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**The International Transmission of Shocks through the Lens of
Foreign Banks in Hong Kong**

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Abstract

We examine the effects of the 2007-09 U.S. financial crisis and the 2011-12 European sovereign debt crisis on global banks' foreign operation in Hong Kong. During both crises, foreign banks from crisis countries did not exhibit significantly different liquidity management than banks from non-crisis countries, suggesting that the liquidity interventions by the home countries' central banks seemed effective. However, foreign banks from crisis countries significantly pulled back their lending in Hong Kong, relative to their non-crisis counterparts, resulting in significantly slower asset growth. Our results suggest the possibility of a lending channel in the transmission of shocks from the home country to the host country.

On the other hand, quantitative easing by central banks is found to have significant effects on their global banks' liquidity management in Hong Kong. Foreign banks held less liquid assets, and up streamed less funds to their parents when their home country central bank conducted QE. QE banks in Hong Kong are also found to lend less, and grew their assets slower, than non-QE banks.

Keywords: financial crisis, foreign banks, quantitative easing

JEL Codes: G01, G21, F65

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I. Introduction and Motivation

The transmission of shocks in the global financial system has always been an important topic in international finance. With the globalization of financial markets and increasing capital flows across countries, the channels and the magnitude of transmission of shocks are evolving over time. In this paper, we are interested in understanding how two recent shocks in advanced foreign economies, namely, the 2007-09 U.S. financial crisis and the 2010-11 euro area sovereign debt crisis, were transmitted to Hong Kong through the crisis country's foreign banking organizations operating in Hong Kong. More specifically, we are interested in examining how a shock in the home country of a global bank affects the operation of its foreign branch in a host country, including lending activities, funding activities, and intrafirm liquidity management.

Following the global financial crisis and the European sovereign debt crisis, with policy rates hitting the lower bound for nominal interest rates, the Federal Reserve, the European Central Bank, and the Bank of England conducted large-scale asset purchases, or quantitative easing, to stimulate their economies. While the Bank of Japan has conducted quantitative easing since early 2000s, it expanded the program in 2013 and 2014 under the quantitative and qualitative easing program (QQE), and in 2016 added "yield curve control" to their QQE by explicitly targeting the 10-year Japanese government bond yield. While there are important differences in the quantitative easing programs across countries, this paper examines the effects of monetary easing in the home country on global banks' foreign operation in Hong Kong, following a similar line of inquiry as in the transmission of shocks.

As an international financial center, Hong Kong has a large number of foreign banks, totaling 146 in 2017. A large majority of these foreign banking affiliates are established as branches of foreign banks, while the larger foreign bank operations are established as subsidiaries. In 2017, 45 of the top 50 global banking organizations (by total assets) had established either a branch or a subsidiary in Hong Kong. These foreign banking operations vary by size, complexity, and scope of activities. Some of them are active in both funding and lending activities, gathering local deposits to provide loans to local borrowers. Others tend to rely more heavily on either lending or funding in the local market, depending on the global bank's business model.¹ As such, the asset and liability management of foreign bank affiliates in Hong Kong varies quite considerably, providing a rich empirical setting to study how foreign banking operations respond to home country financial shocks and home country quantitative easing in a small open economy.

¹ Please see Box 6 "Changing business models of Hong Kong branches of US and European global banks" (pages 81-84) in Hong Kong Monetary Authority (2013) for a description of business models of Hong Kong branches of US and European global banks.

Our empirical strategy is to use the 2007-09 U.S. financial crisis and the 2010-11 euro area sovereign debt crisis as exogenous events to test for differences in foreign banks' lending, funding, and liquidity management in Hong Kong, relative to local banks and foreign banks from non-crisis countries using the difference-in-difference methodology. We apply the same methodology to examine the effects of quantitative easing in the home country on foreign banks in Hong Kong.

There is a growing literature on how global banks manage their liquidity worldwide. For example, Cetorelli and Goldberg (2012) study the liquidity management of U.S. global banks from the perspective of the parent company. They find that funds regularly flow between parent banks and their foreign affiliates in diverse foreign markets; and further show that parent banks experiencing funding shocks tend to reallocate liquidity according to a location-related pecking order, which depends on the relative importance of the foreign affiliates' contributions to their parent companies' revenue stream. Rather than focusing on the parent companies of a few global banks, our approach is to study the liquidity management of a cross section of foreign banks in Hong Kong whose parents are from different foreign countries. Our research design therefore encompasses a wide range of foreign banks, which differ considerably in the scale of foreign operations. More importantly, assuming the shocks in the home country to be exogenous to Hong Kong, this provides a natural experiment setting to isolate the treatment effects on foreign banks from a host country's perspective.

The host country is expected to have a vested interest in the effects of foreign shocks on foreign banks' activities in its jurisdiction, including both funding and lending activities in the local banking markets, as well as their safety and soundness. The empirical evidence on the bank lending channel (see for example Kashyap, Stein and Wilcox 1993, Peek and Rosengren 1997, Kashyap and Stein 2000, Paravisini 2008, Khwaja and Mian 2008) points to the real effects of bank credit availability on the local economy. Although quantifying the magnitude of the economic impact could be challenging, host country policy makers may want to lean against the possibility of an adverse macroeconomic shock originated from a foreign source but transmitted through the foreign bank channel. In a similar spirit, applying the Basel liquidity requirements, including the liquidity coverage ratio and the stable funding ratio, at the foreign branch level, could mitigate the potential spillover of a liquidity shock from the home country to the host country.

The rest of the paper is organized as the following. Section II discusses foreign banks in Hong Kong, which provide a rich environment to conduct quasi-natural experiments on international spillover through the banking channel. Section III describes the U.S. financial crisis and the European sovereign debt crisis, as well as the quantitative easing conducted by major central banks after the crises. We use these exogenous shocks to examine the differences between treated and untreated banks in Hong Kong. The methodology and data are described in Section IV. Section V reports the empirical findings. Section VI concludes.

II. Foreign Banks in Hong Kong

Hong Kong, a former British colony and currently a Special Administrative Region of the People's Republic of China, is a small open economy that has its own government. It is characterized by free trade, low taxation and minimum government intervention. It is the world's 7th largest trading economy, with the mainland China as its most significant trading partner. Hong Kong Gross Domestic Product (GDP) in 2017 was HK\$2,661 billion (US\$341 billion), less than 2 percent of the U.S. GDP in that year. Despite its small size, Hong Kong is an international financial center, hosting 45 of the 50 largest global banking organizations (in terms of consolidated total assets) from around the world.

Indeed, the three largest commercial banks in Hong Kong, the Hong Kong and Shanghai Banking Corporation Limited, the Bank of China (Hong Kong) Limited, and the Standard Chartered Bank (Hong Kong) Limited, are all foreign banks. These three banks have been authorized by the Hong Kong government to issue banknotes in Hong Kong, and they are also referred to as note-issuing banks in Hong Kong.

The Hong Kong dollar is pegged to the US dollar under the Linked Exchange Rate System since 1983, providing a stable local currency that has almost no exchange rate risk with the US dollar. With a stable currency, no restriction on capital flows, and strong links to mainland China and the Asia Pacific Region, Hong Kong serves as both a lending and funding hub for international banks. The cross-border banking funds by the Hong Kong banking sector, on a net basis, rose rapidly before the 2007-09 financial crisis and peaked at US\$222 billion in October 2007; and these cross-border funding flows were driven largely by intra-firm funding flows of globally active bank branches in Hong Kong (Hong Kong Monetary Authority 2014).²

The banking system in Hong Kong has been stable and sound. In 2017, over 60 percent of total financial assets in Hong Kong intermediated through the banking system (compared to less than 40 percent in the U.S. and about 40 percent in the euro area) (Financial Stability Board 2019). Small and medium business enterprises, and households rely on banks as a major source of credit. Moreover, banks in Hong Kong have broad power under the so-called universal banking model, so that they can provide a portfolio of financial services to their customers, including securities brokerage, money managing, and insurance. Profitability of banks in Hong Kong has been robust, with return on equity growing to about 13 percent in 2018. This also motivates foreign banks to enter the Hong Kong market.

² Wong, Tsang, and Kong (2014) provided evidence that during the financial crisis, global banks reacted to a parent-bank funding shock by repatriating funds from their Hong Kong branches through their internal capital market, and thereby transmitting global banks' liquidity shock from the home to the host country. We follow a similar line of inquiry, using a different methodology. Moreover, in addition to studying the 2007-09 U.S. financial crisis on Hong Kong foreign bank branches, we also examine the shock arising from the 2010-11 euro area sovereign debt crisis. Furthermore, we investigate the effects of the crises on foreign bank lending in Hong Kong.

III. Foreign Financial Shocks and Quantitative easing

The 2007-09 global financial crisis originated from the U.S., and the 2010-11 sovereign debt crisis in the euro area are well documented.³ Many global banks headquartered in the U.S. and countries in the euro area have established branches or subsidiaries in Hong Kong before the crises. Our research design is to treat these two financial shocks as natural experiments, and to examine whether foreign banks in Hong Kong whose parents are from the U.S. or the euro area behaved differently in Hong Kong, relative to local banks and other foreign banks from non-crises countries. Given the massive dislocation in the credit market and the interbank market of the home country during the crises, we are particularly interested in how the foreign shocks affect foreign banks' liquidity management in Hong Kong. Whether and how the foreign shocks affect foreign banks' lending and non-lending activities in Hong Kong would also be relevant to the host country banking supervisors and policy makers.

Both the U.S. financial crisis and the euro area sovereign debt crisis sent shock waves across the globe. They are often referred to as global financial crises, dragging down economic growth around the world and disrupting markets in major financial centers. In today's world of globalization and connected markets, both the local economy in Hong Kong and the financial markets there were affected by the crises. It is therefore important to distinguish between the treatment effect, that is, foreign banks from crisis countries, and the systematic effect that affects all banks in Hong Kong. The difference-in-difference approach is well suited for this kind of inquiry.

Following the global financial crises, recessions in the crises countries as well as other advanced economies exhausted conventional monetary policy in many central banks when their policy rates reached the effective zero lower bound. The Federal Reserve, the European Central Bank, and the Bank of England conducted large-scale asset purchases of long-term bonds and other financial assets to stimulate economic growth, boost employment, and raise inflation towards its targeted level. These unconventional monetary policies of asset purchases are referred to as quantitative easing (QE). While the Bank of Japan has conducted quantitative easing since early 2000s, it expanded the program in 2013 and 2014 under the quantitative and qualitative easing program (QQE), and in 2016 added "yield curve control" to their QQE by explicitly targeting the 10-year Japanese government bond yield.

In addition to lowering long-term interest rates, QE creates a large quantity of reserves in the home country's banking system to finance the central bank's asset purchases. Whether QE works and the channels through which QE might work are still the subject of debate in both the

³ See for example, Financial Crisis Inquiry Commission (2011), and Gorton and Metrick (2012a, 2012b) and the references therein for the 2007-09 financial crisis in the U.S., and Lane (2012) and the references therein for the euro area sovereign debt crisis.

academic circle and the policy circle.⁴ Abstracting from how QE might work, we explore whether foreign banks from countries conducting QE performed differently in Hong Kong in their liquidity management and lending activities, relative to local banks and other foreign banks from countries without QE.

In the following subsections, we briefly chronicle the onset and development of the two financial crises, including the associated policy responses by the Federal Reserve and the European Central Bank. Rather than laying out all the twists and turns of the financial crisis, we highlight certain important developments that allow us to define the event dates in our empirical analysis. The last subsection provides a timeline of the QE programs by the Federal Reserve, European Central Bank, Bank of England, and Bank of Japan.

a. 2007-09 U.S. Financial Crisis

A prominent feature of the 2007-09 financial crisis that is relevant to this paper is the severe dislocation it caused in key financial markets that resulted in the seizing up of the interbank funding market. Figure 1 shows the spread between the 3-month London interbank offered rate (LIBOR) and the overnight indexed swap (OIS) rate, which reflects expectations of the overnight federal funds rate over the same 3-month period, from 2005 to 2013. This spread measures the risk premium that banks in the Libor panel face in borrowing 3-month term funds rather than overnight.

Before the financial crisis, the Libor-OIS spread was negligible, implying that banks paid a very small premium in borrowing term funds versus overnight funds. When the run on the wholesale funding market started in August 2007, the Libor-OIS spread spiked up.⁵ In response, shortly after the Federal Reserve's policy making body, the Federal Open Market Committee (FOMC) concluded their scheduled meeting on August 7, the Federal Reserve announced on August 10 that it was providing liquidity to facilitate the orderly functioning of financial markets.

While the liquidity injection by the Federal Reserve prevented the funding market from deteriorating, it did not arrest the skittishness in the market. Towards the end of 2007, the dislocation in the short-term funding market worsened, perhaps due to heightened demand for term funds around year-end when banks prepare for their year-end financial statements. On December 17, 2007, the Federal Reserve, along with four other foreign central banks in Canada,

⁴ See Haldane et al (2016) and the references therein for a review of the existing literature.

⁵ Although the run on the wholesale funding market began in August 2007, the buildup of financial excesses, including the credit boom, rising house prices, expansion of wholesale funding in the so called shadow banking system, had been happening over a number of years before the crisis. What triggered the run seemed to be the failure of a number of subprime mortgage originators in the first half of 2007, and the rapid deterioration in subprime-related security prices.

the U.K., the euro area, and Switzerland responded to the liquidity shock by announcing a number of extraordinary measures designed to address elevated pressures in short-term funding markets. In the U.S., the Federal Reserve started auctioning term funds to depository institutions under the Term Auction Facility (TAF). To meet the dollar shortage overseas, the FOMC authorized temporary swap lines with the European Central Bank and the Swiss National Bank.

The introduction of TAF provided much needed temporary relief to the interbank funding market, and the Libor-OIS spread eased somewhat in early 2008. However, large financial institutions in the U.S., especially broker-dealers which relied heavily on wholesale funding, remained under intense pressure. The financial markets weathered the forced sale of Bear Sterns in March 2008 reasonably well. In early September, the placement of both Fannie Mae and Freddie Mac into conservatorship by the U.S. Treasury pushed the financial system closer to the edge.

On September 15, Lehman Brothers filed for bankruptcy. Not only did financial markets plummet but credit markets seized up. (The spike in the Libor-OIS spread, while unprecedented, might also reflect few transactions taking place in the funding market.) Due to the interconnectedness of large financial institutions, as well as their common exposure, the solvency of many large financial firms was in doubt. Merrill Lynch, another large broker-dealer, announced on September 15 that it was being acquired by Bank of America. AIG received emergency liquidity assistance from the Federal Reserve on September 16. The Washington Mutual Bank was closed by its regulators, and announced on September 25 that it was being acquired by JP Morgan Chase. Wachovia announced on October 3 that it was being acquired by Wells Fargo.

The widespread uncertainty about the solvency and soundness of many banks in the U.S., including the very large ones, essentially drove information asymmetry in credit markets to extreme levels so that the market failed. Indeed, Flannery, Kwan, and Nimalendran (2013) reported that their measures of opacity in large banking firms using market microstructure data skyrocketed. As long as concerns about the solvency of large financial institutions remained in question, the interbank market was unsettled and illiquid. While the Libor-OIS spread continued to be elevated, it was unclear how much transaction volume took place at those rates. It seems quite conceivable that the demand for liquidity by banks reached the highest point during this crisis (Gale and Yorulmazer 2009).

To improve liquidity in the credit market, it became apparent that policy makers had to resolve the root cause of the credit market failure: information asymmetry between borrowers and lenders. In an effort to assist the public's understanding of the health of financial institutions, the Federal Reserve, joint with other federal banking regulators, conducted the Supervisory Capital Assessment Program (SCAP) on 19 of the largest banking firms in late 2008, and publicly announced the SCAP results in May 2009. The release of the SCAP findings, in conjunction with the mandatory recapitalization program, effectively reduced the opacity of

large financial firms and restored public confidence about their solvency. Soon afterward, the interbank funding market returned to normal.

b. 2010-11 Eurozone Sovereign Debt Crisis

With hind sight, the creation of the monetary union among the eurozone countries without a banking union or the fiscal union sowed the seed of fiscal and/or financial imbalances that eventually led to the sovereign debt crisis. Shambaugh (2012) and Lane (2012) provide a good overview of the euro's broader economic crisis. For the purpose of this paper, the relevant part of the euro area sovereign debt crisis is that it also evolved into a banking crisis, due to banks' exposures to both the public and the private sectors.

Figure 2 shows the 5-year Credit Default Swap spreads on the sovereign debt of six countries in the euro zone. This measure of default risk on Greece sovereign debt moved up in late 2009, as market participants started to focus on the slowing economy and fiscal imbalances. Rising default risk in sovereign debt quickly spread to other euro zone countries, including Portugal, Ireland, Spain, and Italy, which all had very bad economic fundamentals.

The sovereign debt crisis exposed the weakness of the banking system in crisis countries. More importantly, it also raised doubt about the soundness of banks in non-crisis countries due to opacity in their exposure. Figure 3 shows the 3-month euribor-eonia spread, which is a measure of the risk premium European banks faced in borrowing term funds versus overnight funds. Similar to the financial crisis in the U.S., at the height of the European sovereign debt crisis, the interbank market failed.

To ease liquidity problems in the euro area, the European Central Bank announced on December 8, 2011 that it was to conduct two three-year long-term refinancing operations (LTROs), one in December 2011 and the other in February 2012. The two LTROs totaled about 1.1 trillion euros. While strong demand reflected genuine funding needs by banks, the ECB estimated excess liquidity reached exceptionally high levels, suggesting that euro area banks were accumulating sizable precautionary liquidity buffers.⁶ With improving market conditions in the later part of 2012, the demand for excess liquidity declined and banks started repayment of the LTROs; the Euribor-Eonia spread also receded to its normal level. By late 2013, banks had repaid about 40 percent of their initial LTRO borrowings.

c. Quantitative Easing

In response to the financial crisis and the onset of the Great Recession in the U.S., the Federal Reserve had lowered the target for its policy rate, the federal funds rate, repeatedly in

⁶ See European Central Bank Monthly Bulletin in January 2014.

2008. By December 2008, the target federal funds rate was reduced to a range of 0 to 25 basis points, which was the lower bound for nonnegative nominal interest rate. Amid the zero lower bound, the Federal Reserve announced that it would start purchasing large quantities of agency debt and mortgage-backed securities to provide support to the mortgage and housing markets, officially launching the QE program in the U.S. From late 2008 to 2014, the Federal Reserve implemented QE through four separate programs, including the Maturity Extension Program in 2011.

Both the economic recession and the constraining zero lower bound in conventional monetary policy are not limited to the U.S. In March 2009, the Bank of England lowered its policy rate, the Bank rate, to 0.50 percent and announced that it would purchase up to £75 billion medium- and long-term bonds, mainly Treasury bonds (gilts). After the initial announcement in 2009, the Bank of England expanded the QE program seven times through August 2016, reaching a total of £435 billion.

In the euro area, the European Central Bank (ECB) had asset purchase programs that were aimed at reducing market stress during the European sovereign debt crisis, including covered bond purchases and discretionary purchases of sovereign bonds of member countries experiencing high yield spreads. These asset purchases were for financial stability purposes to address the risk of a breakup of the euro area. The European Central Bank first used QE to ease overall macroeconomic conditions in January 2015, when it announced that an expanded asset purchase program would begin in March of that year, composed mainly of long-term government bonds. Under its asset purchase program, the ECB purchased assets every month through the end of 2018.

In March 2001, the Bank of Japan was the first central bank to announce a QE policy of large-scale asset purchases to ease monetary policy with interest rates at the zero lower bound. In addition to low growth, the Bank of Japan also faced a deflation problem. This program was expanded over the following five years until 2006, and a second round was started in December 2008. In April 2013, the Bank of Japan under its then new governor Haruhiko Kuroda launched the much bigger quantitative and qualitative monetary easing program, QQE, so named to distinguish it from the earlier QE program. The QQE was expanded further in October 2014; and in September 2016, the Bank of Japan added “yield curve control” to its QQE by aiming its asset purchases to keep the yield on the 10-year government bond around zero.

While there were important differences in the QE programs across central banks, in terms of size, implementation details (stocks versus flows), types of assets purchased, and duration, one thing in common was that central banks financed their asset purchases by creating reserves in their banking system. Whether the excess reserves in the home country banking system had any effects on their global banks’ foreign operation, and thus spilled over to the host country banking system, is an empirical question that this paper addresses. In the empirical analysis, we distinguish the different QE programs by using home country specific dummies when the foreign

bank in Hong Kong was originated from a home country whose central bank conducted QE after the global financial crisis. Although the asset purchases have stopped (except for the Bank of Japan), the portfolios at the central banks have not been unwind other than natural runoff upon asset maturity (see Figure 4), implying the reserves in the banking system remain elevated.

IV. Methodology and Data

To test the effects of home country shocks on foreign bank branches in Hong Kong, controlling for systematic changes in the economic environment in the host country, we use the difference-in-difference approach that can be broadly described by the following regression:

$$\Delta Y_{it} = \alpha_t + \beta_t (\text{Shock}_{it}) + \varepsilon_{it}, \quad (1)$$

where

ΔY_{it} is the change in certain activities of interest of the i th foreign bank branch in Hong Kong before and after the Shock_{it} in country j ,

Shock_{it} equals one if the i th foreign bank branch's parent company is from country j and zero otherwise.

In equation (1), the intercept term α_t measures the systematic change in Y for all foreign banks in Hong Kong before and after the foreign shock during time t . Thus, the effects of any change in local economic conditions in Hong Kong, including the transmission of the foreign shock to the Hong Kong economy through other international linkages, should be absorbed by the intercept term α_t . The coefficient β_t tests whether a foreign bank branch in Hong Kong whose home country experiences a shock behaves significantly differently with regard to Y relative to other foreign branches in Hong Kong. Finding a significant coefficient of β_t would provide evidence that the home country shock is transmitted to the host country through the foreign branch channel, above and beyond other broad transmission channels.

Regarding the banking activities Y that we are interested in examining, they fall into four main categories: the holding of liquid assets, the amount of internal lending to/borrowing from the parent company, the amount of external lending to borrowers inside/outside Hong Kong, and the gathering of retail and wholesale deposits. Specifically, Y includes:

Liquid assets = the weighted amount of liquefiable assets as defined in the *return of liquidity position* reported by foreign bank branches in Hong Kong to the Hong Kong Monetary Authority;

Net Due = due from overseas offices – due to overseas offices;

Loans = total loans and advances to customers⁷;

Loans for use in Hong Kong = loans and advances to customers for use in Hong Kong⁸;

Loans for use outside Hong Kong = Loans minus Loans for use in Hong Kong;

Retail Deposits = total deposits from customers;

Wholesale Deposits = total balances due to banks;

Total Assets

We obtain bank entity-level data from the monthly return of assets and liabilities and the return of liquidity position that authorized institutions (banks) in Hong Kong are required to report to the Hong Kong Monetary Authority. Table 1 provides descriptive statistics for 143 foreign and local banks in Hong Kong from nine countries plus other countries, January 2004 to March 2019.

Monthly averages of Y are computed for each sample bank over the following three-months periods bracketing the 2007-09 U.S. financial crisis, the 2010-2011 euro zone sovereign debt crisis, and the quantitative easing programs conducted by the Federal Reserve, the ECB, the Bank of England, and the Bank of Japan.

Period A: 2007:4 to 2007:6 (pre-US crisis)

Period B: 2009:10 to 2009:12 (post-US crisis, pre-euro crisis)

Period C: 2012:10 to 2012:12 (post-euro crisis)

Period D: 2008:8 to 2008:10 (pre-QE)

Period E: 2019:1 to 2019:3 (current)

To compute the growth rate between two periods, we take the percentage change in Y from period n to period m, where Y is the monthly average over the three-month period n (m). When Y is used to measure composition, such as the loans-to-assets ratio, we compute the change in percentage points in Y from period n to period m, where Y is the monthly average of the ratio over the three-month period n (m). In the case of Net Due, which can be positive (for up streaming funds to parents) or negative (for down streaming funds from parents), we only compute the percentage point change in Net Due to Total Assets between period n and m.

⁷ Interbank bank loans are not included.

⁸ A loan is regarded as for use in Hong Kong if it finances or has a direct impact on the level of economic activity in Hong Kong. For most of the cases, this is determined by whether the loan is made available or disbursed in Hong Kong and by the principal place of business of the customer.

Before fitting equation (1) using bank-level data, we eliminate the outliers in our sample by dropping those observations with ΔY exceeding the 95th percentile or less than the 5th percentile.⁹ Our sample includes a wide range of banks by size, from small foreign banks to the three largest notes-issuing banks in Hong Kong. We fit equation (1) using Weighted Least Square with total assets at the beginning of the event window as weights, and report the robust standard errors in drawing inferences.

V. Results

a. U.S. Financial Crisis

Table 2 reports the effects of the US financial crisis on foreign banks in Hong Kong. ΔY is the change in 3-month average from the pre-crisis period, 2007 Q2, to the post-crisis period, 2009:Q4. Shock equals one if the foreign bank's parent is headquartered in the U.S., and zero otherwise.

Regarding liquidity management, all banks in Hong Kong increased their holding of liquid assets (as percent of total assets) after the U.S. financial crisis. After witnessing severe dislocation in the interbank funding market, especially in the U.S., raising the liquidity buffer would seem like a reasonable reaction.

Consistent with the increase in the holding of liquid assets, foreign banks in Hong Kong up streamed less funds to (or down streamed more funds from) their parents after the U.S. crisis. While this was not the case for US banks on average, the difference (from non-US banks) was not significant. It is noteworthy that the various liquidity facilities introduced by the Federal Reserve in the U.S. during the crisis had not led to significant differences in intrafirm funding between US global banks and other banking organizations.

On lending activities, while banks in Hong Kong on average expanded their loan portfolio between 2007:Q2 and 2009:Q4, US banks lend significantly less than non-US banks. The pull back in lending by US banks was mostly to local borrowers, that is, loans for use in Hong Kong; the coefficient of the change in loans for use outside Hong Kong was not significantly different between US and non-US banks. To the extent that the local borrowers in Hong Kong might not be able to substitute their borrowings from US banks to non-US banks, perhaps due to unique lending relationship or existing lending facilities, any binding credit constraint could undermine real economic activities and employment more generally.

As a result of stagnant loan growth among US banks in Hong Kong, US banks on average shrunk their size (in terms of total assets) after the financial crisis while non-US banks continued to

⁹ This procedure is expected to exclude the effects of mergers and acquisitions that were taken place during the event window.

grow. The difference in asset growth was significant. The results are consistent with the experience in Japan as shown in Peek and Rosengren (1997).

Turning to funding activities, banks in Hong Kong increased their level of retail deposits significantly from 2007:Q2 to 2009:Q4, but the growth was commensurate with asset growth so that the ratio of retail deposit to total asset was about unchanged on average. For US banks in Hong Kong, their lower asset (loan) growth had the effect of significantly boosting their retail deposit to total asset ratio.

After the financial crisis, US banks in Hong Kong relied less on wholesale deposit funding than non-US banks on average, although the difference was not statistically significant. The run in the wholesale (repo) funding market in the U.S. was a leading catalyst that deepened the housing crisis to a full blown financial crisis, which could sharpen US banks response to lower their reliance on wholesale funding.

The fraction of total income derived from noninterest income rose significantly for all banks in Hong Kong after the financial crisis. While the US banks' noninterest income rose less than non-US banks, the difference was not significant. Decline in interest rates during the event window likely diminished interest income for all banks.

b. European Sovereign Debt Crisis

Table 3 reports the effects of the European sovereign debt crisis on foreign banks in Hong Kong. ΔY is the change in 3-month average from the pre-crisis period, 2009:Q4, to the post-crisis period, 2012:Q4. Shock equals one if the foreign bank's parent is headquartered in the euro area, and zero otherwise.

On liquidity management, banks in Hong Kong on average did not change their holding of liquid assets (as percent of total assets) during the European sovereign debt crisis. The point estimate suggests that on average banks originated from the euro area in Hong Kong increased their liquid asset-to-total asset ratio, but the difference was not statistically significant.

From 2009:Q4 to 2012:Q4, foreign banks in Hong Kong up streamed less funds to (or down streamed more funds from) their parents, as evidenced by the significantly negative coefficient of net due to total assets; while euro area banks up streamed even less than non-euro area banks, the difference was not statistically significant.

On lending activities, during the European debt crisis, banks in Hong Kong on average expanded their loan portfolio significantly between 2009:Q4 and 2012:Q4, but banks from the euro area lend significantly less than non-euro area banks. As a result, European banks' share of Hong Kong's total loans and advances shrank to about 4.5% at the end of 2012, down from 9.0% at the

end of 2006.^{10 11} Unlike the U.S. financial crisis, the pull back in lending by euro area banks was mostly to borrowers outside Hong Kong, suggesting that the effects on local credit supply might be more limited.

Similar to the results of the U.S. financial crisis, euro area banks in Hong Kong on average shrunk their size (in terms of total assets) after the European debt crisis while non-euro area banks continued to grow. The finding of global banks' home country crisis on their growth abroad is robust.

On foreign banks' funding activities, the results suggest that the crisis significantly altered euro area banks' funding mix in Hong Kong. Relative to the control group, euro area banks increased retail deposit-to-total asset ratio significantly, while decreased wholesale deposit-to-total asset ratio significantly.¹² The significant decline in wholesale funding by euro area banks in Hong Kong followed the two LTROs by the ECB, consistent with the LTROs relieving funding pressure faced by European banks. Note that the change in foreign banks' funding strategy in Hong Kong could also foster more competition in the retail deposit market there.

During the European sovereign debt crisis, the ratio of noninterest income to total income declined for banks in Hong Kong. Against the backdrop of a fairly stable interest rate environment, this suggests an expansion of lending activities relative to fee based activities by Hong Kong banks on average. Euro area banks in Hong Kong, on the other hand, significantly expanded the contributions of fee-based income to total income. Together with the pull back in lending by euro area banks, the crisis had changed these banks' business model in Hong Kong.

c. Quantitative Easing

Table 4 reports the effects of quantitative easing by four major central banks on foreign and domestic banks in Hong Kong. As described in Section II, the Federal Reserve started large scale asset purchases after its policy rate reached the zero lower bound in late 2008. The QE policy was quickly followed by the Bank of England, the ECB, and the Bank of Japan, which either started or greatly expanded their asset purchase programs to provide stimulus to their economies. For this analysis, we choose 2008:Q3 as the pre-QE period. Although the Federal Reserve, the Bank of England, and the ECB have stopped expanding their balance sheet as of 2019, they have not (actively) unwind their asset purchases and their balance sheets (and hence

¹⁰ Authors' calculation.

¹¹ The market share of credit extended by European banks in Hong Kong's syndicated loan market declined from 29% during 2007-2009 to 15% in 2011 and 16% in 2012.

¹² Non-European banks expanded their wholesale deposits much more rapidly than retail deposits, resulting in a significant drop (increase) in the retail deposits (wholesale deposits) to total assets ratio. This was not the case for European banks.

reserves in the respective banking system) remain elevated. Currently, the Bank of Japan is still expanding its balance sheet. We choose 2019:Q1 as the post-QE period. To allow for country-specific QE effects on Hong Kong banks, four QE dummies are included in the regression: USQE, UKQE, ECBQE, and JAPQE.

Regarding liquidity management, from 2008:Q3 to 2019:Q1, banks in Hong Kong increased their liquidity buffer significantly, as evidenced by the significantly higher liquid asset-to-total asset ratio on average. However, foreign banks from the euro area and Japan did not increase the liquidity buffer by as much, and both the ECBQE and the JAPQE are significantly negative.

The excess reserves in the banking system created by the QE at the home country are expected to lessen global banks' upstreaming of funds from their foreign subsidiaries. This is borne out by the regression results of change in net due to total assets: all four QE dummies are significantly negative. The findings confirm that foreign banks in Hong Kong up streamed less funds to (or down streamed more funds from) their parents when their home country central banks conducted quantitative easing. Together with the results on the change in liquid asset ratio, quite clearly, the quantitative easing in the home country has significant effects on global banks' liquidity management in the host country.

Turning to the effects of QE at home country on global banks' lending in the host country, the results suggest that loan growth among local banks and foreign banks from non-QE countries outpaced those foreign banks from QE countries. Total loans outstanding by UK banks in Hong Kong actually shrunk during the QE window. Lending to local borrowers (loans for use in Hong Kong) by US and UK banks in Hong Kong lagged their non-QE counterparts significantly. These in turn made foreign banks from QE countries in Hong Kong grew significantly slower, in terms of total assets. Overall, the findings suggest that the massive excess reserves created by the QE in the home country do not lead their global banks to register faster loan growth or asset growth in the host country, assuming the demand for loans in Hong Kong was similar between QE banks and non-QE banks. The shortfall in loan growth by QE banks in Hong Kong seems like an interesting research and policy question for future works.

On foreign banks' funding activities, Japanese banks in Hong Kong increased their retail deposit-to-total asset significantly, while UK banks decreased their wholesale deposit-to-total asset significantly. These findings are broadly consistent with the results on liquidity management.

Finally, during the QE, the ratio of noninterest income-to-total income for euro area banks in Hong Kong rose significantly, relative to other banks. This provides further evidence that euro area banks in Hong Kong has (permanently) changed their business model after the European debt crisis. We do not find significant difference in noninterest income for foreign banks originated from the US, UK, and Japan.

VI. Conclusions

In this paper, we use the 2007-09 U.S. financial crisis and the 2011-12 European sovereign debt crisis as quasi-natural experiments to examine how shocks in a home country affect global banks' foreign operation in a host country (Hong Kong) using both local banks and foreign banks from non-crisis countries as controls. The difference-in-difference method is assumed to control for demand-side factors so that our analysis reveals supply-side effects. Using a similar framework, we also examine whether and how the quantitative easing by four major central banks affect their global banks' operation in Hong Kong.

We do not find the financial crises in the U.S. and the euro area had significant effects on their foreign banks' liquidity management in Hong Kong. This could be due to the liquidity facility introduced by the Federal Reserve, and the refinancing operations by the ECB effectively provided ample liquidity in their home countries' banking system. However, during the crises, foreign banks from crisis countries significantly pulled back their lending in Hong Kong, relative to their non-crisis counterparts, resulting in significantly slower asset growth. This could have adverse effects on the host country's economy if there are no readily available close substitutes for foreign banks' credit services.¹³ Banking observers in Hong Kong noted that while the shortfall of short-term loans (e.g. trade finance) might be made up by domestic banks and other Asian banks, there was a general decline in long-term loans during the financial crisis. Thus, the shortage of long-term finance might have filtered through to the cost of borrowing.¹⁴

There is also evidence that following the crisis, foreign banks from crisis countries relied more on retail deposit funding, and less on wholesale deposit funding.

Quantitative easing by central banks is found to have significant effects on their global banks' liquidity management in Hong Kong. Foreign banks held less liquid assets, and up streamed less funds to their parents when their home country central bank conducted QE. QE banks in Hong Kong are also found to lend less, and grew their assets slower, than non-QE banks.

¹³ Relationship lending, especially among small business lending, could make it difficult or costly to switch banks.

¹⁴ For example, the average pricing of syndicated loans arranged for Hong Kong's corporations increased markedly since the first half of 2011, from 114 bps over the reference rate, to around 243 bps in July-August 2012, based on authors' calculation.

References

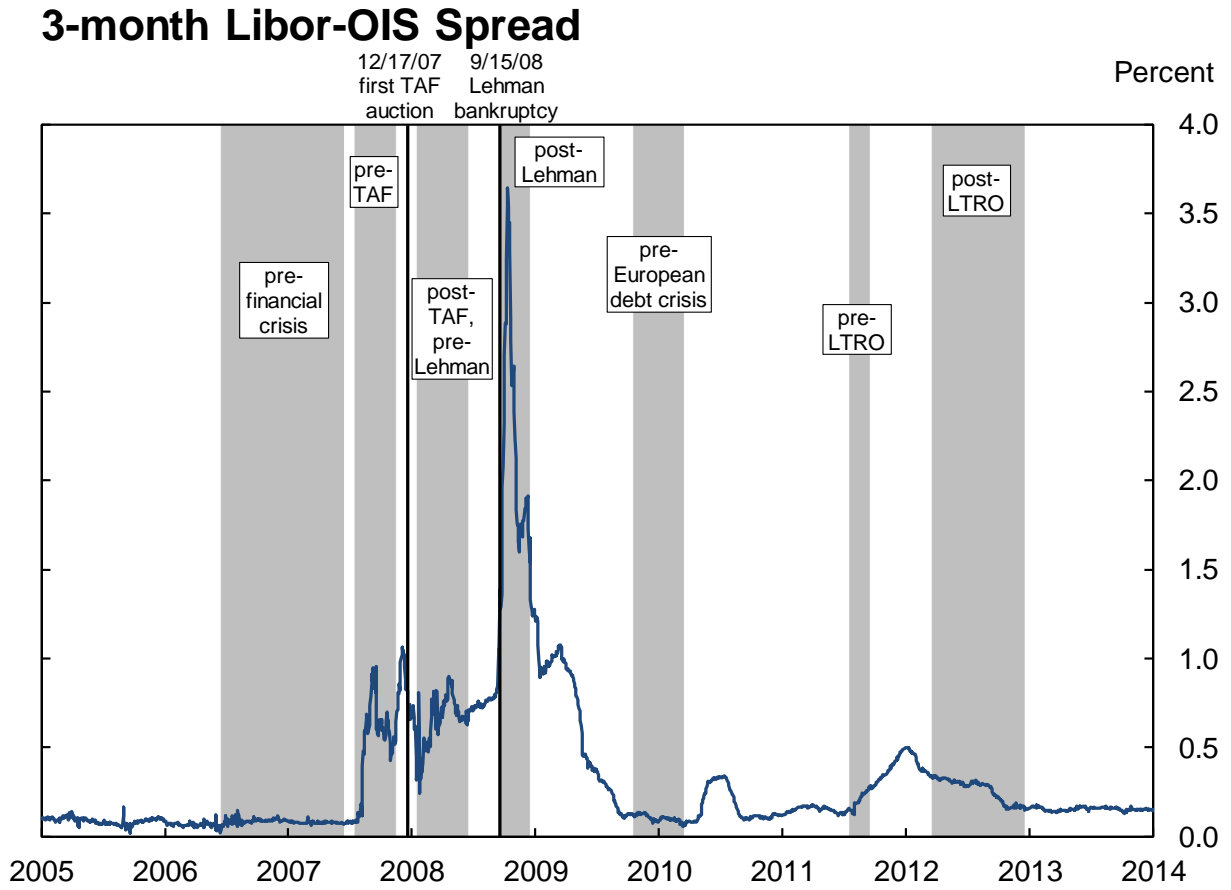
- Cetorelli, N. and L. Goldberg, 2012, Liquidity Management of U.S. Global Banks: Internal Capital Markets in the Great Recession, Federal Reserve Bank of New York Staff Report.
- Financial Crisis Inquiry Commission (2011). The Financial Crisis Inquiry Report: Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States, authorized ed. New York: Public Affairs.
- Financial Stability Board, 2019, Global Monitoring Report on Non-Bank Financial Intermediation 2018.
- Flannery, M., S. Kwan, and M. Nimalendran, 2013, The 2007-2009 Financial Crisis and Bank Opacity, *Journal of Financial Intermediation*, 22 (1), 55-84.
- Gale, D. and T. Yorulmazer, 2009, Liquidity Hoarding, New York University Working Paper.
- Gorton, G. B., and A. Metrick, 2012a, The Financial Crisis of 2007-2009, Yale International Center for Finance Working Paper No. 12-20.
- Gorton, G. B., and A. Metrick, 2012b, Getting up to speed on the financial crisis: A One-weekend-reader's guide," NBER Working Paper Series 17778. Cambridge, Mass.: National Bureau of Economic Research, January, www.nber.org/papers/w17778.
- Haldane, A. G., M. Roberts-Sklar, T. Wieladek, and C. Young, 2016, QE: The Story So Far, Bank of England Working Paper 624.
- Hong Kong Monetary Authority, 2013, Half-Yearly Monetary and Financial Stability Report, March 2013.
- Hong Kong Monetary Authority, 2014, Half-Yearly Monetary and Financial Stability Report, March 2014.
- Kashyap, A.K., J.C. Stein, and D.W. Wilcox, 1993, Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance, *American Economic Review*, 83(1), 78-98.
- Kashyap, A.K. and J.C. Stein, 2000, What Do a Million Observations on Banks Say About the Transmission of Monetary Policy? *American Economic Review*, 90(3), 407-428.
- Khwaja, A.I. and A. Mian, 2008, Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market, *American Economic Review*, 98(4), 1413-1442.
- Lane, P. R., 2012, The European Sovereign Debt Crisis, *Journal of Economic Perspectives*, 26 (3), 49-68.
- Paravisini, D., 2008, Local Bank Financial Constraints and Firm Access to External Finance, 2008, *Journal of Finance*, 63(5), 2161-2193.

Peek, J. and E. Rosengren, 1997, The International Transmission of Financial Shocks: The Case of Japan, *American Economic Review*, 87(4), 495-505.

Shambaugh, J., 2012, "The Euro's Three Crises," *Brookings Papers on Economic Activity*, Spring 2012, 157-211

Wong, E., A. Tsang, and S. Kong, 2014, Implications of Liquidity Management of Global Banks for Host Countries - Evidence from Foreign Bank Branches in Hong Kong, HKIMR Working Paper No. 21/2014.

Figure 1: 3-month Libor-OIS Spread, daily, 2005 to 2013.



Source: Bloomberg

Figure 2: 5-year Credit Default Swap Spreads on Sovereign Debts of Euro Area Countries

Eurozone Sovereign 5-year CDS Spreads

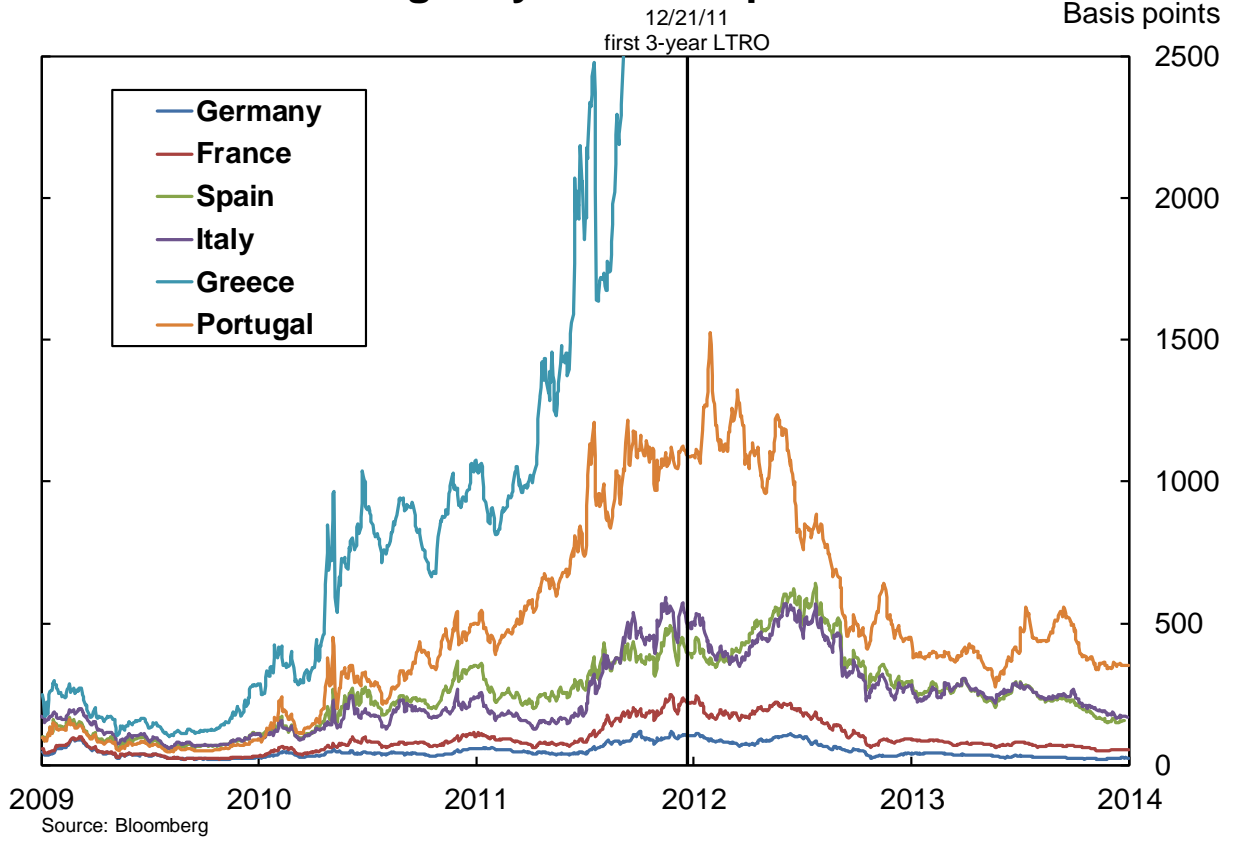
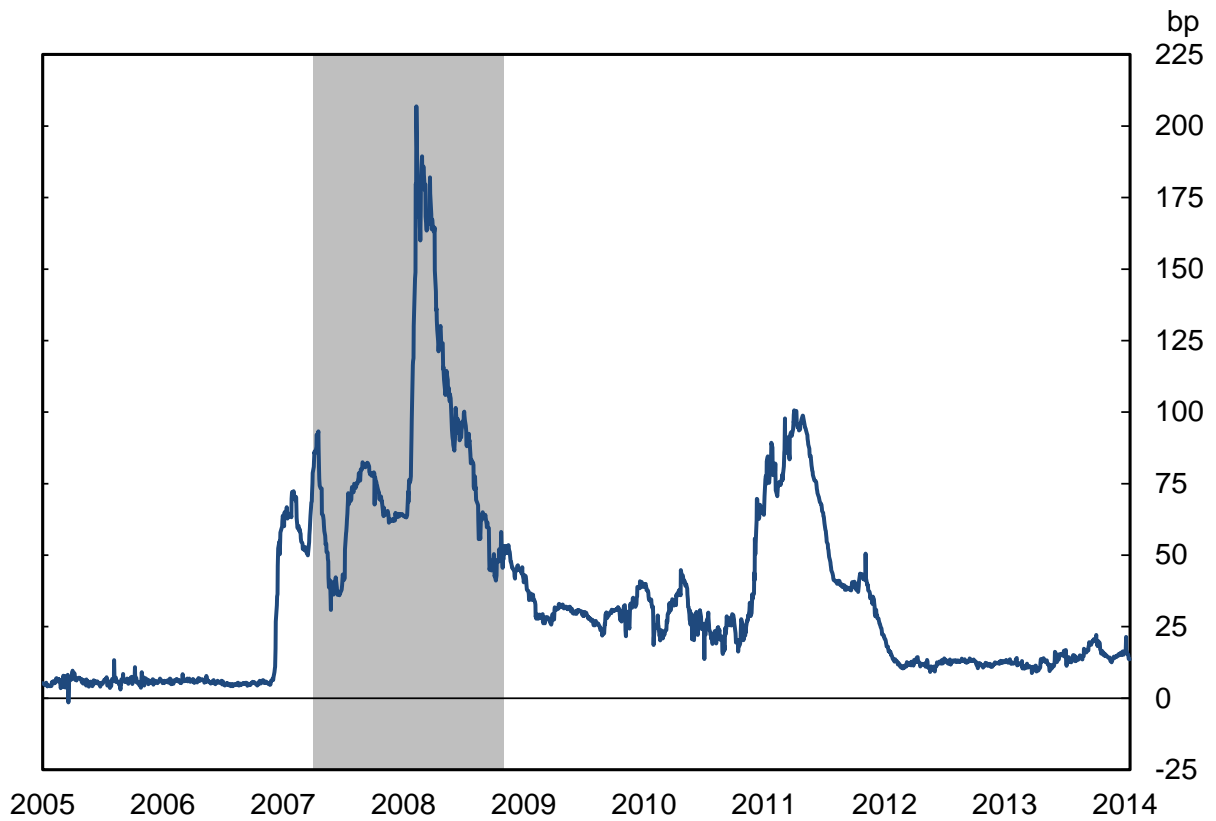


Figure 3: 3-month Euribor-Eonia Spread, daily, 2005-2013.

3-month Euribor-EONIA Spread



Source: Bloomberg

The shaded bar denotes the NBER Recession in the U.S.

Figure 4: Central bank balance sheets

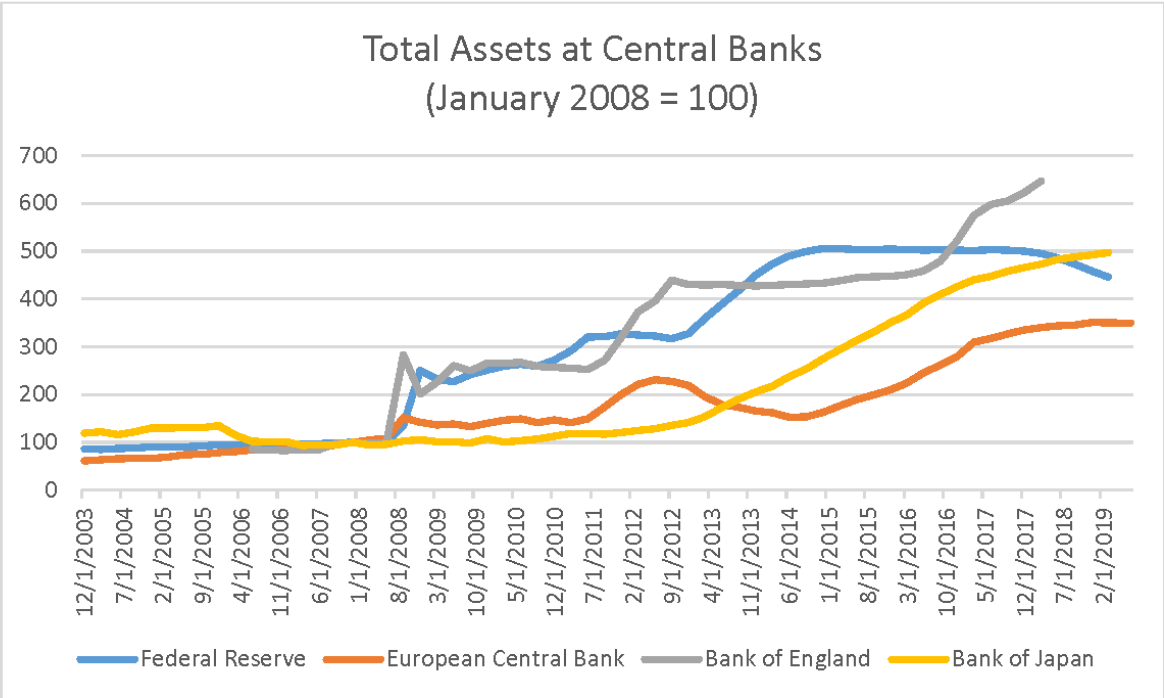


Table 1: Descriptive Statistics (in percent)

Based on monthly data of 143 banks in Hong Kong, January 2004 to March 2019.

Country		Liquid Asset/ Total Assets	Net Due From/ Total Assets	Total Loans/ Total Assets	Retail deposits/ Total Assets	Wholesale deposits/ Total Assets
Switzerland	No. of observations	861	861	861	861	861
	Mean	8.66	10.49	33.08	62.50	31.83
	Median	6.31	4.70	32.84	64.07	29.43
	Standard deviation	10.22	28.11	16.72	17.92	22.61
Germany	No. of observations	964	964	964	964	964
	Mean	3.28	-2.49	21.93	15.12	71.73
	Median	0.72	-1.85	22.34	9.24	77.61
	Standard deviation	6.00	35.06	14.61	15.04	23.28
Spain	No. of observations	318	318	318	318	318
	Mean	7.79	-26.06	40.70	10.74	82.05
	Median	3.17	-17.82	39.14	6.83	84.71
	Standard deviation	9.35	30.78	19.31	11.92	12.61
Italy	No. of observations	626	626	626	626	626
	Mean	6.16	-11.43	25.29	7.62	81.43
	Median	3.30	-4.72	20.95	4.51	83.87
	Standard deviation	8.19	39.83	20.58	9.41	14.07
France	No. of observations	1017	1017	1017	1017	1017
	Mean	6.54	-2.04	20.69	13.89	52.53
	Median	5.91	0.52	18.95	10.00	50.73
	Standard deviation	6.78	31.75	15.09	12.74	28.70

UK	No. of observations	883	883	883	883	883
	Mean	10.95	2.76	30.08	43.16	33.89
	Median	9.09	0.00	33.86	37.25	20.55
	Standard deviation	10.40	28.62	19.29	28.00	30.48
Japan	No. of observations	2027	2027	2027	2027	2027
	Mean	3.65	-30.05	31.22	14.55	73.13
	Median	2.24	-22.93	28.97	9.37	78.76
	Standard deviation	4.78	38.38	23.72	13.81	26.92
US	No. of observations	1880	1880	1880	1880	1880
	Mean	4.88	7.94	23.06	43.13	41.47
	Median	1.39	4.09	16.94	42.28	38.08
	Standard deviation	8.52	32.96	24.80	28.10	29.05
China	No. of observations	1681	1681	1681	1681	1681
	Mean	4.89	-1.03	44.10	53.86	23.48
	Median	3.97	1.36	43.01	59.54	19.93
	Standard deviation	4.95	12.45	10.13	21.88	18.85
Other	No. of observations	13337	13337	13337	13337	13337
	Mean	4.03	-5.57	32.59	36.45	49.29
	Median	1.34	-2.12	32.47	31.34	51.10
	Standard deviation	7.17	30.22	20.80	28.14	28.66
Local	No. of observations	1352	1352	1352	1352	1352
	Mean	7.72	1.88	33.10	72.12	2.90
	Median	4.72	0.18	41.32	74.02	1.85
	Standard deviation	9.40	3.03	19.63	12.75	3.43

Table 2: US financial crisis on foreign banks in Hong Kong, 2007:Q2 to 2009:Q4

WLS regression estimates of: $\Delta Y_{it} = \alpha + \beta t (\text{Shock}_{it}) + \varepsilon_{it}$, where Shock_{it} equals one if the i^{th} foreign bank's parent was from the U.S., zero otherwise.

Dependent variable		Coefficient	Standard error
Change in Liquid Assets to Total Assets in percentage points	Shock	3.53	(2.35)
	Intercept	4.99***	(1.45)
Change in Net Due to Total Assets in percentage points	Shock	3.20	(3.02)
	Intercept	-3.12**	(1.42)
Percent change in Total Loans	Shock	-47.93***	(10.91)
	Intercept	27.48***	(5.77)
Percent change in Loans for use in Hong Kong	Shock	-47.28***	(9.84)
	Intercept	18.45***	(3.54)
Percent change in Loans for use outside Hong Kong	Shock	-23.39	(63.11)
	Intercept	44.59***	(12.38)
Percent change in Total Assets	Shock	-30.82***	(8.21)
	Intercept	24.52***	(3.80)
Change in Total Loans to Total Assets in percentage points	Shock	-2.36	(2.75)
	Intercept	0.06	(0.88)
Change in Retail Deposits to Total Assets in percentage points	Shock	4.76*	(2.41)
	Intercept	0.87	(1.12)
Change in Wholesale Deposits to Total Assets in percentage points	Shock	-3.95	(3.34)
	Intercept	0.81	(1.07)
Change in noninterest income to total income in percentage points	Shock	-4.08	(4.15)
	Intercept	21.41***	(1.99)

Note: Robust standard errors are in parenthesis. ***, **, * indicate significance at the 1% 5% and 10% level respectively.

Table 3: Euro debt crisis on foreign banks in Hong Kong, 2009:Q4 to 2012:Q4

WLS regression estimates of: $\Delta Y_{it} = \alpha + \beta t (\text{Shock}_{it}) + \varepsilon_{it}$, where Shock_{it} equals one if the i^{th} foreign branch's parent was from euro area, zero otherwise.

Dependent variable		Coefficient	Standard error
Change in Liquid Assets to Total Assets in percentage points	Shock	3.22	(2.19)
	Intercept	-1.09	(0.81)
Change in Net Due to Total Assets in percentage points	Shock	-7.43	(5.02)
	Intercept	-3.38*	(1.90)
Percent change in Total Loans	Shock	-60.13**	(29.58)
	Intercept	92.53***	(18.65)
Percent change in Loans for use in Hong Kong	Shock	-30.76	(30.35)
	Intercept	62.78***	(14.92)
Percent change in Loans for use outside Hong Kong	Shock	210.98***	(37.48)
	Intercept	243.05***	(27.70)
Percent change in Total Assets	Shock	-68.95***	(10.66)
	Intercept	45.81***	(6.22)
Change in Total Loans to Total Assets in percentage points	Shock	1.68	(2.21)
	Intercept	6.24***	(1.21)
Change in Retail Deposits to Total Assets in percentage points	Shock	4.33**	(1.91)
	Intercept	-3.42***	(1.00)
Change in Wholesale Deposits to Total Assets in percentage points	Shock	-8.15**	(3.33)
	Intercept	0.95	(0.70)
Change in noninterest income to total income in percentage points	Shock	11.24***	(3.55)
	Intercept	-5.35***	(1.39)

Note: Robust standard errors are in parenthesis. ***, **, * indicate significance at the 1% 5% and 10% level respectively.

Table 4: QEs on foreign banks in Hong Kong, 2008:Q3 to 2019:Q1

WLS regression estimates of: $\Delta Y_{it} = \alpha t + \beta_1 t (\text{USQE}_{it}) + \beta_2 t (\text{UKQE}_{it}) + \beta_3 t (\text{ECBQE}_{it}) + \beta_4 t (\text{JAPQE}_{it}) + \varepsilon_{it}$, where

USQE_{it} equals 1 if the ith foreign bank's parent was from the U.S., 0 otherwise;

UKQE_{it} equals 1 if the ith foreign bank's parent was from the U.K., 0 otherwise;

ECBQE_{it} equals 1 if the ith foreign bank's parent was from the euro area, 0 otherwise;

JAPQE_{it} equals 1 if the ith foreign bank's parent was from Japan., 0 otherwise.

Dependent variable		Coefficient	Standard error
Change in Liquid Assets to Total Assets in percentage points	USQE	1.04	(3.69)
	UKQE	-6.29	(3.80)
	ECBQE	-3.76**	(1.76)
	JAPQE	-3.60***	(1.29)
	Intercept	8.53***	(1.13)
Change in Net Due to Total Assets in percentage points	USQE	-8.48*	(4.56)
	UKQE	-27.40***	(6.74)
	ECBQE	-27.88***	(8.05)
	JAPQE	-25.37***	(6.29)
	Intercept	0.10	(1.73)
Percent change in Total Loans	USQE	-27.75	(49.42)
	UKQE	-304.71***	(18.26)
	ECBQE	-5.41	(122.44)
	JAPQE	-16.33	(43.80)
	Intercept	205.22***	(18.26)
Percent change in Loans for use in Hong Kong	USQE	17.64	(64.65)
	UKQE	-263.41***	(16.26)
	ECBQE	-41.86	(79.60)
	JAPQE	-54.82	(43.25)
	Intercept	163.41***	(16.26)
Percent change in Loans for use outside Hong Kong	USQE	-211.71***	(50.86)
	UKQE	-510.07***	(41.03)
	ECBQE	-60.67	(152.45)
	JAPQE	40.43	(65.88)
	Intercept	411.90***	(40.98)
Percent change in Total Assets	USQE	-124.36***	(24.90)
	UKQE	-206.08***	(17.03)
	ECBQE	-154.37***	(22.97)
	JAPQE	-61.75**	(30.29)
	Intercept	165.82***	(17.03)

Change in Total Loans to Total Assets in percentage points	USQE	3.18	(2.98)
	UKQE	-24.49***	(2.29)
	ECBQE	5.97	(5.46)
	JAPQE	6.73***	(1.87)
	Intercept	6.19***	(1.67)
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Change in Retail Deposits to Total Assets in percentage points	USQE	8.78	(5.78)
	UKQE	-3.23	(6.02)
	ECBQE	-0.21	(3.54)
	JAPQE	5.70*	(2.98)
	Intercept	-3.88***	(1.05)
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Change in Wholesale Deposits to Total Assets in percentage points	USQE	-9.85	(7.49)
	UKQE	-30.21***	(4.65)
	ECBQE	-8.59	(6.62)
	JAPQE	-5.81	(4.46)
	Intercept	-0.77	(1.20)
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Change in noninterest income to total income in percentage points	USQE	-5.06	(6.79)
	UKQE	-2.52	(1.79)
	ECBQE	23.25***	(5.63)
	JAPQE	-0.00	(3.94)
	Intercept	1.67	(1.79)

Note: Robust standard errors are in parenthesis. ***, **, * indicate significance at the 1% 5% and 10% level respectively.