BANK OF ENGLAND

Staff Working Paper No. 595

Cross-border regulatory spillovers: How much? How important? What sectors? Lessons from the United Kingdom

Robert Hills, Dennis Reinhardt, Rhiannon Sowerbutts and Tomasz Wieladek

April 2016

BANK OF ENGLAND

Staff Working Paper No. 595

Cross-border regulatory spillovers: How much? How important? What sectors? Lessons from the United Kingdom

Robert Hills,[1] Dennis Reinhardt,[2] Rhiannon Sowerbutts[3] and Tomasz Wieladek[4]

Abstract

This paper forms the United Kingdom's contribution to the International Banking Research Network's project examining the cross-border spillovers of prudential policy actions, where each participant in the network uses proprietary bank-level data available to central banks. We examine whether UK-owned banks' domestic lending is affected by prudential actions in other countries where they have exposures. We also examine the impact of a change in prudential policy in a foreign-owned UK-resident bank's home jurisdiction on its lending to the United Kingdom. Our results suggest that prudential actions taken abroad do not have significant spillover effects on bank lending in the UK economy as a whole. But there are more granular effects: for instance, when a foreign authority tightens loan-to-value standards, UK affiliates of banks owned from that country expand their lending to UK households and corporates.

Key words: Macroprudential policies, bank lending, spillovers, capital flows.

JEL classification: F32, F34, G21.

(1) Bank of England. Email: robert.hills@bankofengland.co.uk
(2) Bank of England. Email: dennis.reinhardt@bankofengland.co.uk
(3) Bank of England. Email: rhiannon.sowerbutts@bankofengland.co.uk
(4) Currently at Barclays Capital but started this work while at the Bank of England. Email: tomaszwieladek@gmail.com.

We are grateful to James Benford, Claudia Buch, Linda Goldberg, Glenn Hoggarth, Friederike Niepmann and Matthew Willison for excellent comments. We would like to thank the country teams of South Korea and Mexico for providing referee reports. We thank John Lowes and colleagues in the Bank's Statistics and Regulatory Data Division for answering many data related questions. All errors remain ours. Any views expressed are solely those of the authors and so should not be taken to represent those of the Bank of England or its policies.

Information on the Bank's working paper series can be found at
www.bankofengland.co.uk/research/Pages/workingpapers/default.aspx

Publications Team, Bank of England, Threadneedle Street, London, EC2R 8AH
Telephone +44 (0)20 7601 4030 Fax +44 (0)20 7601 3298 email publications@bankofengland.co.uk

ISSN 1749-9135 (on-line)

1. Introduction

In recent years, central banks and supervisors in many countries have been given new instruments and legal powers to address systemic risk, frequently referred to as 'macroprudential' policies and instruments. In this paper, we examine the effect, when these instruments are used overseas, on UK-resident banks' lending behaviour. Specifically, we look at how changes in 'macroprudential' instruments in another country affects domestic lending in the UK, either via affiliates of banks from the country implementing macroprudential policy, or via UK-owned banks that are exposed to that country.

This study represents the UK's contribution to the second project of a network of central banks, the International Banking Research Network (IBRN), which pursues a co-ordinated research agenda across countries, using confidential bank data at the level of the individual institution which are typically available only to central banks. The overall project is described in Buch and Goldberg (2015). Some country contributions, like ours, focus on the *inward* transmission of foreign prudential policy; others focus on the *outward* transmission of domestic policy actions. Each country contribution runs the same core set of regressions, plus additional country-specific specifications as appropriate.

In this paper, we exploit a new IBRN database, put together by the individual central banks participating in the Network, as well as the IMF and the BIS, on seven different types of prudential policy actions taken in 64 countries. The database includes information on tightening and loosening of a wide variety of policies such as capital requirements, sector specific capital buffers, loan-to-value (LTV) ratio limits, reserve requirements on foreign and local currency deposits, interbank exposures and overall concentration limits. This rich database therefore allows us to explore whether the implementation of any these policies abroad affects lending to the UK economy.

Exploring the heterogeneity of prudential regulation is related to a recent paper by Reinhardt and Sowerbutts (2015), who find that domestic non-banks borrow more from abroad after an increase in capital requirements, but not after

an increase in lending standards. They provide evidence that this is most likely the case because foreign branches are not subject to domestic capital regulations.

As one of the largest global financial centres in the world by total banking asset size, UK banks have significant foreign exposures and the UK is also home to a large number of foreign banks. Chart 1 illustrates how large and open the UK is, with the largest amount of cross-border assets and liabilities in nominal terms in the world. The UK banking system is notable in that there is a very high concentration in terms of banking system assets in a few banks with global operations; but also there is a large presence of foreign banks.

Foreign banks account for nearly half of total banking system assets in the UK, amounting to around 250% of GDP (of which around three-quarters is accounted for by branches, and the remainder by subsidiaries) . This means that there are a large number of prudential actions taken abroad which may spill over to the UK, which explains this project's focus on inward spillovers.

Our results suggest that banks do not cut their lending significantly to the UK economy as a whole following a prudential action. This result holds for both UK-owned and foreign banks. Given that the UK is a core country within the international banking system, it is perhaps unsurprising that policy decisions taken by an individual foreign authority would have a limited impact on lending to the UK.[1]

Nevertheless, these aggregate results do appear to conceal important sectoral heterogeneity. The key result that stands out is that foreign affiliates in the UK expand their lending to households and corporates following a tightening of LTV standards in their home country. In addition, we find that UK-owned banks appear to demand less wholesale funding domestically and more from foreign sources if they are exposed to a country tightening LTV regulations.

[1] Aiyar et al (2014a) show the importance of core vs. non-core status in assessing regulatory spillovers. Specifically, they examine how increased capital requirements on individual banks in the UK affect external lending. They find that a 100bps increase in a bank's capital requirement is associated with a reduction in the growth rate of cross-border credit of 5.5 percentage points. They also find that banks tend to favour their most important country relationships, so that the negative cross-border credit supply response in 'core' countries is significantly less than in others.

These results are consistent with Ongena et al (2013), who show that bank increase their lending abroad when faced with restrictions at home. The authors examine the spillovers of regulation via large international banks, examining business lending in Eastern Europe and find that lower barriers to entry, tighter restrictions on bank activities, and higher minimum capital requirements in the parent market are associated with lower bank lending standards abroad.

In a similar vein, Houston et al (2012) use aggregated county data and show that bank capital inflows increase to a particular country if that country has relatively fewer regulations; essentially, looser regulation acts as a 'pull' factor for capital flows. Our focus on sectoral data is also motivated by Danisewicz et al (2015) who explore how branches and subsidiaries react differently to changes in prudential policy in their parent country distinguishing between affiliates interbank and non-bank lending.[2] The sectoral results in this paper underscore the need for future research to examine the impact of prudential policies in a more granular manner.

The paper proceeds as follows: Section 2 describes the specific features of the UK data set and sets out the empirical specification; Section 3 presents the headline results; and Section 4 concludes.

2. Data and stylised facts – United Kingdom

2.1 Bank level data and balance sheet characteristics

The key features of our individual bank dataset are described in detail in Annex A2 of Hoggarth et al (2013) and Appendix 1 of Aiyar et al (2014a). Raw data from the Bank of England's regulatory reporting forms were collected at a quarterly frequency, covering the balance sheets of 360 UK-resident banks (excluding building societies) over the period 2000 Q1–2014 Q4. Bank nationality is determined by where its ultimate parent (e.g. holding company) is located and not by the nationality of the largest shareholder. For example, a 'UK-owned' bank

[2] Specifically, they focus on banks which have both branches and subsidiaries in the UK. They find that branches contract their interbank lending by 6% more than subsidiaries following a prudential capital action but not their lending to non-banks.

simply means that its ultimate parent is incorporated in the United Kingdom. Table A1 describes the construction of variables and their sources.

Dependent variable

In our main (IBRN-wide) specification, the dependent variable ($\Delta Y_{b,t}$) is the exchange-rate-adjusted log change in the stock of loans. To take into account the volatility of this series we cut the edges of the distribution so that observations of growth rates outside of +/- 100% are dropped. For the UK-specific part of this paper, we also explore whether lending to various sectors is affected differently, and so the dependent variable is the exchange-rate-adjusted log change in lending for interbank, private non-financial corporations (PNFC) and household loans. We also look at banks' borrowing and explore the log change in the short-term funding of UK banks from wholesale sources.[3]

Balance sheet control variables

For balance sheet characteristics, we have used the following variables:

- log real assets – i.e. the log of a bank's total assets in levels, deflated by CPI inflation, which we loosely interpret as 'size' ($LogAssets_{i,t-1}$)[4]
- bank's Tier 1 capital to asset ratio ($Tier\ 1\ ratio_{,t-1}$)
- fraction of a bank's portfolio of assets that is illiquid (1- holdings of cash and gilts divided by total assets)[5] ($IlliquidAssetsRatio_{i,t-1}$)
- ratio of total commitments divided by total assets $\left(CommitmentRatio_{i,t-1}\right)$
- core funding – i.e. the fraction of time and sight deposits from domestic residents, divided by total liabilities less Tier 1 capital ($CoreDepositsRatio_{i,t-1}$)

2.2 Data on prudential instruments

[3] This includes interbank funding (i.e. deposits from the UK monetary financial institutions) as well as certificate of deposits and commercial paper issued and repos (excluding repos with public sectors). See Appendix Table A1 for details.

[4] Clearly, other bank attributes could be important in explaining bank behaviour during this period, such as the risk-taking behaviour of banks. While we cannot measure risk-taking precisely, to the extent that too-big-to-fail subsidies are responsible for such risk-taking behaviour, this will be picked up in this 'log real assets' variable.

[5] Holdings of cash and gilts.

The data on prudential actions comes from a new database put together with the expertise of individual central banks participating in the IBRN, together with the IMF and the BIS (see Lim et al (2011), Buch and Goldberg (2015) and Cerutti et al (2015)).

Summary statistics of the count of each type of regulation are presented in Table 2 below. Specification A shows the count of the number of changes in regulation in any country in which a UK bank has operations for each type, of regulation, so for example there are 96 capital requirement changes in countries to which the UK banking system lends, affecting 1109 banks. In Specification B, we examine changes in a foreign-owned bank's home country, so for example there are 45 changes in capital requirements in countries where a foreign-owned bank which operates in the has a parent, affecting 195 banks. The nature of the UK's banking system, with UK banks holding diversified foreign portfolios and the large number of foreign banks, means that there are a large number of foreign policy actions to take into consideration. The exception is for the interbank exposure limit, where there are too few actions, and the concentration ratio, where there are too few actions for specification B, when we examine the impact of regulation in the home country of a foreign affiliate. Each macroprudential action is treated as a dummy variable which takes the value of 1 if macroprudential policy is tightened, -1 if macroprudential policy is loosened and 0 otherwise.

We use two separate specifications to examine the impact of prudential actions. The first is an exposure-weighted index. This is constructed for UK-owned banks only and weights are generated using the average of the assets to a particular country, averaged over four quarters. For example, if bank X has half of its exposures to country A, bank Y has one-tenth of its exposures to country A, and country A tightens capital requirements, and no other country takes an action, then the exposure-weighted index for capital requirements will be 0.5 for bank X and 0.1 for bank Y. If, however, country B, to which bank Y has one-fifth of its exposures, also tightens capital requirements, this exposure-weighted index becomes 0.3 for bank Y (i.e. 0.1 plus 0.2). When country B loosens requirements this becomes 0.1 again for bank Y.

The second specification is applicable to banks with a foreign parent. In this case the index takes a value of 1 when the country of the parent bank tightens regulation and -1 when loosened.

Regulation weighted by foreign exposures (= all exposures of the banks *outside* the home and destination country)

$ExpP_{b,t-l}$ = Foreign exposure weighted regulation

$ExpP_{cum,b,t-1}$ = Cumulative foreign exposure weighted regulation

For the second measure of prudential policy, we use an indicator for when regulation is taken in the parent country for foreign banks only.

Home country regulation (home = country of the parent bank)

$HomeP_{j,t-l}$ = Home country regulation

$HomeP_{cum,j,t-1}$ = Cumulative home country regulation

2.3 Summary statistics for the dataset

Table 1 shows summary statistics for UK and foreign-owned banks. Although UK and foreign-owned banks are of comparable size, foreign-owned banks have lower and more varied loan growth. The deposit ratio is also considerably lower for foreign banks; in the UK, foreign banks are often non-retail banks and do not raise deposits in the UK. While the Tier 1 ratio appears lower for foreign-owned banks, this reflects the fact that many foreign affiliates are branches and so do not have capital located in the UK.[6]

3. Empirical method and estimation results

3.1 Empirical Method

In this section, we describe our empirical model that we use to examine regulatory spillovers from abroad. Specifically, we use the following regression model:

$$\Delta Y_{b,t} = \alpha_0 + \sum_{k=1}^{3} \alpha_j ExpP_{b,t+1-k} + \alpha_4 X_{b,t-1} + f_b + f_t + \epsilon_{b,t} \quad \textbf{(1)}$$

[6] For branches that do not report their own balance sheet, we set Tier 1 ratios to zero (as the regressions include bank fixed effects this will not impact the results for this variable but allows to focus on the full universe of foreign affiliates).

where $\Delta Y_{b,t}$ is the change in log stock of loans to UK residents of bank b at time t, and $ExpP_{b,t}$ is an exposure-weighted measure of the prudential policy actions taken outside the UK. The weights are based on the average share in total lending of the individual banks' cross-border lending to the affected country in the four quarters before the policy was implemented. Note that $ExpP_{b,t}$ enters the model contemporaneously and with two lags. This is to allow prudential policy changes abroad to affect UK lending over the course of three quarters.[7] $X_{b,t-1}$ is the vector of balance sheet characteristics listed in section 2.2. f_b and f_t are bank and time effects, respectively.

It is of course plausible that certain bank characteristics could mitigate or amplify the transmission of external prudential policy actions to UK bank lending. To exploit this hypothesis, we use the following model:

$$\Delta Y_{b,t} = \alpha_0 + \sum_{k=1}^{3} \alpha_j ExpP_{b,t+1-k} + a_4 X_{b,t-1} + \sum_{j=1}^{3} \beta_j ExpP_{b,t+1-j} X_{b,t-1} + f_b + f_t + \epsilon_{b,t} \quad \textbf{(2)}$$

Model **(2)** is identical to model **(1)**, with the difference that the exposure index is now interacted with individual bank characteristics.

Finally, the impact of the changes in policy could also be dependent on the business or credit cycle; we use the following model to investigate if this is the case:

$$\Delta Y_{b,t} = \alpha_0 + \alpha_1 ExpP_{cum,b,t-1} + \alpha_2 X_{b,t-1} + \alpha_3 ExpP_{cum,b,t-1} Z_t + f_b + f_t + \epsilon_{b,t} \quad \textbf{(3)}$$

where Z_t is either the output or credit gap and $ExpP_{cum,b,t-1}$ is a cumulative measure of the credit or business cycle index, cumulated over the last three quarters. Models **(1)-(3)** assume that prudential policy abroad affects lending in the UK (Specification A) through banks' portfolio exposure to countries that implemented these policies. Another plausible channel of transmission is that

[7] See Aiyar at al (2014b) for a similar specification in the context of studying the impact of capital requirement changes on domestic UK lending growth.

those banks that are headquartered in the country that implemented the policies transmit the change in regulation. We therefore re-estimate models **(1)-(3)** substituting $ExpP_{b,t}$ with the indicator of prudential policy in the affected banks home country $HomeP_{j,t}$ (Specification B) where j stands for a bank's home country j. Given that foreign banks have a large market share in the UK financial system it seems important to test for the effects of both UK-headquartered banks (Specification A) and foreign-headquartered banks operating in the UK (Specification B).[8]

In addition to these regressions, which all countries that participate in the IBRN were asked to estimate on their own national datasets, we also explore angles which are unique to the UK. Given that London is one of the world's largest financial centres, two notable features are that a large fraction of bank lending in the UK is interbank or to other financial entities; and that foreign-owned banks account for about two-thirds of total activity. This type of lending might clearly react differently to regulatory spillovers than either real economy or mortgage lending. We therefore also estimate model **(1)** for lending to four different sectors of the economy: the financial sector, the commercial real estate sector, the household sector and the PNFC sector.

The UK, as a global financial centre, is also a funding source for foreign banks and UK banks, and so we also investigate whether banks increase their funding from the UK after a prudential action is taken elsewhere.

3.2 Baseline analysis of transmission of prudential policies to the UK

Table 3 shows the results for the baseline regressions which examine the effect of exposure-weighted changes in regulation on log changes in total loans of UK-owned banks to UK financial and non-financial sectors. Our results suggest that prudential actions taken abroad do not have significant spillover effects on

[8] As specification B focuses on the specific links between affiliates and their home countries, we can also include the business and credit cycle variables of the affiliate's home country as a control variable into all of the specifications. This should help to account for possible endogeneity driven by the fact that macropru is often tightened in the upswing, which could lead to different lending patterns abroad independently of macropru, especially with regard to the lending of foreign affiliates.

bank lending in the UK economy as a whole. A change in capital requirements and sector-specific capital requirements have a small contemporaneous impact on lending to the UK; but this becomes insignificant after the first period and the F-test of the contemporaneous term and its two lags suggests that there are no significant spillovers to UK lending over a 3-quarter period.

There is a puzzle in the sign of these point estimates. A reduction in lending to the UK following a tightening of capital requirements abroad is consistent with the hypothesis that the bank becomes more capital-constrained after an increase in capital requirements and so cuts lending across the globally consolidated group as a whole. However, the sign is different for sectoral capital requirements which only apply to domestic lending [such as on domestic real estate]; this may be due to the fact that the relative-price effect dominates the income effect in this case. But this warrants more investigation.

We find that banks expand their lending to the UK following a reserve requirement action taken abroad, but although the test over the 3-quarter period is significant, this seems to be driven again by the first quarter only.

When the bank-specific (Table 4) and financial and business cycle (Table 5) variables are interacted, these bank-specific and cycle controls rarely seem to have significant effects. This may be because the time and bank fixed effects already account for a lot of the variation in these variables.

The small and only-contemporaneous effects for all instruments suggest that prudential actions taken abroad do not have a long-lasting impact on UK-owned banks' lending to the UK. This has a number of potential explanations. For instance, UK banks have diversified country exposures, meaning that the impact of one country's actions may be very small for the bank as a whole and the bank does not optimise or adjust its strategy in response to changes in regulation which only affect a small part of its balance sheet; alternatively banks could react to prudential policy by rebalancing, but not by changing lending to core markets (as suggested by Aiyar et al (2014a)) and so UK-based banks do not cut lending to the UK; another possibility is that banks rebalance their portfolios across sectors,

leaving overall lending unchanged. We do not have sufficient data or actions to test the first two hypotheses, but we do explore the final – sectoral rebalancing – hypothesis below.

Tables 6-8 show the results for the baseline regressions which examine the effects of a change in lending to the UK by foreign-owned affiliates after a change in regulation in their home country. Table 6 provides some weak evidence that regulatory tightening in affiliates' home countries impacts on their lending in the UK negatively: the coefficient on the first lag of the prudential index is negative and significant. A tightening in reserve requirements in foreign currency leads to a contemporaneous fall in the growth rate of lending to the UK, while lagged reserve requirement tightenings in domestic currency have a similar effect. This is consistent with the hypothesis that replacing reserves is costly, and as a result, banks cut back on their lending. The results on LTV tightening are inconclusive, indicating the possibility that banks rebalance their portfolios across sectors, which we will explore below. However, the F-test on the sum of coefficients to examine the effect of policies over three quarters indicates non-significant spillovers for the prudential index and all of its sub-components. A possible explanation for the lack of significant results may stem from the fact the UK is a major international financial centre and so is likely to be a core country for many banks and hence protected from the retrenchment in lending following regulatory tightening.

As above, the effect of the cycle- or bank-specific controls does not seem to be strong (Tables 7-8), although there is tentative evidence that a positive home country financial cycle increases lending growth in the UK (Table 6), providing some evidence that financial conditions abroad do spill over to the UK via lending of foreign affiliates.

3.3 Exploration of sectoral lending and bank funding

Table 9 summarises the results when we repeat the analysis above at a sectoral level and also examine the role of funding.[9] Turning first to the sectoral lending of UK-owned banks (upper panel of Table 9), we find that the insignificant aggregate results hide important sectoral heterogeneity. We find that banks cut interbank lending to the UK following an increase in capital requirements abroad, but increase their PNFC lending; in other words, the negative coefficient on total lending in Table 3 appears to be driven by a reduction in interbank lending. The point estimates suggest a similar direction but are not significant for sectoral capital requirements. This is consistent with Aiyar et al (2014a), who document negative spillovers of capital requirement increases to banks abroad, but find no response of lending to non-banks abroad. This is likely because non-bank customers are more valuable customers, longer-term and relationship loans. As such it is harder and more costly to cut lending to these customers, which could explain why there is no effect.

Turning to wholesale funding, we find evidence for a reduction in wholesale funding from the UK after countries take LTV actions. This could be explained by UK banks reducing their lending to countries that tighten their LTV requirements, meaning less of a need for wholesale funding (which is out of the scope of this paper). Interestingly, wholesale funding of UK banks from foreign sources increases when they are exposed to countries tightening LTV regulations; this suggests that foreign banks might channel more lending to UK banks if regulation at home prevents them expanding lending in their home countries. Taken together, this is consistent with the possibility that banks shifted the source of their wholesale funding from domestic to foreign sources following LTV tightening in countries to which they have large exposures.[10]

[9] We do not include the results for interbank exposure limits and concentration ratios given that Table 2 shows that we do not have sufficient country-time changes in regulatory policies to draw reliable inferences.

[10] In columns (3) and (5) we find a similar result for UK-owned banks which are exposed to countries tightening sectoral capital requirements or reserve requirements in foreign currency. The result is notably different for reserve requirements in local currency.

We also uncover evidence for sectoral heterogeneity when we examine prudential policies taken in the parent country (lower panel of Table 9). An LTV tightening in the parent country is associated with an increase in the lending to PNFCs and households in the UK. The point estimate of LTV tightening on interbank lending is negative, though insignificant. This indicates the possibility that banks rebalance their portfolios, which could lead to the insignificant result on total affiliate lending we observed in Table 6. The result is consistent with the findings of Ongena et al (2013), who show that banks increase their lending abroad to riskier borrowers when faced with restrictions at home. The results are also quantitatively important. The point estimates imply that the average LTV tightening abroad increases foreign affiliates' lending growth to UK PNFCs by 9 pp and to UK households by 12 pp over a 3-quarter period (although this represents a small proportion of their lending, so the impact on the UK economy may be small).

Finally, a tightening in foreign currency reserve requirements is associated with a reduction in both interbank and PNFC lending, which is consistent, though stronger, with the results on total lending discussed in the previous section.

4. Concluding Remarks

Our results suggest that most prudential actions taken abroad do not have a significant spillover effect on the UK. For total lending to all UK sectors, it is perhaps not surprising that prudential policy actions taken by a single foreign jurisdiction do not appear to affect the UK, given the UK's role as a major international financial centre.

Nevertheless, the aggregate results conceal some sectoral heterogeneity. For example our results suggest that when a foreign authority takes a lending standards action, UK-resident affiliates owned in that jurisdiction expand PNFC and household lending in the UK. This implies that focusing on aggregate variables may underestimate the spillovers of prudential policies and suggest a role for continued improvement of sectoral level data. So far, research such as Lim et

al (2011) and Kuttner and Shim (2013) tended to focus on aggregate variables such as total lending. Our results suggest that investigating rebalancing at the domestic level may yield a deeper understanding of the transmission of prudential policies.

References

Aiyar, S, Calomiris, C, Hooley, J, Korniyenko, Y and Wieladek, T (2014a), 'The international transmission of capital requirements: Evidence from the UK', *Journal of Financial Economics,* 113(3), p. 368-382.

Aiyar, S, Calomiris, C and Wieladek, T (2014b), 'Does Macro-Pru leak?: Evidence from a UK policy experiment', *Journal of Money, Credit and Banking,* 46(1), p. 181-214.

Buch, C, and Goldberg, L (2015), 'Cross-Border Regulatory Spillovers: How Much? How Important? Evidence from the International Banking Research Network', mimeo.

Cerutti, E, Correa, R., Fiorentino, E. and Segalla, E. (2014), 'Prudential Instruments Database' Mimeo.

Danisewicz, P , Reinhardt, D and Sowerbutts, R (2015), 'On a tight leash: Does bank organisational structure matter for macroprudential spillovers?', *Bank of England Staff Working Paper No.524.*

Houston, J, Lin, C and Ma, Y (2012), 'Regulatory arbitrage and international bank flows,' *Journal of Finance*, Vol. 67(5), pages 1845-1895.

Hoggarth, G, Hooley, J and Korniyenko, Y (2013), 'Which way do foreign branches sway? Evidence from the recent UK domestic credit cycle', *Bank of England Financial Stability Paper No. 22*.

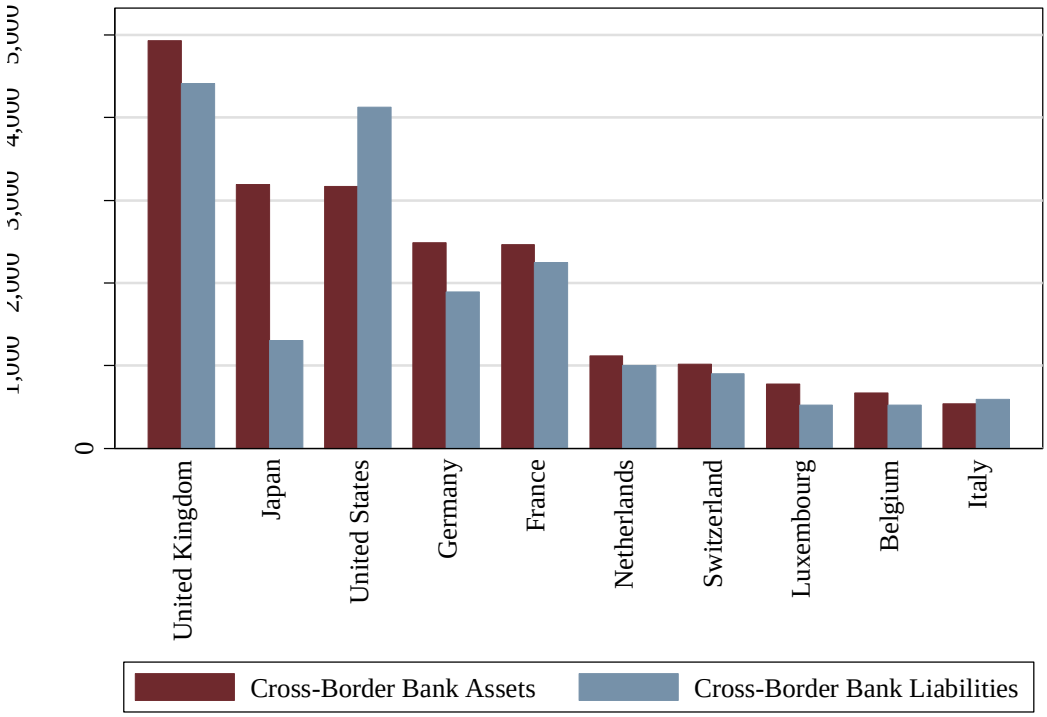
Lim, C, Columba, F, Costa, A, Kongsamut, P, Otani, A, Saiyid, M, Wezel, T and Wu, X (2011), 'Macroprudential policy: what instruments and how to use them? Lessons from country experiences', *IMF Working Papers 11/238*.

Kuttner, K and Shim, I (2013), 'Can Non-Interest Rate Policies Stabilize Housing Markets? Evidence from a Panel of 57 Economies', *NBER Working Papers 19723*.

Ongena, S, Popov, A and Udell, G (2013), '"When the cat's away the mice will play": Does regulation at home affect bank risk-taking abroad?*' Journal of Financial Economics*, Vol. 108(3), pages 727-750.

Reinhardt, D and Sowerbutts, R (2015), 'Regulatory arbitrage in action: evidence from banking flows and macroprudential policy', *Bank of England Staff Working Paper No. 546*.

Chart 1: Cross-border bank assets and liabilities across countries



Source: BIS International Banking Statistics, 2013 Q4. The chart includes countries with more than US$500bn cross-border bank assets.

Table 1: Summary statistics on bank lending and characteristics

Balance sheet characteristics (all in %)	Median	25th percentile	75th percentile	N
UK-owned banks				
Total Loans (ln change)	1.805	-1.403	5.03	1,360
Interbank Loans (ln change)	1.42	-4.804	7.919	1,320
PNFC loans (ln change)	0.892	-2.77	5.431	1,203
Household loans (ln change)	1.26	-0.962	4.117	1,209
Wholesale Funding Domestic (ln change)	1.992	-7.709	13.681	1,264
Wholesale Funding Foreign (ln change)	1.102	-4.822	9.018	1,224
Log Total Assets	16.638	15.204	18.448	1,360
Tier 1 Ratio	10.555	7.198	15.256	1,356
Illiquid Asset Ratio	75.655	54.13	86.378	1,354
International Ratio	17.425	6.73	34.616	1,360
Deposits Ratio	42.948	25.974	59.74	1,359
Foreign-owned banks				
Total Loans (ln change)	0.394	-10.906	11.666	8613
Interbank Loans (ln change)	0.069	-19.596	18.636	7590
PNFC loans (ln change)	-0.075	-8.032	7.13	4860
Household loans (ln change)	0	-8.004	6.597	4117
Wholesale Funding Domestic (ln change)	0	-18.493	17.938	6375
Wholesale Funding Foreign (ln change)	0.997	-8.639	11.1	6482
Log Total Assets	14.937	13.484	16.181	8613
Tier 1 Ratio	4.456	1.957	12.546	8355
Illiquid Asset Ratio	54.903	30.876	79.151	8520
International Ratio	63.153	43.676	74.845	8528
Deposits Ratio	6.344	1.292	16.646	8595

Note: This table provides summary statistics for bank balance sheet and lending data. Data are observed quarterly from 2000Q1 to 2013Q4. Banking data come from the Bank of England (BoE) BT and AL forms and are reported at a quarterly frequency. Banks are split into subgroups - UK-owned, and foreign banks - on the basis of the ownership of a parent firm. Information on banks' ownership comes from the BoE. Variable definitions and sources are given in Table A1.

Table 2: Descriptive statistics on prudential policies

Inward: Specification A

Inward: Specification A

	Base Data (Before Aggregating to Exposure-Weighted Measures)				Exposure-Weighted Observations
Instrument	# of Country-Time Changes	# of Country-Time Changes (Tightening)	# of Country-Time Changes (Loosening)	# of Bank-Time Changes	Proportion ExpP_t Nonzero
Prudential Index	543	363	180	5779	0.677
General capital requirements	96	96	0	1109	0.135
Sector specific capital buffer	72	53	19	804	0.276
Loan-to-value ratio limits	94	70	24	1174	0.407
Reserve requirements: Foreign	122	76	46	984	0.340
Reserve requirements: Local	277	126	151	2681	0.474
Interbank exposure limit	22	21	1	344	0.122
Concentration ratio	33	30	3	431	0.196

Inward: Specification B

Inwards: Specification B

Instrument	# of Country-Time Changes	# of Country-Time Changes (Tightening)	# of Country-Time Changes (Loosening)	# of Bank-Time Changes	Proportion HomeP_t Nonzero
Prudential Index	252	188	64	866	0.101
General capital requirements	45	45	0	195	0.023
Sector specific capital buffer	39	32	32	136	0.016
Loan-to-value ratio limits	70	52	18	252	0.029
Reserve requirements: Foreign	40	25	15	61	0.007
Reserve requirements: Local	108	58	50	324	0.038
Interbank exposure limit	12	12	0	94	0.011
Concentration ratio	19	18	1	67	0.008

Note: This table shows summary statistics on changes in prudential instruments for banks located in the UK over the period 2000-2013. Data on the eight instruments come from Cerutti et al (2014) and are a quarterly basis. The number of changes in prudential instruments is reported on several dimensions, i.e. on the country-time level and on the bank-time level. The last column of each table shows the share of prudential changes to total observations (i.e. the share of nonzero observations). The column "Exposure weighted observations" is based on the underlying data on prudential changes in foreign countries. The reported data is based on the regression sample. "na" indicates that no data are available for this instrument. Source: IBRN.

Table 3: Exposure-weighted inward transmission of regulation

	(1) ExpP= Prudential IndexC	(2) ExpP= Capital Requirements	(3) ExpP= Sector-Specific Capital Buffer	(4) ExpP= Loan To Value Ratio	(5) ExpP= Reserve Requirement Foreign	(6) ExpP= Reserve Requirement Local	(7) ExpP= Interbank Exposure Limits	(8) ExpP= Concentration Ratios
Foreign exposure weighted regulation ExpP_t	-0.00355	-0.147**	0.0804*	0.0335	0.454**	0.208*	-0.182	-0.353*
	(0.0338)	(0.0697)	(0.0438)	(0.0482)	(0.221)	(0.121)	(0.169)	(0.194)
Foreign exposure weighted regulation ExpP_t-1	0.0285	0.185	-0.0129	-0.0582	-0.218	-0.158	0.137	-0.0573
	(0.0426)	(0.150)	(0.0404)	(0.0388)	(0.273)	(0.136)	(0.114)	(0.0815)
Foreign exposure weighted regulation ExpP_t-2	-0.00307	-0.209	0.0188	0.0818	0.185	0.149	-0.0841	-0.0857
	(0.0551)	(0.222)	(0.0330)	(0.0669)	(0.356)	(0.101)	(0.0789)	(0.139)
Sum of Coefficients	*0.0219*	*-0.171*	*0.0864*	*0.0571*	*0.421**	*0.198**	*-0.130*	*-0.496***
F-Test	*0.211*	*1.278*	*1.151*	*0.374*	*2.919*	*3.750*	*0.265*	*5.318*
p-value	*0.648*	*0.263*	*0.288*	*0.544*	*0.0935*	*0.0582*	*0.609*	*0.0251*
Log Total Assets_t-1	1.153	1.143	1.111	1.160	1.191	1.215	1.150	1.025
	(1.737)	(1.759)	(1.704)	(1.743)	(1.725)	(1.725)	(1.728)	(1.735)
Tier1 Ratio_t-1	0.00752	0.00801	0.00816	0.0106	0.00754	0.00624	0.00370	-0.00125
	(0.0615)	(0.0651)	(0.0620)	(0.0596)	(0.0604)	(0.0631)	(0.0614)	(0.0615)
Illiquid Assets Ratio_t-1	0.106**	0.100**	0.108**	0.107**	0.105**	0.100**	0.105**	0.104**
	(0.0445)	(0.0427)	(0.0446)	(0.0446)	(0.0443)	(0.0431)	(0.0456)	(0.0444)
International Activity_t-1	0.0859	0.0757	0.0889	0.0874	0.0854	0.0917	0.0849	0.0842
	(0.0950)	(0.0911)	(0.0954)	(0.0967)	(0.0953)	(0.0979)	(0.0963)	(0.0952)
Core Deposits Ratio_t-1	0.114*	0.114*	0.116*	0.116*	0.118*	0.125*	0.117*	0.122*
	(0.0649)	(0.0651)	(0.0645)	(0.0650)	(0.0656)	(0.0674)	(0.0658)	(0.0642)
Observations	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360
R-squared	0.088	0.106	0.089	0.089	0.090	0.096	0.088	0.091
Adjusted R-squared	0.0419	0.0611	0.0429	0.0431	0.0441	0.0510	0.0427	0.0453
Number of banks	53	53	53	53	53	53	53	53
Time Period	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LHS Variable: Loans	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
LHS Variable: Other	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans
Sample of Banks: Domestic Owned	1	1	1	1	1	1	1	1
Sample of Banks: Foreign Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
Sample of Banks: Domestic and Foreign Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)

This table reports the effects of changes in regulation and firm characteristics on log changes in total loans. The data are quarterly from 2000Q1 to 2013Q4 for a panel of domestic bank holding companies. Foreign exposure weighted regulation is calculated as the weighted average of changes in foreign regulation weighted with total assets and liabilities of that bank in the respective foreign country. For more details on the variables see Appendix Table 1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. ***, **, and * respectively indicate significance at the 1%, 5%, and 10% level.

Table 4: Exposure-weighted inward transmission of regulation - bank variables interactions

	(1) ExpP= Prudential IndexC	(2) ExpP= Capital Requirements	(3) ExpP= Sector-Specific Capital Buffer	(4) ExpP= Loan To Value Ratio	(5) ExpP= Reserve Requirement Foreign	(6) ExpP= Reserve Requirement Local	(7) ExpP= Interbank Exposure Limits	(8) ExpP= Concentration Ratios
Foreign exposure weighted regulation (ExpP)	-0.426	-0.607	0.366	-0.0904	17.73	-0.431	2.590	0.480
	0.413	0.883	0.0627	0.00389	3.900	0.332	0.691	0.0531
	0.523	0.352	0.803	0.950	0.0536	0.567	0.409	0.819
Log Total Assets_t-1	1.014	0.493	0.921	1.065	1.225	1.225	1.168	0.956
	(1.686)	(1.736)	(1.730)	(1.736)	(1.668)	(1.797)	(1.729)	(1.723)
Tier1 Ratio_t-1	0.00861	-0.0244	0.0123	0.00909	0.0180	0.00527	-0.00518	0.00685
	(0.0623)	(0.0770)	(0.0638)	(0.0620)	(0.0578)	(0.0673)	(0.0633)	(0.0597)
Illiquid Assets Ratio_t-1	0.125**	0.125**	0.113**	0.106**	0.105**	0.101**	0.0977**	0.104**
	(0.0488)	(0.0523)	(0.0472)	(0.0459)	(0.0460)	(0.0446)	(0.0443)	(0.0453)
International Activity_t-1	0.0629	0.0550	0.0873	0.0862	0.0966	0.0961	0.0891	0.0880
	(0.0955)	(0.0914)	(0.0957)	(0.0986)	(0.0956)	(0.100)	(0.0947)	(0.0970)
Core Deposits Ratio_t-1	0.0992	0.0826	0.109	0.115*	0.134**	0.123*	0.124*	0.128*
	(0.0638)	(0.0622)	(0.0655)	(0.0678)	(0.0649)	(0.0672)	(0.0651)	(0.0663)
Log Total Assets * ExpP	0.0151	0.0282	0.00830	0.00372	-0.0881	0.0272	-0.0865	0.00988
	0.652	2.109	0.0142	0.00575	0.183	1.390	0.640	0.0159
	0.423	0.152	0.906	0.940	0.671	0.244	0.427	0.900
Tier1 Ratio * ExpP	0.000641	-4.06e-05	-0.0153	0.00891	-0.116	0.00160	0.0309	-0.0110
	0.0781	9.74e-05	4.066	0.677	1.424	0.241	1.738	0.371
	0.781	0.992	0.0489	0.415	0.238	0.625	0.193	0.545
Illiquid Assets Ratio * ExpP	-0.00275	-0.00650	-0.00541	0.00274	-0.0739**	0.00234	0.00691	-0.00177
	0.922	1.637	1.610	0.154	5.099	0.290	0.240	0.0246
	0.341	0.206	0.210	0.696	0.0282	0.592	0.626	0.876
International Activity* ExpP	0.00593	0.00503	-0.000951	-0.00421	-0.100	0.00238	-0.0164	-0.0149
	1.337	1.195	0.0127	0.267	0.502	0.497	0.636	1.239
	0.253	0.279	0.911	0.608	0.482	0.484	0.429	0.271
Core Deposits Ratio * ExpP	0.00518	0.00685**	0.00373	-0.00245	-0.114	-0.00158	-0.0353**	-0.0105
	1.808	5.045	0.375	0.186	1.947	0.435	4.300	1.200
	0.185	0.0290	0.543	0.668	0.169	0.512	0.0431	0.278
Observations	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360
R-squared	0.110	0.140	0.094	0.093	0.104	0.101	0.099	0.100
Adjusted R-squared	0.0543	0.0867	0.0376	0.0359	0.0483	0.0451	0.0431	0.0437
Number of banks	53	53	53	53	53	53	53	53
Time Period	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LHS Variable: Loans	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
LHS Variable: Other	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans
Sample of Banks: Domestic Owned	1	1	1	1	1	1	1	1
Sample of Banks: Foreign Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
Sample of Banks: Domestic and Foreign Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)

This table reports the effects of changes in regulation and firm characteristics and their interactions on log changes in total loans. The data are quarterly from 2000Q1 to 2013Q4 for a panel of domestic bank holding companies. Foreign exposure weighted regulation is calculated as the weighted average of changes in foreign regulation weighted with total assets and liabilities of that bank in the respective foreign country. Bank control variables are included as specified in the lower part of the table but not reported for the sake of brevity.

For ExpP and its interaction effects, the reported coefficient is the sum of the contemporaneous term and two lags, with the corresponding F-statistics for joint significance in parentheses. For more details on the variables see Appendix Table 1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. ***, **, and * respectively indicate significance at the 1%, 5%, and 10% level.

Table 5: Exposure-weighted inward transmission of regulation - cycle interactions

	(1) ExpP_cum= Prudential IndexC	(2) ExpP_cum= Capital Requirements	(3) ExpP_cum= Sector-Specific Capital Buffer	(4) ExpP_cum= Loan To Value Ratio	(5) ExpP_cum= Reserve Requirement Foreign	(6) ExpP_cum= Reserve Requirement Local	(7) ExpP_cum= Interbank Exposure Limits	(8) ExpP_cum= Concentration Ratios
Cumulative foreign exposure weighted regulation (ExpP_cum)	0.0254***	-0.871	0.0216*	0.0258**	0.270***	0.0289	0.0526	0.00447
	(0.00841)	(0.746)	(0.0122)	(0.0129)	(0.0878)	(0.0278)	(0.0456)	(0.0386)
Log Total Assets_t-1	-0.519	-0.316	-0.422	-0.648	-0.00214	-0.221	-0.158	0.0862
	(1.519)	(1.652)	(1.576)	(1.597)	(1.610)	(1.745)	(1.794)	(1.713)
Tier1 Ratio_t-1	-0.0316	-0.0337	-0.0609	-0.0332	-0.00406	-0.0434	-0.00375	0.00574
	(0.0659)	(0.0704)	(0.0756)	(0.0728)	(0.0755)	(0.0784)	(0.0845)	(0.0833)
Illiquid Assets Ratio_t-1	0.142**	0.141**	0.137**	0.141**	0.148**	0.136**	0.142**	0.154**
	(0.0558)	(0.0558)	(0.0540)	(0.0555)	(0.0554)	(0.0542)	(0.0595)	(0.0629)
International Activity_t-1	0.0992	0.0871	0.0856	0.0974	0.111	0.0989	0.0964	0.0905
	(0.0861)	(0.0866)	(0.0861)	(0.0872)	(0.0919)	(0.0899)	(0.0908)	(0.0942)
Core Deposits Ratio_t-1	0.0757	0.0730	0.0731	0.0715	0.0809	0.0863	0.0693	0.0629
	(0.0536)	(0.0587)	(0.0582)	(0.0544)	(0.0586)	(0.0606)	(0.0537)	(0.0580)
BIS financial cycle (host country) * ExpP_cum	0.000183	-0.0374	-0.000149	-0.00125	0.00731	0.00151	-2.07e-05	-0.00242
	(0.000318)	(0.0309)	(0.000616)	(0.000988)	(0.00533)	(0.00106)	(0.00278)	(0.00180)
BIS business cycle (host country) * ExpP_cum	0.00412	-0.561	0.00238	0.00933	0.00900	0.00565	-0.0222	-0.0103
	(0.00411)	(0.412)	(0.00545)	(0.00728)	(0.0332)	(0.00928)	(0.0285)	(0.0131)
Observations	1,363	1,363	1,363	1,363	1,363	1,363	1,363	1,363
R-squared	0.078	0.085	0.074	0.076	0.076	0.075	0.075	0.075
Adjusted R-squared	0.0338	0.0411	0.0302	0.0317	0.0315	0.0312	0.0304	0.0309
Number of banks	57	57	57	57	57	57	57	57
Time Period	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LHS Variable: Loans	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
LHS Variable: Other	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans
Sample of Banks: Domestic Owned	1	1	1	1	1	1	1	1
Sample of Banks: Foreign Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
Sample of Banks: Domestic and Foreign Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)

This table reports the effects of changes in regulation and business and financial cycles and firm characteristics on log changes in total loans. The data are quarterly from 2000Q1 to 2014Q4 for a panel of domestic bank holding companies. Cumulative foreign exposure weighted regulation is calculated as the weighted average of cumulative changes in foreign regulation weighted with total assets and liabilities of that bank in the respective foreign country. The unilateral cycle variables are controlled for by the fixed effects. For more details on the variables see Appendix Table 1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. ***, **, and * respectively indicate significance at the 1%, 5%, and 10% level.

Table 6: Inward transmission of home prudential policy via affiliates

	(1) HomeP= Prudential IndexC	(2) HomeP= Capital Requirements	(3) HomeP= Sector-Specific Capital Buffer	(4) HomeP= Loan To Value Ratio	(5) HomeP= Reserve Requirement Foreign	(6) HomeP= Reserve Requirement Local	(7) HomeP= Interbank Exposure Limits	(8) HomeP= Concentration Ratios
Home country regulation HomeP_t	-0.133	-0.830	2.037	-1.433	-5.587*	1.789	0.359	-4.630
	(1.135)	(2.139)	(1.772)	(2.160)	(3.256)	(2.247)	(2.146)	(3.726)
Home country regulation HomeP_t-1	-1.922**	3.292	-0.406	-3.465*	2.107	-4.251***	0.737	-2.120
	(0.963)	(2.140)	(2.135)	(1.982)	(2.488)	(1.448)	(2.842)	(3.371)
Home country regulation HomeP_t-2	0.597	1.754	-2.239	4.282**	5.018	1.472	-3.146	-4.508
	(0.977)	(1.907)	(2.012)	(2.056)	(4.023)	(1.600)	(2.384)	(3.256)
Sum of Coefficients	-1.458	4.217	-0.608	-0.616	1.538	-0.989	-2.049	-11.26
F-Test	1.266	1.161	0.0420	0.0419	0.240	0.220	0.234	3.605
p-value	0.261	0.282	0.838	0.838	0.624	0.640	0.629	0.0585
Log Total Assets_t-1	-2.445***	-2.439***	-2.443***	-2.423***	-2.438***	-2.433***	-2.425***	-2.385***
	(0.827)	(0.826)	(0.827)	(0.825)	(0.826)	(0.825)	(0.828)	(0.828)
Tier1 Ratio_t-1	0.104**	0.106**	0.104**	0.105**	0.104**	0.105**	0.105**	0.107**
	(0.0495)	(0.0493)	(0.0492)	(0.0492)	(0.0493)	(0.0493)	(0.0493)	(0.0492)
Illiquid Assets Ratio_t-1	0.0953***	0.0948***	0.0952***	0.0955***	0.0940***	0.0948***	0.0951***	0.0957***
	(0.0255)	(0.0254)	(0.0255)	(0.0254)	(0.0254)	(0.0255)	(0.0254)	(0.0254)
Core Deposits Ratio_t-1	-0.0283	-0.0268	-0.0268	-0.0279	-0.0270	-0.0272	-0.0273	-0.0279
	(0.0320)	(0.0319)	(0.0320)	(0.0318)	(0.0319)	(0.0319)	(0.0319)	(0.0319)
BIS financial cycle (Home country)	0.0447*	0.0419*	0.0443*	0.0424*	0.0434*	0.0439*	0.0438*	0.0421*
	(0.0239)	(0.0238)	(0.0239)	(0.0241)	(0.0240)	(0.0240)	(0.0240)	(0.0240)
BIS business cycle (Home country)	0.436*	0.403*	0.399*	0.427*	0.387*	0.402*	0.407*	0.412*
	(0.233)	(0.227)	(0.231)	(0.233)	(0.227)	(0.227)	(0.228)	(0.228)
Observations	8,613	8,613	8,613	8,613	8,613	8,613	8,613	8,613
R-squared	0.019	0.019	0.019	0.019	0.019	0.019	0.018	0.019
Adjusted R-squared	0.0116	0.0114	0.0115	0.0123	0.0118	0.0120	0.0113	0.0116
Number of banks	312	312	312	312	312	312	312	312
Time Period	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LHS Variable: Loans	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
LHS Variable: Other	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans
Sample of Banks: Domestic Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
Sample of Banks: Foreign Owned	1	1	1	1	1	1	1	1
Sample of Banks: Domestic and Foreign Own	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)

Note: This table reports the effects of changes in parent country regulation and firm characteristics on log changes in total loans. The data are quarterly from 2000Q1 to 2013Q4. HomeP refers to the changes in regulation in the home (i.e. parent bank) country of foreign affiliates. For more details on the variables see Appendix Table 1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. ***, **, and * respectively indicate significance at the 1%, 5%, and 10% level.

Table 7: Inward transmission of home prudential policy via affiliates - Bank variables interactions

	(1) HomeP= Prudential IndexC	(2) HomeP= Capital Requirements	(3) HomeP= Sector-Specific Capital Buffer	(4) HomeP= Loan To Value Ratio	(5) HomeP= Reserve Requirement Foreign	(6) HomeP= Reserve Requirement Local	(7) HomeP= Interbank Exposure Limits	(8) HomeP= Concentration Ratios
Home country regulation HomeP_t	11.44	11.61	11.39	-9.816	68.10**	23.73	1.935	5.638
	(8.726)	(15.90)	(9.724)	(16.88)	(32.35)	(18.30)	(14.40)	(20.50)
Home country regulation HomeP_t-1	-11.69	15.26	4.773	-28.91	49.00	6.586	-2.547	-52.30*
	(8.067)	(18.93)	(15.77)	(17.93)	(36.94)	(15.24)	(28.22)	(28.63)
Home country regulation HomeP_t-2	-3.063	-23.35	-10.04	9.691	-54.38*	-4.594	-36.92**	3.443
	(8.235)	(16.20)	(19.43)	(15.41)	(32.60)	(13.52)	(15.09)	(33.98)
Log Total Assets_t-1	-2.406***	-2.415***	-2.473***	-2.478***	-2.437***	-2.384***	-2.428***	-2.384***
	(0.818)	(0.820)	(0.828)	(0.824)	(0.828)	(0.819)	(0.830)	(0.831)
Tier1 Ratio_t-1	0.0944*	0.111**	0.101**	0.0936*	0.0992**	0.111**	0.103**	0.120**
	(0.0506)	(0.0497)	(0.0500)	(0.0488)	(0.0490)	(0.0491)	(0.0490)	(0.0502)
Illiquid Assets Ratio_t-1	0.101***	0.0995***	0.0979***	0.0992***	0.0942***	0.0988***	0.0943***	0.0978***
	(0.0258)	(0.0253)	(0.0255)	(0.0255)	(0.0255)	(0.0254)	(0.0254)	(0.0257)
Core Deposits Ratio_t-1	-0.0275	-0.0252	-0.0332	-0.0270	-0.0266	-0.0236	-0.0267	-0.0296
	(0.0319)	(0.0321)	(0.0322)	(0.0315)	(0.0319)	(0.0315)	(0.0321)	(0.0321)
BIS financial cycle (Home country)	0.0478**	0.0403*	0.0476**	0.0452*	0.0425*	0.0435*	0.0437*	0.0438*
	(0.0238)	(0.0238)	(0.0241)	(0.0241)	(0.0240)	(0.0241)	(0.0240)	(0.0241)
BIS business cycle (Home country)	0.470**	0.394*	0.404*	0.458*	0.368	0.408*	0.398*	0.428*
	(0.233)	(0.228)	(0.230)	(0.236)	(0.230)	(0.228)	(0.228)	(0.229)
Log Total Assets * HomeP	0.163	0.803	0.0993	2.115	-6.046**	-2.166	1.707	2.960
	0.0486	0.241	0.00288	2.108	5.487	1.212	1.105	0.865
	0.826	0.623	0.957	0.148	0.0198	0.272	0.294	0.353
Tier1 Ratio * HomeP	0.232	-0.0380	0.129	0.723***	0.659***	0.294	0.473	-0.336
	2.107	0.0164	0.142	7.223	8.518	0.911	1.759	0.238
	0.148	0.898	0.706	0.00759	0.00377	0.341	0.186	0.626
Illiquid Assets Ratio * HomeP	-0.0584	-0.155	-0.248*	-0.165*	0.166	-0.00344	0.114	-0.157
	1.414	0.969	3.680	3.362	1.970	0.000970	0.361	0.591
	0.235	0.326	0.0560	0.0677	0.161	0.975	0.548	0.443
Core Deposits Ratio * HomeP	0.0194	-0.163	0.245**	0.0288	0.709***	0.0692	-0.0912	-0.0508
	0.182	1.707	5.784	0.0775	13.58	0.373	0.279	0.0561
	0.670	0.192	0.0168	0.781	0.000270	0.542	0.598	0.813
Observations	8,613	8,613	8,613	8,613	8,613	8,613	8,613	8,613
R-squared	0.020	0.020	0.020	0.021	0.022	0.020	0.019	0.021
Adjusted R-squared	0.0116	0.0112	0.0114	0.0128	0.0131	0.0119	0.0104	0.0128
Number of banks	312	312	312	312	312	312	312	312
Time Period	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LHS Variable: Loans	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
LHS Variable: Other	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans
Sample of Banks: Domestic Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
Sample of Banks: Foreign Owned	1	1	1	1	1	1	1	1
Sample of Banks: Domestic and Foreign Own	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)

Note: This table reports the effects of changes in regulation and firm characteristics and their interactions on log changes in total loans. The data are quarterly from 2000Q1 to 2014Q4. HomeP refers to the changes in regulation in the home (i.e. parent bank) country of foreign affiliates. Bank control variables are included as specified in the lower part of the table but not reported for the sake of brevity. For HomeP interaction effects, the reported coefficient is the sum of the contemporaneous term and two lags, with the corresponding F-statistics for joint significance in parentheses. For more details on the variables see Appendix Table 1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. ***, **, and * respectively indicate significance at the 1%, 5%, and 10% level.

Table 8: Inward transmission of home prudential policy via affiliates - cycle interactions

	(1) HomeP= Prudential IndexC	(2) HomeP= Capital Requirements	(3) HomeP= Sector-Specific Capital Buffer	(4) HomeP= Loan To Value Ratio	(5) HomeP= Reserve Requirement Foreign	(6) HomeP= Reserve Requirement Local	(7) HomeP= Interbank Exposure Limits	(8) HomeP= Concentration Ratios
Cumulative home country regulation HomeP_cum	0.106	0.0278	0.805	0.841*	-0.508	-0.266	-0.651	-0.859
	(0.211)	(1.434)	(0.675)	(0.493)	(0.872)	(0.410)	(0.687)	(0.969)
Log Total Assets_t-1	-2.744***	-2.626***	-2.694***	-2.762***	-2.676***	-2.584***	-2.706***	-2.616***
	(0.852)	(0.834)	(0.838)	(0.850)	(0.845)	(0.836)	(0.854)	(0.838)
Tier1 Ratio_t-1	0.106**	0.109**	0.0991**	0.110**	0.110**	0.110**	0.108**	0.112**
	(0.0497)	(0.0494)	(0.0501)	(0.0506)	(0.0497)	(0.0501)	(0.0506)	(0.0489)
Illiquid Assets Ratio_t-1	0.0881***	0.0883***	0.0884***	0.0895***	0.0888***	0.0886***	0.0880***	0.0897***
	(0.0241)	(0.0241)	(0.0241)	(0.0243)	(0.0242)	(0.0241)	(0.0244)	(0.0240)
Core Deposits Ratio_t-1	-0.0271	-0.0254	-0.0280	-0.0235	-0.0259	-0.0244	-0.0250	-0.0236
	(0.0303)	(0.0309)	(0.0305)	(0.0312)	(0.0306)	(0.0304)	(0.0306)	(0.0307)
BIS financial cycle (Home country)	0.0333	0.0385	0.0421*	0.0209	0.0355	0.0512*	0.0318	0.0447*
	(0.0254)	(0.0260)	(0.0241)	(0.0270)	(0.0243)	(0.0263)	(0.0250)	(0.0257)
BIS business cycle (Home country)	0.406*	0.461**	0.519**	0.387	0.402*	0.430*	0.555**	0.435*
	(0.239)	(0.234)	(0.242)	(0.237)	(0.238)	(0.245)	(0.249)	(0.246)
BIS finacnial cycle * HomeP_cum	0.00523	0.0172	-0.0265	0.0135	0.0648	0.0167	0.0237	-0.0229
	(0.00835)	(0.0403)	(0.0359)	(0.0192)	(0.0585)	(0.0155)	(0.0381)	(0.0618)
BIS business cycle * HomeP_cum	-0.0341	-0.869	-0.412*	0.335	-0.221	0.0337	-0.432**	-0.123
	(0.0856)	(1.004)	(0.233)	(0.222)	(0.405)	(0.161)	(0.220)	(0.249)
Observations	8,848	8,848	8,848	8,848	8,848	8,848	8,848	8,848
R-squared	0.019	0.019	0.020	0.020	0.019	0.019	0.020	0.020
Adjusted R-squared	0.0125	0.0124	0.0129	0.0133	0.0125	0.0124	0.0127	0.0125
Number of banks	324	324	324	324	324	324	324	324
Time Period	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LHS Variable: Loans	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
LHS Variable: Other	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans	Total Loans
Sample of Banks: Domestic Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)
Sample of Banks: Foreign Owned	1	1	1	1	1	1	1	1
Sample of Banks: Domestic and Foreign Owned	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)	(1/0)

Note: This table reports the effects of changes in regulation and firm characteristics and their interactions on log changes in total loans. The data are quarterly from 2000Q1 to 2014Q4. HomeP_cum refers to the cumulative changes in regulation in the home (i.e. parent bank) country of foreign affiliates. For more details on the variables see Appendix Table 1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. ***, **, and * respectively indicate significance at the 1%, 5%, and 10% level.

Table 9: Sectoral lending

LHS Variable		(1) ExpP= Prudential IndexC	(2) ExpP= Capital Requirements	(3) ExpP= Sector-Specific Capital Buffer	(4) ExpP= Loan To Value Ratio	(5) ExpP= Reserve Requirement Foreign	(6) ExpP= Reserve Requirement Local
Exposure-weighted inward transmission							
Interbank Loans		-0.215	-0.250*	-0.412	-0.163	0.281	0.196
	p-value	0.190	0.0777	0.233	0.448	0.559	0.138
PNFC loans		0.0879*	0.223*	0.101	0.107	0.165	-0.0618
	p-value	0.0804	0.0524	0.126	0.199	0.565	0.456
Household loans		0.0216	0.0485	0.0814	0.121	-0.504	-0.0762
	p-value	0.651	0.496	0.348	0.327	0.112	0.471
Wholesale Funding (Domestic)		-0.259*	-0.340	-0.219	-0.535***	-0.390	0.571**
	p-value	*0.0906*	*0.195*	*0.251*	*0.00338*	*0.461*	*0.0310*
Wholesale Funding (Foreign)		0.141	-0.270	0.349***	0.375*	1.104**	0.0179
	p-value	*0.316*	*0.332*	*0.00282*	*0.0503*	*0.0411*	*0.905*
Home Macroprudential Policy via affiliates							
Interbank Loans		-1.884	-5.192	-3.297	-3.322	-4.782	0.668
	p-value	0.358	0.388	0.402	0.335	0.335	0.830
PNFC loans		1.771	4.407	2.994	9.738*	-3.615***	0.279
	p-value	0.395	0.326	0.324	0.0996	0.00518	0.919
Household loans		3.082	0.00346	1.633	12.49***	-2.402*	3.980
	p-value	0.0532	0.999	0.621	0.00172	0.0958	0.249
Wholesale Funding (Domestic)		-1.568	0.379	-8.562**	5.154	3.650	-2.363
	p-value	0.488	0.948	0.0135	0.211	0.721	0.453
Wholesale Funding (Foreign)		2.141**	4.589	0.461	-0.506	3.694	2.269
	p-value	0.0417	0.128	0.854	0.803	0.519	0.240
Time Period		2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4	2000Q1-2013Q4
Time fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects		Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the effects of changes in regulation and firm characteristics on log changes in loans to the respective sectors. The dependent variable refers to lending growth in all cases except for 'wholesale funding' which refers to the growth in borrowing from wholesale sources. The data are quarterly from 2000Q1 to 2013Q4 for a panel of domestic bank holding companies. The upper part of the tables gives results for Specification A on exposure-weighted inward transmission via the foreign exposures of UK-owned banks. Foreign exposure weighted regulation is calculated as the weighted average of changes in foreign regulation weighted with total assets of that bank in the respective foreign country. The lower part of the table gives the results for Specification B on inward transmission via foreign affiliates exposed to regulation in their home countries. Each row gives the main result from 6 different regressions using Model (1) for the regulatory measure specified in the row headline. All specifications include fixed effects as specified in the lower part of the table. For more details on the variables see Appendix Table 1. Standard errors are clustered by bank. ***, **, and * respectively indicate significance at the 1%, 5%, and 10% level.

Appendix Table A1: Construction of variables

Variable Name	Definition	Source
Dependent variables (Exchange-rate adjusted log changes)		
Total loan growth	Loans to all UK-resident sectors (resident positions of BT23 and BT29)	Form BT and AL
Interbank loan growth	Loans to other UK banks (resident positions of BT23 plus ALL15, ALL16 and ALL17)	Form BT
Household loan growth	Loans to UK households (ALL18)	Form AL
PNFC loan growth	Loans to UK PNFCs (ALL1 to ALL14)	Form AL

Short-term wholesale funding growth (domestic or foreign)	Deposits from the UK Monetary Financial Institutions + certificates of deposits and commercial paper issued + Repos ex. public sectors from domestic/resident or foreign/non-resident sources (Foreign: BT2J + BT3J + BT6J. Domestic: BT2B + BT2C + BT2D + BT3B + BT3C + BT3D + BT4 + BT5A + BT6B + BT6C + BT6D + BT6H).	From BT
Independent variables		
Illiquid Asset Ratio	1 minus holdings of liquid assets [(BT21+BT23+BT32D)/(BT20-BT19)].	Form BT
Commitments Ratio(t-1)	Commitment ratio: Ratio of total commitments divided by total assets. [BT43/BT40]Includes overdraft, loan, acceptance and other facilities outstanding.	Form BT
LogRealAssets$_{(t-1)}$	The log of a bank's total assets in levels (£1000s), deflated by CPI inflation [BT40].	Form BT
CoreDeposits Ratio $_{(t-1)}$	[Total time and sight deposit from domestic residents]/(Liabilities – balance sheet capital)	Form BT
Tier1Ratio$_{(t-1)}$	(Tier 1 capital)/Assets	Form BT
BIS financial cycle	Country-specific credit gap	BIS
BIS business cycle	Country-specific output gap	BIS

Note: "Form (BT/AL)" refers to the relevant Bank of England reporting form. See http://www.bankofengland.co.uk/statistics/Pages/reporters/defs/default.aspx for full definitions.