for effective measures are shown in Table 3. For each measure, we indicate whether other reinforcing measures were taken concurrently or subsequently (which would positively bias the diagnostic of effectiveness) and whether the measure reinforced other measures taken earlier (which would negatively bias the diagnostic of effectiveness). In three cases, several measures going in the same direction were taken during the same quarter. We then use judgment to assess whether the policy was sufficiently strong to have been the main reason for the change in credit growth. If not, we use a grey font color (instead of black) to present them in the table.

For clarity of exposition we present the measures in Figures 6–9 by type of instrument, sometimes grouping the instruments in sub-groups. For each group of charts, measures that are considered effective show shading next to the vertical lines, and arrows next to the relevant series.

ARR measures slowed down domestic credit growth while they were in place

The experience of Bulgaria and Croatia suggests that ARRs can help restrain domestic credit growth when they are binding and the marginal reserve rates are very high.

The ARR measures in Bulgaria—which had an initial reserve rate of 200 percent—helped reduce the growth of credit to the private sector while they were in place in 2005–06. When they were relaxed, and later abandoned upon EU accession in 2007, credit growth picked up again strongly (Figure 6, top chart). The effect of pre-announcing the ARR is evident: in the first quarter of 2005, banks raced to build up their assets to increase the base from which the credit ceiling would be applied, and a pronounced kink is observed during that period. Once the ceiling became implemented and binding in 2005:Q2, credit growth fell back. However, because a tightening LCP measure was taken concurrently (Figure 6, bottom chart), we cannot attribute fully the slowdown to the ARR measure. Similarly the increase in the penalty rate later in 2005 happened together with further LCP tightening and followed an RW tightening, so the persistence of the domestic credit slowdown cannot be cleanly attributed to the ARR measure. Following the penalty reduction in 2006:Q3, credit growth accelerated, a reversal which may have been reinforced by the removal of the earlier LCP measure.

The so-called credit growth reserve was imposed in Croatia in 2003:Q1 (with an annual credit growth threshold of 17 percent and a penalty rate of 200 percent), then was abandoned one year later, and reinstated in 2007:Q1 (with a lower credit growth threshold and a lower penalty rate). In both instances (Figure 7, top chart), credit growth slowed down. In the

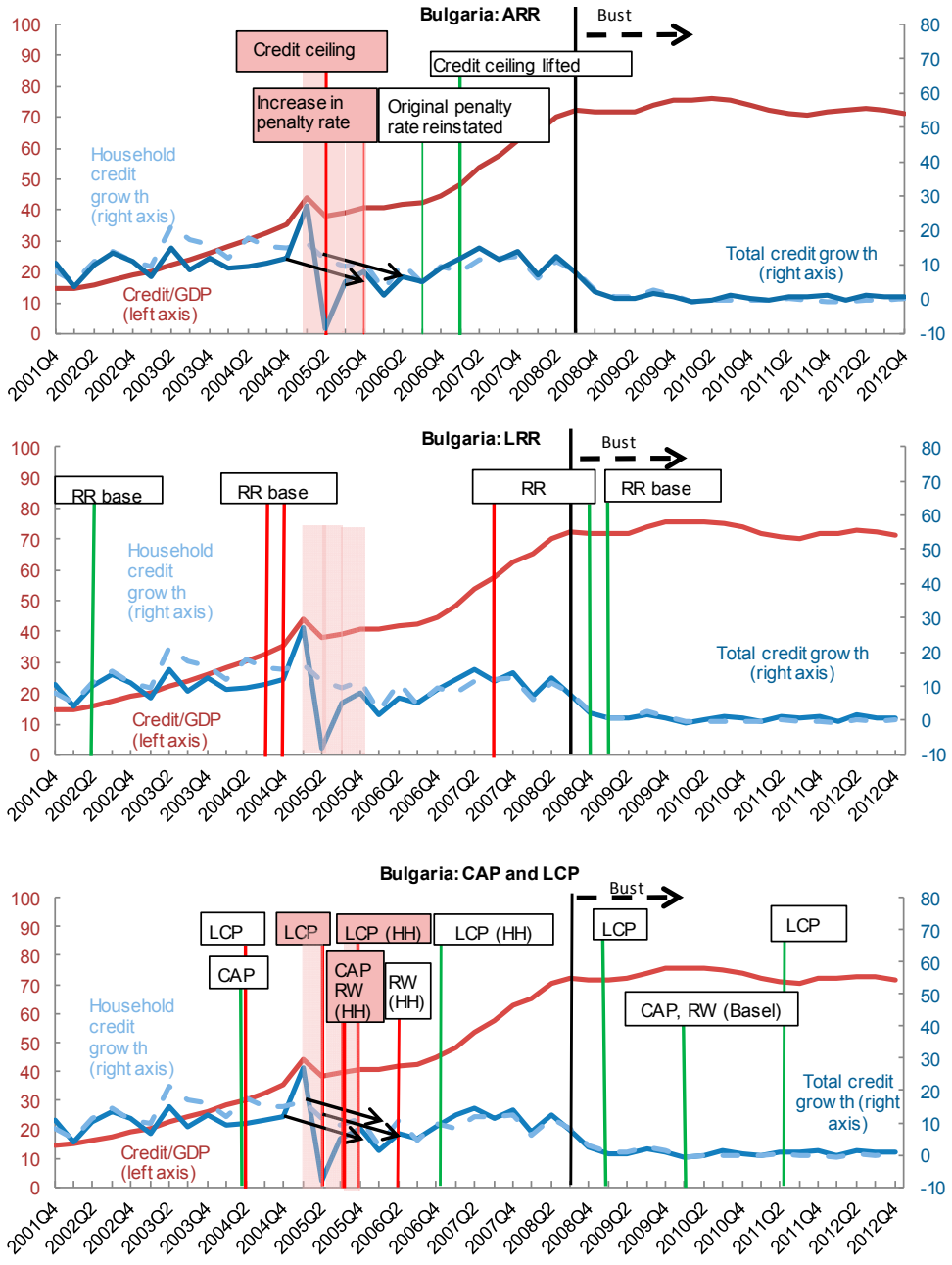
second instance, the penalty was likely deemed insufficient, as credit growth rebounded in 2008:Q1, which led the authorities to increase the penalty to 75 percent. Credit growth resumed its decline then but this decline was soon compounded by the effects of the global financial crisis, making any effectiveness assessment moot. In both instances, a LRR measure (tightening in the FCLR) took place in a nearby period, suggesting a possible reinforcing role of the measure in making it more costly to expand credit as foreign currency liquidity requirements were tightened. However, we do not find that these FCLR measure had any significant impact on the evolution of the share of foreign currency lending (see below) and therefore they do not qualify as effective. Credit growth did not increase immediately after the first credit growth reserve was abandoned. It did after several quarters, at which time policymakers used another set of policy tools, including marginal reserve requirements on foreign borrowing (see below). Credit growth did not increase after the second credit growth reserve was abandoned either as the measure was no longer binding at this point in the cycle.

LRR measures generally had no significant effect on domestic credit growth, except at the peak of the tightening cycle in Serbia

The effect of liability-based reserve requirements and liquidity requirement measures on domestic credit growth appears mixed at best. Policy tightening in Bulgaria (i.e. increasing the rate of reserve requirements, or expanding their base) did not slow down either credit growth or the upward creep of the credit-to-GDP ratio during the boom, while easing measures were not followed by a rebound in credit growth during the bust (Figure 6, middle chart). In Croatia, none of the LRR measures taken except for the two FCLR measures mentioned in the paragraph above is associated with a significant movement in credit growth in the right direction in the two quarters following implementation (Figure 7, middle chart). In Romania, neither the increase in the rate of reserve requirement on FC liabilities (which peaked at 40 percent in 2006) nor the broadening of the base were followed by a credit growth slowdown during the boom (Figure 8, top chart). During the bust period, successive easing of reserve requirements was not followed by any significant increase in credit growth.

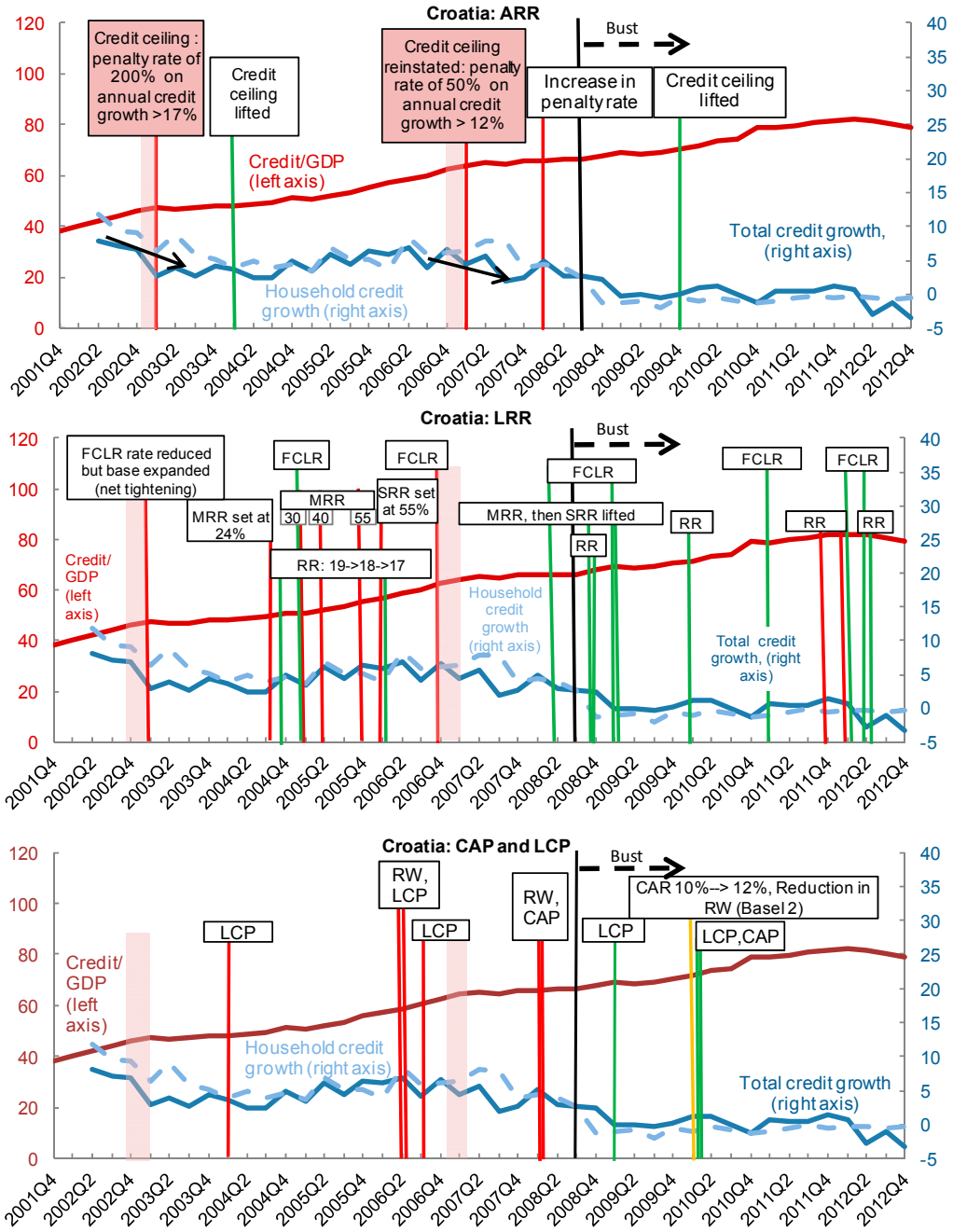
The same is generally true for Serbia, (Figure 9, top chart), although some effect can be observed at the peak of the tightening cycle. In 2006:Q2 credit growth slowed down (and the credit-to-GDP ratio actually declined) when the reserve requirement rate on FC deposits reached 40 percent, and the rate on short-term external borrowing reached 60 percent. After the first easing measure was taken later that year—a reduction of the reserve requirement rate on domestic currency deposits from 18 percent to 15 percent, which was taken concurrently with a reduction in the policy rate for monetary policy reasons in the context of the New Monetary Policy Framework, not for macroprudential reasons—credit growth rebounded and the credit-to-GDP ratio resumed its upward trend. Frequent adjustments of LRRs—although with a tightening bias—suggest that calibration was difficult during the boom. Successive easing measures during the bust period were not followed by a revival of domestic credit growth.

Figure 6. Bulgaria: Domestic Credit to Private Sector, 2001:Q4–2012:Q4
(Exchange-rate-adjusted QoQ growth rate and ratio to GDP, in percent)



Sources: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.
Notes: a green line indicates policy loosening, a red line indicates policy tightening, and a yellow line indicates both loosening and tightening in the same quarter. Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.
ARR = asset-based reserve requirements, LRR = liability-based reserve requirements and liquidity ratios, CAP = capital regulation, LCP = loan classification and provisioning rules.
See Appendix II for a full description of measures.

Figure 7. Croatia: Domestic Credit to Private Sector, 2001:Q4–2012:Q4
(Exchange-rate-adjusted QoQ growth rate and ratio to GDP, in percent)



Sources: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.
Notes: a green line indicates policy loosening, a red line indicates policy tightening, and a yellow line indicates both loosening and tightening in the same quarter. Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.
ARR = asset-based reserve requirements, LRR = liability-based reserve requirements and liquidity ratios, CAP = capital regulation, LCP = loan classification and provisioning rules.
See Appendix II for a full description of measures.

Some sectoral CAP measures were effective at curbing credit to households during the boom

A household credit growth slowdown took place in Bulgaria around the time when risk-weights on mortgages were increased in 2005:Q3 (Figure 6, bottom panel). The effect of that measure was very likely reinforced by the ARR measures taken right before and right after, and by the capital eligibility measure taken in the same quarter, but the decline in household credit growth was stronger than the decline in total credit growth, suggesting that the sectoral dimension of the measure played a role. A further increase of mortgage risk-weights is not associated with a further slowdown, but the effect of the measure was blurred by the easing of the credit ceilings soon after.

Serbia's use of a sectoral leverage ratio helped decrease household credit growth in the second half of 2007, once the measure was recalibrated in the direction of tightening by broadening the base (Figure 9, bottom panel). The effect of this measure was reinforced by an increase in penalties for non-compliance earlier in the year and by lowering the leverage ceiling during the following quarter. The chart suggests that the latter was effective too, but it took place too close to the onset of the GFC to be properly assessed. The sectoral leverage ratio was loosened and then abandoned relatively soon into the bust period in 2009. Its removal had no visible impact on household credit growth.

Other CAP measures did not have a significant effect on total private sector credit growth or household credit growth in any of the four countries (Figures 6–9, bottom panels). We note, however, that the reduction in the minimum CAR from 12 percent to 8 percent (taken concurrently with an easing of ELI measures) in Romania led to a steeper increase in the credit-to-GDP ratio.

Early ELI measures in Romania helped curb household credit growth during the boom

Only Romania used ELI measures during the boom. The introduction of LTV (75 percent) and DSTI limits weakened household credit growth after their introduction in 2004:Q1 (Figure 8, bottom panel), although the level remained very high (above 10 percent QoQ) afterwards. Surprisingly, the tightening of DSTI in 2005:Q3 does not seem to have led to a further reduction. During the bust, the reintroduction of LTV limits (by currency) had no significant impact. Neither did their introduction in Serbia.

LRR measures generally had no significant effect on domestic credit growth, except perhaps when taken concurrently with other measures in Bulgaria

The only broad-based LCP measures associated with signs of effectiveness is the one taken concurrently with the introduction of credit ceilings in Bulgaria in 2005:Q2. However, the measure seems too weak—a lengthening to six months of the time required for restructured exposures to migrate to a lower risk category—to have been a reason to cut credit supply.

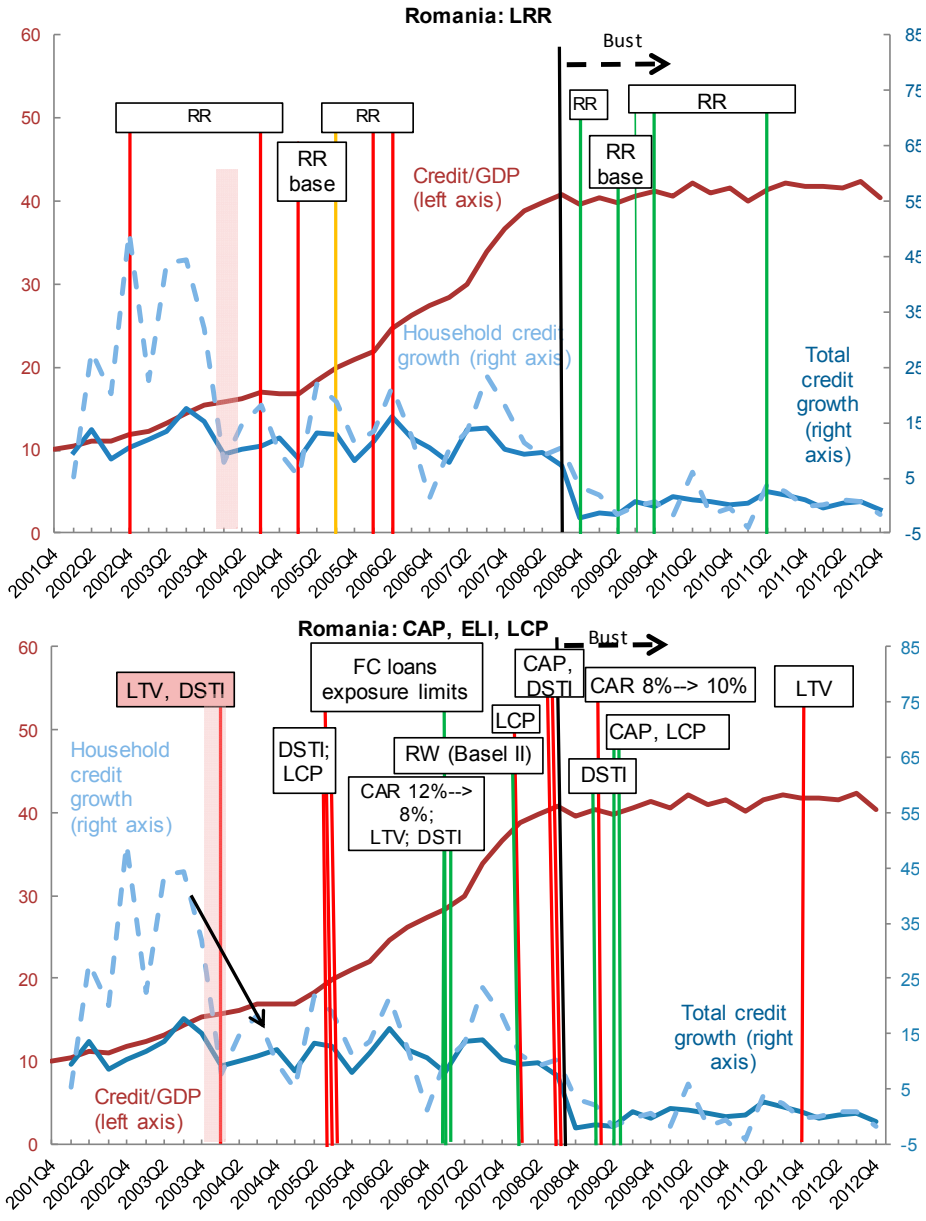
The only sectoral LCP measure associated with signs of effectiveness was also implemented in Bulgaria, was taken concurrently with a tightening of credit ceilings and implemented shortly after risk-weights on mortgages were increased, and three quarters before these risk-weights were increased again. Minimum specific provisions to cover impairment loss were raised from 10 to 20 percent for watch exposures and from 50 to 75 per cent for substandard exposures. This measure may have had a reinforcing effect but is unlikely to have been sufficiently strong to have a significant impact by itself.

No measure had any discernible impact during the bust

As hinted in the discussion above, easing measures implemented during the boom do not seem to have stimulated credit growth.

Figure 8. Romania: Domestic Credit to Private Sector, 2001:Q4–2012:Q4

(Exchange-rate-adjusted QoQ growth rate and ratio to GDP, in percent)



Sources: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.

Notes: a green line indicates policy loosening, a red line indicates policy tightening, and a yellow line indicates both loosening and tightening in the same quarter. Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.

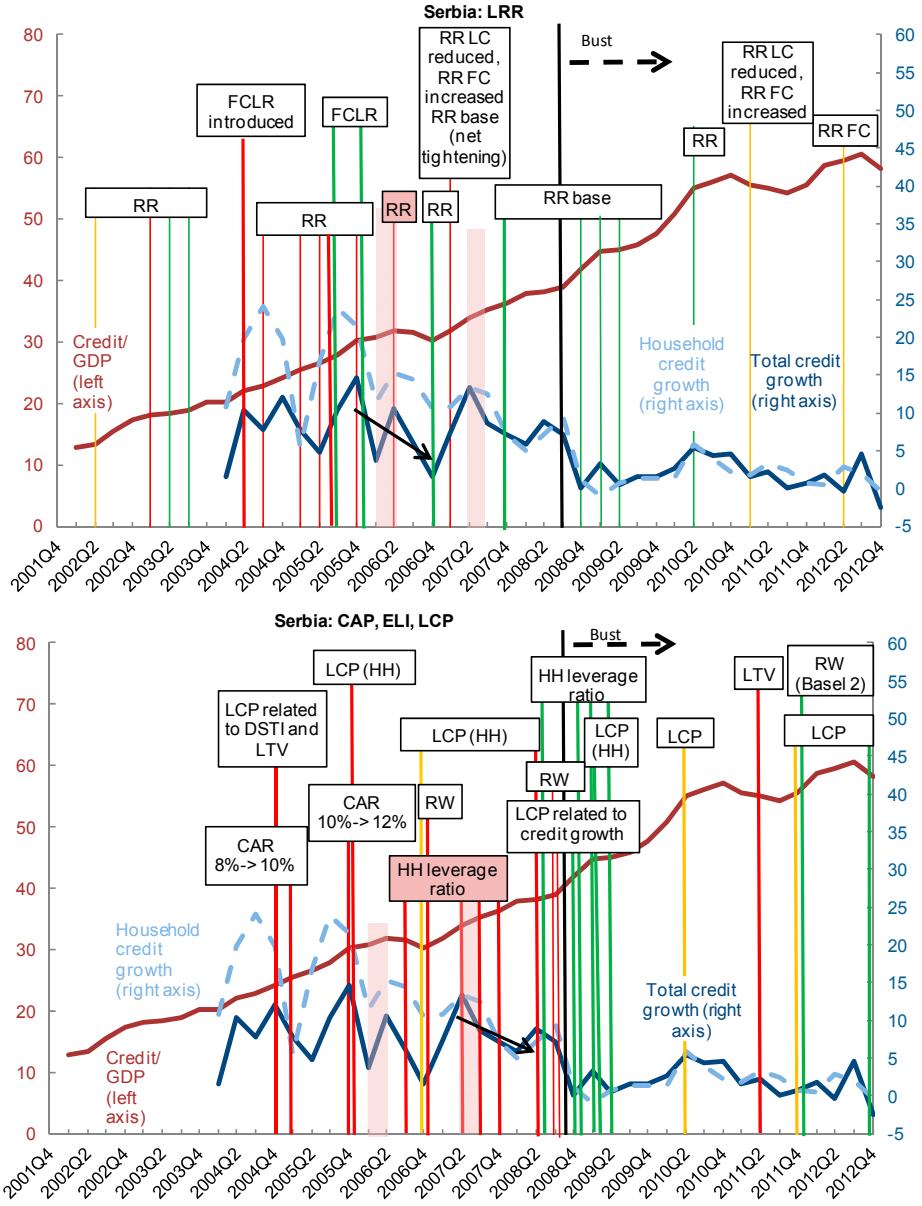
CAP = capital regulation, LCP = loan classification and provisioning rules, LRR = liability-based reserve requirements and liquidity ratios, ELI = eligibility requirements.

FC = foreign currency; LC = domestic currency; HH= household.

See Appendix II for a full description of measures.

Figure 9. Serbia: Domestic Credit to Private Sector, 2001:Q4–2012:Q4

(Exchange-rate-adjusted QoQ growth rate and ratio to GDP, in percent)



Sources: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.

Notes: a green line indicates policy loosening, a red line indicates policy tightening, and a yellow line indicates both loosening and tightening in the same quarter. Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.

CAP = capital regulation, LCP = loan classification and provisioning rules, LRR = liability-based reserve requirements and liquidity ratios, ELI = eligibility requirements.

FC = foreign currency; LC = domestic currency; HH= household.

See Appendix II for a full description of measures.

B. Effect on Share of Domestic Foreign Currency Lending

Policy-makers were mindful not only of the *sectoral* composition of domestic credit but also of its *currency* composition. We thus turn to measures that were directly targeting FC lending or had a direct effect on FC lending and examine their impact on the (exchange-rate-adjusted) share of FC lending in total domestic lending. Since Bulgaria had no measures explicitly targeting FC lending, it is not discussed in this subsection.

We deem a measure targeting foreign currency lending and implemented in period *t* to be effective if the change in the trend of the share of FC lending around *t* has the right sign and is significant. The trend "before" is the difference between the share of FC lending at time *t* and that at time *t-2*, and the trend "after" is the difference between the share of FC lending at time *t+2* and that at time *t*. We use the same approach as in subsection A above to measure "significance", separating this time the periods up to 2007:Q4 (boom) and from 2009:Q2 (bust), i.e. excluding a 5-quarter window around 2008:Q3 (onset of the GFC).

Again, to improve the clarity of the graphic exposition, we present the relevant set of instruments in two waves: LRR at the bottom of Figures 10-12 and the other measures on top. Measures that do not directly target FC lending but were found to be effective at managing total domestic credit growth in Subsection A above are shown in the charts because even a currency-neutral measure could be relevant to the share of FC loans when the funding of the marginal loan is currency-biased (for example because of cheap parent funding in foreign currency). It turns out we do not find that any currency-neutral measure had a significant effect on the change in the trend of FC lending.

Capital measures targeting FC lending helped shift the currency composition of loans during the boom. However, LCP and LRR measures were taken around the same time as these CAP measures and likely reinforced their effect.

In Croatia the share of FC/FC-indexed loans started declining following an increase of risk-weights on FC loans to unhedged borrowers by 25 percentage points in 2006:Q2. The measure coincided with a relatively mild LCP measure that required that banks take into account exchange rate risk in their loan classification (Figure 10, top chart). It also took place only one quarter after the implementation of the SRR on foreign borrowing at a rate of 55 percent, the peak of the MRR/SRR wave of measures. The implementation of a second increase in risk-weights by a further 25 percentage points in 2008:Q1 did not coincide with the implementation of any other FC-related measure. It was also followed by a decline in the share of FC lending, but its effectiveness cannot be assessed properly because it happened too close to the onset of the GFC. In any event, the continued decline in the share of FC lending following that measure did not last because in late 2008 and early 2009, in reaction to the uncertainties about the stability of the kuna triggered by the GFC, households and corporations shifted deposits into FC and banks shifted lending into FC again to match their increased FC liabilities. As a result, the share of FC credit rose again to close to 75 percent

by early 2010. It remained at this level even after Basel II was implemented and the risk-weight differentiation across currencies was dropped.

The case of Serbia provides similar evidence of the effectiveness of a risk-weight measure. Serbia's imposition of a 125 percent risk-weight (an increase of 25 percentage points or more, depending on loan type) on unhedged FC and FC-indexed loans larger than 10 million dinars in 2006:Q4 coincided with a halt in the upward trend in the share of FC and FC-indexed lending (Figure 12, top chart). It also coincided with a reduction in the reserve requirement rate on LC deposits from 18 percent to 15 percent, making a clean attribution difficult. An increase of risk-weights by 25 percentage points on unhedged household loans in 2008:Q3 happened just before the onset of the GFC and its effectiveness can't be properly assessed.

The introduction of Romania's exposure limit on lending to unhedged borrowers in 2005:Q3 was followed by an abrupt decline in the share of FC lending (Figure 11, top chart). However, the measure was taken concurrently with an increase in the reserve requirement base to include all foreign currency liabilities regardless of maturity and an LCP measure, which makes it difficult to attribute this abrupt decline solely to the CAP measure (Figure 11, bottom chart). Upon Romania's accession to the EU in January 2007, the exposure limit was abolished, but the trend in the share of FC lending, which had been upward again following the implementation of a cut in reserve requirements on domestic currency in 2006:Q2, continued.

Except for the two measures mentioned above, there are no other cases of FC LCP measure during the boom which we can analyze. It is therefore possible that tightening FC LCP measures had a certain degree of effectiveness during the boom.

Most LRR measures did not have a significant impact during the boom.

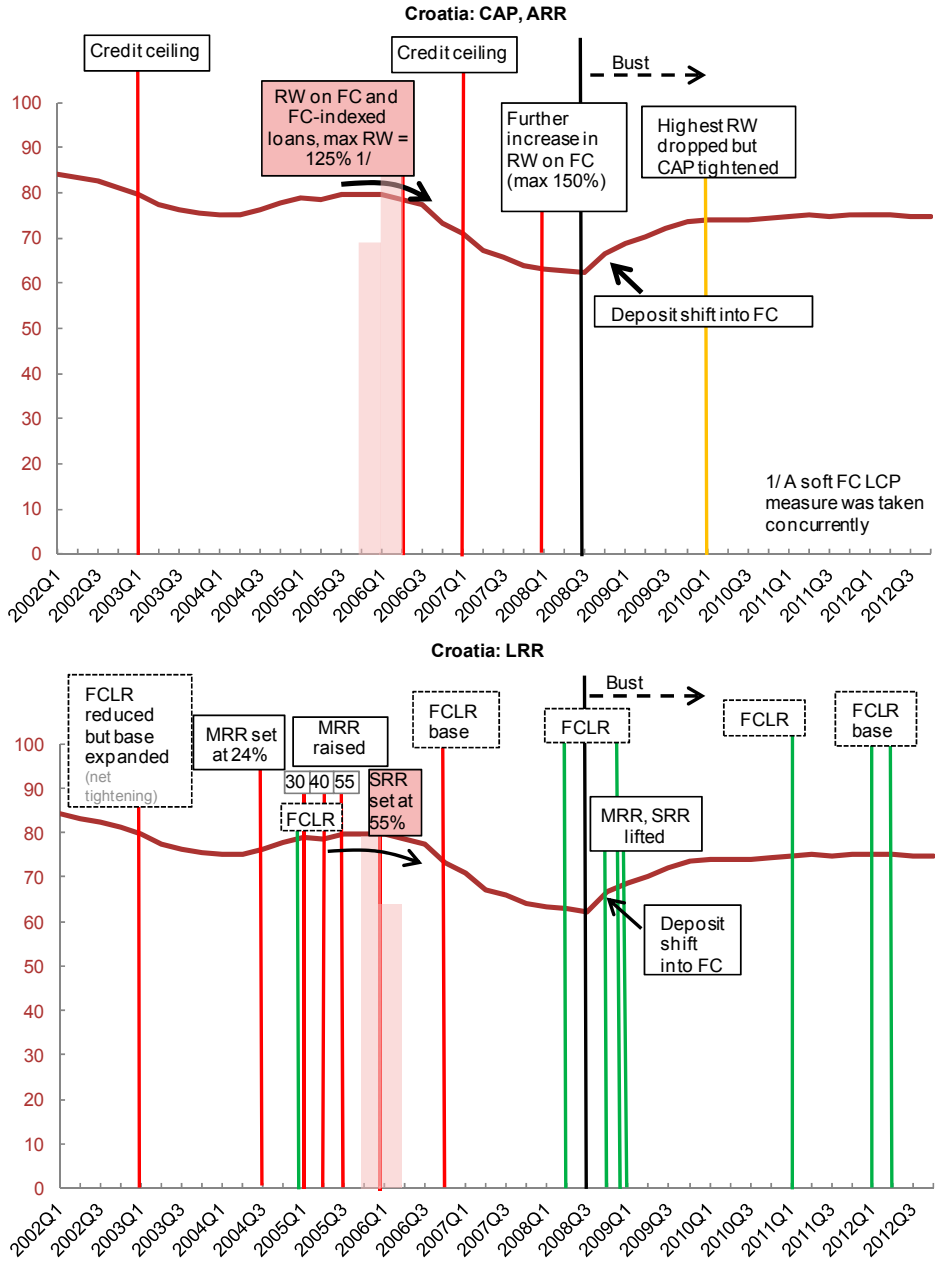
Except for the three LRR measures mentioned above and which took place concurrently (or almost concurrently) with CAP measures, only two strong LRR measures, both implemented in Romania, are identified as effective too: a simultaneous large increase (from 20 percent to 25 percent) of the reserve requirement rate on foreign currency deposits and large decrease (from 25 percent to 18 percent) of the reserve requirement rate on domestic currency deposits in 2002:Q4, and an increase in the reserve requirement base to include all new foreign currency liabilities regardless of maturity in 2005:Q1. Other LRR measures—the majority—did not significantly affect the trend in the share of domestic FC lending, suggesting that they were not strong enough.

No measure had any discernible impact during the bust

Measures in either direction implemented during the bust—including the tightening FC ELI measures—do not seem to have impacted the currency composition of lending within the timeframe we focus on.

Figure 10. Croatia: FC and FC-Indexed Loans, 2001:Q4–2012:Q4

(Ratio to total domestic lending, in percent)



Sources: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.

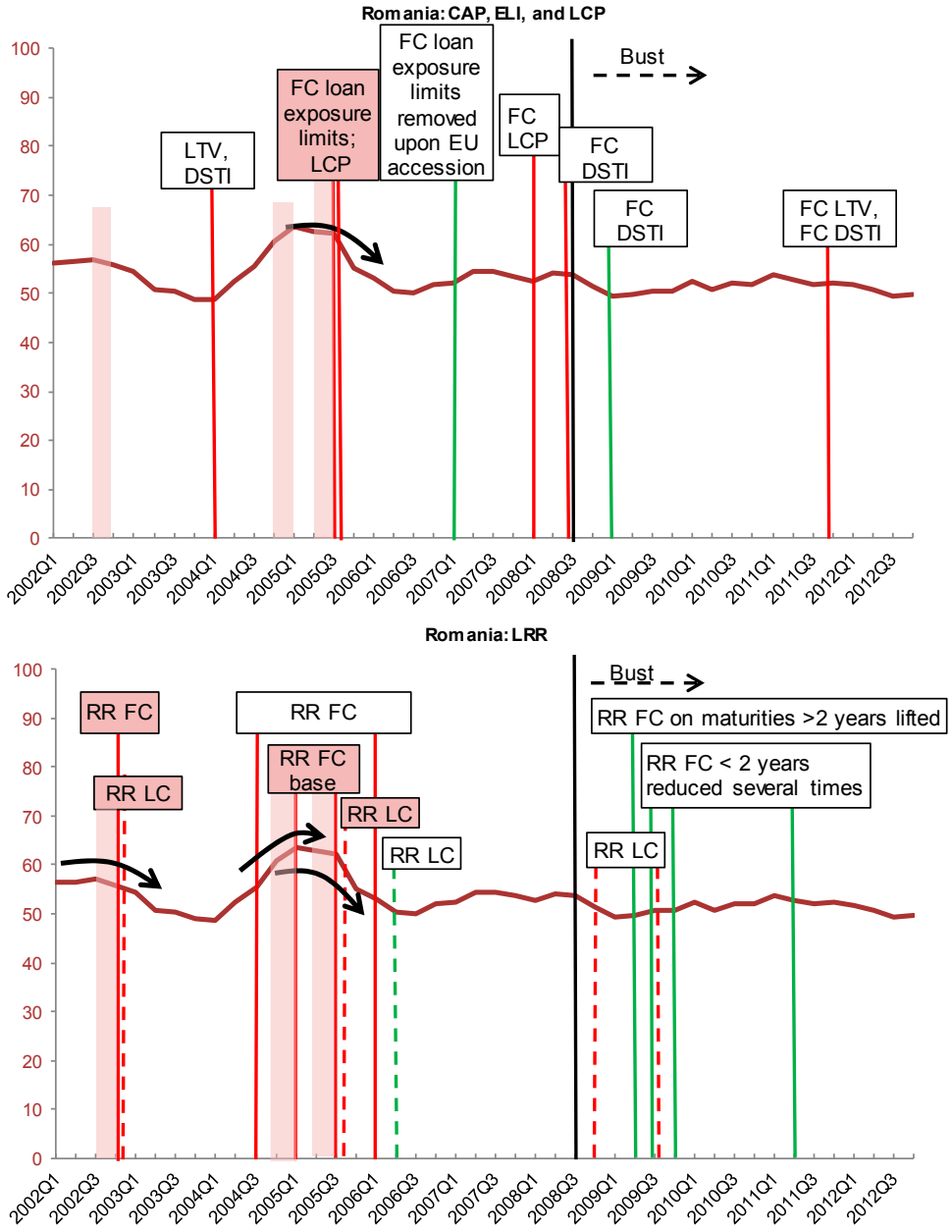
Notes: a green (resp. red) solid line indicates a loosening (resp. tightening) measure on foreign currency funding or lending, and a yellow solid line denotes both loosening and tightening in the same period. A green (resp. red) broken line indicates a tightening (resp. easing) measure on domestic currency funding or lending. Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.

CAP = capital regulation, ELI= eligibility requirements, LCP = loan classification and provisioning rules, LRR = liability-based reserve requirements and liquidity ratios, LTV= loan to value, DSTI= debt service to income, FCLR= foreign currency liquidity requirement, RW= risk-weight., FC = foreign currency; LC = domestic currency.

See Appendix II for a full description of measures.

Figure 11. Romania: FC and FC-Indexed Loans, 2001:Q4–2012:Q4

(Ratio to total domestic lending, in percent)



Sources: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.

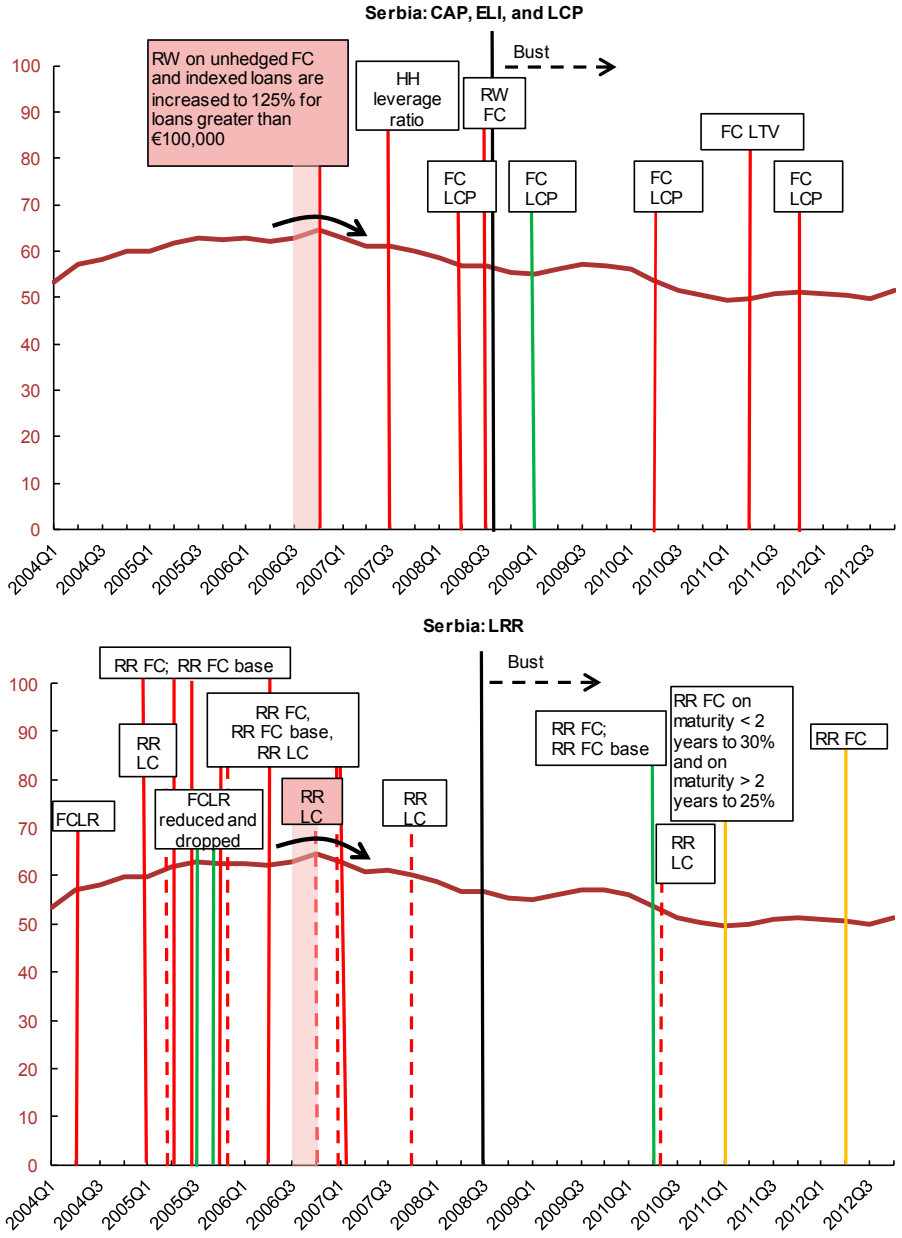
Notes: a green (resp. red) solid line indicates a loosening (resp. tightening) measure on foreign currency funding or lending, and a yellow solid line denotes both loosening and tightening in the same period. A green (resp. red) broken line indicates a tightening (resp. easing) measure on domestic currency funding or lending. Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.

CAP = capital regulation, ELI= eligibility requirements, LCP = loan classification and provisioning rules, LRR = liability-based reserve requirements and liquidity ratios, LTV= loan to value, DSTI= debt service to income, FCLR= foreign currency liquidity requirement, RW= risk-weight., FC = foreign currency; LC = domestic currency.

See Appendix II for a full description of measures.

Figure 12. Serbia: FC and FC-Indexed Loans, 2001:Q4–2012:Q4

(Ratio to total domestic lending, in percent)



Sources: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.

Notes: a green (resp. red) solid line indicates a loosening (resp. tightening) measure on foreign currency funding or lending, and a yellow solid line denotes both loosening and tightening in the same period. A green (resp. red) broken line indicates a tightening (resp. easing) measure on domestic currency funding or lending. Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.

CAP = capital regulation, ELI= eligibility requirements, LCP = loan classification and provisioning rules, LRR = liability-based reserve requirements and liquidity ratios, LTV= loan to value, DSTI= debt service to income, FCLR= foreign currency liquidity requirement, RW= risk-weight., FC = foreign currency; LC = domestic currency.

See Appendix II for a full description of measures.

C. Effect on Share of Bank Foreign Borrowing

Managing the banking system's share of liabilities to non-residents was a major concern in Croatia and Serbia. We thus finally turn to measures that were directly targeting foreign borrowing and examine their impact on the share of liabilities to non-residents to total liabilities. Because we do not have sufficient information on the currency composition of banks' liabilities, we cannot adjust this ratio for exchange rate movements. In the case of Serbia, where exchange rate volatility was significant at times, we deem a measure targeting foreign borrowing to be significant when it unambiguously affects the trend of the share of liabilities to non-residents in the right direction. In the case of Croatia, where the exchange rate was much more stable, we treat the unadjusted ratio as if it was adjusted and use the same methodology as that described in Subsection B above.

We present the relevant set of LRR instruments in the top panels of Figures 13–14. The bottom panels present "control" measures, i.e. measures that do not directly target foreign borrowing but could nevertheless have an indirect effect on it. This includes other LRR measures (e.g. changes in reserve requirements on domestic sources of funding) as well as ARR and CAP measures found to be effective at managing total domestic credit growth in Subsection A or the share of foreign currency lending in subsection B. It turns out we do not find that any of these latter measures had a significant effect on the change in the trend of foreign borrowing.

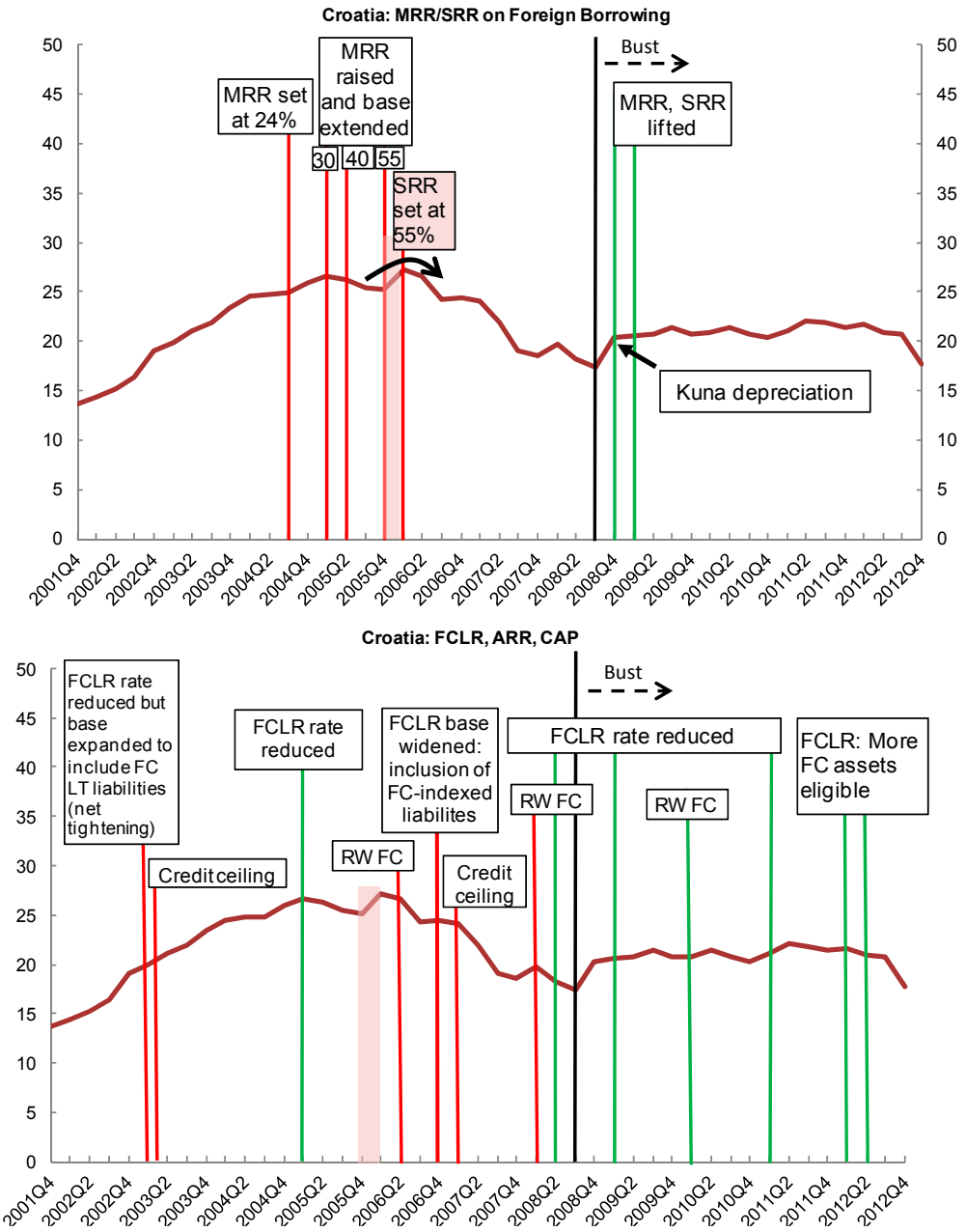
Targeted LRR at their peak intensity reversed the upward trend of bank foreign borrowing during the boom

As bank foreign borrowing was increasing rapidly and the share of liabilities to non-residents was trending upward, measures were imposed in Croatia for the first time in 2004:Q3 (a marginal reserve requirement, with a rate of 24 percent) and in Serbia in 2005:Q1 (a reserve requirement on foreign liabilities with a maturity shorter than 4 years, with a rate of 21 percent). Both countries gradually increased the strength of these requirements as the share of non-resident liabilities did not fall—it actually kept creeping up in Serbia, perhaps as a result of the concurrent increase in the effective reserve requirement rate on domestic liabilities. It is only when Croatia's marginal reserve requirement reached the level of 55 percent and was accompanied by a special reserve requirement of 55 percent (to avoid circumvention via the purchase of bonds issued domestically by non-resident financial institutions) and when Serbia's reserve requirement on foreign borrowing reached 60 percent (on short-term liabilities) and 40 percent (on long-term liabilities) that the trend was reversed. The share then declined until the onset of the GFC and remained broadly constant until the end of our sample period (2012:Q4) in spite of the MRR and SRR being abandoned in late 2008/early 2009 and reserve requirements on foreign borrowing in Serbia being significantly loosened.

It is not clear whether the formulation of a marginal or an average RR made a difference. One possible interpretation for the different choice of instrument is that because the share of liabilities to non-residents was about twice as high in Croatia than in Serbia when they started implementing measures, the Croatian authorities preferred targeting aggressively the marginal inflows rather than targeting the stock less aggressively. In any case, it appears these measures had the additional effect of changing the composition of inflows from debt to equity (see Galac (2010) for evidence in Croatia).

Figure 13. Croatia: Bank Liabilities to Non-Residents, 2001:Q4–2012:Q4

(Ratio to total liabilities, in percent)



Source: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.

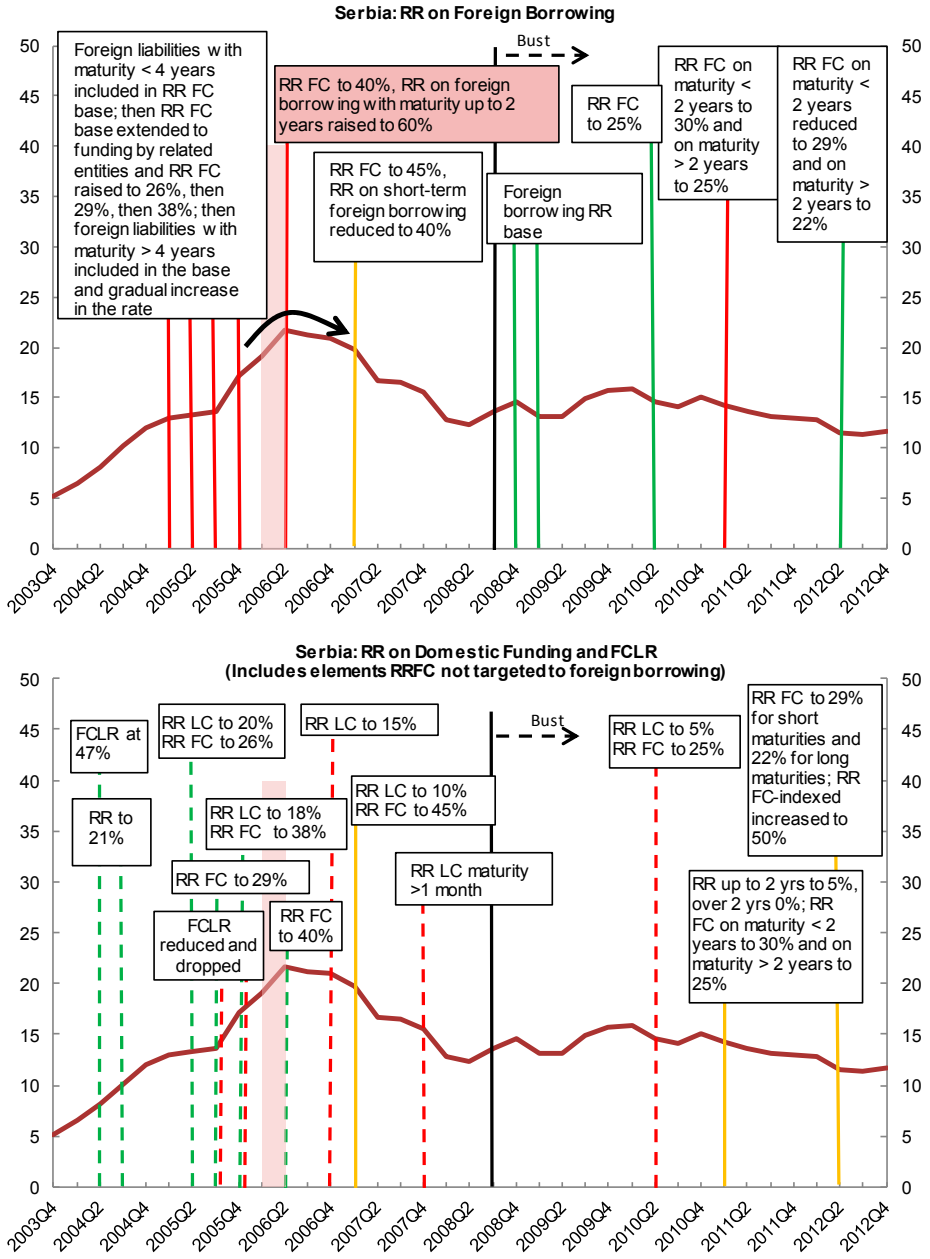
Notes: a green (resp. red) solid line indicates a loosening (resp. tightening) measure on foreign currency funding or lending, and a yellow solid line denotes both loosening and tightening in the same period. A green (resp. red) broken line indicates a tightening (resp. easing) measure on domestic currency funding. . Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.

RR/MRR = liability-based reserve requirements/marginal reserve requirements; FCLR=foreign currency liquidity ratio; ARR= asset-based reserve requirements; CAP= capital adequacy measures; FC = foreign currency; LC = domestic currency.

See Appendix II for a full description of the measures.

Figure 14. Serbia—Bank Liabilities to Non-Residents, 2001:Q4–2012:Q4

(Ratio to total liabilities, in percent)



Source: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.

Notes: a green (resp. red) solid line indicates a loosening (resp. tightening) measure on foreign currency funding or lending, and a yellow solid line denotes both loosening and tightening in the same period. A green (resp. red) broken line indicates a tightening (resp. easing) measure on domestic currency funding. . Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.

RR/MRR = liability-based reserve requirements/marginal reserve requirements; FCLR=foreign currency liquidity ratio; ARR= asset-based reserve requirements; CAP= capital adequacy measures; FC = foreign currency; LC = domestic currency.

See Appendix II for a full description of the measures.

VII. CIRCUMVENTION VIA CROSS-BORDER LENDING

We now examine further evidence to assess whether our proposition made in Section VI that some strong measures displayed symptoms of effectiveness has to be qualified owing to circumvention. We proceed in the same order as above, beginning with credit growth, to FC lending, and finally bank foreign borrowing. For total credit growth and the share of FC lending, we analyze circumvention via cross-border lending—as mentioned earlier, data on lending by domestic nonbanks is not sufficiently available to be taken into account. We look both at cross-border bank lending (using Bank of International Settlements data) and total cross-border lending (using external debt data) whenever available.[25] We do not discuss household credit growth, as cross-border lending data by sector is not available. Overall, we find that circumvention offset the effectiveness of the strictest measures to a large extent.

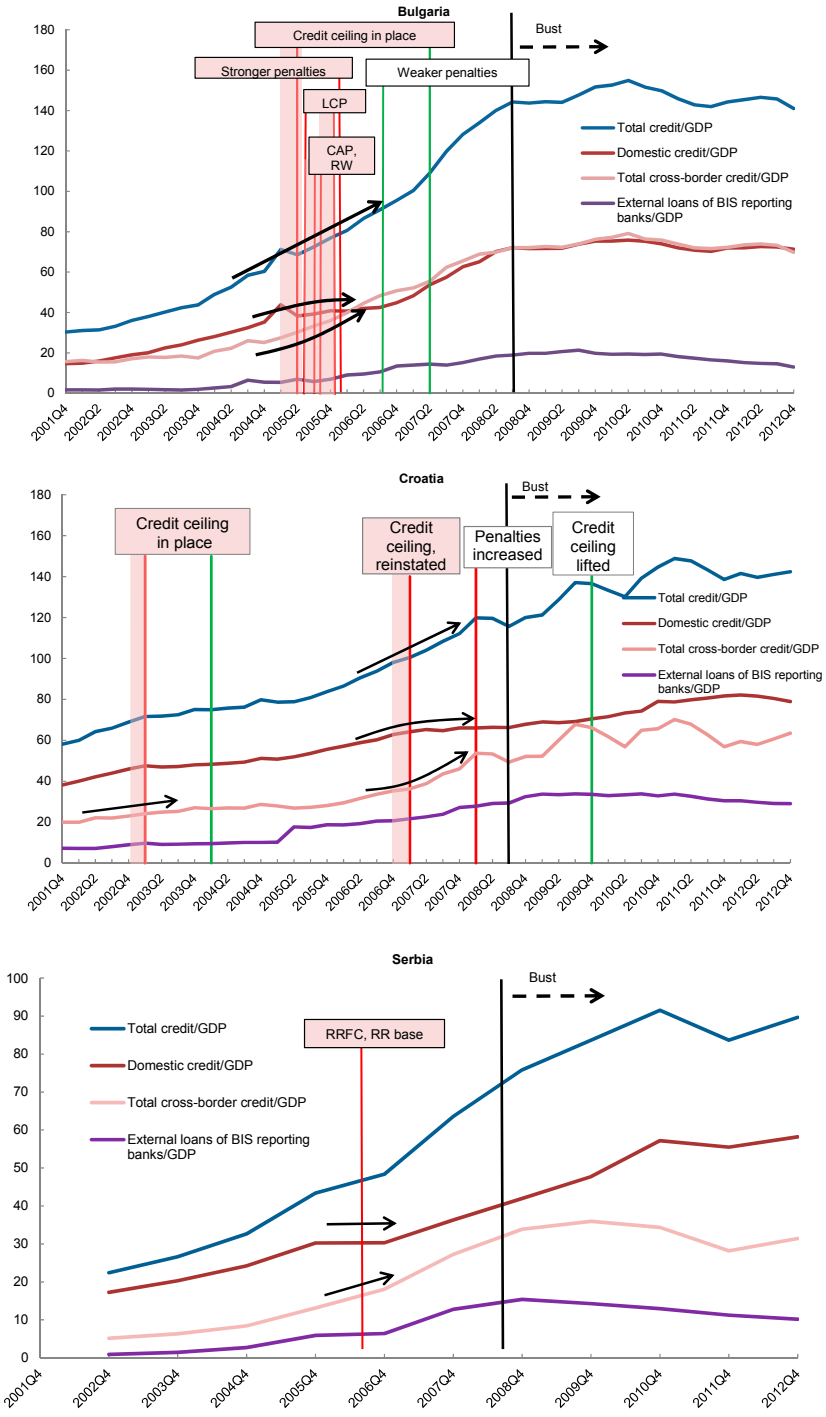
Total credit growth remained strong

We found in Section VI that ARR measures as well as two CAP measures and possibly one LCP measure had been effective in restraining domestic credit growth in Bulgaria. However, the dynamics of credit to the nonbank sector overall (domestic plus cross-border lending) remained broadly unchanged after the implementation of those measures as cross-border credit accelerated (Figure 15, top panel). Cross-border credit volumes became even larger than domestic credit volumes after 2006:Q1. In Croatia, a similar pattern can be observed when the credit growth ceiling was implemented for the second time from 2007:Q1 (Figure 15, middle panel). However, there is no evidence of circumvention during the first credit growth ceiling episode in 2003, perhaps reflecting the fact that the boom in the region was still nascent (and push forces not quite as powerful as they would become later on) and that the credit growth ceiling was higher in 2003 (4 percent quarterly) than in 2007 (12 percent annually). In both Bulgaria and Croatia, the shift by the private sector from borrowing from domestic banks to cross-border borrowing was not a mere artefact of accounting changes by large international banking groups, that is, of the predominance of foreign-owned banks in the domestic market that could have easily booked loans to local customers outside of their local bank subsidiary. In fact, the acceleration in lending by BIS-reporting bank to the non-bank sector remained relatively modest. The shift may instead have reflected a deeper financial integration of the Croatian economy with that of the EU.[26] The fact that Serbia was relatively less integrated with the EU may explain why the growth in cross-border lending did not fully offset the cooling effect of strong LRR measures on domestic credit growth in 2006 (Figure 15, bottom panel).

[25] External debt data at the quarterly frequency is not available for a sufficiently long period in Romania and Serbia.

[26] Croatia became an EU accession candidate in 2004, and accession negotiation began in 2005.

Figure 15. Bulgaria and Croatia: Credit Growth Measures Circumvention, 2001:Q4–2012:Q4
(private sector credit to GDP, in percent)



Source: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), BIS, and authors' calculations.
Notes: a green (resp. red) solid line indicates a loosening (resp. tightening). Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.
LCP = loan classification and provisioning; FCLR=foreign currency liquidity ratio
See Appendix II for a full description of measures.

The share of total foreign currency lending sometimes remained lower

To assess the extent to which cross-border lending undid the effect of the measures targeting the share of FC lending we found to be effective, we modify Figures 10–12 by adding cross-border bank lending and, in the case of Croatia, total cross-border lending to the numerator and the denominator of the ratio (Figure 16).[27] In Croatia, the decline in the share of FC lending after the implementation of the SRR measure in 2006:Q1 and of the risk-weight measure in 2006:Q2 is more muted but still apparent when cross-border lending is factored in (Figure 16, top panel). In Romania, changes in the trend of the FC lending ratio after strong RR or CAP measures are hardly affected by the incorporation of cross-border bank lending (Figure 16, middle panel). Overall, it seems that the currency composition of lending was subject to a somewhat weaker offset via cross-border lending than the volume of lending. In Serbia, the trend reversal that took place after the increase in risk-weights and the decrease in the RR rate on domestic currency deposits in 2006:Q4 vanishes once cross-border bank lending is factored in (Figure 16, bottom panel).

Banks' external borrowing declined but was replaced by corporate external borrowing

We observed in Section VI that strong LRR measures had a dampening effect on banks' liabilities to nonresidents in Croatia and in Serbia. The result seems to have been due to a switch from bank external debt to corporate external debt. Bank external debt continued to grow in Bulgaria during the boom period through 2008, but not so in Croatia or Serbia once the strictest LRR measures were introduced in 2006 (Figure 17). Once the measures were in place, bank debt declined, but external debt of non-financial corporations accelerated, at least until the GFC erupted. Thus, the effect of the measures seem to bear little effect on total private external debt (bank plus nonbank).

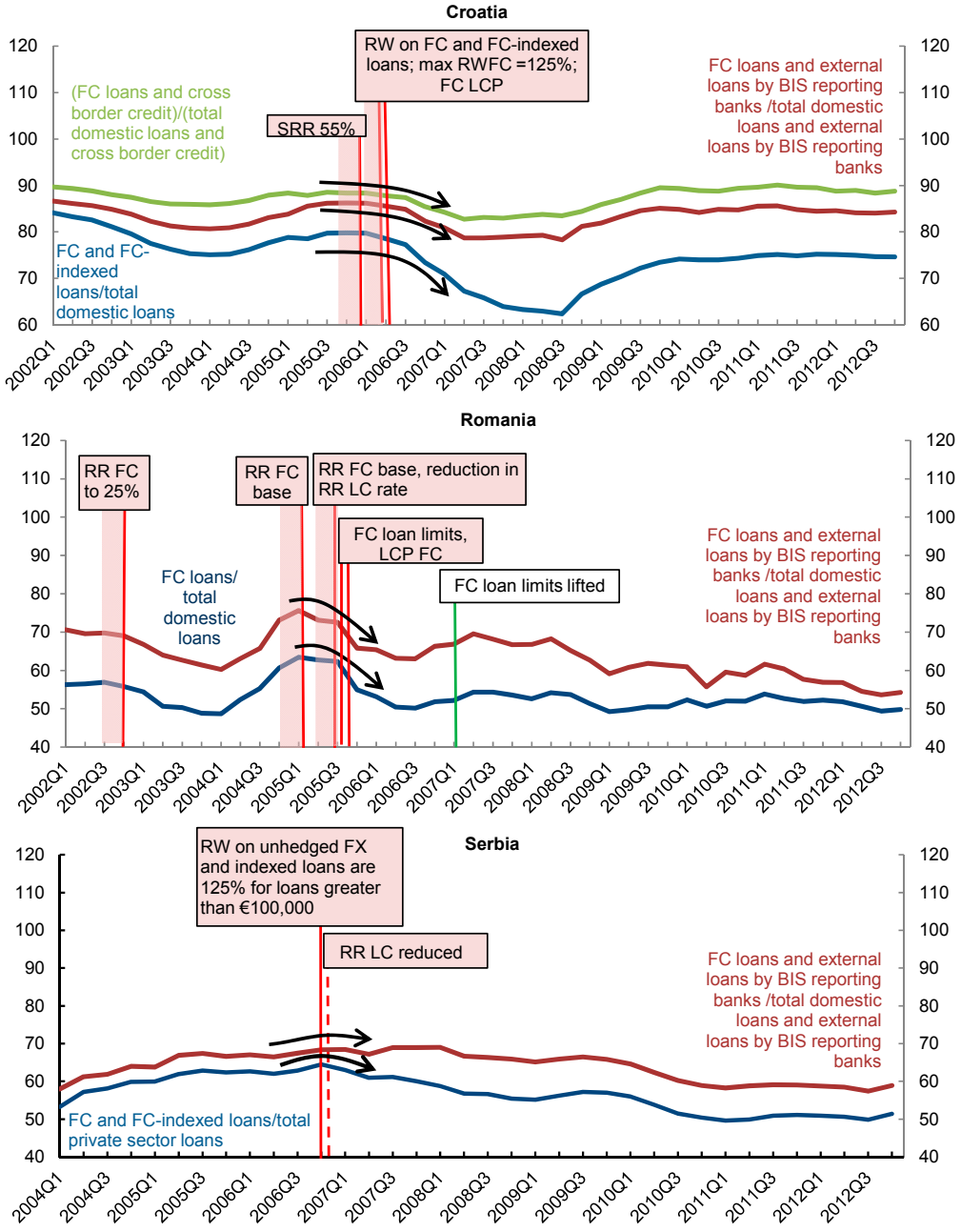
Basel III and the future of circumvention via cross-border lending

In the future, circumvention through cross-border bank borrowing is likely to be constrained, at least to some extent, by the design of Basel III's countercyclical capital buffer (CCyB). According to the Basel III framework, which is embedded in the CRD IV package in the context of the EU, national macroprudential authorities set the level of the CCyB, and international reciprocity is mandatory for CCyBs up to 2.5 per cent (and voluntary above 2.5 percent). Only time will tell whether the calibration of the Basel III CCyB reciprocity parameters is adequate for emerging economies such as Bulgaria, Croatia, Romania and Serbia. In any case, our findings suggest that measures with a broader base—including capital flows management measures targeting nonbank flows—would have been needed to contain overall credit growth in these four economies.

[27] In so doing, we assume that all cross-border lending is in foreign currency.

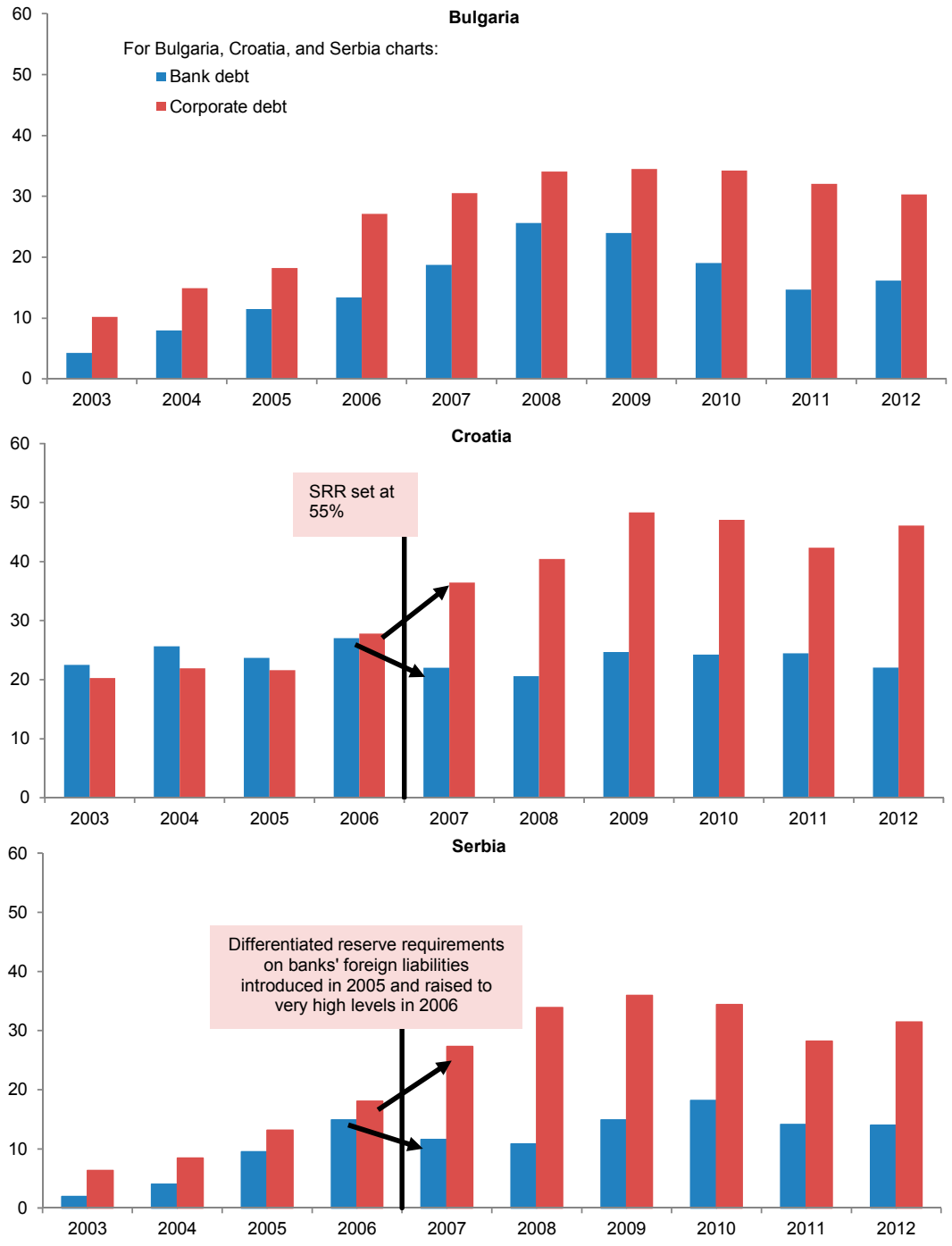
Figure 16. Croatia, Romania and Serbia: FC Lending Measures Circumvention, 2001:Q4–2012:Q4

(percent)



Source: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), BIS, and authors' calculations.
Notes: a green (resp. red) solid line indicates a loosening (resp. tightening) measure on foreign currency funding or lending. A red broken line indicates an easing measure on domestic currency funding. Shaded text indicates effectiveness. Shaded areas indicate quarters when a measure deemed effective was implemented.
RW=risk weight; SRR=special reserve requirement; RR=reserve requirement.
FC = foreign currency; LC = domestic currency.
See Appendix II for a full description of measures.

Figure 17: Private External Debt, 2001–2012
(in percent of GDP)



Source: Vandenbussche, Vogel, and Detragiache (2015), central bank websites and publications, International Financial Statistics (IFS), and authors' calculations.
Notes: Shaded text indicates effectiveness. MRR=marginal reserve requirement on foreign borrowing; SRR=special reserve requirement.

VIII. CONCLUSION

Like most countries in the CESEE region, Bulgaria, Croatia, Romania and Serbia attracted large capital inflows from the early 2000s which contributed to a credit and asset price boom. Policymakers in these four countries deployed a rich set of macroprudential instruments in an attempt to rein in the boom and then temper the subsequent bust triggered by the onset of the global financial crisis. Their actions placed them among the pioneers of macroprudential policy design and implementation in Europe.

We chose to analyze the experience of these countries using a case study methodology, first describing in detail the various instruments and measures they implemented, then analyzing the effectiveness of each measure in meeting a specified intermediate policy target. Our main general findings on measure effectiveness is that only strong measures helped contain the domestic credit growth, the share of foreign-currency-denominated loans provided by the domestic banking sector, or the reliance of the domestic banking sector on foreign borrowing during the boom years, but that the impact of the measures was weakened because of circumvention.

Specifically, we found that during the boom period: (1) binding marginal reserve requirements related to credit growth ("credit growth ceilings") helped contain domestic credit growth; (2) strong sectoral capital measures and (3) the introduction of meaningful loan-to-value and debt-service-to-income ceilings helped limit household credit growth; (4) targeted capital measures and (5) strong, targeted reserve requirements measures contributed to reduce or contain the share of foreign-currency-denominated loans provided by the domestic banking sector; (6) heavy liability-based reserve requirements measures on banks' foreign borrowing helped slow it down; however, (7) circumvention via direct external borrowing largely offset the direct effect of measures (1) and (6). A corollary is that none of the other, less strict measures (the vast majority) is associated with a sign of effectiveness as defined by us. In a few cases, less-immediately-binding loan classification and provisioning measures were taken concurrently with the strong measures we deem effective and may have reinforced their effect. Measures taken during the bust had no discernible impact.

Based on our findings, we draw the following two broader conclusions:

- Only strong, broad-based macroprudential measures have a chance to contain credit booms. Weak-to-moderate measures are likely to lack any bite. Strong measures can be more successful but their impact is likely to be offset by various forms of circumvention. Restricting these channels of circumvention from the start should be an integral part of policy design and is likely to require strong international cooperation. The reciprocity feature for countercyclical capital buffers embedded in Basel III and the supranational perspective brought by the European Central Bank and the European Systemic Risk Board within the new European macroprudential framework are

encouraging in this regard. However, complementary capital flows management measures targeting nonbank flows may still be required.

- The relationship between the strength of a macroprudential policy measure and its effect on an intermediate policy objective is likely not linear in nature. Measures may have a visible effect only above a certain threshold, as seen in several cases where initial tightening measures seemed not to have an effect, until they were further strengthened (e.g. Croatia and Serbia's experience with calibrating liability-based reserve requirements measures). Another source of non-linearity is the likely asymmetric effects of tightening and easing. Furthermore, the effect of macroprudential policies is likely to differ during booms and during busts. To speak to the key issue of instrument calibration, future econometric studies of effectiveness should allow for these non-linear effects and state-contingent effects, and avoid modeling macroprudential policy measures with simple dummy variables.

An interesting area for future research, best explored with bank-level data, would be to analyze of how the effectiveness of macroprudential policy and the degree of circumvention is affected by the degree of foreign ownership of the domestic banking sector. Deeper explorations of the various trade-offs between design features of specific instruments (e.g. outright LTV caps versus risk-weights linked to LTV thresholds) would also be useful.

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APPENDIX I. MACROECONOMIC BACKGROUND

In this Appendix, we describe the macroeconomic context in which the macroprudential measures we analyze in the main text were implemented during the boom (until 2008:Q3) and the bust (from 2008:Q4 onward) phases of the financial cycle. For ease of exposition, we largely ignore that these developments were to some extent endogenous to the macroprudential measures that were enacted over the cycle. This description draws on IMF (2010) and Bakker and Klingen (2012), which contain comprehensive narratives of the boom-bust cycle in the CESEE region.

The Boom (2003–2008)

Macroeconomic Developments

Macroeconomic developments in the four countries reflected to varying degrees region-wide trends and forces that generated a synchronized boom during the mid-2000s. The CESEE region as a whole attracted large capital inflows from the late 1990s to 2008. Initially, the region's post-transition reforms, growth prospects, and integration with Western Europe were the main factors that pulled foreign capital into the region. From 2003 onward, push factors—low interest rates in advanced countries and low global volatility—further boosted capital inflows, as did the expectation of euro adoption and the dismantling of barriers to capital flows in the context of the EU accession. Capital flows became very large by historical standards in the four countries and in the rest of the region (Panel A1, top left) supporting strong output growth.

Output growth was uniformly strong but tilted towards domestic demand. Output grew by 6 percent a year in Bulgaria, Romania and Serbia. Annual GDP growth in Croatia was more modest at 4 percent, reflecting in part Croatia's higher initial income per capita level and therefore lower convergence potential (Table A1). While in Croatia and Serbia domestic demand growth exceeded GDP growth by 0.5 p.p. a year on average, the gap was much higher in Bulgaria (2.2 p.p.) and even higher in Romania (4 p.p.) (Panel A1, top right).

CPI inflation dynamics varied widely in the context of different monetary policy regimes (Table A1). In Romania, inflation declined from double-digit to mid-single digit in the context of the country's transition to inflation targeting, which it adopted formally in 2005. Inflation in Serbia remained high and volatile reflecting a volatile and generally depreciating exchange rate as well as a high degree of pass-through. Inflation volatility was much more contained in Bulgaria and Croatia, in part because of a much higher degree of exchange rate stability than Serbia, but crept up toward 2008.

The domestic demand boom was accompanied by a surge in bank credit, fueled by western European bank funding (Panel A1, bottom left). The speed of real private sector credit growth between 2003 and 2008 was high in Croatia (7 percent), very high in Serbia (16 percent) and stellar in Bulgaria and Romania (22 percent), even if some of the increase

reflected the development of an initially undersized financial sector in the case of the latter country (Table A1). As in most other parts of the CESEE region, western banks became increasingly interested in expanding into the four countries during the past decade, and came to dominate much of the region's banking systems. They provided direct cross-border lending and financed much of the domestic credit increase through deposits and capital injections into their local subsidiaries (Panel A1, bottom right). While the ratio of the external position of western banks relative to GDP grew by a modest 9 percentage points in Croatia and Serbia, Romania and Bulgaria experienced much higher growth at 19 percent and 21 percent respectively.

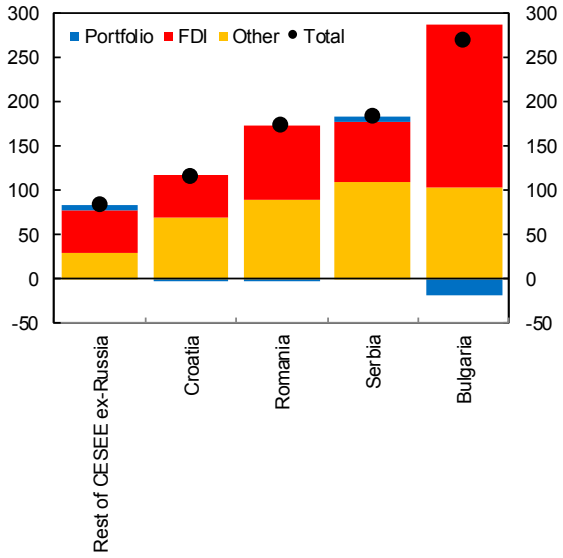
The strong growth of credit was associated with an increasing share of foreign currency loans. Banking systems were already euroized, to various degrees, at the onset of the boom, reflecting episodes of high inflation or hyperinflation that were still fresh in memory. Yet households turned increasingly toward FC-denominated loans during the boom, while the currency composition of loans to corporations significantly shifted towards FC only in Bulgaria. Swiss franc borrowing, with its very low interest rates, became increasingly popular in Croatia, Romania, and Serbia in the late stage of the boom while euro-denominated loans became more prevalent in all countries except Croatia. Better access to foreign exchange funding through parent banks and, in the case of euro-denominated loans, very tight net open foreign currency position regulation favored the supply of FC-denominated loans.

The credit boom also fueled and financed a real estate boom. The credit boom coincided with an equally impressive housing market boom in Bulgaria and Romania while house price inflation remained moderate in Croatia and Serbia (Table A1).

The domestic demand and credit booms contributed to a sharp increase in the current account deficit and external debt soared. Credit and capital flows financed predominantly activities in the nontradable sector, while the relative importance of exports declined. The buildup of external imbalances was most visible in Bulgaria, where the current account deficit exceeded 25 percent of GDP in 2007 (Table A1) and the external debt-to-GDP ratio jumped by 40 percentage points between 2005 and 2007 (Table A1). This reflected the fact that, as a late reformer on its way to join the EU, Bulgaria received the highest capital inflows of all countries in emerging Europe in the pre-crisis period.

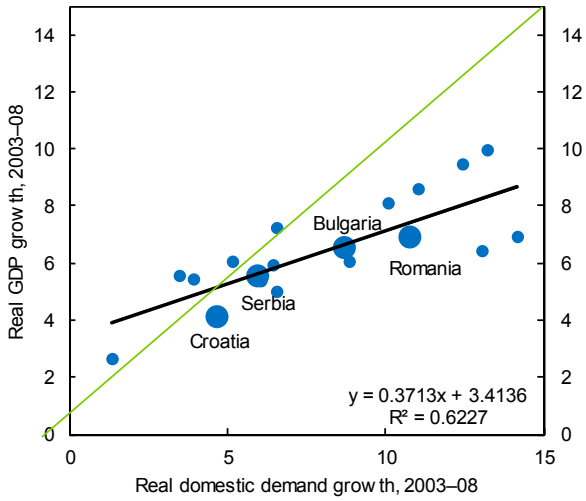
Panel A1. Bulgaria, Croatia, Romania and Serbia: Selected Macro—financial Indicators, 2003–08

Figure 1. CESEE: Cumulative Net Capital Inflows, 2003–08
(Percent of 2003 GDP)



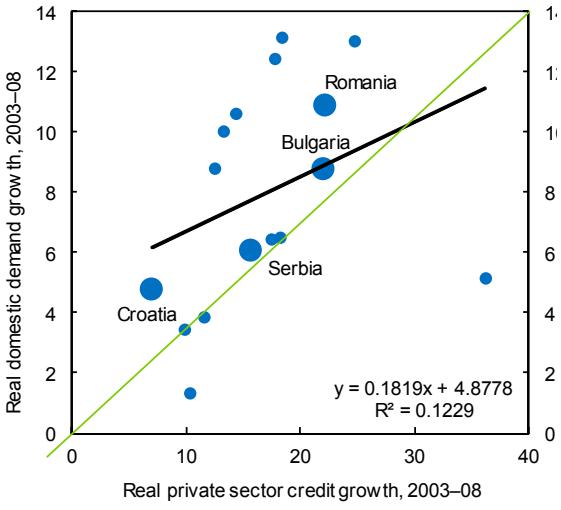
Source: IMF, World Economic Outlook database.

Figure 2. CESEE: Domestic Demand Growth and GDP Growth, 2003–08[1]
(Annual percentage change)



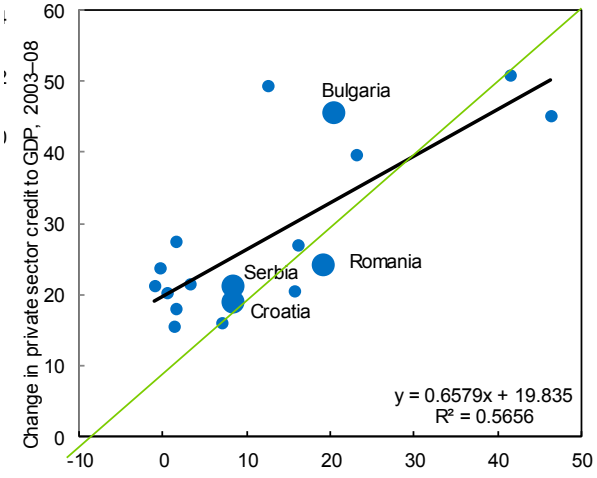
Sources: IMF, *International Financial Statistics* and World Economic Outlook database.

Figure 3. CESEE: Domestic Demand and Private Sector Credit Growth, 2003–08[1]
(Annual percentage change)



Sources: IMF, *International Financial Statistics* and World Economic Outlook database.
[1]As the boom in the Baltic states ended in 2007, data for the Baltics refer to 2002–07.

Figure 4. CESEE: Change in External Position of BIS-Reporting Banks to Banks and Private Sector Credit, 2003–08[1]



Sources: IMF, World Economic Outlook database; International Financial Statistics; and BIS locational banking statistics (Tables 6A-6B).
[1]Values for Serbia before 2005 are extrapolated from the series for Serbia & Montenegro.

Macroeconomic Policies

Monetary Policy

To the extent an active monetary policy was pursued, it was mostly focused on inflation and exchange rate developments and generally not (or at least not explicitly) on credit developments:

- In Bulgaria, the currency board did not allow any independent monetary policy. The central bank accumulated sizeable reserves, equivalent to 39 percent of GDP at end-2007, strengthening confidence in the currency board.
- In Croatia, monetary policy was largely geared toward maintaining exchange rate stability. While the stable exchange rate regime kept inflation and inflation expectations low (Table A1), it also reduced perceived exchange rate risk and may have thus contributed to the growth in foreign-currency borrowing.
- In Romania, the National Bank of Romania switched to inflation targeting in August 2005 from nominal exchange rate depreciation targeting to curb growing inflation. In spite of missing inflation targets, monetary policy engineered a significant disinflation until 2007, while credit growth remained untamed.
- In Serbia, progress was made with disinflation and from 2006 the focus of monetary policy shifted from the exchange rate to inflation, culminating in the adoption of formal inflation targeting in 2008.

Fiscal Policy

As seen in Table A1, only Bulgaria managed to have budget surpluses during the boom:

- Between 2005 and 2008, Bulgaria maintained an average fiscal balance of 3 percentage points of GDP. As a result, it managed to bring down its gross government debt to 15.5 percent of GDP at end-2008.
- In Croatia, while the headline fiscal deficit was brought down to 1.3 percent of GDP by 2008, the cyclically-adjusted fiscal balance remained large during the boom years. Similarly, public debt, including the guaranteed stock, remained elevated, leaving little room for fiscal maneuver during the crisis. Challenging reform needs in the public sector were left unaddressed, creating ossified spending structures with high mandatory expenditure (Rahman, 2010).

- In Romania, fiscal policy was generally procyclical. Loose fiscal policy exacerbated overheating and added to vulnerabilities. Despite rapid growth and accordingly buoyant revenues, the fiscal deficit increased from 1 percent of GDP in 2005 to 5 percent of GDP in 2008—spending doubled in nominal terms between 2005 and 2008 alone. Public employment rose by 24 percent between 2004 and 2008. Wages in the public sector grew even faster than in the private sector, increasing the wage bill by

2 percentage points of GDP over this period, and lifting wage levels in the public sector above those in the private sector. Pensions also increased several times, culminating in a 20 percent hike in late 2008 that pushed the public pension bill up by 2.5 percentage points of GDP compared to 2006.

- In Serbia, public finances recorded relatively small deficits or small surpluses, although public expenditures remained high at over 50 percent of GDP. The pre-crisis fiscal position was a large deficit, once cyclical effects are stripped away, but government debt was reduced from 78 percent of GDP in 2003 to 34 percent in 2008.

The Bust (2009–2012)

Macroeconomic Developments

In late-2008, the global financial crisis quickly spilled over to the four countries through both financial and trade channels. Sovereign bond spreads and sovereign CDS spreads soared (Panel A2, top left), stock markets plunged, capital inflows suddenly dried up, and exchange rates came under pressure. In Serbia, confidence in the banking sector was shaken and households withdrew 12 percent of their deposits from the banking system during September-November 2008. The Serbian dinar lost up to 20 percent of its value against the euro, despite heavy foreign exchange intervention by the central bank. In Romania, the currency fell by 15 percent between October 2008 and early 2009. On the trade side, exports and imports plunged as both foreign and domestic demand collapsed. Serbia entered into an IMF-supported program in January 2009, while Romania entered into one in April 2009.

The four countries experienced a deep recession, with Serbia experiencing a milder downturn. Bulgarian GDP stagnated in the fourth quarter of 2008, shrank through 2009, there was temporary recovery in 2010 and only a modest growth in 2012 (Table A2). Croatia was the worst performer of the group in 2009, when economic activity contracted by 6.9 percent. The country was still mired in recession in 2010 and GDP continued to stagnate in 2012. Romanian GDP growth had one of the sharper reversals across EU countries during the last quarter of 2008. The recession ended in 2010, but the recovery was weak. Serbia managed to contain the GDP loss to 3.5 percent in 2009 and returned to quarter-on-quarter growth in the third quarter of that year. Subsequent growth however was tepid and stagnation took hold in 2012. In all countries, the recovery was export-led while domestic demand remained a drag on growth and kept softening through 2012 (Panel A2, top right) while unemployment kept rising.

Table A1. Key Macroeconomic and Financial Indicators, 2003–08

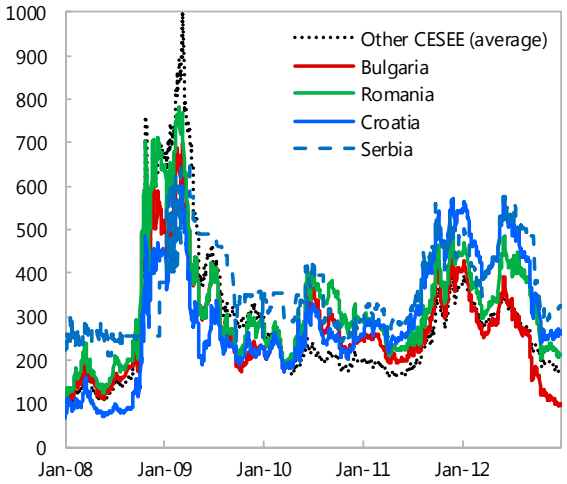
	2003	2004	2005	2006	2007	2008	2003	2004	2005	2006	2007	2008
	Gross Domestic Product Growth (percent)						**Consumer Price Index Inflation (percent, average)**					
Bulgaria	5.5	6.7	6.4	6.5	6.4	6.2	2.3	6.1	6.0	7.4	7.6	12.0
Croatia	5.4	4.1	4.3	4.9	5.1	2.1	1.8	2.0	3.3	3.2	2.9	6.1
Romania	5.2	8.5	4.2	7.9	6.3	7.3	15.4	11.9	9.0	6.6	4.8	7.8
Serbia	2.5	9.3	5.4	3.6	5.4	3.8	2.9	10.6	16.2	10.7	6.9	12.4
	Nominal Credit Growth (percent, FX-adjusted)						**Real Estate Price Inflation (percent, eop)**					
Bulgaria	50.0	48.3	32.3	23.8	63.5	32.8	21.1	57.5	21.6	17.4	34.6	11.7
Croatia	14.4	13.9	21.8	25.3	14.9	10.8	-7.4	22.1	-12.7	9.3	7.3	0.3
Romania	70.3	43.7	49.2	61.8	53.7	25.5	…	…	…	46.3	47.8	22.8
Serbia	…	35.4	43.1	23.5	41.6	23.6	36.1	14.0	21.9	0.9	5.1	28.9
	Current Account Balance (percent of GDP)						**External Debt (percent of GDP)**					
Bulgaria	-5.3	-6.4	-11.7	-17.6	-25.2	-23.2	63.3	67.1	63.6	82.3	100.3	97.7
Croatia	-6.0	-4.1	-5.3	-6.7	-7.3	-9.0	72.8	76.1	68.8	78.7	81.7	80.9
Romania	-5.8	-8.4	-8.6	-10.4	-13.4	-11.6	36.8	38.0	37.0	44.4	50.1	48.2
Serbia	-7.3	-12.1	-8.7	-10.2	-16.1	-21.6	69.5	59.6	61.3	66.8	67.3	64.4
	Fiscal Balance (percent of GDP)						**Government Debt (percent of GDP)**					
Bulgaria	0.0	1.6	2.3	3.3	3.3	2.9	46.5	39.1	29.4	23.4	18.6	15.5
Croatia	-4.7	-3.4	-2.8	-2.6	-2.1	-1.3	35.4	37.6	38.2	35.4	32.9	29.3
Romania	-2.2	-3.4	-0.7	-1.4	-3.1	-4.8	24.2	21.1	17.6	12.6	12.7	13.6
Serbia	-2.9	0.1	1.1	-1.0	-1.4	-2.0	77.8	65.4	56.3	43.0	35.6	34.2
	Monetary policy rate (percent, average)						**Appreciation against the euro (percent, eop)**					
Bulgaria	…	…	…	…	…	…	0.0	0.0	0.0	0.0	0.0	0.0
Croatia	…	…	…	…	…	…	-2.7	-0.3	4.0	0.4	0.3	0.0
Romania	…	…	9.8	8.6	7.5	9.8	-15.1	3.7	7.9	8.7	-6.3	-9.4
Serbia	10.8	14.4	15.9	18.9	10.4	15.1	-10.0	-13.4	-7.4	88.6	-0.3	-10.6

Source: IMF, *International Financial Statistics,* World Economic Outlook database. And BSA database; Haver Analytics; central bank websites; national statistical offices; Centar Nekretnina; Colliers; REAS; and IMF staff calculations.

The downturn eased inflationary pressures in the four economies (Table A2). Bulgaria experienced the most dramatic drop in CPI inflation from 12 percent in 2008 to 2.5 percent in 2009 and subsequently remained close to this level despite the gradual improvement in GDP growth. The inflationary pressures remained low in Croatia and Romania, but not in Serbia, where the exchange rate had stabilized soon after program approval but came under renewed pressure in the context of the developing crisis in Greece.

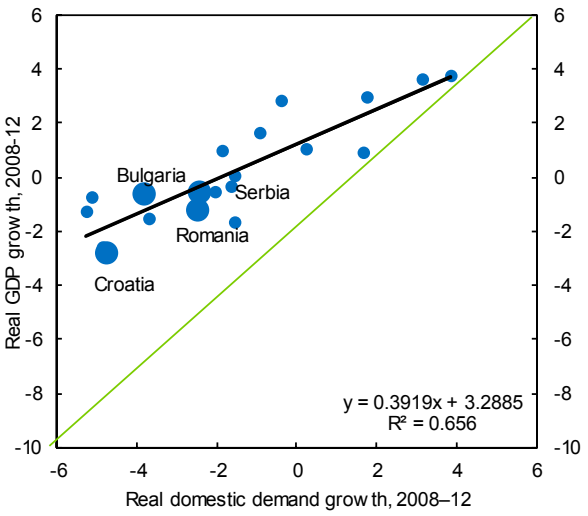
Panel A2. Bulgaria, Croatia, Romania and Serbia: Selected Macro—financial Indicators, 2008–12

Figure 1. 5-Year Average Sovereign CDS Spreads, 2008-2012
(Basis points)



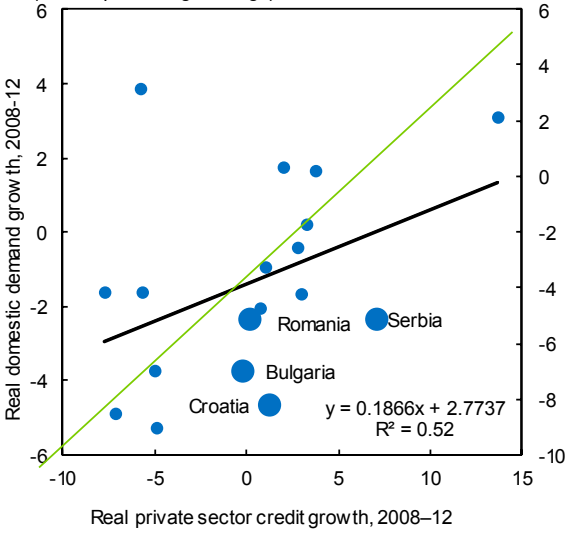
Source: Datastream.

Figure 2. CESEE: Domestic Demand Growth and GDP Growth, 2008-12
(Annual percentage change)



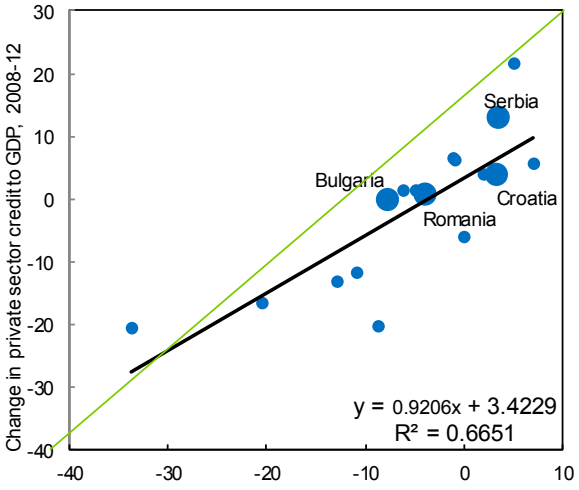
Sources: IMF, *International Financial Statistics* and World

Figure 3. CESEE: Domestic Demand and Private Sector Credit Growth, 2008–11
(Annual percentage change)



Sources: IMF, *International Financial Statistics* and World Economic Outlook database.

Figure 4. CESEE: Change in External Position of BIS-reporting Banks to Banks and Private Sector Credit, 2008–12



Sources: IMF, World Economic Outlook database and *International Financial Statistics*; and BIS locational banking statistics (Tables 6A-6B).

Credit growth came to a halt as global financial stress forced Western banks to freeze or reverse their expansion into CESEE (Panel A2, bottom left). Bank lending contracted due to both demand and supply factors as households began to deleverage while banks tightened lending standards and Western banks reduced the funding provided to CESEE as they shifted their focus on repairing their home country balance sheet (Panel A2, bottom right). The decline in foreign bank funding led to greater competition for domestic deposits and rising interest rates at times. Credit conditions tightened. Croatia introduced government-sponsored credit schemes in 2010 and 2011, which seem to have had a limited impact on restoring credit growth.

The slump in domestic demand reversed the trend of rising asset prices (Table A2). In Bulgaria, real housing prices grew by 12 in 2008 but then declined by 26 in the subsequent year. The Serbian market proved the most resilient generally avoiding the downturn that befell other countries save for a brief contraction in 2011.

Current account deficits shrank as a result of the collapse in domestic demand but external debts generally continued rising (Table A2). Bulgaria's current account turnaround was the most spectacular as its large pre-crisis deficit turned into a modest surplus in 2011. In the other three countries, the improvement in the current account during the bust was not enough to prevent an increase in external debt by 25–30 percent of GDP over 2008–2012.

Financial Sector Crisis Management

Besides entering into IMF-supported programs and implementing the macroprudential measures discussed in the main text (in which we include changes to rate and base of reserve requirements), national authorities took a set of additional measures to ensure financial system and exchange rate stability during the height of the global financial crisis.

- **Deposit insurance coverage was quickly increased**. In the wake of the uncertainty that followed the collapse of Lehman Brothers, banks were confronted with deposits withdrawals. This situation could precipitate a run on the banking system that could potentially destabilize domestic currencies. To stem these risks, the deposit insurance coverage was increased significantly to about €50,000 between October and December 2008.

- **Monetary measures to relieve liquidity pressures were quickly implemented.** In addition to tightly managing the kuna liquidity in the interbank market, the Croatian National Bank intervened intermittently in the foreign exchange market to contain depreciation pressures and also simplified rules for access to liquidity assistance in order to alleviate liquidity shortages in the interbank market. In Romania, the National Bank of Romania reacted to significant liquidity pressures in the domestic interbank markets promptly in October 2008 by broadening the range of accepted collateral and

extending credit lines through its emergency liquidity assistance framework. The National Bank of Serbia acted to boost banks' foreign currency liquidity mostly by amending the rules governing reserve requirements. In the case of the three countries with a floating exchange rate regime, the scope to loosen monetary policy was limited given the large prevalence of foreign currency loans to unhedged borrowers and the large negative effects on balance sheets such significant depreciations would have entailed.

- **Banks were strongly encouraged not to pay dividends and most foreign parent banks agreed to maintain their exposure to host countries throughout the crisis.** The latter took place either through the European Bank Coordination Initiative in the context of IMF-supported programs (in the case of Romania and Serbia) or through other similar mechanisms (in the case of Bulgaria and Croatia).

Macroeconomic Policies

Monetary Policy

- In Bulgaria, the currency board did not allow any independent monetary policy. The stock of international reserves declined by about 22 percent between end-2008:Q3 and end-2009:Q1 but stabilized at that level, helping maintain the confidence in the currency board.

- In Croatia, monetary policy remained geared toward maintaining exchange rate stability.

- Despite the large negative output gap, inflation remained stubbornly high in Romania, reducing the scope for a more accommodative monetary policy. While core inflation declined, headline inflation lagged partly due to supply side shocks such as excise tax hikes, the pass-through from the exchange rate depreciation of October 2008, and administrative price increases. As a result, the central bank missed inflation targets for three years in a row. As inflationary and exchange rate pressures abated, the NBR was able to ease monetary policy in support of economic recovery, reducing the policy rate by a cumulative 400 basis points from February 2009.

- Following the depreciation prior to the program in Serbia, the exchange rate was broadly stable during the remainder of 2009. However, new exchange rate pressure built in the context of the crisis in Greece, leading to another depreciation of around 10 percent against the euro. This also gave rise to a flare up of inflation by 11 percent in 2011. The National Bank of Serbia raised interest rates substantially in response.

Table A2. Key Macroeconomic and Financial Indicators, 2008–12

	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
	Gross Domestic Product Growth (percent)					Consumer Price Index Inflation (percent, average)				
Bulgaria	6.2	-5.5	0.4	1.8	0.6	12.0	2.5	3.0	3.4	2.4
Croatia	2.1	-6.9	-2.3	-0.2	-1.9	6.1	2.4	1.0	2.3	3.4
Romania	7.3	-6.6	-1.1	2.2	0.7	7.8	5.6	6.1	5.8	3.3
Serbia	3.8	-3.5	1.0	1.6	-1.5	12.4	8.1	6.2	11.1	7.3
	Nominal Credit Growth (percent, FX-adjusted)					Real Estate Price Inflation (percent, eop)				
Bulgaria	32.2	3.6	1.0	3.2	2.9	11.7	-26.3	-5.6	-6.2	-1.4
Croatia	9.8	-0.6	2.9	3.3	-4.2	0.3	-3.6	-4.1	0.8	-1.3
Romania	26.3	-2.3	3.4	6.1	0.0	22.8	-2.4	-9.2	6.2	-3.1
Serbia	22.7	9.3	17.5	5.9	4.8	28.9	9.3	13.6	-11.6	2.3
	Current Account Balance (percent of GDP)					External Debt (percent of GDP)				
Bulgaria	-23.0	-8.9	-1.5	0.1	-0.9	97.3	113.5	102.3	89.3	96.6
Croatia	-9.0	-5.2	-1.2	-0.9	0.0	80.9	104.5	105.9	96.8	105.1
Romania	-11.6	-4.1	-4.4	-4.5	-4.4	47.9	71.9	74.2	70.9	77.3
Serbia	-21.7	-6.6	-6.8	-9.1	-10.7	62.4	80.3	86.3	76.5	92.6
	Fiscal Balance (percent of GDP)					Government Debt (percent of GDP)				
Bulgaria	2.9	-0.9	-4.0	-2.0	-0.5	15.5	15.6	14.9	15.4	17.5
Croatia	-1.3	-4.2	-5.1	-5.3	-3.9	29.3	35.8	42.6	47.4	54.0
Romania	-4.8	-7.3	-6.4	-4.3	-2.5	13.6	23.8	31.1	34.3	38.2
Serbia	-2.0	-3.9	-3.9	-4.3	-7.2	33.4	38.1	46.5	49.5	62.4
	Monetary policy rate (percent, average)					Appreciation against the euro (percent, eop)				
Bulgaria	…	…	…	…	…	0.0	0.0	0.0	0.0	0.0
Croatia	…	…	…	…	…	0.0	0.2	-1.1	-1.9	-0.2
Romania	9.8	9.1	6.5	6.2	5.3	-9.4	-5.7	-1.3	-0.8	-2.5
Serbia	15.1	13.1	9.1	11.5	10.1	-10.6	-7.6	-9.1	0.8	-8.0

Source: IMF, *International Financial Statistics,* World Economic Outlook database. And BSA database; Haver Analytics; central bank websites; national statistical offices; Centar Nekretnina; REAS; and IMF staff calculations.

Fiscal Policy

- In Bulgaria, the fiscal balance deteriorated significantly during 2008-2009 in part because the rapid spending growth of the boom years continued until mid-2009. While this large swing in the fiscal balance is likely to have helped mitigate the downturn, it also forced the government to withdraw application for the Exchange Rate Mechanism II (ERM-II), the gateway to euro adoption, and thus postpone entry into the European Monetary Union (EMU). Tax revenues in 2009 fell short of targets as they declined during the economic downturn, and measures to improve tax administration yielded less than anticipated, however expenditure was close to plan. Nevertheless, the cash outturn substantially understated actual government outlays. After the discovery of

arrears, it became clear that the 2010 cash deficit target of 0.75 percent of GDP was no longer attainable. Confronted further with disappointing tax revenues, the government raised the target to 4.8 percent of GDP. To contain the deficit, the government froze pensions and wages, streamlined public administration, increased excise duties, and hiked taxes on gambling and real estate. This ultimately resulted in a cash deficit of 3.9 percent of GDP. In light of difficult market conditions and the government's decision not to seek financing from international institutions, the government financed the deficit by drawing down its fiscal reserve buffers by around 3 percent of GDP. Further consolidation efforts in 2011 and 2012 reduced the deficit to 0.5 percent of GDP, below the Maastricht deficit criterion.

- Given the large financing needs and the uncertain market outlook, fiscal policy in Croatia needed to contain the budget deficit. In the course of 2009, the authorities adopted three supplementary budgets. The measures in these budgets, amounting to 2.25 percent of GDP, were mostly on the spending side. These measures contained the 2009 fiscal deficit to 4 percent of GDP. Despite substantial positive contributions from measures undertaken in 2009 and 2010, the general government's deficit widened to slightly above 5 percent of GDP in 2010 and 2011 on the back of falling revenues. Only in 2012 it was reduced to just under the 2009 level.

- While Romania's debt-to-GDP ratio was amongst the lowest in Europe, lack of market financing, together with the unsustainable increase in government spending and the need to restore market confidence, meant that there was little room for fiscal stimulus when the crisis struck. Under the IMF-supported program, the new government aimed for a fiscal consolidation of 3 percentage points of GDP in 2009—without corrective measures the deficit would have ballooned to 9 percent of GDP. However, it soon became clear that the economic downturn would be much deeper than initially foreseen and fiscal policy needed recalibration. A compromise was struck to accommodate more than half of the effect of the deterioration—allowing the deficit to rise above 7 percent of GDP—while implementing an additional adjustment of 2 percentage points of GDP. These measures, while highly pro-cyclical, helped to firmly anchor credibility of the fiscal adjustment plans and secured a sharp reduction in the deficit from 6.4 percent of GDP in 2010 to 2.5 percent of GDP in 2012.

- Serbia's public finances were in an unfavorable position when the crisis hit as Serbia's history of fiscal dominance put a high premium on stabilizing public finances early and credibly. A large, fiscal adjustment package of 3.5 percent of GDP was agreed in May 2009, with most measures comprising of nominal freezes or across-the-board discretionary spending cuts. Measures taken under the program succeeded in keeping the deficit below 4 percent of GDP through 2010. However, further public finance decline in 2011 and in 2012 pushed the deficit up to 7.2 percent of GDP by the end of 2012.

APPENDIX II: LIST OF MEASURES TAKEN BY COUNTRY

List of Abbreviations of Macroprudential Instruments

Prudential Measure	Description
CAP: CAPITAL MEASURES	
mincap	Minimum required capital adequacy ratio
cap	Capital eligibility
hhsc	Maximum on ratio of household loans to share capital
fcsc	Maximum on ratio of fc loans to own funds
basel	Basel II
rwmol	Risk weights / mortgage loans
rwmolfc	Risk weights surcharge/ FC mortgage loans
rwcons	Risk weights / consumer loans
rwconsfc	Risk weights surcharge/ FC consumer loans
rwcorp	Risk weights on corporate loans
rwcorpfc	Risk weights on fc corporate loans
LCP: PROVISIONING MEASURES	
gp	Rules for general provisions
dp	Rules for specific provisions
dpfc	FC-loans rules for specific provisions
LRR: LIABILITY-BASED LIQUIDITY MEASURES	
rr	Reserve requirements rate on LC deposits
rrfc	Reserve requirements rate on FC deposits
rrbase	Reserve requirements base
fclr	Foreign currency liquidity requirement
fclrbase	Foreign currency liquidity requirement base
mrr	Marginal reserve requirements
srr	Special reserve requirements
ARR: ASSET-BASED LIQUIDITY MEASURES	
cgr	Credit growth reserve
cc	Marginal reserve requirements on credit growth above a threshold
ELI: ELIGIBILITY MEASURES	
ltv	Loan-to-value ceiling
ltvfc	FC loan-to-value ceiling
dsti	Debt-service-to-income ceiling
dstifc	FC debt-service-to-income ceiling
NBK: NONBANK REGULATORY POLICY	
other	Regulatory measures on non-banks.

List of Measures Taken in the Period 2002–12 by Country

Bulgaria: Prudential Measures

Quarter	
2002Q1	
2002Q2	**rrbase**: exclusion of borrowed funds with a maturity over two years.
2002Q3	
2002Q4	
2003Q1	
2003Q2	
2003Q3	
2003Q4	
2004Q1	
2004Q2	**dp**: evaluation and classification of risk exposures of banks was tightened as doubtful and loss exposures were consolidated into the non-performing loans category. **cap**: ordnance on the capital adequacy was amended by setting out conditions for inclusion the retained profit from previous years and the current year profit in primary capital.
2004Q3	**rrbase**: increase in reserve requirement ratio to 4% on long-term attracted resources (with maturity over two years) and repos of end-clients.
2004Q4	**rrbase**: rate on liabilities with maturity above two years raised from 4% to 8%.
2005Q1	
2005Q2	**cc**: introduction of credit ceilings: a bank is subject to marginal reserve requirements of 200% if (i) it expands credit by more than 6% per quarter on average, taking end-Q1 2005 as the base period; and (ii) the sum of its loans and the risk-weighted off-balance sheet items converted into assets, reduced by the amount of own funds, exceeds 60%. **dp**: loans overdue by more than 30 days, 60 days, or 90 days, have to remain classified as "watch," "substandard" and "non-performing," respectively, for a minimum of 6 months.
2005Q3	**cap**: regulatory minimum capital adequacy ratios must be satisfied while excluding current profits from the capital base. **rwmol_threshold**: amendments to Regulation 8 were introduced: mortgage credits are treated with 50% risk weight only if the amount of credit is less than 70% of the value of collateral (70% loan-to-value ratio), otherwise the risk-weight is 100%.
2005Q4	**cc:** the penalty rate for breaching credit ceilings was temporarily increased for banks exceeding the limit by 1-2%, from 200 to 300%, and to 400% for excesses of more than 2%. **dp:** the provisioning requirements for impaired household credits was raised: from 10% to 20% for loans overdue by 30-60 days ("watch" category), and from 50% to 75% for loans overdue by 60-90 days ("substandard" category).
2006Q1	
2006Q2	**rwmol_threshold**: the risk weighting for mortgage loans used in the calculation of the capital adequacy ratio was effectively raised, by lowering the loan-to-value ratio threshold from 70% to 50%.
2006Q3	**cc:** the progressive range of additional minimum required reserves was eliminated.
2006Q4	**dp**: the six-month period of keeping problematic mortgage and consumer loans in the classification groups "watch," "substandard" and "non-performing" was abolished when the regular service of these loans has been resumed.

Bulgaria: Prudential Measures (continued)

Quarter	
2007Q1	**cc:** end of credit limits. **basel**: the implementation of a legal framework comprising the latest European directives introducing Basel II requirements; Bulgaria acceded to the European Union introducing compliance between Bulgarian legislation and European directives on credit institutions. Risk-weights under standardized approach are unchanged.
2007Q2	
2007Q3	**rr, rrfc:** reserve requirements were increased from 8% to 12%.
2007Q4	
2008Q1	
2008Q2	
2008Q3	
2008Q4	**rr, rrfc:** reserve requirements were decreased from 12% to 10%.
2009Q1	**dp:** the loan classification and provisioning rules were loosened by increasing the number of days within each classification category; loan restructuring through maturity extensions up to two years does not lead to reclassification. **rrbase**: reducing the minimum required reserves on funds attracted by banks from abroad from 10% to 5% and removing the minimum reserve requirements on funds attracted from state and local government budgets.
2009Q2	
2009Q3	
2009Q4	
2010Q1	**cap**: the requirement to hold a general shareholders' assembly for the recognition of current profit or profit from the previous year as a capital base element was dropped. **rwmol, rwmolfc, rwmol_threshold, rwcons, rwconsfc**: for banks using the standardized approach to credit risk, the risk-weight for retail exposures was reduced from 100% to 75%, and the risk-weight for mortgage exposures was reduced from 50% to 35% (loan-to-value from 50% to 70%); however 100% risk weight remains in place if above the threshold.
2010Q2	
2010Q3	
2010Q4	
2011Q1	
2011Q2	**dp:** term of realization by banks of the collateral provided to them in the form of buildings or regulated land property was extended.
2011Q3	
2011Q4	
2012Q1	
2012Q2	
2012Q3	
2012Q4	

Croatia: Prudential Measures

Quarter	
2002Q1	
2002Q2	
2002Q3	
2002Q4	
2003Q1	**cgr**: banks for which the growth of assets exceeded 4% in a given quarter (equals 17% annual growth) were required to buy low-yielding central bank paper: this rule was temporary and was kept in place only in 2003, cover 200%. **fclr**, **fclrbase**: foreign currency liquidity requirement reduced from 53% to 35%, but expanded base to include foreign currency long-term liabilities. Net tightening.
2003Q2	
2003Q3	
2003Q4	
2004Q1	**cgr**: credit growth reserve dropped **gp**: if growth of specific items of assets and off-balance sheet contingent liabilities exceeds 20%, banks need to form and maintain provisions, and retain profits.
2004Q2	
2004Q3	**mrr**: marginal reserve requirement rate on net foreign borrowing was initially set at 24%.
2004Q4	**rr**: reserve requirements ratio was cut to 18%.
2005Q1	**fclr:** the rate of minimum required liquid foreign currency claims was cut from 35% to 32%. **mrr**: marginal reserve requirement rate was raised to 30%.
2005Q2	**mrr**:marginal reserve requirement rate was raised to 40%; base extended during the year several times.
2005Q3	
2005Q4	**mrr**: marginal reserve requirement rate was raised to 55%.
2006Q1	**rr**: reserve requirements ratio was reduced to 17%. **srr**: special reserve requirements on securities are calculated every second Wednesday in a month, by applying a 55% rate to the prescribed base.
2006Q2	**rwmolfc, rwconsfc, rwcorpfc:** risk weights on foreign currency or foreign currency-indexed loans to unhedged borrowers in non-government increased from 50% to 75% (for mortgages) and from 100% to 125% (for others). **dpfc:** banks are obliged to monitor, analyze and assess the adjustment of debtors' foreign exchange positions and adaptability of their cash flows to any variability in their liability levels which might occur as a result of exchange rate changes.
2006Q3	**gp**: tightened growth rate on extra countercyclical provisioning measure up to 15%.
2006Q4	**fclr:** foreign currency liquidity requirement base included foreign currency indexed liabilities; final deadline for adjustment to 32%.
2007Q1	**cgr**: credit growth reserve reimposed at 12% annual growth, with cover of 50%.
2007Q2	
2007Q3	
2007Q4	

Croatia: Prudential Measures (continued)

Quarter	
2008Q1	**rwmolfc, rwconsfc, rwcorpfc**: risk weights for unhedged borrowers were increased by a further 25 percentage points: applied weights are 100% (which replaced 75%) and 150%. **cgr**:credit growth reserve penalty was increased to 75%. **cgrcap**: banks growing faster than 12% per year have to maintain a capital requirements rato higher than 12% plus 150% of credit growth above 12%.
2008Q2	**fclr**: foreign currency liquidity requirement rate reduced to 28.5%
2008Q3	
2008Q4	**mrr**: marginal reserve requirements were abolished. **rr:** reserve requirement rate was cut from 17% to 14%.
2009Q1	**srr**: special reserve requirments were terminated. **fclr**: foreign currency liquidity requirement reduced in two steps to 20%. **dp**: measure requiring additional general provision related to credit growth was dropped.
2009Q2	
2009Q3	
2009Q4	**cgr**: credit growth reserve was dropped.
2010Q1	**rr:** reserve requirement rate was cut from 14% to 13%. **rwmol, rwmolfc, rwmol_threshold, rwcons, rwconsfc, rwcorpfc, mincap**: with the adoption of Basel II the very high risk weights were dropped but minimum captial adequacy requirements was increased to 12% from 10% to compensate; from now on risk weights on mortgages are contingent on the loan-to-value ratio: for a loan-to-value up to 75% the risk weight is 35%, otherwise it is 100%. **cgrcap**: credit growth reserve cap was dropped. **dp**: available for sale assets and some off-balance sheet items were excluded from the classification.
2010Q2	
2010Q3	
2010Q4	
2011Q1	**fclr:** foreign currency liquidity requirement reduced from 20% to 17%.
2011Q2	
2011Q3	
2011Q4	**rr:** reserve requirement rate was raised from 13% to 14%.
2012Q1	**rr:** reserve requirement rate was raised from 14% to 15%. **fclrbase:** the minimum foreign currency liquidity requirement rate remained at 17%, but the definition of foreign currency claims was broadened recognizing T-bills subscribed by banks as liquid foreign currency claims.
2012Q2	**rr:** reserve requirement rate was reduced from 15% to 13.5%. **fclrbase**: the calculation of minimum required foreign currency claims will also include 50% of the amount of bank loans granted to economic entities.
2012Q3	
2012Q4	

Romania: Prudential Measures

Quarter	
2002Q1	
2002Q2	
2002Q3	
2002Q4	**rr, rrfc:** reserve ratios were reduced to 18% for reserves in domestic currency and raised to 25% for reserves in foreign currency.
2003Q1	
2003Q2	
2003Q3	
2003Q4	
2004Q1	**ltv, dsti**: consumer credit: installments shall not exceed 30% of net incomes of the borrower and his family; downpayment of at least 25% or cosigner commitment for purchases of goods; collateral and/or cosigner commitment for other types of consumer credit; mortgage credit: credit value shall not exceed 75% of the property value; installments shall not exceed 35% of net incomes of the borrower and his family.
2004Q2	
2004Q3	**rrfc:** reserve requirement ratio on foreign currency deposits raised from 25% to 30%, reserve ratio on domestic currency deposits remains at 18%.
2004Q4	
2005Q1	**rrbase**: reserve requirements broadened to include all foreign currency liabilities carrying maturities of over two years.
2005Q2	
2005Q3	**dsti**: eligibility criteria further tightened; overall installments associated with the sum of all credit contracts shall not exceed 40% of net incomes. **rr**: reserve requirements on domestic currency liabilities reduced from 18% to 16%. **dpfc:** regulation on provisioning and loan classification was refined to take into account the foreign currency risk of the borrower. **fcsc:** foreign currency credit exposure of a credit institution arising from loans granted to unhedged individuals and legal persons shall not exceed 300% of own funds. **rrbase**: reserve requirements base broadenend to include all foreign currency liabilities carrying maturities of over two years regardless of the date at which they were raised.
2005Q4	
2006Q1	**rrfc:** reserve requirements on foreign currency liabilities raised from 30% to 35% and then to 40%. **other**: non-bank credit institutions (leasing, financial credit, etc.) enter into the regulatory perimeter.
2006Q2	**rr**: reserve requirements increased from 16% to 20% (first time in 6.5 years).
2006Q3	
2006Q4	**other**: eligibility constraints on household loans now also apply to regulated non-bank credit institutions.
2007Q1	**mincap**: following EU entry, minimum capital requirements drops from 12% to 8%. **dsti**: eligibility criteria are now defined by banks' internal models. **ltv**: loan-to-value limit was abandoned. **fcsc**: exposure limits lifted
2007Q2	
2007Q3	
2007Q4	

Romania: Prudential Measures (continued)

Quarter	
2008Q1	**dpfc:** higher provisioning rate for loans to unhedged foreign currency borrowers. **rwmol_threshold**: with the adoption of Basel II risk weights on mortgages were made contingent on the loan-to-value ratio: for an loan-to-value up to 75% the risk weight is 35%, otherwise it is 100%. **basel**: full enforcement of Basel II regulatory framework. Lower risk-weights (standardized approach).
2008Q2	
2008Q3	**cap:** current year profits were excluded from regulatory capital. **dstifc:** banks have to consider the interest and exchange rate risk in setting the indebtedness ceiling (set on a case by case basis by using internal risk models). **other**: eliminate the possibility that non-bank financial institutions entered into the Special Register should include interim profit in the calculation of own funds.
2008Q4	**rr**: reserve requirementes on domestic currency liabilities reduced from 20% to 18%.
2009Q1	**dstifc:** requirement to take into calculation interest rate risk and currency risk when setting the indebtedness ratio for clients taking loans backed by mortgage on the home or the land within city limits was removed. **mincap**: the minimum capital adequacy ratio was set at 10% as long as the multilateral financing arrangement with the EU, the IMF and other IFIs was in place.
2009Q2	**dp**: a fraction of the collateral value (less than 25%) can be deducted from the value of "loss" (i.e. 90+ days overdue) exposures to compute provisions (under the old regulation, no deduction was allowed). **cap**: reversal of August 2008 measure. **rrbase:** reserve requirements on foreign currency liabilities with residual maturity greater than two years reduced from 40% to 0%.
2009Q3	**rr**: reserve requirements on domestic currency liabilities reduced from 18% to 15%. **rrfc:** reserve requirements on foreign currency liabilities with maturity less than two years were reduced from 40% to 35% and later to 30%.
2009Q4	**other**: regulation 20/2009 allows inclusion of interim profits in capital. **rrfc:** reserve requirements on foreign currency liabilities with maturity less than two years were reduced from 30% to 25%.
2010Q1	
2010Q2	
2010Q3	
2010Q4	
2011Q1	
2011Q2	**rrfc:** reserve requirements on foreign currency liabilities with maturity less than two years reduced from 25% to 20%.
2011Q3	
2011Q4	**ltv, ltvfc, dstifc:** introduce a loan-to-value ceiling by type of loan currency denomination, and specific foreign currency shocks to determine the maximum indebtedness level.
2012Q1	
2012Q2	
2012Q3	
2012Q4	

Serbia: Prudential Measures

Quarter	
2002Q1	
2002Q2	**rrfc, rrbase:** base for calculating reserve requirements was increased by including foreign currency deposits. **rr, rrfc**: the reserve ratio was reduced from 24.5% to 20%.
2002Q3	
2002Q4	
2003Q1	**rr, rrfc:** reserve requirements ratio raised from 20% to 23%.
2003Q2	**rr, rrfc:** further reduction of the rr ratio to 22%, and to 20%.
2003Q3	**rr, rrfc:** required reserve ratio reduced from 20% to 18% and kept unchanged until the end of the year.
2003Q4	
2004Q1	
2004Q2	**fclr:** banks are required to deposit 47% (banks undergoing rehabilitation 100%) of citizens' foreign exchange savings with the central bank.
2004Q3	**rr, rrfc:** increase of the reserve requirement rate from 18% to 21%.
2004Q4	**dp:** if debt service-to-income exceed 30% and down-payment is less than 20%, classified as E and subject to 100% provisioning (exception: housing loans); before were subject to 25% provisioning.
2005Q1	**mincap**: minimum capital adequacy ratio was raised from 8% to 10%, and later to 12%. **rrbase**: foreign currency base is extended: inclusion of liabilities arising from foreign currency loans from foreign legal entities with maturity up to four years and liabilities arising from unchanged remunerated sterilization of dinar foreign loans registered by banks.
2005Q2	**rr, rrfc:** introduction of a differentiated reserve: 20% on dinar reserve base and 26% on foreign currency reserve base. **rrbase**: the base also included liabilities towards subsidiary and related banks abroad.
2005Q3	**rrfc:** reserve requirements on foreign exchange reserve calculation base was raised from 26% to 29%. **rrbase:** base for calculation of foreign currency reserves was expanded to include liabilities in respect of credits from foreign legal entities with contracted maturity over four years; a 7% ratio was applied on the expanded foreign exchange reserve base. **fclr**: minimum foreign currency liquidity against foreign currency savings reduced from 47% to 45%, then to 43%.
2005Q4	**rrbase**: reserve requirements calculation base was reduced by the amount of long-term housing loans insured by government, but was expanded to include funds from abroad under transactions performed by the bank in the name and for the account of third parties; a differentiated ratio of 35% was introduced and applied on foreign currency clause-indexed dinar deposits, later raised to 38%; foreign currency base is extended. **rr**: decrease of the reserve requirement rate applied to the dinar base from 20% to 18%. **rrfc:** further rise in foreign currency reserve requirement rate from 29% to 35%, and then to 38%. **dp**: household loan classified in category E if no credit bureau report. **mincap**: minimum capital adequacy ratio was raised to 12%. **fclr**: minimum foreign currency liquidity against foreign currency savings reduced from 43% to 42% in October, then to 42% in November, then dropped in December.

Serbia: Prudential Measures (continued)

Quarter	
2006Q1	**other**: the NBS took over the authority for regulating and supervising the leasing industry (Sept. 2005) and subjected leasing companies to a 10% reserve requirement on foreign borrowing (Feb. 2006)
2006Q2	**rrfc:** the reserve requirement ratio on foreign currency deposits and on foreign currency clause-indexed dinar deposits was raised from 38% to 40%. **rrbase**: foreign currency reserving base was expanded to include foreign currency subordinated obligations; deposits of leasing companies with banks are subject to 100% reserve requirement; the reserve requirements on foreign currency deposits and credits from abroad with repayment period of up to two years were increased from 40% to 60%.
2006Q3	**hhsc:** obligation for banks to reconcile their gross household dinar loans and their share capital, so that it is lower than or equivalent to 200% of the value of share capital; loans for housing construction supported by government were excluded but amendment that foreign currency loans also have to be included.
2006Q4	**rr**: decrease in reserve requirements on dinar reserving base from 18% to 15%. **dp:** banks receive more independence for the calculations of special provisions; new debt service-to-income criterion (including housing) included in provisioning rule: by applying criteria defined in their internal documents, banks are to classify into categories D or E all receivables from natural persons whose total monthly credit obligations, excluding obligations in respect of housing loans, exceed 30% of their regular net monthly income, or, including obligations in respect of housing loans, exceed 50% of their monthly income. **rwcorpfc:** risk weights for foreign currency lending go up with new banking regulation to 125% for unhedged borrowers if borrowing amount is larger than 10 million dinars.
2007Q1	**rr**: decrease of reserve requirements on the dinar reserving base from 15% to 10%. **rrfc:** reserve requirement ratio on the foreign currency reserving base and a portion of the dinar reserving base made up of foreign currency-indexed dinar deposits was raised from 40% to 45%. **rrbase**: reserve requirement ratio on short-term external borrowing is reduced from 60% to 40% and a uniform reserve requirement ratio on dinar obligations arising from deposits and loans received from abroad was introduced and set at the level of 45% regardless of their maturity.
2007Q2	**hhsc**: tightened penalty measures for non-compliance and ordered banks to pay interest on the difference between the prescribed and the actually deposited amount of funds; stronger penalty measures against banks for the submission of inaccurate data resulting in the miscalculation of gross household lending to share capital ratios.
2007Q3	**hhsc**: the definition of gross household lending was changed to encompass all housing loans, including those supported by government program.
2007Q4	**hhsc**: the ratio of gross household lending to share capital was prescribed not to exceed 150% at the end of any calendar month. **rrbase:** ratio on dinar liabilities under deposits with maturity of over one month was reduced to 5%.

Serbia: Prudential Measures (continued)

Quarter	
2008Q1	
2008Q2	**dpfc:** minimum downpayment for consumer loans with foreign currency clause to avoid classification in category E increased from 20% to 30%, but exclusion of credit cards and loans without foreign currency clause. **hhsc**: extension of deadline to achieve the prescribed ratio for banks failing to comply.
2008Q3	**gp**: general provisions required if credit growth is larger than 15%. **rwmolfc, rwconsfc:** risks weights on fc-loans to households are increased by 25 pps: 75% for foreign currency-mortgage, 125% for foreign currency consumer loans.
2008Q4	**rrbase:** several easing measures regarding the calculation of the reserve requirement were taken, but ratios remained unchanged. **hhsc:** further easing measures relating to the adjustment of gross household lending to share capital of bank and penalties were taken, for certain period. **gp:** cancelled general provisions if credit growth larger than 15%.
2009Q1	**rrbase:** base for reserve requirement calculation reduced again, banks were exempted from calculation of reserve requirements on the amount of dinar- and foreign currency-denominated liabilities from deposits and credits received from abroad. **hhsc**: ratio of household lending to share capital has to be lower or equal to 200% (instead of 150%) **dp, dpfc:** suspended rule for higher provisioning if downpayment smaller than 30%.
2009Q2	**rrbase:** base for reserve requirement calculation reduced again. **hhsc:** cessation of validity of rule on ratio of household lending to share capital
2009Q3	
2009Q4	
2010Q1	
2010Q2	**rr**: reduction in the reserve requirement ratio on the dinar base to 5%. **rrfc:** reduction in the reserve requirement ratio on the foreign currency base to 25%, whilst the number of exemptions from required reserve calculation has been reduced. **rrbase**: the number of exemptions from foreign currency reserve requirements was adjusted with significant effects of increased liquidity. **dp**, **dpfc:** amendments to loan classification and provisioning rules by reducing provisioning for domestic currency credit and raising provisioning for foreign currency loans.
2010Q3	
2010Q4	

Serbia: Prudential Measures (continued)

Quarter	
2011Q1	**rrfc**, **rrbase**: differentiated reserve ratios on both the dinar and foreign currency reserving base subject to the maturity of liabilities: dinar liabilities with maturity up to two years became subject to 5% ratio, while those with maturity over two years to 0% ratio; the ratio on foreign currency liabilities with maturity up to two years is set at 30% and that on liabilities with maturity over two years at 25%.
2011Q2	**ltvfc:** introduced a set of measures regarding foreign currency-denominated and foreign currency-indexed lending to citizens: foreign currency-denominated and foreign currency-indexed loans may be approved only subject to a down payment or placement of deposit of no less than 30% of the loan amount; the loan-to-value of foreign currency-denominated and indexed mortgage loans are limited to a maximum of 80%.
2011Q3	
2011Q4	**dp**: lowering of the provisioning percentages for categories B, C and D; another change is that banks are no longer obliged to allocate reserves from earnings for a part of the special reserve for estimated losses that is not covered by allowances for impairment. **dpfc:** prescribed that total monthly credit obligations are contracted in a considerable amount in foreign currency or in dinars with a foreign currency clause if at least 20% of those obligations are contracted in this way. **basel:** Basel II implemented in December 2011.
2012Q1	
2012Q2	**rrfc, rrbase:** cut in foreign currency reserve requirement ratios from 30% to 29% for short maturities and from 25% to 22% for long maturities. **rrbase:** raised to 50% the ratio on the portion of foreign currency reserve base comprised of foreign currency-indexed dinar liabilities.
2012Q3	
2012Q4	**dp**: regulatory easing in respect to the recognition of mortgage as adequate collateral.