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**Working Paper**

## Spillovers of the United States' unconventional monetary policy to emerging Asia: The bank lending channel

ADB Working Paper, No. 619

**Provided in Cooperation with:**

Asian Development Bank Institute (ADBI), Tokyo

*Suggested Citation:* Xu, Ying; Hai Anh La (2016) : Spillovers of the United States' unconventional monetary policy to emerging Asia: The bank lending channel, ADB Working Paper, No. 619, Asian Development Bank Institute (ADBI), Tokyo

This Version is available at:

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## **ADB Working Paper Series**

### **SPILLOVERS OF THE UNITED STATES' UNCONVENTIONAL MONETARY POLICY TO EMERGING ASIA: THE BANK LENDING CHANNEL**

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Ying Xu and Hai Anh La

No. 619  
December 2016

**Asian Development Bank Institute**

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Suggested citation:

Xu, Y., and H. A. La. 2016. Spillovers of the United States' Unconventional Monetary Policy to Emerging Asia: The Bank Lending Channel. ADBI Working Paper 619. Tokyo: Asian Development Bank Institute. Available: <https://www.adb.org/publications/spillovers-united-states-unconventional-monetary-policy-emerging-asia>

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In this publication, "\$" refers to US dollars.

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**Abstract**

This paper assesses the spillover effects of the United States' unconventional monetary policy (i.e., quantitative easing programs adopted during 2008–2014) on the Asian credit market. With a focus on cross-border bank lending, we employed firm-level loan data with regard to the syndicated loan market and measured the international bank lending channel through changes in United States dollar-denominated loans extended to Asian borrowers. We found that the growth of dollar credit in Asia increased substantially in response to quantitative easing in the United States financial market. The results of this study confirm the existence of the bank lending channel in Asia and emphasize the role of credit flows in transmitting financial conditions. The paper also provides new evidence of cross-border liquidity spillover in the syndicated loan market. We found that the overall spillover effect was large but differed significantly in Asia by types of borrowing firms, financing purposes, and loan terms at different stages of the quantitative easing programs. The paper concludes with a discussion of relevant policy implications for the region.

**JEL Classification:**F21, F36, G01, G21, G28

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# 1. INTRODUCTION

The enormous asset purchase programs recently implemented by the United States (US) Federal Reserve following the 2007–2009 global financial crisis (GFC) are unprecedented in modern US history. Over a 5-year period (2008–2014), the Federal Reserve's balance sheet (in US dollars) increased more than five-fold from below \$800 billion to \$4.4 trillion. These asset purchase programs are the main components of the so-called unconventional monetary policy adopted by the US Federal Reserve, when compared to traditional “interest-rate” policies. While the positive effect of this unconventional monetary policy on the recovery of the post-GFC US economy is generally agreed upon, a major point of debate and, to a certain extent, concern are its cross-border spillover effects on the rest of the world, and especially emerging market economies (Chen, Mancini–Griffoli, and Sahay 2014; Lim, Mohapatra, and Stocker 2014; Bowman, Londono, and Saprizo 2015; Morais, Paydro, and Ruiz 2015).

It is well-known that Asian economies are becoming increasingly integrated with global financial markets, and the US market in particular. Thus, spillover effects are expected, and presumably exist in a number of formats and through a range of channels. A good understanding of the spillover effects on Asia is essential for an informed policy response in the region (Morgan 2011; Cho and Rhee 2013; Kawai 2015).

A growing pool of literature on the international transmission of unconventional monetary policies has identified a set of theoretical channels of transmission and empirical evidence from regions across the world, including Asia. These conceptualized channels range from the exchange rate, to exports, financial markets, and monetary policy response (Bruno and Shinn 2003; Caruana 2013; Kawai 2015). Empirically, spillover effects are established on (i) prices, such as the exchange rate and interest rates (both short-term and long-term); and (ii) quantities, such as exports and capital flows (Hausman and Wongswan 2011; He and McCauley 2013; Wright 2014; Bowman, Londono, and Saprizo 2015).

This paper examines spillover effects on capital flows, specifically bank flows. In particular, we assess the bank lending channel as a means of transmitting the US unconventional monetary shock to the Asian credit market. A distinctive feature of the transmission mechanism is that international banks facing large shocks to their liquidity supply pass these fluctuations on to borrowing firms, irrespective of the firms' overall credit worthiness. For instance, it was found that the 1998 Russian default as a negative liquidity shock was transmitted to Peru through reduced bank lending by international banks (Schnabl 2012). In addition, during the GFC, significant levels of bank credit withdrawals from emerging Asia demonstrated the recent Asian experience of the bank lending channel spreading external liquidity shocks in the region (Xu and La 2015).

Adding to this conventional understanding of the role of banks in propagating global liquidity shocks, Bruno and Shin (2014) proposed a new element by linking exchange rates to changes in global liquidity. In their model of global bank behavior, easing financial conditions in the US causes upward pressure on local currency appreciation against dollars, which strengthens borrowers' balance sheet positions and therefore increases bank leverage. Empirically, Morais et al. (2015) found that expansive quantitative easing in the US is indeed associated with a higher supply of loans from European and US banks in Mexico.

The current study is focused on emerging Asia. We use dollar credit (i.e., loans denominated in US dollars) to capture the full scale of shock transmission to the Asian credit market. As liquidity carriers, US banks may play a direct role in transmitting US liquidity conditions to Asia through cross-border bank lending. Nevertheless, bank ownership fails to capture the full transmission because many intermediators indirectly facilitate the transmission. First, global banks headquartered in Europe have been found to serve as chief intermediators of dollar credit to Asia (Shin 2011; 2013). They collect dollar funding from their foreign branches in the US market, then deploy the funding globally, including into the Asian market. While European banks were forced to retreat from Asia after the sovereign debt crisis hit the European continent, they have gradually been replaced by regional banks from Singapore and Hong Kong, China (Remolona and Shim 2015). In addition, many local banks (e.g., in the Republic of Korea [henceforth, Korea]) fund local lending by borrowing in the global wholesale market, which constitutes another group of intermediators.

Accordingly, compared to bank ownership, dollar credit identifies both direct transmission from US banks and indirect transmission from European global banks, Asian regional banks, and local banks as intermediators. It can be argued that some dollar credit may come internally from local dollar deposits; however, He and McCauley (2013) found that the region's foreign currency credit extension has grown faster than regional foreign currency deposits, implying that the region depends heavily on external sources to fund dollar loans. Meanwhile, it could be argued that some cross-border loans may be denominated in local currencies. Nevertheless, the "original sin" hypothesis remains relevant for most emerging Asian economies, as their external debts are typically denominated in foreign currencies.<sup>1</sup>

This study uses firm-level loan data compiled from Thomson Reuters Loan Pricing Corporation's (LPC) DealScan. The database is widely known for its comprehensive coverage of the global syndicated loan market, which accounts for a substantial part (around 40%) of international banking activity in Asia.

To our knowledge, this paper is the first firm-level study of the spillover effects of US quantitative easing programs on the Asian credit market.

## **2. UNITED STATES QUANTITATIVE EASING PROGRAMS AND THE ASIAN SYNDICATED LOAN MARKET**

### **2.1 United States Large-Scale Asset Purchasing Programs**

The US economy fell into a deep recession following the sub-prime mortgage crisis and subsequent financial crisis of 2007–2009. Gross domestic product contracted continuously for 18 months from December 2007 to June 2009. Conventional expansionary monetary policies failed to turn around the largest economy in the world; instead, nominal interest rates were stuck in the infamous "zero lower bound." The US Federal Reserve responded by unprecedentedly adopting a series of large-scale asset purchasing programs, also known as quantitative easing programs, from late 2008. The first quantitative easing programs, which focused on the purchase of

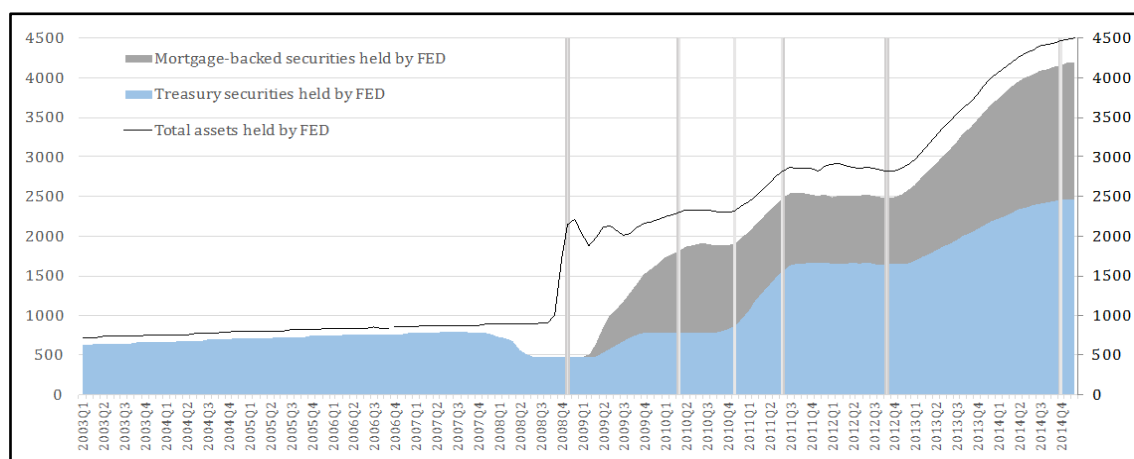
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<sup>1</sup> The PRC authorities began promoting the internationalization of the renminbi in early 2006. The set of policy initiatives implemented included the establishment of the dim sum bond (renminbi-denominated) and the promotion of cross-border trade renminbi settlement. Nevertheless, the effects on the credit market remain contested.

government-sponsored enterprise debt and mortgage-backed securities, led the Federal Reserve's balance sheet to increase from below \$800 billion on average, to more than \$1.5 trillion (Figure 1). The second and third phases of the unconventional monetary policy (quantitative easing period [QE] 2 and QE3), which focused on long-dated government securities (QE2) and mortgage-backed securities (QE3), further expanded the Federal Reserve's balance sheet to \$4.4 trillion. In total, the entire program increased the Federal Reserve's balance sheet more than five-fold over a 5-year period.

In December 2013, the Federal Reserve announced its decision to reduce the purchase gradually as the US economy steadily recovered. This decision was implemented in January 2014. Generally considered "tapering," this continued until the end of QE3 in October 2014.

**Figure 1: Total Assets Held by the Federal Reserve**  
(\$ billion)



FED = Federal Reserve, QE = quantitative easing period.

Note: Cutting points for the three quantitative easing periods (QE) and tapering follow Lim et al. (2014): QE1 (Nov 2008–Mar 2010), QE2 (Nov 2010–Jun 2011), QE3 (Sep 2012–Dec 2014), and tapering (Dec 2013–Oct 2014).

Source: This figure was constructed using monthly data from Federal Reserve Economic Data.

## 2.2 The Syndicated Loan Market in Emerging Asia

This study focuses on the effects of US quantitative easing programs on the loan market in emerging Asia, especially the syndicated loan market, which represents a substantial percentage (20%–30%) of international banking activities (Cerutti, Hale, and Minoiu 2014). This share is potentially even larger in Asia.<sup>2</sup> Syndicated loans are loans extended to a borrower by a group of lenders, that is, a "syndicate." The amount of individual syndicated loans tends to be larger and the term thereof longer than that of bilateral loans (i.e., involving a single borrower and single lender). This market has experienced remarkable growth since the early 2000s due to the mutual benefits to

<sup>2</sup> For instance, in 2013, outstanding foreign loans of ten Asian economies (see note under Figure 2 for country coverage, excluding Taipei, China) totaled \$4.55 billion, according to the World Bank's Global Financial Development Database (under the category "loans from non-resident banks"). According to our calculations, in 2013, the sum of outstanding syndicated loans (denominated in US dollars, a useful proxy for cross-border loans) held by the same group of countries was \$1.868 billion, 37% of the foreign loan amount. As detailed in section 4, we converted syndicated new deals (flow) to outstanding loans (stock) data. When calculated using this method, on average, syndicated loans accounted for around 40% of total cross-border loans in these ten Asian economies during 2009–2014.



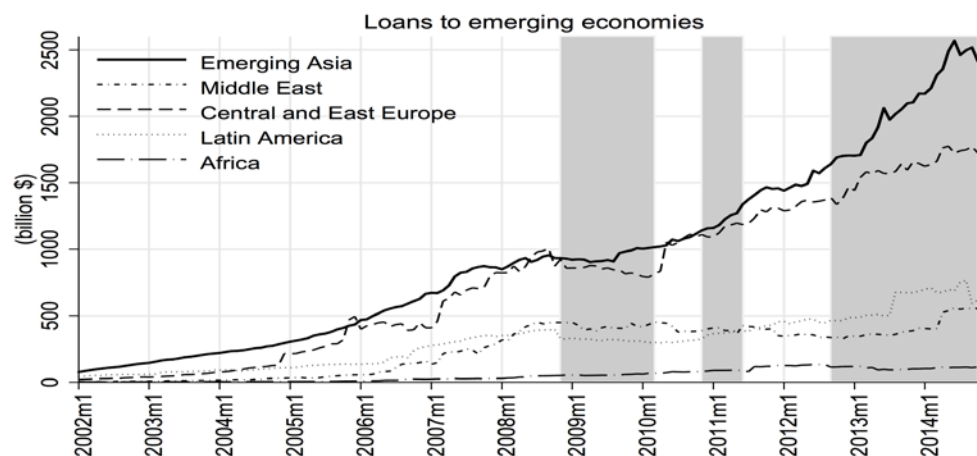
both lenders and borrowers. On one hand, syndication helps lenders overcome balance sheet constraints and diversify risks by limiting exposure to individual borrowers; on the other hand, borrowers are given access to a large group of lenders and accordingly reduced funding risks.

The following range of stylized facts can be observed about the Asian market over the past 15 years (2009–2014).

**Fact 1: Among emerging economies, Asian borrowers represent the largest share in the syndicated loan market.**

Compared with other emerging economies in Central and Eastern Europe and Latin America, emerging Asian borrowers topped the syndicated loan market (Figure 2). The total of their outstanding loans reached approximately \$2.6 trillion in 2014, far above the total loans taken out by other emerging markets. The Asian market is also growing quickly. An annual growth rate of 42% was observed in 2004–2007, followed by a brief stagnation during the GFC and a recovery in late 2009 after the Federal Reserve launched its first quantitative easing program. Higher growth was seen during QE2 and QE3, with an annual growth rate of 22% during QE3.

**Figure 2: Syndicated Loans to Emerging Economies, by Region**



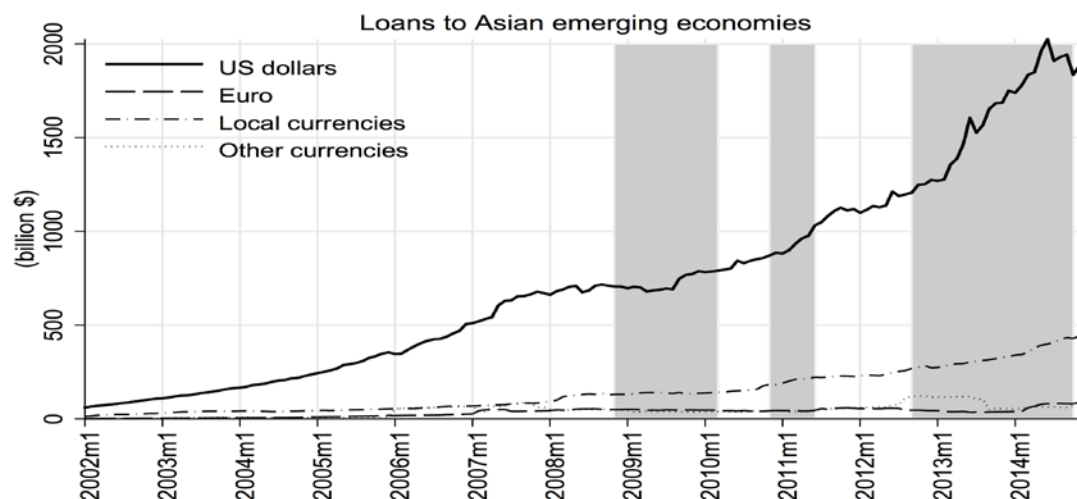
Note: This figure shows outstanding syndicated loans (stock) aggregated for emerging economies in five regions. We converted new deals (flow) compiled from Thomson Reuters Loan Pricing Corporation's DealScan database to loans outstanding (stock). The conversion method is described in detail in section 3.2.

**Fact 2: Dollar credit remains dominant in the Asian market despite a steady increase in local currency loans, mainly to Singapore and the PRC.**

In terms of currency denomination, US dollar credit remains dominant, accounting for three quarters of the Asian market by the end of 2014 (Figure 3). Despite experiencing a mild “sudden stop” in 2008, and a subsequent slowdown during the GFC, its recovery has been strong and it almost regained its pre-crisis momentum in QE3.

The share of euro credit remained small over the observation period. In contrast, local currency loans increased rapidly, a trend overwhelmingly driven by the People's Republic of China (PRC) and Singapore since the GFC, and Malaysia and Hong Kong, China by a relatively smaller margin (Figure 4b).

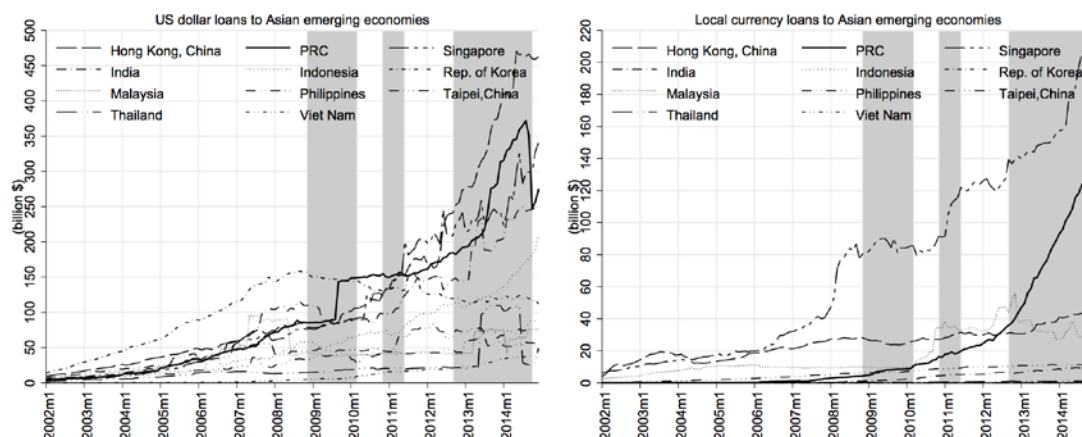
**Figure 3: Syndicated Loans to Asian Emerging Economies, by Currency Denomination**



Note: This figure shows outstanding syndicated loans (stock) aggregated for emerging economies in five regions. We converted new deals (flow) compiled from Thomson Reuters Loan Pricing Corporation's DealScan database to loans outstanding (stock). The conversion method is described in detail in section 3.2.

**Fact 3: Dollar credit shows higher volatility and a more visible response to the US' unconventional monetary policy compared to local currency loans.**

**Figures 4a (left) and 4b (right): Syndicated Loans to Asian Emerging Economies, by Currency Denomination and by Country**



PRC = People's Republic of China.

Note: This figure shows outstanding syndicated loans (stock) aggregated for emerging economies in five regions. We converted new deals (flow) compiled from Thomson Reuters Loan Pricing Corporation's DealScan database to loans outstanding (stock). The conversion method is described in detail in section 3.2.

A comparison of dollar loans (Figure 4a) and local currency loans (Figure 4b) suggests that dollar loans are considerably more volatile. They also seem to respond more swiftly to external factors such as the GFC and US quantitative easing programs.

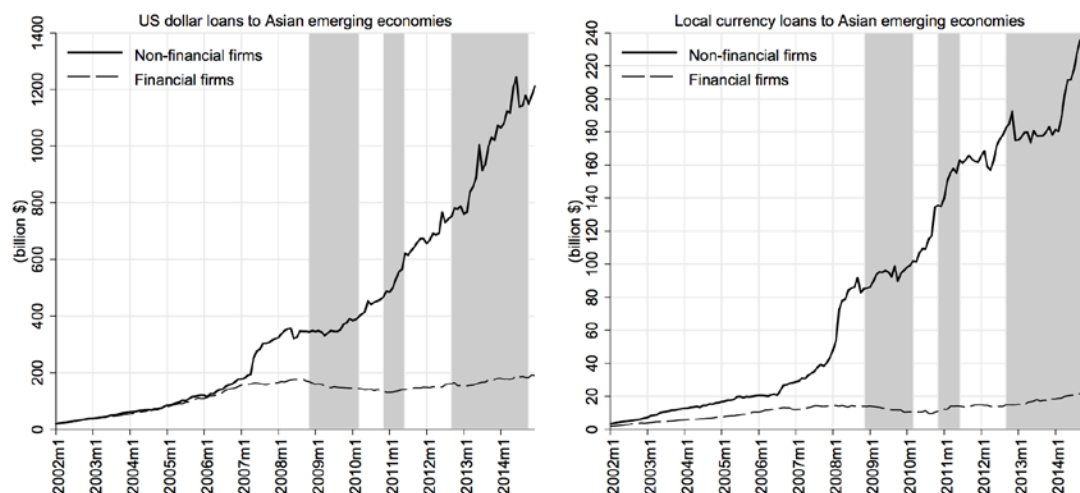
Figure 4a shows that dollar loans to a number of Asian countries stagnated during the GFC and subsequently increased sharply during QE1, whereas the scale of response varied in other Asian economies. The increasing trend continued through QE2 and QE3 when many forces came into play, including (i) the unfolding of the sovereign debt crisis in Europe during QE2, (ii) Japan embarking on its quantitative easing programs in the middle of QE3, and (iii) monetary responses gradually being put into place in many Asian economies. By contrast, the market for local currency loans is quite stable, except for in the PRC, Singapore, and Malaysia.

Dollar loans to Korea followed a strikingly different trend due to policy intervention. Korea relied heavily on external sources of funding, predominantly in dollars as shown in the syndicated loan market. The total amount of outstanding dollar loans more than tripled from 2002 to almost \$150 billion in 2008. After the collapse of Lehman Brothers, the monetary authority in Korea imposed a levy on banks' non-deposit foreign currency liabilities. As expected, dollar loans to Korea fell 35% from 2008 to 2014.

**Fact 4: Since the GFC, non-financial firms have been the main borrowers in the syndicated loan market, as compared to financial institutions.**

A notable transition in the composition of borrowers occurred during the GFC (Figure 5a). Before the crisis, financial and non-financial firms were both the main players in the market. Dollar loans to financial firms, generally banks, grew as quickly as dollar loans to non-financial firms. This changed permanently in the run-up to and after the crisis. While dollar lending to the non-financial sector more than doubled during the QEs, lending to financial firms slowed after the crisis and only recovered slightly during QE3. Nevertheless, its post-GFC peak accounts were less than one sixth that of the non-financial firms. Similar patterns are observed for local currency loans (Figure 5b).

**Figures 5a (left) and 5b (right): Syndicated Loans to Asian Emerging Economies, by Currency Denomination and by Borrower Type**



Note: This figure shows outstanding syndicated loans (stock) aggregated for emerging economies in five regions. We

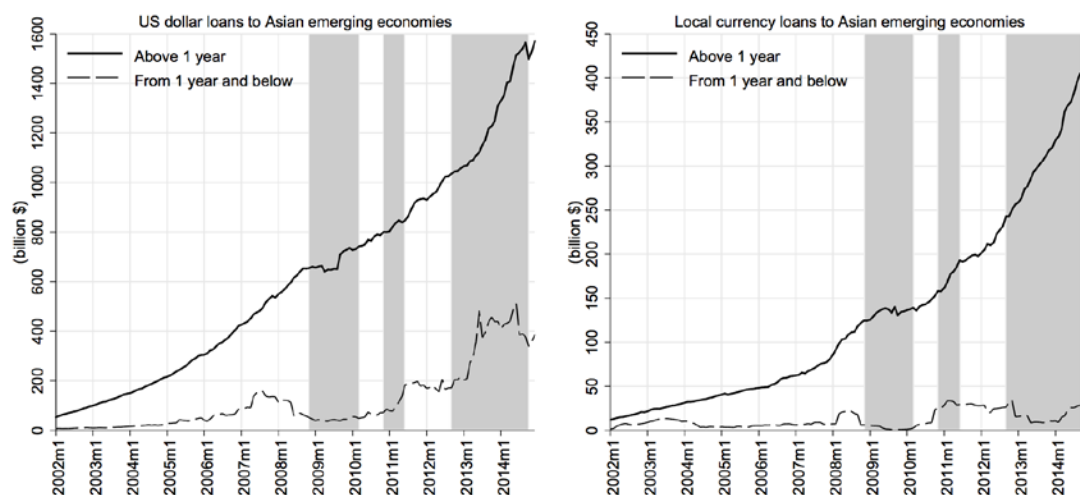
converted new deals (flow) compiled from Thomson Reuters Loan Pricing Corporation's DealScan database to loans outstanding (stock). The conversion method is described in detail in section 3.2.

**Fact 5: The majority of dollar loans to emerging Asian borrowers are for medium- to long-term financing of future investment.**

The majority (four fifths) of dollar loans to emerging Asian borrowers are medium- to long-term (>1 year) loans for financing future investment, that is, “physical investment” in a large sense (Figures 6a and 7a). The primary uses of these credit lines include (i) general operations such as working capital and purchases, (ii) takeover or acquisition lines to acquire assets or a company, (iii) capital expenditure to acquire or upgrade physical assets, and (iv) project finance to finance a specific project.<sup>3</sup> A small decline was seen in these credit lines during the GFC, followed by a steady recovery during the QEs. A similar trend is traceable for local currency loans (Figures 6b and 7b).

However, short-term (<1 year) loans behaved differently (Figures 6a and 6b). They are more volatile and responded more bluntly to shocks, whether that of the GFC or quantitative easing. In addition, while both short-term dollar loans and local currency loans were boosted by the quantitative easing shocks, the scale of dollar loans was much larger. Dollar loans for “financial investment” (including debt repayment and investment in financial assets) increased steadily despite the GFC (Figure 7a). Financial investment projects financed by local currency loans even outpaced those for physical investment after the GFC (Figure 7b). Hence, the latest developments in short-term loans and loans for financial investment warrant special attention and further examination in the empirical analysis below.

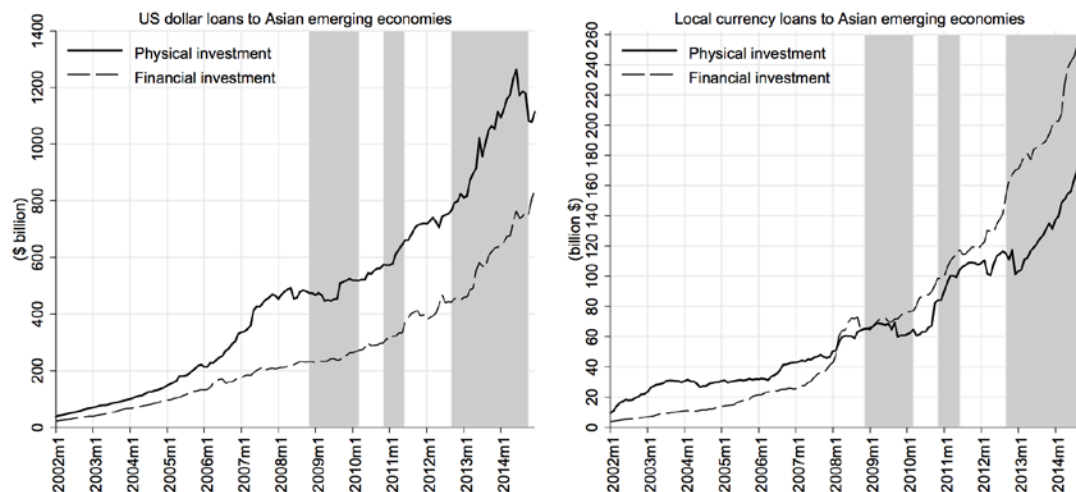
**Figures 6a (left) and 6b (right): Syndicated Loans to Asian Emerging Economies, by Currency Denomination and by Maturity**



Note: This figure shows outstanding syndicated loans (stock) aggregated for emerging economies in five regions. We converted new deals (flow) compiled from Thomson Reuters Loan Pricing Corporation's DealScan database to loans outstanding (stock). The conversion method is described in detail in section 3.2.

<sup>3</sup> The grouping follows Almeida, Campello, and Hackbarth (2011).

**Figures 7a (left) and 7b (right): Syndicated Loans to Asian Emerging Economies, by Currency Denomination and by Financing Purposes**



Note: This figure shows outstanding syndicated loans (stock) aggregated for emerging economies in five regions. We converted new deals (flow) compiled from Thomson Reuters Loan Pricing Corporation's DealScan database to loans outstanding (stock). The conversion method is described in detail in section 3.2.

Overall, dollar credit dominates and plays a leading role in the Asian syndicated loan market, in spite of the GFC. In the run-up to the crisis, dollar credit experienced high-speed growth, serving as a major external source of financing for both financial and non-financial Asian firms. After the GFC and quantitative easing periods, most dollar loans were channeled to non-financial firms for medium- to long-term physical investment. While dollar borrowing is predominantly longer term, short-term loans increased substantially after QE3, and there was also an upsurge in loans to finance investment in financial assets. The US quantitative easing programs seem to have facilitated the recovery of the syndicated loan market, which was hit mildly by the crisis. However, multiple forces of both demand and supply were in effect. In the following section, an augmented, fixed-effect, panel data model is used to examine the supply effect of the US quantitative easing programs on the Asian credit market.

### 3. METHODOLOGY

#### 3.1 The Identification Strategy

The primary hypothesis of this study concerning the bank lending channel is that the US quantitative easing programs boosted the growth of dollar credit to Asia through cross-border lending. This could be a result of liquidity spillover or local currency appreciation. The classic identification challenge in empirical analyses of the bank lending channel is to separate the demand and supply effects. Not surprisingly, US quantitative easing programs affect both the demand from firms for bank credit and the bank supply of such credit. A simple example of this is that, if the Federal Reserve injects a large amount of liquidity, this is likely to increase credit growth domestically and credit outflow to Asian firms. At the same time, it will boost the US economy and its imports accordingly, leading to the recovery of Asia's export industry and increasing its credit demand.

However, the transmission of the US unconventional monetary policy through cross-border bank flows could be supply-driven, demand-driven, or (most likely) both. It is crucial to separate these effects to help design informed policy responses that target the source of the problems. For instance, a steady increase in cross-border loans driven by demand from non-financial firms in post-GFC Asia could be a positive sign of recovery for the global economy. However, a supply-driven credit boom invites valid concerns about excessive risk-taking and should be closely monitored and properly regulated, if necessary. Therefore, this study focuses on the supply side or the bank lending channel, which highlights the role of banks as loan suppliers in transferring shocks to their credit supply.

Because a change in loan volume reflects both demand and supply effects, the establishment of the bank lending channel requires that demand and supply effects be carefully separated. An augmented, fixed-effects, panel data model has been adopted to control for firm-specific, time-invariant, and time-varying credit demand effects. Essentially, we examine how credit to the same firm in the same year varies by different credit sources. In other words, the greater growth of dollar loans compared with that of local currency loans suggests the existence of the bank lending channel and its role in transmitting liquidity shocks.

An important underlying assumption is that the dollar liquidity supply responds to US monetary policy shocks, while the supply of local currency loans responds predominantly to local financial and economic conditions. If it responds to foreign monetary policy changes, it only does so slowly, via monetary policy response. This assumption generally applies to emerging Asian economies (Wu et al. 2011). Hence, the immediate effects on dollar credit can reasonably be considered to capture the existence of the bank lending channel.

Another concern relates to the heterogeneous demand for dollar loans and for local currency loans. Although the augmented, fixed effect model controls for the general demand effects, it fails to control for demand for dollar loans. Due to local currency appreciation, or expectations thereof, expected costs of interest payments would differ for dollar and local currency loans, and therefore result in differing demand for the two types of credit lines. While this may not be a major factor in borrowing decisions, it is necessary to apply a robustness test to the Hong Kong, China sample to address this concern empirically. Since Hong Kong, China adopts a currency board whereby Hong Kong dollars are pegged to the US dollar, the sub-sample of Hong Kong, China rules out this concern and provides an even more accurate measurement of the bank lending channel.

### 3.2 Model Specification

We used an augmented, fixed effect model to address the identification problem. Specifically, we used *firm*  $\times$  *period* fixed effects to identify time-invariant (size, industry, and country) as well as time-varying (risks or investment opportunities), firm-level, fixed effects. Accordingly, we included in the model a set of indicator variables,  $\sum_{t=1}^T \sum_{i=1}^n a_{i,t}$ , denoting firm  $i$ , ( $i = 1, \dots, n$ ) at year  $t$ , ( $t = 1, \dots, T$ ). The identification is that, for the same borrowing firm in the same year (demand effects are controlled), the difference in loan volume is attributable to the difference in loan sources (i.e., supply effects), proxied by currency denomination.

The structural-form loan equation is specified as follows:

$$\Delta \ln(L_{i,c,m}) = \beta_0 + \beta_1 \ln(L_{i,c,m-1}) + \beta_2 DL_{i,m} + \beta_3 QE_m + \beta_4 DL_{i,m} QE_m + \beta_5 \mathbf{X}_{i,c,m} + \sum_{t=1}^T \sum_{i=1}^n a_{i,t} + \varepsilon_{i,c,m},$$

where  $\Delta \ln(L_{i,c,m})$  is the growth of the loan volume (stock), denominated in currency  $c$  (US dollar or domestic currency), borrowed by firm  $i$  at month  $m$ .  $\ln(L_{i,c,m-1})$  is the loan volume lagged by 1 month to capture any persistence in borrowing behavior.  $DL_{i,m}$  is an indicator variable: 1 for US dollar-denominated loans and 0 for domestic currency loans.  $QE_m$  is a quantitative easing program measured by the growth of the sum of US Treasury Securities and mortgage-backed securities held by the US Federal Reserve at month  $m$ . The key variable of interest is the interaction term of  $DL_{i,m} \times QE_m$ , which captures the transmission of the US monetary shock (quantitative easing programs) to the Asian credit market, and therefore the bank lending channel.  $\mathbf{X}_{i,c,m}$ , a vector, contains loan purpose (= 1 if for financial asset purposes, = 0 otherwise) and a short-term loan (= 1 if shorter than 1 year, = 0 if longer than 1 year). Finally,  $\sum_{t=1}^T \sum_{i=1}^n a_{i,t} = a_i \times t$ , ( $i = 1, \dots, n$ ;  $t = 1, \dots, T$ ) identifies time-invariant and time-varying, firm-specific, fixed effects.<sup>4</sup>

## 4. DATA

The quantitative easing data series was generated by taking monthly sums of the US Federal Reserve's holdings of US Treasury Securities (all maturities) and mortgage-backed securities (all maturities) as reported in the Federal Reserve Economic Database.

The loan data were derived from the DealScan database. This global database, established in 1987, is known for its extensive coverage of the international commercial loan market, especially the syndicated loan market.<sup>5</sup> As the database contains information on individual new loan issuance, the loan data are measures of flow. However, as firms' borrowing decisions and the size of borrowing depend heavily on the outstanding loans on their balance sheet, we constructed stock data based on flow data using a method similar to that used by the Bank of International Settlements (2002).

The conversion was carried out as follows. First, we used 1990 as the base year because DealScan provides wide coverage of private loan issuance from the early 1990s in the Asian region, which is our focus. Second, using data on the loan amount for each deal and its maturity, we constructed the stock of loans for firms at each time point (month) by adding any new loan at that point to the remaining outstanding loan, if extant, after the monthly repayment. Third, without loss of generality, we assumed a

<sup>4</sup> Time fixed-effects are captured yearly rather than monthly to circumvent the issue of a large amount of potential collinearity between time-fixed effects and other indicator variables.

<sup>5</sup> According to the LPC, although the data collection process mainly relies on information provided by contacts within the private debt market, data on syndicated loans is collected specifically from the LPC's association with the Loan Syndications and Trading Association. Moreover, lenders have incentives to report these data because league tables are powerful marketing tools in the syndicated loan market. For more information, see Carey, Post, and Sharpe (1998). As DealScan collects loan data based on information provided at the time of the announcement of loan facilities, loan commitments need not be drawn down fully or immediately. Still, the announcement of loan contracts reflects bank managers' lending decisions and their consideration of supply and demand factors at that time, which are crucial to our study of shock effects on lending.



zero interest rate and spread the monthly repayments equally to avoid calculation complications.<sup>6</sup> The remaining outstanding loan was therefore measured based on the volume of each new loan, the recorded commencement date and maturity of the loan contract, and the monthly repayment. For example, if firm *i* makes a 1-year loan of \$1.2 million from bank *j* at month 0, then this becomes an outstanding loan of \$1.1 million at month 1, \$1.0 million at month 2, and finally \$0 at month 12 when it is paid off. Finally, as DealScan identified the currency denomination for each deal, the constructed loan (stock)—integrating outstanding and new loans—were then summed up by firm, month, and currency denomination.

We selected 11 emerging Asian economies—the PRC; Hong Kong, China; India; Indonesia; Malaysia; the Philippines; Singapore; Taipei, China; Thailand; Korea; and Viet Nam. The borrowers are firms from these 11 economies, whereas lenders can be banks from these economies, as well as other regions in the world. This analysis covers the entire post-GFC period from November 2008 to December 2014 (data most recently available). Although it can be argued that it should cover a longer period to include the pre-GFC period, as it seeks to compare QEs and non-QEs, we focused on the post-GFC period to ensure overall comparability. The entire sample included 443,739 observations and spanned a period of 74 months for 6,959 companies in the 11 emerging Asian economies. A description and summary of the statistics of the variables are in Tables A1 and A2.

For individual deals, DealScan provides detailed information on firm and loan characteristics. Table 1 breaks down the syndicated market by a range of categories over the period under study. Under the category of currency denomination, consistent with Figures 3, 4a, and 4b in the stylized facts, dollar loans dominate in the regional market. Among the emerging economies listed, Indonesia and Viet Nam borrow in the market entirely in dollars. Dollar credit accounts for the bulk of syndicated loans extended to all of the other economies, except for Singapore and Malaysia.

If we group borrowers into non-financial and financial firms,<sup>7</sup> consistent with Figures 5a and 5b, the volume channeled to non-financial firms outweighs that channeled to financial firms in all economies except the Philippines. In terms of loan purposes, loans used to finance general operational needs surpass those used for investment in financial assets or debt repayment. The exception is Hong Kong, China, which shows an equal split. Finally, regarding loan maturity, while medium- to long-term loans clearly lead in most countries, Thailand and Taipei, China show a significant share of short-term loans.

Table 2 shows the average stock of syndicated loans over the three quantitative easing programs. Accelerated growth is observed. The average growth rate from QE1 to QE3 is four times higher than that from QE1 to QE2. A falling rate is shown for Korea due to policy intervention, as discussed in the section above.

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<sup>6</sup> A zero interest payment is mainly due to a large number of missing data on loan rates. While this may lead to inaccuracy, given the massive size of the syndicated deals on average, interest payments are relatively less important.

<sup>7</sup> Another group of borrowing firms are unidentifiable, and account for less than 30% of the total borrowing firms.



**Table 1: Breakdown of Syndicated Loans (Averages) over the Period  
(2009M1–2014M12)**  
(\$ billion)

	Currency Denomination					Borrowers			
	Dollar Loans		Local Currency Loans			Non-financial Firms		Financial Firms	
	Total	Volume	% in Total	Volume	% in Total	Volume	% in Total	Volume	% in Total
Emerging Asia	1,420.77	1,179.88	83.05	240.89	16.95	841.42	59.22	170.77	12.02
Singapore	305.76	181.43	59.34	124.33	40.66	233.48	76.36	15.71	5.14
Hong Kong, China	252.20	220.60	87.47	31.60	12.53	158.28	62.76	15.97	6.33
PRC	230.02	188.42	81.92	41.60	18.08	92.75	40.32	16.20	7.04
India	151.54	146.14	96.44	5.40	3.56	97.15	64.11	29.56	19.51
Rep. of Korea	130.98	130.89	99.93	0.09	0.07	61.58	47.02	39.72	30.32
Indonesia	98.87	98.87	100.00	0.00	0.00	51.70	52.29	20.67	20.91
Malaysia	77.22	49.48	64.08	27.74	35.92	49.59	64.22	6.34	8.21
Taipei, China	69.31	60.05	86.63	9.26	13.37	47.37	68.34	0.91	1.31
Philippines	49.04	48.93	99.77	0.11	0.23	10.15	20.70	21.05	42.93
Thailand	36.50	35.74	97.93	0.76	2.07	26.88	73.65	2.04	5.58
Viet Nam	19.33	19.33	100.00	0.00	0.00	12.48	64.57	2.62	13.55
	Loan Purposes					Loan Maturity			
	Physical Investment		Financial Investment			ST Loans (<1 year)		MLT Loans (>1 year)	
	Total	Volume	% in Total	Volume	% in Total	Volume	% in Total	Volume	% in Total
Emerging Asia	1,420.77	854.32	60.13	566.44	39.87	214.82	15.12	1,205.94	84.88
Singapore	305.76	118.52	38.76	187.24	61.24	66.51	21.75	239.26	78.25
Hong Kong, China	252.20	121.47	48.17	130.73	51.83	29.88	11.85	222.32	88.15
PRC	230.02	170.06	73.93	59.96	26.07	18.49	8.04	211.53	91.96
India	151.54	120.16	79.29	31.38	20.71	28.10	18.54	123.44	81.46
Rep. of Korea	130.98	81.95	62.57	49.03	37.43	9.71	7.41	121.28	92.59
Indonesia	98.87	68.82	69.61	30.05	30.39	6.18	6.25	92.69	93.75
Malaysia	77.22	52.63	68.15	24.59	31.85	13.79	17.86	63.43	82.14
Taipei, China	69.31	40.67	58.68	28.64	41.32	20.85	30.07	48.47	69.92
Philippines	49.04	34.40	70.14	14.64	29.86	4.66	9.50	44.39	90.50
Thailand	36.50	30.15	82.60	6.35	17.40	15.70	43.01	20.80	56.98
Viet Nam	19.33	15.50	80.20	3.83	19.80	0.98	5.08	18.35	94.92

MLT = medium- to long-term, PRC = People's Republic of China, ST = short-term.

**Table 2: Amount of Loans (Averages) Over the Three Qualitative Easing Periods**  
(\$ billion)

	Total	QE1	QE2	QE3	Growth QE1–QE2 (%)	Growth QE1–QE3 (%)
Emerging Asia	1,420.77	864.91	1,132.38	1,948.59	30.92	125.29
Singapore	305.76	169.44	254.62	410.63	50.27	142.35
Hong Kong, China	252.20	113.97	172.46	396.49	51.33	247.91
PRC	230.02	118.74	170.33	346.69	43.44	191.97
India	151.54	94.89	110.90	210.03	16.88	121.35
Rep. of Korea	130.98	147.89	132.46	118.64	–10.43	–19.78
Indonesia	98.87	57.27	72.69	133.68	26.93	133.43
Malaysia	77.22	49.46	76.82	96.80	55.34	95.72
Taipei, China	69.31	43.69	62.24	84.43	42.48	93.28
Philippines	49.04	46.40	42.87	55.68	–7.61	19.99
Thailand	36.50	16.98	21.39	65.56	25.99	286.18
Viet Nam	19.33	6.20	15.58	29.95	151.26	382.96

PRC = People's Republic of China, QE = quantitative easing program.

## 5. RESULTS

This study focuses on the spillover effect of the US qualitative easing programs on the emerging Asian credit market through the channel of cross-border lending. Column 1 in Table A3 shows the baseline results for the whole population. Our key results are *QE* measured by growth in federal assets and its interactions with the indicator variable of dollar credit, *DL*. The coefficient of *QE* and the coefficient of its interaction terms capture all of the *QE* effects, and the coefficient of its interaction terms identifies the effects of the bank lending channel (i.e., to what extent the shock is transmitted through banks). The results show that the US large-scale asset purchase programs indeed boost the growth of cross-border loans to Asian borrowers. To be specific, every 1% increase in the Federal Reserve's balance sheet is associated with a 0.231% increase in total loans borrowed, on average. Of this, the bank lending channel accounts for half (0.102%), supporting the existence of a large, significant bank lending channel that propagates the easing of US financial conditions to the Asian credit market.

To obtain a better understanding of the scale through a rough estimation, the total five-fold increase in the Federal Reserve's balance sheet over the three quantitative easing periods implies a 100% increase in syndicated loans to Asia during this time, including both demand- and supply-side effects. Of this increase, 50% occurred through the supply-side, bank lending channel.

Apart from the key variables of interest, the coefficient of the initial level of outstanding loans is significant, and negatively associated with loan growth. This is as expected because firms with more debt obligations are less likely to have an appetite for new loans. In addition, growth in dollar credit is, on average, much higher (106%) than that of domestic currency credit. This is consistent with the stylized fact that the syndicated loan market represents a substantial portion of international banking activities in Asia, and that cross-border bank credit is predominantly denominated in foreign currencies, mainly dollar credit. Finally, in line with the stylized facts observed, the growth of short-term loans is significantly slower than that of medium- to long-term loans, and

growth in loans for financial investment is significantly slower than that of medium- to long-term loans and physical investment loans.

Columns 2–7 in Table A3 test conditions for the bank lending channel and compare results between sub-samples. Columns 2 and 3 compare non-financial firms with financial firms as borrowers. Columns 4 and 5 compare samples by loan purposes: financing for future investment against financing financial assets or debt repayment. Columns 6 and 7 compare samples by loan maturity, that is, short-term loans versus longer term loans. In spite of variations in signs of coefficients associated with  $QE$ , a positive, strong bank lending channel is found in almost all sub-samples, except in loans for financial investment. However, this exception is largely due to the PRC sample. If the PRC is excluded from the sample, the bank lending channel exists, even in loans for financial investment (Table A4). In comparison with non-bank lending  $QE$  effects, the bank lending channel plays a larger role in accelerating loans for financial investment and short-term loans in the  $QE$  periods, which raises concerns.

Table A4 reports results for non-PRC emerging Asia, which could probably serve as the baseline result considering that the PRC is an outlier (Table A7). The PRC has unique macroeconomic conditions and a unique government stance on cross-border capital flows. Although it embarked on a series of initiatives to liberalize its capital account in early 2000, capital controls remain largely in the segment of bank flows. To the extent allowed by limits set by the Government of the PRC, cross-border interbank flows did accommodate PRC firms' demand for foreign currency loans (He and McCauley 2013). Nevertheless, the supply of domestic credit from domestic financial institutions in local currencies dominates the trend observed in its post-GFC credit market. The ratio of domestic credit to GDP increased from 97% in 2008 to 128% in 2013. This dominance is observable in the syndicated market for the PRC, as is clear from the stylized facts.

The sample of non-PRC emerging Asia confirms a larger bank lending channel in the total  $QE$  effects across samples compared to the emerging Asia sample that includes the PRC. Meanwhile, as expected, the results of the PRC sample suggest the absence of the bank lending channel, despite the fact that  $QE$  effects are large and positive, especially among non-financial firms and medium- to long-term loans (Table A5). One interpretation of this set of results could be that, although the US unconventional monetary policy has led to an increase in syndicated loans to the PRC, they are mainly a result of demand effects in the expectation of the recovery of the US and global economies.

Table A6 presents the results for the Hong Kong, China sub-sample as a robustness test to address the concern relating to heterogeneous demand for dollar versus local currency loans. We find that the bank lending channel exists in the Hong Kong, China sample, and at a larger scale in total  $QE$  effects, compared to the baseline results. Similarly, a larger role of bank lending in the transmission of quantitative easing shocks is found in short-term loans and financial investment loans.

Table A7 lists results for all country sub-samples. Positive and significant bank lending is confirmed for all countries, except the PRC, for reasons previously explained. Among the other countries, the quantitative easing spillovers are purely supply-side driven in Korea, Malaysia, the Philippines, and Viet Nam, as quantitative easing programs significantly increased dollar credit—but not domestic currency loans—to these countries. In contrast, economies like Hong Kong, China; India; Indonesia; Singapore; Taipei, China; and Thailand all saw rising local currency loans over the quantitative easing periods.

Next, we examined individual quantitative easing periods for the sample of non-PRC emerging Asia (Table A8). The bank-lending channel (supply-effect) was nonexistent in QE1, but became visible after the second wave of quantitative easing and imposed a stronger effect during QE3. We then broke down the entire sample by borrower type to observe changes during the quantitative easing periods (Table A9). While the sample of non-financial firms showed the same pattern as the overall results, a noteworthy distinction for the financial firms is that the lending channel was weak or insignificant in QE1 and QE2, but became dominant in QE3. In other words, up to QE3, dollar lending increased quickly in contrast to a falling trend of loans extended by domestic financial institutions.

A similar contrast is observable with regard to investment purpose (Table A10). Loans channeled into the financial sector picked up speed during QE3, implying that supply-driven dollar credit spilled quickly into the financial sector at the end of the QEs. Finally, a further investigation into loan maturity suggests that short-term loans responded quickly and substantially in the initial programs, but became subdued when faced with the rise of longer term loans in subsequent quantitative easing periods (Table A11).

## 6. CONCLUSIONS AND POLICY IMPLICATIONS

We set out to examine the spillover effects of the US quantitative easing programs on the Asian credit market through cross-border bank lending. We employed firm-level loan data on the syndicated loan market and measured the bank lending channel through changes in US dollar loans extended to Asian borrowers in the market. After separating the demand-side effects by adopting an augmented, fixed effect model, we found that the growth of dollar credit increased in Asia in response to quantitative easing in the US financial market. The results confirmed the existence of the bank lending channel in Asia and emphasized that credit flows are important for transmitting financial conditions (International Monetary Fund 2010).

Moreover, this study provides new evidence of cross-border liquidity spillover through the syndicated loan market. We found that the overall effect of the bank lending channel in the syndicated loan market is, on average, large in Asia, irrespective of types of firms, financing purposes, and loan maturity. In the early stages of the quantitative easing programs, the lending channel existed for non-financial firms but not for financial firms, for financing physical investment but not for debt repayment. However, as the Federal Reserve's asset programs continued and intensified in 2013 and 2014, the lending channel began to facilitate quick credit flow into financial firms and the financing of assets.

The results also show that the early quantitative easing programs increased short-term loans substantially greater and faster than medium- to long-term loans. As loan syndication is typically used to finance large-scale, long-term projects, the result raises concern about term mismatch. With the US Federal Reserve's exit from quantitative easing programs and the dollar strengthening accordingly, the reversal of dollar credit is expected to increase the rollover costs of those short-term dollar debts or make refinancing impossible. Overall, debt burden will increase for existing borrowers, especially for firms that rely heavily on dollar credit in the market without properly hedging foreign exchange risks.

The bank lending channel reveals an unintended consequence of the pro-cyclicality of capital flows, magnified by monetary policy spillovers. Generally recommended policy responses include global regulation and globally coordinated monetary policies. Proper regulation of cross-border banking requires global regulatory coordination because multiple stakeholders, not a single authority, are involved. Likewise, globally coordinated monetary policies can help reduce negative externalities. Nonetheless, while these policy prescriptions are effective in principle, they are challenging to implement because regulation designs and monetary policies often prioritize domestic rather than global imperatives (Brunnermeier et al. 2012).

While a number of encouraging initiatives on regional cooperation and safety nets have been put into place, concrete actions should follow policy dialogue and information exchange. Institutions such as the Association of Southeast Asian Nations plus the PRC, Japan, and Korea's Macroeconomic Research Office; Asia-Pacific Economic Cooperation forums; and regional financial safety nets such as the Chiang Mai Initiative Multilateralization Agreement could have an effect; however, this will not necessarily be large without a clear policy agenda and binding enforcement mechanisms.

Macro-prudential policies may have a straightforward effect in imposing targeted regulations on banks engaged in cross-border activities (Brunnermeier et al. 2012). In addition to traditional instruments such as caps on loan-to-value, debt-to-income, and non-core liabilities, counter-cyclical capital requirements should be carefully designed and properly put into effect. More importantly, constant efforts should be made to monitor and share information on global banks' balance sheet capacity to manage potential risks adequately in the cross-border credit market.

Finally, the development of financial markets, such as the derivative, stock, and bond markets, is an important long-term strategy. Given foreign currency exposure and its impact on balance sheets, derivative products will help manage exchange rate risks at the micro level, and foreign exchange swap lines managed by governments will be useful in times of crisis. While bank credit and the health of the banking industry is crucial in Asia, the development of the stock and corporate bond markets will provide valuable alternatives when banks are in trouble. Deepening financial markets in the region will help build a dynamic and robust financial sector, which is crucial for safeguarding regional financial stability.

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## APPENDIX

**Table A1: Description of Main Variables**

	Definition	Data Source	Whole		QE1		QE2		QE3	
			Mean	SE	Mean	SE	Mean	SE	Mean	SE
$\Delta \ln(L_{i,c,m})$	$\Delta \ln(L_{i,c,m}) = \ln(L_{i,c,m}) - \ln(L_{i,c,m-1})$ The logarithm difference of the loan volume (stock) denominated in currency $c$ (US dollar or domestic currency) borrowed by firm $i$ at month $m$ and $m - 1$	Reuters/LPC's DealScan database	1.12	2.60	0.75	2.35	0.84	2.44	1.48	2.76
$\ln(L_{i,c,m-1})$	The logarithm of the loan volume denominated in currency $c$ borrowed by firm $i$ at month $m - 1$	Reuters/LPC's DealScan database	1.50	2.29	1.63	2.31	1.62	2.33	1.35	2.24
$DL$	An indicator variable, 1 for US dollar-denominated loans and 0 for domestic currency loans	Reuters/LPC's DealScan database	0.36	0.48	0.39	0.49	0.37	0.48	0.34	0.47
$QE$	Quantitative easing programs, measured by the logarithm difference of the sum of US Treasury Securities and mortgage-backed securities held by the Federal Reserve at $m$ and $m - 1$	The Federal Reserve Economic Database	0.59	0.87	-0.17	0.85	0.56	0.70	0.97	0.72
$Fin. invest.$	A vector contains loan purpose (= 1 if for financial investment, = 0 if otherwise)	Reuters/LPC's DealScan database	0.39	0.49	0.41	0.49	0.40	0.49	0.38	0.48
$ST loans$	A vector contains loan term (= 1 if shorter than 1 year, = 0 if longer than 1 year)	Reuters/LPC's DealScan database	0.11	0.32	0.12	0.32	0.12	0.32	0.11	0.31

LPC = Loan Pricing Corporation, SE = standard error, QE = quantitative easing period, US = United States.

**Table A2: Description of Main Variables**

		1	2	3	4	5	6
1	$\Delta Ln(L(i, c, m))$	1					
2	$Ln(L_{i,c,m-1})$	-0.4650 <sup>***</sup>	1				
3	$DL$	0.1010 <sup>***</sup>	0.2690 <sup>***</sup>	1			
4	$QE$	0.2090 <sup>***</sup>	-0.1940 <sup>***</sup>	-0.0253 <sup>***</sup>	1		
5	$Fin. invest.$	0.0176 <sup>***</sup>	0.0135 <sup>***</sup>	0.0201 <sup>***</sup>	-0.0154 <sup>***</sup>	1	
6	$ST\ loans$	-0.0935 <sup>***</sup>	-0.1540 <sup>***</sup>	0.0438 <sup>***</sup>	-0.0032 <sup>**</sup>	-0.0369 <sup>***</sup>	1

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Note: Standard errors in parentheses.



**Table A3: Asian Emerging Economies (Dependent Variable:  $\Delta \ln(L_{i,c,m})$ )**

	Total (1)	Non- Financial Firms (2)	Financial Firms (3)	Physical Investment (4)	Financial Investment (5)	ST Loans (6)	MLT Loans (7)
$\ln(L_{i,c,m-1})$	-0.734*** (0.001)	-0.746*** (0.002)	-0.623*** (0.004)	-0.804*** (0.001)	-0.846*** (0.002)	-0.929*** (0.004)	-0.743*** (0.001)
<i>DL</i>	1.061*** (0.009)	1.009*** (0.012)	1.106*** (0.027)	1.441*** (0.009)	0.987*** (0.012)	0.462*** (0.028)	1.195*** (0.009)
<i>QE</i>	0.129*** (0.004)	0.175*** (0.006)	-0.192*** (0.016)	0.066*** (0.004)	0.110*** (0.005)	-0.040*** (0.012)	0.147*** (0.004)
<i>DL * QE</i>	0.102*** (0.006)	0.119*** (0.009)	0.303*** (0.022)	0.123*** (0.007)	0.008 (0.008)	0.083*** (0.017)	0.101*** (0.007)
<i>Fin. invest.</i>	-0.016*** (0.007)	0.126*** (0.010)	-0.737*** (0.024)			0.279*** (0.022)	-0.054*** (0.007)
<i>ST loans</i>	-1.788*** (0.010)	-1.816*** (0.015)	-1.625*** (0.024)	-2.066*** (0.011)	-1.696*** (0.014)		
<i>Constant</i>	1.951*** (0.006)	1.893*** (0.008)	1.791*** (0.020)	1.949*** (0.005)	2.212*** (0.007)	0.637*** (0.016)	1.907*** (0.006)
<i>Obs.</i>	443,739	242,743	45,644	269,871	173,868	50,732	393,007
<i>F – Stat.</i>	61,659	35,050	4,211	74,658	60,590	11,044	74,198
<i>p – value</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>Adj. R<sup>2</sup></i>	0.436	0.446	0.340	0.567	0.624	0.502	0.467

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

MLT = medium- to long-term, ST = short-term.

Note: Standard errors in parentheses.

**Table A4: Non-People's Republic of China Emerging Asia  
(Dependent Variable:  $\Delta \ln(L_{i,c,m})$ )**

	Total (1)	Non- financial Firms (2)	Financial Firms (3)	Physical Investment (4)	Financial Investment (5)	ST Loans (6)	MLT Loans (7)
$\ln(L_{i,c,m-1})$	-0.720*** (0.001)	-0.736*** (0.002)	-0.631*** (0.004)	-0.788*** (0.002)	-0.845*** (0.002)	-0.924*** (0.004)	-0.727*** (0.001)
<i>DL</i>	1.033*** (0.009)	0.992*** (0.013)	1.137*** (0.027)	1.430*** (0.010)	0.962*** (0.013)	0.460*** (0.029)	1.163*** (0.010)
<i>QE</i>	0.109*** (0.005)	0.163*** (0.006)	-0.204*** (0.017)	0.049*** (0.005)	0.094*** (0.006)	-0.048*** (0.013)	0.127*** (0.005)
<i>DL * QE</i>	0.131*** (0.007)	0.145*** (0.010)	0.313*** (0.023)	0.154*** (0.007)	0.028*** (0.009)	0.093*** (0.019)	0.133*** (0.007)
<i>Fin. invest.</i>	-0.015*** (0.007)	0.127*** (0.010)	-0.727*** (0.024)			0.301*** (0.024)	-0.058*** (0.008)
<i>ST loans</i>	-1.730*** (0.011)	-1.717*** (0.016)	-1.648*** (0.024)	-2.039*** (0.011)	-1.591*** (0.015)		
<i>Constant</i>	1.769*** (0.006)	1.758*** (0.008)	1.763*** (0.021)	1.727*** (0.006)	2.090*** (0.007)	0.433*** (0.018)	1.735*** (0.006)
<i>Obs.</i>	388,079	217,722	42,938	232,995	155,084	44,049	344,030
<i>F – Stat.</i>	49,769	29,838	4,041	58,488	52,321	9,609	59,422
<i>p – value</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>Adj. R<sup>2</sup></i>	0.415	0.433	0.346	0.542	0.616	0.503	0.444

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

MLT = medium- to long-term, ST = short-term.

Note: Standard errors in parentheses.

**Table A5: People's Republic of China (Dependent Variable:  $\Delta \ln(L_{i,c,m})$ )**

	Total (1)	Non- financial Firms (2)	Financial Firms (3)	Physical Investment (4)	Financial Investment (5)	ST Loans (6)	MLT Loans (7)
$\ln(L_{i,c,m-1})$	-0.826*** (0.003)	-0.814*** (0.005)	-0.517*** (0.016)	-0.894*** (0.003)	-0.861*** (0.005)	-0.995*** (0.012)	-0.840*** (0.003)
$DL$	1.209*** (0.025)	1.140*** (0.041)	0.669*** (0.117)	1.385*** (0.025)	1.275*** (0.039)	0.327*** (0.105)	1.360*** (0.025)
$QE$	0.221*** (0.011)	0.264*** (0.020)	0.071 (0.068)	0.113*** (0.011)	0.244*** (0.016)	-0.016 (0.024)	0.232*** (0.012)
$DL * QE$	-0.061*** (0.017)	-0.073*** (0.028)	0.110 (0.092)	-0.013 (0.016)	-0.174*** (0.023)	0.018 (0.043)	-0.072*** (0.017)
$Fin. invest.$	0.025 (0.025)	0.153*** (0.038)	-0.952*** (0.132)			-0.035 (0.066)	0.036 (0.027)
$ST loans$	-2.376*** (0.032)	-2.756*** (0.048)	-0.960*** (0.169)	-2.159*** (0.032)	-2.950*** (0.047)		
$Constant$	3.238*** (0.017)	3.074*** (0.029)	2.197*** (0.079)	3.397*** (0.014)	3.186*** (0.022)	2.061*** (0.042)	3.101*** (0.017)
$Obs.$	55,660	25,021	2,706	36,876	18,784	6,683	48,977
$F - Stat.$	13,893	5,483	194	19,504	9,193	1,480	17,130
$p - value$	0.000	0.000	0.000	0.000	0.000	0.000	0.000
$Adj. R^2$	0.586	0.554	0.272	0.719	0.702	0.499	0.625

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

MLT = medium- to long-term, ST = short-term.

Note: Standard errors in parentheses.

**Table A6: Hong Kong, China (Dependent Variable:  $\Delta \ln(L_{i,c,m})$ )**

	Total (1)	Non- financial Firms (2)	Financial Firms (3)	Physical Investment (4)	Financial Investment (5)	ST Loans (6)	MLT Loans (7)
$\ln(L_{i,c,m-1})$	-0.732*** (0.004)	-0.730*** (0.006)	-0.592*** (0.007)	-0.800*** (0.004)	-0.865*** (0.004)	-0.885*** (0.010)	-0.727*** (0.004)
$DL$	0.423*** (0.027)	0.165*** (0.043)	0.459*** (0.041)	0.435*** (0.028)	0.898*** (0.036)	0.254*** (0.066)	0.457*** (0.029)
$QE$	0.069*** (0.014)	0.154*** (0.024)	-0.244*** (0.022)	-0.065*** (0.014)	0.097*** (0.015)	-0.131*** (0.028)	0.116*** (0.015)
$DL * QE$	0.209*** (0.021)	0.188*** (0.034)	0.369*** (0.037)	0.289*** (0.022)	0.068*** (0.023)	0.232*** (0.047)	0.180*** (0.022)
$Fin. invest.$	0.166*** (0.020)	0.225*** (0.032)	-0.180*** (0.038)			0.428*** (0.060)	0.188*** (0.022)
$ST loans$	-1.744*** (0.030)	-1.963*** (0.063)	-1.367*** (0.035)	-2.080*** (0.029)	-1.858*** (0.047)		
$Constant$	2.416*** (0.020)	2.519*** (0.032)	1.501*** (0.031)	2.549*** (0.018)	2.810*** (0.020)	0.378*** (0.035)	2.425*** (0.021)
$Obs.$	56,869	25,783	11,461	31,594	25,275	6,581	50,288
$F - Stat.$	7,360	3,037	1,306	8,500	9,860	1,769	8,024
$p - value$	0.000	0.000	0.000	0.000	0.000	0.000	0.000
$Adj. R^2$	0.419	0.395	0.393	0.561	0.651	0.559	0.424

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

MLT = medium- to long-term, ST = short-term.

Note: Standard errors in parentheses.

**Table A7: Non-People's Republic of China Emerging Asia,  
by Country (Dependent Variable:  $\Delta \ln(L_{i,c,m})$ )**

	Emerging Asia	Non-People's Republic of China emerging Asia	People's Republic of China	Hong Kong, China	India	Indonesia
$\ln(L_{i,c,m-1})$	-0.734*** (0.001)	-0.720*** (0.001)	-0.826*** (0.003)	-0.732*** (0.004)	-0.730*** (0.003)	-0.750*** (0.006)
<i>DL</i>	1.061*** (0.009)	1.033*** (0.009)	1.209*** (0.025)	0.423*** (0.027)	1.124*** (0.021)	2.464*** (0.045)
<i>QE</i>	0.129*** (0.004)	0.109*** (0.005)	0.221*** (0.011)	0.069*** (0.014)	0.182*** (0.010)	0.075** (0.030)
<i>DL * QE</i>	0.102*** (0.006)	0.131*** (0.007)	-0.061*** (0.017)	0.209*** (0.021)	0.156*** (0.016)	0.240*** (0.034)
<i>Fin. invest.</i>	-0.016** (0.007)	-0.015** (0.007)	0.025 (0.025)	0.166*** (0.020)	-1.124*** (0.019)	-0.161*** (0.035)
<i>ST loans</i>	-1.788*** (0.010)	-1.730*** (0.011)	-2.376*** (0.032)	-1.744*** (0.030)	-1.610*** (0.022)	-3.025*** (0.047)
<i>Constant</i>	1.951*** (0.006)	1.769*** (0.006)	3.238*** (0.017)	2.416*** (0.020)	1.811*** (0.013)	1.115*** (0.036)
<i>Obs.</i>	443,739	388,079	55,660	56,869	68,900	21,595
<i>F – Stat.</i>	61659	49769	13893	7360	10166	3604
<i>p – value</i>	0.000	0.000	0.000	0.000	0.000	0.000
<i>Adj. R<sup>2</sup></i>	0.436	0.415	0.586	0.419	0.452	0.485

	Republic of Korea	Malaysia	Philippines	Singapore	Taipei, China	Thailand	Viet Nam
$\ln(L_{i,c,m-1})$	-0.662*** (0.004)	-0.749*** (0.004)	-0.613*** (0.008)	-0.799*** (0.005)	-0.776*** (0.003)	-0.689*** (0.006)	-0.835*** (0.011)
<i>DL</i>	1.676*** (0.026)	1.118*** (0.034)	1.890*** (0.059)	0.751*** (0.046)	0.399*** (0.016)	1.036*** (0.032)	2.148*** (0.092)
<i>QE</i>	-0.004 (0.013)	0.022 (0.014)	-0.001 (0.037)	0.123*** (0.021)	0.104*** (0.006)	0.102*** (0.017)	0.022 (0.060)
<i>DL * QE</i>	0.049** (0.019)	0.136*** (0.024)	0.146*** (0.044)	0.072** (0.030)	0.060*** (0.013)	0.106*** (0.026)	0.388*** (0.066)
<i>Fin. invest.</i>	-0.188*** (0.023)	-0.063** (0.026)	-0.522*** (0.042)	0.376*** (0.032)	0.343*** (0.010)	(0.024) (0.032)	-0.310*** (0.068)
<i>ST loans</i>	-1.391*** (0.025)	-2.186*** (0.032)	-2.467*** (0.066)	-2.313*** (0.049)	-1.192*** (0.021)	-1.425*** (0.044)	-2.859*** (0.114)
<i>Constant</i>	1.043*** (0.016)	2.414*** (0.020)	1.061*** (0.042)	3.255*** (0.032)	1.196*** (0.009)	1.302*** (0.022)	2.185*** (0.081)
<i>Obs.</i>	50,616	28,390	10,715	33,816	92,021	19,980	5,177
<i>F – Stat.</i>	4763	5135	987	5831	11741	2295	1972
<i>p – value</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>Adj. R<sup>2</sup></i>	0.337	0.505	0.336	0.492	0.414	0.389	0.689

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

MLT = medium- to long-term, ST = short-term.

Note: Standard errors in parentheses.

**Table A8: Non-People's Republic of China Emerging Asia,  
by Quantitative Easing Period  
(Dependent Variable:  $\Delta \ln(L_{i,c,m})$ )**

	Whole Period	QE1	QE2	QE3
$\ln(L_{i,c,m-1})$	-0.720*** (0.001)	-0.694*** (0.003)	-0.681*** (0.004)	-0.727*** (0.003)
$DL$	1.033*** (0.009)	0.916*** (0.017)	0.833*** (0.030)	1.156*** (0.020)
$QE$	0.109*** (0.005)	0.021** (0.009)	0.133*** (0.015)	0.176*** (0.008)
$DL * QE$	0.131*** (0.007)	-0.003 (0.014)	0.096*** (0.026)	0.175*** (0.013)
$Fin. invest.$	-0.015** (0.007)	-0.381*** (0.014)	-0.131*** (0.022)	0.340*** (0.013)
$ST loans$	-1.730*** (0.011)	-1.750*** (0.021)	-1.687*** (0.033)	-1.697*** (0.019)
$Constant$	1.769*** (0.006)	1.823*** (0.011)	1.697*** (0.019)	1.634*** (0.013)
$Obs.$	388,079	87,479	41,469	138,992
$F - Stat.$	49,769	10,322	4,407	17,870
$p - value$	0.000	0.000	0.000	0.000
$Adj. R^2$	0.415	0.378	0.330	0.411

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

QE = quantitative easing period.

Note: Standard errors in parentheses.

**Table A9: Non-People's Republic of China Emerging Asia, by Borrower Type  
and Quantitative Easing Period (Dependent Variable:  $\Delta \ln(L_{i,c,m})$ )**

	Financial Firms				Non-financial Firms			
	Whole Period	QE1	QE2	QE3	Whole Period	QE1	QE2	QE3
$\ln(L_{i,c,m-1})$	-0.631*** (0.004)	-0.581*** (0.008)	-0.605*** (0.012)	-0.655*** (0.008)	-0.736*** (0.002)	-0.707*** (0.004)	-0.689*** (0.006)	-0.748*** (0.003)
$DL$	1.137*** (0.027)	0.617*** (0.048)	1.090*** (0.088)	1.578*** (0.066)	0.992*** (0.013)	0.995*** (0.025)	0.651*** (0.042)	1.087*** (0.026)
$QE$	-0.204*** (0.017)	-0.207*** (0.030)	-0.095* (0.055)	-0.116*** (0.033)	0.163*** (0.006)	0.082*** (0.013)	0.184*** (0.020)	0.202*** (0.011)
$DL * QE$	0.313*** (0.023)	0.077* (0.044)	0.107 (0.083)	0.258*** (0.050)	0.145*** (0.010)	0.017 (0.020)	0.176*** (0.035)	0.194*** (0.018)
$Fin. invest.$	-0.727*** (0.024)	-0.759*** (0.046)	-0.809*** (0.071)	-0.521*** (0.044)	0.127*** (0.010)	-0.232*** (0.020)	-0.042 (0.030)	0.458*** (0.017)
$ST loans$	-1.648*** (0.024)	-1.563*** (0.046)	-1.824*** (0.071)	-1.624*** (0.045)	-1.717*** (0.016)	-1.791*** (0.034)	-1.481*** (0.049)	-1.782*** (0.027)
$Constant$	1.763*** (0.021)	1.865*** (0.036)	1.679*** (0.063)	1.517*** (0.047)	1.758*** (0.008)	1.755*** (0.016)	1.725*** (0.025)	1.674*** (0.016)
$Obs.$	42,938	11,569	4,773	13,236	217,722	43,564	23,735	81,182
$F - Stat.$	4,041	930	427	1,331	29,838	5,208	2,589	11,386
$p - value$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
$Adj. R^2$	0.346	0.294	0.309	0.359	0.433	0.38	0.334	0.434

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

QE = quantitative easing period.

Note: Standard errors in parentheses.

**Table A10: Non-People's Republic of China Emerging Asia, by Investment Purpose and Quantitative Easing Period (Dependent Variable:  $\Delta \ln(L_{i,c,m})$ )**

	Financial Investment				Physical Investment			
	Whole Period	QE1	QE2	QE3	Whole Period	QE1	QE2	QE3
$\ln(L_{i,c,m-1})$	-0.845*** (0.002)	-0.826*** (0.003)	-0.820*** (0.006)	-0.837*** (0.003)	-0.788*** (0.002)	-0.756*** (0.003)	-0.755*** (0.005)	-0.794*** (0.003)
<i>DL</i>	0.962*** (0.013)	0.913*** (0.024)	0.791*** (0.041)	0.986*** (0.027)	1.430*** (0.010)	1.233*** (0.020)	1.342*** (0.032)	1.569*** (0.021)
<i>QE</i>	0.094*** (0.006)	0.045*** (0.010)	0.129*** (0.019)	0.144*** (0.011)	0.049*** (0.005)	-0.020** (0.010)	0.071*** (0.016)	0.105*** (0.008)
<i>DL * QE</i>	0.028*** (0.009)	-0.040** (0.016)	-0.039 (0.031)	0.080*** (0.017)	0.154*** (0.007)	0.035** (0.016)	0.088*** (0.027)	0.178*** (0.014)
<i>ST loans</i>	-1.591*** (0.015)	-1.590*** (0.029)	-1.507*** (0.046)	-1.622*** (0.027)	-2.039*** (0.011)	-2.041*** (0.024)	-2.076*** (0.034)	-1.984*** (0.019)
<i>Constant</i>	2.090*** (0.007)	1.783*** (0.012)	1.951*** (0.022)	2.291*** (0.016)	1.727*** (0.006)	1.733*** (0.011)	1.630*** (0.017)	1.661*** (0.011)
<i>Obs.</i>	155,084	36,619	16,844	53,599	232,995	50,860	24,625	85,393
<i>F – Stat.</i>	52,321	12,078	4,833	16,597	58,488	10,378	5,242	22,048
<i>p – value</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>Adj. R<sup>2</sup></i>	0.616	0.601	0.552	0.592	0.542	0.471	0.468	0.546

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

QE = quantitative easing period.

Note: Standard errors in parentheses.

**Table A11: Non-People's Republic of China Emerging Asia, by Loan Maturity and Quantitative Easing Period (Dependent Variable:  $\Delta \ln(L_{i,c,m})$ )**

	Short-term Loans				Medium- and Long-term Loans			
	Whole period	QE1	QE2	QE3	Whole period	QE1	QE2	QE3
$\ln(L_{i,c,m-1})$	-0.924*** (0.004)	-0.902*** (0.008)	-0.916*** (0.012)	-0.919*** (0.008)	-0.727*** (0.001)	-0.707*** (0.003)	-0.680*** (0.005)	-0.734*** (0.003)
<i>DL</i>	0.460*** (0.029)	0.106** (0.047)	0.455*** (0.086)	0.833*** (0.063)	1.163*** (0.010)	1.082*** (0.018)	0.914*** (0.032)	1.255*** (0.020)
<i>QE</i>	-0.048*** (0.013)	-0.095*** (0.022)	0.022 (0.042)	0.005 (0.025)	0.127*** (0.005)	0.034*** (0.009)	0.149*** (0.016)	0.192*** (0.008)
<i>DL * QE</i>	0.093*** (0.019)	0.097*** (0.032)	-0.047 (0.064)	0.054 (0.038)	0.133*** (0.007)	-0.022 (0.014)	0.154*** (0.027)	0.183*** (0.013)
<i>Fin. invest.</i>	0.301*** (0.024)	0.022 (0.041)	-0.377*** (0.067)	0.932*** (0.043)	-0.058*** (0.008)	-0.446*** (0.015)	-0.120*** (0.023)	0.282*** (0.013)
<i>Constant</i>	0.433*** (0.018)	0.425*** (0.029)	0.568*** (0.052)	0.223*** (0.039)	1.735*** (0.006)	1.806*** (0.011)	1.633*** (0.019)	1.610*** (0.012)
<i>Obs.</i>	44,049	10,590	4,760	15,086	344,030	76,889	36,709	123,906
<i>F – Stat.</i>	9,609	2,597	1,087	3,013	59,422	12,167	4,966	21,778
<i>p – value</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>Adj. R<sup>2</sup></i>	0.503	0.522	0.487	0.475	0.444	0.404	0.34	0.444

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

QE = quantitative easing period.

Note: Standard errors in parentheses.