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Abstract

This paper provides new evidence on the factors affecting protracted credit contraction in the wake of the global financial crisis. The paper applies panel vector autoregressions to a global panel that consists of quarterly data for 41 countries for the period 2000–2011 and documents that domestic private credit growth is highly sensitive to cross-border funding shocks around the world. This relationship is significantly stronger in Central and Eastern Europe, a region with considerably stronger foreign presence, higher cross-border funding, and elevated loan-to-deposit ratios compared with the rest of the world. The paper shows that high foreign ownership per se does not appear to explain credit response differences to foreign funding shocks. Rather, there is a stronger response in countries that exhibit high loan-to-deposit ratios and a high reliance on foreign funding relative to local deposits. The results suggest that funding model differences were at the heart of the post-crisis credit contraction in several Central and Eastern European countries. These findings have important regulatory and supervisory implications for emerging countries in Central and Eastern Europe as well as for other countries.

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The Impact of Funding Models and Foreign Bank Ownership on Bank Credit Growth: Is Central and Eastern Europe Different?

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I. Introduction

By the turn of the new century the financial sector landscape in Central and Eastern Europe and Central Asia (ECA) had changed dramatically. Most countries in the region were finalizing comprehensive banking restructuring programs and restoring the solvency of their banking systems. In many cases these restructuring programs also included extensive transfers of bank ownership to foreign strategic investors, especially Western European banks. In the years preceding the global financial crisis these parent banks expanded their operations in the ECA region through new subsidiaries, and in many cases also provided extensive funding support to these subsidiaries, taking advantage of easy funding conditions in Western European and global markets. In several ECA countries domestically-owned banks also took advantage of easy international funding conditions and borrowed extensively abroad.

This period was characterized by strong bank credit growth to the private sector in most ECA countries. As shown in Figure 1, credit growth in Central and Southern Eastern Europe (the new European Union (EU) member states and the Western Balkans) and in the former Confederation of Independent States (CIS) increased dramatically in the years preceding the crisis, much more than in other emerging countries. Moreover, credit grew at much higher rates than deposits as reflected in increasing loan-to-deposit ratios and the increasing share of foreign liabilities—typically a less stable funding source—in total bank liabilities. The dramatic gains in access to finance for households and corporates contributed to an impressive expansion of output and consumption, raising the prospects of rapid convergence of standards of living and integration with Western Europe. These prospects, combined with a prolonged period of abundant liquidity, generally outweighed regulatory concerns with excessive credit growth and over-reliance on cross-border wholesale funding.

The weaknesses of this business model and the cross-border supervisory context in which it operated were exposed when the fall-out of the US sub-prime crisis reached Europe and both bank funding and solvency conditions deteriorated rapidly. Although most countries across the world experienced a severe contraction of credit during the crisis, the ECA region was particularly affected (Figure 1) given the closer economic and financial links with Western

Europe which faced prolonged episodes of financial market stress, including a high degree of foreign ownership and greater reliance of cross-border funding in many countries. As a result, the slowdown of credit growth in the ECA region was generally driven by foreign banks, as they initiated efforts to repair their balance sheets and retrench to home markets.

Concerns with a dramatic credit crunch in the ECA region led to a concerted effort by regulators and multilateral institutions to preserve minimum levels of cross-border funding, particularly funding by (Western European) parent banks. This effort – labeled as the Vienna Initiative – appears to have succeeded in avoiding a very severe credit contraction in the participating countries (de Haas et al, 2012). Yet, the mere fact that this outcome required a concerted effort by many actors revealed the potential downside risks associated with foreign banks and cross-border funding, and triggered a renewed debate about the benefits and costs associated with foreign banks, cross-border finance, and financial integration.

The crisis triggered an increasing research effort to disentangle the factors that drove the more pronounced and protracted fall in post-crisis credit growth in most ECA countries. This research effort is warranted, as some ECA countries with a high degree of foreign ownership but less reliance on foreign funding seem to have been less affected (e.g. Czech Republic, Poland, Slovakia), while other ECA countries with a lower degree of foreign ownership but strong reliance on cross-border funding were very affected (e.g. Kazakhstan, Slovenia, Ukraine).

Research based on bank-level data confirms that foreign banks did contract local credit provision more than domestic banks in emerging countries, but also that balance sheet structures matter, including funding structures. Countries that had a strong presence of foreign banks but also relied more on their domestic deposit base suffered a much less severe credit slowdown. The balance sheet strength of parent banks also seems to matter—host countries with stronger parent banks also experienced a less severe credit slowdown.

These results suggest the need to put more emphasis on the discussion of business models, regulatory standards, and supervisory arrangements, rather than foreign ownership *per se*. One

potential weakness of this research, however, is the reliance on bank-level data that does not provide sufficient granularity on funding structures, including the levels of foreign funding. The exposure to cross-border funding—arguably one of the main transmission channels of international financial crises—is generally proxied by the ratio of deposits to assets. The fact that recent research work has found that this variable is significant is reassuring, confirming the importance of funding structures, but the lack of a variable measuring more accurately the exposure to foreign funding raises questions about the relevance of these results for the regulatory debate on cross-border banking.

Our paper contributes to the literature by examining the relative importance of foreign ownership and foreign funding from a different angle. First, we use country-level data instead of bank-level data, which allows us to explicitly measure the reliance on foreign funding. Second, we follow a different methodology—panel vector autoregressions (PVARs)—to examine the relationship between funding structures and credit growth.

There are several advantages in using the PVAR methodology to study the importance of different factors in explaining credit growth. First, in VARs, all variables are treated as endogenous and interdependent so all the feedback effects are explicitly included in the model. Thus, VARs are designed to explicitly address the endogeneity problem, which is a serious challenge in studying the empirical relationships between credit growth, economic growth, and funding sources. Second, unlike single country VARs that need long time series for efficiency, PVARs can be used with relatively short time-series. This is important for our study since the quarterly data on foreign liabilities are only available for about the past 10 years. Third, the PVAR methodology can distinguish between the short-term impacts of each of the factors based on the impulse-response functions and the long-term cumulative impacts of shocks based on variance decompositions. In addition, the impulse-response functions based on PVARs can register any delayed impacts on (and of) the variables under consideration. Fourth, as in any panel-based method, PVARs allow us to control for country- and year-fixed effects. Country-fixed effects will capture time-invariant country characteristics that can explain credit growth, such as institutions, rule of law, credit information and other relatively static features of the

business environment. Year-fixed effects will capture global shocks affecting finance and growth, such as the effect of the recent financial crisis that is common for all countries in the same quarter. Thus, PVAR is a methodology that is well-suited to the questions this study aims to address.

Our main findings can be summarized as follows. Applying PVARs to a global panel that consists of quarterly data for 41 countries in ECA, Asia, Latin America, and the Middle East and Africa for the period 2000-2011, we document that private credit growth is highly sensitive to cross-border funding shocks around the world, and particularly sensitive in the average ECA country. Moreover, we show that countries with high loan-to-deposit ratios or high reliance on foreign funding exhibit a stronger response of private credit to foreign funding shocks. Higher loan-to-deposit ratios make banks more vulnerable to general wholesale funding shocks while high reliance on foreign funding specifically signifies sensitivity to foreign shocks. At the same time, we also show that foreign ownership *per se* does not explain the different credit responses during the crisis in our sample of countries. These findings are robust to additional sample splits designed to disentangle the differential impact of ownership and funding structures on credit growth in ECA and non-ECA countries. Taken together, our findings suggest that funding model differences with the rest of the world were at the heart of ECA's protracted post-crisis credit growth contraction, not its high prevalence of foreign bank ownership.

These findings have important policy implications. Rather than trying to curtail and scale back foreign bank presence, this paper suggests regulators ought to focus on business models of local affiliates of international banks and the regulation of cross-border funding. Indeed, Western European banks are already adjusting their business models by deleveraging, derisking, shifting to local, more stable sources of funding, and reducing loan-to-deposit ratios (e.g. Impavido, Rudolph and Ruggerone (2013), Raiffeisen (2013), and Unicredit (2013)). However, eradicating cross-border funding altogether and promoting a fully domestically funded subsidiary model also appears suboptimal as it may lead to costly pockets of inert liquidity and capital within the banking group. This raises various regulatory issues which we will discuss in our concluding

comments. Moreover, significant impediments to cross-border funding in countries with low domestic savings but with the desire to fund productive investments, could curtail growth.

The remainder of our paper is organized as follows. Section II summarizes the recent literature. Section III describes our data. Section IV outlines our econometric methodology: panel vector autoregressions (PVARs). Section V presents our main empirical results. Section VI concludes with policy recommendations. The annex provides an additional discussion of the PVAR methodology.

II. Overview of the Literature

It has long been acknowledged that foreign banks may contribute to financial sector development in emerging and developing markets. This positive contribution may take place by lowering the costs of financial intermediation and increasing the quality of financial services; increasing access to financial services for some households and firms, and enhancing the performance of borrowers. By increasing competition in the host country; bringing in up-to-date technology to the market; introducing new, more diversified products and services, and pressing regulators to reform and modernize the regulation and supervision of financial systems, foreign banks can help countries rapidly accelerate the development of their financial systems (see e.g. Giannetti and Ongena (2012), and Claessens and Van Horen (2013) for a comprehensive review of the literature).

At the same time, the crisis has renewed interest in examining the downside risks of foreign banks. Practically all the research work conducted immediately after the crisis showed that foreign banks drove the credit boom before the crisis and the credit slowdown after the crisis (e.g. de Haas Van Lelyveld (2011), de Haas et al (2012), Cull and Martinez Peria (2012), Popov and Udell (2012)). De Haas et al (2012) also explore the impact of the Vienna Initiative and show that the initiative succeeded in softening the inevitable deleveraging process in the ECA region and preventing an uncoordinated "rush to the exit" that would have generated dramatic consequences for the region. However, they also add that a far better solution (than the *ad hoc* Vienna Initiative effort) would entail the creation of a pan-European supervisor for large groups

supplemented by adequate capital and liquidity regulation as well as host-country macroprudential supervision to curb externally funded credit booms.

More recent research work has included an effort to disentangle more clearly the factors underlying the relationship between foreign banks and credit in times of crisis. Thus, the recent literature has tried to distinguish between varying parent bank characteristics, home and host country profiles and balance sheet structures. In this regard, Claessens and Van Horen (2012) use a database on bank ownership for 137 countries over 1995-2009 to review foreign bank behavior and impact and conclude that in the recent financial crisis foreign banks reduced credit more compared to domestic banks. However, this was not a uniform finding. They also observed that foreign banks that generated a relative large part of their funding from deposits continued to lend relatively more in 2009, showing the importance of funding structures.

Kapan and Minoiu (2013) extend this line of investigation by drawing attention to the balance sheet strength of foreign banks in determining the transmission of financial sector shocks. Using data from the syndicated loan market, they review the variations in banks reliance on wholesale funding and their structural liquidity position just prior to the crisis (2007Q2) to estimate the impact of exposures to market freezes during 2007-08 on the supply of credit. They conclude that banks with strong balance sheets were better able to maintain lending during the crisis. Specifically, banks that were more dependent on market funding, had lower structural liquidity, and were less capitalized reduced the supply of credit more than other banks. They conclude that their results provide support for the recent regulatory proposals under Basel III.

Choi, Gutierrez, and Martinez-Peria (2013) reach similar conclusions based on an extensive bank-level panel dataset that allows them to explore the role of subsidiary and parent financial characteristics, as well as the impact of parent origin and geographic reach. Overall, the analysis finds robust evidence that foreign banks curtailed the growth of credit relative to other banks, independently of the host region. However, this was less so for foreign banks in countries that signed the Vienna Initiative and for those with higher deposit funding ratios and better capitalized parents. In other words, the funding structure of foreign bank affiliates and the

capitalization of parent banks proved to be significant and distinct factors driving the lending behavior of foreign banks during the global crisis.

Although there is recognition that both demand and supply factors contributed to the credit contraction most of the empirical literature does not examine in more detail this critical issue. Takats (2010) and Feyen and Gonzalez del Mazo (2013) are an exception in this regard by making an effort to identify supply and demand factors. By using a panel regression framework to analyze the key drivers for cross-border bank lending to 21 emerging economies between 1995 and 2009, Takats (2010) argues that while both supply and demand factors contributed to the credit drop, the former that was more important during the crisis. Finding that a 1% increase in output is associated with an increase of around 0.2% in credit (the most important demand factor in the analysis is GDP), the paper argues that while demand and supply factors tend to be more balanced during non-crisis periods (e.g. between 2003 and 2007), during the crisis the stress experienced by major internationally active banks limited the supply of cross-border lending and the overall pace of credit creation, i.e., the impact of supply was stronger.

Using a similar framework to disentangle demand from supply effects, Feyen and Gonzalez del Mazo (2013) argue that the decline in foreign lending activity of Western European banks in a large sample of emerging economies across the world—consisting of cross-border claims and claims of local affiliates—was supply driven during periods of high European financial stress. Similarly, using ECB lending survey data, Feyen and Gonzalez del Mazo (2013) also find that while falling demand was mostly responsible for the reduction in longer-term credit flows in Europe after the onset of the global financial crisis, supply factors played a significant role during periods of financial stress.

III. Data

To model the interaction between our variables of interest using a PVAR approach, we compile a panel database with quarterly data covering 41 countries in various regions with about 11 years of data available for most countries. Table 1 provides a description of the variables and the sources, while Appendix Table A1 shows the availability of each of the key variables by country.

A. Panel VAR Variables

The variables in our PVAR model are taken from the IMF's International Financial Statistics (IFS): PRIVATE CREDIT, FOREIGN LIABILITIES, GDP, and DEPOSITS. We construct our variables as follows. First, to ensure stationary, we calculate quarter-on-quarter nominal growth rates in local currencies for all variables in the system. Second, we construct real growth rates by subtracting the quarter-on-quarter percent change in the CPI index.[2] Third, to remove significant country-specific seasonality in GDP growth rates, we regress them on country-specific quarter dummies and subtract the predicted values. Table 2A provides the key descriptive statistics of the variables in the PVAR model.

PRIVATE CREDIT is the quarter-on-quarter real growth rate of private credit denominated in local currency. Private credit equals deposit money bank credit to the domestic private sector. FOREIGN LIABILITIES is the quarter-on-quarter real growth rate of foreign liabilities of deposit money banks denominated in local currency. These liabilities consist of claims of non-residents (both financial and non-financial) on the domestic banking system, and include deposits, securities, loans, financial derivatives and other liabilities. Note that these liabilities include the claims of foreign banks on their subsidiaries, in the form of loans, deposits, or other instruments. These foreign liabilities constitute the cross-border linkages between home and host countries and the channels through which financial shocks are transmitted. GDP is the quarter-on-quarter, seasonality-adjusted growth rate of real GDP in local currency. DEPOSITS is the quarter-on-quarter real growth rate of bank deposits. Bank deposits consist of the sum of domestic demand, time, and savings deposits of deposit money banks.

Table 2A shows that the mean real quarterly growth rates of FOREIGN LIABILITIES were higher than those of PRIVATE CREDIT AND DEPOSITS, and its standard deviation was considerably higher, by a factor of three or larger. This result reveals the major weakness of

[2] We also used GDP deflators but this variable limited the sample. All our results hold using the GDP deflator although they become slightly less significant.

foreign funding – its volatility in periods of crisis. The mean growth rates of FOREIGN LIABILITIES AND PRIVATE CREDIT foreign were much higher in the case of ECA countries, relative to Non-ECA countries, reflecting the greater reliance of the ECA region on foreign funding and the key role played by cross-border finance in ECA's pre-crisis credit boom. Interestingly, the standard deviation of FOREIGN LIABILITIES in the ECA and non-ECA regions are similar, revealing that countries in the two regions are potentially exposed to the same volatility in periods of crisis, but ECA countries are much more exposed, given their greater reliance on foreign funding. This result will be further explored in Section V.

B. Sample Split Variables

One of the objectives of this paper is to understand the factors that drive the response of PRIVATE CREDIT to other PVAR variables in ECA countries and other emerging countries, and identify the differences across regions. In doing so, we use various variables hypothesized to explain the difference to split the sample further. These variables are the loan-to-deposit ratio (LDR), the share of foreign ownership of the banking system (FOREIGN OWNERSHIP), and the share of foreign liabilities in total bank liabilities (FOREIGN FUNDING). To gauge the impact of these variables, we split the sample based on their pre-crisis values, right before the banking system weaknesses in ECA became apparent. Table 2B reports the pre-crisis country averages for our three sample-split variables broken for ECA and non-ECA countries.[3] Appendix Table A2 reports individual country-level data.

More specifically, LDR is the loan-to-deposit ratio calculated as the ratio of PRIVATE CREDIT to DEPOSITS, defined as above from the IFS. LDR proxies the extent to which domestic bank credit is funded by domestic deposits. An LDR in excess of 100 percent implies that credit is financed with other sources of funding such as parent funding, unsecured wholesale funding in international or domestic markets, or other instruments such as covered bonds. Some of these

[3] We use 2007:Q4 values for LDR and FOREIGN FUNDING. We use the closest available observation for FOREIGN OWNERSHIP, which is 2008 for most countries.

funding sources are typically short-term and highly sensitive to market conditions, in contrast with retail deposits which are usually more stable. FOREIGN FUNDING is a proxy for the banking system's reliance of foreign sources of funding relative to total funding, calculated as the ratio of FOREIGN LIABILITIES to the sum of FOREIGN LIABILITIES AND DEPOSITS. FOREIGN FUNDING complements LDR and provides information on the extent to which the deposit funding gap captured by the LDR measures is filled with foreign sources of funding. Lastly, FOREIGN OWNERSHIP measures the fraction of banking system assets that are majority-owned by non-residents. These data are taken from the World Bank's Bank Regulation and Supervision Survey.

Table 2B shows that LDR, FOREIGN FUNDING and FOREIGN OWNERSHIP are significantly higher in ECA countries, relative to non-ECA countries, although the standard deviations also suggest that there is substantial variation across countries within each of the two regions. This is an important result that will also be further explored in Section V.

C. Correlations

Panel A of Table 3 presents the correlations between our PVAR variables for the full sample, as well as for ECA and the rest of the sample ("non-ECA"). As expected, the correlation between DEPOSITS and PRIVATE CREDIT is high in all samples. We also observe that FOREIGN LIABILITIES are correlated with PRIVATE CREDIT (0.40). However, this correlation is almost twice as high in ECA compared to non-ECA (0.50 vs. 0.23). This suggests that credit in the ECA region is more vulnerable to foreign funding shocks than in the rest of the world, a hypothesis we formally test with PVARs in Section V.

Panel B of Table 3 displays the correlations for the sample split variables and clearly shows the different funding model in ECA, reflected in the high correlation between FOREIGN FUNDING and LDR in that region and the absence of a correlation between these two variables outside the region. Indeed many banks in ECA relied on foreign funding to supplement domestic deposits and sustain high credit growth, resulting in high loan-to-deposit ratios (see also Figure 1). Some countries in the non-ECA region have high LDR ratios but these reflect primarily domestic

liabilities. We also find that FOREIGN FUNDING and FOREIGN OWNERSHIP are significantly and positively correlated in the full sample implying that foreign bank ownership is generally associated with higher cross-border funding. Interestingly, the correlation between these two variables is not significant in the two sub-samples. This reflects the fact that both FOREIGN OWNERSHIP and FOREIGN FUNDING are generally higher in ECA compared to non-ECA countries, but also that within each sub-sample there is a greater variety of combinations (see Table 4, Panel B and Table A2). More specifically, Central and Southern European countries tend to have high levels of foreign ownership but different levels of parent funding, while CIS countries tend to have lower levels of foreign ownership but domestic banks in some of these countries have borrowed significantly from wholesale markets abroad.

IV. Methodology[4]

A. Panel Vector Autoregressions (PVARs)

PVARs combine the advantages of the traditional Vector Autoregression (VAR) approach with the panel-data approach. Our PVAR methodology follows Love and Zicchino (2006). Basic VARs allow for the simultaneous analysis of the evolution of a system of endogenous variables. The prime benefit of VARs is that the dynamic impact of orthogonal shocks can be evaluated—i.e. the isolated impact of a shock of one variable on the system over time, keeping the shocks of the other variables equal to zero. At the same time, the panel-data dimension of PVARs allows for unobserved, time-invariant heterogeneity of the cross-sectional units (e.g. countries) to be controlled for with fixed effects.

The PVAR technique is therefore particularly suitable for our purposes because we seek to model the evolution of a system of four variables of interest—PRIVATE CREDIT, FOREIGN LIABILITIES, GDP, AND DEPOSITS—in a set of countries which significantly differ along various dimensions such as the level of financial and economic development and the quality of regulatory and institutional frameworks. Moreover, these countries are faced with common exposures such as global financial and economic shocks and extraordinary measures of large

[4] See Annex for further technical details on PVARs.

central banks. Controlling for these common exposures is particularly relevant because our sample includes the onset of the global financial crisis during which financial stress rapidly spilled over to other parts of the world significantly increasing the size of common risk factors.

The structure of our baseline PVAR model can be written in reduced form as follows:

$$Z_{it} = \Gamma_0 + \Gamma_1 Z_{it-1} + f_i + d_t + e_{it} \quad (1)$$

where Z_{it} is a vector of our four variables for quarter *t* and country *i* and modeled as a function of the first-order lags of all variables in the system. The f_i and d_t terms are dummy variables for country *i* and quarter *t* which capture time-invariant country-specific effects and time-varying common effects, respectively.

To minimize the influence of outliers, we winsorize all variables by replacing the data below the 1st percentile with the value of the 1st percentile. Similarly, we replace the data above the 99th percentile with the value of the 99th percentile.[5]

B. Impulse-response Functions and Variable Orderings

One of the advantages of PVARs is their ability to model the impact of an isolated shock or innovation of a single variable on the whole system over time, while setting the innovations of all other variables equal to zero. This produces so-called impulse-response functions which display a point estimate of the response and a corresponding confidence interval for several post-shock periods. The response can be said to be statistically significant if the confidence interval does not include the horizontal axis (i.e. the zero line) of the impulse-response function. Impulse-responses take into consideration the estimated coefficients matrix, as well as the correlation of residuals across equations.

However, the errors across the variables in the system are typically correlated, which inhibits the attribution of the impact of an innovation of a single variable to that variable only. To isolate the

[5] We choose to winsorize the data to avoid a significant reduction in our sample size by dropping these outliers. However, our results are robust to excluding these observations from the system (results available upon request).

impact of innovations, it is necessary to decompose the residuals in such a way that they become orthogonal. The common solution is to adopt a particular variable ordering which assumes that variables that come earlier in the order affect all following variables contemporaneously, while variables that come later affect previous variables only with a lag. That is, in the VAR model all the variables are treated as endogenous, the ordering only affects the timing of the responses and the variables that come later in the ordering have a delayed response on the variables that come earlier in the ordering. As a result of this process, the correlation between the residuals of two variables is allocated to the variable that comes first in the ordering. The ordering can therefore have implications for the shape of impulse-response functions and for variance decompositions.

In our baseline model, we assume the following ordering: FOREIGN LIABILITIES, GDP, DEPOSITS and PRIVATE CREDIT. We place FOREIGN LIABILITIES first since it is to a large extent driven by external supply factors such as global risk appetite, parent bank health, economic home conditions, and global funding markets. This assumption implies that FOREIGN LIABILITIES affects all other variables contemporaneously. In contrast, the other variables can only affect FOREIGN LIABILITIES with a 1-quarter lag. This is a reasonable assumption since reversing the flow of foreign liabilities is likely to take some time.

We place PRIVATE CREDIT last in the order because arguably PRIVATE CREDIT can react to all other factors quickly, i.e. in the same quarter; however, the PRIVATE CREDIT only affects other variables with a 1-quarter lag. Indeed, typically there is a delay between loan origination and loan deployment, so an impact on other variables can only be expected with a lag.

Having established FOREIGN LIABILITIES and PRIVATE CREDIT as first and last in the order, respectively, in our baseline model we put GDP second, followed by DEPOSITS. Our rationale is that GDP has a more immediate impact on DEPOSITS as money demand responds more quickly to changes in GDP, while changes in DEPOSITS are likely to affect GDP only

with a lag. However, the alternative ordering in which DEPOSITS enters second and GDP third produces qualitatively similar results.[6]

In this paper, we aim to understand the differences in responses of PRIVATE CREDIT to shocks in various sub-samples to gauge whether i) there are differences between country groupings and ii) what factors can explain those differences. In our first sample split, we explore whether there are differences between the ECA region and the rest of the sample. Second, we split the full sample based on the three sample split variables that highlight the differences in ECA's banking model: LDR, FOREIGN OWNERSHIP, and FOREIGN FUNDING. We use the pre-crisis median value of each of these variables to split the full sample into high and low subsamples of equal size. After each split, we produce separate impulse-response functions for each subsample for visual inspection. To test for statistical significance between the subsamples we also produce impulse-response functions of the response *difference* of the two subsamples and use the associated confidence interval to determine statistical significance.

C. Variance Decompositions

Besides impulse-response functions, we also employ variance decompositions to understand the cumulative impact of the shock of a particular variable on the system. More specifically, variance decompositions show the percent of the variation in one variable after a certain amount of time that is explained by the shock of another variable and therefore provide an indication of the magnitude of the total effect a variable exerts on another. We report the total effect accumulated over 10 quarters, but longer time horizons produced equivalent results since after 10 quarters the effect of a shock has mostly worked its way through the system.

V. Empirical Results

A. T-tests: Is ECA Different from the Rest of the World?

[6] The order for our alternative model is: FOREIGN LIABILITIES, DEPOSITS, GDP and PRIVATE CREDIT. The main results are not affected. However, in the variance decomposition, the impact of GDP on PRIVATE credit is slightly smaller and the impact of DEPOSITS is slightly larger compared to the baseline model (results available upon request).

Before presenting our PVAR results, we first ascertain the presence of differences between ECA and the rest of the world. In doing so, we split our sample into ECA and non-ECA subsamples and run basic mean comparison t-tests to document statistically significant differences in the subsample means of an indicator of interest. By running t-tests for different periods, we are able to track the evolution of our variables in ECA and non-ECA before (2005-07), during (2008-2009), and after (2010-2011) the global financial crisis.

Table 4 presents the results. Panel A documents the ECA vs. non-ECA differences for the PVAR variables: PRIVATE CREDIT, FOREIGN LIABILITIES, GDP, and DEPOSITS. We observe that in the pre-crisis period, ECA was significantly different from the rest of the sample in terms of the growth of foreign liabilities, private credit, and deposits. The quarterly real rate of growth of foreign liabilities and private credit for ECA was more than double the respective rates of growth in non-ECA countries: 10.06% vs. 3.64% for foreign liabilities and 7.87% vs. 3.15% for private credit. These differences are statistically significant and reveal the distinctiveness of ECA's business model, which consisted of rapid private credit growth sustained by large inflows of foreign funding. The resulting ECA credit boom contributed to higher average real deposit growth (5.42% vs. 2.65%) and in real GDP growth (0.95% vs. 0.51%) compared to non-ECA.

Next, we study the PVAR variables during the peak of the crisis in 2008-2009. During that period, credit growth declined in both regions, but relatively more in ECA, due to the sharp drop in foreign liabilities. Private credit growth remained higher in ECA (2.15% vs. 1.45%), but the difference is only marginally significant in this period, in contrast with the preceding period. Foreign liabilities growth declined significantly but remained higher in ECA (2.33% vs. 0.74%), reflecting the impact of the Vienna Initiative. However, the difference of foreign liabilities was not statistically significant in this period, reflecting substantial variations in the sample, including the ECA subsample. Note that economic activity contracted significantly in ECA during this period (-1.86% vs. -0.51%), driven by the sharper slowdown in credit and other factors (exports, remittances, tourism).

In the immediate post-crisis years (2010-2011), many non-ECA countries started their recovery as evidenced by the acceleration of foreign liabilities, private credit, and deposit growth. In contrast, the growth of foreign liabilities and credit in ECA were significantly slower, reflecting the onset of the EU's sovereign and banking crisis, its protracted effects on cross-border lending, and ECA's greater dependency on foreign funding. The continuation of the crisis in the EU is also reflected in the lower GDP and deposit growth rates in ECA, although the differences are not statistically significant.

Given such distinctive differences in the impact of the global crisis and the path of recovery in ECA vs. non-ECA economies, we seek to understand what key pre-crisis features of financial systems in ECA could be responsible for such differences. As discussed, we hypothesize the differences could be attributed to dissimilarities in the funding model and/or the extent of foreign ownership. Therefore, to gauge business model differences we use t-tests on LDR, FOREIGN OWNERSHIP and FOREIGN FUNDING. Table 4, Panel B shows the results.

The average LDR in ECA is significantly higher than in non-ECA (127% vs. 101%). The higher LDR shows that ECA banks relied much more on non-deposit, external funding and had significantly less liquid assets to deal with a liquidity shock compared to non-ECA banks. Moreover, since ECA's LDR exceeds 100% by a wide margin, ECA had to fund its liquidity gap from other sources, especially of foreign nature, as evidenced by the fact that FOREIGN FUNDING was twice as high in ECA compared to non-ECA (32% vs. 11%). While these foreign sources of funding can act as stabilizers when stress originates from the domestic financial sector (e.g. De Haas and Van Lelyveld, 2006), they can also function like conduits of foreign financial stress (e.g. Cetorelli and Goldberg, 2010). The ECA funding model contrasts sharply with the one of foreign bank affiliates in Latin America which typically source their funding in domestic markets—mostly retail deposits—which impedes excessive credit expansion and the transmission of foreign stress.

At the same time, we find that foreign ownership is also very high in ECA. In the average non-ECA country, 33% of banking assets are majority-owned by non-residents compared to 65% in

the average ECA country. Therefore, many ECA countries have relatively high foreign bank ownership, high foreign funding dependence, *and* high loan-to-deposit ratios. As such, it is difficult to disentangle the impact of foreign ownership from the impact of foreign funding based on sample averages. In addition, such sample averages cannot distinguish whether demand (e.g. GDP) or supply (e.g. foreign liabilities and deposits) factors drove the decline of the private credit because all these variables deteriorated simultaneously during the crisis. To address these issues we now turn to PVARs.

B. The Baseline Model for the Entire Sample

Our baseline PVAR models the interaction between PRIVATE CREDIT, FOREIGN LIABILITIES, GDP, and DEPOSITS using Generalized Method of Moments (GMM) estimations for our entire sample of 41 countries. As discussed, the PVAR approach allows us to exploit the panel structure of our sample while at the same time modeling the dynamic interactions between our variables and how they behave in response to shocks. Importantly, the PVAR allows us to separately study demand and supply factors to better understand the evolution of PRIVATE CREDIT. Because we include all countries, the baseline model will provide a good idea of the basic interactions between the variables for the average country and help us interpret the findings when we start splitting the sample.

For completeness, we report the coefficient estimates of our reduced form PVAR models for the full sample, and the ECA and non-ECA subsamples in Table 5. Since our main focus is to isolate how shocks to one variable affect another variable, we don't focus on the coefficient estimates and instead turn our attention to the impulse-response functions.

Figure 2 shows 4×4=16 impulse-response functions for our baseline model. Each row corresponds to a particular variable and shows 4 impulse-response functions which display how this variable responds to an isolated shock of each of the variables in the system (i.e. including the variable itself). Each response is traced for 6 periods (1.5 years) after which the shock has mostly worked its way through the system and any residual impact is minimal. For example, the graph in row 1, column 4 reports the response of FOREIGN LIABILITIES to a shock in

PRIVATE CREDIT and the graph in row 4, column 1 reports the response of PRIVATE CREDIT to a shock in FOREIGN LIABILITIES. Because PRIVATE CREDIT comes later in the ordering, its impact on FOREIGN LIABILITIES is delayed by one period (and hence there is no effect at time zero), while the impact of FOREIGN LIABILITIES on PRIVATE CREDIT is immediate and positive at time zero. Each graph shows the point estimates of the impulse-response function (the middle line) as well as the 5% and 95% confidence bounds (the top and the bottom lines) which are based on Monte Carlo simulations (see Annex). The confidence interval allows us to gauge whether a shock triggers a statistically significant response by inspecting whether the interval excludes the x axis (i.e. the zero line).

Given our research objective, we focus on row 4 which displays how PRIVATE CREDIT responds to various shocks. The upper part of Table 6 presents the point estimates of the impulse-response of PRIVATE CREDIT to each of the factors for the 6 periods which are plotted in Figure 2 in row 4. We start with the impact of our supply factors. We document a significantly positive response of PRIVATE CREDIT to a shock in FOREIGN LIABILITIES. This suggests that FOREIGN LIABILITIES is a significant driver of PRIVATE CREDIT in the entire sample: a one standard deviation shock in FOREIGN LIABILITIES results in a 1.24% increase in PRIVATE CREDIT at time zero which is large given that average PRIVATE CREDIT in our entire sample is 3.2% and its standard deviation is 5.1% (see Table 2A). This is a key result which we will study further in order to understand response differences in ECA vs. non-ECA countries. Next, we find a positive response of PRIVATE CREDIT to GDP, which captures the demand for credit. This response is also statistically significant, but somewhat smaller in magnitude: 0.59% at time zero. Finally, we observe a positive and significant response of PRIVATE CREDIT to a DEPOSITS shock: 1.53% at time zero. Thus, we conclude that all our supply and demand factors are significant drivers of PRIVATE CREDIT.

Various other impulse-response functions in Figure 2 show interesting results that are statistically significant. FOREIGN LIABILITIES responds positively to a PRIVATE CREDIT shock (row 1, column 4) suggesting that a sudden increase in credit can be funded by FOREIGN LIABILITIES which can typically be attracted on short notice. These results are clearly caputing

the mobilization of foreign funding from both parent banks and wholesale markets abroad during the credit boom period. At the same time, DEPOSITS also respond positively to a PRIVATE CREDIT shock (row 3, column 4) but the magnitude is smaller than for foreign liabilities, arguably because it is more difficult to significantly raise deposits in the short term. Together, these findings imply that foreign sources of funding can be useful to temporarily fill domestic funding gaps. We also confirm that a PRIVATE CREDIT shock boosts GDP, which is expected since private credit typically expands consumption and investment. This corroborates with results of the finance and growth literature (e.g. Levine, 1997). Finally, all variables have a positive and significant response to their own shocks (the charts on the diagonal of Figure 2), but this is simply a mechanical result.

Impulse-response functions are useful to study the short-term response of each variable to a shock in another variable. To examine the long-term cumulative impact of a shock we compute variance decompositions. Table 7, Panel A displays the variance decomposition for our baseline model. Each cell in the table shows what percent of variation in the row variable is explained by the column variable after the 10 quarters, i.e. 2.5 years. Note that by construction shocks to a variable of its own lag explains most of its variance (i.e. the diagonal of Table 7, Panel A contains the largest values).

Row 4 of Table 7, Panel A reports that a FOREIGN LIABILITIES shock explains a large part of the variance in PRIVATE CREDIT (9.7%). DEPOSITS shocks explain an even larger portion of the variance (14.2%), but this is expected, given that typically DEPOSITS account for the largest share of total bank liabilities in all countries, including countries that rely more on foreign funding. The fact that FOREIGN LIABILITIES explain a large part of the variance of PRIVATE CREDIT, almost equal to that of DEPOSITS, despite representing typically a much smaller share of total bank liabilities, reveals again the downside risks associated with cross-border borrowing. By contrast, shocks to GDP do not seem to contribute to the variance in PRIVATE CREDIT (2.4%). This could be due to longer response lags or noise in the quarterly GDP data in some countries in the sample.

Taken together, our PVAR model explains a substantial portion of the variation in PRIVATE CREDIT (26.2% is explained by other variables and 73.8% is explained by its own shocks). A smaller portion of the variation in DEPOSITS and FOREIGN LIABILITIES is explained by other variables: 7.4% and 3.3%, respectively. The explanatory power of GDP is substantially lower (less than 1% is explained by non-GDP factors). However, our objective is to build a predictive model for PRIVATE CREDIT and our model fulfills this objective. Our next goal is to compare the impact of various shocks to private credit growth in different country samples. Therefore, we will use these findings as our reference point for our subsample results.

Before we proceed with our sample splits, we conduct various robustness checks to our baseline model. First, our baseline impulse-response functions and variance decompositions do not change significantly when we i) include an additional lag in the model[7] or ii) change the ordering of the variables where we interchange DEPOSITS and GDP (results available on request). Second, we find that dropping large outliers (i.e. extreme observations above 99th percentile and below 1st percentile) rather than winsorizing the data do not affect the results (results available on request). Therefore, in the remainder of this paper, we use the ordering of the baseline model and include 1 lag only.

C. Sample Splits: Is ECA Different from the Rest of the World?

After having established the baseline impulse-response functions and variance decompositions for the whole sample, we set out to explain whether PRIVATE CREDIT in the ECA region responded differently compared to the rest of the world. Indeed, our basic sample mean analysis suggested that ECA experienced a deeper PRIVATE CREDIT contraction which persisted for several more years relative to the rest of the world.

[7] Adding an additional lag to the model significantly increases the number of coefficients that have to be estimated – i.e. from 16 in our baseline model to 32 – and reduces the number of observations from 1,591 in the baseline model to 1,554 because one year of data is lost. The loss in degrees of freedom is particularly relevant for models for subsamples.

We therefore split our full sample into ECA and non-ECA subsamples and run separate PVARs for each subsample. The two subsamples are roughly equal in size: (ECA: 22 countries, 947 observations; non-ECA: 19 countries, 820 observations). Figure 3 presents the results. For space considerations, we only present impulse-response functions and variance decompositions for PRIVATE CREDIT, our key variable. The first and second rows in Figure 3 show the PRIVATE CREDIT impulse-response functions to shocks of all four variables for the ECA and non-ECA subsamples, respectively ("Sample: ECA" and "Sample: Non-ECA"). Both rows exhibit very similar patterns to our baseline findings and confirm our key result: the significant and positive response of PRIVATE CREDIT to a FOREIGN LIABILITIES shock. We also observe a positive and significant response in both samples to GDP and DEPOSITS shocks.

The key question, however, is whether the magnitude of the PRIVATE CREDIT response to a FOREIGN LIABILITIES shock is significantly different in a statistical sense between the ECA and non-ECA subsamples. Visual inspection of the 95th percentile bound of the first two rows shows that response to a FOREIGN LIABILITIES shock is substantially larger in the ECA sample: 1.71% vs. 1.10% in non-ECA. Table 6 reports the actual point estimates for the impulse-response functions in period zero: 1.53 and 0.89 in ECA and non-ECA, respectively. The ECA response is thus 0.64 percentage points higher (72%), which is an economically relevant difference. The difference is even more pronounced after 1 quarter: the response in period 1 in ECA is 0.74, while in non-ECA it is 0.23, which is about 3 times lower. This pattern continues for several quarters – even in quarter 3 the ECA response is at 0.28, while the non ECA is at 0.07. Thus, the impact of FOREIGN LIABILITIES shocks in ECA is not only stronger in magnitude, but also lasts longer.

To assess whether this difference is also statistically significant, we calculate the impulse-response functions of the *difference* between ECA and non-ECA. Figure 3, row 3 presents the result ("Sample: Difference"). Row 3, column 1 confirms the difference is indeed significant (i.e. the zero line does not fall within the confidence interval). The other impulse-response functions in row 3 show that PRIVATE CREDIT does not behave differently in ECA in response to a GDP shock, while there is a slightly larger response to a DEPOSIT shock after 1 period.

Lastly, we compute the variance decompositions in the ECA and non-ECA subsamples to study the cumulative longer-term impact of various shocks on PRIVATE CREDIT. Table 7, Panel B reports the results. To save space, we only report the decompositions for the PRIVATE CREDIT variable. The first row is the baseline decomposition for the whole sample, replicated from Panel A. The second and third rows show the decompositions for the ECA and non-ECA subsamples, respectively. A FOREIGN LIABILITIES shock explains 6.0% of the PRIVATE CREDIT variation in non-ECA countries which is substantially less than the baseline of 9.7% (see Table 7, Panel A). In contrast, a FOREIGN LIABILITIES shock explains 12.9% of the variation in the ECA subsample, more than twice as large as in the non-ECA group. These findings establish the second of our key results: PRIVATE CREDIT in ECA has been more heavily influenced by shocks to FOREIGN LIABILITIES. Unlike the case of Non-ECA countries, shocks to FOREIGN LIABILITIES in ECA countries explain almost the same share of the variations of PRIVATE CREDIT as DEPOSITS, despite the fact that FOREIGN LIABILITIES account for a smaller share of bank liabilities than DEPOSITS, even in ECA. This result reflects both the larger exposure of ECA countries to cross-border finance (larger FOREIGN FUNDING) and the much higher volatility of FOREIGN LIABILITIES in periods of crisis, as reported in Table 2A.

D. Further Sample Splits: Explaining Differences in Private Credit Responses

After having established that PRIVATE CREDIT is significantly more responsive to FOREIGN LIABILITIES shocks in ECA compared to non-ECA countries, this section seeks to identify the factors that drive the difference—different factors will imply different policy implications. As discussed above, the banking sector in ECA is markedly different from those in non-ECA countries along our sample split variables: ECA countries exhibit significantly higher foreign ownership (FOREIGN OWNERSHIP), higher reliance on foreign funding (FOREIGN FUNDING), and higher LDR ratios (LDR).

To further investigate which of these factors is driving the observed difference between the ECA and non-ECA subsamples, we perform sample splits using each of the three sample-split variables one at a time. In each case we split the whole sample in two subsamples of equal size

based on the median value of the variable in question. The sample-split approach is similar to interacting each of the factors with the responsiveness of private credit to foreign liabilities.[8]

First, we test whether LDR is driving the response differences. We calculate the pre-crisis median LDR ratio in our full sample using data from the fourth quarter of 2007. We then split the full sample into high and low LDR subsamples of equal size based on the median and rerun our baseline model for each sample. The impulse-response results are presented in Figure 4 and the variance decompositions are presented in Table 7, Panel B. We find that the difference between the response of PRIVATE CREDIT to a FOREIGN LIABILITIES shock in both high LDR and low LDR samples is positive and statistically significant.[9] In addition, the responses differ significantly in magnitude. The variance decomposition shows that in the high LDR subsample, a FOREIGN LIABILITIES shock explains 14.1% of the variation in PRIVATE CREDIT, while this is only 5.6% in the low LDR sample. This finding suggests that high LDRs are associated with a stronger response of PRIVATE CREDIT to FOREIGN FUNDING shocks and consistent with the notion that high LDRs are at least partially responsible for the ECAs weak crisis and recovery experience while the rest of the world proved more resilient.

Next, we perform another sample split and run new PVARs to test whether foreign funding dependence is driving the difference. In doing so, we use pre-crisis FOREIGN FUNDING values for all countries from the fourth quarter of 2007 and split the sample into high and low FOREIGN FUNDING subsamples. The impulse-response results are presented in Figure 5 and the variance decompositions are presented in Table 7, Panel B. We find that the difference between the response of PRIVATE CREDIT to a FOREIGN LIABILITIES shock in high and low FOREIGN FUNDING samples is positive and statistically significant. Again, we find a strong difference in the magnitude of response to shocks. The variance decompositions show that in the high FOREIGN FUNDING subsample a FOREIGN LIABILITIES shock explains 12.9% of the variation in PRIVATE CREDIT, while it only explains 6.9% in the low FOREIGN

[8] Note that such interactions cannot be modeled directly in a VAR setting.
[9] The significance is at about 5% in period 1 because the bottom 5th percentile line is touching the zero line, while it is stronger in periods 0 and period 2 and 3.

FUNDING subsample. These results suggest that high reliance of countries on foreign funding is associated with stronger response of PRIVATE CREDIT to FOREIGN FUNDING. Again, the results are in line with the hypothesis that high reliance on foreign funding is responsible for explaining the difference between the ECA and non-ECA samples.

Lastly, we split our full sample using FOREIGN OWNERSHIP. Based on the latest pre-crisis data, we create high and low FOREIGN OWNERSHIP subsamples. The impulse-response results are presented in Figure 6 and the variance decompositions are presented in Table 7, Panel B. We find that the difference between the responses of PRIVATE CREDIT to a FOREIGN LIABILITIES shock in the high and low FOREIGN OWNERSHIP samples are not statistically significant (row 3). The variance decompositions show that in the high FOREIGN OWNERSHIP subsample a FOREIGN LIABILITIES shock explains 10.0% of the variation in PRIVATE CREDIT while it explains 9.1% in the low FOREIGN OWNERSHIP subsample, which is not materially different. These results suggest foreign ownership itself is not associated with a stronger response of PRIVATE CREDIT to FOREIGN LIABILITIES, in contrast with high LDR and high FOREIGN FUNDING. Therefore, we find no evidence that foreign ownership *per se* is responsible for the observed differences between ECA and non-ECA countries in their impact of a FOREIGN LIABILITIES shock on PRIVATE CREDIT.

Taken together, our findings suggest that high LDR and high FOREIGN FUNDING in ECA have significantly contributed to the difference in responses of PRIVATE CREDIT to FOREIGN LIABILITY shocks in ECA vs. non-ECA countries. In contrast, we do not find that high FOREIGN OWNERSHIP drives the difference. This implies that the funding model of banks in ECA is at the heart of ECA's vulnerability to external financial shocks rather than the strong presence of foreign banks in the region *per se*.

E. What factors explain differences of ECA with the rest of the world?

Our previous results suggest that the differences in the impact of FOREIGN LIABILITY shocks on PRIVATE CREDIT between ECA and other regions are not driven by differences in FOREIGN OWNERSHIP. Instead, these differences seem to be driven primarily by the lack of a

more stable funding model, reflected in high loan-to-deposit ratios (LDR) and much greater reliance on foreign funding (FOREIGN FUNDING).

In this section we provide further evidence on the factors that drive the differences in ECA and the rest of the world. While all three factors – LDR, FOREIGN FUNDING and FOREIGN OWNERSHIP – are higher in ECA, not all factors are high in all countries at the same time, as we discussed above. This allows us to investigate which of the three factors is driving the difference between ECA and non-ECA in terms of the response of private credit to foreign funding shocks. In doing so, we adopt the following procedure. First, we create "truncated ECA samples" by removing countries that are high on one of the characteristics that we are interested in—FOREIGN OWNERSHIP, FOREIGN FUNDING, and LDR. Such a "truncated ECA sample" is more similar to the rest of the world in terms of the selected characteristic (i.e. FOREIGN FUNDING), but can be different in terms of the other two characteristics (i.e. LDR and FOREIGN OWNERSHIP). Then we run PVARs on both samples and compare the results of the "truncated ECA sample" with the rest of the world. We do this subsequently for each of our three variables of interest. If we still find a difference between ECA and the rest of the world, we conclude that the specific characteristic appears not to be driving such difference (and vice versa). Table 4, Panel C provides the summary statistics of the various truncated ECA samples.

First, we remove from the ECA sample countries that are high on FOREIGN FUNDING. We use the pre-crisis median of FOREIGN FUNDING to construct this truncated sample. The resulting sample contains ECA countries with relatively low FOREIGN FUNDING. However, even the relatively low FOREIGN FUNDING countries in ECA still have significantly higher FOREIGN FUNDING (20% in the truncated ECA sample, vs. 11% in the non-ECA sample). This stacks the cards towards confirming the differential impact in the truncated ECA sample and the non-ECA sample. We then compare the truncated ECA sample with the non-ECA sample. Figure 7 presents the differences between the samples in the impulse-responses of the response of PRIVATE CREDIT to a FOREIGN LIABILITIES shock. Graph in row 1, column 1 shows that the difference between the truncated ECA sample and non-ECA sample is not significantly

different from zero. This suggests that FOREIGN FUNDING is indeed a factor that explains the response difference between the (full) ECA sample and the non-ECA sample.

Second, we remove from the ECA sample countries that are high on LDR. Again, we use the pre-crisis median LDR in ECA to create the truncated sample. The resulting truncated ECA sample is not significantly different from non-ECA sample in terms of LDR. The graph in Figure 7 row 1, column 2 shows that again, there is no longer a significant difference between ECA and non-ECA samples. Thus, LDR appears also a factor responsible for the observed response differences between the (full) ECA sample and non-ECA sample.

Third, we remove from the ECA sample countries that are high on FOREIGN OWNERSHIP. Again, we use the pre-crisis median FOREIGN OWNERSHIP in ECA to make the truncated sample. The results in row 2, column 1 in Figure 7 show that there still a significant response difference between the truncated ECA sample and the non-ECA sample.

Before drawing conclusions, Table 4, Panel 4 shows that even the truncated ECA sample still has a relatively high level of FOREIGN OWNERSHIP. Average FOREIGN OWNERSHIP in the truncated sample is 39%, while it is 33% in the rest of the world. However, this difference in not statistically significant. Nevertheless, to ascertain the finding, we perform a stricter test. We drop four remaining high FOREIGN OWNERSHIP countries (Serbia (75%), Latvia (68%), Poland (68%) and Armenia (60%)). This further truncated ECA sample has average FOREIGN OWNERSHIP of 23%, which is below the average FOREIGN OWNERSHIP in the non-ECA sample (i.e. 33%), but not significantly different. We then proceed to compare the behavior of this ECA sub-sample with the non-ECA sample. Again, we find the two samples show statistically significantly different responses of PRIVATE CREDIT to FOREIGN OWNERSHIP (row 2, column 2).[10] In other words, even when the ECA looks statistically the same in terms of

[10] We have performed this test after truncating the sample even further – by removing all countries with foreign ownership above 52%, which removed 3 additional countries: Armenia (60%), Latvia (68%) and Poland (67%). The resulting truncated sample has only 7 ECA countries and has the average foreign ownership of 23%, which is way below the non-ECA average of 33% (but not statistically different). Nevertheless, we still find significant

average FOREIGN OWNERSHIP as our non-ECA sample, there is still a significant difference in the response of PRIVATE CREDIT to FOREIGN FUNDING shocks. Therefore, we conclude that foreign ownership does not appear to be the factor that is driving the difference of between the (full) ECA and non-ECA samples.

To summarize our findings, we show that removing from the full ECA sample countries with very high FOREIGN FUNDING or very high LDR makes the "truncated ECA" sample similar to the rest of the world in terms of the response of PRIVATE CREDIT to FOREIGN FUNDING shocks. This suggests that high FOREIGN FUNDING and high LDR are indeed factors that are driving the observed differences between the (full) ECA and non-ECA samples. In contrast, high FOREIGN OWNERSHIP is not driving these differences because even when high FOREIGN OWNERSHIP countries are removed from the ECA sample and the truncated ECA sample has lower average FOREIGN OWNERSHIP than the non-ECA sample, there is still a significant difference in the response of PRIVATE CREDIT to FOREIGN FUNDING shocks. These results provide more direct evidence that high FOREIGN FUNDING and high LDR ratios were key factors in explaining the higher sensitivity of PRIVATE CREDIT to FOREIGN FUNDING shocks in ECA, while high FOREIGN OWNERSHIP per se did not account for this.

VI. Summary of Conclusions and Policy Implications

By applying PVARs to a global country panel database we show that bank credit growth to the private sector is highly sensitive to cross-border funding shocks around the world. We find that this relationship is significantly stronger in the average ECA country where the response is 72% larger compared to the average country in the rest of the world. At the same time, we show that foreign ownership *per se* does not explain the different credit responses in our sample of countries. Instead, our results indicate stronger responses in countries with high loan-to-deposit ratios and stronger reliance on foreign funding. Higher loan-to-deposit ratios make banks more

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differences between responses of private credit to foreign liabilities between this very small sample and the non-ECA sample.

vulnerable to general wholesale funding shocks while high reliance on foreign funding specifically implies exposure to more volatile cross-border financing flows and sensitivity to foreign shocks. Taken together, our findings therefore suggest that funding model differences with the rest of the world were at the heart of ECA's post-crisis credit growth contraction, and that this contraction was not simply due to the high prevalence of foreign bank ownership in the region.

Our findings provide yet another illustration of the potential downside risks of financial opening or financial integration in the absence of adequate regulatory and supervisory frameworks. The easy access to parent funding and direct wholesale borrowings abroad exposed many ECA countries to substantial funding risks which materialized when cross-border flows were interrupted by the global crisis and parent bank health deteriorated. The sudden slowdown of the pace of funding contributed in turn to a sharp slowdown of credit and GDP growth, as well as an accumulation of non-performing loans in many countries (Raiffeisen (2013) and Unicredit (2013)).[11]

As discussed, the Vienna Initiative prevented a severe withdrawal of parent funding and a more dramatic slowdown of credit in the participating countries, but all the countries that were overextended before the crisis have been adjusting their funding structures, both the countries that relied more on parent funding and those that relied more on direct borrowings abroad. This ongoing adjustment is reflected in the decline in loan-to-deposit ratios and the share of foreign liabilities to total liabilities. This adjustment was necessary to curb the excess of the pre-crisis period, and reflect both market and regulatory pressures. The central question being faced by regulators in the region is the extent to which this adjustment will continue to take place.

Recent market research by one of the major international banks operating in the region suggests that European banks will continue adjusting their loan-to-deposit ratios and levels of foreign funding and may eventually move towards a "Spanish" or

[11] The credit boom exposed ECA countries to other risks as well, including credit, interest rate, and exchange rate risks in their consumer, mortgage and SME portfolios.

"Santander" model of standalone subsidiaries which are locally funded and capitalized (Raiffeisen (2013)). This business model was adopted from the outset by Spanish parent banks operating in Latin America and seems to have been driven by pressures from the home supervisor itself (Impavido, Rudolph and Ruggerone (2013) and CGFS (2010b)). This model has minimized within group contagion and mitigated the transmission of the crisis on Latin American banks, although it also possibly sacrifices efficiency of scale, funding, and liquidity, and may lead to costly pockets of liquidity and capital (see, e.g. Fiechter et al (2011) and Schoenmaker (2013)).

The "Spanish model" of standalone subsidiaries is a relevant benchmark for the ECA region, but possibly an extreme solution for a region that shares a common market and a regulatory framework (including the European passport for licensing) and that seeks to establish a banking union in the future. However, in the absence of a common fiscal backstop as part of such a union, standalone subsidiaries can reduce risks to host supervisors and tax payers. Recognizing that the banking union is a long-term project, the question is whether there are regulatory and supervisory approaches that would allow ECA countries to reap most of the benefits of financial integration in the coming years, while mitigating the risks.

The full implementation of Basel III may contribute to the achievement of such an objective. Basel III is expected to boost capital and liquidity and also promote more stable funding through the Net Stable Funding ratio (NSFR). The Basel III approach also opens room for the introduction of additional capital charges on banks with domestic and regional systemic importance, such as Western European banks with a network of subsidiaries in the ECA region.[12] However, the extent to which Basel III will be used to address effectively the problems identified in the crisis remains to be seen. More specifically, the scope for curbing excessive parent funding through the NSFR needs to be further clarified and regulated, and the calibration of capital surcharges to the risks generated by cross-border lending by banks with domestic and regional systemic importance also remains to be tested.

[12] The BIS (2012) discusses a framework for dealing with domestic systemically important banks, including banks with an extensive network of subsidiaries within a region.

Moreover, while Basel III may enable national regulators (home and/or host authorities) to preserve financial stability while maintaining an element of cross-border finance, an additional question is whether further and complementary measures could also contribute to the achievement of this objective. In this regard, some national regulatory authorities already introduced additional measures to induce a more rapid balance sheets adjustment after the crisis without excessively curtailing foreign funding. For example, in 2012 Austrian regulators introduced a cap of 110 percent on the loan-to-deposit ratios of all subsidiaries of Austrian parent banks (see Austrian Financial Market Authority and Austrian National Bank (2012)). The ratio provided some flexibility as it was applied on a flow basis and allowed for the inclusion of long-term domestic market funding instruments (such as covered bonds) in the definition of deposits. Moreover, the level of the cap was determined by the actual region-wide average loan-to-deposit ratio of Austrian subsidiaries, implying that only the more over-extended countries had to adjust their balance sheets. Also, some exceptions to the rule were granted to small subsidiaries.

The approach of Austrian regulators does imply some flexibility relative to the "Spanish model", although it was still met with reservations by many host regulators and parent banks when it was introduced. While there was a general consensus on the need for adjustment, a cap on loan-to-deposit ratios—even when applied on a flow or marginal basis—was considered by many regulators as an excessively blunt instrument that undermined the singleness and openness of European financial markets and financial integration. Also, concerns about the timeliness of the measure were raised. Moreover, smaller countries indicated that they would face greater difficulties, given their more limited scope to develop local and alternative sources of domestic finance.[13]

Therefore, home and host regulators in Europe still face the challenge of designing an effective regulatory framework for cross-border banking in the coming years. Such a framework may include supplements to Basel III to prevent the funding and credit growth excesses of the past

[13] The loan-to-deposit cap was introduced suddenly without consulting host supervisors. After protest of host supervisors, the measure was transformed into a "monitoring measure".

decade and the risk of another crisis, while allowing banking institutions to benefit from the centralized management of capital, liquidity, and funding. There are a variety of measures that can be taken by either home or host authorities, imposed at either the parent or subsidiary level. Beyond national measures, European authorities may also consider if specific supervisory guidance on cross-border funding is needed. In any case, meeting this challenge will be relevant for ECA countries, especially smaller countries that face more constraints to develop local capital markets, and that may continue depending relatively more on parent and other cross-border bank funding.

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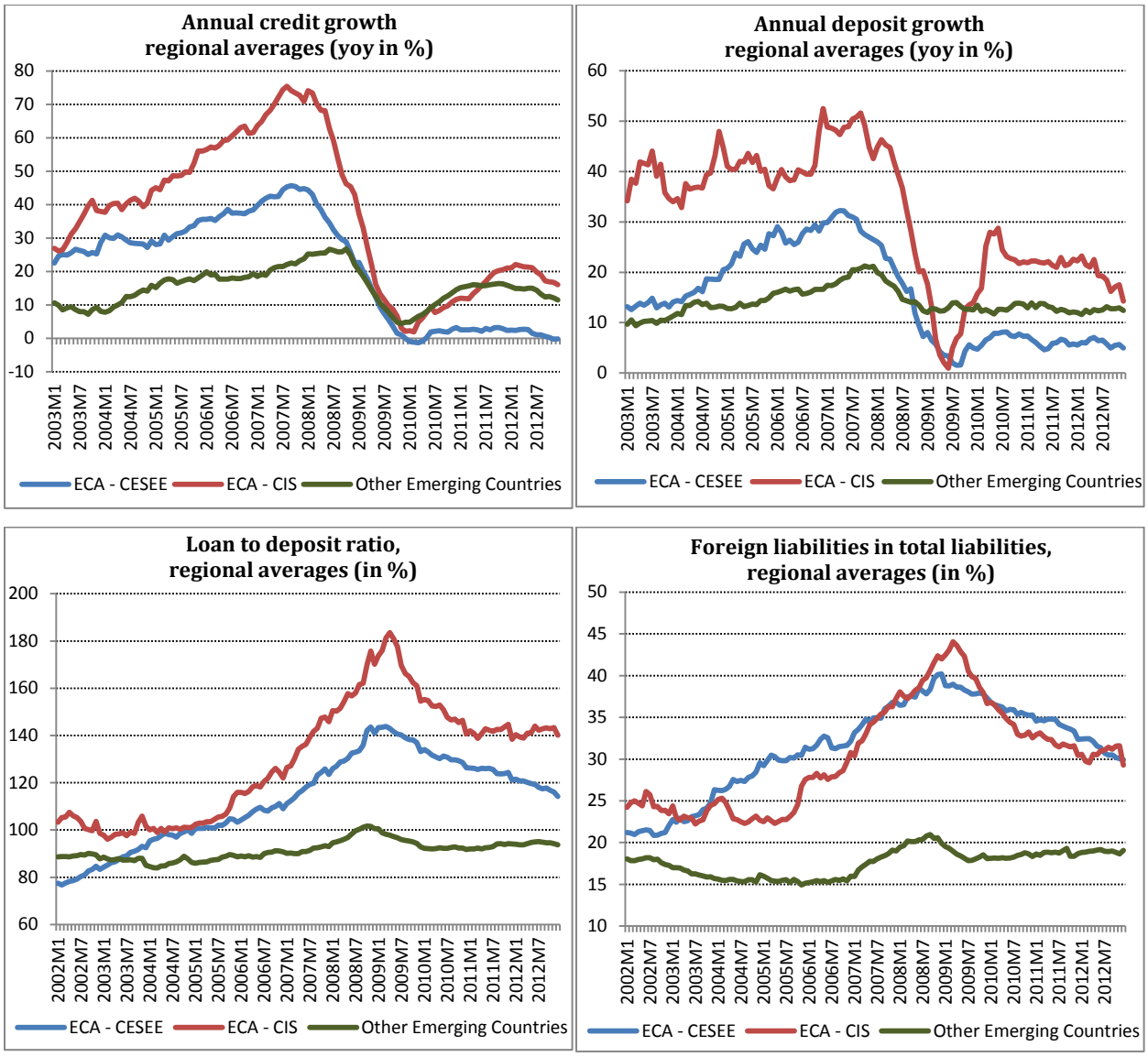
Figure 1 – Credit Trends in ECA and Other Countries



Source: IFS

Figure 2 - Baseline Panel Vector Autoregression Model

The figure displays impulse-response functions of the baseline 1-lag PVAR model which is based on 4 variables: FOREIGN LIABILITIES (foreign), GDP (gdp), DEPOSITS (deposits), and PRIVATE CREDIT (priv cred).

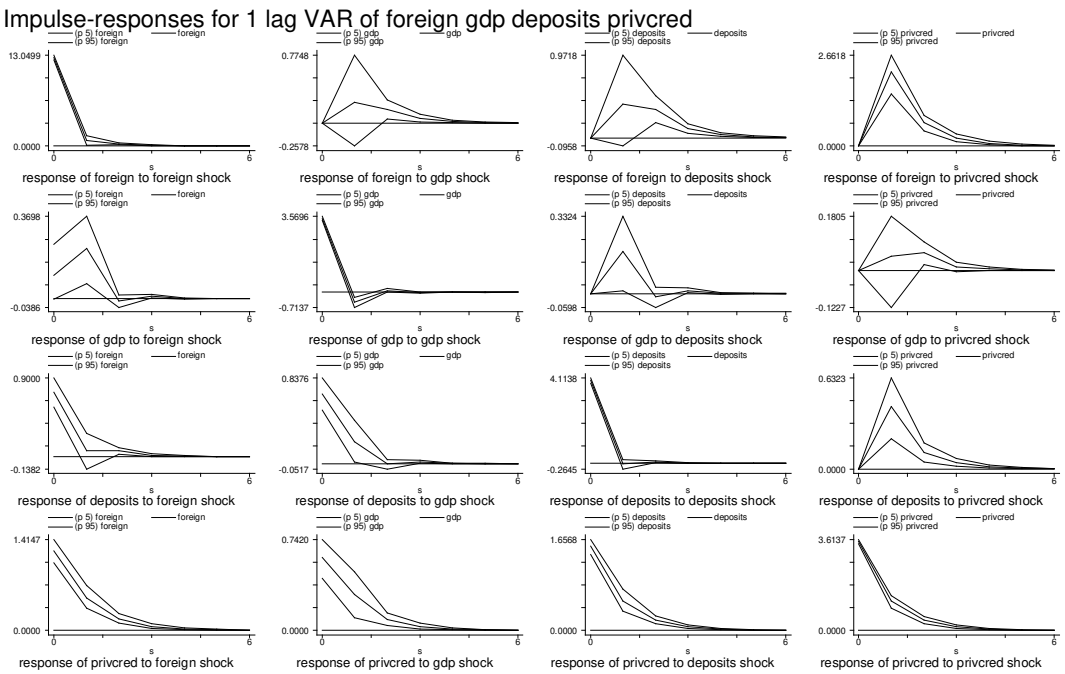


Figure 3 - ECA vs. Non-ECA Sample Split

The figure shows impulse-response functions of PRIVATE CREDIT due to various shocks. The first and second rows provide the functions for the ECA and non-ECA subsamples, respectively. The third row provides the difference functions between these subsamples. The shocks are as follows: "foreign" is FOREIGN LIABILITIES, "gdp" is GDP, "deposits" is DEPOSITS, and "privcred" denotes PRIVATE CREDIT itself.

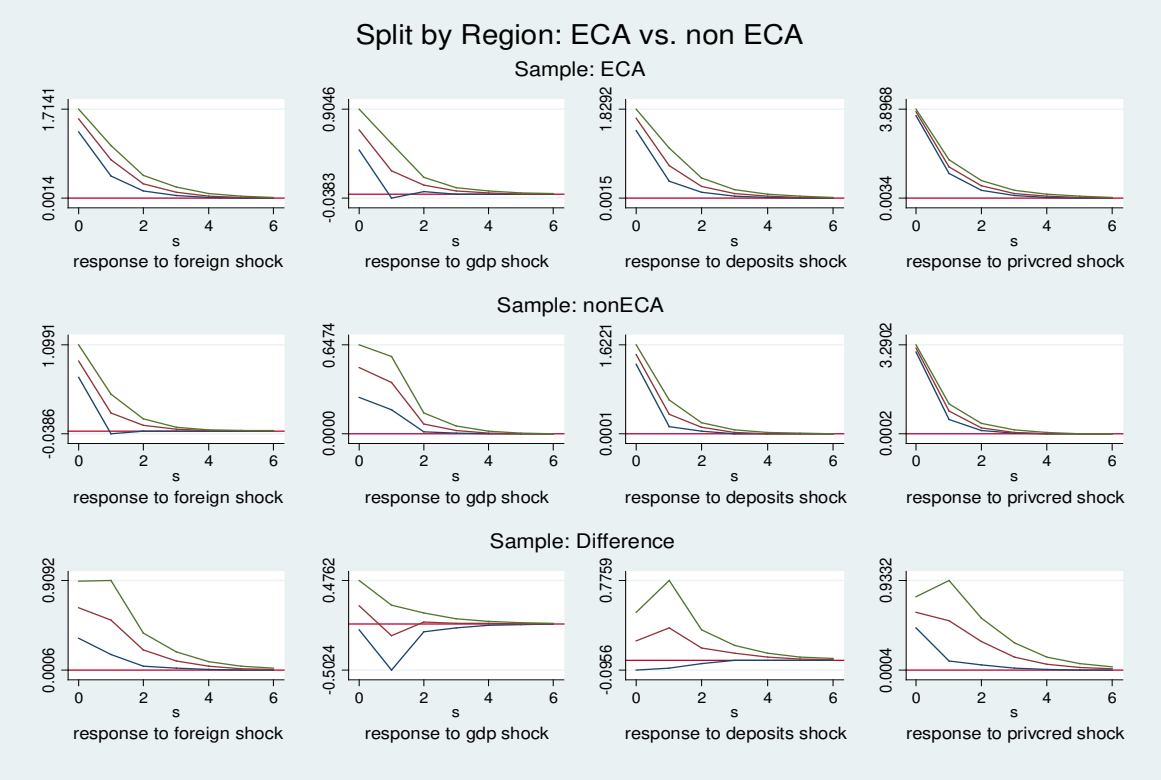


Figure 4- Sample Split by High and Low Loan-to-Deposit Ratios

The figure shows impulse-response functions of PRIVATE CREDIT due to various shocks. The first and second rows provide the functions for the high LDR and low LDR subsamples, respectively. The split is based on the median value (see text for details). The third row provides the difference functions between these subsamples. The shocks are as follows: "foreign" is FOREIGN LIABILITIES, "gdp" is GDP, "deposits" is DEPOSITS, and "privcred" denotes PRIVATE CREDIT itself.

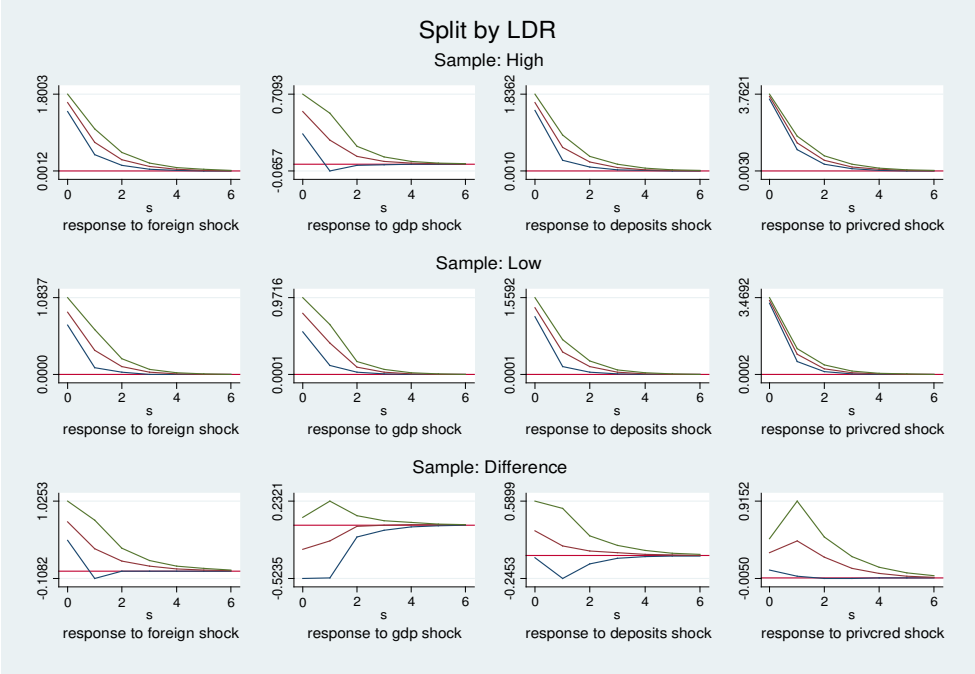


Figure 5 - Sample Split by High and Low Foreign Funding Dependence

The figure shows impulse-response functions of PRIVATE CREDIT due to various shocks. The first and second rows provide the functions for the high FOREIGN FUNDING and low FOREIGN FUNDING subsamples, respectively. The split is based on the median value (see text for details). The third row provides the difference functions between these subsamples. The shocks are as follows: "foreign" is FOREIGN LIABILITIES, "gdp" is GDP, "deposits" is DEPOSITS, and "privcred" denotes PRIVATE CREDIT itself.

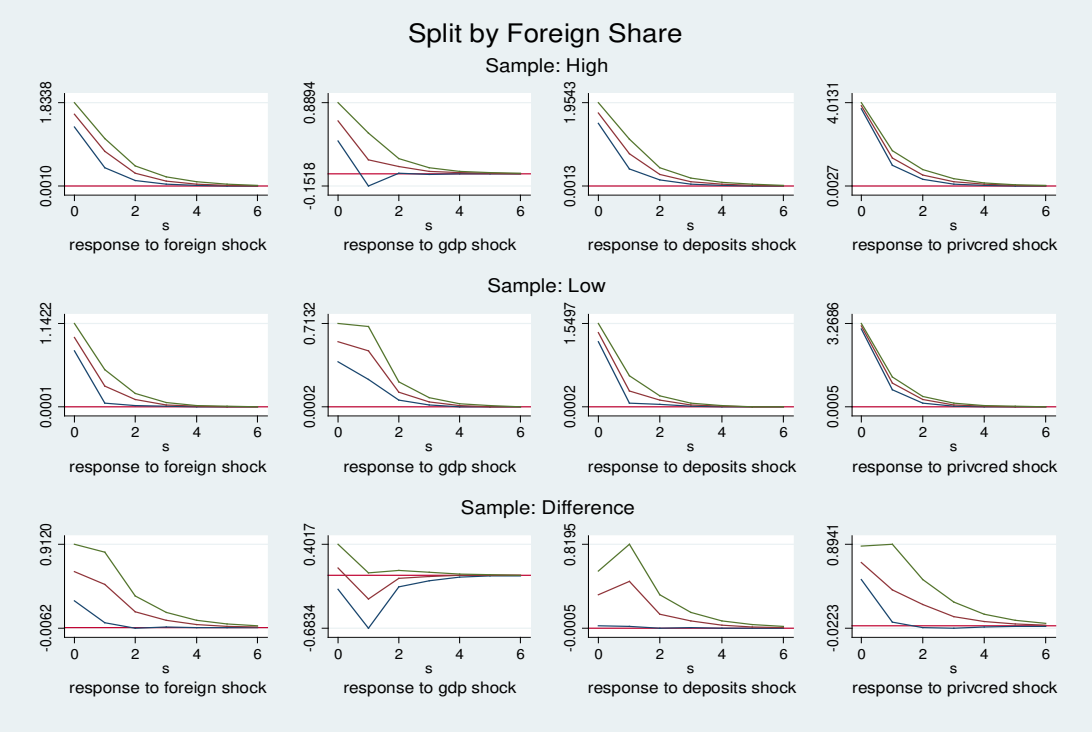


Figure 6 - Sample Split by High and Low Foreign Ownership

The figure shows impulse-response functions of PRIVATE CREDIT due to various shocks. The first and second rows provide the functions for the high FOREIGN OWNERSHIP and low FOREIGN OWNERSHIP subsamples, respectively. The split is based on the median value (see text for details). The third row provides the difference functions between these subsamples. The shocks are as follows: "foreign" is FOREIGN LIABILITIES, "gdp" is GDP, "deposits" is DEPOSITS, and "privcred" denotes PRIVATE CREDIT itself.

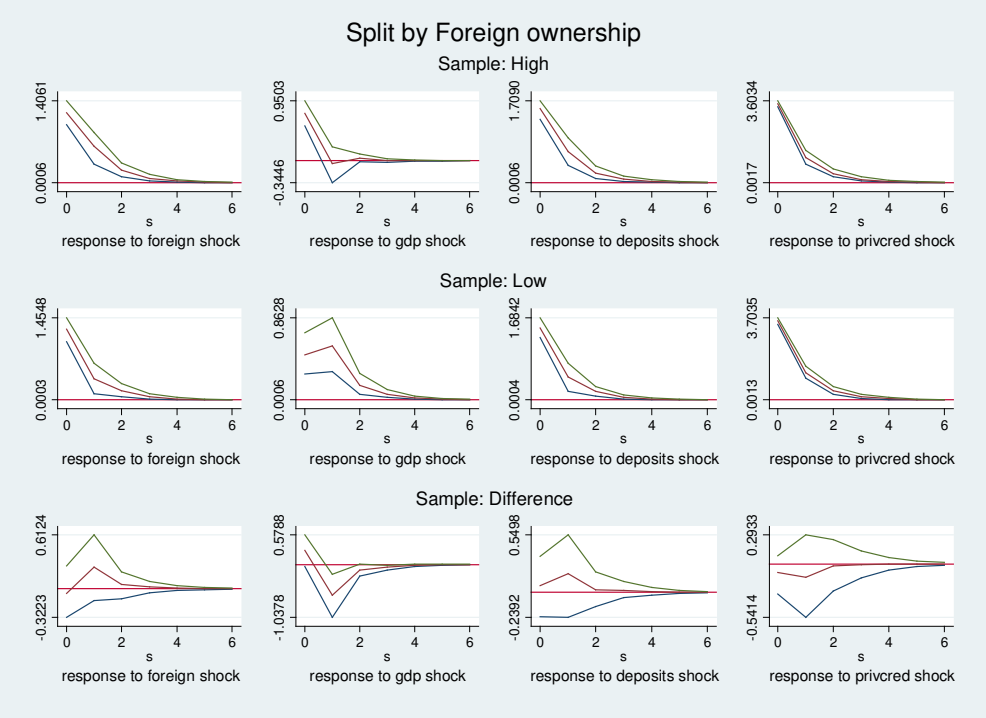
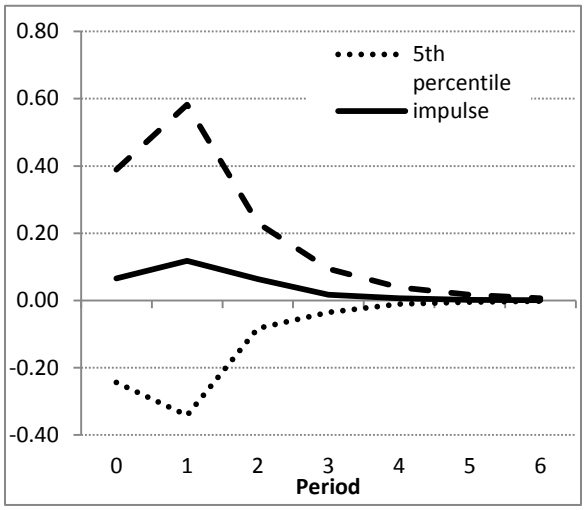


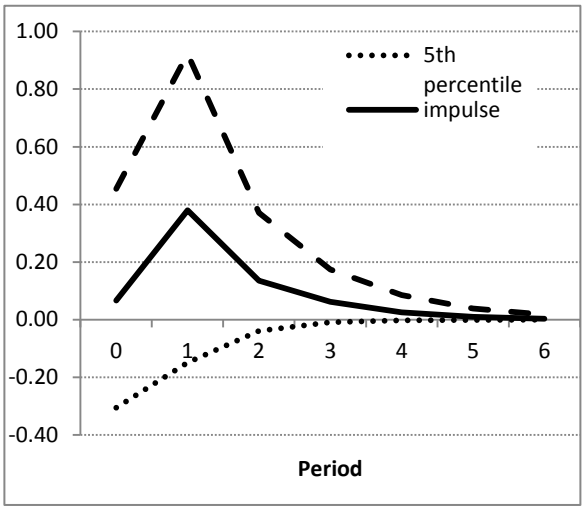
Figure 7 - Truncated ECA sample vs. non-ECA

The graphs show differences in responses of PRIVATE CREDIT to FOREIGN LIABILITIES in truncated ECA samples vs. the rest of the sample. Each truncated ECA sample is constructed by removing, one at a time, from the ECA sample countries above the median for each of the three characteristics: FOREIGN OWNERSHIP, FOREIGN FUNDING and LDR. The graph in column 2, row 2 removes an additional 4 countries which have FOREIGN OWNERSHIP above 51% (see text for details).

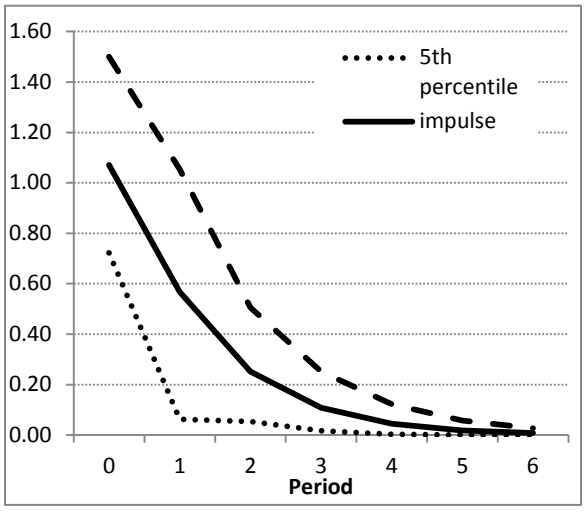
ECA without high FOREIGN FUNDING versus non-ECA



ECA without high LDR versus non-ECA



ECA without high FOREIGN OWNERSHIP (above the median) versus non-ECA



ECA without high FOREIGN OWNERSHIP (> 51%) versus non-ECA

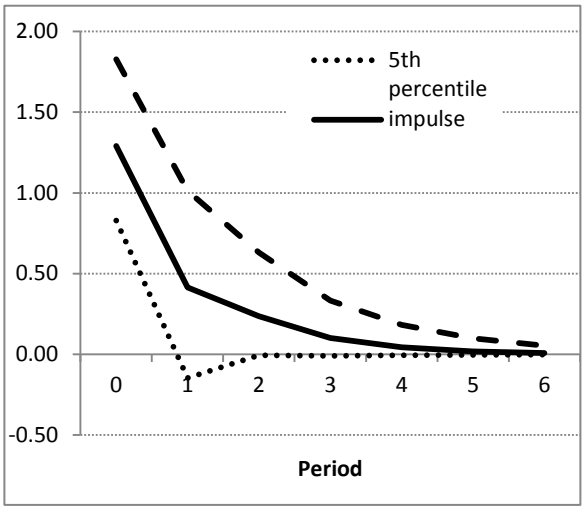


Table 1 - Variable Definitions and Sources

Variable Name	Full Name	Definition	Source
GDP	GDP	Gross Domestic Product, Nominal. Quarterly growth rates from figures in national currency (in percentage).	IMF, International Financial Statistics. For Albania, Colombia, Sri Lanka, Egypt, Tunisia and Nigeria, the sources are respective central bank websites.
PRIVATE CREDIT	Private Credit	Other Depository Corporations, Line 22d (Claims on Private Sector). Quarterly growth rates from figures in national currency (in percentage).	IMF, International Financial Statistics. For Bulgaria, Czech Republic, Hungary, Latvia, Lithuania and Poland, the sources are respective central bank websites.
FOREIGN LIABILITIES	Foreign Liabilities	Other Depository Corporations, Line 26c (Liabilities to Non-residents). Quarterly growth rates from figures in national currency (in percentage).	IMF, International Financial Statistics
DEPOSITS	Deposits	Other Depository Corporations, Line 24 (Transferable Deposits Included In Broad Money) + line 25 (Other Deposits Included In Broad Money). Quarterly growth rates from figures in national currency (in percentage).	IMF, International Financial Statistics
FOREIGN OWNERSHIP	Foreign Ownership of Banks	Share of banking system's assets where foreigners own 50% or more equity (in percentage). End-of-year figures.	World Bank, Bank Regulation and Supervision Survey
LDR	Loan-to-deposit ratio	Private Credit/Deposits*100.	IMF, International Financial Statistics
FOREIGN FUNDING	Share of foreign liabilities	Foreign liabilities/(foreign liabilities + Deposits)*100.	Authors calculation based on the original data from above sources

Table 2A - Summary Statistics for Quarterly PVAR Variables

All variables are expressed as quarterly real growth rates (%).

i) Full sample

	FOREIGN LIABILITIES	PRIVATE CREDIT	GDP	DEPOSITS
N	1,767	1,767	1,767	1,767
mean	3.86	3.23	-0.01	2.62
Sd	13.66	5.12	3.53	4.67
p1	-28.10	-10.72	-11.05	-9.80
p25	-4.42	0.11	-1.55	-0.10
p50	2.36	2.66	0.07	2.08
p75	9.97	6.00	1.71	4.85
p99	52.40	19.42	9.21	16.70

ii) ECA

	FOREIGN LIABILITIES	PRIVATE CREDIT	GDP	DEPOSITS
N	947	947	947	947
mean	5.75	4.55	-0.05	3.41
Sd	14.07	5.78	4.18	5.42
p1	-29.13	-10.79	-13.67	-10.61
p25	-2.99	0.61	-1.82	-0.07
p50	4.37	4.56	0.06	2.82
p75	12.43	8.18	2.05	6.59
p99	55.20	20.31	10.55	20.50

iii) Non-ECA

	FOREIGN LIABILITIES	PRIVATE CREDIT	GDP	DEPOSITS
N	820	820	820	820
mean	1.68	1.71	0.03	1.70
Sd	12.84	3.70	2.60	3.40
p1	-27.09	-9.55	-7.31	-7.26
p25	-5.72	-0.33	-1.28	-0.18
p50	-0.13	1.61	0.08	1.67
p75	7.12	3.60	1.40	3.56
p99	43.67	11.36	6.48	10.30

Table 2B – Pre-Crisis Summary Statistics for Split Variables

All variables are expressed as percentages (%) and reflect 2007:Q4 values for LDR and FOREIGN FUNDING and the closest available observation for FOREIGN OWNERSHIP, which is 2008 for most countries.

i) Full sample

	LDR	FOREIGN FUNDING	FOREIGN OWNERSHIP
N	41	41	41
mean	115.10	0.22	50.02
p50	99.58	0.17	51
Sd	48.96	0.16	31.47

ii) ECA

	LDR	FOREIGN FUNDING	FOREIGN OWNERSHIP
N	22	22	22
mean	127.22	0.32	64.64
p50	115.5	0.28	79.61
Sd	47.30	0.16	31.48

iii) Non-ECA

	LDR	FOREIGN FUNDING	FOREIGN OWNERSHIP
N	19	19	19
mean	101.07	0.11	33.09
p50	83.53	0.10	29.93
Sd	48.27	0.06	21.94

Table 3 - Correlations

Panel A. PVAR Variables

	FOREIGN LIABILITIES	GDP	DEPOSITS	PRIVATE CREDIT
Full Sample				
FOREIGN LIABILITIES	1			
GDP	**0.05**	1		
DEPOSITS	**0.24**	**0.18**	1	
PRIVATE CREDIT	**0.40**	**0.16**	**0.51**	1
ECA				
FOREIGN LIABILITIES	1			
GDP	0.05	1		
DEPOSITS	**0.30**	**0.20**	1	
PRIVATE CREDIT	**0.50**	**0.18**	**0.54**	1
non ECA				
FOREIGN LIABILITIES	1			
GDP	0.06	1		
DEPOSITS	**0.13**	**0.11**	1	
PRIVATE CREDIT	**0.23**	**0.11**	**0.42**	1

Bold numbers indicate statistical significance at 5%.

Panel B. Sample Split Variables

	FOREIGN OWNERSHIP	FOREIGN FUNDING	LDR
Full Sample			
FOREIGN OWNERSHIP	1		
FOREIGN FUNDING	**0.35**	1	
LDR	0.08	**0.54**	1
ECA			
FOREIGN OWNERSHIP	1		
FOREIGN FUNDING	-0.06	1	
LDR	-0.12	**0.96**	1
non ECA			
FOREIGN OWNERSHIP	1		
FOREIGN FUNDING	0.30	1	
LDR	-0.11	-0.02	1

Bold numbers indicate statistical significance at 5%.

Table 4 - Mean Tests for ECA vs. Non-ECA

Reported are t-tests for differences in means between ECA and non-ECA countries. Variables are quarterly growth rates (%). Significance is indicated by: ***, **, *, NS represent 1%, 5%, 10%, and above 10% respectively.

Panel A: Key Differences for PVAR Variables (growth rates in %)

	Sample: Non-ECA		Sample: ECA		
	N(1)	Mean(1)	N(2)	Mean(2)	Significance
	Years 2005-2007				
FOREIGN LIABILITIES	300	3.64	286	10.06	***
GDP	239	0.51	263	0.95	**
DEPOSITS	312	2.65	286	5.42	***
PRIVATE CREDIT	312	3.15	286	7.87	***
	Years 2008-2009				
FOREIGN LIABILITIES	214	0.74	192	2.33	NS
GDP	160	-0.51	176	-1.86	***
DEPOSITS	222	1.59	192	1.34	NS
PRIVATE CREDIT	222	1.45	192	2.15	*
	Years 2010-2011				
FOREIGN LIABILITIES	214	3.62	192	-0.02	***
GDP	159	0.09	176	-0.11	NS
DEPOSITS	222	1.81	192	1.59	NS
PRIVATE CREDIT	222	2.19	192	0.67	***

Panel B: Key Differences for Sample Split Variables

Variables are measured at pre-crisis levels: 2007 Q4 for LDR and FOREIGN FUNDING and 2008 for FOREIGN OWNERSHIP.

	Sample: Non-ECA		Sample: ECA		
Variable	N(1)	Mean(1)	N(2)	Mean(2)	Significance
LDR	19	101%	24	127%	**
FOREIGN FUNDING	19	11%	24	32%	***
FOREIGN OWNERSHIP	19	33%	24	65%	***

Panel C: Key Differences for Sample Split Variables for truncated ECA sample

Variables are measured at pre-crisis levels: 2007 Q4 for LDR and Foreign funding and 2008 for foreign ownership. Truncated ECA sample is constructed by removing from ECA sample countries above the median for each of the indicator one at a time. FOREIGN OWNERHSIP 2 sample is truncated further to remove 4 more countries with high foreign ownership: (Serbia, 75%, Latvia, 68%, Poland 68% and Armenia 60%), in effect it removes all countries with foreign ownership above 51%.

	Sample: Non-ECA		Sample: truncated ECA		
Variable	N(1)	Mean(1)	N(2)	Mean(2)	Significance
LDR	19	101%	11	92%	NS
FOREIGN FUNDING	19	11%	11	20%	***
FOREIGN OWNERSHIP	19	33%	11	39%	NS
FOREIGN OWNERSHIP 2	19	33%	7	23%	NS

Table 5 - GMM Estimates of the Reduced-Form PVAR Models

This table reports system estimates in which each of the dependent variables is regressed on the lags of the other variables in the system, estimated by system GMM in which the original variables are transformed using forward orthogonal deviations. The instruments are lags of the untransformed variables as described in text. All variables enter as real quarterly growth rates.

	Dependent Variable:							
	FOREIGN LIABILITIES		GDP		DEPOSITS		PRIVATE CREDIT	
	Coef	*T-stat*	Coef	*T-stat*	Coef	*T-stat*	Coef	*T-stat*
Full Sample								
L.FOREIGN	0.01	*0.33*	0.02	*2.01*	0.00	*-0.33*	0.00	*0.72*
L.GDP	-0.01	*-0.10*	-0.14	*-3.28*	0.05	*1.38*	0.03	*0.78*
L.DEPOSITS	-0.14	*-1.44*	0.04	*1.41*	-0.05	*-1.39*	0.01	*0.23*
L.CREDIT	0.61	*5.95*	0.01	*0.49*	0.12	*3.44*	0.33	*8.89*
ECA								
L.FOREIGN	0.00	*0.01*	0.02	*1.90*	0.00	*-0.24*	0.01	*0.89*
L.GDP	-0.02	*-0.13*	-0.15	*-2.61*	0.03	*0.64*	-0.00	*-0.06*
L.DEPOSITS	-0.18	*-1.54*	0.03	*0.76*	-0.04	*-0.77*	0.02	*0.40*
L.CREDIT	0.69	*4.83*	-0.01	*-0.38*	0.09	*1.74*	0.36	*7.10*
Non ECA								
L.FOREIGN	0.02	*0.44*	0.00	*0.63*	0.00	*-0.12*	0.00	*-0.08*
L.GDP	0.00	*0.00*	-0.12	*-2.56*	0.11	*2.41*	0.10	*2.03*
L.DEPOSITS	-0.05	*-0.28*	0.07	*2.52*	-0.09	*-1.66*	-0.01	*-0.18*
L.CREDIT	0.47	*3.30*	0.05	*1.87*	0.19	*4.14*	0.27	*4.93*

Table 6 - Impulse-response Functions for Private Credit Growth

Each cell shows a response of private credit to a shock in a column variable in a period specified in the Period column. The same responses are plotted in the middle line in the last row of graphs in Figure 2 for the full sample and Figure 3 for ECA vs. non-ECA sample split.

Period	FOREIGN LIABILITIES	GDP	DEPOSITS	PRIVATE CREDIT
		Full Sample		
0	1.24	0.59	1.53	3.53
1	0.51	0.29	0.54	1.16
2	0.18	0.09	0.18	0.40
3	0.06	0.03	0.06	0.14
4	0.02	0.01	0.02	0.05
5	0.01	0.00	0.01	0.02
6	0.00	0.00	0.00	0.01
		ECA		
0	1.53	0.68	1.63	3.76
1	0.74	0.25	0.68	1.35
2	0.28	0.10	0.24	0.53
3	0.11	0.04	0.10	0.20
4	0.04	0.01	0.04	0.08
5	0.02	0.01	0.01	0.03
6	0.01	0.00	0.01	0.01
		Non-ECA		
0	0.89	0.49	1.45	3.16
1	0.23	0.37	0.35	0.84
2	0.07	0.07	0.12	0.23
3	0.02	0.03	0.03	0.07
4	0.01	0.00	0.01	0.08
5	0.00	0.00	0.00	0.01
6	0.00	0.00	0.00	0.00

Table 7. Variance Decompositions

Panel A. Baseline PVAR Model

Each cell shows the percent of variation in the row variable explained by a shock of the column variable after 10 quarterly periods.

	FOREIGN LIABILITIES	GDP	DEPOSITS	PRIVATE CREDIT
Baseline Model				
FOREIGN LIABILITIES	96.7%	0.0%	0.1%	3.1%
GDP	0.5%	99.2%	0.2%	0.0%
DEPOSITS	3.2%	3.0%	92.6%	1.2%
PRIVATE CREDIT	9.7%	2.4%	14.2%	73.8%

Panel B. Variance Decomposition for Private Credit Growth in Various Sample Splits

Each cell reports the percent of variance in PRIVATE CREDIT explained after 10 quarters by a shock to the column variable.

	Obs	FOREIGN LIABILITIES	GDP	DEPOSITS	PRIVATE CREDIT
Full Sample	1,767	9.7%	2.4%	14.2%	73.8%
ECA	947	12.9%	2.3%	13.9%	70.9%
Non-ECA	820	6.0%	2.6%	15.7%	75.6%
High LDR	895	14.1%	1.6%	13.9%	70.5%
Low LDR	872	5.6%	4.8%	13.2%	76.3%
High FOREIGN FUNDING	799	12.9%	1.9%	14.7%	70.4%
Low FOREIGN FUNDING	968	6.9%	3.8%	13.8%	75.5%
High FOREIGN OWNERSHIP	886	10.0%	3.0%	15.2%	71.8%
Low FOREIGN OWNERSHIP	881	9.1%	3.0%	12.8%	75.2%

Table A1: Data availability by Country

Region	Country	GDP	privcred	foreign	deposits	LDR
ECA	Albania	2005Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Armenia	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Azerbaijan	2001Q2-2011Q4	2001Q2-2011Q4	2001Q2-2011Q4	2001Q2-2011Q4	2001Q2-2011Q4
	Belarus	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Bulgaria	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Croatia	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Czech Republic	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Estonia	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Georgia	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Hungary	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Kazakhstan	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Latvia	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Lithuania	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Macedonia, FYR	2003Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Poland	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Romania	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Russian Federation	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Serbia, Republic of	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Slovak Republic	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Slovenia	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Turkey	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Ukraine	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
LAC	Argentina	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Brazil	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Chile	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Colombia	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4

	Mexico	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Peru	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Uruguay	2005Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
ASIA	China, P.R.: Mainland	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Indonesia	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Korea, Republic of	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Malaysia	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Philippines	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Sri Lanka	2002Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Thailand	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
MENA & Africa	Egypt	2001Q4-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Jordan	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Morocco	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Qatar	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	Tunisia	2000Q2-2011Q3	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4
	South Africa	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4	2000Q2-2011Q4

Table A2. Country Averages for Sample Split Indicators

Country	FOREIGN OWNERSHIP	LDR	FOREIGN FUNDING
		ECA Countries	
Albania	94%	48%	7%
Armenia	60%	117%	29%
Azerbaijan	9%	130%	27%
Belarus	22%	115%	21%
Bulgaria	84%	112%	26%
Croatia	91%	99%	25%
Czech Republic	85%	84%	15%
Estonia	99%	206%	55%
Georgia	91%	160%	41%
Hungary	85%	143%	35%
Kazakhstan	13%	198%	59%
Latvia	68%	246%	70%
Lithuania	86%	166%	48%
Macedonia, FYR	93%	83%	13%
Poland	67%	94%	14%
Romania	88%	114%	37%
Russia	19%	120%	28%
Serbia	75%	98%	27%
Slovak Republic	96%	93%	26%
Slovenia	31%	152%	48%
Turkey	17%	72%	16%
Ukraine	51%	150%	34%
Average	**65%**	**127%**	**32%**
		Non ECA Countries	
Argentina	31%	62%	10%
Brazil	21%	72%	8%
Chile	41%	137%	9%
China	2%	234%	5%
Colombia	22%	174%	10%
Egypt	31%	55%	4%
Indonesia	33%	68%	6%
Jordan	51%	84%	27%
Korea	77%	168%	18%
Malaysia	22%	91%	10%
Mexico	84%	81%	9%
Morocco	21%	67%	2%

Peru	51%	71%	13%
Philippines	12%	53%	11%
South Africa	30%	126%	15%
Sri Lanka	15%	95%	15%
Thailand	6%	100%	4%
Tunisia	28%	118%	17%
Uruguay	52%	65%	20%
Average	**33%**	**101%**	**11%**

Annex 1

Technical Details on Panel Vector Autoregressions (PVARs)

Correlation problem between fixed effects and regressors

The advantage of PVAR is the same as the advantage of any panel approach – i.e. in allowing for explicit inclusion of fixed effects in the model, denoted f_i in Equation (1), which captures all unobservable time-invariant factors at the country level. However, fixed effects present an estimation challenge which arises in any model which includes lags of the dependent variables: the fixed effects are correlated with the regressors and therefore the mean-differencing procedure commonly used to eliminate fixed effects would create biased coefficients.

To avoid this problem we use forward mean-differencing, also referred to as the `Helmert procedure' (see Arellano and Bover, 1995). This procedure removes only the forward mean, i.e. the mean of all the future observations available for each firm-year. This transformation preserves the orthogonality between transformed variables and lagged regressors, which allows us to use lagged regressors as instruments and estimate the coefficients by system Generalized Method of Moments (GMM).[14]

The time-fixed effects are implemented by time-differencing all the variables prior to inclusion in the model, which is equivalent to putting time dummies in the system.

Recursive ordering

To isolate the impact of a shock to a single variable while computing impulse-response functions, we need to account for the fact that the actual variance-covariance matrix of the errors is unlikely to be diagonal. In other words, they are correlated which inhibits attribution of the impact of the shock of a variable to itself. A common solution is to adopt a particular ordering

[14] In our case the model is "just identified" because the number of regressors equals the number of instruments, therefore system GMM is mathematically equivalent to equation-by-equation 2SLS. Also, there are no overidentifying restrictions because the number of instruments is equal to the number of variables in the model.

and allocate any correlation between the residuals of any two variables to the variable that comes first in the ordering. This procedure is known as a Choleski decomposition of the variance-covariance matrix of residuals and is equivalent to transforming the system into a “recursive" VAR for identification purposes (see Hamilton (1994) for the derivations and discussion of impulse-response functions).

Generating confidence intervals of impulse-response functions

To analyze the impulse-response functions we need an estimate of the confidence intervals of the point estimates. Since the various impulse-response functions are constructed from the estimated VAR coefficients, their standard errors need to be taken into account. We calculate confidence intervals with Monte Carlo simulations. To do so, we randomly generate a draw of coefficients Γ_0 and Γ_1 from Equation (1) using the model estimations and the variance-covariance matrix and re-calculate the impulse-responses. We repeat this procedure 200 times and then generate the 5th and 95th percentiles of this distribution which we use as confidence intervals.

Impulse–response functions of differences between two subsamples

Because the two subsamples are independent, the impulse-responses of the differences are equal to the difference in impulse-responses. To calculate the confidence interval, we merge the distributions of errors via Monte-Carlo simulations with 200 repetitions each for both samples and generate a new distribution which is the difference between errors generated in each of the repetitions (i.e. each of the 200 errors now contains the difference between the distributions). From this new distribution we generate new 5^{th} and 95^{th} percentile bounds.