

Cross-Border Bank Funding Supply and Bank Lending: Evidence from Slovenia[☆]

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Abstract

We propose a way to identify shocks to the supply of foreign funds to banks and investigate the dynamic effects of these shocks on lending to firms, real activity, and prices. We distinguish between foreign funding supply shocks to domestic and foreign-owned banks. The increase in the supply of foreign funds to banks generates strong, procyclical and persistent fluctuations in bank lending, real GDP, and prices. Foreign-owned banks are slower and more restrained in passing the increase in foreign funding to firms. Shocks to foreign funding supply are more important for foreign-owned banks than for domestic banks, relative to other shocks. This is why foreign-owned banks contribute more than domestic banks to fluctuations in real GDP, loans, and to the correlation between them, despite the more restrained response of lending.

JEL classification: E32, E51, F34, F36, G21.

Keywords: Financial integration, Cross-border capital flows, Bank lending, Bank funding, Business cycles

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1. Introduction

Cross-border financial flows have long been regarded as important drivers of economic fluctuations. Their importance has increased with the creation of the Euro and the resulting elimination of exchange rate risk, which has fostered financial integration. The latter had a bigger impact on debt-type flows, in particular those entering the economy through its banking system. Often, small and more open countries that are typically more financially integrated are more susceptible to cross-border debt inflows to domestic banking system, which can amplify domestic credit booms (Lane (2013) and Lane and McQuade (2014)).

Typically, all cross-border capital flows have been considered as exogenous for the recipient economy. Blanchard (2011) has pointed out that this is not always the case: "We often think of inflows and outflows as coming primarily from decisions by foreign investors. The reality is that many of these inflows and outflows often come from decisions by domestic investors." This distinction is important, because the effects of cross-border capital flows on the economy may depend on what drives them, and may also require different policy responses (Moreno et al., 2016).

To distinguish different drivers of international capital flows, the literature typically classifies them as either push factors, which originate from outside the country, or pull factors, which originate from within the country (Moreno et al., 2016). The precise operational definitions differ. For example, Fratzscher (2012) defines push factors as global common factors and pull factors as country-specific factors. With this definition, a factor can originate from the outside the country, but it may still be country-specific. There may also be regional factors (e.g., Eller et al. (2016)) that are difficult to fit in one of these categories (Koepke, 2015) and may not be completely exogenous to a country within the region. This is one of the reasons why several authors have argued that a more structural interpretation of these factors is required (e.g., Milesi-Ferretti and Tille (2011), or Cerutti et al. (2014)).

Several papers have been more precise on the underlying structural shocks

that affect global factors. For instance, the work by Bekaert et al. (2013), Bruno and Shin (2015), and Rey (2015) has, among other things, found that a significant part of variation in the VIX index, which has typically been considered a global factor driving capital flows, can be explained by changes in the U.S. monetary policy. Focussing on cross-border bank flows, Cerutti et al. (2014) define a global liquidity factor that is consistent with the notion of the 'ease of financing'. Cetorelli and Goldberg (2012b) and Cetorelli and Goldberg (2012a) provide a very precise structural interpretation for cross-border bank lending in terms of global banks' liquidity management and their responses to local shocks.

The contribution of this paper is along three lines. First, we propose, in a time-series context, a way to identify structural shocks to the supply of foreign funding to banks within the country, either domestic, foreign-owned, or to the banking system as a whole. This is conceptually very close to the notion of the 'ease of financing' in Cerutti et al. (2014) and is closely related to the supply of liquidity by parent banks in the context of foreign-owned banks (as in Cetorelli and Goldberg (2012b)), but allows us to identify a foreign funding supply shock for domestic banks as well. To identify a shock to foreign funding, we first define indicators of supply of foreign funding to banks, extending the idea of 'Mix' indicators (Kashyap et al., 1993) to bank liabilities, using data on gross debt by sector, instrument, and bank type from the flow of funds statistics. This enables us to use sign restrictions to identify shocks to the supply of foreign funding to banks from other shocks such as domestic demand, or a domestic (loan) supply shock.¹ To the best of our knowledge, we are the first to use such an approach to identify shocks in the supply of foreign funding to banks and its transmission to lending and the real economy.

Second, we complement the existing literature by focusing on the dynam-

¹There are two advantages of this approach. First, the use of gross rather than net flows is a more appropriate measure of capital flows (Borio and Disyatat, 2011). Second, relying on flows instead of interest rates allows us to better capture the effects of credit rationing, which improves identification.

ics of shock transmission, while distinguishing between all banks in the aggregate, domestic banks, and foreign-owned banks. This allows us to investigate whether the responses of various types of banks to foreign funding shocks are different also in terms of their dynamics. An advantage of focussing on the dynamics is that we can analyse which structural shock is important in driving macroeconomic fluctuations and the co-movement between variables at cyclical frequencies. Most empirical studies that distinguish between domestic and foreign-owned banks use cross-section or panel data, where the analysis of dynamics at cyclical frequencies is more difficult (or impossible).²

Finally, our analysis requires fewer assumptions about the data. Most of the literature has to make assumptions regarding the valuation of stocks and flows (see Lane and Milesi-Ferretti (2007), or De Haas and van Lelyveld (2006)). In our sample, before the adoption of the Euro, the exchange rate has been fixed. The maximum deviation of the exchange rate from the parity at which the Euro was adopted has been less than 0.08% in any month (and zero on average). Moreover, capital flows have been unrestricted throughout the period under investigation. These two properties mean that we have a consistent dataset without having to make assumptions regarding valuation or controlling for changes in capital flow restrictions, which is typically not the case in cross-country studies.

We find that the increase in the supply of foreign funds to banks generates strong, procyclical and persistent fluctuations in bank lending, real GDP, and prices. While this is the case for both domestic and for foreign-owned banks, the latter transmit changes in foreign funding supply to firms both slower and with a lower magnitude than domestic banks. The more restrained transmission of shocks to foreign funding supply by foreign-owned banks is even more evident if one accounts for the differences in the structure of bank liabilities of domestic and foreign-owned banks.

²De Haas and van Lelyveld (2006) is an example for the Central, Eastern, and South East European (CESEE) region.

85 However, we also find that, relative to other shocks, shocks to foreign fund-
ing supply have been much more important for foreign-owned banks than for
domestic banks. The reason is not that foreign-owned banks behave more pro-
cyclically, but that they face foreign funding shocks that are much more im-
portant relative to other shocks. This is why, conditional on shocks to foreign
90 funding supply, foreign-owned banks contribute more than domestic banks to
fluctuations in real GDP, loans, and the correlation between them.

Although we perform the analysis using the data for Slovenia, we believe
the findings have implications for other small open economies in the Central,
Eastern, and South Eastern Europe (CESEE) with a similar structure of the
95 economy and significant foreign bank penetration. Fluctuations in financial
flows in Slovenia since the entry into the ERM II and after accession to the
Euro Area are not country-specific and have been a broader concern in the re-
gion.³ Policymakers in the CESEE countries have been concerned about foreign
funding flows that enter the region through foreign banks and have established
100 the Vienna Initiative to discuss and monitor these flows.⁴

The paper begins with a brief description of the data, method and identi-
fication in Section 2. Sections 3 and 4 discuss the main results, and Section 5
concludes.

2. Data, method, and identification

105 In the analysis we use quarterly data on real GDP, price level proxied by the
GDP deflator, sectoral flow of funds data on bank and firm liabilities, supple-

³Most countries that have been preparing to join the Euro and after the Euro adoption
experienced capital inflows, followed by significant outflows during the recent crisis (De Haas
and van Lelyveld (2006), De Haas et al. (2015)). Because of the similar economic structure
and history, many authors examine countries in the CESEE as a group (De Haas and Naaborg
(2006), Eller et al. (2016)).

⁴The Vienna Initiative publishes a periodic publication, the CESEE Deleveraging Monitor
(recently changed to CESEE Deleveraging and Credit Monitor), that reports developments in
the cross-border credit flows in the region (Vienna Initiative (2012), Vienna Initiative (2016)).

mented by the breakdown of bank loans and liabilities based on bank ownership (domestic or foreign), consistent with the flow-of-funds data. The sectoral flow of funds are on the consolidated basis, i.e., they represent the amount of funds provided by one sector to another, by instrument and maturity. The breakdown by bank ownership is available at the instrument level. The sample period is from 2004Q1 to 2013Q3. Throughout this period, the market share of foreign banks has been stable around 30%.⁵

2.1. Estimation method

We use a structural vector autoregressive (VAR) model to condition the analysis on shocks. The estimated reduced-form VAR takes the following form:⁶

$$Y_t = c + t + A_0 D_t + \sum_{i=1}^q A_i Y_{t-i} + u_t, \quad (1)$$

where c is a constant, t is a linear trend, D_t is a vector of quarterly dummies, Y_t is a vector of endogenous variables, and u_t is a reduced-form error term. q is the number of lags and A_i are coefficient matrices.⁷

The VARs include real GDP, GDP deflator, bank loans to firms, and two variables that serve as bank loan supply and foreign funding indicators. All data are in log-levels, except loan supply indicators and foreign funding indicators, which are in levels.

⁵Data before 2004 are not available at quarterly frequency. In 2013Q3 the transfer of a portion of bank loans to the Bank Asset Management Company caused a structural break in the series, so we end our sample at that point. The definition of foreign banks follows Bank of Slovenia (2015). There have been no sizeable new entries, mergers, or takeovers. The average market share of foreign banks in the sample is 30% measured by the size of the entire balance sheet, and 32% measured by the size of loans to firms, with fluctuations of less than 4 p.p. around these points.

⁶The VAR is estimated using ordinary least squares, with all variables in levels or log-levels. This yields consistent estimates even when variables are (co)integrated, as long as sufficient number of lags is used. We opt for three lags in all specifications.

⁷Including a deterministic trend is not necessary, although it is common in empirical work (see den Haan (2000)). We have examined the robustness of our results to alternatives with no trend and with quadratic trend. The results are not materially affected.

2.2. Foreign funding and bank loan supply indicators

125 The identification of changes in bank funding supply from abroad and the
supply of bank loans to firms is based on the idea of Kashyap et al. (1993).
They note that if the share of bank loans among firm liabilities with similar
characteristics declines, then this must be due to the (relative) tightening of the
supply of bank loans. Their measure of bank loan supply is a ratio of short-term
130 bank loans to the sum of short-term bank loans and commercial paper issued by
firms (non-financial corporations), which they call the 'Mix'. The rationale is
that if short-term bank loans and commercial paper are close substitutes, then
changes in the demand for financing will not affect the Mix, because firms seek
financing both at banks and on the markets. Only if there is a change in the
135 supply of bank loans (relative to the supply of commercial paper), the Mix will
be affected.

We extend this idea to bank liabilities and construct Mix indicators to identify
shocks in the supply of funding from abroad to banks. If banks have local
and foreign sources of funding, then an increase in the proportion of funding
140 from abroad indicates that the supply of funding from abroad has increased, relative
to the local supply of funding. We use similar reasoning when we consider
banks' supply of loans to firms and define Mix indicators for firm liabilities. If
the proportion of bank loans among firm debt liabilities increases, this signals
an easing of the supply of bank loans (relative to other debt sources).⁸

145 We define the benchmark Mix variable *at the bank level*, $MixF$, as the ratio
of liabilities to banks abroad to all debt liabilities of banks on a consolidated
basis (excluding interbank liabilities). We do so for the banking system as a
whole, for foreign-owned banks, and for domestic banks. We have experimented
with different definitions of $MixF$ and obtained similar results.⁹

⁸When computing Mix indicators, we use all debt variables on a consolidated basis, i.e., we take into account only funds that come from other sectors. Intra-sector lending does not represent an inflow in the sector and is excluded.

⁹The alternatives in the numerator included liabilities to banks and depositors abroad, and all debt liabilities from abroad, including securities issued by banks and held by foreigners.

150 To define the benchmark Mix variable *at the firm level*, $MixH$, we follow the
argument of Oliner and Rudebusch (1996) and consider all relevant financing
alternatives of firms, i.e., trade credit, outstanding securities, and loans from
non-bank intermediaries.¹⁰ Quantitatively and economically the most impor-
tant alternative to bank financing in Slovenia is trade credit, and the results are
155 not affected if some or all other alternatives are omitted.¹¹

The advantage of using Mix indicators based on outstanding stock of debt
instead of interest rates for identification is that Mix indicators better capture
the effect of credit rationing than interest rates do. As argued by Stiglitz and
Weiss (1981), interest rates are not a suitable screening device, because there
160 may be borrowers that are willing to take a loan at a given interest rate, but
are not able to obtain one due to rationing. This implies that fluctuations in
the supply of funds may not be fully reflected in interest rates, either quoted or
those based on actual transactions. Similarly, De Haas and van Lelyveld (2006)
argue that perceived riskiness of borrowers may not be fully reflected in interest
165 rates.¹² Our approach is therefore complementary and potentially more precise
than approaches based on spreads or interest rates often used for identification
of loan supply shocks (e.g., Bijsterbosch and Falagiarda (2015) or Gambetti and
Musso (2012)).

There are two reasons for focusing on bank lending to firms. The first is that,

We chose liabilities to banks abroad in the numerator as the benchmark because this is quan-
titatively the most important source of foreign funding and because foreign-owned banks have
extended periods with no securities issued. In the denominator we considered the liabilities
of the entire banking system as an alternative.

¹⁰When we define $MixH$ for domestic and foreign-owned banks separately, we include in
the denominator only loans to domestic and foreign banks, respectively, together with trade
credit, securities, and loans from non-bank intermediaries.

¹¹Loans to firms from abroad are quantitatively less important and limited to only a handful
of firms. The data do not allow us to distinguish foreign loans to firms by the type of
intermediary. While there are securities issued by firms, the amounts outstanding are small.

¹²See Ciccarelli et al. (2014) for evidence how banks tightened credit standards in Europe
and Bank of Slovenia (2015) for Slovenia.

170 unlike households, firms can raise funding from other, non-bank sources, which
 makes it possible to construct *MixH*. The second is that banks in Slovenia
 have used their funds mainly to finance loans to firms. Direct lending of banks
 from abroad to domestic firms has been rare (see Gabrijelčič et al. (2016), Bank
 of Slovenia (2009)), while household borrowing has been very restrained.¹³

175 A concern regarding the Mix-based indicators of loan supply is that changes
 in the indicators may be driven by shifts of financing between different types
 of firms. Oliner and Rudebusch (1996) pointed out that changes in the Mix
 may be due to the shift of all forms of financing from small firms to large firms,
 because the latter rely less on bank loans and more on commercial paper. This
 180 argument is less of a concern in Slovenia, where all firms are small from the
 financing perspective (securities and commercial paper were either not used
 during the sample or their use was negligible).¹⁴

2.3. Identification

To identify shocks to bank funding supply from abroad we rely on a set
 185 of loan supply indicators and sign restrictions (Uhlig (2005) or Fry and Pagan
 (2011)). These are summarised in Table 1.

Table 1: Sign restrictions for identified shocks

Expansionary shock	GDP defl.	GDP	Loans	MixH	MixF
Foreign funding supply			+	+	+
Home bank loan supply			+	+	-
Aggregate supply	-	+	+	-	
Aggregate demand	+	+	+	-	

¹³Households in Slovenia are among the least indebted in Europe (Arrondel et al., 2014).

¹⁴Data on firm balance sheets by firm size, industry, etc. are not available at quarterly frequencies and not detailed enough by instruments and sectors, which prevents a formal investigation of potential distributional shifts. We used interpolated annual data to investigate whether large firms, who likely have more access to foreign financing, behave differently, but found no significant differences between large and small firms.

An expansionary foreign funding supply shock is defined as a situation when $MixF$, $MixH$, and loans increase on impact. If the supply of funds from abroad for banks increases relative to the supply of other sources of bank funds, then $MixF$ increases. To be consistent with the notion that banks pass the increase in the supply of foreign funds to firms, bank loan supply has to increase, which implies that both $MixH$ (the proportion of bank loans to firms in all firm debt liabilities) and loans must increase. Note that if $MixH$ did not increase, then an increase in $MixF$ would be consistent with a loan demand shock in the home country and not with an increase in bank funding supply from abroad.¹⁵

Although we are interested in the foreign funding supply shock, we follow Fry and Pagan (2011) and identify other shocks to ensure that the foreign funding supply shock is correctly identified. The additional shocks are bank loan supply shock originating in the home country, aggregate demand and aggregate supply shock. The one remaining unidentified shock is meant to capture the effects of all other shocks and we check that it does not have the same sign pattern as the bank funding supply shock.

A positive bank loan supply shock originating in the home country is identified as the increase in the proportion of bank loans among the alternative sources of firm finance, $MixH$, and the decrease in the proportion of foreign funding of banks, $MixF$. The rationale is that when banks have excess funding within the country, they will be inclined to repay some of their foreign liabilities, resulting in a decrease in $MixF$. At the same time, they will try to increase lending, resulting in an increase in $MixH$ and loans.

¹⁵As a robustness check, we also identified loan demand shock as the fifth shock with signs as the bank funding supply shock, but with a zero restriction on $MixH$. The rationale is that an increase in loan demand should not affect the composition of firm liabilities, but it may induce banks to borrow abroad. The results for the bank funding supply shock are not materially different from those reported below. We examined robustness of our results using several definitions of $MixF$ and $MixH$, and obtained similar results. Another robustness check was based on recursive identification and yielded results consistent with those reported here. All results are available upon request.

210 To identify aggregate demand and aggregate supply shocks, we rely on as-
sumptions consistent with a number of theoretical models (see Gambetti and
Musso (2012) or Bijsterbosch and Falagiarda (2015) for an overview). An ex-
pansionary aggregate demand shock increases prices and real GDP, while an
expansionary aggregate supply shock increases real GDP and decreases prices.
215 We assume that both aggregate demand and aggregate supply shocks increase
lending, but that they more than proportionally increase non-bank lending at
home. The reason is that the main alternative to bank lending to firms is trade
credit, which increases with economic activity more than bank loans.¹⁶

In all cases, we only impose sign restrictions on impact responses. We follow
220 Fry and Pagan (2011) and first generate a set of 500 models that all satisfy
sign restrictions in Table 1 (*structural identification*). To select a single model
from this set of models (*model identification*), we use the median target ap-
proach.¹⁷ Confidence bands are generated using bootstrap around the median
target response.

225 3. The bank funding supply channel

The responses to an increase in foreign funding supply to banks, standard-
ised to a one percentage point increase in the foreign funding supply indicator,
MixF, are plotted in Figure 1. The left column shows the results for the bank-
ing system as a whole, the middle column for foreign-owned banks, and the right
230 column for domestic banks.

For the banking system as a whole and for both domestic and foreign-owned
banks, an expansionary shock to foreign funding supply causes a strong and

¹⁶Note that trade credit increases automatically with an increase in sales, while obtaining
bank loans involves costs and delays related to loan applications.

¹⁷This approach picks the model whose impulse responses are closest to the median of
the responses of all models that satisfy sign restrictions. The measure of proximity is the
minimum squared distance between the model's impulse responses and the median impulse
response from the set of models that satisfy sign restrictions. See Fry and Pagan (2011) for
details.

persistent increase in lending and real GDP, which is significant statistically and economically. The responses of prices are mixed on impact, but prices
235 tend to increase after about one year after the shock. The response of loans is mirrored closely by the increase in *MixH*, which indicates that banks pass the increase in the supply of foreign funds to firms by increasing loans supply.

The short-run responses of domestic and foreign-owned banks are different. Foreign-owned banks respond more slowly in passing on the shock to their for-
240 eign funding to firms, as the increase in loans is significant only on impact and then again after a delay. The increase in both loans and *MixH* of foreign banks is also less persistent compared to domestic banks. The aggregate response is therefore driven mainly by the response of domestic banks.¹⁸

The magnitudes of responses in Figure 1 are similar for all types of banks
245 and the banking system. However, because the structure of bank balance sheets differs with respect to foreign funding, it is not clear that a comparison based on the standardisation of the shock with respect to *MixF* is appropriate. Domestic banks use only 20.5% of foreign funding, foreign-owned banks use 50.8%, and the banking system as a whole 29.5% (all are sample averages), so that a 1 p.p.
250 increase in *MixF* means that foreign-owned banks are subject to a substantially larger shock in terms of the balance sheet size than domestic banks or the banking system. If we take the liability structure of the banking system as the benchmark, then the responses of domestic banks should be scaled up by a factor 1.44, and the responses of foreign banks scaled down by a factor 0.58. With
255 such scaling, the peak real GDP response to a foreign funding supply shock is 2.7% for the banking system, 0.8% for foreign banks, and 2.0% for domestic banks. The peak responses for loans are 4.7%, 1.4%, and 5.5% for the banking system, foreign banks, and domestic banks, respectively.¹⁹

We also compare the magnitudes of real GDP and lending responses after

¹⁸About 70% of bank lending to firms in the sample comes from domestic banks.

¹⁹Note that the responses are not precisely estimated and the numbers reported may not add up.

260 taking into account the market share of foreign-owned banks, which has been
stable with mild fluctuations around 30% over the sample, both when measured
in terms of balance sheet size and in terms of lending. Again taking the banking
system as a whole as the benchmark, this implies that responses of real GDP
and loans should be scaled up by a factor of 3.3 for foreign-owned banks and by
265 a factor of 1.7 for domestic banks. The peak GDP response to a shock in foreign
funding supply, adjusted for the balance sheet structure and the market share
is 2.6% for foreign-owned banks and 3.4% for domestic banks. The balance-
sheet and market-share adjusted peak response of loans is 4.6% and 9.4% for
foreign-owned and domestic banks, respectively.

270 Therefore, even after taking into account the structure of bank liabilities
and the market share, the finding that foreign-owned banks respond less vig-
orously to shocks in foreign bank funding supply still holds. This is not only
because they respond to shocks more gradually than domestic banks, but also
because the magnitude of their response is lower. These results reinforce the
275 finding that the transmission of shocks to bank funding supply to the domes-
tic economy is slower and more attenuated when it goes through foreign-owned
banks. A possible interpretation that is consistent with the reported findings
is that foreign-owned banks follow more prudent lending practices (as reported
in Brezigar-Masten et al. (2015)), which is why they distribute funds obtained
280 from abroad more gradually to the economy. The macroeconomic consequence
of such practice is that a given shock to foreign banks leads to less procyclical
behaviour of lending, real GDP, and inflation.

4. Shocks to foreign funding supply and business cycles

To determine whether shocks to foreign funding supply are important rela-
285 tive to other shocks in influencing the business cycle, we use the co-movement
statistic of den Haan (2000). This statistic allows us to decompose the con-
tributions of all *structural* shocks to standard deviations or correlations to any

variable in the VAR.²⁰ This allows us to investigate whether the shock to foreign
funding supply is important relative to other shocks in driving the co-movement
of the variables of interest. We focus on the standard deviations of real GDP
and loans, and on the correlation between them.

The results are reported in Figure 2, where the columns correspond to the
columns in Figure 1. The left column shows the results for the banking sector as
a whole. Aggregate demand shocks (dashed line) are the most important driver
of fluctuations in real GDP and loans, and their correlation, except at very
short time horizons. They are closely followed by the shock to foreign funding
supply to banks (dotted line), which is the second most important shock in the
medium run. It contributes about a quarter to the standard deviation of real
GDP and loans, and contributes about one fifth to the positive correlation of
real GDP and loans (bottom-left panel in Figure 2). At frequencies below one
year, fluctuations of loans and the co-movement of loans and real GDP tend to
be driven by shocks to home loan supply, but their effects diminish at longer
horizons.

The results for foreign-owned banks (second column of Figure 2) are similar
to the results for the aggregate, except that shocks to foreign funding supply gain
importance after about four quarters, consistent with the finding reported above
that foreign-owned banks respond to foreign funding supply more gradually. For
domestic banks (third column of Figure 2), shocks to aggregate demand are by
far the most important drivers of fluctuations in real GDP and loans, as well as
their correlation. Shocks to foreign funding supply, while much less important
than for the aggregate or for foreign-owned banks, are still the second most
important shock in terms of their contribution to fluctuations and the correlation
between real GDP and bank loans.²¹

²⁰The co-movement between two variables, conditional on a shock, is the standardised product of impulse responses to this shock up to the chosen time horizon. Note that the total correlation or standard deviation *do not* depend on how the shocks are identified.

²¹Totals reported in the bottom panels of Figure 2 (thick full lines) are consistent with correlations obtained using more standard methods (which do not permit conditioning on

These results indicate that the findings reported in Section 3 are only part of
315 the explanation how foreign funding supply shocks transmit through banks to
the economy. While it is still the case that, conditional on the foreign funding
supply shock, foreign-owned banks act less expansionary than domestic banks
and that they do so with a delay, the results from this section show that shocks to
foreign funding supply have been much more important for foreign-owned banks
320 than for domestic banks. Therefore, conditional on shocks to foreign funding
supply, foreign-owned banks have contributed more to the fluctuations in real
GDP, loans, and the correlation between them, compared to domestic banks.
The reason, however, is not that foreign-owned banks act more procyclically
than domestic banks, but that the foreign funding shock has been much more
325 important for foreign-owned banks, relative to other shocks. This is likely due
to the structure of their balance sheets, where funding from abroad is more than
twice as large as the funding from abroad for domestic banks.²²

5. Conclusions

In this paper we propose a way to identify a shock to the foreign funding
330 supply to banks in the domestic economy using gross data from the flow of funds
statistics and sign restrictions. We distinguish between the banking sector,
foreign-owned banks, and domestic banks.

Our findings suggest that the effect of changes in the supply of foreign funds
to banks on the domestic economy is strong and persistent. An increase in the
335 supply of foreign funding to banks results in a protracted expansion of domestic
lending, real activity and, after a delay, prices.

shocks). Using a Christiano-Fitzgerald band-pass filter corresponding to frequencies between
six and 32 quarters, we obtain the correlation between domestic bank loans and real GDP of
0.54, and the correlation between loans by foreign-owned banks and real GDP of 0.33.

²²Note that the unidentified shock is a negligible driver of fluctuations or co-movement
between real GDP or loans. This indicates that we are not missing an important driver of
business cycles by leaving one shock unidentified in our VARs.

Foreign-owned banks are more restrained in passing the increase in foreign funding to firms than domestic banks, and this remains the case when we account for the differences in the structure of liabilities of domestic and foreign-owned banks. This finding implies that foreign-owned banks transmit shocks from foreign funding supply slower and with a lower magnitude than domestic banks. An explanation consistent with these findings is that foreign-owned banks follow stricter lending practices, which slows the process of lending new funds received from abroad.

Shocks to foreign funding supply are second only to shocks to aggregate demand in terms of their importance as a driver of macroeconomic fluctuations in real GDP, loans, and their co-movement. However, shocks to foreign funding supply for foreign-owned banks are much more important, relative to other shocks, than for domestic banks. This is why shocks to foreign funding supply that affect foreign-owned banks contribute more to economic fluctuations than the same shocks that affect domestic banks. The reason for such a finding is not that foreign-owned banks behave more procyclically, but that they face foreign funding shocks that are much more important relative to other shocks. These findings give a mixed picture on the role of foreign-owned banks in transmission of foreign funding supply shocks. On the one hand, foreign-owned banks tend to act more stabilising for domestic lending and the business cycle because they are transmitting shocks more slowly and less vigorously. But on the other hand, the importance of foreign funding supply shocks is much bigger for foreign-owned banks, so that the overall effect is not stabilising. This is consistent with the anecdotal evidence that a significant part of fluctuations in our sample has been driven by changes in the availability of the supply of foreign funding to banks.

The main message for the policymakers is that they should closely monitor changes in bank funding conditions for domestic and foreign-owned banks. In principle, to avoid a credit boom, output expansion and the loss of external competitiveness due to the increase in prices, macroprudential policies can be used either to dampen bank borrowing abroad or to slow the extension of these funds to firms. Our findings suggest that measures that reduce the importance

of foreign funding shocks to foreign-owned banks would be beneficial in terms
of reducing the co-movement between bank loans and GDP and the volatility
370 of both.

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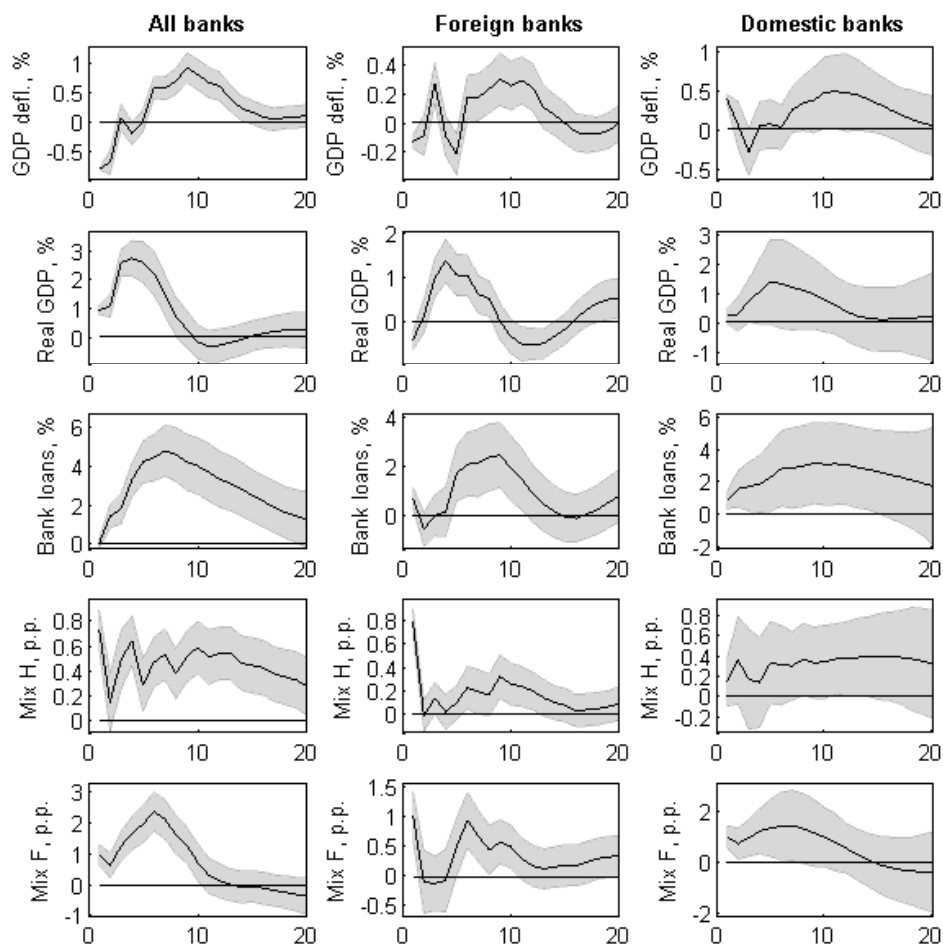


Figure 1: Effects of an expansionary bank funding shock, identification with sign restrictions. Notes: Impulse responses to a 1 standard deviation shock to *MixF*. The responses are percentage deviations from initial values, except for the mixes, which are in percentage points. Shaded areas are 90 percent confidence bands, generated using bootstrap with 1000 draws.

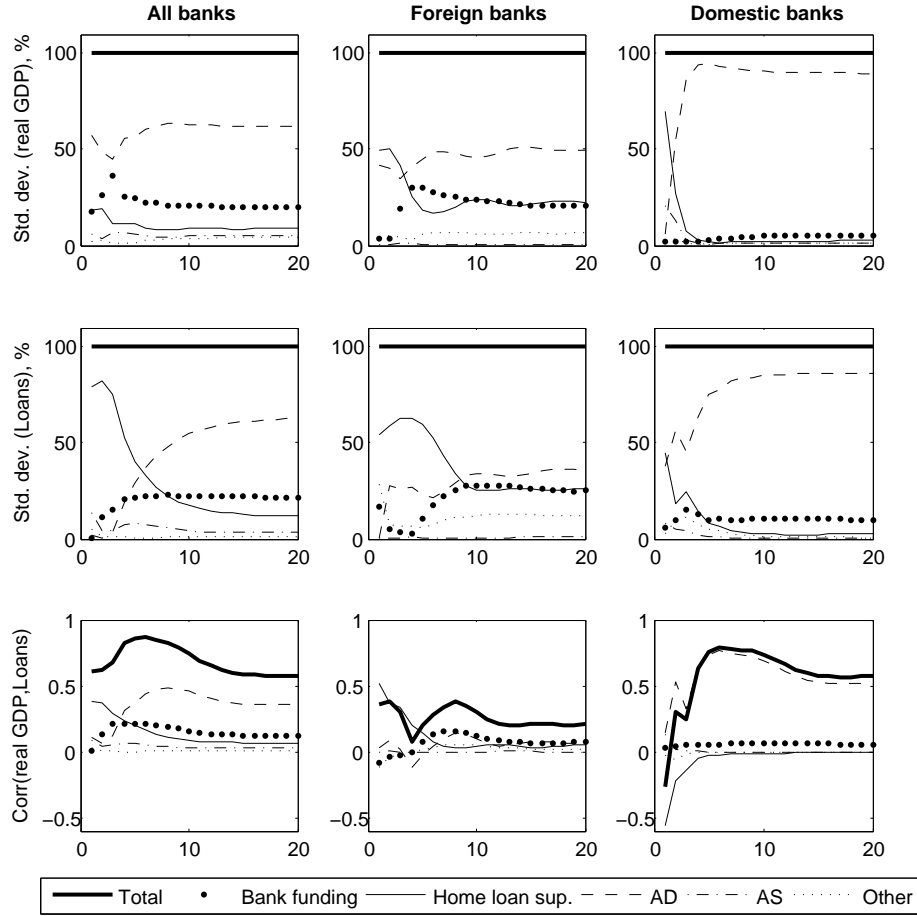


Figure 2: Co-movement and variance decomposition. Notes: The top and middle rows show the contributions of structural shocks to the standard deviation of real GDP and loans, in percent. The x-axis indicates the time horizon in quarters. The bottom row shows the contribution of shocks to the correlation between real GDP and loans. Left, middle, and right columns corresponds to VARs with all loans, loans of foreign-owned banks, and loans of domestic banks, respectively. The contributions of shocks are labelled as 'Bank funding' for the shock to foreign bank funding, 'Home loan sup.' for the shock to domestic loan supply, 'AD' for the aggregate demand shock, 'AS' for the aggregate supply shock, and 'Other' for the unidentified shock.