

Regulatory arbitrage in action: evidence from banking flows and macroprudential policy*

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Abstract

We use a new database on macroprudential policy actions to examine whether macroprudential regulations affect international banking flows. We find evidence that borrowing by the domestic non-bank sector from foreign banks increases after home authorities take a macroprudential *capital* action. We find no increase in borrowing from foreign banks after an action which tightens *lending standards* (such as limits on loan-to-value ratios for house purchase). Evidence on reserve requirements is mixed. Differences in the application of regulation for lending standards and capital regulation for international banks mean that while there is a level playing field for lending standards regulation, this does not always apply for capital regulation, giving foreign branches regulated by their home authorities a competitive advantage. Our results are, at first sight, different from the literature on regulatory arbitrage: we find that foreign banks *expand* their lending into host countries where regulation is *tightened*. But this does not occur when regulations apply also to them. The results have implications for macroprudential instrument choice and calibration, and for reciprocating regulation internationally.

Keywords: Macroprudential policies; Cross-border banking flows; Leakages; Regulatory arbitrage

JEL Classification: F32, F34, G21.

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1 Introduction

Following the global financial crisis macroprudential policies have become part of many central banks' toolkits. These instruments are being used actively to address cyclical and structural risks within financial systems; and as such there has been extensive debate about the use of different instruments for different microprudential and macroprudential objectives. But the effectiveness of these instruments may be compromised if banks and borrowers are able to avoid these measures via regulatory arbitrage or if the regulation is subject to 'leakages', whereby the activity migrates to institutions which are not covered by the instruments.

Much of the debate over leakages has focused on lending by 'shadow banks' or non-bank financial institutions, but another kind of regulatory leakage stems from internationally active banks. Macroprudential measures, as with much of prudential regulation and supervision, are taken at the national level; and some macroprudential instruments - in the absence of reciprocal arrangements - cannot be applied to all financial institutions within a country. One reason for this uneven application of regulation is bank legal structure; foreign branches and cross-border lending are not necessarily subject to the same regulatory measures as domestically-regulated banks. It is reasonable to expect that banks that are not subject to the measures in a country may exploit this unlevel playing field by expanding their lending in that country.

Not all instruments will be applied unevenly. Financial regulators are only able to apply capital regulation to banks which are headquartered in the country or to subsidiaries of foreign banks. Foreign banks' branches or cross-border lending would not be captured by the regulations. In contrast, product regulation, such as placing a limit on the maximum loan-to-value mortgage a household can get, usually applies to all products sold in a particular country. This means that all financial institutions are subject to the same macroprudential regulation and there is less potential for avoidance by borrowing from a foreign institution.

If leakage does occur, whether it is of concern depends on the aim behind the macroprudential measure. For example, if the aim was to increase the capital levels of domestic banks to make them more resilient then this will be little affected if agents respond by increasing their borrowing from foreign banks. But on the other hand the policy would be undermined by agents increasing borrowing from foreign banks if the aim was to reduce domestic agents' borrowing. This 'leakage' has implications for both the policy choice and the calibration of

any macroprudential instrument.

At the same time, but from the opposite perspective, policymakers may need to be vigilant against the risk that their own banks expand lending into foreign economies, when a macroprudential measure in the foreign economy does not apply to their banks.

Unsurprisingly policymakers have adopted strategies to minimise the risk of leakage, including reciprocity arrangements, subsidiarisation and targeted capital flow management measures. Reciprocity is a cornerstone of the Basel III agreement on the countercyclical capital buffer. When the buffer is activated in one country, reciprocity requires supervisory authorities in all other countries to apply the same buffer on their banks' exposures to that country if the buffer is 2.5 percent or less of risk-weighted assets (reciprocity of higher buffers is voluntary).

However, as yet, there is currently no international agreement that would mandate reciprocity for any other macroprudential instruments, which means that there is the potential for leakages. This means different macroprudential instrument choices are likely to have different implications for banks' and borrowers' abilities to avoid macroprudential regulatory measures. In this paper we explore whether macroprudential instrument choice affects the degree of leakage. To shed light on this question for different macroprudential instruments, we draw on a hand collected panel database of over 1000 macroprudential policy actions taken by 68 countries. We classify macroprudential policy actions into capital, lending standards and reserve requirements actions. We merge these data with BIS international banking flows data and estimate the extent to which a macroprudential policy action in a country leads to an increase in lending by foreign banks either cross-border or locally via foreign affiliates.

We find evidence for leakages in response to capital actions: borrowing by the domestic non-bank sector from foreign banks increases after home authorities increase capital standards. But we find no evidence for an increase in borrowing from foreign banks after an action which tightens lending standards. Evidence on reserve requirements is mixed. These results can be explained by the fact that a tightening of capital regulation gives foreign branches a competitive advantage, while there is no expansion in lending when tighter regulations also apply to foreign banks as is often the case for lending standards regulation.

This paper is structured as follows. Section 2 discusses the related literature. Section 3 develops our hypotheses. Sections 4 and 5 discuss the data and estimation respectively.

Section 6 illustrates our results and section 7 concludes.

2 Literature

Our paper is related to various strands in the literature. First, there is a large literature on the international spillovers generated by monetary policy. On monetary policy the early academic literature often concluded that gains from co-operation may be small (eg Oudiz and Sachs (1984); Obstfeld and Rogoff (2002)). But there is more recent evidence that international spillovers of unconventional monetary policies may have been sizable, including to emerging market economies (see, for example Fratzscher, Duca, and Straub (2013)) and Bauer and Neely (2012) on the Feds LSAP program).

There are far fewer papers on international spillovers from macroprudential policy actions. A few papers focus on coordination of macroprudential policies from a theoretical perspective such as Jeanne (2014) and Korinek (2013). However, fewer still papers discuss the empirical implications of *imperfect* macroprudential instruments, which is what we examine. When imperfect macroprudential instruments are examined the literature generally examines them in the context of the coordination with monetary policy. These papers generally justify a ‘leaning against the wind’ approach to using monetary policy on the grounds that monetary policy is a broader instrument meaning that there is less scope to avoid it.

Bengui and Bianchi (2014) is the theoretical paper that is closest to the heart of this paper, despite a focus on capital flow management policies. They examine an environment where regulators are unable to apply their policies to a subsection of agents. The authors find that while regulated agents reduce their risk taking in response to the controls, unregulated agents respond by taking more risk. This expansion in risk taking occurs because the regulation has made the market safer. But it undermines the effect of the policy.

Our paper examines the effect of banks not subject to the macroprudential regulatory action. We do not examine the effect of macroprudential regulations on the behaviour of banks subject to the actions, such as the effect on their supply of domestic credit. However, the behavioural response of banks subject to the regulation has been examined in a number of papers such as Lim, Costa, Kongsamut, Otani, Saiyid, Wezel, and Wu (2011), Vandebussche, Vogel, and Detragiache (2012) and Tovar, Garcia-Escribano, and Martin (2012). Lim et al. (2011) is the first post-crisis paper to provide systematic evidence of the use of and effectiveness of macroprudential instruments. The paper uses cross-country panel regressions

across 10 different macroprudential instruments to examine the change in credit growth after the introduction of macroprudential instruments for 49 countries. They find that many of the most frequently used instruments are effective in reducing both credit growth and also the pro-cyclicality of credit. Vandenbussche et al. (2012) is a similar paper that focuses on measures taken in Central, Eastern and South-Eastern European (CESEE) countries and also examines the effect on house prices. They show that changes in capital requirements can decrease house price growth, but changes in reserve requirements or lending standards had a less significant effect in CESEE countries.

There is some evidence from the UK of this kind of leakage for capital requirements where time-varying minimum capital requirements on individual banks to UK regulated banks and foreign subsidiaries did not apply these regulations to foreign branches. Aiyar, Calomiris, and Wieladek (2012) find that foreign branches increase lending in response to a regulation-induced decline in lending by domestically regulated banks. The average branch increases lending by about 0.3% in response to a decline in lending by its reference group of domestic banks of 1%. In other words, this ‘leakage’ undoes about one third of the decline in lending growth that occurred due to the increase in capital requirements.¹

A number of papers examine the related topic of regulatory arbitrage and cross-border banking flows, which suggest that changes in regulation are a significant driver of cross-border banking flows. Houston, Lin, and Ma (2012) investigate the factors influencing international bank flows from 26 source countries to 120 recipient countries over the 1999-2009 period and consider whether cross-country differences in regulations, using the Barth, Caprio, and Levine (2013) database, have affected the flow of capital. They find evidence that banks have transferred funds (loans and portfolio investments) to markets with less stringent regulations.

Bremus and Fratzscher (2014) examine the effect of changes to regulatory policy on cross-border bank lending since the global financial crisis, again using the Barth et al. (2013) database. They find that increases in financial supervisory power or independence have encouraged cross-border lending but tighter capital regulation has lowered cross-border lending. Ongena, Popov, and Udell (2013) analyse the effect of bank regulation in domestic (i.e., home-country) markets on multinational banks’ lending standards in foreign (i.e., host-country) markets. They test two alternative hypotheses: whether stricter home country regulation induces banks to develop a more conservative business model which they then

¹More generally, Hoggarth, Hooley, and Korniyenko (2013) show that foreign branches in the UK behave more procyclically than subsidiaries.

export to the foreign markets they are in; or alternatively, they might increase risk-taking abroad to make up for the inability to take on risk in their home-country market. They find evidence supporting the latter hypothesis. However, in contrast to our paper, none of these papers examines heterogeneity in the application of regulation within a country. We examine something slightly different - but related to - regulatory arbitrage. Regulatory arbitrage applies when a bank uses loopholes in regulatory systems in order to circumvent unfavorable regulation and continue to undertake the same activity. In contrast, what we examine is whether banks exploit the fact that they are not subject to the regulation and instead expand their activity. From the borrower's point of view, however, the outcome is equivalent to regulatory arbitrage, as they receive the same loan from a bank which is not subject to the regulation.

This paper expands on these previous works by using a wider set of instruments than capital to examine leakages. In addition the use of a macroprudential panel dataset allows us to investigate the differential effects of regulation over time, previous papers have had to rely on snapshots in time such as with Barth et al. (2013).

3 Hypotheses

3.1 Macroprudential Policies

To define hypotheses on the effect of macroprudential policy actions on banking flows, we categorise macroprudential actions into three broad categories, which are likely to have differing implications for banking flows:

1. Capital regulation - this encompasses increases in both overall capital requirements and actions such as changes in risk weights on exposures to specific sectors
2. Lending standards - this encompasses actions such as restrictions on permissible loan-to-value (LTV), debt-to-income (DTI) ratios and underwriting standards
3. Reserve requirements are not traditionally a macroprudential policy. But this instrument is sometimes used for financial stability purposes and is likely to have macroprudential consequences. Reserve requirements are typically classified as monetary policy tools for controlling the supply of credit by banks, not tools for limiting banks' exposures to liquidity risk. However, reserve requirements are similar to liquidity requirements in terms of their economic effects.

The data and their source are described further in Section 4. For each of these instruments we examine both tightening and loosening actions.

3.2 Assumption on the cost of raising equity

How does the borrowing by the domestic non-bank sector from foreign banks change following a tightening or loosening of macroprudential policies? We have a number of hypotheses informed by the theoretical literature and the mechanics of bank's balance sheets. These hypotheses differ depending on the type of macroprudential policy action. Importantly, we are interested in whether foreign banks have an incentive to change their lending to the domestic non-bank sector *relative to* domestic banks' lending.²

One assumption underlying the paper is that raising capital and reserves is privately expensive. The former is an assumption that has been the subject of considerable debate in both the academic and policy literature. Amongst others Gorton and Metrick (2012) show, in violation of the Modigliani-Miller theorem, there is a money-like premium on wholesale short-term bank debt, reflecting its usefulness as a medium of exchange. The existence of implicit guarantees on bank debt also leads to a violation of the Modigliani-Miller theorem, as debt no longer becomes more expensive in response to a reduction in a bank's equity.

The above frictions relate to *existing equity*. For the purposes of this paper the cost of *issuing* equity is more important as we examine the change in lending around an increase or decrease in capital requirements. Myers and Majluf (1984) emphasise the asymmetry of information between informed management and uninformed outsiders as a reason why issuing equity is expensive. If management acts on behalf of existing shareholders, then a choice to raise new equity will be taken as a negative signal by outsiders, since management will be more inclined to sell stock when they think it is overvalued. There are a number of effects that may mitigate this cost of issuing equity. The adverse selection costs from issuing equity may be reduced if the equity issuance is forced, e.g. by a regulator increasing capital requirements. However, it is important to bear in mind that raising a minimum capital ratio requirement does not necessarily require banks to raise equity; banks can achieve the higher ratio by choosing to shrink assets or retain more profits and so adverse selection costs still remain. Cornett and Tehranian (1994) show that while this 'forced issuance' effect to reduce the adverse selection costs exists, it is small; as such we expect that there is a positive cost

²The empirical framework we employ identifies the extent to which foreign banks' lending growth deviates from the overall domestic credit cycle.

of raising capital even when the capital requirement has been increased due to regulatory action.

In theory, the cost of issuing equity should vary with the credit cycle and equity issuance should be cheaper in the upturn phase of the cycle, which should coincide with when policymakers take action to address a buildup in systemic risk. Some instruments, such as the countercyclical capital buffer have been explicitly designed with this in mind. However, Baron (2015) examines equity issuance for banks and find that it is countercyclical. He shows that government guarantees play a crucial role in driving banks' countercyclical issuance as equity issuance is countercyclical when government guarantees are strong and procyclical when government guarantees are weak.

The hypotheses below are formed on the premise that there are costs associated with raising capital.

3.3 Hypotheses on the effect of macroprudential actions

Hypothesis 1 *If bank capital requirements are increased, domestic agents will borrow more from abroad*

As capital requirements increase the weighted average cost of capital for banks subject to this measure increases. Domestic banks and foreign subsidiaries will be captured, but foreign branches and cross-border lending will not be. This generates a funding advantage for foreign branches and foreign banks undertaking cross-border lending, which - if passed through to borrowers³ - will mean an increase in borrowing from these institutions. There is some evidence for such an effect in the UK, see Aiyar et al. (2012).

Hypothesis 2 *Tightening regulation that applies to lending standards does not lead non-bank agents to borrow more from abroad* Lending standards regulation is generally product or financial conduct regulation that applies to the product regardless of whether it is sold by a foreign or domestic bank. As such we do not expect foreign banks to have an advantage relative to domestic banks, and there should hence not be an increase in borrowing from foreign banks. There may, however, still be a cross-border dimension to lending standards stemming from *differences* in the tightness of lending standard regulation across countries. Ongena et al. (2013) show that tighter regulatory standards domestically are associated with

³Pass through will occur under most reasonable forms of competition structure. To some extent banks may choose to increase their margins rather than increase lending, however we do not have price or interest margin available at the necessary level of granularity to test whether this is the case.

banks increasing their risk-taking abroad, potentially lowering actual lending standards in foreign countries. In our case, it may be the case that a tightening in lending standards domestically to levels above respective regulations abroad may induce foreign banks to *reduce* lending domestically as they are no longer able to achieve the desired risk profile. What remains unclear in this line of argument is whether foreign banks would reduce their actual lending or merely shift into higher risk lending within the same country. Since the only available data are the aggregate quantity of lending we are unable to observe this risk-shifting effect.

Hypothesis 3 *If reserve requirements are increased at home, then domestic agents will increase their borrowing from foreign banks*

Reserve requirements set the minimum fraction of deposits and notes that a bank must hold as reserves rather than lend out. Higher reserve requirements reduce the amount that a bank can lend unless it replaces the funding from elsewhere, which will be more expensive than deposit funding. Given that reserve requirement changes are mainly applied as an instrument in emerging markets we conjecture that foreign banks will find it easier to replace this funding, by obtaining it from abroad, than locally incorporated banks. This provides a competitive advantage to foreign banks, meaning that domestic agents are more likely to borrow from them.

4 Data

In this section, we describe the data sources, the screening procedures and variable definitions.

4.1 Data Sources and Variable Definitions

We collect quarterly data for banking flows, macroprudential policy actions, and economic and financial control variables from several different sources. Table 1 describes the data sources. Our final sample includes 37 countries over the period 2005 Q1 to 2014 Q3. Countries included are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Switzerland, China, Czech Republic, Germany, Denmark, Spain, Finland, France, UK, Greece, Hong Kong, Hungary, Indonesia, India, Ireland, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, Norway, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Sweden,

Thailand, Turkey and US. Table 2 gives the summary statistics.

Macroprudential policy actions. The database on macroprudential policy actions has been constructed from a number of sources. Lim et al. (2011), Borio and Shim (2007), Kuttner and Shim (2013) and International Monetary Fund (2014) have been the main sources. Data from these sources have been supplemented with hand-collected data from searches of regulators' websites and financial stability reports, and from communication with relevant authorities. This allowed us to build a dataset containing information on a wide range of macroprudential policy actions in 70 countries over the period 1990 to 2014. In our analysis the use of instruments is coded in the form of a dummy variable which takes the value of 1 if there has been such an action in that quarter and 0 otherwise. Ideally we would have information about the strength of macroprudential actions. However, there is to date no comprehensive dataset on measuring macroprudential policy intensity in a cross-country, cross-time consistent way. Barth et al. (2013) constitutes probably the best attempt. Unfortunately, their data comes in 4-yearly surveys and focus on microprudential banking supervision and regulation (and do not include some of the policies we like to examine such as lending standards). Their data are hence not suitable for our event-study type analysis.

The difficulty of deriving quantitative indices of macroprudential intensity stem largely from the fact that the use of macroprudential policies is idiosyncratic across countries, where even policies which sound similar such as an LTV limit vary in their implementation, for example by applying only to second mortgages or to all mortgages. Similarly, risk weights often differ across countries, which makes comparing the intensity of capital regulation across countries difficult. Two existing papers do not use the dummy approach: Bakker, Dell'Ariccia, Laeven, Vandenbussche, Igan, and Tong (2012) and Vandenbussche et al. (2012). Bakker et al. (2012) use a composite measure of six types of instruments but, given that one contribution of our paper is to examine the effect of different instruments, this approach is not suitable for this work. Vandenbussche et al. (2012) construct an index of macroprudential policy strength for certain Eastern European countries. This approach has strong merits but also suffers from the downside that even policies that appear similar in terms of apparent intensity, have strongly different intensities in reality depending on the prevailing market conditions. Both the above mentioned papers find results which are in line with the papers such as Lim et al. (2011) that use dummy variables. As a result our preferred specification is to use dummy variables.

The data also records implementation rather than announcement dates. Our analysis may hence miss some potential actions by banks prior to the enactment of the respective macroprudential measure. But we examine anticipation effects in section 6 and do not find evidence for them.

We cover any action which is ‘macroprudential’-like, rather than focusing on actions that have been specifically taken for macroprudential purposes. It is difficult to separate out macroprudential from microprudential policy actions based on the stated intent of authorities.

In our analysis, we exploit information on tightening or loosening of capital requirements, reserve requirements and lending standards. We group similar actions together, so for example all risk weight and capital requirement actions are combined to create the variable ‘capital’. Similarly actions such as limits on loan-to-value ratios, debt service ratios and repayment periods are grouped as ‘lending standards’, given that these all apply to borrowers, are introduced via the same framework of regulations and are frequently taken at the same time. We are also able to observe changes in reserve requirements. These are traditionally considered to be a monetary policy instrument, but have been used for macroprudential purposes to protect against liquidity risks and against credit growth. Gray (2011) provides background on the changing use and purposes of reserve requirements.

Although the early time period mainly covers actions taken in emerging economies, advanced economies have been more proactive in taking macroprudential actions since the global financial crisis. Figure 3 shows that there had been a variety of macroprudential policy actions for each of the policies we consider and that measures have been taken both before and after the crisis. Figures 4 and 5 show the same data as 3 but in more detail for capital and lending standards actions for clarity. There are both tightening and loosening actions in each category, though it is noteworthy that for both capital and lending standards tightening actions were taken more frequently than loosening actions. The number of actions is higher in later years, which reflects the growing recognition of the importance of macroprudential policy.

Banking flows. To estimate the effect of these macroprudential policies on the level of cross-border borrowing we use data on cross-border borrowing, which are constructed from the BIS consolidated banking statistics. They contain quarterly consolidated international claims of domestically-owned banks on other countries broken down by the sector the bor-

rower is in. The data are available for around 30 BIS reporting banking systems, which include the largest financial centers. Lending can be either directly cross-border or locally via foreign affiliates. The dataset contains both information on exposures by country of immediate borrower and on the reallocation of claims (ie risk transfers) to the country of ultimate risk. The ultimate risk data give a much better picture of the bilateral lending relations that we study in this paper than the immediate borrower data. Importantly, consolidated data consists - unlike the immediate borrower data - of local claims in foreign *and* in local currency. However, this restricts our sample to start in 2005 because the data have only been collected since this point.

Claims can be split either by borrowing sector (banks, public, or non-bank private sector) or type of lending (cross-border or local) but not by both. For the purpose of studying leakages of macroprudential policies, we focus on cross-border and local lending to the domestic non-bank private sector.

When a country is not a BIS reporting country, we use the data provided by BIS reporting countries on their claims on non-banks to the non-BIS reporting country as a proxy for the borrowing of non-banks from foreign banks in that country. We acknowledge that this may underestimate of the stock of lending in countries where the domestic non-bank sector receives significant amounts of funding from non-BIS reporting countries. However, as BIS reporting banks are the major financial centres we are confident that the great majority of the cross-border lending to non-reporting countries has been captured. In addition, we examine lending *growth* rather than the stock of lending.

Using these data we derive our dependent variable as the percentage change in bilateral banking liabilities of domestic non-banks as:

$$\Delta Liabilities_{i,j,t} = \frac{F_{i,j,t}}{S_{i,j,t-1}} \times 100, \quad (1)$$

- F denotes the (exchange rate adjusted) change in assets or liabilities of country i to country j , reported to the BIS, while S denotes the previous-quarter *stock* of assets or liabilities.

We screen the data in the following ways. Growth in bilateral borrowing from foreign banks is winsorised at the 5% level and we exclude bilateral pairs where the stock of bilateral borrowing from foreign banks is below 10bps of receiving country GDP. These adjustments

ensure that extreme values are removed and that the results are not driven by bilateral pairs which do very little financial trade with each other.

Economic and Financial Statistics. Table 1 contains all the variable descriptions and data sources for the main variables and other statistics used. Most importantly, domestic credit growth is measured as the percentage change in quarterly credit of domestic banks to the domestic non-bank financial sector using data from the BIS. Exploiting the bilateral dimension, we express GDP growth, inflation and exchange rate depreciation vis-à-vis the USD as the difference between host (i) and home country (j).⁴

4.2 A First Look at the Data

Figure 1 illustrates the borrowing of domestic non-banks from foreign banks as a % of GDP in Q3 2014. These proportions are large, typically over 20% of GDP and as such foreign banks are typically important providers of credit. An expansion or contraction of lending by foreign banks following a macroprudential action has the potential to be economically significant.

In our sample, we make use of most of the events in the database. Specifically, we make use of lending standards actions, reserve requirements and increases in capital requirements. Some of the instruments in the database have not been used often enough to produce reasonable estimates. For example we omit actions with fewer than ten observations, such as government directed credit, large exposure limits and off-balance sheet requirements.

Figure 2 shows the variation in the use of macroprudential instruments across different regions including omitted instruments. It is clear that the use of instruments has varied across regions. This reflects the different risks that countries have faced, different instruments that authorities have legally available, and political backdrops which reflect the difficulty - or otherwise - of implementing regulation which can be seen as intrusive. As a large number of actions have been taken to address risks in housing markets, it also reflects the different structures of housing markets. Emerging markets are more active in taking measures to address risks associated with foreign currency lending, given the high degree of financial dollarisation observed. Factors influencing the decision to take a macroprudential action are examined in section 5.

⁴All explanatory variables except macroprudential policy events are winsorised at the 2.5% level.

For the earlier years in our sample macroprudential actions were mainly taken by emerging market economies. As noted by Lim et al. (2011), policy frameworks similar to ‘macroprudential’ frameworks existed in some emerging market economies in the past, as they started to use some of the instruments following their own financial crises during the 1990s. These tend to be part of a broader ‘macro-financial’ stability framework that also includes the exchange rate and capital account management. In the post- global financial crisis period, however, the sample is more evenly balanced as advanced economies have made more use of ‘macroprudential’ instruments.

5 Empirical Methodology

5.1 Baseline Model

We estimate the effect of a macroprudential policy action in country i on the change in the amount that it borrows from country j . We estimate the following panel regression:

$$\Delta Borrowing_{i,j,t} = \alpha + \beta Macropru_{i,t-x} + CreditGrowth_{i,t} + Controls_{i,t-1} + \delta_i + \theta_{j,t} + \epsilon_{i,j,t} \quad (2)$$

where $\Delta Borrowing_{i,j,t}$ is the quarterly percentage change in cross-border and/or local borrowing of non-banks in country i from country j 's banks at time t as given by equation 1. $Macropru$ is a dummy which takes the value of 1 when country i implements a macroprudential measure and 0 otherwise. We run separate regressions to cover the three types of macroprudential actions and have separate dummies for tightening and loosening. $CreditGrowth$ is domestic credit growth extended by domestic resident banks. Domestic $Controls$ are Exchange Rate Depreciation, Inflation and Real GDP Growth. δ_i are country fixed effects for the country taking macroprudential action. $\theta_{j,t}$ are sending country-quarter fixed effects. Standard errors are clustered at the bilateral pair (i, j) level.

The sending country-quarter fixed effects are important to our identification strategy. They capture all factors external to the country implementing the macroprudential policy, such as swings in global risk or macroprudential policies taken abroad. Our coefficients hence capture changes in foreign bank lending growth driven by domestic factors of the country taking the macroprudential policy action.

The inclusion of domestic credit growth - credit extended by all domestic resident banks to the private non-financial sector - has a noteworthy impact on the interpretation of our regression coefficients. By controlling for the (contemporaneous) domestic credit cycle, we

focus our attention on changes in foreign bank lending growth over and above changes in domestic credit growth, such as lending driven by changes in the relative competitive advantage of foreign banks vis-à-vis domestic banks.

Exploiting the bilateral dimension, we express GDP growth, inflation and exchange rate depreciation vis-à-vis the USD as the difference between host (i) and home country (j).

As we are agnostic about the time-period over which macroprudential policy may affect banking flows, we vary the lag structure of the *Macropriu* variable to let macroprudential actions affect borrowing from foreign banks over different time horizons. Our baseline results refer to the macroprudential event dummy being switched to 1 if a country enacted a macroprudential policy in any of the preceding two quarters. There are several arguments for choosing this as the baseline as the costs of capital requirements mainly accrue to *raising* equity rather than maintaining a higher level of equity. Six months (two quarters) is likely a reasonable amount of time to raise the necessary equity. As such we expect that the effects will diminish after this time. This length of time also allows time for the policy to be implemented, and gives borrowers time to adjust and potentially avoid the measure by changing banks. However, we do not attach much weight to these arguments and, as such, consider a wide variety of lag structures.

We consider both tightening *and* loosening events. As discussed, following the theoretical literature we conjecture to find stronger effects for tightening actions as these are more likely to be binding and are mainly driven by the costs of raising equity. Loosening actions are on the other hand often implemented in periods of stress when banks' are repairing their balance sheets.

5.2 Identification Assumptions

5.2.1 Exogeneity of macroprudential policy action

Endogeneity is a possible concern as authorities respond to emerging risks in their own jurisdictions. Conceivably, policy makers are concerned specifically about strong credit growth by foreign banks fueling domestic credit booms and decide to enact macroprudential policies targeted specifically at such lending. This would cause an upward bias in our coefficients even *after* controlling for the domestic credit cycle. However, the measures we consider do not discriminate based on currency or residency and are hence different from what the IMF calls capital flow management measures (CFMs), which have been in many emerging

economies the first port of call for policy makers worried about strong lending growth by foreign banks (potentially in foreign currency). Capital regulations, lending standards and reserve requirements are broad measures that affect either all regulated resident banks or all domestic lending suitable to target the overall credit cycle rather than lending by specific lenders such as foreign banks.⁵

We formally test whether macroprudential policies at home are driven by borrowing from abroad. As such we examine whether borrowing from foreign banks affects the probability of observing changes in macroprudential regulation in the home country. If the exogeneity assumption is valid then we expect borrowing growth from abroad not to impact the probability of the home country changing its macroprudential policy.

Table 3 presents the results. We include sending country quarter fixed effects. In general we find no significant effect of foreign bank lending growth which suggests that a growth in residents' borrowing from abroad plays no significant role in the regulator's decisions to change macroprudential regulation. The exceptions are for a tightening in lending standards where we find that an increase in borrowing from abroad makes it *less* likely that a country tightens lending standards; this strengthens our results as the expectation would be that an increase in borrowing from abroad, and therefore capital inflows, would lead macroprudential regulation to be tightened. However, the effect is small and we ignore this strengthening effect. An increase in borrowing from abroad makes it less likely that a country loosens reserve requirements which is what would be expected.

5.2.2 Parallel trends

If the evolution of borrowing growth in countries taking and not taking macroprudential actions is similar before the macroprudential action is taken, then this allows us to believe that in the absence of changes in macroprudential regulation they would have continued to have a similar trend and that any divergences after the action is taken can be attributed to the effect of the action.

This analysis is complicated by the moving event windows and the fact that countries take macroprudential actions at different points in time. As a result, as our baseline, we consider only events which are at least two years apart to make sure that the pre-treatment periods and post-treatment periods do not overlap. In theory any country that has taken a

⁵The case is less clear cut for reserve requirements in some countries. In Costa Rica, Peru and Russia reserve requirements measures have targeted foreign banks/non-residents in particular. We exclude these countries and results on reserve requirements remain robust.

macroprudential action in the past is likely to be following the ‘post treatment’ trend rather than the ‘pre treatment’ trend. Although, as mentioned above, we are agnostic about the time period over which macroprudential policies might have an effect four quarters is likely to be a reasonable baseline. Longer periods would come at the expense of having to drop more countries to construct the parallel trends. Finally, given the unconditional nature of the exercise we restrict ourselves to examining the two quarters before and after the event and examine the impact of macroprudential actions on foreign bank lending growth over longer periods in our regression analysis.

Figures 6 and 7 plot the median growth rates in borrowing from foreign banks for countries over the two quarters preceding a change in macroprudential policy. Countries which took a macroprudential action are illustrated by blue lines and triangles while countries with no macroprudential action are illustrated by red dashed lines and circles. In most cases the foreign borrowing of treated and control countries follows a very similar pattern prior to the change in regulation. This suggests that any change in foreign borrowing following a macroprudential action are likely to be as a result of the action rather than because of different pre-treatment trends in the evolution of foreign borrowing by countries that took such actions and those that did not.

The figures also contain the post-treatment episode and give hence an unconditional view on the results. It is noteworthy that while lending growth of foreign banks to domestic non-banks follows a similar trend in quarters before a capital tightening, the median growth rate for the group of treated countries rises in the quarter of the capital tightening event, while the median growth rate of non-treated countries remains stable. We do not see such a divergence in median growth rates after quarters where lending standards and reserve requirements were tightened.

6 Results and discussion

This section presents first our baseline results on how tightening or loosening of different types of macroprudential policies affects borrowing by domestic non-banks from foreign banks. It then discusses robustness. In all specifications we include country fixed effects as well as sending country quarter fixed effects.

6.1 Baseline Regression

Table 4 shows our baseline estimates for liabilities of the *non-bank* sector.

Positive coefficients should be interpreted as this variable being associated with an increase in borrowing from abroad by banks or non-banks in the country which enacted the macroprudential policy. The results should be interpreted carefully: many of these actions were not taken for macroprudential purposes, but for other reasons such as microprudential regulation.

Our controls have the expected signs. An expansion in credit growth (a control for domestic credit demand) is associated with more borrowing from abroad, as is greater GDP growth. The latter is expected as banks are likely to expand their lending into countries with higher growth prospects.

Table 4 illustrates our baseline results. Neither a tightening or loosening in **lending standards** is associated with a change in cross-border and local foreign affiliate borrowing by the domestic non-bank private sector. This is consistent with the hypothesis as outlined in section 3.3 that lending standards affect borrowing from all sources as it is applied to the product level, meaning that foreign banks do not enjoy a competitive advantage. We do not find evidence of a contraction in lending which would have been consistent with the evidence found in Ongena et al. (2013); but, as noted in section 3.3 we do not have the data to draw strong conclusions about the bank risk-shifting hypothesis.

Reserve requirements have the expected sign with a tightening in reserve requirements being associated with a 1.1 pp increase in the growth rate of borrowing from cross-border or local foreign affiliates while a loosening in requirements is associated with a 1.4% drop in the growth rate of borrowing. This is consistent with the hypothesis in section 3.3 that when domestic banks are more liquidity constrained foreign banks appear to step in and extend more lending to the domestic non-bank sectors.

Finally, we document evidence for leakages: a tightening in **capital regulation** is associated with an increase in non-bank borrowing from foreign banks. Taking the baseline results of column (2), a typical capital tightening event leads to an increase in the growth rate of borrowing from abroad of 1.3 pp. We do not find statistically significant evidence of an effect of loosening in capital regulation although the coefficients enter with the expected sign. This is not surprising as it is not clear what the effect of loosening capital requirements would be. As noted in section 3.3 the principal costs of capital accrue to *issuing* capital rather

than retaining it so the competitive advantage of a bank that is not subject to the same regulation will be smaller than in the situation when capital requirements are increased.⁶

Turning to the timing of the effects, Figure 8 plots the coefficients of the above regressions but varies the time period over which macroprudential policy has an effect, essentially varying x of $\beta Macropriu_{i,t-x}$ in (2). These show that the results on lending standards are robust to increasing the number of quarters, we allow macroprudential policies to affect banking flows. The negative effect of loosening of reserve requirements on borrowing from foreign banks is robust to extending the lag length. Finally, our results on the leakages of capital tightening are also robust when considering banking flows for up to 3 or 4 quarters.

6.2 Branches and subsidiaries

In theory there are two explanations why borrowers borrow more from abroad following a capital tightening action. The first is that they enjoy a regulatory advantage. As authorities are able to apply capital regulation to *subsidiaries* which they supervise but not branches this suggests that leakages should occur via *branches*. If this is the case then countries where foreign lending is mainly done through branches, rather than subsidiaries, should see more leakages. The second is that multinational banks have a larger investor base and are able to raise capital more easily than local banks. If this is the case then there should be no real difference between countries where foreign lending is mainly done through branches and countries where lending is done through subsidiaries.

We attempt to test this latter hypothesis. We do not have access to the individual bank data from a large set of countries as it is confidential to ascertain whether bank lending to/from a particular country is via branches or subsidiaries. However, we do have information as to the relative importance of subsidiaries or branches in each banking system from Fiechter, Otker-Robe, Ilyina, Hsu, Santos, and Surti (2011). We extended these data using data from the ECB and extended the data for non-EA countries forward in time until the end of our sample. For most countries, the share of subsidiaries in total subsidiaries and branch assets has been stable over time to justify such an extension (see Fiechter et al. (2011)).

In Table 5, we show the results of regressions when we include an interaction term between the share of subsidiaries in total assets of subsidiaries and branches and capital tightening

⁶There is considerable theoretical uncertainty about the effects of a cut in capital requirements as market participants may not wish the bank to become less-well capitalised, meaning that the market - rather than the regulatory - requirement will be binding

for which we documented a leakage above (Note the controls are included but not shown). As expected, the coefficient is negative and significant. A test of the sum of the interaction term and the base term on capital regulation tightening reveals that there is no leakage for banking systems where foreign affiliates are mainly subsidiaries rather than branches (i.e. we cannot reject the null of the sum being significantly different from zero).

6.3 Robustness

We run a number of robustness checks and extensions to our main specifications.

We first examine the robustness of our baseline results to changes in the specification. Our results (not shown but available on request) are robust to employing bilateral pair fixed effects rather than country fixed effects. The results are also robust when moving to a stricter winsorisation procedure for the growth in borrowing from foreign banks (10% instead of 5%).

Next, we examine robustness to different samples. Column (1) in table 6 shows the results for interacting the macroprudential regulation dummies with a dummy for 1 when a country is classified as an emerging market economy based on the classification contained in the IMF's 2014 WEO database. Column (1) and (2) suggest that the 'leakage' effects of capital regulation tightening occur only in 'advanced economies'. At first sight this appears to be a surprising result, but it is consistent with the results in section 6.2 above. In Latin American and Central and Eastern Europe, subsidiaries are dominant, while in Asia it is the branch structure that dominates. As shown in figure 2, in Asia lending standards actions are much more common than capital actions. This combination of factors can explain the lack of leakages observed for emerging markets. In contrast, in advanced economies branch structures are more common, although there is considerable variation.⁷ These results lend support for the 'arbitrage' hypothesis rather than 'ease of raising capital requirements' hypothesis as with advanced economies it is more difficult to argue that foreign banks have better access to investors than local banks.

The crisis period in the middle of our sample may have influenced the transmission of macroprudential policies. We hence excluded in column (2) the period following the collapse of Lehman Brothers (2008 Q4 to 2009 Q4) from our sample. The main results on capital tightening and lending standards are robust to the exclusion of this period.

Finally, we include changes in the central bank's policy rate into the regression (column

⁷See for example Figure 2 in Fiechter et al. (2011).

3). It enters negatively but insignificantly. The results on capital tightening and lending standards regulation remain unchanged.

However, the results on reserve requirements do change for all the robustness checks and although the signs remain the same and in the expected direction, the significance reduces to become insignificant. As such we do not focus on the reserve requirement results when drawing conclusions.

More generally, in theory, monetary policy and macroprudential policy can be used to both substitute for and also complement each other. In the latter case macroprudential and monetary policies would be tightened at the same time and there is a risk that we do not correctly identify the effect of the macroprudential policy. While monetary policy and macroprudential policy are changed together, there are also many instances where macroprudential policy changes while monetary policy is broadly unchanged and vice versa. Macroprudential policy has also been tightened and loosened through tightening and loosening cycles of monetary policy which suggests that we are able to separately identify the effects of macroprudential policy. The times when monetary and macroprudential policy have *historically* moved in the same direction was during the crisis as countries loosened policies to stimulate growth. As shown above the results are robust to exclusion of this period.

In addition, for our results not to hold, the way that monetary policy and macroprudential policies are changed would have to be systematically different for changes in lending standards vs changes in capital or reserve requirements. We examined when monetary policies and macroprudential policies were moved in the same direction and found no difference for the frequency of concurrent lending standards and monetary policy moves vs. capital and monetary policy moves.⁸ As such we do not think that our results are driven by monetary policy shocks rather than macroprudential policy.

7 Conclusion

In the aftermath of the recent financial crisis there has been a high appetite for the use of measures to address systemic risk in the financial system. Many have stressed the use of macroprudential measures, but there are many potential macroprudential instruments available. These differ in their scope of application creating the opportunity for avoidance. With this in mind we examine a potential source of avoidance: the effect of macroprudential

⁸The results are omitted but available on request

policies on agents' borrowing from foreign banks - which may undermine the intent of the original regulation.

The results of this paper suggest that a tightening of capital regulation induces domestic non-banks to increase their borrowing from abroad while a tightening of lending standards does not have the same effect. We find evidence suggestive that the uneven application of capital regulation - in that capital requirements only apply to home banks and foreign subsidiaries but not to branches - is a driver of the increase in foreign borrowing. We do not get the same results for lending standards; the likely driver of this is the fact that lending standards regulation typically applies to all products sold in a country.

This suggests that uneven application of regulation may be a driver of international capital flows. This is over and above the effect, which has been documented extensively in the literature, where banks transfer funds to markets with fewer banking regulations. Our results show a subtle contrast: banks transfer funds to countries which *tighten* regulatory standards, but transfer these funds when the regulatory tightening does not apply to them, and instead confers upon them a competitive advantage.

Our results suggest that instrument choice matters for the effectiveness of macroprudential policy. Indeed, some of the results in the literature - which focus on the domestic effects - may be influenced by how open and subsidiarised the country's banking system is, and the fact that currently reciprocity arrangements only apply to the countercyclical capital buffer. Our research is supportive of building strong reciprocity frameworks with a high degree of automaticity. It is welcome that reciprocity of the countercyclical capital buffer is a cornerstone of Basel III, and EU law requires automatic reciprocation of CCB rates from 2016. These rules do not, however, proscribe rules for all potential macroprudential instruments. The results presented in this paper suggests that there are likely to be also leakages with regard to other capital and liquidity-like policies suggesting that there may be benefits from extending the principle of reciprocity further. At the European level assessing the cross-border impact of macroprudential policies and coordinating Member States' action is at the heart of the mandate of the ESRB (the European Systemic Risk Board). Capital rules (CRD IV/CRR) which have been in force since 1 January 2014 already foresee some coordination procedures involving the ESRB for specific instruments. But more work needs to be done on working out an optimal and feasible reciprocation and coordination strategy.

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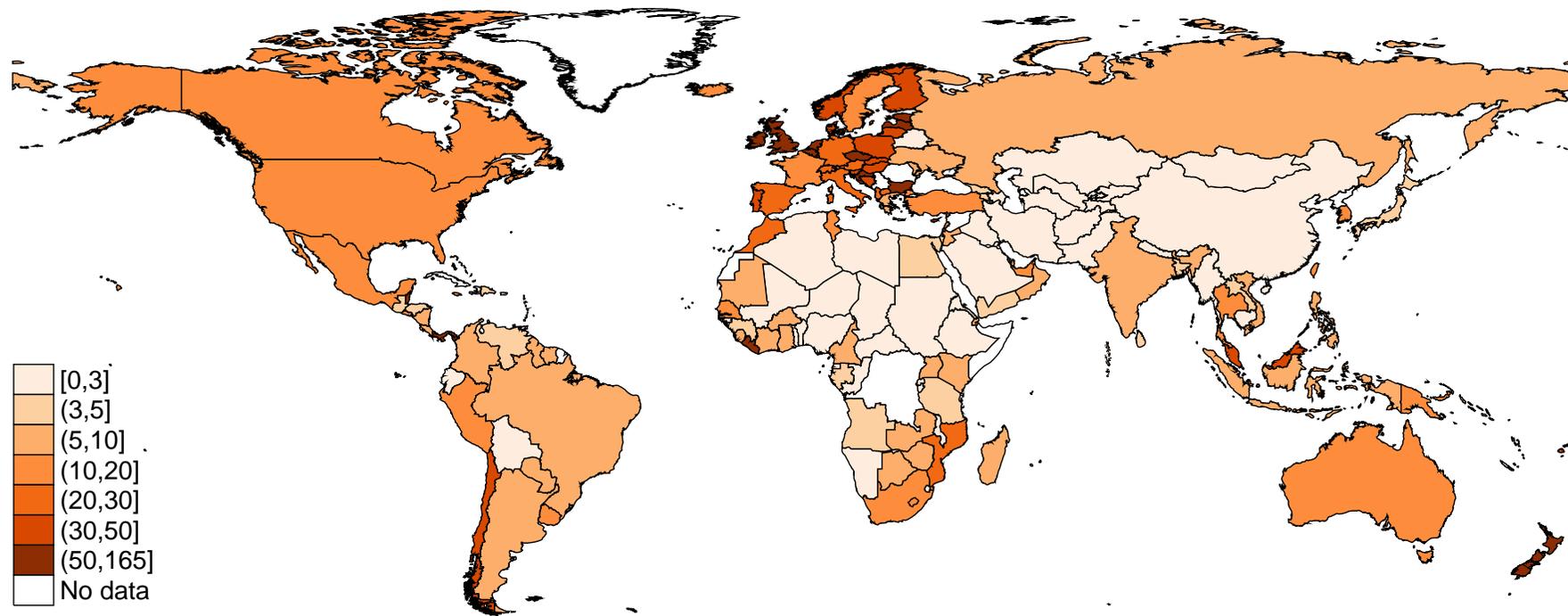


Figure 1: Borrowing of non-banks from foreign banks (% of GDP, 2013 Q4). Borrowing of domestic non-banks from foreign banks is measured as the consolidated foreign claims of BIS-reporting banking systems on the respective domestic non-bank sector taken from the BIS International Banking Statistics.

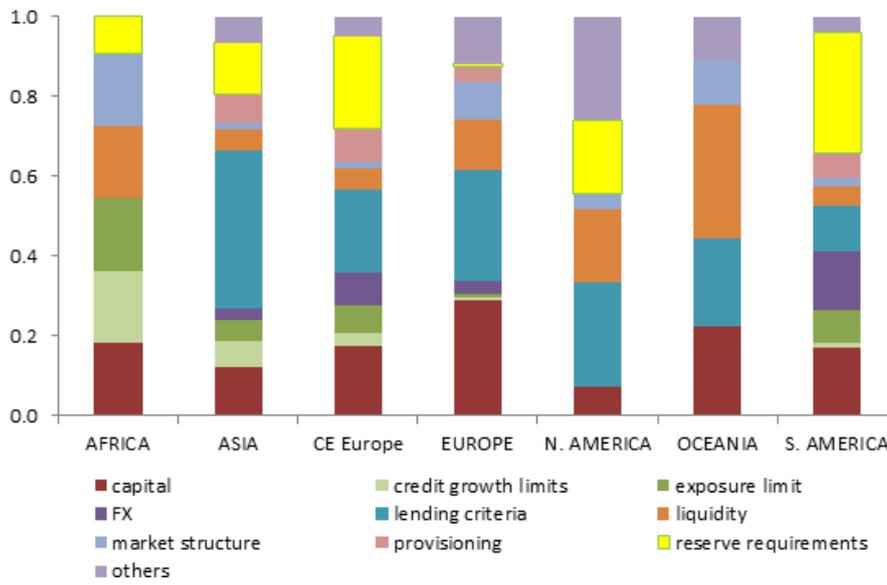


Figure 2: The use of macroprudential instruments by region

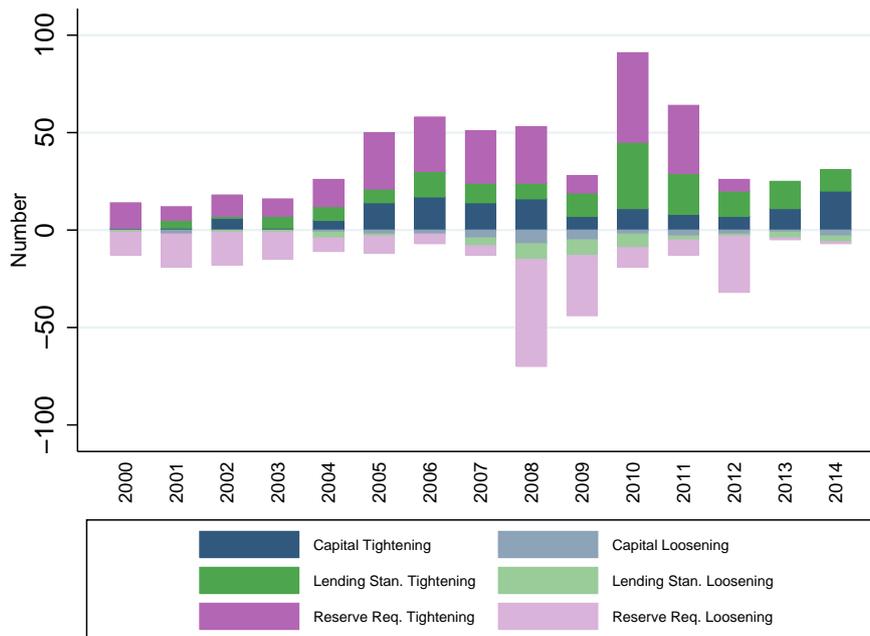


Figure 3: Macroprudential actions in the database

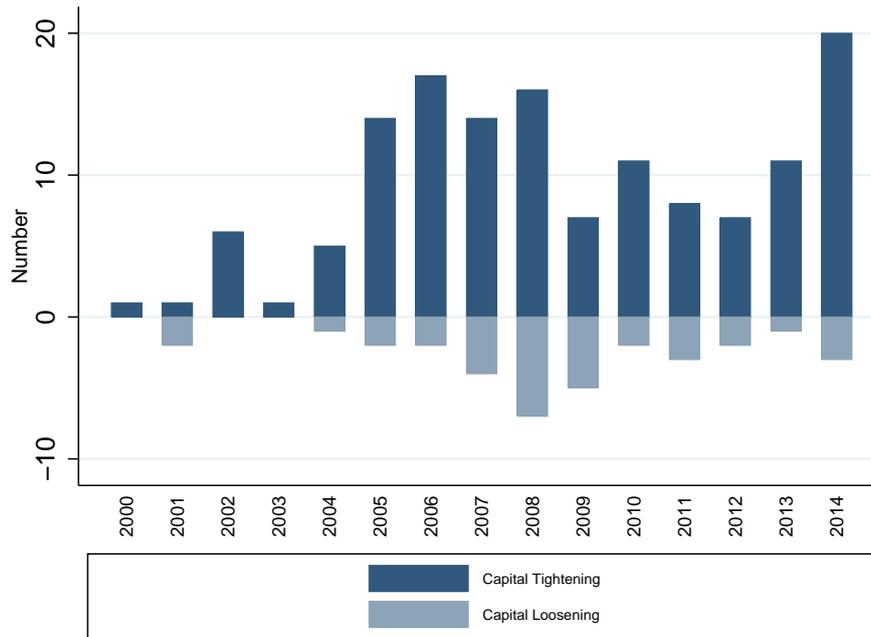


Figure 4: Capital actions in the database

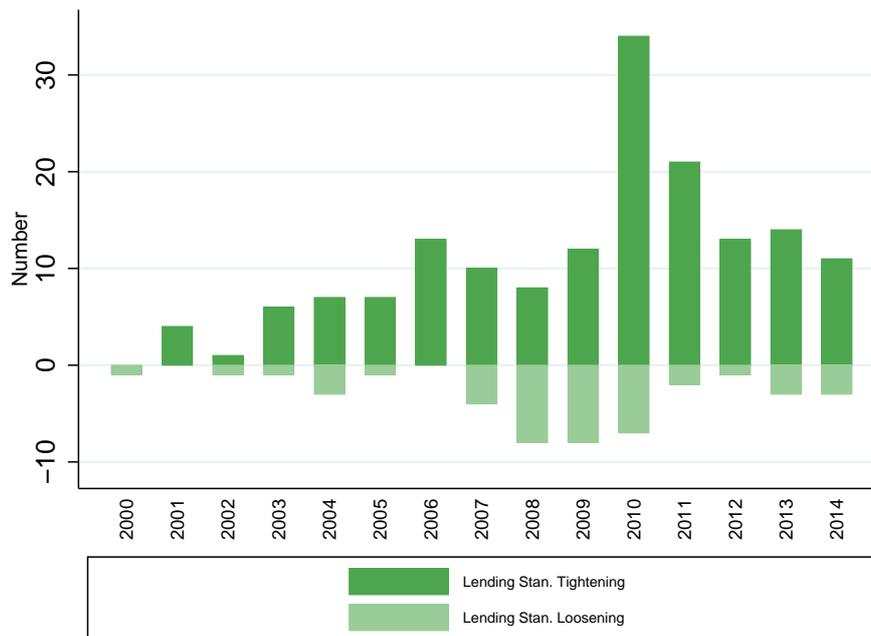


Figure 5: Lending standards in the database

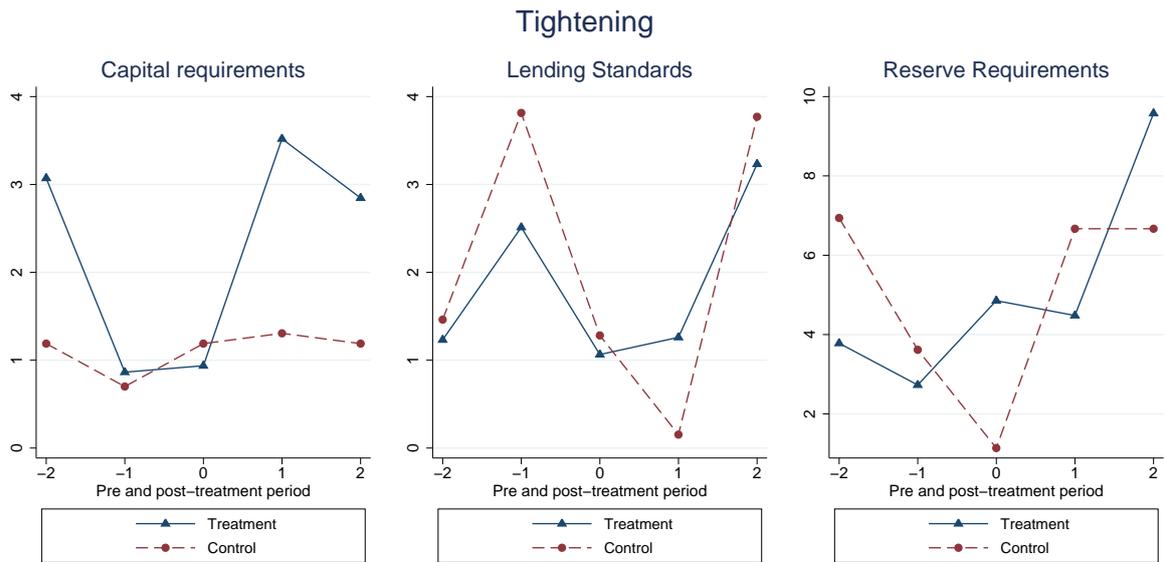


Figure 6: Parallel Trends: Tightening

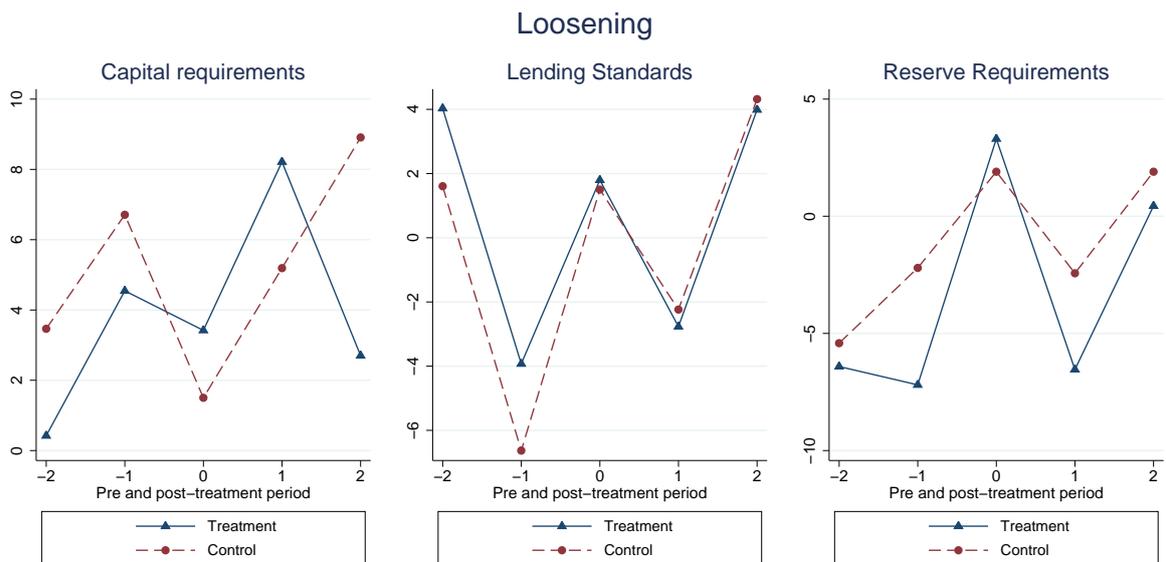


Figure 7: Parallel Trends: Loosening. The figure plots the mean of the growth in domestic non-bank borrowing from foreign banks around tightening or loosening events of regulatory policies. The sample is described in Section 4. The method is described in Section 5. Data are from the BIS International Banking Statistics.

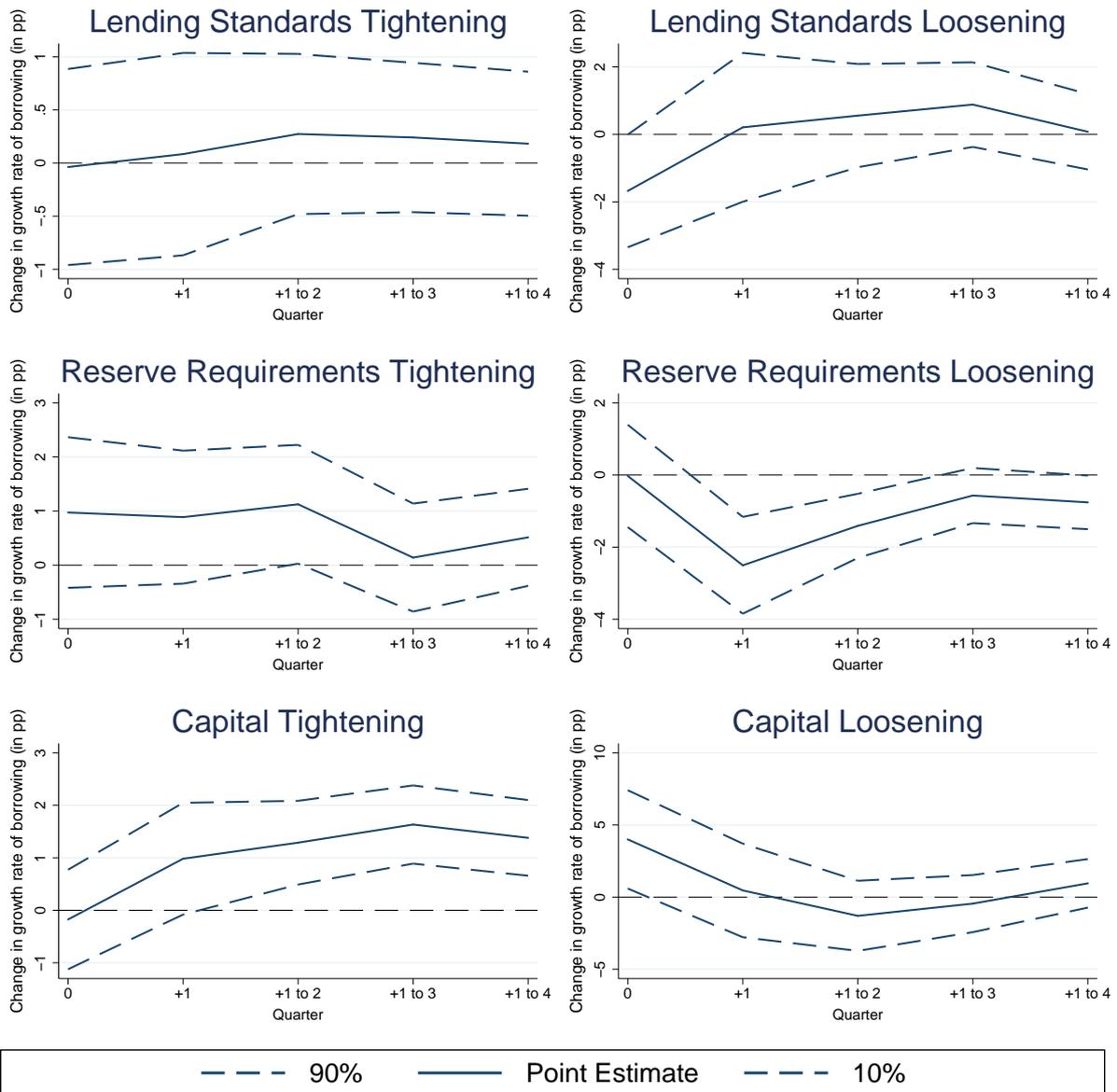


Figure 8: Macroprudential regression coefficients for different impact windows The figure plots the regressions coefficient of macroprudential policy dummies on non-bank borrowing from foreign banks and their confidence intervals for various options for the lag structure on these dummies (and conditioning on other factors). See Section 5 for details on the regressions specification. '0' refers to the contemporaneous effect. +1 to +2 refers to our baseline results obtained with equation (1). Data on consolidated domestic non-bank borrowing from foreign banks are from the BIS International Banking Statistics.

| Variable | Description | Source |
|-------------------------------------|---|---|
| <i>Borrowing from foreign banks</i> | | |
| Foreign bank borrowing by non-banks | Cross-border and local lending by foreign banks to domestic non-banks (Change, %) | Consolidated BIS International Banking Statistics |
| Foreign bank borrowing by banks | Cross-border and local lending by foreign banks to domestic banks (Change, %) | Consolidated BIS International Banking Statistics |
| <i>Macroprudential Policies</i> | | |
| Lending Standards Regulation | Lending Standards include LTVs, DTIs and LTIs. Tightening includes Introduction of new Regulations | Various Sources. See Section 4 |
| Reserve Requirements | Increase in the reserve requirements regulated banks have to hold with the domestic central bank | Various Sources See Section 4 |
| Capital Regulation Tightening | Capital regulations include requirements, risk weights, sectoral measures and systemic risk buffers. Tightening includes Introduction of new Regulations. | Various Sources. See Section 4. |
| <i>Domestic Variables</i> | | |
| Credit Growth | Quarterly Credit of Domestic Banks to the domestic non-bank financial sector (Changes, %). | BIS |
| GDP Growth | Quarterly Real GDP growth (yoy, %). | World Economic Outlook (IMF) |
| Inflation | Quarterly Inflation Rate (yoy, %). | World Economic Outlook (IMF) |
| ER depreciation | Change in log end-of-period nominal exchange rate. US dollar numéraire. | Datastream |

Table 1: Data Sources

| Variable | Number Events | Mean | Std.dev. | Min | Max | Obs. |
|-------------------------------------|------------------|-------|----------|---------|---------|-------|
| <i>Borrowing from foreign banks</i> | | | | | | |
| By domestic non-banks (%-Change) | | 3.385 | 20.031 | -35.484 | 62.179 | 19574 |
| By domestic banks (%-Change) | | 4.714 | 33.666 | -55.557 | 103.670 | 17870 |
| <i>Macroprudential Policies</i> | | | | | | |
| <i>Lending Standards Regulation</i> | | | | | | |
| Tightening | 70 | 0.092 | 0.289 | 0.000 | 1.000 | 19574 |
| Loosening | 17 | 0.020 | 0.139 | 0.000 | 1.000 | 19574 |
| <i>Reserve Requirements</i> | | | | | | |
| Tightening | 49 | 0.037 | 0.190 | 0.000 | 1.000 | 19574 |
| Loosening | 42 | 0.052 | 0.222 | 0.000 | 1.000 | 19574 |
| <i>Capital Regulation</i> | | | | | | |
| Tightening | 56 | 0.063 | 0.243 | 0.000 | 1.000 | 19574 |
| Loosening | 9 | 0.009 | 0.095 | 0.000 | 1.000 | 19574 |
| <i>Domestic Variables</i> | | | | | | |
| Credit Growth (%) | | 8.171 | 11.443 | -10.559 | 42.743 | 19574 |
| GDP Growth Differential (%) | | 0.713 | 3.131 | -6.691 | 8.170 | 19574 |
| Inflation Differential (%) | | 0.956 | 2.696 | -4.022 | 9.029 | 19574 |
| ER depreciation Differential | | 0.001 | 0.039 | -0.092 | 0.103 | 19574 |

Table 2: Summary Statistics.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|-----------------------------|-------------------|------------|----------------------|------------|--------------------|------------|
| | Lending Standards | | Reserve Requirements | | Capital Regulation | |
| | Tightening | Loosening | Tightening | Loosening | Tightening | Loosening |
| Foreign Bank Lending Growth | -0.0001* | -0.0000 | 0.0000 | -0.0001 | 0.0001 | 0.0000 |
| | (0.0001) | (0.0000) | (0.0001) | (0.0000) | (0.0001) | (0.0000) |
| Credit Growth | 0.0009*** | 0.0002* | 0.0004** | -0.0002* | 0.0010*** | 0.0004*** |
| | (0.0003) | (0.0001) | (0.0002) | (0.0001) | (0.0002) | (0.0001) |
| GDP Growth | 0.0010 | -0.0001 | 0.0046*** | 0.0008 | 0.0046*** | -0.0015*** |
| | (0.0011) | (0.0006) | (0.0013) | (0.0009) | (0.0011) | (0.0004) |
| Inflation | -0.0019 | -0.0047*** | 0.0078*** | 0.0080*** | -0.0058*** | -0.0009 |
| | (0.0012) | (0.0009) | (0.0018) | (0.0015) | (0.0015) | (0.0006) |
| ER Depreciation | 0.2066*** | -0.0227 | 0.1523*** | 0.0898** | -0.3131*** | 0.0248 |
| | (0.0466) | (0.0203) | (0.0462) | (0.0409) | (0.0408) | (0.0209) |
| Constant | 0.0067 | 0.0399*** | -0.0667*** | -0.0486*** | 0.0881*** | 0.0577*** |
| | (0.0131) | (0.0095) | (0.0188) | (0.0138) | (0.0170) | (0.0058) |
| Observations | 19,574 | 19,574 | 19,574 | 19,574 | 19,574 | 19,574 |
| Country Pairs | 584 | 584 | 584 | 584 | 584 | 584 |
| Adjusted R2 | 0.0944 | 0.0619 | 0.191 | 0.240 | 0.103 | 0.0324 |

Table 3: Exogeneity of Macropu to Borrowing from Foreign Banks. The table presents the estimated parameter values from linear probability fixed-effects panel regressions including sending country/quarter fixed effects. The dependent variable is the quarterly percentage change in bilateral cross-border and local liabilities of domestic non-banks from foreign banks. Standard errors, clustered at country pair level, are reported in brackets. *** is significant at the 1% level, ** at the 5% level and * at the 10% level. Data on banking flows are collected from the Bank for International Settlements' International Banking Statistics database. The sample period is from 2005Q1 to 2014Q3.

| | (1) | (2) |
|---------------------------------|---------------------|----------------------|
| Lending Standards Tightening | 0.428 (0.453) | 0.274 (0.457) |
| Lending Standards Loosening | 0.320 (0.919) | 0.556 (0.927) |
| Reserve Requirements Tightening | 1.425** (0.664) | 1.126* (0.665) |
| Reserve Requirements Loosening | -1.349** (0.543) | -1.409*** (0.539) |
| Capital Regulation Tightening | 1.506*** (0.481) | 1.289*** (0.483) |
| Capital Regulation Loosening | -1.397 (1.495) | -1.298 (1.472) |
| Credit Growth | | 0.058*** (0.017) |
| GDP Growth Differential | | 0.298*** (0.075) |
| Inflation Differential | | 0.271** (0.108) |
| ER Depreciation Differential | | -0.342 (4.191) |
| Constant | 1.996*** (0.769) | -2.945** (1.150) |
| Observations | 19,574 | 19,574 |
| Country Pairs | 584 | 584 |
| Adjusted R2 | 0.180 | 0.181 |

Table 4: Macroprudential regulations and borrowing from foreign banks by domestic non-banks The table presents the estimated parameter values from panel regressions including country fixed effects as well as sending country/quarter fixed effects. The dependent variable is the quarterly percentage change in bilateral cross-border and local liabilities of domestic non-banks from foreign banks. Standard errors, clustered at the country pair level, are reported in brackets. *** is significant at the 1% level, ** at the 5% level and * at the 10% level. Data on banking flows are collected from the Bank for International Settlements' International Banking Statistics database. The sample period is from 2005Q1 to 2014Q3.

| | (1) | (2) |
|--|---------------------|----------------------|
| Lending Standards Tightening | 0.685 (0.619) | 0.743 (0.621) |
| Lending Standards Loosening | 0.625 (1.374) | 0.308 (1.393) |
| Reserve Requirements Tightening [1] | 2.506 (1.887) | 0.690 (0.792) |
| Reserve Requirements Loosening | -1.417** (0.622) | -1.376** (0.618) |
| Capital Regulation Tightening [2] | 1.242** (0.608) | 3.329*** (0.928) |
| Capital Regulation Loosening | 1.064 (1.836) | 1.265 (1.855) |
| Share of Subsidiaries | 3.380 (2.741) | 3.449 (2.742) |
| RR Tightening * Share of Subsidiaries [3] | -2.267 (2.135) | |
| Capital Tightening * Share of Subsidiaries [4] | | -3.750*** (1.435) |
| Controls | YES | YES |
| Observations | 15,677 | 15,677 |
| Countries | 475 | 475 |
| Adjusted R2 | 0.192 | 0.192 |

Table 5: Share of Subsidiaries. The table presents the estimated parameter values from panel regressions including country fixed effects as well as sending country/quarter fixed effects. The dependent variable is the quarterly percentage change in bilateral cross-border and local liabilities of domestic non-banks from foreign banks. Standard errors, clustered at country pair level, are reported in brackets. *** is significant at the 1% level, ** at the 5% level and * at the 10% level. Data on banking flows are collected from the Bank for International Settlements' International Banking Statistics database. Data on the share of subsidiaries are collected from Fiechter et al. (2011) updated using data from the ECB. The sample period is from 2005Q1 to 2014Q3.

| | (1) | (2) | (3) |
|-------------------------------------|----------------------|--------------------|---------------------|
| | EMEs | Excluding Crisis | Policy Rate |
| Lending Standards Tightening | -0.108 (0.570) | 0.308 (0.462) | 0.294 (0.459) |
| Lending Standards Loosening | 0.979 (1.139) | 1.162 (0.981) | 0.500 (0.931) |
| Reserve Requirements Tightening | 2.422 (3.396) | 0.931 (0.669) | 1.115 (0.738) |
| Reserve Requirements Loosening | -1.218 (0.933) | -0.899 (0.547) | -1.253** (0.556) |
| Capital Regulation Tightening | 1.467** (0.673) | 1.250** (0.512) | 1.344*** (0.486) |
| Capital Regulation Loosening | -7.285*** (2.173) | -0.935 (1.545) | -1.383 (1.479) |
| Lending Standards Tightening*EME | 1.001 (0.937) | | |
| Lending Standards Loosening*EME | -1.717 (1.880) | | |
| Reserve Requirements Tightening*EME | -1.758 (3.464) | | |
| Reserve Requirements Loosening*EME | -0.326 (1.112) | | |
| Capital Regulation Tightening*EME | -0.448 (0.928) | | |
| Capital Regulation Loosening*EME | 9.232*** (2.804) | | |
| EME Dummy | -4.170*** (1.260) | | |
| Policy Rate (Change) | | | -0.272 (0.417) |
| Controls | YES | YES | YES |
| Observations | 19,574 | 18,597 | 19,206 |
| Country Pairs | 584 | 584 | 584 |
| Adjusted R2 | 0.181 | 0.175 | 0.179 |

Table 6: Country Groupings, Crisis Period and Policy Rate The table presents the estimated parameter values from panel regressions including country fixed effects as well as sending country/quarter fixed effects. The dependent variable is the quarterly percentage change in bilateral cross-border and local liabilities of domestic non-banks from foreign banks. Standard errors, clustered at country pair level, are reported in brackets. *** is significant at the 1% level, ** at the 5% level and * at the 10% level. Data on banking flows are collected from the Bank for International Settlements' International Banking Statistics database. The sample period is from 2005Q1 to 2014Q3.