Borradores de ECONOMÍA

Sudden Yield Reversals and Financial Intermediation in Emerging Markets*

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Abstract

Banks in emerging market economies rely on cross-border interbank lending to financing firms in the real sector. By matching cross-border bank-to-bank loan level data with domestic bank-to-firm loan level data, and firm-level data, this paper shows that sudden yield reversal observed during the 2013 Fed taper tantrum resulted in a substantial contraction of cross-border interbank lending in emerging markets that significantly reduced the supply of domestic corporate credit and increased the corporate loan rates. Results show that firms with an ex-ante high concentration of credit granted by exposed banks in the cross-border interbank market exhibited low bank credit and substantial real effects, including a decline in imports and exports. The results further indicate that cross-border intra-group lending and domestic unsecured interbank funding contribute to smoothing the effects of sudden yield reversals on the financial intermediation. Overall, the results are consistent with the notion that banks' exposition in international credit markets contributes to global financial conditions' transmission to the economy.

JEL: E43, E58, L14, G12, G21.

Key Words: Sudden Yield Reversals; Cross-Border Interbank Lending; Financial Intermediation, Lending Relationships; Emerging Markets

Reversiones repentinas de rendimientos e intermediación financiera en mercados emergentes

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Resumen

Los bancos en las economías de mercados emergentes dependen de los préstamos interbancarios transfronterizos para financiar empresas en el sector real. Usando datos a nivel de préstamos transfronterizos entre bancos, datos a nivel de préstamos domésticos de bancos a firmas y datos a nivel de firma, este documento muestra que la reversión repentina de rendimientos observadas durante el Fed *Taper Tantrum* de 2013 generó una contracción sustancial del crédito interbancario transfronterizo en los mercados emergentes que resultó en una significativa reducción de la oferta doméstica de crédito corporativo y en mayores tasas de los préstamos. Los resultados muestran que las firmas con una alta concentración de crédito otorgado por los bancos más expuestos en el mercado de préstamos interbancarios transfronterizos exhibieron bajo crédito bancario y efectos reales sustanciales, incluyendo una disminución de las importaciones y exportaciones. Los resultados indican además que los préstamos transfronterizos intra-grupo y el fondeo interbancario doméstico contribuyen a suavizar los efectos de las reversiones repentinas de rendimientos sobre la intermediación financiera. En general, estos resultados son consistentes con la noción de que la exposición de los bancos en los mercados internacionales de crédito contribuye a la transmisión de las condiciones financieras globales en la economía.

Clasificación JEL: E43, E58, L14, G12, G21.

Palabras clave: Reversiones repentinas de rendimientos, Intermediación financiera, Mercados Emergentes, Crédito interbancario transfronterizo, Relaciones bancarias

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1.   Introduction

How sudden yield reversals affect financial intermediation in emerging markets? Banks in emerging market economies rely on the cross-border interbank credit market to financing non-financial firms. In the aftermath of the global financial crisis of 2008-09 the use of this type of foreign funding dramatically increased because of the excessive liquidity granted by central banks in advanced economies and the lower interest rates environment. During mid-2008 and early 2013 central banks in advanced economies implemented alternative liquidity facilities and granted abundant liquidity to alleviate liquidity tensions in the financial markets. These *unconventional* monetary policies implemented in the U.S.—such as the quantitative easing (QE)—and in other advanced economies like the Eurozone, U.K., and Japan to alleviate domestic liquidity tensions increased global liquidity, leading to capital inflows, and easing the financial conditions in emerging markets (Tillmann, 2016; Anaya et al., 2017). Between May and December of 2013, Fed officials informed the market on the possibility of tapering its securities purchases namely the "Fed taper tantrum"[1], an *unexpected* announcement that generated higher uncertainty in emerging markets, leading to a sudden yield reversal materialized in capital outflows, revisions to expected short-term yields, lower cross-border lending, exchange rate depreciation and increased funding costs (Eichengreen and Gupta, 2015; Bowman et al., 2015; Aizenman et al., 2016; Avdjiev and Takáts, 2019; Acharya and Vij, 2021; Chari et al., 2021). Currently, policy makers are concerned about the potential implications from the Covid-19 tantrum on financial markets in emerging economies (Gudmundsson et al., 2022; Das et al., 2022). Despite the growing evidence on the implications of the Fed taper tantrum in emerging markets, little is known on how this sudden yield reversal affected the financial intermediation and the real activity in emerging economies.

In this paper, we use cross-border bank-to-bank loan level administrative data matched with domestic bank-to-firm loan level data (corporate loans from the credit registry) and firm-level administrative data, to examine how the sudden yield reversal observed during the 2013 Fed taper

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[1] In early May 2013, Fed officials first began to talk of the possibility of tapering its securities purchases (gradually reducing them from $85 billion monthly to a lower level until its potential termination depending on the US economy conditions). However, on May 22, 2013, the Chairman Ben Bernanke raised the possibility of tapering in his testimony to the Congress, confirming the higher probability to initiate a tapering soon (Bernanke, 2013). The uncertainty related to the QE termination remained until December 18, 2013, when new data on the condition of the US economy led Fed officials to make statements that moderated prior expectations of tapering (see Eichengreen and Gupta, 2015; Aizenman et al., 2016). Other authors argue that the Tapering period continued until June of 2014 (Chari et al., 2021)

tantrum affected the financial intermediation and the real economy in Colombia. We employ a similar approach to Khwaja and Mian (2008) to examine the impact of this global liquidity shock on the supply of credit and the real economy in an emerging market economy. Our exogenous liquidity shock is associated to the sudden yield reversal observed during the Fed taper tantrum that affected the availability of cross border interbank liquidity in emerging markets (Avdjiev and Takáts, 2019). We first analyze the changes in the supply of *cross-border interbank lending* by international banks to Colombian banks before and during the Fed taper tantrum. Then, we study how the supply of *corporate credit* (bank-to-firm) and loan rates (in both foreign and local currency) by Colombian banks with high ex-ante exposure in the cross-border interbank market changed during the Fed taper tantrum. Using information on bank lending relationships in both the cross-border interbank and the domestic unsecured interbank market, we further study the role of internal capital markets and lending relationships in alleviating banks' liquidity shocks. Lastly, we identify the real effects exhibited by those firms with a high concentration of credit from exposed banks in the cross-border interbank market during the Fed taper tantrum, including the effects on trade. To our knowledge, this is the first paper that traces the impact of the Fed taper tantrum on financial intermediation and the real activity in an emerging market economy.

Our estimations provide four main results. First, we find that during the Fed Taper tantrum international banks significantly reduced the *supply* of cross-border credit to Colombian banks, and that the contraction in credit was substantially larger among banks with ex-ante higher exposure in the cross-border lending market. The estimated reduction in the supply of short-term cross-border credit was about 11 percent and increased to 19 percent for banks with high ex-ante exposure in the cross-border lending market. In the long-term segment, these reductions reached 8 percent and 16 percent, respectively. Interestingly, we observe that banks that belong to a banking group (i.e., branch, subsidiary or headquarter) were less affected in their credit conditions relative to banks that only borrow from non-affiliated banks, consistent with the role of internal capital markets (Cetorelli and Goldberg, 2012; Schnabl, 2012) and with evidence on intragroup funding (Reinhardt and Riddiough, 2015). Moreover, we find that the contraction of cross-border credit induced by the Fed Taper tantrum, was more pronounced during increases in sovereign risk, suggesting potential evidence on flight-to-quality as international banks seem to react more during increases in sovereign risk perceptions (see, Beber et al., 2009).

4

Second, we find that the *supply of corporate credit* in both foreign and local currency was significantly lower during the Fed taper tantrum. We observe that the amount of credit in *foreign currency* allocated to local firms declined by around 13 percent during the Fed taper tantrum. Moreover, banks with a higher exposition in the cross-border bank lending market (exposed banks) reduced the supply of corporate credit in foreign currency by an additional 20 percent vis-à-vis banks with low exposition in that market. Similarly, during the Fed taper tantrum, the supply of corporate credit in *local currency* declined by around 4 percent, while exposed banks exhibited an additional 11 percent reduction. These exposed banks also charged higher loan rates to corporate loans granted in both foreign and local currency. Firms borrowing from banks with high exposition in the cross-border lending market paid around 1.7 percentage points more on loans in foreign currency than those firms borrowing from less exposed banks, which corresponds to a spread of about 12 percent over the mean loan rate during the evaluated period (14.6 percent). The spread charged by exposed banks on loans in local currency was about 1.29 percentage points (i.e., 7.5 percent over the mean loan rate, 17.1 percent). These results indicate that exposed banks in the cross-border lending market transmit global financial conditions to domestic credit markets.

Third, we document that during the Fed taper tantrum, those exposed banks in the cross-border interbank market that relied more on their closest lenders in the domestic unsecured interbank market reduced by less the supply of credit to non-financial firms, and increased in a lower magnitude their loan rates, compared to exposed banks with low use of unsecured funding. This suggests that lending relationships can provide a liquidity insurance for banks facing global liquidity shocks. Moreover, the results indicate that unsecured interbank lending has a significant influence on bank lending.

Fourth, we find that firms with ex-ante high concentration of credit granted by exposed banks exhibited a substantial decline in the supply of corporate credit, especially those firms in the trade sector, which in turn presented lower performance and an important contraction in their imports and exports. Specifically, firms that ex-ante to the Fed taper tantrum, contracted more than 50 percent of their credit with exposed banks (i.e., high-exposition firms), exhibited a relative decline in loan volume, total liabilities and total assets of about 22 percent, 19 percent and 18 percent, respectively; during the year of the Fed taper tantrum compared to low-exposition firms. These high-exposition firms exhibited a decline of 21 percent in their imports and a reduction of

17 percent in their exports relative to low-exposition firms. The results are robust across different subsamples of firms. Importantly, in the total sample that includes firms without trade, the high-exposition firms exhibited a relative decline in credit and negative real effects (i.e., lower sales and investments), suggesting that firms without trade activity (but with high concentration of credit from exposed banks) were also credit rationed and exhibited lower performance. These results indicate that sudden yield reversals have substantial real effects on firms that depend more on bank credit, especially those in need of trade finance.

Our results contribute to several strains in the literature. First, our findings support the view that one of the most important channels through which monetary policy in the US impacts global financial conditions is related to cross-border bank lending (Bruno and Shin, 2015; Rey, 2016; Temesvary et al., 2018; Miranda-Agrippino and Rey, 2020; Buch et al., 2019; Braüning and Ivashina, 2020; Demirgüç-Kunt et al., 2020). We find that during the Fed Taper tantrum period, international banks significantly reduced the supply of short-term (3 to 12 months) cross-border credit to Colombian banks, and that the contraction in credit was substantially larger among banks with higher ex-ante exposure in the short-term segment. The higher decline in the short-term segment, compared to the long-term segment, can explain the observed reduction in the supply of domestic corporate credit (i.e., resulting from a potential increase in the borrowers' credit risk), in line with the predictions of the model in Bruno and Shin (2015). The authors show that banks with access to US dollar wholesale markets channel funds to banks in other parts of the world. The demand for this funding is, in turn, largely determined by the effective credit risk associated with lending to local borrowers. When the local currency weakens against the US dollar, the health of the balance sheets of local borrowers with currency mismatches deteriorates, resulting in higher credit risk, and hence, diminished bank lending capacity.

Second, our results extend the evidence on the potential effects of internal capital markets in mitigating global liquidity shocks (Cetorelli and Goldberg, 2012). We identify that during the Fed taper tantrum, those banks that borrowed within the same banking group (intra-group) exhibited a lower contraction in the amount of cross-border funding compared to banks that borrowed from non-affiliated banks. This finding supports previous evidence on the role of intra-group funding in the cross-border interbank market when global conditions deteriorate (Reinhardt and Riddiough, 2015). The rationality of this finding is related with the view that peer monitoring

within banking groups can prevent risk shifting in response to higher interest rates, and hence, among banks that borrow internationally, the transmission of liquidity shocks by non-affiliated lenders is stronger than the transmission by affiliated banks (Schnabl, 2012).

Third, we show evidence on the effects of the Fed taper tantrum on the *domestic corporate credit market* in an emerging economy, thereby extending the evidence focused on financial and FX markets (Eichengreen and Gupta, 2015; Fratzscher et al., 2018; Avdjiev and Takáts, 2019; Chari et al., 2021). We also build on previous evidence that evaluate the effects of sudden capital inflows (associated to sovereign debt markets) on financial intermediation in emerging economies (Carranza and Moreno-Burbano, 2020; Williams, 2018). We find that the *supply of corporate credit* in both foreign and local currency was significantly lower during the Fed taper tantrum, specially from banks with a high exposition in the cross-border interbank credit market. Thus, we show that exposed banks to international capital markets transmit global financial conditions locally (see, Baskaya et al., 2017; Kalemli-Özcan, 2019; Di Giovanni et al., 2021; Cantú et al., 2022).

Fourth, we observe that during the Fed taper tantrum, the central bank of Colombia increased by 25 percent the supply of liquidity (i.e., increased the size of the daily expansionary repo auctions) allowing banks to obtain higher short-term liquidity. Consistent with the effect of central bank liquidity on interbank markets during episodes of heightened uncertainty (Allen et al., 2009; Christensen et al., 2009; Freixas et al., 2011; Abbassi et al., 2021), we show that banks with a high use of interbank funding (i.e., net borrowers) lend significantly more (and charge lower loan rates) to non-financial firms. Moreover, during the Fed taper tantrum, these banks reduced in a lower degree their supply of corporate credit (and increased by less their loan rates) relative to banks with a low use of interbank funding. Thus, we show the (in)direct effect of central bank liquidity on corporate lending and provide evidence on the influence of interbank funding on bank lending (Altavilla et al., 2019; Beck et al., 2021).

Furthermore, we find that during the Fed taper tantrum, banks affected by the decline of cross-border bank credit (exposed banks) that rely more on their closest lenders in the unsecured interbank market reduced by less the supply of credit (an increased by lees loan rates) to non-financial firms. This suggests that lending relationships provide a liquidity insurance for banks facing global liquidity shocks (see, Cocco et al., 2009; Afonso et al., 2014; DiMaggio et al., 2017).

7

Braüning and Fecht (2017) find that during the global financial crisis of 2008, relationship lenders in the German interbank market provided cheaper loans to their closest borrowers, confirming that lending relationships help banks to reduce search frictions, even for opaque borrowers. We extend the evidence provided in these studies by showing the influence of lending relationships over the supply of corporate credit during sudden yield reversals.

Fifth, we find a substantial decline in the supply of corporate credit by exposed banks in the cross-border interbank market to non-financial firms in the trade sector. These firms, in turn, exhibited lower performance (i.e., decline in assets, liabilities, investments and sales) and a contraction of 21 percent in imports and 17 percent in exports, relative to firms that borrowed less from exposed banks. This finding extends the evidence on the impact of bank liquidity shocks on the real activity (see, Schnabl, 2012; Paravisini et al., 2015; Ahn and Sarmiento, 2019; Bruno and Shin, 2019; Alfaro et al., 2021) and is consistent with the view that bank specialization makes credit difficult to substitute (Paravisini et al., 2020).

Lastly, our results indicate that the degree of banks' exposition in international credit markets influences their supply of credit in domestic credit markets. The estimated effects of the Fed taper tantrum on the supply of corporate credit to non-financial firms were observed in a banking system with a relatively low exposition to foreign credit markets. During the evaluated period, the average ratio of banks' debt in foreign currency to total liabilities was around 12 percent and the share of corporate credit in foreign currency to total credit 11 percent, which is related to the role of the FX macroprudencial regulation established since 2007 (see, Vargas et al., 2017, Lemus et al., 2021). Thus, emerging market economies with higher exposition of their banking systems to foreign credit markets could exhibit a higher contraction in the supply of cross-border credit and in turn, a more important decline in domestic corporate credit during sudden yield reversals (see for instance, Braüning and Ivashina, 2020; Bruno and Shin, 2019). Therefore, macroprudential policies aimed at reducing domestic banks' exposition in international credit markets can enhance financial stability in emerging market economies (see, Cerutti et al., 2017; Ahnert, et al., 2020, Das et al., 2022).

The remainder of this paper is organized as follows. Section 2 describes the data and the sample construction. Section 3 provides initial evidence on the effects of the Fed taper tantrum on

the cross-border interbank lending market and the domestic corporate credit market in Colombia. Section 4 presents the methodology and the results of the estimations. Finally, section 5 concludes.

2. Data and Sample Construction

To study the effects of the sudden yield reversals around the Fed taper tantrum period on financial intermediation in Colombia, we employ a rich dataset composed by granular information on foreign and domestic credit markets, unsecured interbank loans, and firms' balance-sheet information, including trade.

We employ four main datasets. First, we use regulatory data from *Banco de la República* (the central bank of Colombia) on bank-to-bank loan level cross-border loans granted by foreign banks to Colombian banks. The cross-border interbank credit market is a global market in which banks actively exchange short-term and long-term liquidity. In Colombia, all the credits granted by foreign banks to domestic banks should by registered at the central bank for regulatory purposes. Banks that borrow in the cross-border interbank market and lend in *local* currency should use a derivative position to cover their potential currency mismatch. In addition to this, the amount borrowed plus the amount lent in *foreign* currency should be lower than five times the bank's capital equity.[2] The short-term segment of the cross-border interbank market (between 3 to 12 months) is typically employed for trade finance (i.e., banks intermediate loans for firms in the trade sector) and the long-term segment (between 13 to 60 months) is mainly used for banks' investments. For instance, the Colombian banking expansion in Central America around 2010-11 was mostly financed using long-term funding in the cross-border interbank market (see Lemus et al., 2021).

The cross-border credit data include information on the loan amount, maturity, credit limit, identity and location of both borrower and lender bank. We use the outstanding amount of the credit at the borrower-lender-quarter level. We only include active credit lines for at least two consecutive quarters to have a relatively homogenous set of frequent lenders in the sample. The final sample includes 506 borrower-lender-quarter credit observations among 8 Colombian private

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[2] This FX macroprudential measure was established in July of 2007 to limit currency mismatches and excessive credit growth sustained by foreign debt (see, Vargas et al., 2017). The use of this type of prudential regulation has been useful to increase monetary policy transmission by reducing the reliance of banks in foreign debt (see, Dias et al., 2020; Lemus et al., 2021).

banks with 213 international banks during 2012Q2 to 2014Q2 period (i.e., four quarters immediately before and after the first announcement on the Fed taper tantrum)[3]. During the evaluated period, Colombian banks borrowed, on average, from 8 banks, with a minimum of 4 lenders and a maximum of 15 lenders. The mean loan amount in the short-term segment (maturity less than 12 months) was 453.3 USD million and in the long-term segment (maturity greater than 12 months) it was around 670.2 USD million. On average, 22 percent of loans were granted by banks that belong to the same banking group of the borrower bank (i.e., subsidiary, branch or headquarter) (Table A1).

Our second dataset is composed by bank-firm-quarter loan level data from the Colombian credit registry database supplied by the *Superintendencia Financiera de Colombia* (SFC). This dataset includes quarterly information on the loan volume, maturity, loan rate, currency, collateral value, the bank and firm identifiers, among other loan level and firm characteristics. Loans contracted in foreign currency should be reported by banks to the SFC using the exchange rate of the end of period (i.e., reported in local currency). We exclude from the sample loans granted to individuals pursuing entrepreneurial activity and loans to firms without balance-sheet information at the *Superintendencia de Sociedades* (SS), as our study focuses on credit granted to corporations.[4] To center the analysis on firms that depend on domestic bank credit, we exclude from the sample large firms that issued bonds and those with access to international credit markets during the evaluated period (Schnabl, 2012). The sample is also restricted to firms with credit operations granted by more than two banks to allow for credit substitution across banks (Khwaja and Mian, 2008). We match the cross-border interbank credit database with the corporate credit data using the bank identification number and the period. The sample covers the period 2012Q2 to 2014Q2 and includes 481,431 bank-firm-quarter observations including 26,837 firms and 21 private commercial banks, from which 429,894 observations (89.3 percent) correspond to loans denominated in local currency, and 51,537 (10.7 percent) to loans denominated in foreign currency.

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[3] The group of banks with active credit lines in the cross-border lending market is composed by a combination of large domestic banks (Bancolombia, Banco de Bogotá, Banco de Occidente, Banco Colpatria, Banco Davivienda) and subsidiaries of international banks that operate in Colombia (Banco BBVA, Banco Itaú). These banks accounted for around 77 percent of corporate credit in Colombia during the evaluated period.

[4] Non-financial firms with assets value greater than COP 1,000 million (around 320,000 USD) should report balance-sheet and financial statements at the end of the fiscal year to the *Superintendencia de Sociedades*, the regulatory agency of the Government of Colombia that oversees corporations (see https://www.supersociedades.gov.co/SitePages/Inicio.aspx).

The mean loan volume in local currency was 145.3 COP million and 187.5 COP million for loans in foreign currency (around 45,300 USD and 58,600 USD, respectively). The mean loan rate for loans denominated in local currency was 17.1 percent, and 14.3 percent for loans contracted in foreign currency. The matched sample contains the universe of corporate credits granted by 8 banks with credit lines in the cross-border lending market and 13 private banks that do not have access to this foreign credit market. This allows to compare the supply of credit to non-financial firms between exposed and non-exposed banks in the cross-border interbank market.

To study the influence of unsecured funding to support the supply of bank credit to non-financial firms during the Fed taper tantrum, we employ a third dataset composed by confidential information on the universe of bilateral *unsecured overnight loans* collected by the SFC and reported by all banks at a daily frequency. Unique to this paper, we employ observed data on overnight unsecured interbank loans instead of approximations of the interest rates and volumes extracted from large-value payment systems.[5] For our analysis, we compute the net borrowed position at the bank-quarter level. That is, the amount of unsecured interbank funds borrowed minus the amount lent by each bank during a quarter. The sample includes 189 bank-quarter level observations for the 21 banks operating in the corporate credit market during 2012Q2-2014Q2. During the period, the mean loan amount in the unsecured interbank market was 11,652 COP million and the mean net borrowed position was 6,157 million COP (about 4.3 USD million and 1.5 USD million, respectively). We also compute a measure of lending concentration (i.e., the 3-HHI) defined as the sum of the squared value of the percentage of total quarterly borrowing from the borrowers' three largest relationships (Afonso et al., 2014). On average, net borrowers have concentrated trading patterns with their lenders, with an average of 3-HHI of 0.38, while net lenders have an average 3-HHI of 0.88. The higher concentration of lenders in banks that are net lenders in the unsecured interbank market suggest that they tend to borrow less frequent, and when they borrow, usually trade with only one bank. We match the unsecured funding data with the corporate credit data using the bank identification number to have these measures at the bank-quarter-level.

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[5] Thus, we can directly observe the characteristics of the interbank loans (i.e., rates, volumes, maturities, and counterparties) as they are registered by the participants daily and reported to the SFC. Therefore, we avoid the disadvantages of the traditional algorithms employed in the literature to extract information on interest rates and the volume of the loans (see, for instance, Furfine 2001; Heijmans, et al. 2010).

Given that most of cross-border interbank credit is channeled by domestic banks to non-financial firms for trade finance (72 percent) and working capital (28 percent) (Banco de la República, 2013c; 2020), we examine whether firms with a high dependency of credit from exposed banks in the cross-border interbank market exhibited real effects, including effects on trade.[6] To do this, we employ balance sheet information at the firm-level from the SS matched with firm-level trade data from *Dirección de Impuestos y Aduanas Nacionales* (DIAN), the Colombian taxes and customs department. We use end-of-year annual balance sheet data due to Colombian commercial firms are required to disclose financial reports to the SS only once a year (i.e., we do not have quarterly financial information for our sample of Colombian commercial firms). To identify those firms with trade activity, we match the annual database from SS with the trade information from DIAN using the firm's identification number registered in both datasets. The trade information on imports and exports is available at the firm-month level. We aggregate the outstanding value of imports and exports at the firm-year level. The sample with annual information on financial statements and trade from 2012 to 2014 includes 80,511 firm-year observations for the 26,837 firms with bank credit in the SFC database, from which 8,573 have imports, 3,590 have exports, and 2.917 have both exports and imports. These figures represent 31.9 percent, 13.4 percent, and 10.8 percent of the sample of firms with bank credit, respectively. Thus, the detailed dataset allows to trace the direct impact of the Fed taper tantrum on foreign and domestic credit markets in Colombia, and to identify the associated real effects on the borrowers, including those firms in the trade sector.

3. Cross-Border Inter-bank Lending and Domestic Credit during the Fed Taper Tantrum

In this section, we provide initial evidence on the effect of the Fed taper tantrum on the cross-border interbank market and the corporate credit market in Colombia. The Fed taper tantrum consisted in a sequence of announcements made by Fed officials on the possibility of tapering its

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[6] The Central Bank of Colombia conducts a quarterly survey to banks with active credit lines abroad that includes information on the destination of foreign borrowing for the real sector by term and category (i.e., working capital and trade finance). In 2013Q1, banks reported that 72 percent of cross-border credit was allocated to trade finance and 28 percent to working capital (Banco de la República, 2013c). These figures remained relatively similar by 2019Q4, 70 and 30 percent, respectively (Banco de la República, 2020).

securities purchases between May and December of 2013. The announcements were: i) Bernanke's speech to the Congress (May, 22); ii) FOMC (July, 31); iii) FOMC (September, 17); and iv) FOMC (December, 18).[7] These announcements generated capital outflows, lower cross-border credit, exchange rate depreciation and increased funding costs in emerging economies (Eichengreen and Gupta, 2015; Aizenman et al., 2016; Avdjiev and Takáts, 2019). In Colombia, the Fed Taper tantrum affected expectations on short-term liquidity (i.e., the secured money market used by banks to trade liquidity using public debt bills as collateral), raising concerns among monetary authorities (see, Banco de la República, 2013a; IMF, 2014). In response to the higher uncertainty in financial markets, the central bank kept its policy rate unchanged and increased the liquidity supply by around 25 percent through its daily repo operations (Banco de la República, 2013b).

In **Figure 1** we show the evolution of cross-border bank lending before and during the Fed taper tantrum. The figure includes the rate of growth of short-term (maturity less than 1 year) and long-term credit (maturity greater than 1 year) granted by international banks to Colombian banks in the cross-border bank lending market between 2012Q2 and 2014Q2, along with the Colombian CDS spread on 5-years sovereign debt in foreign currency in basis points (bps) (right axis). The vertical line corresponds to the second quarter of 2013 (i.e., when the Fed taper tantrum announcements initiated). We observe that the rate of growth of the cross-border bank credit in the short-term segment declined from 2.8 percent to -2.4 percent between 2013Q1 and 2013Q2 (i.e., after Bernanke's speech to the Congress on May, 22 of 2013), and reached a contraction of -4.3 percent by 2013Q4 (following the FOMC announcements). The rate of growth of the cross-border credit in the long-term exhibited a reduction of around 4 percent one quarter after the first announcement of the Fed taper tantrum (i.e., around the FOMC of July 31st), from 4.1 percent in 2013Q2 to 0.43 percent in 2013Q3. The higher reduction of the short-term segment can be associated to the potential allocation of domestic credit in foreign currency.

We also observe a sharp increase in the Colombian CDS spread on 5-year sovereign debt in foreign currency between 2013Q1 and 2013Q2 (from 94 bps to 132 bps, i.e., 40 percent) that

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[7] The uncertainty related to the QE termination began in May, 22, 2013 with the Bernanke's speech to the U.S. Congress (Bernanke, 2013) and remained until September, 17, 2013 when the Fed moderated prior expectations of tapering (Eichengreen and Gupta, 2015). Aizenman et al., (2014) consider that the Fed taper tantrum uncertainty remained until December 18, 2013, when the Fed decided at the FOMC meeting to taper its quantitative easing policy by $10 billion per month, to $75 billion. They also show that financial markets in emerging economies react to both FOMC statements and Fed officials' communications.

coincides with the beginning of the Fed taper tantrum period. The CDS remained growing until 2013Q4 (FOMC of December 18) reaching 145 bps. Then, the CDS spread decreased to the similar levels observed before the Fed taper tantrum. The rapid increase in the Colombian CDS spread reflects the higher sovereign risk associated to the uncertainty about the Fed taper tantrum, which explains the sudden yield reversals driven by capital outflows from emerging economies.

In **Table 1** we present the results of mean comparison tests to examine how market conditions in the cross-border bank lending market changed during the Fed taper tantrum. As previously defined, before the Fed taper tantrum corresponds to the period between 2012Q2 and 2013Q1 and during the Fed taper tantrum covers the 2013Q2 to 2014Q2 period (i.e., four quarters immediately before and after the first announcement on the Fed taper tantrum). We observe that the average loan amount in the short-term segment of the cross-border market during the Fed taper tantrum was lower in 55,2 USD million compared to the period before the Fed taper tantrum (i.e., a reduction of 11.4 percent), while the mean loan amount in the long-term segment declined by 21,7 USD million during the same period. (i.e., a contraction of 3.3 percent). The mean quota declined by 4 percent during the same period. The mean number of lenders (i.e., international banks) declined from 12 to 10 during the Fed taper tantrum while the number of borrowers (Colombian banks) remained in 8 banks. The mean CDS spread increased by 24.8 percent, from 105 bps to 131 bps. These figures indicate that Colombian banks exhibited an important reduction in the amount of cross-border credit during the Fed taper tantrum and faced higher sovereign risk.[8]

Figure 2 depicts the rate of growth of loans granted in *foreign* currency by Colombian banks to non-financial firms during 2012Q2 to 2014Q2 period. We compare the loan growth rate between banks with a high (low) exposition, which are banks with a share of total credit in the cross-border interbank lending market to total liabilities above (below) the median during the evaluated period. We observe that, during the Fed taper tantrum, both types of banks exhibited a lower loan growth in foreign currency (about 6.5 percent) compared to the previous period. Banks with a high exposition exhibited a greater reduction vis-à-vis banks with low exposition. The rate

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[8] In Figure 1 and Table 1 we show that the cross-border credit to Colombian banks rapidly declined around the Fed taper tantrum. As we do not have information on the supply of credit by the same set of international banks to banks in other jurisdictions, we can only observe part of the response of international banks during the Fed taper tantrum and therefore cannot confirm a flight-to-quality as documented in Avdjiev and Takáts (2019). Giannetti and Laeven (2012) explore the flight-to-quality observed during the global financial crisis of 2008-09.

of growth of corporate credit in foreign currency of banks with *high* exposition decreased from 11 percent in 2013Q1 to 3.6 percent in 2013Q2 (i.e., 7.4 percentage points after the first announcement on the Fed taper tantrum) and reached a negative growth of -2.53 percent by 2013Q4. Banks with *low* exposition exhibited a decline of 1.2 percentage points between 2013Q1 and 2013Q2, and then registered a rate of growth of -1.6 percent by 2013Q4.

Figure 3 shows the evolution of the rate of growth of loans granted in *local* currency by Colombian banks to non-financial firms between 2012Q2 and 2014Q2. In this case, we compare the rate of growth of loans between banks that borrow in the cross-border interbank lending market (8 banks) against banks that do not have access to that foreign credit market (13 banks). We observe that banks that have access to the cross-border interbank lending market exhibited a lower rate of growth of credit in *local* currency to non-financial firms vis-à-vis banks without access to the cross-border lending market. The mean rate of growth of exposed banks declined 5.5 percentage points, from 13.7 percent in 2013Q2 to 8.2 in 2013Q4, while the rate of growth of non-exposed banks declined by 2.1 percentage points during the same period. Interestingly, the contraction of corporate credit in local currency initiated one quarter after the decline in credit in foreign currency.

The lower decline in the corporate credit can be explained by the FX macroprudential regulation in Colombia that restricts the excessive use of banks' foreign debt to intermediate bank credit. During the evaluated period, on average, banks' debt in foreign currency to total liabilities was around 12 percent and corporate credit in foreign currency was around 11 percent of total credit. As mentioned in **Section 2**, banks that borrow in the cross-border interbank credit market and lend in *local* currency should use a derivative position to cover their potential currency mismatch. In addition to this, the amount borrowed plus the amount lent in *foreign* currency should be lower than five times the bank's capital equity.

Overall, these figures indicate that Colombian banks exposed to the cross-border interbank lending market exhibited an important reduction in the amount of credit during the Fed taper tantrum and that they also faced the effects of higher sovereign risk. Furthermore, these figures indicate that banks with a higher exposition in the cross-border interbank market seem to transmit the global liquidity shock from the Fed taper tantrum to domestic credit markets.

15

4. The Fed Taper Tantrum and The Financial Intermediation in Emerging Markets

In this section we present the results of several tests to understand the effects of the Fed taper tantrum on the financial intermediation in Colombia. We analyze the effects on the supply of cross-border lending, domestic corporate credit in both foreign and local currency, and the associated real effects.

4.1. Cross-border bank lending during the Fed taper tantrum

Our first exercise consists in analyzing the changes in the *supply* of cross-border interbank credit to Colombian banks around the Fed Taper tantrum. The analysis is conducted at the lender-borrower-quarter level including four quarters immediately before and after the first announcement on the Fed taper tantrum (i.e., from 2012Q2 to 2014Q2). The sample includes 506 borrower-lender-quarter observations among 8 Colombian banks with 213 international banks. During the evaluated period, the minimum number of lenders per borrower was 4 banks, meaning that, in our sample, Colombian banks are allowed to switch across lenders, a key condition to the identification strategy (Khwaja and Mian, 2008). We split the sample among loans with maturity less than one year (short-term), more than one year (long-term) and quota, which refers to the credit limit at the lender-borrower-quarter level.

The specification can be presented as follows:

$$Loan\ Volume_{b,l,q} = \alpha + \beta_1\ Post_q + \beta_2\ High\_Exposition_{b,q-1}*Post_q + \beta_3\ High\_Exposition_{b\ q-1}*Banking\ Group_{b,l,q} + \beta_4\ High\_Exposition_{b\ q-1}*Banking\ Group_{l,b,q}*Post_q + \beta_5\ Controls_{q-1} + \gamma_b + \gamma_{b,q} + \varepsilon_{b,l,q} \quad (1)$$

where *Loan Volume$_{b,l,q}$* is the value (in logs) of the outstanding loan given to borrower bank *b* by lender bank *l* in quarter *q*. *Post$_q$* is an indicator that the observation is after the first announcement on the Fed taper tantrum (i.e., since 2013Q2). *High_Exposition$_{b,q-1}$* is an indicator that equals one (0) if the borrower bank's total debt in the cross-border interbank market is above (below) the median in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1). *Banking Group$_{b,l,q}$* is an indicator that equals one if the lender bank belongs to the same banking group of the borrower bank including a subsidiary, a branch or headquarter, and 0

otherwise. *Controls_{q-1}*, is a set of macroeconomic variables including the change in the exchange rate COP/USD, domestic DGP growth and inflation in quarter *q-1*. We include borrower fixed effects γ_b, to control for borrower characteristics and borrower*time fixed effects $\gamma_{b,t}$, to control for the demand of credit by Colombian banks over time. Standard errors, $\varepsilon_{l,b,q}$, are clustered at the lender bank and quarter levels (See variable definitions in **Table A1**).

Results are displayed in **Table 2**. In column 1, we observe that during the Fed taper tantrum, the availability of short-term cross-border interbank credit declined by around 9 percent. A lower level of credit (6 percent) was also observed in the long-term segment and in the credit limit (columns 4 and 7, respectively). These effects remain statistically significant in columns 2, 5 and 8 when we add the vector of macroeconomic controls to the specification. We find that Colombian banks with ex-ante higher exposition in the cross-border interbank market exhibited a lower availability of short-term credit. The estimated coefficient points to a relative reduction that reaches 19 percent (column 2). The reduction was also observed in the long-term segment (16 percent) and in the credit limit (6 percent) (columns 5 and 8, respectively). Banks with higher exposition in the cross-border interbank market that belong to a banking group are associated with a higher supply of credit vis-à-vis banks that borrow only from non-affiliated banks. The estimated coefficient suggests that those banks received 23 percent more credit in the short-term segment, around 8 percent in the long-term segment, and that the credit limit is higher in about 6 percent. Interestingly, during the Fed taper tantrum, those banks that belong to a banking group were less affected in their credit conditions relative to banks that only borrowed from non-affiliated banks. The estimated coefficient indicates a relative increase in the supply of short-term credit of about 6 percent (column 2). However, in the long-term segment and in terms of credit limit those banks exhibited similar conditions than banks that borrowed from non-affiliated banks (columns 5 and 8). In columns 3, 6 and 9, we show that these results are robust to the inclusion of borrower*time, suggesting changes in the supply of cross-border credit to Colombian banks.

In sum, the results indicate that during the Fed Taper tantrum period, foreign banks significantly reduced the supply of cross-border credit to Colombian banks, and that the contraction in credit was substantially larger among banks with higher (ex-ante) exposition in the short-term segment of the cross-border interbank market. Moreover, the evidence suggests that

banks that belong to a banking group can partially smooth the effects of sudden yield reversal on the availability of short-term foreign credit.

4.2. Cross-border bank lending and sovereign risk

During the Fed taper tantrum, Colombian CDS spread significantly increased, reflecting higher sovereign risk, and accentuating the decline in cross-border lending to Colombian banks (**Figure 1**). Using a similar specification than the one in Eq. (1), we test whether sovereign risk affected more credit conditions in the cross-border interbank market during the Fed taper tantrum. We also check whether cross-border credit within the same banking group can alleviate the contraction in credit associated to higher sovereign risk. To do this, we include in Eq. (1) the Colombian CDS spread on 5-year sovereign debt in foreign currency in quarter q-1 (CDS_{q-1}) as a measure of sovereign risk.

Table 3 presents the result of this test. As in the previous exercise, we proceed gradually with the inclusion of the fixed effects to provide robust evidence across alternative specifications. In columns 1, 4 and 7, we only include borrower fixed effects. We confirm that during the Fed taper tantrum Colombian banks exhibited a lower availability of cross-border credit. We find that the contraction of credit induced by the Fed Taper tantrum increased under high sovereign risk (i.e., the coefficient of $High\_Exposition_{b,q-1}*CDS_{q-1}*Post_q$ is negative and significant). This result remains significant across alternative specifications including macroeconomic controls (columns 2, 5, and 8) and borrower*time fixed effects (columns 3, 6 and 9). For example, a one standard deviation increase in CDS_{q-1} is associated with a reduction in the supply of short-term cross-border lending in $High\_Exposition_{b,q-1}$ banks of around 14.5 percent (column 3). The decline in long-term credit for those high-exposition banks is around 10 percent (column 6) and reaches 8.5 percent in the credit limit (column 9). This finding can be interpreted as evidence of flight-to-quality given that international banks seem to react more (i.e., by reducing the supply of credit) during increases in sovereign risk perceptions. We find that there is no significant difference in the supply of cross-border credit among banks that belong to the same banking group and non-affiliated banks during changes in sovereign risk. However, the estimated coefficient of the interaction of $Banking\_Group_{b,l,q}*CDS_{q-1}*Post_q$, indicates that during the Fed taper tantrum, cross-border credit within the same banking group increased by around 3.2 percent in the short-term segment, 4.4

percent in the long-term segment, and 3.6 percent in the credit limit compared to the period before. This result confirms that bank affiliates tend to support credit within the same banking group under sudden yield reversals.

4.3. Corporate credit during the Fed taper tantrum: Credit Supply

We are interested in understanding how the decline in the supply of cross-border lending to Colombian banks during the Fed taper tantrum affected the supply of credit to non-financial firms. In **Figure 2**, we observe that during the Fed taper tantrum, domestic banks in Colombia exhibited a lower corporate loan growth in foreign currency, which was more pronounced for those banks with a high exposition in the cross-border interbank market. Similarly, in Figure 3, we observe that during the Fed taper tantrum, banks that borrowed in the cross-border interbank market reduced by more the supply of credit in local currency vs. banks that do not have access to this market.

In this section, we formally test how the decline in the supply of cross-border interbank credit to Colombian banks during the Fed taper tantrum affected their supply of corporate credit. We employ bank-firm-quarter loan level data from the Colombian credit registry database supplied by the SFC. The sample period is from 2012Q2 to 2014Q, that is four quarters immediately before and during the Fed taper tantrum. The sample includes 481,431 bank-firm-quarter credit operations among 26.837 firms with 21 private commercial banks, from which 8 banks are borrowers in the cross-border interbank lending market. In the sample, 89.3 percent of loans are denominated in local currency, and 10.7 percent to loans are denominated in foreign currency. We exclude from the sample large firms that issued bonds or stocks and those with access to international credit markets during the evaluated period. The sample is also restricted to firms with credit operations granted by more than two banks to allow for firms' credit substitution across banks (Khwaja and Mian, 2008) and to firms with balance-sheet information, among other filters (see **Section 2** for details).

The proposed model in Eq. (2) allows to explore the changes in the supply of corporate credit from exposed versus non-exposed banks in the cross-border interbank market to firms with multiple bank relationships that depend on bank credit.

19

The specification is as follows:

$$Y_{f,b,q} = \alpha + \beta_1 \, Post_q + \beta_2 \, High\_Exposition_{b,q-1}*Post_q + \beta_3 \, High\_Exposition_{b,q-1}*Interbank_{b,q-1} +$$
$$\beta_3 \, High\_Exposition_{b,q-1}* \, Interbank_{b,q-1}*Post_q + \gamma_{f,b} + \gamma_{f,q} + \gamma_{s,q} + \varepsilon_{f,b,q} \quad (2)$$

where $Y_{f,b,q}$ are loan-level variables (log of loan volume and loan interest rate) aggregated at the firm-bank-quarter level (i.e., firm f, bank b, and quarter q). $Post_q$ is an indicator that the observation is after 2013Q1. The sample of corporate loans includes 8 banks with active credit lines in the cross-border interbank market and 13 private banks without access to this foreign credit market during the evaluated period. Usually, banks that borrow abroad can directly lend in foreign currency to local firms. Thus, we need to use two alternative measures of the bank's exposition in the cross-border interbank market. First, to examine the supply of corporate credit in *foreign* currency, we define $High\_Exposition_{b,q-1}$ as an indicator that equals one (0) if the bank's total debt in the cross-border lending market is above (below) the median in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1). Second, to analyze the supply of corporate credit in *local* currency, we define $Exposition_{b,q-1}$ as an indicator that equals one if the bank borrowed liquidity from the cross-border lending market in the quarter prior to the first announcement on the Fed taper tantrum, and 0 otherwise. Hence, the interaction of $Exposition_{b,q-1}*Post_q$ allows to compare whether, during the Fed taper tantrum, the supply of credit (in local currency) to non-financial firms differs between exposed and non-exposed banks in the cross-border lending market.[9] Alternatively, the interaction of $High\_Exposition_{b,q-1}*Post_q$ captures the changes in the supply of credit to non-financial firms (in foreign currency) among banks with high and low exposition in the cross-border interbank market during the Fed taper tantrum.

We are interested in to identify the influence of unsecured funding to support the supply of bank credit to non-financial firms. Theoretical models on interbank lending relationships predicts that participants of the unsecured interbank market maintain stable lending relationships to exchange liquidity between surplus and deficit banks and specially, to properly gain access when they face liquidity shocks (Rochet and Tirole, 1996). Empirical evidence suggests that banks with stable lending relationships in the unsecured interbank market usually lend more (and at lower

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[9] We use an alternative measure of the bank's exposition in foreign markets based on the total debt in foreign currency to total liabilities and find that the main results remain qualitatively similar to the ones observed in the baseline model (see, Table A2).

prices) to their known borrowers in this market (Cocco et al., 2009). Moreover, when there are exogenous shocks to liquidity supply, concentrated lenders insulate borrowers from the shocks without charging significantly higher interest rates (Afonso et al., 2014), even in times of heightened uncertainty such as the global financial crisis of 2008-9 (see, Braüning and Fecht, 2017; DiMaggio et al., 2017). Thus, unsecured interbank funding can influence bank lending to non-financial firms (as documented in Altavilla et al., 2019, Beck et al., 2021).

To identify the influence of unsecured funding on the supply of corporate credit, we compute the net borrowed position at the bank-level using loan-level data on unsecured operations in the domestic interbank market (see **Section 2** for details on the sample construction). That is, the amount of unsecured interbank funds borrowed by bank b from all banks minus the amount lent by bank b to all banks during quarter q. We define $Interbank_{b,q-1}$ as an indicator equals to one (0) for banks with a positive net borrowed position during quarter $q-1$ that are above (below) the median. We include this variable lagged one period to check whether the reliance on unsecured funding translates into a more stable supply of credit in q. The interaction of $High\_Exposition_{b,q-1}*$ $Interbank_{b,q-1}*Post_q$ tests whether unsecured funding allowed more exposed banks in the cross-border interbank market to smooth the liquidity shock observed during the Fed taper tantrum over their supply of credit in *foreign* currency to non-financial firms. In a similar fashion, the interaction of $Exposition_{b,q-1}*$ $Interbank_{b,q-1}*Post_q$ makes the same test but among exposed and non-exposed banks and for loans granted in local currency. We include firm-bank fixed effects $\gamma_{f,b}$, to control for time-invariant firm-bank characteristics (including the determinants of firm-bank matching) and firm-quarter fixed effects $\gamma_{f,q}$ to control for quarterly movements in credit demand at the firm level (Jiménez et al., 2014). We also include specifications with sector-quarter fixed effects, $\gamma_{s,q}$ to control for variations in credit demand at the sectoral level. Standard errors are double-clustered at the bank and quarter levels.

Results on the supply of corporate credit are displayed in **Table 4** and are presented for loans denominated in foreign currency (Panel A) and for loans in local currency (Panel B). In columns (1-3), we observe that, consistent with the reduction in the supply of cross-border credit to domestic banks (Table 3), loan volume in foreign currency to non-financial firms declined by around 13 percent during the Fed taper tantrum period, compared with the previous four quarters. This indicates that the supply of credit in foreign currency to non-financial firms was negatively

affected during the Fed taper tantrum, suggesting that sudden yield reversals affect financial intermediation in emerging economies. The estimated coefficient of the interaction of $High\_Exposition_{b,q-1}*Post_q$ reveals that banks with a higher exposition in the cross-border interbank lending market reduced the supply of corporate credit in foreign currency by around 20 percent vis-à-vis banks with less exposition in that market (columns 2 and 3). This result suggests that banks with high exposition in international credit markets transmit global liquidity shocks to domestic credit markets. The lack of statistical significance of the estimated coefficient of $Interbank_{b,q-1}$ suggests that the main net borrowers in the unsecured interbank market provide similar amount of credit in foreign currency to non-financial firms compared with banks that borrow less unsecured funds. However, we find that during the Fed taper tantrum period, those banks with high use of unsecured funding allocated around 4 to 6 percent more credit in foreign currency compared with banks with low use of unsecured funding. This result indicates that unsecured funding can contribute to stabilize the supply of domestic credit to non-financial firms.

The positive and significant coefficient of the triple interaction $High\_Exposition_{b,q-1}*Interbank_{b,q-1}*Post_q$ indicates that, during the Fed taper tantrum, more exposed banks in the cross-border interbank market with a high use of domestic unsecured funding reduced in a lesser extend (about 9 percent) the supply of credit in foreign currency compared to exposed banks that used less unsecured funds (column 3). We can argue that due to only 8 participants in the domestic unsecured interbank market were directly affected by the decline of cross-border lending, some of the remaining 45 participants granted liquidity to the affected banks. This can be the result of the higher central bank liquidity that is channeled by participants of the interbank market (León et al., 2018). Therefore, this evidence suggests that unsecured interbank funding can provide liquidity insurance for banks facing global liquidity shocks.

In columns (4) to (6), we evaluate the changes in the supply of corporate credit in *local* currency around the Fed taper tantrum. We identify that corporate credit in local currency declined by around 4 percent during the Fed taper tantrum period compared with the previous period, confirming that sudden yield reversals affect financial intermediation in emerging economies. This effect can be observed because the FX macroprudential regulation in Colombia allows banks to borrow in foreign currency and lend in local currency as long as they cover the currency mismatch with an asset denominated in the same currency of the contracted debt. The estimated coefficient

of *Exposition$_{b,q-1}$*Post$_q$* indicates that banks that borrowed in the cross-border bank lending market reduced the supply of credit in local currency to firms by an additional 9 percent versus banks that did not borrow from the cross-border bank lending market (column 5). In the specification including region-sector fixed effects, the reduction in credit reaches 11 percent (column 6). This evidence confirms that banks rationed in foreign capital markets transmit global liquidity shocks to domestic credit markets.

We identify that those banks with a high use of unsecured funding are associated with a significantly higher supply of credit in local currency. These banks lend on average 15 percent more than banks with a low use of unsecured funding (columns 4 to 6). This result reveals that the unsecured interbank market provides a stable source of bank funding, allowing banks to sustain their supply of corporate credit. In fact, the positive and significant effect of the interaction *Interbank$_{b,q-1}$*Post$_q$* suggests that banks with a high use of unsecured funding were less affected by the Fed taper tantrum as they reduced in a lesser degree (about 3 percent) their supply of credit in local currency vis-a-vis banks with a low use of unsecured funding. In line with the results observed in Panel A, we find that during the Fed taper tantrum period, exposed banks in the cross-border lending market with a high use of unsecured funding exhibited a lower contraction in the supply of corporate credit in local currency compared to exposed banks that use less unsecured funding. Overall, these results indicate that the global liquidity shock faced by Colombian banks in the cross-border interbank lending market was transmitted to the domestic corporate credit market in both foreign and local currency. Moreover, the evidence suggests that this global liquidity shock was partially mitigated by the banks' reliance on domestic unsecured funding.

4.4. Corporate credit during the Fed taper tantrum: Loan rates

To further understand the effects of the Fed Taper tantrum on the corporate credit market, we replicate the previous analysis replacing the dependent variable in Eq. (2) with *Interest Rate$_{f,b,q.}$* that is, the loan interest rate (measured in percent) of loans granted to firm *f* by bank *b* in quarter *q*. As before, we split the sample between loans granted in foreign currency (Panel A) and loans granted in local currency (Panel B). Results in **Table 6** (Panel A), suggest that during the Fed Taper tantrum, banks charged 1.36 percentage points over loans granted in foreign currency

(column 1). Firms borrowing from banks with high exposition in the cross-border lending market paid around 1.7 percentage points more than those firms borrowing from less exposed banks, which corresponds to a spread of about 12 percent over the mean loan rate during the evaluated period (14.6 percent) (columns 1 to 3). Consistent with the mitigating effect of unsecured funding on the supply of foreign credit, we observe that during the Fed taper tantrum, banks with a high use of unsecured funding increased loan rates in a lower level (about 48 bps) versus banks with low use of unsecured funding. Moreover, this effect was significantly higher for banks with high exposition in the cross-border lending market (i.e., an additional discount of 46 bps) (column 3).

In Panel B, we observe similar results over loan rates of corporate credit in local currency (columns 4 to 6). During the Fed Taper tantrum, banks charged 1.12 percentage points more over loans granted in local currency compared to the previous period. Firms borrowing from exposed banks in the cross-border interbank market paid between 1.24 and 1.29 percentage points more than those firms that borrowed from non-exposed banks. This represents a spread of about 7.5 percent over the mean loan rate during the evaluated period (17.1 percent). We also find that during the Fed taper tantrum, banks with a high use of unsecured funding increased loan rates in a lower degree (around 1.25 percent) compared with banks that borrow less in the unsecured interbank market (column 5). This effect was significantly higher among banks with high exposition in the cross-border interbank market (i.e., an additional discount of 77 bps) (column 6). These results confirm our previous findings and reveal that unsecured funding effectively contributes to mitigate banks' liquidity shocks.

4.5. Corporate Credit and Lending Relationships

The amount of funds borrowed from banks in the unsecured interbank market strongly depends on the intensity of the borrower-lender relationship. As we mention before, banks borrowing from stable counterparts (known lenders) usually obtain higher funding and lower prices than banks that borrow more from spot lenders (Cocco et al., 2009), even in times of heightened uncertainty in financial markets (Braüning and Fecht, 2017). To understand if lending relationships in the unsecured interbank market effectively allows banks to insulate more their supply of corporate credit from the global liquidity shock observed during the Fed taper tantrum, we replicate the analysis in **Table 4** and **Table 5** using a measure of the overall concentration of

borrowers' relationships in the unsecured interbank market instead of the amount borrowed in this market (i.e., $Interbank_{b,q-1}$). We compute the 3-HHI as the sum of the squared value of the percentage of total quarterly borrowing from borrowers' three largest relationships. We define $Interbank\_C_{b,q-1}$ as an indicator equals to one (0) for banks that are net borrowers and have a 3-HHI above (below) the median in quarter q-1. Thus, we are comparing banks that are net borrowers and that borrow from concentrated lenders against banks that are net lenders and borrow from more lenders (i.e., net lenders with less concentrated relationships). The results on the supply of corporate credit are displayed in **Table 7** for loans granted in foreign currency (Panel A) and for loans in local currency (Panel B). We find similar results that the ones observed using our measure of unsecured funding. The positive and significant estimated coefficient of $High\_Exposition_{b,q-1}*Interbank\_C_{b,q-1}*Post_q$ suggests that exposed banks with concentrated lending relationships mitigated better the global liquidity shock (i.e., they reduced by 9 percent less the supply of corporate credit in foreign currency) versus banks that use less interbank funding and that have less concentrated relationships (column 3). A similar effect is observed in the supply of credit in local currency (column 6). Results in **Table 7** confirm that lending relationships also allowed banks to partially smoothing the effect of the global liquidity shock on the corporate loan rates in both foreign and local currency (columns 3 and 6).

4.6. Real Effects from Sudden Yield Reversals

As we mentioned before, most of cross-border bank lending is channeled by domestic banks to non-financial firms for trade finance (72 percent) and working capital (28 percent) (Banco de la Republica, 2013c; 2020). Therefore, in this section we explore whether firms with a high dependency of credit from exposed banks in the cross-border credit market exhibited changes in their performance during the Fed taper tantrum. We analyze whether the contraction in corporate credit resulted in a deterioration of the real activity of these borrowers. To do this, we employ annual information on financial statements and trade from 2012 to 2014 for the 26,837 firms with bank credit in the SFC database (i.e., the sample of borrowers analyzed in section 4.3 but using annual firm-level data). As mentioned in **Section 2**, we conduct this analysis at the firm-level using end-of-year annual balance sheet data due to Colombian commercial firms are required to disclose financial reports only once a year. It is important to recall that we focus the analysis on non-

financial firms that depend on domestic bank credit (i.e., we do not include large firms that issue bonds or stocks and those that have access to international credit markets). Additionally, the sample only includes firms borrowing from more than two banks to allow for credit substitution across banks. The sample includes 80,511 firm-year observations. We construct subsamples depending on the trade activity of the firms. In the sample we have 8,573 firms with imports, 3,590 with exports, and 2,917 with both exports and imports. These figures represent 31.9 percent, 13.4 percent, and 10.8 percent of the full sample of firms, respectively.

In particular, we estimate the following model:

$$z_{f,y} = \alpha + \beta_1 High\_Exposition_{f,y-1} * Post_y + \gamma_f + \gamma_b + \gamma_{r,s,y} + \varepsilon_{f,y} \qquad (3)$$

where $z_{f,y}$ are a series of firm f level outcomes in year y including $Loan\ Volume_{f,y}$, that is the value of total outstanding loans (in logs) of firm f in year y in both local and foreign currency. $Exports_{f,y}$, $Imports_{f,y}$, $Assets_{f,y}$, $Sales_{f,y}$, $Investments_{f,y}$ and $Liabilities_{f,y}$ are, respectively, the logarithm of the total exports, total imports, total assets, total sales, total investments and total liabilities (including bank loans) of firm f in year y. $High\_Exposition_{f,y-1}$ is an indicator that equals one if more than 50 percent of the aggregated value of the firm's loans was contracted with banks exposed in the cross-border interbank lending market in the year prior to the Fed taper tantrum (i.e., 2012), and zero otherwise. $Post_y$ is an indicator variable that equals one if the borrower's yearly balance sheet value is in 2013, and zero otherwise. Finally, we include firm fixed effects γ_f, bank fixed effects γ_b, and region-sector-year fixed effects $\gamma_{r,s,y}$ to control for unobserved heterogeneity at the firm and bank level, and to control for demand shocks.[10] Standard errors are clustered at the firm level.

Results are presented in **Table 8**. Panel A presents the results using the sample of firms with imports. Panel B shows the results for the sample of firms with exports. Panel C reports the results for the sample of firms with both imports and exports. Lastly, Panel D presents the results for the full sample of firms. Columns 1-2 confirms that, consistent with the previous results (i.e.,

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[10] In cases where the firm holds loans from more than one bank, the bank-year fixed effects are defined based on the bank from which the firm holds the largest value of outstanding loans.

Table 2), the volume of loans granted to firms with a high exposition to banks that borrowed in the cross-border interbank market exhibited a relative decline from 13 to 24 percent in the year of the Fed taper tantrum. The higher contraction is exhibited within firms that are importers (Panel A) and among those that are both importers and exporters (Panel C). In the full sample of firms, the relative decline in loan volume for those firms with high concentration of credit granted by exposed banks reaches 14 percent (Panel D).

Similarly, columns 3 and 4 show a relative decline in total firm liabilities (many of which are bank loans) of around 19 percent among importers and in firms with imports and exports (Panel A and C). The relative decline in liabilities for exporters was 15 percent and in the full sample of firms around 9 percent (Panel B and D). This suggests that, in our sample, firms with trade activity were not able to substitute bank lending for other debt contracts. Consistent with the credit contraction having substantial real effects, column 6 shows a relative 19 to 8 percent decrease in the assets of high exposition firms, especially among importers (Panel A) and exporters (Panel B). Remarkably, columns 9 and 10 reveal that during the Fed taper tantrum, high-exposition firms exhibited a relative decline of 14 percent in exports and 19 percent in imports (Panel A and B). In the subsample of firms with both imports and exports, the contraction in exports and imports reached 17 percent and 21 percent, respectively (Panel C). We observe that total sales and investments in high exposition firms also exhibited a relative decline across the different subsamples, with higher contractions among importers (Panel A). These results are consistent with evidence on the negative effects of bank liquidity shocks on firms' performance and trade (Paravisini et al., 2015; Bruno and Shin, 2019). Furthermore, these findings support the specialized demand argument in Paravisini et al. (2020), as those high-exposition firms depend more on the intermediation of credit from local banks specialized in trade finance. Overall, the results are consistent with the notion that the level of banks' exposition in international credit markets contributes to global financial conditions' transmission to the economy.

5. Final Remarks

Domestic banks in emerging economies rely on the cross-border interbank lending market to financing firms in the real sector. Using cross-border bank-to-bank loan level data matched with domestic bank-to-firm loan level data and firm-level data on financial statements and trade, this

paper shows that the sudden yield reversal observed during the 2013 Fed taper tantrum resulted in a contraction of cross-border credit to Colombian banks that reduced their supply of corporate credit affecting firms' performance and trade.

We find that the sudden yield reversal observed during the 2013 Fed taper tantrum resulted in a substantial contraction of the supply of cross-border interbank credit to Colombian banks. The estimated contraction of cross-border credit was more pronounced during increases in sovereign risk, suggesting evidence on flight-to-quality. Interestingly, banks that belong to a banking group (branch, subsidiary or headquarter) were less affected in their credit conditions relative to banks that only borrowed from non-affiliated banks in the cross-border interbank market. This suggests that internal capital markets can provide liquidity insurance during sudden yield reversals.

We show that during the Fed taper tantrum, high-exposed banks in the cross-border interbank market reduced significantly more their supply of corporate credit to non-financial firms in both foreign and local currency, relative to less exposed banks. These high-exposed banks also charged higher loan rates in corporate loans granted to non-financial firms in both foreign and local currency. This evidence indicates that exposed banks in the cross-border interbank market transmit global financial conditions to domestic credit markets. We identify that those exposed banks that rely more on domestic unsecured interbank funding reduced by less their supply of credit to non-financial firms and charged lower loan rates, compared to exposed banks with low use of unsecured funding. This result suggests that lending relationships contribute to smoothing bank liquidity shocks during sudden yield reversals.

Furthermore, we find that during the Fed taper tantrum period, firms with an ex-ante high concentration of credit granted by exposed banks in the cross-border interbank market, exhibited a more pronounced contraction in the supply of corporate credit and lower performance, including a substantial decline in both exports and imports, relative to firms with less exposition. These adverse real effects were particularly larger within firms in the trade sector.

Overall, the results indicate that banks that borrow liquidity in the cross-border interbank market transmit global financial conditions to domestic credit markets with substantial real effects. This implies that the degree of bank exposition in international credit markets conditions the supply of credit in domestic credit markets. Thus, macroprudential policies aimed at reducing

domestic banks' exposition in foreign credit markets can contribute to enhancing the financial stability in emerging market economies.

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Table A1 – Descriptive Statistics

This table reports the summary statistics of the variables used in the tests. The variables are defined at four levels: "cross-border bank-to-bank level" (i.e., lender- borrower-quarter), "corporate loan-level" (i.e., firm-bank-quarter), "firm-level" (i.e., firm-year), and "bank-level" (i.e., bank-quarter). The cross-border interbank market variables are obtained from *Banco de la República Colombia*. The corporate loan-level variables are obtained from the credit registry of the *Superintendencia Financiera de Colombia* (i.e., the Colombian Financial Supervisor). The firm-level variables are obtained from *Superintendencia de Sociedades* (i.e., Colombian Corporate Supervisor) and *Direccion de Impuestos y Aduanas Nacionales* (DIAN) (i.e., Colombian Taxes and Customs Department). The bank-level variables are obtained from the banks' daily regulatory reports on unsecured loans to the *Superintendencia Financiera de Colombia*. Detailed variable definitions are provided in Table A2.

	Unit	Observations	Average	p10	Median	p90	St. Dev
Cross-border credit bank-to-bank level:							
Loan Volume$_{b,l,q}$ (short-term)	USD (million)	506	453.3	3.2	114.6	680.7	187.3
Loan Volume$_{b,l,q}$ (long-term)	USD (million)	506	670.2	5.5	219.1	1590.4	278.2
Quota$_{b,l,q}$	USD (million)	506	1124.8	8.9	335.4	2284.2	457.4
Banking Group$_{b,l,q}$	(1/0)	506	0.22	0	0	0.81	0.37
Corporate credit loan-level:							
Loan Volume_LC$_{f,b,q}$	COP (million)	429,894	145.3	10.5	93.4	354.7	183.2
Interest Rate_LC$_{f,b,q}$	%	429,894	17.1	9.8	14.9	30.4	7.5
Maturity_LC$_{f,b,q}$	Years	429,894	2.15	0.8	1.7	4.3	1.4
Loan Volume_FC$_{f,b,q}$	COP (million)	51,537	187.5	35.2	122.7	750.3	192.4
Interest Rate_FC$_{f,b,q}$	%	51,537	14.3	7.2	12.4	25.6	6.1
Maturity_FC$_{f,b,q}$	Years	51,537	1.04	0.6	1.2	2.5	0.8
Firm-level:							
Loan Volume$_{f,y}$	(Logs)	80,511	5.8	0.3	4.7	6.9	2.3
Liabilities$_{f,y}$	(Logs)	80,511	7.3	3.2	6.4	8.1	1.2
Assets$_{f,y}$	(Logs)	80,511	8.2	3.7	8.6	9.2	1.4
Sales$_{f,y}$	(Logs)	80,511	4.4	0.9	4.9	7.8	0.6
Investments$_{f,y}$	(Logs)	80,511	3.2	0.7	4.1	6.4	0.9
Exports$_{f,y}$	(Logs)	80,511	5.2	0.7	4.8	7.7	0.7
Imports$_{f,y}$	(Logs)	80,511	5.8	0.8	6.3	7.9	1.3
Bank-level							
Interbank Net Position$_{b,q}$	(Logs)	189	6.1	2.3	5.8	14.1	2.2
3HHI$_{b,q}$	%	189	0.38	0.14	0.28	0.62	0.17

Macro controls							
Colombia CDS Spread$_q$	(bps)	9	117	75	119	151	35
Real GDP$_q$	(%)	9	1.6	-1.0	1.5	2.9	1.4
Exchange Rate$_q$	(%)	9	6.2	-17.4	2.4	34.6	15.2
Inflation Rate$_q$	(%)	9	2.7	1.9	2.8	3.5	0.6

Table A2 – Variable Definitions

Cross-border credit (borrower-lender-quarter level):

$Loan\ Volume_{b,l,q}$ (short-term) — Value of the outstanding loans that borrower bank b holds from lender bank l in quarter q with maturity less than one year (in USD million)

$Loan\ Volume_{b,l,q}$ (long-term) — Value of the outstanding loans that borrower bank b holds from lender bank l in quarter q with maturity greater than one year (in USD million)

$Quota_{l,b,q}$ — Value of the credit limit that borrower bank b holds from lender bank l in quarter q (in USD million)

$Banking\ Group_{l,b,q}$ — Indicator equals one if the lender bank l belongs to the same banking group of the borrower bank b including a subsidiary, a branch or headquarter, and 0 otherwise.

Corporate credit (bank-firm-quarter level):

$Loan\ Volume\_LC_{f,b,q}$ — Value of the outstanding loans contracted in local currency that firm f holds from bank b in quarter q (COP million)

$Interest\ Rate\_LC_{f,b,q}$ — Average annualized loan rate of the outstanding loans contracted in local currency that firm f holds from bank b in quarter q, weighted by loan volume (percent).

$Loan\ Volume\_FC_{f,b,q}$ — Value of the outstanding loans contracted in foreign currency that firm f holds from bank b in quarter q (COP million)

$Interest\ Rate\_FC_{f,b,q}$ — Average annualized loan rate of the outstanding loans contracted in foreign currency that firm f holds from bank b in quarter q, weighted by loan volume (percent)

$Maturity\_LC_{f,b,q}$ — Average maturity in years of the outstanding loans contracted in local currency that firm f holds from bank b in quarter q, weighted by loan volume (in Logs)

$Maturity\_FC_{f,b,q}$ — Average maturity in years of the outstanding loans contracted in foreign currency that firm f holds from bank b in quarter q, weighted by loan volume (in Logs).

Table A2 – Variable Definitions (Continuation)

Firm-Level Variables

$Loan\ Volume_{f,y}$	Value of bank loans of firm f in a year y (COP million) (in Logs).
$Liabilities_{f,y}$	Total liabilities of firm f in a year y (COP million) (in Logs).
$Assets_{f,y}$	Value of assets of firm f in a year y (thousands of Colombian pesos) (in Logs).
$Sales_{f,y}$	Value of sales of firm f in a year y (thousands of Colombian pesos) (in Logs).
$Investments_{f,y}$	Value of investments of firm f in a year y (thousands of Colombian pesos) (in Logs).
$Exports_{f,y}$	Value of exports of firm f in a year y (USD million) (in Logs).
$Imports_{f,y}$	Value of imports of firm f in a year y (USD million) (in Logs).
$High\_Exposition_{f,y,}$	Indicator that equals one if more than 50% of the aggregated value of the firm's loans was contracted withbanks exposed in the cross-border interbank market in the year prior to the Fed taper tantrum (i.e., 2012)

Bank-Level Variables

$Interbank_{b,q-1}$	Indicator equals to one (0) for banks with a positive net borrowed position in the unsecured interbank market during quarter q-1 that are above (below) the median
$Interbank\ Net\ Position_{b,q}$	The amount of unsecured interbank funds borrowed minus the amount lent by bank b during a quarter q (millions of Colombian pesos)
$High\_Exposition_{b,q-1}$	Indicator that equals one (0) if the bank's total debt in the cross-border interbank market is above (below) the median in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1).
$Exposition_{b,q-1}$	Indicator that equals one if the bank borrowed liquidity from the cross-border interbank market in the quarter prior to the first announcement on the Fed taper tantrum, and 0 otherwise.
$Interbank\_C_{b,q-1}$	Indicator equals to one (0) for banks that are net borrowers in the unsecured interbank market and have a 3-HHI above (below) the median in quarter q-1.
$3\text{-HHI}_{b,q}$	The sum of the squared value of the percentage of total quarterly borrowing in the unsecured interbank market from borrowers' three largest relationships of bank b in quarter q (in %)

Macroeconomic controls

$CDSq$	Value of the credit default swaps of Colombian 5-year sovereign debt in foreign currency (basis points).
$Real\ GDPq$	Quarterly change of the real GDP (in %)
$Exchange\ Rateq$	Quarterly change of the exchange rate (COP/USD) (in %)
$Inflation\ Rateq$	Quarterly change of the Colombian inflation rate (in %)

Figure 1. Cross-Border Interbank Market and the Fed Taper Tantrum
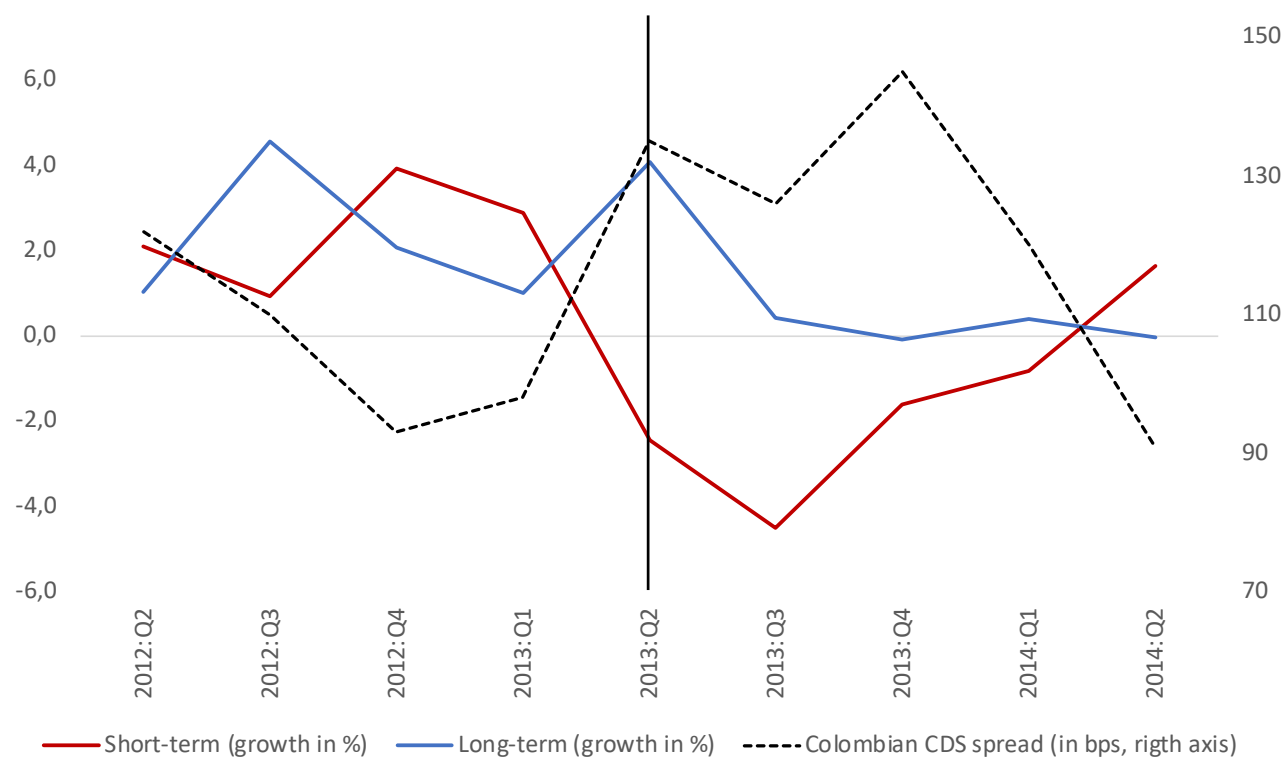
Notes: This figure depicts the rate of growth of short-term (maturity less than 1 year) and long-term credit granted by international banks to Colombian banks in the cross-border interbank market during 2012Q2 to 2014Q2 period. Colombian CDS spread is the quarterly mean spread on 5-year sovereign debt in foreign currency in basis points (bps) (right axis). The vertical line corresponds to the second quarter of 2013 when the Fed taper tantrum announcements initiated. Source: Quarterly information at the bank-to-bank-quarter level from *Banco de la República* and Bloomberg.

Table 1. The Cross-Border Interbank Market and the Fed Taper Tantrum

Market conditions	Before the Fed taper tantrum (2012Q2-2013Q1)	During the Fed taper tantrum (2013Q2-2014Q2)	Difference (absolute value)	Difference (in %)
Average quota (credit limit)	1318.4	1265.3	-53.1*	-4.0%
Average amount of loans (short-term)	483.4	428.2	-55.2*	-11.4%
Average amount of loans (long-term)	653.4	631.7	-21.7*	-3.3%
Number of lenders (foreign banks)	12	10	-2	-16.7%
Number of borrowers (local banks)	8	8	0	0.0%
Colombia CDS spread (bps)	105	131	26*	24.8%

Notes: This table presents mean comparison tests using quarterly information from the cross-border interbank market. The data corresponds to 506 bank-to-bank credit lines granted by 213 foreign banks to 8 Colombian banks between 2012Q2 and 2014Q2 (amount in USD million). Colombian CDS spread is the quarterly mean spread on 5-year sovereign debt in foreign currency in basis points (bps). Before the Fed taper tantrum covers the period 2012Q2 to 2013Q1. During the Fed taper tantrum corresponds to the period 2013Q2 to 2014Q2.* $p > 0.01$. Source: Regulatory information at the bank-to-bank credit level from *Banco de la República Colombia*.

Figure 2. Corporate Credit in Foreign Currency to Non-Financial Firms around the Fed Taper Tantrum

Notes: This figure depicts the rate of growth of loans granted by Colombian banks to non-financial firms in foreign currency during 2012Q2 to 2014Q2 period. We compare credit growth between banks with a high (low) exposition, which are banks with a share of total credit in the cross-border interbank market to total liabilities above (below) the median during the evaluated period. Vertical line corresponds to the second quarter of 2013 when the Fed taper tantrum announcements initiated. Source: Quarterly information at the bank-firm-quarter level from *Superintendencia Financiera de Colombia*.

Figure 3. Corporate Credit in Local Currency to Non-Financial Firms around the Fed taper tantrum
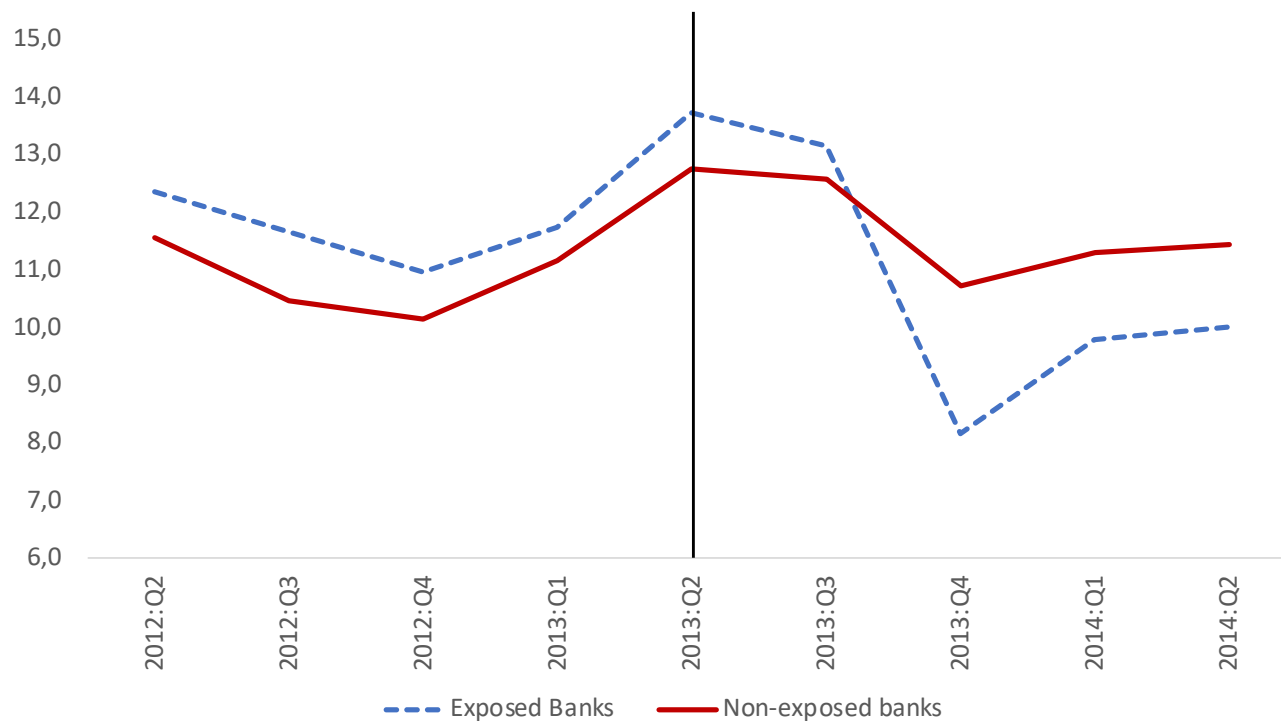
Notes: This figure depicts the rate of growth of corporate loans in local currency granted by banks to non-financial firms during 2012Q2 to 2014Q2 period. Exposed banks (8 banks) are banks that borrowliquidity in the cross-border interbank market, while non-exposed banks (13 banks) are banks that do not have access to that market (i.e., they do not have active credit lines with international banks). Vertical line corresponds to the second quarter of 2013 when initiated the Fed taper tantrum announcements. Source: Quarterly information at the bank-firm-quarter level from *Superintendencia Financiera de Colombia*.

Table 2. Cross-Border Interbank Credit During the Fed Taper Tantrum

This table reports the results of an analysis of credit conditions in the cross-border interbank market around the Fed taper tantrum. The analysis is conducted at the lender-borrower-quarter level, including four quarters immediately before and after the first announcement on the Fed taper tantrum (i.e., from 2012Q2 to 2014Q2). The analysis is presented for loans with maturity less than one year (short-term), more than one year (long-term) and quota, that refers to the credit limit at the lender-borrower level. $High\_Exposition_{b,q-1}$ is an indicator that equals one (0) if the borrower bank's total debt in the cross-border interbank market is above (below) the median in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1). $Loan\ Volume_{b,l,q}$ is the value (in logs) of the outstanding loan given to borrower bank b by lender bank l in quarter q. $Post_q$ is an indicator that the observation is after the first announcement on the Fed taper tantrum (i.e., since 2013Q2). $Banking\ Group_{l,b,q}$ is an indicator that equals one if the lender bank belongs to the same banking group of the borrower bank including a subsidiary, a branch or headquarter. $Controls_{q-1}$ include the change of the COP/US exchange rate, Colombia's inflation rate and GDP growth in quarter q-1. Standard errors (in parentheses) are clustered at the lender bank and quarter levels. *** p<0.01, ** p<0.05, * p<0.1. Detailed variable definitions are provided in Table A1.

| | $Loan\ Volume_{b,l,q}$ | | | | | | | | |
| | Short-term | | | Long-term | | | Quota | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Post_q$	-0.09***	-0.11***		-0.06***	-0.08***		-0.05***	-0.07***	
	(0.02)	(0.02)		(0.01)	(0.02)		(0.02)	(0.02)	
$High\_Exposition_{b,q-1}*Post_q$	-0.18***	-0.19***		-0.15***	-0.16***		-0.04***	-0.06***	
	(0.03)	(0.03)		(0.04)	(0.03)		(0.01)	(0.02)	
$High\_Exposition_{b,q-1}$ $*Banking\ Group_{l,b}$	0.24**	0.23***		0.07***	0.08**		0.06***	0.06***	
	(0.05)	(0.05)		(0.02)	(0.03)		(0.02)	(0.02)	
$High\_Exposition_{b,q-1}$ $*Banking\ Group_{l,b}*Post_q$	0.06***	0.06***	0.07***	0.02	0.03	0.01	0.03	0.03	0.02
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)
Observations	506	506	506	506	506	506	506	506	506
R-squared	0.54	0.57	0.52	0.51	0.53	0.59	0.52	0.55	0.56
Borrower FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Borrower*Time FE	No	No	Yes	No	No	Yes	No	No	Yes
$Controls_{q-1}$	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Number of Borrowers	8	8	8	8	8	8	8	8	8
Number of Lenders	213	213	213	213	213	213	213	213	213

Table 3. Cross-Border Interbank Credit During the Fed Taper Tantrum and Sovereign Risk

This table reports the results of an analysis of credit conditions in the cross-border interbank market around the Fed taper tantrum. The analysis is conducted at the lender-borrower-quarter level, including four quarters immediately before and after the first announcement on the Fed taper tantrum (i.e., from 2012Q2 to 2014Q2). The analysis is presented for loans with maturity less than one year (short-term), more than one year (long-term) and quota that refers to the credit limit at the lender-borrower-quarter level. $High\_Exposition_{b,q-1}$ is an indicator that equals one (0) if the borrower bank's total debt in the cross-border interbank market is above (below) the median in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1). $Loan\ Volume_{b,l,t}$ is the value (in logs) of the outstanding loan given to borrower bank b by lender bank l in quarter q. $Post_q$ is an indicator that the observation is after the first announcement on the Fed taper tantrum (i.e., since 2013Q2). CDS_{t-q} is the Colombian CDS spread on 5-year sovereign debt in foreign currency in quarter q-1. $Banking\ Group_{l,b,q}$ is an indicator that equals one if the lender bank belongs to the same banking group of the borrower bank including a subsidiary, a branch or headquarter. $Controls_{q-1}$ include the change of the COP/US exchange rate, Colombia's inflation rate and GDP growth in quarter q-1. Standard errors (in parentheses) are clustered the lender bank and quarter levels. *** p<0.01, ** p<0.05, * p<0.1. Detailed variable definitions are provided in Table A1.

| | $Loan\ Volume_{b,l,q}$ | | | | | | | | |
| | Short-term | | | Long-term | | | Quota | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Post_q$	-0.08***	-0.09***		-0.09***	-0.10***		-0.07***	-0.08***	
	(0.02)	(0.03)		(0.02)	(0.04)		(0.02)	(0.03)	
$High\_Exposition_{b,q-1}*CDS_{q-1}$	-0.07	-0.06		-0.13	-0.14		-0.07	-0.02	
	(0.12)	(0.11)		(0.09)	(0.12)		(0.14)	(0.13)	
$High\_Exposition_{b,q-1}$	-0.72**	-0.75***	-0.77***	-0.54***	-0.53***	-0.57***	-0.45***	-0.42**	-0.49**
$*CDS_{q1}*Post_q$	(0.25)	(0.23)	(0.31)	(0.19)	(0.24)	(0.25)	(0.04)	(0.04)	(0.05)
$Banking\ Group_{l,b}*CDS_{q-1}$	-0.14	-0.13		0.07	0.09		0.09	0.08	
	(0.15)	(0.15)		(0.12)	(0.13)		(0.15)	(0.12)	
$Banking\ Group_{l,b}*CDS_{q-1}*$	0.12***	0.14***	0.16***	0.18**	0.21**	0.23**	0.15***	0.17***	0.19***
$Post_q$	(0.04)	(0.04)	(0.05)	(0.9)	(0.10)	(0.11)	(0.04)	(0.05)	(0.05)
Observations	506	506	506	506	506	506	506	506	506
R-squared	0.58	0.57	0.62	0.59	0.61	0.63	0.59	0.62	0.64
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower*Time FE	No	No	Yes	No	No	Yes	No	No	Yes
$Controls_{q-1}$	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Number of Borrowers	8	8	8	8	8	8	8	8	8
Number of Lenders	213	213	213	213	213	213	213	213	213
SD CDS_q	19	19	19	19	19	19	19	19	19

Table 4. Corporate Credit During the Fed Taper Tantrum: Credit Supply

This table reports the results of an analysis of corporate credit conditions around the Fed taper tantrum. The analysis is conducted at the bank-firm-quarter level, including four quarters immediately before and after the Fed taper tantrum (i.e., from 2012Q2 to 2014Q1). *Loan Volume$_{f,b,q}$* is the value (in logs) of the outstanding loan given to firm f by bank b in quarter q. The analysis is presented for loans denominated in foreign currency (Panel A) and local currency (Panel B). *High_Exposition$_{b,t-1}$* is an indicator that equals one (0)if the bank's total debt in the cross-border interbank market is above (below) the median in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1). *Exposition$_{b,q-1}$* is an indicator that equals one if the bank borrowed liquidity from the cross-border interbank market in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1), and 0 otherwise. *Post$_q$* is an indicator that the observation is after 2013Q1. *Interbank$_{b,q-1}$* is an indicator that equals one for banks with a positive net borrowed position in the domestic unsecured interbank market that are above the median, and 0 for banks below the median during the quarter $q-1$. Standard errors (in parentheses) are clustered the bank and quarter levels. *** p<0.01, ** p<0.05, * p<0.1. Detailed variable definitions are provided in Table A1.

	Loan Volume$_{f,b,q}$					
	Panel (A) Foreign Currency			Panel (B) Local Currency		
	(1)	(2)	(3)	(4)	(5)	(6)
Post$_q$	-0.13***			-0.04***		
	(0.02)			(0.01)		
*High_Exposition$_{b,q-1}$*Post$_q$*	-0.17***	-0.18***	-0.20***			
	(0.04)	(0.03)	(0.04)			
Interbank$_{b,q-1}$	0.08	0.09	0.07	0.16***	0.14***	0.15***
	(0.07)	(0.06)	(0.04)	(0.04)	(0.06)	(0.04)
Interbank$_{b,q-1}$ Post$_q$*		0.04**	0.06***		0.03**	0.03***
		(0.02)	(0.02)		(0.01)	(0.01)
High_Exposition$_{b,q-1}$ Interbank$_{b,q-1}$* Post$_q$*	0.06***	0.08***	0.09***			
	(0.02)	(0.02)	(0.03)			
Exposition$_{b,q-1}$ Post$_q$*				-0.07***	-0.09***	-0.11***
				(0.02)	(0.02)	(0.03)
Exposition$_{b,q-1}$ Interbank$_{b,q-1}$* Post$_q$*				0.03***	0.05**	0.06***
				(0.01)	(0.02)	(0.02)
Observations	51,537	51,537	51,537	429,894	429,894	429,894
R-squared	0.74	0.76	0.79	0.75	0.77	0.82
Firm-Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Quarter FE	No	Yes	No	No	Yes	No
Region-Sector-Quarter FE	No	No	Yes	No	No	Yes

Table 5. Corporate Credit During the Fed Taper Tantrum: Loan Interest Rate

This table reports the results of an analysis of corporate credit conditions around the Fed taper tantrum. The analysis is conducted at the bank-firm-quarter level including four quarters immediately before and after the Fed taper tantrum (i.e., from 2012Q2 to 2014Q1). *Interest Rate*$_{f,b,q}$is the loan interest rate (measured in percent) of loan extended to firm f by bank b in quarter q. The analysis is presented for loans denominated in foreign currency (Panel A) and local currency (Panel B). *High_Exposition*$_{b,t-1}$ is an indicator that equals one (0) if the bank's total debt in the cross-border lending market is above (below) the median in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1). *Exposition*$_{b,q-1}$ is an indicator that equals one if the bank borrowed liquidity from the cross-border lending market in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1), and 0 otherwise. *Post*$_q$ is an indicator that the observation is after 2013Q1. *Interbank*$_{b,q-1}$ is an indicator that equals one for banks with a positive net borrowed position in the domestic unsecured interbank market that are above the median, and 0 for banks below the median during the quarter q-1. Standard errors (in parentheses) are clustered the bank and quarter levels. *** p<0.01, ** p<0.05, * p<0.1. Detailed variable definitions are provided in Table A1.

	Interest Rate$_{f,b,q}$					
	Panel (A) Foreign Currency			Panel (B) Local Currency		
	(1)	(2)	(3)	(4)	(5)	(6)
Post$_q$	1.36***			1.12***		
	(0.45)			(0.19)		
High_Exposition$_{b,q-1}$*Post*$_q$	1.64***	1.66***	1.69***			
	(0.30)	(0.32)	(0.36)			
Interbank$_{b,q-1}$	-0.32	-0.27	-0.31	-0.92***	-0.87***	-0.83***
	(0.20)	(0.19)	(0.17)	(0.32)	(0.25)	(0.19)
Interbank$_{b,q-1}$* *Post*$_q$		-0.21**	-0.23*		-0.38**	-0.41**
		(0.12)	(0.13)		(0.18)	(0.20)
High_Exposition$_{b,q-1}$* *Interbank*$_{b,q-1}$* *Post*$_q$	-0.44***	-0.43**	-0.46**			
	(0.21)	(0.25)	(0.23)			
Exposition$_{b,q-1}$* *Post*$_q$				1.24***	1.26***	1.29***
				(0.35)	(0.37)	(0.36)
Exposition$_{b,q-1}$* *Interbank*$_{b,q-1}$* *Post*$_q$				-0.71**	-0.73**	-0.77**
				(0.36)	(0.37)	(0.38)
Observations	51,537	51,537	51,537	429,894	429,894	429,894
R-squared	0.68	0.70	0.74	0.67	0.71	0.75
Firm-Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Quarter FE	No	Yes	No	No	Yes	No
Region-Sector-Quarter FE	No	No	Yes	No	No	Yes
Average (Interest Rate$_{f,b,q}$)	14.6	14.6	14.6	17.1	17.1	17.1

Table 6. Corporate Credit During the Fed Taper Tantrum: Credit Supply and Lending Relationships

This table reports the results of an analysis of corporate credit conditions around the Fed taper tantrum. The analysis is conducted at the bank-firm-quarter level including four quarters immediately before and after the Fed taper tantrum (i.e., from 2012Q2 to 2014Q1). $Loan\ Volume_{f,b,q}$ is the value (in logs) of the outstanding loan given to firm f by bank b in quarter q. The analysis is presented for loans denominatedin foreign currency (Panel A) and local currency (Panel B). $High\_Exposition_{b,t-1}$ is an indicator that equals one (0) if the bank's total debt in the cross-border interbank market is above (below) the median in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1). $Exposition_{b,q-1}$ is an indicator that equals one if the bank borrowed liquidity from the cross-border interbank market in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1), and 0 otherwise. $Post_q$ is an indicator that the observation is after 2013Q1. $Interbank\_C_{b,q-1}$ is an indicator equals to one (0) for banks that are net borrowers and have a 3-HHI above (below) the median in quarter q-1. Standard errors (in parentheses) are clustered the bank and quarter levels. *** p<0.01, ** p<0.05, * p<0.1. Detailed variable definitions are provided in Table A1.

	$Loan\ Volume_{f,b,q}$					
	Panel (A) Foreign currency			Panel (B) Local Currency		
	(1)	(2)	(3)	(4)	(5)	(6)
$Post_q$	-0.11***			-0.03***		
	(0.02)			(0.01)		
$High\_Exposition_{b,q-1}*Post_q$	-0.24***	-0.26***	-0.27***			
	(0.05)	(0.04)	(0.04)			
$Interbank\_C_{b,q-1}$	0.09	0.11	0.13	0.14***	0.16**	0.18***
	(0.08)	(0.07)	(0.08)	(0.04)	(0.07)	(0.06)
$Interbank\_C_{b,q-1}* Post_q$		0.04**	0.06***		0.04***	0.05**
		(0.02)	(0.02)		(0.02)	(0.02)
$High\_Exposition_{b,q-1}* Interbank\_C_{b,q-1}* Post_q$	0.06***	0.08***	0.09***			
	(0.02)	(0.02)	(0.03)			
$Exposition_{b,q-1}* Post_q$				-0.08***	-0.09***	-0.10***
				(0.02)	(0.02)	(0.03)
$Exposition_{b,q-1}* Interbank\_C_{b,q-1} * Post_q$				0.05**	0.06**	0.07***
				(0.02)	(0.03)	(0.03)
Observations	51,537	51,537	51,537	429,894	429,894	429,894
R-squared	0.74	0.75	0.77	0.78	0.79	0.81
Firm-Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Quarter FE	No	Yes	No	No	Yes	No
Region-Sector-Quarter FE	No	No	Yes	No	No	Yes

Table 7. Corporate Credit During the Fed Taper Tantrum: Loan Rates and Lending Relationships

This table reports the results of an analysis of corporate credit conditions around the Fed taper tantrum. The analysis is conducted at the bank-firm-quarter level including four quarters immediately before and after the Fed taper tantrum (i.e., from 2012Q2 to 2014Q1). *Interest Rate*$_{f,b,q}$ is the loan interest rate (measured in percent) of loan extended to firm f by bank b in quarter q. The analysis is presented for loans denominated in foreign currency (Panel A) and local currency (Panel B). *High_Exposition*$_{b,t-1}$ is an indicator that equals one (0) if the bank's total debt in the cross-border lending market is above (below) the median in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1). *Exposition*$_{b,q-1}$ is an indicator that equals one if the bank borrowed liquidity from the cross-border lending market in the quarter prior to the first announcement on the Fed taper tantrum (i.e., 2013Q1), and 0 otherwise. *Post*$_q$ is an indicator that the observation is after 2013Q1. *Interbank_C*$_{b,q-1}$ is an indicator equals to one (0) for banks that are net borrowers and have a 3-HHI above (below) the median in quarter q-1. Standard errors (in parentheses) are clustered the bank and quarter levels. *** p<0.01, ** p<0.05, * p<0.1. Detailed variable definitions are provided in Table A1.

	Interest Rate$_{f,b,q}$					
	Panel (A) Foreign Currency			Panel (B) Local Currency		
	(1)	(2)	(3)	(4)	(5)	(6)
Post$_q$	1.38***			1.07***		
	(0.43)			(0.38)		
High_Exposition$_{b,q-1}$*Post*$_q$	1.57***	1.61***	1.63***			
	(0.38)	(0.39)	(0.41)			
Interbank_C$_{b,q-1}$	-0.37	-0.32	-0.34	-0.74**	-0.69**	-0.72***
	(0.25)	(0.21)	(0.23)	(0.38)	(0.36)	(0.31)
Interbank_C$_{b,q-1}$* *Post*$_q$		-0.27**	-0.29**		-0.33***	-0.35**
		(0.14)	(0.15)		(0.15)	(0.18)
High_Exposition$_{b,q-1}$* *Interbank_C*$_{b,q-1}$* *Post*$_q$	-0.38***	-0.41***	-0.43**			
	(0.17)	(0.19)	(0.21)			
Exposition$_{b,q-1}$* *Post*$_q$				1.17***	1.21***	1.24***
				(0.47)	(0.49)	(0.52)
Exposition$_{b,q-1}$* *Interbank_C*$_{b,q-1}$ * *Post*$_q$				-0.65**	-0.67***	-0.69**
				(0.34)	(0.33)	(0.35)
Observations	51,537	51,537	51,537	429,894	429,894	429,894
R-squared	0.66	0.69	0.72	0.65	0.68	0.71
Firm-Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Quarter FE	No	Yes	No	No	Yes	No
Region-Sector-Quarter FE	No	No	Yes	No	No	Yes
Average(Interest Rate$_{f,b,q}$)	14.6	14.6	14.6	17.1	17.1	17.1

Table 8. Corporate Credit and Real Effects During the Fed Taper Tantrum

This table reports the results of an analysis of firm outcomes around the Fed taper tantrum using financial statements and trade activity at the firm level. The analysis is conducted at the firm-year level including observations from 2012 to 2014 using firm f level outcomes in year y. *Loan Volume$_{f,y}$* is the value of total outstanding loans (in logs) of firm f in year y in both local and foreign currency. *Exports$_{f,y}$, Imports$_{f,y}$, Assets$_{f,y}$, Sales$_{f,y}$, Liabilities$_{f,y}$* and *Invertments$_{f,y}$* are, respectively, the logarithm of the total exports, total imports, total assets, total sales, total liabilities (including bank loans) and total investments of firm f in year y. *High_Exposition$_{f,y-1}$* is an indicator that equals one if more than 50% of the aggregated value of the firm's loans was contracted with banks exposed in the cross-border interbank market in the year prior to the Fed taper tantrum (i.e., 2012). *Post$_y$* is an indicator variable that equals one if the borrower's yearly balance sheet value is in 2013, and zero otherwise. Panel A presents the results using the sample of firms with imports. Panel B shows the results for the sample of firms with exports. Panel C reports the results for the sample of firms with both imports and exports. Panel D presents the results for the full sample of firms. Standard errors (in parentheses) are clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1. Detailed variable definitions are provided in Table A1.

Panel A: Firms with Imports

	Loan Volume$_{f,y}$		Liabilities$_{f,y}$		Assets$_{f,y}$		Sales$_{f,y}$		Imports$_{f,y}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High_Exposition$_{f,y-1}$ *Post$_y$*	-0.23***	-0.24***	-0.18***	-0.19***	-0.17***	-0.19***	-0.23***	-0.24***	-0.17***	-0.19***
	(0.06)	(0.07)	(0.04)	(0.04)	(0.05)	(0.06)	(0.05)	(0.05)	(0.06)	(0.06)
Observations	25,731	25,731	25,731	25,731	25,731	25,731	25,731	25,731	25,731	25,731
R-squared	0.81	0.82	0.82	0.83	0.87	0.88	0.77	0.79	0.78	0.79
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector-Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Panel B: Firms with Exports

	Loan Volume$_{f,y}$		Liabilities$_{f,y}$		Assets$_{f,y}$		Sales$_{f,y}$		Exports$_{f,y}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High_Exposition$_{f,y-1}$ *Post$_y$*	-0.15***	-0.16***	-0.14***	-0.15***	-0.13***	-0.14**	-0.12***	-0.13**	-0.13***	-0.14***
	(0.04)	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)	(0.03)	(0.04)	(0.03)	(0.04)
Observations	10,779	10,779	10,779	10,779	10,779	10,779	10,779	10,779	10,779	10,779
R-squared	0.77	0.79	0.81	0.83	0.85	0.86	0.77	0.79	0.79	0.81
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector-Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Panel C: Firms with Exports and Imports

	Loan Volume$_{f,y}$		Liabilities$_{f,y}$		Assets$_{f,y}$		Exports$_{f,y}$		Imports$_{f,y}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High_Exposition$_{f,y-1}$ *Post$_y$	-0.21***	-0.22***	-0.17***	-0.19***	-0.16***	-0.18***	-0.15***	-0.17***	-0.19***	-0.21***
	(0.05)	(0.06)	(0.04)	(0.05)	(0.03)	(0.05)	(0.03)	(0.04)	(0.06)	(0.07)
Observations	8,751	8,751	8,751	8,751	8,751	8,751	8,751	8,751	8,751	8,751
R-squared	0.82	0.86	0.83	0.85	0.89	0.91	0.73	0.75	0.79	0.82
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector-Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Panel D: Full Sample of Firms

	Loan Volume$_{f,y}$		Liabilities$_{f,y}$		Assets$_{f,y}$		Sales$_{f,y}$		Investments$_{f,y}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High_Exposition$_{f,y-1}$ *Post$_y$	-0.13***	-0.14***	-0.11**	-0.13***	-0.07**	-0.08**	-0.08**	-0.10**	-0.06**	-0.07**
	(0.04)	(0.04)	(0.05)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.03)
Observations	80,511	80,511	80,511	80,511	80,511	80,511	80,511	80,511	80,511	80,511
R-squared	0.75	0.76	0.77	0.79	0.81	0.83	0.78	0.79	0.72	0.74
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector-Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes