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## THE INTERNATIONAL TRANSMISSION OF MONETARY POLICY THROUGH FINANCIAL CENTRES: EVIDENCE FROM THE UNITED KINGDOM AND HONG KONG

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# The International Transmission of Monetary Policy through Financial Centres:
# Evidence from the United Kingdom and Hong Kong

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## Abstract

This paper explores the cross-border transmission of monetary policy by comparing and contrasting the results for two major international financial centres: Hong Kong and the United Kingdom. We examine the effect of monetary policy in the USA, euro area and Japan, on UK- and Hong Kong-resident banks' domestic lending behaviour, using individual bank-level data. Focusing on financial

interconnections and other balance sheet characteristics as a transmission mechanism, we find that both of these factors play an important role in the transmission of foreign monetary policy. We are able to establish evidence for both a bank funding and bank portfolio channel of monetary policy, for both Hong Kong and the UK. There are important differences between the two countries; in particular, the currency denomination of lending appears to play a major role only in the UK, which probably reflects Hong Kong's linked exchange rate system by which the HK dollar is pegged with the US dollar. These results contrast to the largely inconclusive results from previous studies, whose aggregate nature may have masked offsetting individual bank effects.

**Keywords**: International financial linkages, monetary policy transmission, bank lending
**JEL classification**: G21, E52, F42

# 1.    Introduction

Large scale asset purchases have been a feature of international monetary policy for several years. But now, in the US, the FOMC has started to raise its policy rate and normalise its balance sheet, and authorities in the UK and euro area are beginning to talk about reducing the need for extraordinary monetary policy accommodation. In a world where financial markets and banking systems are highly integrated, monetary policy has cross-border as well as domestic effects. Indeed, the international transmission of monetary policy has long been a core topic of interest of central bankers, although the policy debate was often focused on the impact on exchange rates and the effect of capital flows on emerging markets. However, given that advanced economies have highly integrated financial systems, any spillovers from another country's monetary policy may be substantive.

In this paper, which forms part of a wider project of the International Banking Research Network, we explore this issue of integrated financial systems and financial interlinkages in monetary policy transmission by comparing and contrasting the results for two major international financial centres: Hong Kong and the United Kingdom.   We find this comparison informative, especially as it allows us to explore different aspects of financial interlinkages as well as bank characteristics, although the parallels are not exact, given differences in the structure of the UK and Hong Kong banking systems, as discussed in detail below.

The existing literature is often inconclusive about the direction and magnitude of the international transmission of monetary policy, although this may be because the key transmission channels work in different directions.  The use of individual bank-level data from these countries, which is central to the IBRN project (Buch et al 2017), helps us to unpick some of the channels of monetary policy transmission. In particular, we combine data on financial interlinkages, in the form of banks' borrowing and lending to the country that changes monetary policy, with data on the characteristics of individual banks that lead to differentiation in international spillovers.  In this way, we can make inferences about the extent to which the transmission channels most typically discussed in the literature (i.e.  those which lead to the portfolio rebalancing and bank funding channels) are in operation.

We examine the effect of monetary policy in the USA, euro area and Japan, on UK and Hong Kong-resident banks' lending behaviour, with a focus on the role of financial interconnections as a transmission mechanism.[1] In the case of domestic-owned UK banks, foreign subsidiaries and foreign branches show sizable financial linkages in terms of banks' lending or funding with the rest of the world. We hence focus on a sample retaining all bank types and directly estimate the relevance of specific financial linkages for the transmission of systemic country monetary policy to UK bank lending. In the case of Hong Kong, the banking sector is dominated by foreign branches which are highly integrated with their parent banks in their home countries as reflected by the large intragroup positions of branches. This allows us to focus directly on a sample of foreign branches[2] and estimate how changes in monetary policy in the parent country impacts bank lending in Hong Kong. Indeed, we can go a step further and estimate how the balance sheet characteristics of parent banks influence the transmission of monetary policy from home countries to their foreign branches.

An important aim of the paper is to employ information on financial linkages and balance sheet characteristics to make inferences about the relative importance of the bank funding[3] and portfolio channels of monetary policy (see Bernanke and Blinder, 1992 and Bernanke and Gertler, 1995). The 'bank funding channel' means that banks may face more constraints in funding after a tightening in monetary policy, causing them to <u>reduce</u> their lending abroad – this is about the overall *quantity* of lending. In contrast, according to the portfolio channel, when monetary policy tightens in a country, borrowers in that country become less creditworthy or demand fewer loans, and so banks <u>increase</u> lending in other countries in order to keep their overall portfolio of risk unchanged – this is about the overall composition of lending, but implies in an open economy setting an increase in the quantity loaned abroad. By focusing on individual bank balance sheets we are able to closer examine the frictions that lead to these channels. As set out in Buch et al (2017) in more details, we focus on the bank-level characteristics rather than the theoretical channels as such, since our econometric analysis is conducted directly in terms of those characteristics.

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[1] For the analysis of Hong Kong, we also examine the effect of UK monetary policy on banks' lending behaviour.

[2] Since the focus of this paper is to examine the effect of monetary policy transmission from the USA, euro area, Japan and the UK, we therefore restrict our sample to those whose parents are headquartered in these systemic countries.

[3] We prefer the expression bank funding channel over the alternative expression bank lending channel, given it operates compared to the other major channel we investigate on the liability side of banks' balance sheets.

Turning to the results, we find evidence consistent with both bank funding and portfolio channels for both the UK and Hong Kong. In the case of the UK, when the euro area or the US tightens monetary policy, banks with large lending to the US or euro area show a more positive change in their real-sector lending to the UK compared to other banks, which is consistent with a portfolio channel. In Hong Kong, parent banks with more lending business increase their lending to Hong Kong by more after a monetary policy tightening, also consistent with a portfolio channel. On the funding side, effects are weak in the UK and in fact only significant for Japanese monetary policy; but in Hong Kong, there is evidence that branches whose parents have a higher deposit-to-asset ratio (i.e. they are less reliant on wholesale funding) tend to attain higher loan growth to real sector than their counterparts when home-country monetary policy tightens.

The currency denomination of lending plays an important role: in the UK the effect of financial interlinkages on the asset side seem to be strongest for sterling-denominated lending, but financial funding interlinkages seem to have a bigger effect on foreign-currency denominated lending. Importantly, a tightening in US monetary policy leads to a larger negative change in USD-denominated financial lending by banks dependent on the US for net funding. However, we do not find a significant difference in the effect between USD and HKD in Hong Kong, perhaps reflecting the stable linked exchange rate system with the USD.

This paper is related to various strands of the literature, which we do not discuss in detail here because the issue is covered in depth in the meta-analysis paper for this project (Buch et al, 2017). However, it is worth highlighting a few studies that have also focused on the currency dimension of lending. One motivation of our focus on the currency denomination of lending is provided by Brauning and Ivashina (2017). They highlight that banks' funding is usually dominated in a different currency than the foreign assets banks intend to fund. But the price for such synthetic funding depends on the price of hedging FX exposures. They show that following a monetary tightening cross-border/cross-currency liquidity flows back home imply lower swapping activity and marginal costs of funding foreign lending. This leads, similar to a portfolio rebalancing effect, to an increase in lending abroad. This increase should, however, occur in the currency of the foreign market as lending in the currency of the

home country is not subject to the lower marginal costs FX swaps; in other words, a US tightening should lead to an increase in lending in the home currency.

Ongena et al (2017) use data from Hungary, which has a high proportion of foreign currency denominated lending and find that changes in foreign monetary policy conditions affect bank lending more in foreign currency than in domestic currency. Their story is somewhat simpler, in that a monetary policy tightening by a foreign central bank increases the bank's cost of funding in the foreign currency but not the domestic currency and that affects the bank's local lending decisions.

On the funding side, Berthou et al (2017) examine the effect of the US dollar funding shock experienced by European banks in the summer of 2011 when US money market funds sharply decreased their exposure to European financial institutions during the sovereign debt crisis. They find that banks borrowing more US dollars from the US financial sector before the shock reduced their loans to French firms exporting to the US by more and that this had an effect on exports to the US by these firms. This is in line with our result that banks which borrow more from the US decrease their USD lending in the UK by more than other firms.

Takats and Temesvary (2016) examine the currency dimension of monetary policy transmission in a panel of BIS reporting countries. They find that monetary policy shocks in specific currencies transmit lending in those currencies even when neither the lending banking system nor borrowing country uses this currency as their own. While we are not able to test the latter aspect, our results for the UK on the transmission of US monetary policy via USD-denominated financial lending in the UK is in line with their findings. In fact, that we do not find a similar channel for the transmission of euro-area monetary policy to the UK may be driven by the fact that a significant proportion of financial linkages with the UK are not denominated in euros but other currencies, including USD.

The paper proceeds as follows: section 2 discusses the structure of the UK and Hong Kong sectors, which follows by our main hypothesis. Section 3 describes the specific features of the UK and Hong Kong data. Section 4 sets out the empirical specification. Section 5 presents the headline results while section 6 concludes.

# 2. Hypotheses

## 2.1 Structure of the UK and Hong Kong banking sectors and transmission channels

Both the UK and Hong Kong are particularly good case studies to assess the transmission of monetary policy via bank lending. They have much in common, and, to the extent that they differ, those differences can be informative about the global transmission mechanisms. In this section, we briefly discuss how the different structures of the two banking sectors might affect our priors and the focus of our empirical analysis.

The UK and Hong Kong are the first and fourth most competitive financial centres in the world respectively, according to one authoritative recent study (Z/Yen Group, 2017). Chart 1-UK and Tables 1a-UK and 1b-UK describe the structure of the UK banking system. 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 subsidiaries and branches (foreign banks are a similar size to resident banks, but do not contain the largest banks). Foreign branches are considerably larger than foreign subsidiaries (Table 1a UK) but both branches and subsidiaries have significant linkages to the rest of the world (Chart 1-UK). In addition, UK-owned banks in aggregate have significant foreign exposures and also source significant portions of their funding from abroad and from multiple countries. We hence focus in the case of the UK on a sample retaining all bank types and directly estimate the relevance of specific financial linkages for the transmission of systemic country monetary policy to UK bank lending.

Similar to the UK, Hong Kong also has a large presence of foreign banking operations. Importantly, foreign banks account for nearly half of total banking system assets in both the UK and Hong Kong. However, there are key differences between the two countries. In particular, in terms of distribution of foreign banks, the UK has a more even mix of branches and subsidiaries with 76 foreign subsidiaries and 120 branches, while the Hong Kong system is dominated by foreign branches: at the end of 2015, of 148 foreign licenced banks operating in Hong Kong, 134 were foreign branches.[4] The liability structure of foreign banks in Hong Kong differs significantly between subsidiaries and branches. Chart

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[4] At the end of 2015, 45 of the top 50 global banking organisations have established a foreign branch in Hong Kong.

1-HK shows the liability structure for different bank type as of end 2015. For the group of foreign subsidiaries, their liability structure is similar to that of domestic banks in Hong Kong which largely fund their business by local retail deposits. By contrast, intragroup funding from overseas offices shares a significant part of foreign bank branches' liabilities, and the share is even more significant for foreign branches from the four systemic countries (i.e. the US, EA, JP and the UK).

Given that the majority of foreign banks are in the form of branches in Hong Kong and the large differences, contrary to the UK, in the liability structure between branches and subsidiaries, the analysis of Hong Kong focuses on foreign bank branches ("FBHKs"). Our prior is that FBHKs are prone to international transmission of monetary policy from the home country of their parent bank as parent bank funding in general is by far the most significant funding source for foreign bank branches and that parent bank funding is more sensitive to the parent-country monetary policy. Moreover, since these FBHKs are part of the overall parent bank, the balance sheet characteristics of parent banks would play a key role in determining the extent of monetary policy transmission.

In the case of the UK, the generally high dependence on cross-border bank funding, especially from major partners including the US, euro area and Japan, suggests that the lending of UK banks may be affected by monetary policy changes. But on the other hand UK banks receive their funding from multiple sources, suggesting that they might be able to replace it from another source in the event of a single-country change in monetary policy. Evidence in the existing literature for a bank funding channel in the UK has been limited: Butt et al (2014) find that there is no evidence that QE operated via this channel in the UK.

While banks may be easily able to replace funding from another source, this may not be the case for funding in a particular currency. If, for example, the US tightens monetary policy then funding in USD may be lost but banks may replace that lost USD funding with funding in GBP or EUR. GBP, USD and JPY are all free-floating currencies, with a hedging cost which suggests that the channel of Brauning and Ivashina (2017) above may play a role. In contrast, as Hong Kong dollar is pegged with the US dollar through the Linked Exchange Rate System, so there may be little differentiation in the response between HKD and USD lending.

## 2.2     Bank-level characteristics, frictions and the cross-border transmission of monetary policy

This section presents in detail the hypotheses on how the channels of monetary policy transmission may work in the context of the UK and Hong Kong banking sectors, given balance sheet heterogeneity among banks.

Where there are frictions in raising external finance, banks may face more constraints in funding after a tightening in monetary policy, causing them to reduce their lending, including their foreign lending. This is about the overall *quantity* of lending, and often known as the 'bank funding' channel described in the literature. In the case of the UK, funding linkages between UK banks and systemic countries are likely to play a key role: banks relying on net funding from countries where the banking system experienced a tightening in short-term funding rate should be more impacted than other banks. Our baseline measure is therefore net funding from *ctry* (ratio to total liabilities).[5, 6] Banks that are most dependent on net funding from systemic countries are also more likely to be exposed to a loss in funding when these countries tighten monetary policy. For Hong Kong, the corresponding measure of funding linkage for FBHKs is *NetDueTo*[7] (i.e. their net reliance on parent bank funding) and we conjecture that the transmission tends to be weaker for FBHKs with lower reliance on parent funding.

Apart from banks' direct funding linkages with systemic countries, funding frictions can also be driven by a number of other balance sheet factors. Cetorelli and Goldberg (2012) show that global banks manage their liquidity at a global level which can change the transmission of monetary policy. De Haas and van Lelyveld (2010) show that banks with strong parents are able to expand lending faster and that they do not need to reduce credit supply when faced with a negative shock. Following Disyatat (2011)'s framing of the bank funding channel of monetary policy as an tightening in monetary policy being associated with a higher external finance premium,[8] we posit that the extent of the

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[5] A focus on net funding is useful because gross cross-border lending and funding are highly correlated so that gross funding might not be a good measure.

[6] Where countries *ctry* are the UK's core financial partners: the United States, the euro area and Japan.

[7] NetDueTo is defined as "due to overseas offices" (the liabilities of FBHKs) minus "due from overseas offices" (the assets of FBHKs), to capture FBHK's net intragroup funding position. By definition, a positive (negative) NetDueTo for a FBHK in Hong Kong means that the FBHK is a net borrower from (lender to) the rest of its banking group.

[8] Disyatat (2011) shows that changes in the quantity of loan supply are driven by changes in the external finance premium. In particular, it argues that when banks are dependent on non-deposit funding, an increase of the policy rate may lead to an

transmission tends to be smaller if the parent bank has a higher core deposit ratio (*CoreDeposits)* and liquid asset ratio  (*liquidAssetRatio).* The former indicates a lower reliance on wholesale funding (as they are financed more by customer deposits instead), while the latter suggests a high ability to reduce the funding constraints arising from tighter monetary policy. In addition, Tier 1 ratio (*Tier1ratio)* would affect the external finance premium and net worth of a bank and so we conjecture that banks with lower Tier 1 ratios will be less able to expand lending.

In contrast, according to the portfolio channel, when monetary policy tightens in a country, borrowers in that country become less creditworthy or demand fewer loans, and so banks increase lending in other countries in order to keep their overall portfolio of risk unchanged.  This is about the overall *composition* of lending, but implies in an open economy setting an increase in the quantity loaned abroad.

As this effect comes from a bank's assets – its loan portfolio – financial interlinkages on the asset side are used to examine this channel. When monetary policy is tightened in a given country a reduction in demand in that country (demand effect) plus a reduction in collateral values/borrower risk effect (portfolio channel) will lead a bank to re-allocate its lending elsewhere, including to the UK and Hong Kong. Both of these channels should be strongest for banks with more exposure on their asset side to the respective country, and especially to non-banks. For the UK our baseline measure is therefore gross lending to *ctry's* non-bank sector (scaled by total assets). For Hong Kong, the corresponding measure would be parent bank's loan to asset ratio (*LoanAssets*).  We predict that that banks which do a greater proportion of lending would therefore increase their lending to Hong Kong by more. In addition, we assume that the rebalancing effect via Hong Kong branch would be smaller for parent banks with higher level of impaired loans to total loan ratio (*ImpairedLoan).* This is because while banks may act to maintain the same portfolio of risk by rebalancing its loan portfolio away from domestic borrowers towards foreign borrowers when home-country monetary policy tightens, the effect of such loan rebalancing strategy may be limited if banks already have a high level of risk in their loan portfolio. Instead of rebalancing within their loan portfolio, banks may also need to rebalance across asset classes by substituting away from loans and towards other safer assets. If this

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increased external finance premium for banks' non-deposit funding. Therefore, higher reliance on non-deposit funding would face a higher increase in external finance premium when monetary policy tightens.

is the case, when monetary policy tightens in the home country, we would expect lower loan growth in parent banks' overall loan portfolio and hence lower loan growth in their Hong Kong branch.

## 2.3    Choice of the monetary policy measures

As discussed in Buch et al (2017), the appropriate choice of the monetary policy measure also depends on whether we are examining how monetary policy affects a bank's funding or lending. For a bank's funding, the actual short-term policy rate is the relevant monetary policy measure given that its path has a floor at the zero lower bound (ZLB). As discussed, as banks rely on short-term funding, monetary policy actions that affect the long end of the yield curve may not be as relevant. It is likely that unconventional monetary policy does not affect bank lending through the traditional bank lending channel, as banks are flushed with reserves, but through the portfolio channel. When testing for the presence of the bank funding channel, we focus hence on the actual short-term policy rate, while when testing for the portfolio channel, we focus on either the shadow rate or directly on measures of quantitative easing.

# 3. Data and stylised facts for banks in the UK and Hong Kong

### 3.1  Bank-level data and balance sheet characteristics

For the UK, raw data from the Bank of England's regulatory reporting forms were collected at a quarterly frequency over the period 2000Q1–2015 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 simply means that its ultimate parent is incorporated in the United Kingdom. Table A1 describes the construction of variables and their sources. Tables 1a and 1b provide the summary statistics.

For Hong Kong, we construct branch-level variables for FBHKs using regulatory data from the *return of assets and liabilities*, and the *quarterly analysis of loans and advances and provisions*. Parent-level variables are constructed using consolidated data of the ultimate parent from *SNL* and *S&P Capital*

*IQ.*[9] The estimation sample consists of 35 FBHKs from the four systemic countries (the UK, euro area, the United States and Japan), covering the period 2000Q1 – 2015Q4. These banks are selected using the following criteria: We first include all FBHKs from the four systemic countries. We then exclude FBHKs that are no longer active at the end of 2015 and/or have less than ten years of operation. FBHKs that have experienced mergers and acquisitions or changes in their home country or no lending operation during the sample period are also excluded. The summary statistics for major variables in our estimations are shown in Table 1-HK.

*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.[10]

*Bank balance sheet characteristics*

Bank balance sheet characteristic enter as control variables to account for bank-specific variation over time not captured otherwise by the regression framework. For both countries, we use 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' (and which will also probably pick up other factors such as the risk-taking behaviour of banks, to the extent that this reflects too-big-to-fail subsidies) (*LogAssets$_{b,t-1}$*)

− bank's Tier 1 capital-to-asset ratio *(Tier 1 ratio$_{,b,t-1}$)*

− fraction of a bank's portfolio of assets that is liquid (holdings of cash and gilts divided by total assets) *(liquidAssetsRatio$_{b,t-1}$)*

− core funding – i.e. the fraction of time and sight deposits from domestic residents, divided by total liabilities less Tier 1 capital *(CoreDepositsRatio$_{b,t-1}$)*

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[9] Since quarterly data are only available in recent years for most of our sample, missing quarterly data in the early part of the estimation period are obtained by linearly interpolating the annual data.

[10] This drops 4% of the sample in the case of total loan growth and a sample including both UK-headquartered and non-UK headquartered banks. For the case of Hong Kong, this drops 3.5% of the sample.

For Hong Kong, we also include the parent bank's loan-to-assets ratio ($LoanAssets_{b,j,t-1}$), impaired-loans-to-gross-loans ratio ($ImpairedLoan_{b,j,t-1}$), and a ratio of NetDueTo to liabilities for the FBHKs ($NetDueTo_{b,j,t-1}$).

### 3.2 Data on monetary policy

Two variables are employed in the baseline model to reflect separately the stance of conventional and unconventional monetary policies. Specifically, actual policy rate changes ($\Delta$Short Rate) are adopted to reflect the stance of conventional monetary policy, while quarterly changes in the ratio of central bank assets to GDP ($\Delta$QE) proxy for the stance of unconventional monetary policy. QE data and short-term policy rates are from national sources (see Buch et al, 2017).

While changes in the ratio of central bank assets to GDP may act as a good proxy for central bank balance sheet policy, it may not be able to fully capture the yield curve effect arising from other unconventional monetary policy tools (such as forward guidance) which is expected to affect bank's portfolio allocation decision. To account for this important yield curve effect during the unconventional environment, we also use the two-factor shadow policy rate as described in Krippner (2012), which is based on the term structure of interest rates. These are available for the USA, euro area, UK and Japan.[11] Although there are some concerns that the estimated level of the shadow rate may not be a perfect measure of monetary stance, because it is sensitive to the assumption underlying the specification, *changes* in shadow rates – the focus of this project – have been shown to be consistent and an effective proxy for monetary policy changes (see also the discussion in Buch et al, 2017).

## 4.    Empirical methodology

In this section, we describe the empirical model that we use to examine monetary policy spillovers from abroad. Throughout, we follow Buch et al. (2017).

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[11] http://www.rbnz.govt.nz/research-and-publications/research-programme/additional-research/measures-of-the-stance-of-united-states-monetary-policy/comparison-of-international-monetary-policy-measures

We rely as discussed above on two main specifications which differ depending on the monetary policy measures employed. While we use the first to explore both bank funding and portfolio re-balancing channels, the second is appropriate only for studying the portfolio rebalancing channel. This is because the cost at which banks fund themselves cannot be negative, and the shadow rate can be negative. Owing to the differences in the source of monetary policy transmission as discussed in section 2, the two specifications for the analysis of Hong Kong differ slightly from those we use for the UK.

For the UK, we look at financial linkages directly, examining whether countries which do more lending or gain more funding from the affected country change their lending to the UK by more than those which are less affected. For Hong Kong, we do more direct tests of parent balance sheet variables, for instance how a parent which has more lending businesses or is less reliant on wholesale funding changes its lending to Hong Kong via FBHKs. The two models are graphically summarised in the annex in Chart 2:

For the analysis of the UK, we run first a panel regression of the following form:

$$\Delta Y_{b,t} = \alpha_0 + \sum_{ctry}\left(\sum_{k=0}^{K}\left(\alpha_{1,k}^{ctry}\cdot \Delta MP_{t-k}^{ctry}\cdot Channel_{b,t-K-1}^{ctry} + \alpha_{2,k}^{ctry}\cdot \Delta QE_{t-k}^{ctry}\cdot Channel_{b,t-K-1}^{ctry}\right)\right.$$

$$\left. + \alpha_3^{ctry}Channel_{b,t-K-1}^{ctry}\right) + \alpha_4 X_{b,t-1} + f_b + f_t + \epsilon_{b,t} \qquad\qquad (1-a)$$

$\Delta Y_{b,t}$ is the log change of lending to the private non-bank sector (households and private non-financial corporates, or PNFCs) or the financial sector (interbank loans) by bank *b* at time *t* (as defined in section 3).

$\Delta MP_{t-k}^{ctry}$ is the measure of changes in foreign monetary policy rates where the countries (*ctry*) are the UK's core financial partners: the United States, the euro area and Japan. We also include changes in domestic monetary policy into the regression, which is important in the face of moderately high positive correlations between changes in policy rates in systemic countries.[12]

$\Delta QE_{t-k}^{ctry}$ is the measure of changes in quantitative easing, i.e. changes in the stock of asset purchases.

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[12] The correlation between UK and US shadow rates is 67%.

$Channel_{b,t-K-1}^{ctry}$ is a variable that explores the role of financial linkages in the transmission of monetary policy. As discussed in section 2, these are either net funding from *ctry* (ratio to total assets) or gross lending to *ctry's* non-bank sector depending on the channel under consideration. The respective channel variables above enter the regression at the lag t-K-1 to make sure that they are not affected by included changes in monetary policy.

$X_{b,t-1}$ is a vector of time-varying *bank* control variables (see data section for a list of variables). Importantly, the regression includes parent-country time fixed effects $f_t$ as controls for other global and domestic factors (including the non-interacted monetary policy variable). $f_b$ are bank fixed effects. Standard errors $\epsilon_{b,t}$ are clustered at the bank level.

For the analysis of HK, the first specification is modified as below;

$$\Delta Y_{b,j,t} = \alpha_0 + \sum_{k=0}^{K}(\alpha_{1,k} \Delta MP_{t-k}^{parent}.Channel_{b,t-K-1} + \alpha_{2,k}\Delta QE_{t-k}^{parent}.Channel_{b,t-K-1}) + \alpha_3 Channel_{b,t-K-1}$$

$$+ \alpha_4 X_{b,j,t-1} + f_{j,t} + f_b + \epsilon_{b,t} \qquad\qquad (1-b)$$

Since the source of monetary policy shock is from the country of the parent bank of the Hong Kong branch, $\Delta MP_{t-k}^{ctry}$ and $\Delta QE_{t-k}^{ctry}$ have been replaced by $\Delta MP_{t-k}^{parent}$ and $\Delta QE_{t-k}^{parent}$ (i.e. monetary policy measures in the home country) respectively. Similarly, characteristics of parent banks (those discussed in section 2) have replaced the financial linkages as the $Channel_{b,t-K-1}^{ctry}$. Importantly, parent country-time fixed effects has been adopted instead of pure time fixed effects in order to capture changes in loan demand conditions and other macro conditions that are common across parent banks in the parent country. Since the regression model includes $f_b$ and $f_{j,t}$, the estimated $\sum_{k=0}^{K} \alpha_{1,k}$ reflects the importance of cross-sectional differences in balance sheet characteristics on the response of $\Delta Y_{b,j,t}$ to $\Delta MP_{t-k}^{parent}$, while $\sum_{k=0}^{K} \alpha_{2,k}$ reflects the importance of balance sheet factors on the response of $\Delta Y_{b,j,t}$ to $\Delta QE_{t-k}^{parent}$.

Our second specification relies on a more comprehensive measure of changes in the monetary policy stance, namely the shadow rates discussed in section 3. The exact specification for the UK takes the following form:

$$\Delta Y_{b,t} = \alpha_0 + \sum_{ctry} \left( \sum_{k=0}^{K} \left( \alpha_{1,k}^{ctry} \cdot \Delta MP_{t-k}^{ctry} \cdot Channel_{b,t-K-1}^{ctry} \right) + \alpha_3^{ctry} Channel_{b,t-K-1}^{ctry} \right) + \alpha_4 X_{b,t-1} + f_b + f_t$$
$$+ \epsilon_{b,t} \qquad\qquad (2-a)$$

where $\Delta MP_{t-k}^{ctry}$ now captures changes in shadow rates and $\Delta Y_{b,t}$ refers only to log changes in lending to the private non-bank sector (households and PNFCs).

Applying the same modification made for the first specification, the second specification for Hong Kong becomes the following;

$$\Delta Y_{b,j,t} = \alpha_0 + \sum_{k=0}^{K} \left( \alpha_{1,k} \Delta MP_{t-k}^{parent} . Channel_{b,t-K-1} \right) + \alpha_2 Channel_{b,t-K-1} + \alpha_3 X_{b,j,t-1} + f_{j,t} + f_b + \epsilon_{b,t}$$

$$(2-b)$$

where $\Delta MP_{t-k}^{parent}$ now captures changes in shadow rates in the country of parent banks.

# 5. Estimation results

This section presents our empirical findings. We first focus on the results for the bank funding channel. We present the estimation results of the baseline model in Tables 2-UK and 2-HK. The estimation results for the existence of a portfolio rebalancing channel, are presented in Tables 3-UK and 3-HK. Note that the signs on MP and QE are predicted to be in the opposite direction as an increase in QE is like a loosening.

## 5.1    Evidence for funding-related frictions

For the UK, columns (1), (3), (5) and (7) in Table 2-UK show the effect of monetary policy on household and PNFC lending and we find no evidence of a bank funding channel for the 'real' sector (i.e. lending to households and PNFCs): banks that are more heavily exposed to countries which tighten monetary policy do not change their lending in a significantly different way relative to those which are not.  This is in line with Butt et al (2014), who also find no evidence of a bank lending channel domestically for the UK from UK QE. As mentioned above, this might be expected given that banks in the UK have access to multiple sources of funding and may be able to replace it easily. However, we do find some tentative evidence for a that banks face funding frictions which cause them to cut lending when we examine *interbank* loans. For instance, columns (6) and (8) show that banks that are more dependent on net interbank funding from Japan tend to reduce their interbank lending in the UK by more than other banks, once Japan tightens monetary policy.  However, because we only find evidence for Japanese monetary policy for which there are only few changes in Japanese conventional monetary policy and it is driven by a few banks with large exposures to Japan, it is not economically important and we do not emphasise this result.

 For Hong Kong, we find greater evidence of bank funding channel on lending to the real economy [Table 2A-HK].  In particular, we find that FBHKs whose parents have a higher deposit-to-asset ratio (i.e. less reliant on wholesale funding) tend to attain higher loan growth than their counterparts when home-country monetary policy tightens [column 5]. This is consistent with the hypothesis implicit in the bank funding channel that changes in the short-term rate are less likely to produce a binding funding constraint to the parent bank if it is less dependent on wholesale funding.

We also find that parent banks' reliance on wholesale funding plays a role in determining the extent of inward transmission of home-country unconventional monetary policy. Specifically, in response to a one-standard-deviation increase in QE – which lowers yields and bank funding costs - (i.e. increase in the ratio of central bank assets to GDP by 1.85 ppt[13], lending by a FBHK with a parent bank with higher dependence on wholesale funding (assuming its deposit-to-asset ratio is one standard

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[13] Equivalent to a one-standard-deviation change in parent-country QE (see Table 1-HK).

deviation below the mean) would be 3.7% higher compared to an average FBHK.[14] This finding is in line with Temesvary et. al (2015), who finds that US banks with lower deposit-to-asset ratios increase their bilateral cross-border flows by more than others in response to an expansion of the Fed's purchases of Treasury securities. This may be because the implementation of QE in the home country would induce more liquidity in the wholesale market – an effect not present with conventional monetary policy.

The stronger evidence for a bank funding channel in HK than in the UK is perhaps not surprising when we consider that FBHKs are more reliant on funding from their parent than UK banks and so maybe less able to substitute funding following a monetary policy shock. That said, the insignificant coefficients for the interaction term on FBHK's *NetDueTo* suggest that FBHKs with a higher reliance on parent funding may not necessarily result in a lower loan growth in response to tighter monetary conditions in the home country. Rather, as shown above, parent funding conditions appear to be more important in affecting the loan growth of their Hong Kong branch when home-country monetary policy tightens. For example, a FBHK that is highly dependent on parent funding may not necessarily face a negative funding shock in response to a tightening of monetary policy in the home country if its parent bank is able to ease funding constraint by easily tapping alternative external funding sources.

Table 2B-HK shows the results of the same estimation but examining interbank lending. We do not find strong evidence of conventional monetary policy spillovers for FBHKs' interbank lending, as the estimated coefficients on the interaction term between the change in the policy rate and the channel variables are not statistically significant. Nevertheless, the parent bank's liquid asset ratio seems to matter in determining the inward transmission of changes of QE from the home country of FBHKs (Table 2B-HK, columns (3) and (5)). Specifically, when the parent country expands QE, a more liquidity-constrained parent bank (i.e. lower liquid asset ratios) would likely benefit more from the loosening of liquidity condition arising from QE and thus its foreign branches would tend to increase interbank lending by a greater extent relative to its counterparts. This result provides tentative evidence that the bank funding channel may be at work during periods of unconventional monetary policy.

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[14] The estimate is calculated using the coefficient on the interaction term on $\sum QE^{parent}*CoreDeposits$ (i.e.-0.112 in column 5 of Table 2A-HK). We multiply it with one standard deviation of CoreDeposits (18% in Table 1-HK) and change of QE (1.85ppts) respectively (= -0.112*-18*1.85=3.7%).

**5.2      Evidence for asset-related frictions and the portfolio rebalancing channel**

In this section, we only focus on lending to the real economy given that the portfolio rebalancing channel in theory works principally via real economy lending. As a result, interbank lending is omitted from both the tables.

For the UK, we find evidence that the portfolio rebalancing channel is in operation for lending to the real economy.  We find in Table 3-UK columns (7) and (8), that, when the FOMC or ECB tightens monetary policy, banks with a higher share of their claims in the US or the euro area respectively experience a larger increase in their bank lending growth to UK real sectors.  This result holds in specifications using QE plus changes in short rates as well as changes in shadow rates only.  It is consistent with the portfolio rebalancing channel in that banks rebalance their portfolio away from the country which tightens monetary policy and instead lends abroad, in this case to the UK. The results are quantitatively important: they imply that a bank with 10pp more exposures to the US than another bank displays a 3% higher lending growth to UK real sectors over a 1 year period following an increase in US short rates of 1pp.

We do not find evidence to support the existence of a portfolio rebalancing channel to the UK in case of conventional monetary policy tightening in Japan. This might be explained by the fact that UK banks have on average (and, importantly, compared to the US and euro area) small exposures to the Japanese non-bank sector (Table 1b-UK).

For Hong Kong there is also evidence of asset-side frictions that are suggestive of a portfolio rebalancing channel for foreign monetary policy. We find that, in response to a tighter home-country monetary policy, a parent bank with a higher loan-to-asset ratio (columns (1) and (3) of Table 3-HK) is associated with higher loan growth to the Hong Kong real economy. This is consistent with the portfolio rebalancing channel hypothesis in that parent banks with a bigger loan portfolio would rebalance by more and increase their lending abroad, in this case via their Hong Kong branch.  We also find the expected negative sign for the interaction between loan-to-asset ratio and parent-country QE, although it is statistically insignificant.

Columns (4) to (6) of Table 3-HK present the estimation results using changes in the shadow rate as the monetary policy instrument (i.e. Eq.2-b). The results are in line with columns (1) to (3) as the

estimated coefficients are statistically significant and with the expected signs (i.e. positive coefficients on the loan-to-asset ratio only in column (6)).

In addition, we find that FBHKs tend to attain a lower loan growth than others if their parent banks have a higher share of impaired loans when monetary policy tightens in the home country (columns (5) and (6) of Table 3-HK). This finding is line with our conjecture that parent bank may be less able to maintain the overall portfolio of risk by simply rebalancing its loan portfolio elsewhere, but rather it may need to replace its loan assets with other safer assets, if the bank has already been constrained by a high impaired loan ratio.

Taken together these results are supportive of the existence of a portfolio rebalancing channel of monetary policy in both countries. In particular, in response to a monetary policy tightening, banks which have more lending business, either as a share of their total assets or via more exposure to that country, tend to increase their lending abroad by more -  in this case to Hong Kong and the UK- to maintain their overall portfolio of risk unchanged. Yet, there is some evidence in the case of Hong Kong to suggest that the effect of such rebalancing strategy for maintaining risks may be limited if parent banks are subject to high impaired loan ratios.

### 5.3    Currency dimension

An important question is whether the transmission channels differ depending on currency denomination – in other words, whether say US monetary policy affects USD lending in the UK to a different extent than lending in sterling.  In the UK, a large part of domestic lending is denominated in sterling, but euro and US dollars are also widely used (see Table 1a-UK). For the UK, we find that results for the bank funding channel are driven by foreign-currency denominated lending (Table 4-UK). Importantly, a tightening in US monetary policy leads to a larger negative change in USD-denominated financial lending by banks dependent on the US for net funding.

That the transmission of US monetary policy via USD is stronger than for transmission of EA monetary policy via euro-denominated lending may not be surprising when we examine more carefully the nature of financial linkages. While Table 1b shows that most of the funding from the US is denominated in USD, only around half of funding from the EA is denominated in euros on average. It is however likely that transmission is stronger via the currency of where the shock occurs (see Takats

and Temesvary, 2017), so that the high share of USD in funding from the euro area may make it harder to find a euro bank funding channel of ECB monetary policy.

Turning to the currency denomination of asset-side frictions, we find that results seem to be driven by sterling-denominated lending (Table 5-UK).This finding appears consistent with a recent paper by Brauning and Ivashina (2017).

In Hong Kong, we repeat our estimation exercise on domestic lending denominated in USD and HKD respectively, the two largest currencies (Table 4-HK and 5-HK).[15] We find that the sign and magnitude of coefficients on USD and HKD lending is similar. which may reflect the longstanding Linked Exchange Rate System. Probably reflecting the same reason, we also find evidence to support an existence of the portfolio rebalancing channel in both USD and HKD lending of FBHKs (Table 5-HK).

### 5.4    Robustness

We conduct a robustness check to address the potential concern that changes in monetary policy stance may be correlated with economic conditions in the home country. We do this by repeating the empirical analysis using changes in Taylor-rule residuals which are orthogonalised from home-country GDP growth and inflation which we derive from the residual of a regression of home country monetary policy on real GDP growth and inflation in that country. For the UK, we find in Table A2-UK columns 1-4 that our main results for funding-related frictions remain robust with regard to the (negative) effect of a tightening in US monetary policy on USD- denominated financial lending in the UK. The same holds for asset-related frictions (columns 5-8): we continue to find evidence supportive of a portfolio channel associated with US and EA monetary policy for sterling-denominated lending (column 6) and now also somewhat stronger evidence for a portfolio channel of QE (especially EA and Japanese QE).

 For Hong Kong, we perform the same exercise and find that the evidence for the bank funding channel is somewhat weakened as the coefficients on interaction term between changes of home-country Taylor-residual with core deposit ratio turns statistically insignificant despite with the expected sign (table A2-HK). However, we continue to find evidence of funding channel associated with home-country QE. Also, the results for the portfolio channel remain qualitatively similar to our main results in

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[15] Data on other currency disaggregation in lending are not available.

the previous section (Table A3-HK). Taken these together, the robustness analyses suggest the potential correlations among monetary policy stance and domestic conditions do not materially impact our main results in the previous section.

# 6. Conclusion

We find evidence of the importance of financial interlinkages for monetary policy transmission in two advanced economy financial centres: the UK and Hong Kong. Financial interlinkages matter on both sides of the balance sheet: both in terms of how banks fund themselves but also on the lending side.

We find evidence in both the UK and Hong Kong of frictions that suggest the operation of a portfolio rebalancing channel – which arises due to demand for lending falling or lending becoming riskier in the country where policy is tightened.  For funding, the effect is stronger in Hong Kong, which may reflect that these banks are more heavily dependent on their parent. But when we examine the currency dimension of funding, this is more important in the UK, probably because, unlike sterling, the Hong Kong dollar is linked to the US dollar.

While these effects may 'net off' on average, the spillover effects are heterogeneous amongst banks. The magnitude and direction of the spillover depends both on balance sheet factors such as loan-to-assets and deposit-to-assets ratios but also direct financial interlinkages with the country that tightens monetary policy. An important implication is that host-country supervisors should take into account the effect arising from parent banks' balance sheet structures and the currency dimension of lending when assessing the international spillover of monetary policy through foreign banks.

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# Appendix:

**Chart 1-HK: Liability structure of banks in Hong Kong by different bank type (as of end-2015)**

% of total liabilities
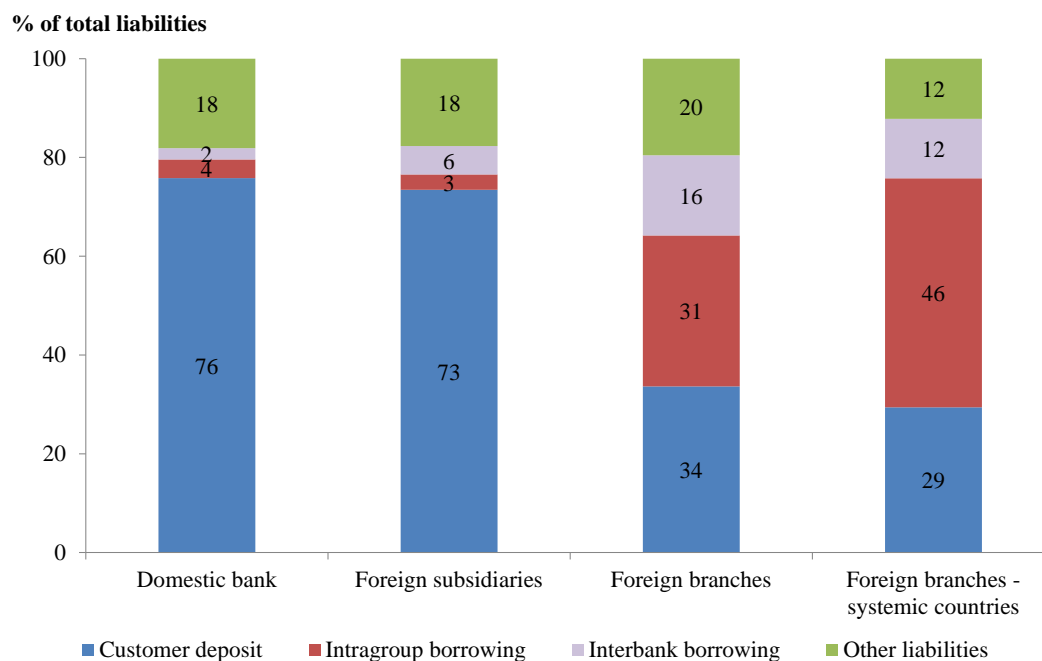


Note: Systemic countries refer to the US, euro area, Japan and the UK.

Source: HKMA

**Chart 1-UK: Cross-border liabilities of banks in the UK by bank type**
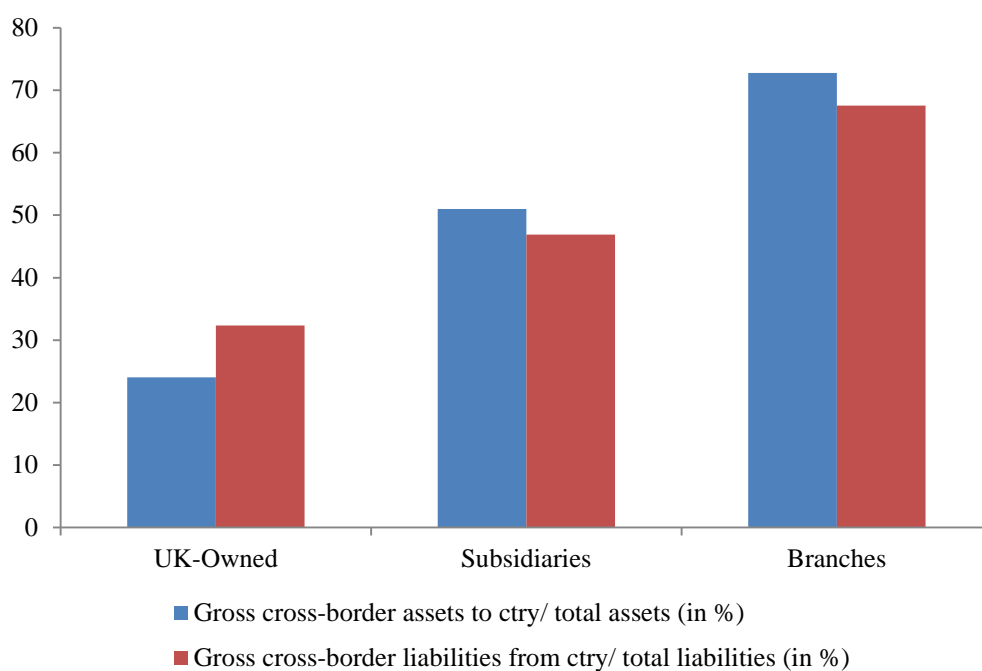
**Chart 2: Graphical illustration for empirical models**



Foreign economy

Domestic economy

Changes in monetary policy in respective economy

Japan economy

Euro Area economy

US economy

Cross border liabilities

Cross border claims

Banks in UK
(domestic-owned, foreign bank subsidiaries and branches)

Lending

UK economy, interbank
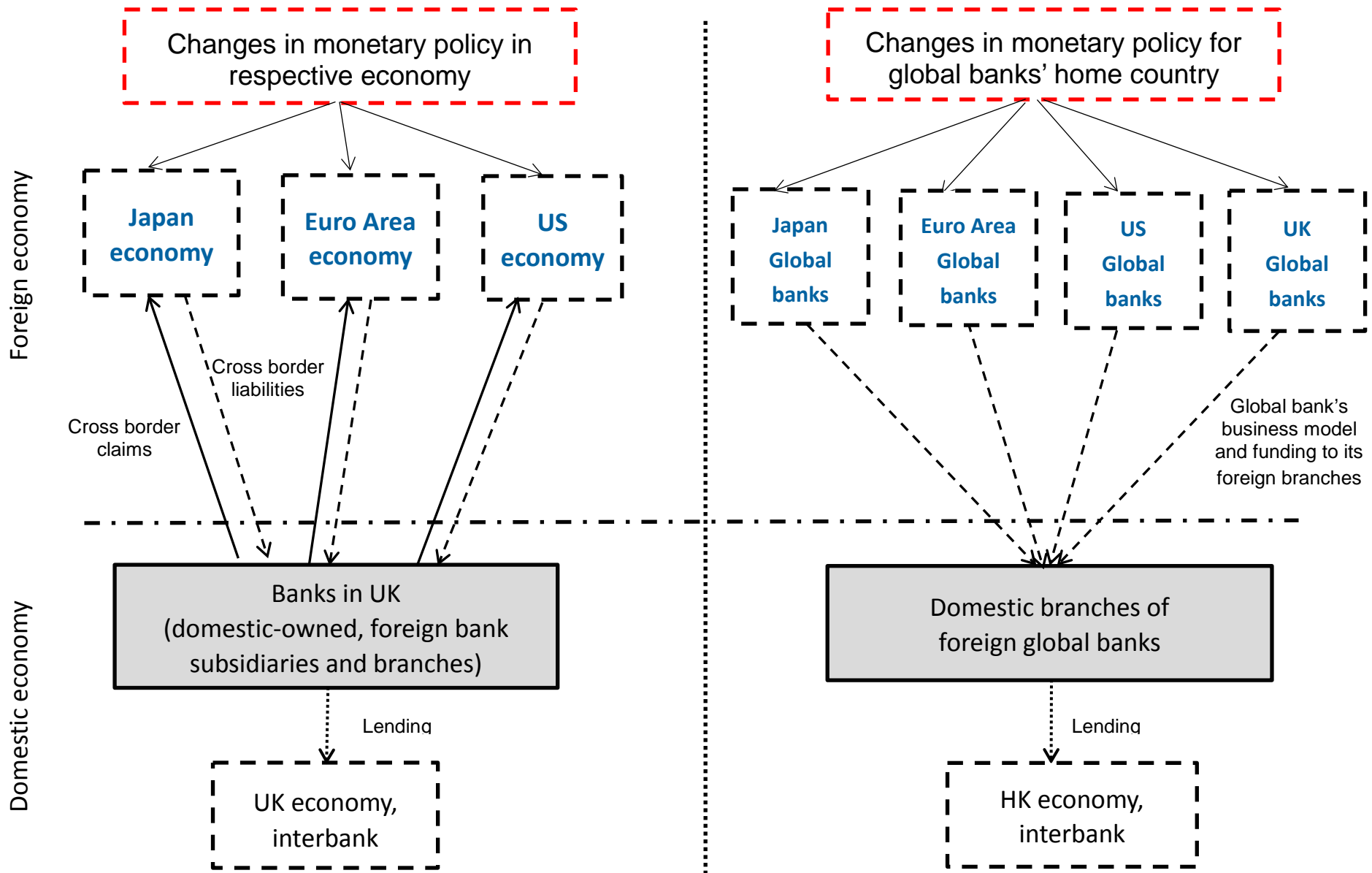
**UK: Inward transmission through UK banks' financial linkage with systemic countries**

Changes in monetary policy for global banks' home country

Japan Global banks

Euro Area Global banks

US Global banks

UK Global banks

Global bank's business model and funding to its foreign branches

Domestic branches of foreign global banks

Lending

HK economy, interbank

**HK: Inward transmission through domestic branches of foreign global banks**

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## Table 1-HK: Summary statistics of the estimation sample (Inward transmission via FBHKs)

| Variable | Mean | SD | P25 | P75 | Number of banks |
|---|---|---|---|---|---|
| **USD bn, as of 2015Q4** | | | | | |
| Total asset and number of the resident banking sector | 15.82 | 42.40 | 0.94 | 13.92 | 155 |
| Total asset and number of foreign banks | 12.13 | 25.82 | 0.95 | 12.28 | 148 |
| Total asset and number of foreign subsidiaries | 50.40 | 61.62 | 16.52 | 58.91 | 14 |
| Total asset and number of foreign branches | 8.13 | 13.97 | 0.62 | 7.80 | 134 |
| Total asset and number of foreign branches from systemic countries | 11.96 | 16.74 | 1.13 | 13.93 | 35 |
| **Estimation sample  (FBHKs from systemic countries)** | | | | | |
| **USD bn, as of 2015Q4** | | | | | |
| Domestic loans | 2.06 | 3.89 | 0.04 | 1.66 | 35 |
| HKD | 0.94 | 2.17 | 0.01 | 0.43 | 35 |
| USD | 0.94 | 1.57 | 0.01 | 1.16 | 35 |
| Domestic interbank loans | 0.28 | 0.69 | 0.00 | 0.17 | 35 |
| HKD | 0.05 | 0.16 | 0.00 | 0.01 | 35 |
| USD | 0.10 | 0.32 | 0.00 | 0.05 | 35 |
| **Dependent Variables** | | | | | |
| Δ domestic loans (%) | 0.78 | 19.24 | -8.82 | 9.74 | |
| Δ domestic loans (USD) (%) | 0.66 | 29.99 | -12.76 | 14.47 | |
| Δ domestic loans (HKD) (%) | -0.56 | 23.18 | -9.52 | 9.40 | |
| Δ Domestic interbank loans (%) | 0.74 | 45.24 | -30.35 | 32.94 | |
| **Monetary policy Variables** | | | | | |
| ΔShadow Rate[Home] (%) | -0.06 | 0.32 | -0.07 | 0.00 | |
| ΔPolicy Rate[Home] (%) | -0.11 | 0.59 | -0.39 | 0.22 | |
| ΔQE[Home] (%) | 0.41 | 1.85 | -0.25 | 1.12 | |
| **Transmission Channel Statistics (ratios in %)** | | | | | |
| *Bank funding channel* | | | | | |
| Net IG (to branch) funding ratio | -0.51 | 38.15 | -26.88 | 24.09 | |
| Deposits / Total Assets | 52.96 | 18.37 | 38.85 | 66.68 | |
| Liquid asset ratio | 4.07 | 4.65 | 1.00 | 5.22 | |
| *Portfolio rebalancing channel* | | | | | |
| Tier 1 ratio | 9.97 | 2.81 | 7.60 | 12.33 | |
| Securities / Total Assets | 39.20 | 13.51 | 28.18 | 49.69 | |
| Loans / Total Assets | 44.66 | 13.49 | 35.58 | 54.06 | |
| Impaired loans / Total loans | 3.79 | 3.54 | 1.71 | 4.93 | |

## Table 1a -UK: Summary Statistics

| Variable | Mean | SD | P25 | P75 | Obs. |
|---|---|---|---|---|---|
| **Banking System Characteristics (£bn, as of 2015 Q4)** | | | | | |
| Total assets and number of the resident banking sector | 24.13 | 84.89 | 0.51 | 9.06 | 253 |
| Total assets and number of foreign banks | 15.30 | 43.40 | 0.54 | 9.50 | 196 |
| Total assets and number of foreign subsidiaries | 9.93 | 30.38 | 0.39 | 5.65 | 76 |
| Total assets and number of foreign branches | 18.70 | 49.74 | 0.64 | 13.03 | 120 |
| Domestic household and corporate lending | 15.53 | 45.38 | 0.58 | 4.64 | 86 |
| *Sterling* | 15.10 | 44.90 | 0.04 | 26.20 | 86 |
| *Euros* | 0.17 | 0.46 | 0.00 | 0.38 | 86 |
| *Other (Mostly USD)* | 0.28 | 0.68 | 0.00 | 0.56 | 86 |
| Domestic interbank loans | 6.10 | 34.98 | 0.02 | 0.56 | 253 |
| *Sterling* | 4.28 | 30.40 | 0.00 | 1.76 | 253 |
| *Euros* | 0.81 | 3.16 | 0.00 | 0.81 | 253 |
| *Other (Mostly USD)* | 1.01 | 4.02 | 0.00 | 1.55 | 253 |
| **Dependent variables (in % )** | | | | | |
| Domestic household and corporate sector lending grow | 0.38 | 19.48 | -5.49 | 6.58 | 12061 |
| Domestic financial sector lending growth | 0.13 | 33.38 | -14.99 | 15.31 | 21850 |
| **Bank balance sheet characteristics (in % )** | | | | | |
| Log total assets | 14.04 | 2.40 | 12.49 | 15.68 | 25000 |
| Tier1 ratio | 16.31 | 21.70 | 2.67 | 19.25 | 23452 |
| Liquid assets ratio | 46.34 | 30.16 | 20.07 | 70.78 | 25214 |
| Core deposits ratio | 26.04 | 33.49 | 1.60 | 41.24 | 24814 |
| Commitments ratio | 39.48 | 29.22 | 14.41 | 61.65 | 23586 |
| **Monetary Policy Changes (in pp)** | | *Min* | *Max* | | |
| Changes in US shadow rates (SSR) | -0.09 | 0.66 | *-0.32* | *0.32* | 22691 |
| Changes in EA SSR | -0.08 | 0.50 | *-0.36* | *0.27* | 22691 |
| Changes in Japanese SSR | -0.05 | 0.42 | *-0.32* | *0.14* | 22691 |
| Changes in UK SSR | -0.08 | 0.80 | -0.33 | 0.21 | 22691 |
| Changes in US short rates | -0.07 | 0.46 | -0.03 | 0.04 | 22691 |
| Changes in EA short rates | -0.04 | 0.33 | -0.17 | 0.00 | 22691 |
| Changes in Japanese short rates | 0.00 | 0.07 | -0.01 | 0.01 | 22691 |
| Changes in UK short rates | -0.08 | 0.40 | -0.08 | 0.00 | 22691 |
| Changes in US QE | 0.27 | 1.02 | -0.12 | 0.28 | 22691 |
| Changes in EA QE | 0.21 | 1.49 | -0.27 | 0.67 | 22691 |
| Changes in Japanese QE | 0.78 | 2.45 | -0.86 | 2.54 | 22691 |
| Changes in UK QE | 0.24 | 1.37 | -0.22 | 0.33 | 22424 |

## Table 1b -UK: Summary Statistics on Financial Linkages

| Variable | | Mean | SD | P10 | P90 | Obs. |
|---|---|---|---|---|---|---|
| **Bilateral and currency links (in % )** | | | | | | |
| Gross cross-border assets to ctry non-banks/ total assets | | | | | | |
| USA | | 3.211 | 7.66 | 0 | 8.17 | 15008 |
| | USD | 2.531 | 6.52 | 0 | 6.395 | 14961 |
| | Euro | 0.274 | 0.95 | 0 | 0.738 | 15058 |
| | Yen | 0.093 | 1.426 | 0 | 0.043 | 15111 |
| EA | | 7.123 | 10.536 | 0.002 | 18.887 | 15957 |
| | USD | 1.428 | 3.028 | 0 | 3.649 | 16022 |
| | Euro | 4.817 | 8.727 | 0 | 13.699 | 15919 |
| | Yen | 0.1 | 0.519 | 0 | 0.132 | 16017 |
| Japan | | 0.615 | 2.57 | 0 | 1.364 | 10420 |
| | USD | 0.155 | 1.236 | 0 | 0.143 | 10423 |
| | Euro | 0.031 | 0.239 | 0 | 0.003 | 10481 |
| | Yen | 0.333 | 1.582 | 0 | 0.61 | 10399 |
| Gross cross-border liabilities from ctry/ total liabilities | | | | | | |
| USA | | 4.736 | 9.732 | 0.023 | 12.569 | 13837 |
| | USD | 3.129 | 6.926 | 0.001 | 8.447 | 13832 |
| | Euro | 0.542 | 2.89 | 0 | 0.908 | 13827 |
| | Yen | 0.116 | 0.957 | 0 | 0.064 | 13823 |
| EA | | 19.49 | 25.902 | 0.177 | 60.778 | 15549 |
| | USD | 4.064 | 7.718 | 0 | 11.397 | 15615 |
| | Euro | 9.22 | 16.476 | 0 | 30.875 | 15593 |
| | Yen | 0.233 | 1.137 | 0 | 0.465 | 15619 |
| Japan | | 4.32 | 13.507 | 0.001 | 7.187 | 7209 |
| | USD | 1.134 | 4.402 | 0 | 1.961 | 7216 |
| | Euro | 0.405 | 2.729 | 0 | 0.116 | 7212 |
| | Yen | 2.606 | 9.607 | 0 | 3.21 | 7209 |
| Net cross-border funding from ctry all sectors / total assets | | | | | | |
| USA | | 0.016 | 10.339 | -6.379 | 5.886 | 13256 |
| | USD | -0.763 | 8.436 | -6.333 | 4.191 | 13256 |
| | Euro | 0.237 | 2.859 | -0.361 | 0.453 | 13256 |
| | Yen | 0.036 | 1.011 | -0.015 | 0.007 | 13256 |
| EA | | 0.43 | 24.87 | -20.094 | 23.749 | 14802 |
| | USD | -0.841 | 9.524 | -7.92 | 5.258 | 14807 |
| | Euro | -0.508 | 14.133 | -9.135 | 8.893 | 14805 |
| | Yen | -0.064 | 1.218 | -0.298 | 0.202 | 14807 |
| Japan | | 0.77 | 9.75 | -3.115 | 2.556 | 6733 |
| | USD | -0.3 | 6.112 | -1.515 | 0.84 | 6734 |
| | Euro | -0.417 | 5.009 | -0.142 | 0.024 | 6734 |
| | Yen | 1.54 | 8.752 | -1.08 | 1.516 | 6732 |

## Table 2A-HK: Estimation results for testing bank funding channel

The dependent variable is log changes in loans to non-bank customers in Hong Kong. The data are quarterly from 2000Q1 to 2015Q4 for a panel of foreign-owned resident branches. All specifications include fixed effects as specified in the lower part of the table. Figures in the parentheses are the p-values. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| MP measures | $\Delta$Short Rate + $\Delta$QE | | | | |
| Dependent variable | $\Delta$ Domestic loans | $\Delta$ Domestic loans | $\Delta$ Domestic loans | $\Delta$ Domestic loans | $\Delta$ Domestic loans |
| $\Sigma\Delta MP^{Parent}$_t to t-3 *NetDueTo_t-4 | -0.0122 | | | | 0.0245 |
| | (0.916) | | | | (0.822) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 * Coredeposits_t-4 | | 0.407 | | | 0.646* |
| | | (0.205) | | | (0.0621) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 * LiquidAssetRatio_t-4 | | | 0.254 | | -0.616 |
| | | | (0.83) | | (0.593) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 * Tier1Ratio_t-4 | | | | -2.77 | -2.887 |
| | | | | (0.515) | (0.504) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 *NetDueTo_t-4 | -0.0127 | | | | -0.00902 |
| | (0.563) | | | | (0.667) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 * Coredeposits_t-4 | | -0.127** | | | -0.112** |
| | | (0.0182) | | | (0.0314) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 * LiquidAssetRatio_t-4 | | | -0.00466 | | -0.036 |
| | | | (0.969) | | (0.737) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 * Tier1Ratio_t-4 | | | | -0.634 | -0.25 |
| | | | | (0.236) | (0.598) |
| NetDueTo_t-4 | 0.004 | | | | -0.001 |
| | (0.903) | | | | (0.987) |
| Coredeposits_t-4 | | 0.044 | | | 0.044 |
| | | (0.785) | | | (0.796) |
| LiquidAssetRatio_t-4 | | | 0.137 | | 0.159 |
| | | | (0.629) | | (0.555) |
| Tier1Ratio_t-4 | | | | -0.024 | -0.351 |
| | | | | (0.983) | (0.767) |
| LogRealAssets_t-1 | 5.383 | 5.542 | 6.361 | 4.818 | 3.199 |
| | (0.421) | (0.366) | (0.291) | (0.462) | (0.670) |
| Tier1Ratio_t-1 | 1.219 | 1.364* | 1.552* | | |
| | (0.130) | (0.088) | (0.067) | | |
| LiquidAssetRatio_t-1 | 0.004 | 0.018 | | 0.035 | |
| | (0.985) | (0.932) | | (0.877) | |
| CoreDeposits_t-1 | 0.058 | | 0.019 | 0.086 | |
| | (0.742) | | (0.917) | (0.597) | |
| LoanAssets_t-1 | 0.138 | 0.178 | 0.167 | 0.057 | 0.107 |
| | (0.580) | (0.411) | (0.458) | (0.782) | (0.682) |
| ImpairedLoan_t-1 | -0.090 | 0.040 | 0.059 | 0.007 | -0.341 |
| | (0.854) | (0.932) | (0.905) | (0.989) | (0.551) |
| NetDueTo_t-1 | | -0.041 | -0.043 | -0.036 | |
| | | (0.273) | (0.220) | (0.313) | |
| Observations | 1,568 | 1,546 | 1,543 | 1,506 | 1,496 |
| R-squared | 0.405 | 0.407 | 0.403 | 0.422 | 0.434 |
| Number of bank | 35 | 35 | 35 | 35 | 35 |
| Cluster | bank | bank | bank | bank | bank |
| ParentCountry-Time effect | Y | Y | Y | Y | Y |
| Bank fixed effect | Y | Y | Y | Y | Y |
| adjusted R2 | 0.0646 | 0.0723 | 0.0670 | 0.0875 | 0.0828 |

## Table 2B-HK: lending to banks in Hong Kong (bank funding channel)

The dependent variable is log changes in lending to banks in Hong Kong. The data are quarterly from 2000Q1 to 2015Q4 for a panel of foreign-owned resident branches. All specifications include fixed effects as specified in the lower part of the table. Figures in the parentheses are the p-values. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| MP measures | $\Delta$Short Rate + $\Delta$QE | | | | |
| Dependent variable | $\Delta$ Lending to banks | $\Delta$ Lending to banks | $\Delta$ Lending to banks | $\Delta$ Lending to banks | $\Delta$ Lending to banks |
| $\Sigma\Delta MP^{Parent}$_t to t-3 *NetDueTo_t-4 | 0.0687 | | | | 0.0123 |
| | (0.692) | | | | (0.96) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 * Coredeposits_t-4 | | -0.553 | | | -0.674 |
| | | (0.188) | | | (0.274) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 * LiquidAssetRatio_t-4 | | | -1.002 | | 0.564 |
| | | | (0.515) | | (0.801) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 * Tier1Ratio_t-4 | | | | 3.32 | 3.259 |
| | | | | (0.584) | (0.674) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 *NetDueTo_t-4 | 0.0373 | | | | 0.0567 |
| | (0.538) | | | | (0.377) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 * Coredeposits_t-4 | | -0.129 | | | -0.246 |
| | | (0.429) | | | (0.171) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 * LiquidAssetRatio_t-4 | | | -0.705** | | -0.864** |
| | | | (0.0243) | | (0.0183) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 * Tier1Ratio_t-4 | | | | -0.357 | 0.0789 |
| | | | | (0.752) | (0.956) |
| NetDueTo_t-4 | -0.033 | | | | -0.019 |
| | (0.666) | | | | (0.796) |
| Coredeposits_t-4 | | 0.087 | | | 0.148 |
| | | (0.785) | | | (0.651) |
| LiquidAssetRatio_t-4 | | | 1.045 | | 0.973 |
| | | | (0.231) | | (0.255) |
| Tier1Ratio_t-4 | | | | 0.260 | -0.541 |
| | | | | (0.922) | (0.838) |
| LogRealAssets_t-1 | 6.571 | 5.830 | 4.398 | 7.182 | 4.985 |
| | (0.537) | (0.576) | (0.666) | (0.554) | (0.626) |
| Tier1Ratio_t-1 | 1.327 | 0.852 | 1.090 | | |
| | (0.719) | (0.819) | (0.760) | | |
| LiquidAssetRatio_t-1 | 0.864 | 0.808 | | 0.812 | |
| | (0.221) | (0.229) | | (0.214) | |
| CoreDeposits_t-1 | 0.091 | | 0.092 | 0.112 | |
| | (0.814) | | (0.821) | (0.792) | |
| LoanAssets_t-1 | 0.336 | 0.316 | 0.216 | 0.345 | 0.148 |
| | (0.425) | (0.423) | (0.626) | (0.335) | (0.721) |
| ImpairedLoan_t-1 | 0.858 | 1.036 | 1.077 | 1.349 | 0.951 |
| | (0.426) | (0.368) | (0.311) | (0.255) | (0.409) |
| NetDueTo_t-1 | | -0.062 | -0.035 | -0.047 | |
| | | (0.427) | (0.641) | (0.559) | |
| Observations | 1,263 | 1,244 | 1,241 | 1,218 | 1,208 |
| R-squared | 0.457 | 0.448 | 0.447 | 0.454 | 0.474 |
| Number of bank | 35 | 35 | 35 | 35 | 35 |
| Cluster | bank | bank | bank | bank | bank |
| ParentCountry-Time effect | Y | Y | Y | Y | Y |
| Bank fixed effect | Y | Y | Y | Y | Y |
| adjusted R2 | 0.0633 | 0.0524 | 0.0524 | 0.0549 | 0.0561 |

## Table 2 - UK: Financial linkages and the bank funding channel

| Channel: Net Cross-border Liabilities from ctry / Total Assets | LHS: | (1) HH and PNFC lending | (2) Interbank loans | (3) HH and PNFC lending | (4) Interbank loans | (5) HH and PNFC lending | (6) Interbank loans | (7) HH and PNFC lending | (8) Interbank loans |
|---|---|---|---|---|---|---|---|---|---|
| ΣΔMP US_t to t-3(*Channel_t-4) | | 0.0286 | 0.0579 | | | | | 0.0251 | 0.0547 |
| | | 0.633 | 0.410 | | | | | 0.673 | 0.432 |
| ΣΔMP EA_t to t-3(*Channel_t-4) | | | | -0.0185 | 0.00235 | | | -0.0134 | 0.00303 |
| | | | | 0.679 | 0.975 | | | 0.767 | 0.968 |
| ΣΔMP JP_t to t-3(*Channel_t-4) | | | | | | 0.768 | -2.858** | 0.830 | -2.765** |
| | | | | | | 0.186 | 0.0401 | 0.164 | 0.0460 |
| ΣΔQE US_t to t-3(*Channel_t-4) | | -0.0117 | 0.0307 | | | | | -0.0159 | 0.0299 |
| | | 0.851 | 0.669 | | | | | 0.802 | 0.679 |
| ΣΔQE EA_t to t-3(*Channel_t-4) | | | | -0.00624 | 0.00225 | | | -0.00722 | 0.00180 |
| | | | | 0.562 | 0.908 | | | 0.504 | 0.927 |
| ΣΔQE JP_t to t-3(*Channel_t-4) | | | | | | -0.00767 | -0.0413 | -0.00320 | -0.0386 |
| | | | | | | 0.825 | 0.338 | 0.926 | 0.363 |
| Log total assets_t-1 | | -0.0865 | -1.630** | -0.346 | -2.004*** | -0.0701 | -1.619** | -0.300 | -2.015*** |
| | | 0.900 | 0.0169 | 0.625 | 0.00519 | 0.919 | 0.0177 | 0.672 | 0.00479 |
| Tier1 Ratio_t-1 | | -0.0412 | 0.0978* | -0.0594 | 0.0879 | -0.0495 | 0.104** | -0.0600 | 0.0893* |
| | | 0.407 | 0.0623 | 0.232 | 0.101 | 0.328 | 0.0474 | 0.226 | 0.0952 |
| Liquid asset ratio_t-1 | | 0.0162 | -0.176*** | 0.00226 | -0.189*** | 0.0129 | -0.176*** | 0.00244 | -0.189*** |
| | | 0.387 | 1.39e-09 | 0.910 | 2.37e-10 | 0.490 | 1.50e-09 | 0.904 | 2.90e-10 |
| Core deposits ratio_t-1 | | 0.0239 | 0.0552 | 0.0126 | 0.0356 | 0.0269 | 0.0549 | 0.0122 | 0.0352 |
| | | 0.506 | 0.224 | 0.721 | 0.437 | 0.454 | 0.224 | 0.729 | 0.445 |
| Channel US_t-4 | | 0.0400 | -0.0639 | | | | | 0.0247 | -0.0756 |
| | | 0.474 | 0.305 | | | | | 0.666 | 0.224 |
| Channel EA_t-4 | | | | -0.0404* | -0.0517** | | | -0.0398 | -0.0537** |
| | | | | 0.0984 | 0.0345 | | | 0.110 | 0.0270 |
| Channel JP_t-4 | | | | | | -0.0849* | 0.0877 | -0.0900** | 0.0727 |
| | | | | | | 0.0516 | 0.139 | 0.0447 | 0.213 |
| Sum of (Impact) ΔMP_t(*Channel) Coefficients | | | | | | | | -0.525 | -0.537 |
| | | | | | | | | 0.127 | 0.582 |
| Sum of Coefficients on all ΔMP(*Channel) | | | | | | | | 0.842 | -2.708** |
| | | | | | | | | 0.167 | 0.0534 |
| Sum of (Impact) ΔQE_t*Channel Coefficients | | | | | | | | -0.00961 | -0.0196 |
| | | | | | | | | 0.823 | 0.773 |
| Sum of Coefficients on all ΔQE*Channel | | | | | | | | -0.0263 | -0.00685 |
| | | | | | | | | 0.720 | 0.936 |
| Time fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | | 8,237 | 11,426 | 8,236 | 11,426 | 8,231 | 11,420 | 8,230 | 11,418 |
| R-squared | | 0.098 | 0.044 | 0.098 | 0.044 | 0.098 | 0.044 | 0.101 | 0.046 |
| Adjusted R-squared | | 0.0562 | 0.00445 | 0.0564 | 0.00451 | 0.0561 | 0.00514 | 0.0570 | 0.00512 |
| Number of banks | | 291 | 374 | 291 | 374 | 291 | 374 | 291 | 374 |
| Monetary Policy Choice | | Short Rate+ΔQE | Short Rate+ΔQE | Short Rate+ΔQE | Short Rate+ΔQE | Short Rate+ΔQE | Short Rate+ΔQE | Short Rate+ΔQE | Short Rate+ΔQE |
| Channel Studied | | Bank Funding | Bank Funding | Bank Funding | Bank Funding | Bank Funding | Bank Funding | Bank Funding | Bank Funding |

Note: The dependent variable is log changes in loans to the domestic non-financial private sector in the non-shaded columns and log changes in loans to the domestic financial sector (interbank) in the shaded columns. The data are quarterly from 2000Q1 to 2015Q4 for a panel of all resident banks. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. P-values below coefficient estimates indicate the level of significance.

## Table 3-HK: Estimation results for testing portfolio rebalancing channel

The dependent variable is log changes in loans to non-bank customers in Hong Kong. The data are quarterly from 2000Q1 to 2015Q4 for a panel of foreign-owned resident branches. All specifications include fixed effects as specified in the lower part of the table. Figures in the parentheses are the p-values. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | ΔShort Rate + ΔQE | | | ΔShadow Rate | | |
| | Δ Domestic loans | Δ Domestic loans | Δ Domestic loans | Δ Domestic loans | Δ Domestic loans | Δ Domestic loans |
| $\Sigma\Delta$MP Parent_t to t-3 * LoanAssets_t-4 | 0.692** | | 0.71** | 0.292 | | 0.391** |
| | (0.0489) | | (0.0204) | (0.128) | | (0.0465) |
| $\Sigma\Delta$MP Parent_t to t-3 * ImpairedLoan_t-4 | | -1.609 | -3.888 | | -1.957*** | -2.657*** |
| | | (0.805) | (0.55) | | (0.00943) | (0.000802) |
| $\Sigma\Delta$QE Parent_t to t-3 * LoanAssets_t-4 | -0.023 | | -0.0254 | | | |
| | (0.605) | | (0.562) | | | |
| $\Sigma\Delta$QE Parent_t to t-3 * ImpairedLoan_t-4 | | 0.0924 | 0.124 | | | |
| | | (0.83) | (0.773) | | | |
| LoanAssets_t-4 | 0.109 | | 0.031 | 0.128 | | 0.051 |
| | (0.614) | | (0.892) | (0.530) | | (0.804) |
| ImpairedLoan_t-4 | | 0.653 | 0.597 | | 0.714 | 0.578 |
| | | (0.391) | (0.464) | | (0.220) | (0.307) |
| LogRealAssets_t-1 | 4.662 | 6.438 | 3.787 | 6.686 | 6.334 | 5.664 |
| | (0.356) | (0.315) | (0.475) | (0.154) | (0.312) | (0.238) |
| Tier1Ratio_t-1 | 1.542** | 1.313 | 1.291* | 1.544** | 1.189 | 1.178* |
| | (0.025) | (0.145) | (0.093) | (0.027) | (0.154) | (0.095) |
| LiquidAssetRatio_t-1 | 0.026 | -0.027 | -0.099 | 0.054 | -0.050 | -0.078 |
| | (0.898) | (0.903) | (0.647) | (0.796) | (0.813) | (0.729) |
| CoreDeposits_t-1 | 0.121 | 0.139 | 0.166 | 0.135 | 0.141 | 0.181 |
| | (0.458) | (0.408) | (0.341) | (0.402) | (0.401) | (0.293) |
| LoanAssets_t-1 | | 0.110 | | | 0.082 | |
| | | (0.584) | | | (0.661) | |
| ImpairedLoan_t-1 | 0.312 | | | 0.364 | | |
| | (0.588) | | | (0.515) | | |
| NetDueTo_t-1 | -0.061* | -0.063* | -0.066* | -0.059 | -0.066** | -0.068** |
| | (0.085) | (0.054) | (0.061) | (0.109) | (0.038) | (0.048) |
| Observations | 1,495 | 1,512 | 1,475 | 1,495 | 1,512 | 1,475 |
| R-squared | 0.419 | 0.414 | 0.425 | 0.417 | 0.414 | 0.423 |
| Number of bank | 35 | 35 | 35 | 35 | 35 | 35 |
| Cluster | bank | bank | bank | bank | bank | bank |
| ParentCountry-Time effect | Y | Y | Y | Y | Y | Y |
| Bank fixed effect | Y | Y | Y | Y | Y | Y |
| adjusted R2 | 0.0792 | 0.0809 | 0.0800 | 0.0798 | 0.0858 | 0.0850 |

## Table 3 -UK: Financial linkages and the portfolio rebalancing channel

| LHS: HH and PNFC lending. Channel: Cross-border Assets to Non-Banks in ctry / Total Assets | MP-Measure | (1) ΔShort Rate+ΔQE | (2) ΔShadow Rate | (3) ΔShort Rate+ΔQE | (4) ΔShadow Rate | (5) ΔShort Rate+ΔQE | (6) ΔShadow Rate | (7) ΔShort Rate+ΔQE | (8) ΔShadow Rate |
|---|---|---|---|---|---|---|---|---|---|
| ΣΔMP US_t to t-3(*Channel_t-4) | | 0.0923 | 0.0915 | | | | | 0.303*** | 0.245** |
| | | 0.482 | 0.374 | | | | | 0.00596 | 0.0207 |
| ΣΔMP EA_t to t-3(*Channel_t-4) | | | | 0.274** | 0.210** | | | 0.278** | 0.195* |
| | | | | 0.0128 | 0.0117 | | | 0.0371 | 0.0632 |
| ΣΔMP JP_t to t-3(*Channel_t-4) | | | | | | 2.771 | 0.598 | -4.248 | 0.139 |
| | | | | | | 0.532 | 0.356 | 0.396 | 0.846 |
| ΣΔQE US_t to t-3(*Channel_t-4) | | -0.0825 | | | | | | -0.0866 | |
| | | 0.310 | | | | | | 0.374 | |
| ΣΔQE EA_t to t-3(*Channel_t-4) | | | | -0.0128 | | | | -0.0370 | |
| | | | | 0.699 | | | | 0.407 | |
| ΣΔQE JP_t to t-3(*Channel_t-4) | | | | | | -0.278* | | -0.344* | |
| | | | | | | 0.0695 | | 0.0366 | |
| Log total assets_t-1 | | -0.0978 | -0.155 | -0.0929 | -0.127 | -0.164 | -0.0786 | 0.0656 | 0.0213 |
| | | 0.889 | 0.825 | 0.895 | 0.857 | 0.836 | 0.920 | 0.934 | 0.978 |
| Tier1 Ratio_t-1 | | -0.0832 | -0.0857 | -0.0526 | -0.0525 | -0.0716 | -0.0742 | -0.0973* | -0.105* |
| | | 0.193 | 0.182 | 0.306 | 0.305 | 0.211 | 0.187 | 0.0979 | 0.0647 |
| Liquid asset ratio_t-1 | | 0.00753 | 0.00767 | 0.00501 | 0.00456 | 0.00780 | 0.00426 | 0.00701 | 0.00411 |
| | | 0.698 | 0.692 | 0.806 | 0.823 | 0.703 | 0.835 | 0.763 | 0.860 |
| Core deposits ratio_t-1 | | -0.0105 | -0.0114 | 0.0191 | 0.0181 | -0.0238 | -0.0212 | -0.0284 | -0.0289 |
| | | 0.757 | 0.742 | 0.600 | 0.620 | 0.534 | 0.580 | 0.429 | 0.436 |
| Channel US_t-4 | | -0.0416 | -0.0579 | | | | | 0.0321 | 0.00728 |
| | | 0.604 | 0.448 | | | | | 0.749 | 0.941 |
| Channel EA_t-4 | | | | 0.00666 | 0.00808 | | | 0.0121 | 0.00389 |
| | | | | 0.882 | 0.861 | | | 0.849 | 0.952 |
| Channel JP_t-4 | | | | | | 0.112 | -0.339 | 0.527 | 0.372 |
| | | | | | | 0.726 | 0.430 | 0.128 | 0.204 |
| Sum of (Impact) ΔMP_t(*Channel) Coefficients | | | | | | | | -2.988 | 0.878 |
| | | | | | | | | 0.423 | 0.102 |
| Sum of Coefficients on all ΔMP(*Channel) | | | | | | | | -3.667 | 0.579 |
| | | | | | | | | 0.461 | 0.426 |
| Sum of (Impact) ΔQE_t*Channel Coefficients | | | | | | | | -0.261** | |
| | | | | | | | | 0.0328 | |
| Sum of Coefficients on all ΔQE*Channel | | | | | | | | -0.467** | |
| | | | | | | | | 0.0289 | |
| Time fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | | 7,777 | 7,777 | 8,167 | 8,167 | 6,042 | 6,042 | 5,884 | 5,884 |
| R-squared | | 0.091 | 0.091 | 0.094 | 0.093 | 0.095 | 0.091 | 0.095 | 0.091 |
| Adjusted R-squared | | 0.0499 | 0.0499 | 0.0519 | 0.0521 | 0.0530 | 0.0494 | 0.0495 | 0.0479 |
| Number of banks | | 263 | 263 | 284 | 284 | 195 | 195 | 188 | 188 |
| Channel Studied | | Portfolio | Portfolio | Portfolio | Portfolio | Portfolio | Portfolio | Portfolio | Portfolio |

Note: The dependent variable is log changes in loans to the domestic non-financial private sector. We employ specification (1) discussed in section 4 in the non-shaded columns and specification (2) in the shaded columns. The data are quarterly from 2000Q1 to 2015Q4 for a panel of all resident banks. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. P-values below coefficient estimates indicate the level of significance.

## Table 4-HK: Currency dimension for bank funding channel

The dependent variable is log changes in loans to non-bank customers in Hong Kong. The data are quarterly from 2000Q1 to 2015Q4 for a panel of foreign-owned resident branches. All specifications include fixed effects as specified in the lower part of the table. Figures in the parentheses are the p-values. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | (1) | (2) | (3) |
|---|---|---|---|
| | $\Delta$Short Rate + $\Delta$QE | | |
| | $\Delta$ Domestic loans | $\Delta$ Domestic loans (USD) | $\Delta$ Domestic loans (HKD) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 *NetDueTo_t-4 | 0.0245 | 0.0262 | -0.094 |
| | (0.822) | (0.801) | (0.462) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 * Coredeposits_t-4 | 0.646* | 0.7** | 0.656* |
| | (0.0621) | (0.0329) | (0.0939) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 * LiquidAssetRatio_t-4 | -0.616 | -0.921 | -0.101 |
| | (0.593) | (0.376) | (0.914) |
| $\Sigma\Delta MP^{Parent}$_t to t-3 * Tier1Ratio _t-4 | -2.887 | -0.939 | -1.08 |
| | (0.504) | (0.837) | (0.778) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 *NetDueTo_t-4 | -0.00902 | -0.0121 | -0.0288 |
| | (0.667) | (0.598) | (0.296) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 * Coredeposits_t-4 | -0.112** | -0.165*** | -0.18* |
| | (0.0314) | (0.00262) | (0.0544) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 * LiquidAssetRatio_t-4 | -0.036 | 0.0571 | 0.113 |
| | (0.737) | (0.607) | (0.302) |
| $\Sigma\Delta QE^{Parent}$_t to t-3 * Tier1Ratio _t-4 | -0.25 | 0.247 | -0.231 |
| | (0.598) | (0.62) | (0.605) |
| NetDueTo_t-4 | -0.001 | -0.014 | -0.030 |
| | (0.987) | (0.697) | (0.419) |
| Coredeposits_t-4 | 0.044 | 0.039 | 0.291 |
| | (0.796) | (0.829) | (0.187) |
| LiquidAssetRatio_t-4 | 0.159 | 0.138 | 0.039 |
| | (0.555) | (0.624) | (0.909) |
| Tier1Ratio_t-1 | -0.351 | 0.136 | -0.733 |
| | (0.767) | (0.921) | (0.615) |
| LogRealAssets_t-1 | 3.199 | 5.378 | -3.762 |
| | (0.670) | (0.447) | (0.617) |
| Tier1Ratio_t-1 | | | |
| LiquidAssetRatio_t-1 | | | |
| CoreDeposits_t-1 | | | |
| LoanAssets_t-1 | 0.107 | 0.187 | -0.123 |
| | (0.682) | (0.468) | (0.668) |
| ImpairedLoan_t-1 | -0.341 | -0.176 | -1.437*** |
| | (0.551) | (0.700) | (0.000) |
| NetDueTo_t-1 | | | |
| Observations | 1,496 | 1,485 | 1,437 |
| R-squared | 0.434 | 0.425 | 0.443 |
| Number of bank | 35 | 35 | 35 |
| Cluster | bank | bank | bank |
| ParentCountry-Time effect | Y | Y | Y |
| Bank fixed effect | Y | Y | Y |
| adjusted R2 | 0.0828 | 0.0677 | 0.0839 |

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## Table 4 -UK: Currency dimension and the bank funding channel

| LHS: Interbank Loans | | (1) | (2) | (3) |
|---|---|---|---|---|
| Channel: Net Cross-border Liabilities from ctry / Total Assets | LHS Currency: | Sterling | Euros | Other (mostly USD) |
| ΣΔMP US_t to t-3(*Channel_t-4) | | 0.0714 | -0.00609 | -0.251** |
| | | 0.629 | 0.959 | 0.0446 |
| ΣΔMP EA_t to t-3(*Channel_t-4) | | 0.101 | 0.0293 | -0.00546 |
| | | 0.269 | 0.661 | 0.956 |
| ΣΔMP JP_t to t-3(*Channel_t-4) | | -1.471 | -6.009** | -3.569*** |
| | | 0.192 | 0.0102 | 0.00382 |
| ΣΔQE US_t to t-3(*Channel_t-4) | | 0.0143 | -0.0301 | 0.0714 |
| | | 0.866 | 0.824 | 0.556 |
| ΣΔQE EA_t to t-3(*Channel_t-4) | | -0.0123 | -0.0126 | 0.00824 |
| | | 0.600 | 0.549 | 0.693 |
| ΣΔQE JP_t to t-3(*Channel_t-4) | | -0.0778 | -0.0559 | -0.0845** |
| | | 0.235 | 0.156 | 0.0215 |
| Sum of (Impact) ΔMP_t(*Channel) Coefficients | | -1.591 | -1.413 | -2.991** |
| | | 0.140 | 0.421 | 0.0175 |
| Sum of Coefficients on all ΔMP(*Channel) | | -1.299 | -5.986** | -3.825*** |
| | | 0.263 | 0.0107 | 0.00247 |
| Sum of (Impact) ΔQE_t*Channel Coefficients | | -0.0334 | -0.0102 | 0.00269 |
| | | 0.614 | 0.910 | 0.974 |
| Sum of Coefficients on all ΔQE*Channel | | -0.0758 | -0.0986 | -0.00493 |
| | | 0.484 | 0.487 | 0.970 |
| Time fixed effects | | Yes | Yes | Yes |
| Bank fixed effects | | Yes | Yes | Yes |
| Observations | | 10,442 | 8,120 | 9,124 |
| R-squared | | 0.049 | 0.059 | 0.048 |
| Adjusted R-squared | | 0.00440 | 0.00609 | 0.000240 |
| Number of banks | | 374 | 342 | 341 |
| Monetary Policy Choice | | Short Rate+ΔQE | Short Rate+ΔQE | Short Rate+ΔQE |
| Channel Studied | | Bank Funding | Bank Funding | Bank Funding |

Note: The dependent variable is log changes in loans to the domestic financial sector (interbank loans) denominated either in sterling (column 1), Euros (column 2), or other currencies (column 3). The data are quarterly from 2000Q1 to 2015Q4 for a panel of all resident banks. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. P-values below coefficient estimates indicate the level of significance.

## Table 5-HK: Currency dimension for portfolio rebalancing channel

The dependent variable is log changes in loans to non-bank customers in Hong Kong. The data are quarterly from 2000Q1 to 2015Q4 for a panel of foreign-owned resident branches. All specifications include fixed effects as specified in the lower part of the table. Figures in the parentheses are the p-values. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| MP measures | ΔShort Rate + ΔQE | | | ΔShadow rate | | |
| Variables | Δ Domestic loans | Δ Domestic loans (USD) | Δ Domestic loans (HKD) | Δ Domestic loans | Δ Domestic loans (USD) | Δ Domestic loans (HKD) |
| ΣΔMP Parent_t to t-3 * LoanAssets_t-4 | 0.71** | 0.472* | 1.065*** | 0.391** | 0.335** | 0.576* |
| | (0.0204) | (0.0717) | (0.00275) | (0.0465) | (0.0308) | (0.051) |
| ΣΔMP Parent_t to t-3 * ImpairedLoan_t-4 | -3.888 | -8.45** | -0.329 | -2.657*** | -3.457*** | 1.062 |
| | (0.55) | (0.0323) | (0.961) | (0.000802) | (0.0000733) | (0.45) |
| ΣΔQE Parent_t to t-3 * LoanAssets_t-4 | -0.0254 | -0.0676 | -0.147* | | | |
| | (0.562) | (0.41) | (0.0501) | | | |
| ΣΔQE Parent_t to t-3 * ImpairedLoan_t-4 | 0.124 | 1.719* | -0.385 | | | |
| | (0.773) | (0.0751) | (0.441) | | | |
| LoanAssets_t-4 | 0.031 | -0.011 | 0.141 | 0.051 | 0.020 | 0.090 |
| | (0.892) | (0.960) | (0.543) | (0.804) | (0.925) | (0.678) |
| ImpairedLoan_t-4 | 0.597 | 0.391 | 0.616 | 0.578 | 0.354 | 0.555 |
| | (0.464) | (0.701) | (0.567) | (0.307) | (0.663) | (0.469) |
| LogRealAssets_t-1 | 3.787 | 8.776 | 0.094 | 5.664 | 8.746 | 2.149 |
| | (0.475) | (0.124) | (0.991) | (0.238) | (0.127) | (0.791) |
| Tier1Ratio_t-1 | 1.291* | 0.067 | 0.645 | 1.178* | 0.232 | 0.892 |
| | (0.093) | (0.951) | (0.655) | (0.095) | (0.832) | (0.528) |
| LiquidAssetRatio_t-1 | -0.099 | -0.081 | -0.068 | -0.078 | 0.019 | 0.038 |
| | (0.647) | (0.806) | (0.817) | (0.729) | (0.955) | (0.896) |
| CoreDeposits_t-1 | 0.166 | -0.043 | 0.216 | 0.181 | -0.054 | 0.231 |
| | (0.341) | (0.848) | (0.256) | (0.293) | (0.799) | (0.142) |
| LoanAssets_t-1 | | | | | | |
| ImpairedLoan_t-1 | | | | | | |
| NetDueTo_t-1 | -0.066* | -0.087 | -0.088*** | -0.068** | -0.093 | -0.085*** |
| | (0.061) | (0.132) | (0.002) | (0.048) | (0.109) | (0.002) |
| Observations | 1,475 | 1,360 | 1,418 | 1,475 | 1,360 | 1,418 |
| R-squared | 0.425 | 0.430 | 0.439 | 0.423 | 0.423 | 0.429 |
| Number of bank | 35 | 35 | 35 | 35 | 35 | 35 |
| Cluster | bank | bank | bank | bank | bank | bank |
| ParentCountry-Time effect | Y | Y | Y | Y | Y | Y |
| Bank fixed effect | Y | Y | Y | Y | Y | Y |
| adjusted R2 | 0.0800 | 0.0616 | 0.0901 | 0.0850 | 0.0603 | 0.0825 |

## Table 5 - UK: Currency dimension and the portfolio re-balancing channel

| LHS: HH and PNFC lending. Channel: Cross-border Assets to Non-Banks in ctry / Total Assets | | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| | MP-Measure | ΔShort Rate+ΔQE | ΔShort Rate+ΔQE | ΔShort Rate+ΔQE | ΔShadow Rate | ΔShadow Rate | ΔShadow Rate |
| | LHS Currency: | Sterling | Euros | Other (mostly USD) | Sterling | Euros | Other (mostly USD) |
| ΣΔMP US_t to t-3(*Channel_t-4) | | *0.261** | 0.123 | -0.0387 | *0.195*** | 0.124 | -0.134 |
| | | *0.0670* | 0.595 | 0.764 | *0.0353* | 0.446 | 0.360 |
| ΣΔMP EA_t to t-3(*Channel_t-4) | | *0.356*** | 0.0616 | 0.0684 | *0.282*** | 0.160 | -0.0759 |
| | | *0.0146* | 0.733 | 0.660 | *0.0178* | 0.227 | 0.598 |
| ΣΔMP JP_t to t-3(*Channel_t-4) | | *-10.29** | 5.871 | 8.889 | 0.708 | -0.151 | -1.291 |
| | | *0.0559* | 0.433 | 0.229 | 0.353 | 0.908 | 0.161 |
| ΣΔQE US_t to t-3(*Channel_t-4) | | -0.0671 | -0.133 | -0.141 | | | |
| | | 0.462 | 0.345 | 0.463 | | | |
| ΣΔQE EA_t to t-3(*Channel_t-4) | | -0.0587 | 0.000234 | 0.0288 | | | |
| | | 0.137 | 0.997 | 0.575 | | | |
| ΣΔQE JP_t to t-3(*Channel_t-4) | | -0.247 | 0.107 | 0.0115 | | | |
| | | 0.125 | 0.777 | 0.961 | | | |
| Sum of (Impact) ΔMP_t(*Channel) Coefficients | | -2.733 | -5.685 | 2.603 | 1.609 | 0.352 | -0.217 |
| | | 0.630 | 0.462 | 0.681 | 0.0240 | 0.736 | 0.788 |
| Sum of Coefficients on all ΔMP(*Channel) | | *-9.676** | 6.055 | 8.919 | 1.184 | 0.133 | -1.501 |
| | | *0.0702* | 0.415 | 0.224 | 0.117 | 0.921 | 0.109 |
| Sum of (Impact) ΔQE_t*Channel Coefficients | | *-0.232*** | -0.279 | 0.168 | | | |
| | | *0.0231* | 0.0823 | 0.308 | | | |
| Sum of Coefficients on all ΔQE*Channel | | *-0.373** | -0.0254 | -0.100 | | | |
| | | *0.0657* | 0.951 | 0.747 | | | |
| Time fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | | 5,834 | 4,705 | 4,994 | 5,834 | 4,705 | 4,994 |
| R-squared | | 0.087 | 0.082 | 0.085 | 0.086 | 0.079 | 0.080 |
| Adjusted R-squared | | 0.0406 | 0.0285 | 0.0327 | 0.0414 | 0.0276 | 0.0304 |
| Number of banks | | 188 | 166 | 176 | 188 | 166 | 176 |
| Channel Studied | | Portfolio | Portfolio | Portfolio | Portfolio | Portfolio | Portfolio |

Note: The dependent variable is log changes in loans to the domestic non-financial private sector denominated either in sterling (columns 1 and 4), Euros (columns 2 and 5), or other currencies (columns 3 and 6). The data are quarterly from 2000Q1 to 2015Q4 for a panel of all resident banks. All specifications include fixed effects as specified in the lower part of the table. Standard errors are clustered by bank. P-values below coefficient estimates indicate the level of significance.

## Appendix tables

### –Table A1 -HK: Construction of variables

| Variable Name | Definition | Source |
|---|---|---|
| *Dependent variables* | | |
| Domestic loan growth | Loans and advances to customers in Hong Kong by the FBHK, including trade finance loans | HKMA |
| Interbank loan growth | Loans to unconnected authorized institutions in Hong Kong by the FBHK | HKMA |
| *Transmission & control variables* | | |
| LogRealAssets | The log of parent bank's total assets in levels, deflated by GDP deflator of parent country | S&P Capital IQ |
| LoanAssets | Total loans / Total assets of the parent bank | S&P Capital IQ |
| LiquidAssetRatio | Total cash and equivalents/ Total assets of the parent bank | S&P Capital IQ |
| CoreDeposits | Total customer deposits / Total assets of the parent bank | S&P Capital IQ |
| ImpairedLoan | Total impaired loans / Total assets of the parent bank | S&P Capital IQ |
| SecuritiesAssets | [Investment securities + Trading asset securities + mortgage backed securities]/ Total assets of the parent bank | S&P Capital IQ |
| Tier1Ratio | Tier 1 capital / Total assets of the parent bank | S&P Capital IQ |
| NetDueTo | [Due to overseas offices of the FBHK – Due from overseas offices of the FBHK]/ Total liabilities of the FBHK | HKMA |
| BIS financial cycle | Country-specific credit gap | BIS |
| BIS business cycle | Country-specific output gap | BIS |

## Table A2-HK: Robustness results for bank funding channel based on Taylor-residuals

The dependent variable is log changes in loans to non-bank customers in Hong Kong. The data are quarterly from 2000Q1 to 2015Q4 for a panel of foreign-owned resident branches. All specifications include fixed effects as specified in the lower part of the table. Figures in the parentheses are the p-values. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | (1) | (2) | (3) |
|---|---|---|---|
| MP measures | ΔTaylorShock (policy rate) + ΔQE | | |
| Dependent variable | Δ Domestic loans | Δ Domestic loans (USD) | Δ Domestic loans (HKD) |
| ΣΔMP Parent_t to t-3 *NetDueTo_t-4 | 0.0193 | 0.0115 | -0.11 |
| | (0.904) | (0.941) | (0.515) |
| ΣΔMP Parent_t to t-3 * Coredeposits_t-4 | 0.432 | 0.589 | 0.439 |
| | (0.335) | (0.16) | (0.324) |
| ΣΔMP Parent_t to t-3 * LiquidAssetRatio_t-4 | 0.123 | -0.15 | 0.671 |
| | (0.907) | (0.865) | (0.516) |
| ΣΔMP Parent_t to t-3 * T1_t-4 | 1.812 | 3.384 | -1.079 |
| | (0.76) | (0.597) | (0.831) |
| ΣΔQE Parent_t to t-3 *NetDueTo_t-4 | -0.0105 | -0.0126 | -0.0243 |
| | (0.601) | (0.517) | (0.486) |
| ΣΔQE Parent_t to t-3 * Coredeposits_t-4 | -0.127** | -0.179*** | -0.199** |
| | (0.0212) | (0.00134) | (0.0462) |
| ΣΔQE Parent_t to t-3 * LiquidAssetRatio_t-4 | -0.0367 | 0.0432 | 0.109 |
| | (0.729) | (0.699) | (0.351) |
| ΣΔQE Parent_t to t-3 * Tier1Ratio _t-4 | -0.093 | 0.351 | -0.147 |
| | (0.834) | (0.464) | (0.743) |
| NetDueTo_t-4 | -0.005 | -0.019 | -0.028 |
| | (0.880) | (0.607) | (0.474) |
| Coredeposits_t-4 | 0.007 | 0.004 | 0.264 |
| | (0.962) | (0.980) | (0.216) |
| LiquidAssetRatio_t-4 | 0.155 | 0.164 | -0.000 |
| | (0.555) | (0.561) | (1.000) |
| Tier1Ratio _t-4 | -0.581 | -0.025 | -0.836 |
| | (0.584) | (0.984) | (0.552) |
| LogRealAssets_t-1 | 3.250 | 5.667 | -3.593 |
| | (0.647) | (0.393) | (0.630) |
| Tier1Ratio_t-1 | | | |
| LiquidAssetRatio_t-1 | | | |
| CoreDeposits_t-1 | | | |
| LoanAssets_t-1 | 0.052 | 0.147 | -0.164 |
| | (0.828) | (0.542) | (0.573) |
| ImpairedLoan_t-1 | -0.295 | -0.125 | -1.429*** |
| | (0.608) | (0.789) | (0.000) |
| NetDueTo_t-1 | | | |
| Observations | 1,496 | 1,485 | 1,437 |
| R-squared | 0.430 | 0.424 | 0.439 |
| Number of bank | 35 | 35 | 35 |
| Cluster | bank | bank | bank |
| ParentCountry-Time effect | Y | Y | Y |
| Bank fixed effect | Y | Y | Y |
| adjusted R2 | 0.0761 | 0.0662 | 0.0767 |

## Table A3-HK: Robustness results for portfolio rebalancing channel based on Taylor-residuals

The dependent variable is log changes in loans to non-bank customers in Hong Kong. The data are quarterly from 2000Q1 to 2015Q4 for a panel of foreign-owned resident branches. All specifications include fixed effects as specified in the lower part of the table. Figures in the parentheses are the p-values. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| MP measures | ΔTaylorShock (policy rate) + ΔQE | | | ΔTaylorShock (shadow rate) | | |
| Dependent variable | Δ Domestic loans | Δ Domestic loans (USD) | Δ Domestic loans (HKD) | Δ Domestic loans | Δ Domestic loans (USD) | Δ Domestic loans (HKD) |
| ΣΔMP Parent_t to t-3 * LoanAssets_t-4 | 0.785* | 0.557* | 1.554*** | 0.359* | 0.343** | 0.503 |
| | (0.0925) | (0.0921) | (0.00452) | (0.0734) | (0.0343) | (0.156) |
| ΣΔMP Parent_t to t-3 * ImpairedLoan_t-4 | -2.963 | -2.796 | 4.689 | -2.444*** | -3.181*** | 1.435 |
| | (0.668) | (0.695) | (0.577) | (0.00232) | (0.00336) | (0.395) |
| ΣΔQE Parent_t to t-3 * LoanAssets_t-4 | -0.043 | -0.0684 | -0.181** | | | |
| | (0.361) | (0.389) | (0.0344) | | | |
| ΣΔQE Parent_t to t-3 * ImpairedLoan_t-4 | 0.325 | 1.975** | -0.363 | | | |
| | (0.474) | (0.0458) | (0.416) | | | |
| LoanAssets_t-4 | 0.005 | 0.010 | 0.073 | 0.012 | -0.008 | 0.013 |
| | (0.981) | (0.965) | (0.758) | (0.955) | (0.966) | (0.957) |
| ImpairedLoan_t-4 | 0.762 | 0.372 | 0.644 | 0.685 | 0.459 | 0.457 |
| | (0.295) | (0.727) | (0.524) | (0.222) | (0.584) | (0.564) |
| LogRealAssets_t-1 | 4.986 | 10.091* | -0.088 | 5.400 | 9.029 | 1.711 |
| | (0.294) | (0.064) | (0.991) | (0.231) | (0.130) | (0.828) |
| Tier1Ratio_t-1 | 1.323* | 0.335 | 0.565 | 1.209* | 0.327 | 0.875 |
| | (0.086) | (0.750) | (0.686) | (0.092) | (0.768) | (0.545) |
| LiquidAssetRatio_t-1 | -0.090 | -0.045 | -0.131 | -0.089 | 0.004 | 0.019 |
| | (0.678) | (0.894) | (0.658) | (0.691) | (0.990) | (0.949) |
| CoreDeposits_t-1 | 0.143 | -0.076 | 0.200 | 0.169 | -0.062 | 0.230 |
| | (0.419) | (0.723) | (0.272) | (0.318) | (0.766) | (0.145) |
| LoanAssets_t-1 | | | | | | |
| ImpairedLoan_t-1 | | | | | | |
| NetDueTo_t-1 | -0.069* | -0.084 | -0.088*** | -0.068** | -0.094 | -0.082*** |
| | (0.059) | (0.147) | (0.003) | (0.047) | (0.113) | (0.002) |
| Observations | 1,475 | 1,360 | 1,418 | 1,475 | 1,360 | 1,418 |
| R-squared | 0.425 | 0.429 | 0.439 | 0.425 | 0.420 | 0.428 |
| Number of bank | 35 | 35 | 35 | 35 | 35 | 35 |
| Cluster | bank | bank | bank | bank | bank | bank |
| ParentCountry-Time effect | Y | Y | Y | Y | Y | Y |
| Bank fixed effect | Y | Y | Y | Y | Y | Y |
| adjusted R2 | 0.0803 | 0.0606 | 0.0905 | 0.0882 | 0.0555 | 0.0814 |

## –Table A1 -UK: Construction of variables

| Variable Name | Definition | Source |
|---|---|---|
| *Dependent variables (Exchange-rate adjusted log changes)* | | |
| Household and PNFC loan growth | Loans to UK households and PNFCs (ALL1 to ALL14 and ALL18) | Form AL |
| Interbank loan growth | Loans to other UK banks (resident positions of BT23 plus ALL15, ALL16 and ALL17) | Form BT |
| *Independent variables* | | |
| Liquid Asset Ratio | (BT21+BT23+BT32D)/(BT20-BT19). | Form BT |
| Commitments Ratio | Commitment ratio: Ratio of total commitments divided by total assets. [BT43/BT40]Includes overdraft, loan, acceptance and other facilities outstanding. | Form BT |
| LogRealAssets | The log of a bank's total assets in levels (£1000s) [BT40], deflated by CPI inflation. | Form BT |
| CoreDeposits Ratio | [Total time and sight deposit from domestic residents]/(Liabilities – balance sheet capital) | Form BT |
| Tier1Ratio | (Tier 1 capital)/Assets | Form BT |
| BIS financial cycle | Country-specific credit gap | BIS |
| BIS business cycle | Country-specific output gap | BIS |
| *Financial Linkages* | | |
| Gross cross-border assets to *ctry*/ total assets | CC15 vis-à-vis the US, the Euro Area, or Japan. Also CC15 in USD, Euros, or Yen. | CC |
| Gross cross-border liabilities from *ctry* / total liabilities | CL1 vis-à-vis the US, the Euro Area or Japan. Also CL1 in USD, Euros, or Yen. | CL |
| Net cross-border funding from *ctry* all sectors / total assets | CL1 minus CC1 vis-à-vis the US, the Euro Area or Japan. Also CL1 minus CC1 in USD, Euros, or Yen. | CC and CL |

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.

## Table A2 –UK: Robustness results for Taylor residuals

| LHS: Financial lending (1-4); HH and PNFC lending (5-8) | MP-Measure | (1) ΔShort Rate+ΔQE | (2) ΔShort Rate+ΔQE | (3) ΔShort Rate+ΔQE | (4) ΔShort Rate+ΔQE | (5) ΔShort Rate+ΔQE | (6) ΔShort Rate+ΔQE | (7) ΔShort Rate+ΔQE | (8) ΔShort Rate+ΔQE |
|---|---|---|---|---|---|---|---|---|---|
| | | Channel: Net Cross-border Liabilities from ctry / Total Assets | | | | Channel: Cross-border Assets to Non-Banks in ctry / Total Assets | | | |
| | LHS Currency: | All | Sterling | Euros | Other (mostly USD) | All | Sterling | Euros | Other (mostly USD) |
| ΣΔMP US_t to t-3(*Channel_t-4) | | 0.0271 | 0.0842 | 0.122 | -0.293* | 0.317*** | 0.272* | 0.177 | 0.0673 |
| | | 0.760 | 0.622 | 0.335 | 0.0712 | 0.00508 | 0.0821 | 0.460 | 0.652 |
| ΣΔMP EA_t to t-3(*Channel_t-4) | | -0.0502 | 0.0795 | 0.0220 | -0.148 | 0.464** | 0.595*** | 0.260 | 0.0365 |
| | | 0.649 | 0.602 | 0.864 | 0.322 | 0.0194 | 0.00913 | 0.418 | 0.906 |
| ΣΔMP JP_t to t-3(*Channel_t-4) | | -1.770 | -2.542** | -2.204 | -0.886 | -5.235 | -15.33*** | 4.810 | 9.143 |
| | | 0.216 | 0.0185 | 0.142 | 0.432 | 0.259 | 0.000 | 0.582 | 0.200 |
| ΣΔQE US_t to t-3(*Channel_t-4) | | 0.0250 | 0.00228 | -0.00237 | 0.120 | -0.131 | -0.0692 | -0.159 | -0.117 |
| | | 0.720 | 0.977 | 0.986 | 0.300 | 0.183 | 0.389 | 0.220 | 0.540 |
| ΣΔQE EA_t to t-3(*Channel_t-4) | | -8.66e-05 | -0.0170 | -0.0167 | 0.00970 | -0.0621 | -0.0852** | -0.0228 | 0.0390 |
| | | 0.997 | 0.462 | 0.397 | 0.668 | 0.179 | 0.0276 | 0.728 | 0.460 |
| ΣΔQE JP_t to t-3(*Channel_t-4) | | -0.0634 | -0.122* | -0.0561 | -0.0958** | -0.474** | -0.456** | 0.0690 | -0.0667 |
| | | 0.203 | 0.0704 | 0.311 | 0.0192 | 0.0111 | 0.0119 | 0.859 | 0.784 |
| Sum of (Impact) ΔMP_t(*Channel) Coefficients | | -1.198 | -3.177** | -0.572 | -2.586* | -6.031 | -7.651* | -6.853 | 1.582 |
| | | 0.179 | 0.0267 | 0.771 | 0.0602 | 0.136 | 0.0947 | 0.485 | 0.818 |
| Sum of Coefficients on all ΔMP(*Channel) | | -1.793 | -2.378** | -2.060 | -1.327 | -4.454 | -14.47*** | 5.247 | 9.247 |
| | | 0.215 | 0.0331 | 0.172 | 0.249 | 0.333 | 0.000220 | 0.543 | 0.193 |
| Sum of (Impact) ΔQE_t*Channel Coefficients | | -0.0504 | -0.0655 | 0.00136 | 0.0768 | -0.311** | -0.261*** | -0.224 | 0.165 |
| | | 0.471 | 0.336 | 0.989 | 0.341 | 0.0133 | 0.00475 | 0.165 | 0.281 |
| Sum of Coefficients on all ΔQE*Channel | | -0.0385 | -0.137 | -0.0752 | 0.0340 | -0.667*** | -0.610*** | -0.113 | -0.144 |
| | | 0.666 | 0.205 | 0.604 | 0.791 | 0.00331 | 0.00403 | 0.791 | 0.640 |
| Time fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | | 11,418 | 10,442 | 8,120 | 9,124 | 5,884 | 5,834 | 4,705 | 4,994 |
| R-squared | | 0.046 | 0.049 | 0.059 | 0.047 | 0.095 | 0.088 | 0.083 | 0.085 |
| Adjusted R-squared | | 0.00548 | 0.00488 | 0.00578 | -0.000373 | 0.0498 | 0.0419 | 0.0291 | 0.0331 |
| Number of banks | | 374 | 374 | 342 | 341 | 188 | 188 | 166 | 176 |
| Channel Studied | | Bank Funding | Bank Funding | Bank Funding | Bank Funding | Portfolio | Portfolio | Portfolio | Portfolio |

Note: The dependent variable is log changes in loans to the domestic non-financial private sector or other domestic banks denominated either in all currencies, sterling, euros or other currencies. The data are quarterly from 2000Q1 to 2015Q4 for a panel of all resident banks. Standard errors are clustered by bank. P-values below coefficient estimates indicate the level of significance.