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The Effect of the China Connect*

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Abstract

We document the effect on Chinese firms of the Shanghai (Shenzhen)-Hong Kong Stock Connect. The Connect was an important capital account liberalization introduced in the mid-2010s. It created a channel for cross-border equity investments into a selected set of Chinese stocks while China's overall capital controls policy remained in place. Using a difference-in-difference approach, and with careful attention to sample selection issues, we find that mainland Chinese firm-level investment is negatively affected by contractionary U.S. monetary policy shocks and that firms in the Connect are more adversely affected than those outside of it. These effects are stronger for firms whose stock return has a higher covariance with the world market return and for firms relying more on external financing. We also find that firms in the Connect enjoy lower financing costs, invest more, and have higher profitability than unconnected firms. We discuss the implications of our results for the debate on capital controls and independence of Chinese monetary policy.

Keywords: Capital Controls; Global Financial Cycle; Foreign Spillovers; FOMC Shocks; China Connect; Corporate Investment
JEL Classification: F38; E40; E52; G15

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1 Introduction

The Shanghai (Shenzhen)-Hong Kong "Stock Connect" program, the China Connect, allows investors in mainland China, Hong Kong residents and foreign investors to trade eligible stocks listed on the other market, through the exchange and clearing houses in their home markets. This program, announced in April 2014 and begun in November 2014, is a major step toward internationalizing China's security markets. In 2016, the program was extended to the Shenzhen exchange. The China Connect is a natural experiment in equity market liberalization that took place amid an overall capital controls policy that remained tight and unchanged. Importantly, the program allows only a set of Chinese firms to be traded by foreign investors, while the remaining firms are left out. The China Connect thus provides a unique setting to test the wide-ranging effects of stock market liberalization.

Existing literature has studied the short-run effect of stock market liberalization on the domestic economy (see Chari and Henry (2004, 2008), Bekaert, Harvey, and Lundblad (2005) for example). Yet, few papers investigate its long-run implications and effects on the real economy. One difficulty is identification: when a country liberalizes its stock market, it typically allows foreigners to trade all stocks. As we describe in detail below, the China Connect liberalization was much different, and in a way that enhances econometric identification.[1] That said, even a carefully designed policy experiment like the Connect can still expose the domestic economy to the global financial cycle in the long run, consistent with Rey (2015) and as we document below in the case of China, given the hole it creates in the "wall" of capital controls policy.

In this paper, we systematically study the effect of the Connect on Chinese firms. We document both long-run exposure to the global financial cycle and short-run benefits such as stock price reevaluation, lower financing costs, and expanded investment. Because the Connect shock created two groups of firms, we differentiate between the control group that remained protected by capital controls and the connected treatment group that became more open to foreign influences.[2] A major methodological concern, however, stems from the fact that connected firms were not chosen randomly and that choice may not be orthogonal to unobserved factors that also affect firm equity returns, financing costs, and investment. We

[1] Two features are important for the identification. First, the China Connect only includes select domestic stocks. Second, the government liberalizes gradually and does not change the overall tight capital controls policy (see Song and Xiong (2018) and Brunnermeier, Sockin, and Xiong (2018)).

[2] The Connect is different from China's partial opening to foreign investment examined by Fernald and Rogers (2002): the A-share, B-share market, in which different classes of shares in the same firm were allowed to be held only by domestic and foreign investors, respectively.

address this concern in a number of ways that lead us to believe that the link between being in the Connect and the resulting firm-level outcomes we document is causal.

The first hypothesis we investigate is that investment by firms in the Connect, with less protection from inland capital controls, will be more sensitive to external shocks than investment by unconnected firms. Our proxy for external shocks is the U.S. monetary policy shocks series of Rogers et al. (2018). We use this along with quarterly firm-level investment of listed companies in China. We find that firms in the Connect are indeed more sensitive to Fed monetary policy shocks than those not in the Connect, after inclusion. The investment rate by treated firms declines by a net average of 2.8% following a unit increase in the shock, controlling for firm-level investment opportunity, cash flow, size, and local economic conditions. This result is robust to a battery of tests.

Our second hypothesis concerns the channel through which U.S. monetary policy shocks affect domestic investment. We find that firms whose stock return co-moves more with the global market return are affected more by these shocks after inclusion in the Connect. Furthermore, firms relying more on external financing are more sensitive. These findings are consistent with a risk-premium channel. Given that the China Connect permanently changes the cost of funding for connected firms, firms whose stock returns have a higher covariance with the global market return are more responsive when U.S. monetary policy changes the risk-free rate and global risk-aversion. These effects transmit to the real economy by altering firm investment decisions. For firms whose return co-moves more with the global market return, their investment is more responsive because their risk-premiums are more sensitive.

Our last hypothesis is that, if this increased sensitivity of Chinese corporate investment to external shocks were the only effect of the Connect, firms would act to remain out of the Connect, something we do not observe. We establish that firms in the Connect have a higher stock price reevaluation and thus invest more than unconnected firms in the short run. Furthermore, they also enjoy lower financing costs, and earn higher net income on equity (ROE) and assets (ROA), relative to firms outside of the Connect. These findings are consistent with previous papers such as Chari and Henry (2004, 2008).

Literature Review We contribute to several strands of literature. First, the literature on global financial cycles. For example, Rey (2015) and Miranda-Agrippino and Rey (2019) provide compelling evidence that a global financial cycle might lead asset prices and financial variables to co-move across the globe. Moreover, they argue that U.S. monetary policy

is the driving force. Meanwhile, many papers have focused on the channel through which the global financial cycle can affect the local economy (see di Giovanni et al. (2017)). Cerutti et al. (2019) challenge the importance of the global financial cycle in explaining variations in capital flows, however. We also study the spillover effects of U.S. monetary policy shocks in the presence of capital controls.

Second, our paper is related to the literature on capital controls. One conclusion from the Global Financial Cycles literature is that capital controls can create a useful wall against external shocks (see IMF (2012), Jeanne et al. (2012), Rey (2015) and Miranda-Agrippino and Rey (2019)). The empirical evidence for the effectiveness of capital controls is mixed, however (Magud et al. (2018), Rebucci and Ma (forthcoming) and Erten et al. (forthcoming)). One difficulty is that the policy is usually endogenous and sticky: many countries put capital controls in place simultaneously with adverse events and do not change them frequently.[3] For example, Forbes et al. (2015) find that most capital flows management measures do not significantly achieve stated objectives of exchange rate management, capital flows management, monetary policy independence, and taming volatility. However, Miniane and Rogers (2007) and Han and Wei (2018) do find evidence that capital controls buffer the spillover effects from U.S. monetary policy to emerging market exchange rates and interest rates, while Ostry et al. (2012) and Bruno et al. (2017) find some supporting evidence for the effectiveness of capital controls on bank credit.[4] One key difference in our paper lies in the identification of the policy shock. The Connect program is unlike nationwide capital control reforms documented in other papers (Henry (2000a,b, 2003) and Bekaert et al. (2005) for example), and is thus a cleaner policy experiment from which we can establish causal relationships.

Third, our paper is related to the literature on corporate investment and macro uncertainty. For example, Ottonello and Winberry (2018) document an investment channel of U.S. monetary policy and find that firms with low default risk are the most responsive to monetary policy shocks. Husted et al. (forthcoming) find that monetary policy uncertainty significantly delays U.S. firm investment in ways that are in line with both real options theory and a financial frictions channel. Consistently, we also find that Chinese corporate investment is negatively affected by contractionary U.S. monetary policy shocks. Differ-

[3] An exception is Brazil (see Alfaro et al. (2017) who study the effect of capital controls in Brazil).

[4] A relatively new literature justifies the use of capital controls to address pecuniary externalities or aggregate demand externalities. For pecuniary externalities, see Lorenzoni (2008), Jeanne and Korinek (2018, 2010a), Bianchi (2011), Korinek (2018), Benigno et al. (2013) and Ma (forthcoming). For papers with aggregate demand externalities, see Korinek and Simsek (2016) and Farhi and Werning (2016).

ently, we document a reduction in corporate investment for connected firms relative to unconnected ones following a contractionary FOMC shock. Our results provide additional evidence, derived from a clean identification, on the effects of capital account policies.

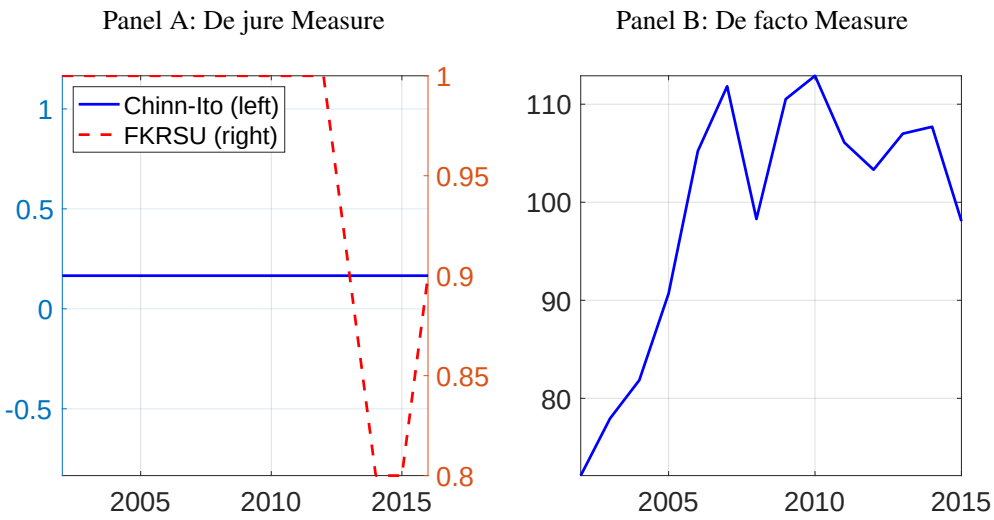
Fourth, our paper is related to the literature establishing positive effects of stock market liberalizations. For example, Henry (2000a,b, 2003), Chari and Henry (2004, 2008) and Bekaert et al. (2005) document positive long-run growth effects for liberalizing countries. Consistent with this, we find a positive effect of China's stock market liberalization on Chinese corporate investment. Differently, we provide a more comprehensive analysis of the liberalization on the corporate sector under our policy experiment.

Finally, our paper belongs to the literature using the China Connect as a natural experiment to test theoretical predictions. For example, Xing et al. (2018) use the Connect to test the impact of capital market openness on high frequency market quality. Similarly, Liu et al. (2018) use the policy shock to test the speculative nature of beta and the multiplier effect of speculation on demand shocks. Different from those papers, we also analyze macroeconomic transmission and study both real and financial effects of the Connect.

Policy Implications As is well known, China has imposed very strict capital controls (see Figure 1). Despite this, Chinese policymakers initiated the Connect. Trading under this program is subject to a maximum cross-border investment quota together with a daily quota. It has been argued that the Connect is a well-designed controlled capital account liberalization (Prasad (2017)), which presumably should minimize the impact of external shocks to domestic Chinese sectors. Our results indicate that even such a carefully designed policy experiment can expose domestic listed firms to external shocks. The findings in this sense support the use of capital controls in curbing external shocks. However, our results also point to many positive effects that firms enjoy from inclusion in the Connect. Overall, this suggests that firms are able to hedge the negative consequences from increased sensitivity to foreign shocks under this carefully calibrated liberalization.

In the next section, we describe the institutional background of the Connect. Section 3 develops our main hypotheses through a simple theoretical framework. Section 4 describes our data and key variables construction. Section 5 discusses estimation strategy, including how we address sample selection issues, and presents the baseline empirical findings on firm investment. Sections 6 and 7, respectively, present results from firm heterogeneity on the baseline and results on the "positive" effects of the Connect. Section 8 concludes.

Figure 1 Chinese Capital Account Restrictions



NOTE: Panel A plots de jure measures of capital controls from Chinn and Ito (2006) and Fernández, Rebucci, and Uribe (2015). A higher value for the former (latter) means a higher (lower) degree of capital account openness. Panel B plots the de facto measure, the sum of gross stocks of foreign assets and liabilities as a ratio to GDP, from Lane and Milesi-Ferretti (2007).

2 Institutional Background

China's two domestic stock exchanges, the Shanghai Stock Exchange (SHSE) and Shenzhen Stock Exchange (SZSE), were established in December 1990 and April 1991, respectively. Their A share markets combined are the second largest in the world in total market capitalization, trailing only the US. The number of listed firms has been growing since market inception, with more than 3,500 firms listed and traded at the end of 2018.

Foreign investors were traditionally restricted from trading in the A-share market. After the Asian financial crisis, the China Securities Regulatory Commission (CSRC) has taken a gradual and prudential approach to opening the financial markets (see Prasad and Wei (2005) and Song and Xiong (2018)). The CSRC first introduced a B-share market exclusively to foreign investors in 2001. One year later, the Qualified Foreign Institutional Investor (QFII) program was initiated to certain overseas *institutional* investors, which allowed limited access to A-share stocks. However, getting QFII licences was extremely difficult, requiring applicants to meet certain standards for financial stability concerns. In the first year, only 12 qualified foreign investors were approved and approval ceased during

2006-2007.[5] There are also restrictions on domestic residents purchasing overseas stocks. However, beginning in 2006, domestic institutional investors have been allowed to purchase foreign stocks under the Qualified Domestic Institutional Investor (QDII) program.

The Shanghai (Shenzhen)-Hong Kong Stock Connect was first proposed in 2007 by the Binhai New Area of Tianjin and the Bank of China. However, regulators postponed the program until on April 10, 2014, the CSRC and Hong Kong Securities and Futures Commission (SFC) made a joint announcement to start the program. The plan was to include all foreign investors as well as any mainland investors who have a stock account with balances no less than 500,000 RMB (approximately 72,000 USD), regarded as a relatively low barrier to enter both markets.[6] The Connect was officially launched on November 17, 2014. Unlike both QFII and QDII, which have a relatively small size and only focus on *institutional* investors, the China Connect is larger and includes both institutional and retail investors. In December 2016, the Shenzhen Stock Exchange was also opened to the Hong Kong Stock Connect. The Shenzhen Exchange includes both growth and high-tech startup firms like ChiNext. Overall, more than one thousand stocks from the mainland have become connected to overseas investors, including both large-cap and mid-cap stocks.

Although the Connect is a loosening of capital account restrictions, trading through the program is nevertheless subject to aggregate quotas. The daily quota of trading capitalization is 13 billion RMB for the Shanghai Exchange and 10.5 billion RMB for the Hong Kong Exchange. On April 11, 2018, the daily quota increased four-fold to 42 billion and 52 billion, respectively. Moreover, short selling through the Connect is banned.

There were two big waves of the Connect program. For the Shanghai-Hong Kong Connect, eligible stocks include all the constituent stocks of the SSE 180 Index, SSE 380 Index, and all the SSE-listed A shares that are not included as constituent stocks of the relevant indices but which have corresponding H shares listed on SEHK (so called "A-H" dual listed stocks), except for SSE-listed shares which are not traded in RMB and SSE-listed shares which are under risk alert (including shares of "ST companies", "*ST companies companies" and shares subject to the delisting process under the SSE rules). Similarly, for Shenzhen-Hong Kong, eligible stocks include all constituent stocks of the SZSE Component Index, SZSE Small/Mid Cap Innovation Index which have a market

[5] Detailed comparison between the QFII/QDII and Stock Connect can be found at: http://english.sse.com.cn/investors/shhkconnect/introduction/comparing.

[6] Detailed information can be found on the website of the Hong Kong Stock Exchange. https://www.hkex.com.hk/-/media/HKEX-Market/Mutual-Market/Stock-Connect/Getting-Started/Information-Booklet-and-FAQ/Information-Book-for-Investors/Investor_Book_En.pdf

capitalization of not less than RMB 6 billion and all the SZSE A-H dual listed stocks, except for SZSE-listed shares which are not traded in RMB and for SZSE-listed shares which are under risk alert (including shares of "ST companies", "*ST companies companies" and shares subject to the delisting process under the SSE rules) or under delisting arrangement.[7] Eligible securities are included and excluded based on adjustments made to the indexes and the timing at which relevant A shares are placed under risk alert or released from risk alert. The authority makes adjustments semi-annually, based on these criteria.

Table A.1 shows the timeline of the Connect program. On November 17, 2014, the Shanghai-Hong Kong Stock Connect was made effective, with 416 constituent stocks in the SSE 180 index, SSE 380 index, and A-H dual listed stocks eligible for the Program. The list was revised slightly due to adjustment of the 180 and 380 index. On December 5, 2016, the program was expanded to Shenzhen, with 676 stocks from the SZSE Component Index on a designated list eligible for overseas investors.[8]

3 Theoretical Motivation and Hypothesis Development

3.1 A Simple Conceptual Framework

Our framework combines insights from both the literature on financial liberalization and the global financial cycle. Following the standard neoclassical production framework, e.g. Chari and Henry (2004, 2008), the optimal investment decision for firm i equates the marginal benefit of production to the cost of funding. Stock market liberalization has no impact on the marginal benefit of production since it is determined by production technology. However, funding costs change with liberalization. As a result, the global financial cycle can have an impact on investment through its impact on the funding cost after liberalization. In a world with efficient markets, the funding cost for firm i should equal its stock return. Specifically, the first-order condition after liberalization can be written as

$$E[f_i'(k_i^*)] = r^* + \gamma^* \text{cov}(r_i, r_W) \tag{1}$$

[7] Detailed information can be found from the Hong Kong Stock Exchange at https://www.hkex.com.hk/Mutual-Market/Stock-Connect/Getting-Started/Information-Booklet-and-FAQ?sc_lang=en.

[8] Originally, there were 537 (856) connected stocks from Shanghai (Shenzhen). Following the literature, we drop some firms (as detailed in Section 4), such that we have 416 (676) firms in the end.

where $f_i(\cdot)$ is a concave production function like Cobb-Douglas, k_i^* is capital per unit of effective labor (total capital stock divided by total effective labor), r^* is the global risk-free rate, γ^* is the risk-aversion for the marginal investor, and $\text{cov}(r_i, r_W)$ is the covariance between the equity return r_i for firm i and the global market return r_W (ignoring depreciation).

U.S. monetary policy, the crucial source of transmission emphasized by the global financial cycle literature, can affect the risk aversion of global investors and thus have an impact on the global market (see Kalemli-Ozcan (2019), Miranda-Agrippino and Rey (2019)). Therefore, according to our simple framework, there should be two effects through which the global financial cycle can affect domestic investment after liberalization. When U.S. interest rates rise, (1) the global risk free rate r^* increases and (2) the global risk-aversion coefficient γ^* becomes higher. Both lead to a reduction in domestic investment. As a result, Chinese firm investment should be differently affected by U.S. monetary policy after the Connect, depending on inclusion. Other implications emerge from this framework. The risk free rate channel reflects a common shock to all stocks after the Connect. On the other hand, the risk-aversion channel is firm-specific and depends on (1) whether the firms can be traded by overseas investors and (2) how sensitive the stock returns are to the global systematic risk factor, measured by $\text{cov}(r_i, r_W)$.[9]

Furthermore, and importantly, those effects should be absent / weaker before the Connect since the cost of funding is unaffected (less affected) by U.S. monetary policy. One can see this from the investment decision before the Connect as follows

$$E[f_i'(k_i)] = r + \gamma \text{cov}(r_i, r_M) \tag{2}$$

where k_i is capital per unit of effective labor, r is the domestic risk-free rate, γ is the risk-aversion for the domestic marginal investor, and $\text{cov}(r_i, r_M)$ is the covariance term of the equity return r_i for firm i and the market return r_M for the domestic market.

Two implications follow. First, the domestic risk-free rate should be less sensitive to U.S. monetary policy because China has imposed very tight capital controls, as shown in Figure 1 (see Han and Wei (2018)). Second, it is less likely that domestic investors' risk aversion will be affected by the global financial cycle before the Connect since capital controls policy prevents them from accessing international financial markets. As a result, one should not expect any significant impact from U.S. monetary policy to domestic investment before the Connect (barring leakages in overall capital controls).

[9] This logic is similar to the risk-sharing channel identified in Chari and Henry (2004, 2008).

Capital controls thus play the role of a "wall" between the domestic economy and the international market, reducing the impact of the global financial cycle on the domestic economy. With the introduction of the China Connect, domestic investment is more sensitive to the cycle due to the funding cost channel: for connected firms, their investment should be more sensitive to the U.S. monetary policy shock compared with both the unconnceted firms and themselves prior to inclusion in the Connect.

In addition to increasing the sensitivity of domestic investment to the global financial cycle, liberalization can bring benefits in the short run through the risk-sharing channel, as in Chari and Henry (2004, 2008). To see this, assuming that $\gamma = \gamma^*$, one can write the impact of stock market liberalization on investment as follows. Subtracting equation (1) from equation (2),

$$\Delta E[f_i'(k_i^*)] \equiv E[f_i'(k_i)] - E[f_i'(k_i^*)] = r - r^* + \gamma \text{DIFCOV}_i \tag{3}$$

where $\text{DIFCOV}_i = \text{cov}(r_i, r_M) - \text{cov}(r_i, r_W)$ is a measure of risk-sharing as in Chari and Henry (2004, 2008). Testable predictions for investment and equity prices emerge from equation (3). The Connect enables international investors to trade domestic stocks, which ultimately leads to stock price revaluation and thus investment. Specifically, there are two factors that change with the liberalization: one is a common factor, i.e. the risk-free rate $r - r^*$, and the other is a firm-specific risk premium component, measured by γDIFCOV_i. Given that the Connect changes the risk-free rate permanently, it can affect both connected and unconnected firms. As for the risk premium, however, it affects the connected and unconnected firms differently. Presumably, firms in the connect are more affected than the unconnected ones because those firms are now priced by a new systematic risk factor, the global market return, while unconnceted firms are still priced by the domestic systematic risk factor, i.e., the domestic market return. Furthermore, firms with a high DIFCOV should experience a greater repricing after liberalization, other things equal.

3.2 Hypothesis Development

We form our hypotheses based on the simple conceptual framework above. As seen in the Chinn-Ito index of countries capital account restrictions (see Figure 1), China has imposed a very tight and persistent capital controls policy. Capital controls measures from Fernández et al. (2015) confirm this characterization of policy, albeit with a small relaxation after 2014. De facto capital account restrictions, as measured by the sum of gross

stocks of foreign assets and liabilities as a ratio of GDP indicate an upward trend for China starting from the early 2000s, with fluctuations around 100 after 2010. That China's overall capital controls policy has not changed significantly in recent decades implies that the impact of the global financial cycle on the domestic economy before the Connect should be minimal. However, the Connect created a channel through which the global financial cycle can affect the domestic economy, via the cost of funding channel. The absence of a sharp change in the above de facto measure of capital controls, despite the Connect, is consistent with the initial intention of the policy: reducing excessive capital flows and opening part of the stock market to foreign investors. To the extent that controls are effective, there should be smaller external spillover effects on firms that are not in the Connect and hence function more under the protection of capital controls. If controls are not effective, there should not be significant differences between connected and unconnected firms in their investment responses to external shocks after the connection. Thus, our first hypothesis:

Hypothesis 1. *Firms included in the Connect program become more sensitive to external shocks than unconnected firms, after the Connect.*

We further investigate which types of firms are more sensitive to external shocks after the Connect. According to our conceptual framework, firms' investment should be more sensitive to external shocks when they have greater risk-sharing with the global market, i.e. a higher $\text{cov}(r_i, r_W)$. This leads to the corollary to our first hypothesis:

Hypothesis 2. *Firms with relatively higher sensitivity to the global market (i.e., higher $cov(r_i, r_W)$) in the Connect program have more sensitive investment expenditures to external shocks after the Connect.*

Finally, we hypothesize that if the only effect of the Connect were that Chinese firms' investment became more sensitive to external shocks, firms would behave so as to remain out of the Connect. We are unaware of any such behavior, and thus conjecture that:

Hypothesis 3. *Firms included in the Connect experience positive effects, such as a higher stock price response and higher investment boom, after the Connect. Moreover, these effects are stronger for firms with a higher risk-sharing measure (i.e. a higher $DIFCOV_i$).*

As noted above, we test these hypotheses with a detailed data set and difference-in-difference estimation and careful consideration of sample selection. We find strong support for all three hypotheses.

4 Data

We combine data from two main sources. The first is the U.S. monetary policy shock of Rogers et al. (2018). The second is firm-level data from the China Stock Market and Accounting Research (CSMAR) Database.

4.1 U.S. Monetary Policy Shock

Rogers et al. (2018) construct a Fed monetary policy shock series (MPS^{US}) that is a combination of three surprises: Target Fed Funds rate surprises, which were zero between December 2008 and December 2015; Forward Guidance surprises; and Large Scale Asset Purchase surprises (zero before the QE1 program). This is a high-frequency surprise series, measuring changes in yields from 15 minutes before the Federal Open Market Committee (FOMC) announcement to 30 minutes afterward.[10] The MPS^{US} series begins in January 1990 and ends in December 2017.[11] During this period, the 250 shocks have a mean of -0.022 and standard deviation of 0.119. To match the US monetary policy shock with our quarterly firm data, we aggregate the MPS^{US} within each quarter in two ways, as in Ottonello and Winberry (2018). One is a simple sum of the (typically two) surprises that occur each quarter. The idea is to capture the cumulative amount of monetary policy shocks in a given quarter. Recognizing the slow adjustment of corporate investment decisions, we also use a value weighted sum to construct the quarterly MPS^{US}, where the weight is given by the number of days remaining in the quarter after FOMC announcement day. We estimate all of our regressions using both shock series. Because results are highly robust to the alternative definitions, we feature simple aggregation of FOMC surprises in our table.[12] The summary statistics of the monetary policy shock series are reported in Table A.2.

4.2 Firm-level Variables

We collect firm-level data from the China Stock Market and Accounting Research (CSMAR) Database. Our sample starts at the time all A-share stocks were traded on the Exchanges. B-share stocks are excluded because they can only be traded by foreign investors.

[10] The series also includes a handful of inter-meeting announcements. See the original paper (or Wright's website) for the underlying data and details on construction of the surprises.

[11] We use the Eastern U.S. time zone, a half-day behind the Chinese time zone. This is not an issue for our analysis of quarterly data.

[12] Results using value weighted surprises that we do not display here are available upon request.

As is conventional, we drop financial and utility firms since they share different disclosure regulations and their liquidity positions are special compared with firms in other sectors. Following the literature, we require firms to have at least two years of historical data as in Fama and French (1993). We exclude firms listed after year 2014 to get rid of the effect of new IPOs. Our sample period runs from 2002 to 2017, with the beginning date chosen to reflect when the CSRC required all listed firms to file quarterly financial reports.[13] We drop observations with missing key values for investment, Tobin's Q or cash flow. The final sample comprises 87,740 firm-quarter observations, covering 2,174 unique firms. The detailed distribution by industry and year can be found in Table A.4 of the Appendix.

Our main measure of firm-level investment is defined as capital expenditures divided by beginning-of-quarter book value of total assets (lagged total assets), where the capital expenditures are calculated as cash payments for the acquisition of fixed assets, intangible assets and long-term assets (from the cash flow statement) minus cash receipts from selling those assets, plus cash paid for operating lease.[14] We control for an array of firm-level characteristics that might affect corporate investment (see Julio and Yook (2012) and Cao et al. (2016) for example). The key control variables include Tobin's Q, calculated as the book value of total assets minus the book value of equity plus the total market value of equity (close price at quarter end multiple by share outstanding) scaled by book value of total assets; size, the natural logarithm of the book value of total assets; cash flow, measured by earnings before interest and taxes (EBIT) plus depreciation and amortization minus interest expenses and taxes scaled by lagged total assets; and sales growth, defined as the growth rate of revenue. We winsorize our sample at the top and bottom 1% of all continuous variables to guard against outliers. The details of variable construction are reported in Table A.5 of the Appendix.

Table A.3 reports summary statistics for the firm characteristics. Quarterly capital expenditure is 3.5% on average, with a standard deviation of 4.5%, slightly higher than for U.S. listed firms (see Jens (2017)). Tobin's Q is 2.624 on average with a standard deviation of 1.94. Size is 21.781 on average with a standard deviation of 1.275. The mean of cash flow is 0.036 with a standard deviation of 0.046. Sales growth is 0.413 on average with a standard deviation of 0.8. All statistics are consistent with previous studies on China (see Cao et al. (2016) for example).

[13] The announcement date is April 6, 2001 and became effective in 2002. Detailed information can be found at: http://www.gov.cn/gongbao/content/2002/content_61983.htm.

[14] Our measure of investment to asset ratio is equivalent to capital expenditure (Compustat data item # 128 CAPX) which is commonly used in U.S. based studies.

5 Estimation Strategy and Firm-Level Investment Results

Our objective is to identify the average effect of the Connect on outcomes such as investment, equity returns, and financing costs for Chinese firms that were included in the program, i.e., the average impact of treatment on the treated. Specifically, we are interested in comparing, e.g., investment of connected firms to the counterfactual — investment of unconnected firms at the same point in time. Conceptually, we would like firms to have been randomly assigned to the Connect and compare the average outcomes of the two groups. Absent that, we use a difference-in-differences method that mimics a random selection hypothetical under reasonable conditions.[15] This compares the change in outcomes in the treatment group before and after the Connect announcement to the change in outcomes in the control group. By comparing changes, we control for observed and unobserved firm characteristics that might be correlated with the Connect decision and with the outcomes. The change in the control group is an estimate of the true counterfactual: what would have happened to the treatment group if there had been no Connect.

5.1 Estimation Strategy: Difference-in-Differences

We utilize the following augmented version of the standard investment-Q specification.

$$Y_{it} = \alpha_i + \alpha_s + \beta_1 \text{Connect}_{it} + \beta_2 \text{MPS}_t^{\text{US}} + \beta_3 \text{MPS}_t^{\text{US}} \times \text{Connect}_{it} + \Gamma Z_{it} + \varepsilon_{it} \qquad (4)$$

where i indexes the firm and t is a time index (quarterly frequency). The dependent variable is corporate investment Y_{it}, defined as quarterly capital expenditure scaled by book value of total assets at beginning of the quarter. α_i is a firm fixed effect and α_s is a year fixed effect. The explanatory variables of interest are MPS_t^{US}, Connect_{it}, and their interaction. We consider both equal weighted and value (date) weighted quarterly MPS_t^{US} as described above. In our regressions, Connect_{it} is a dummy variable indicating whether firm i is included in the Connect program at quarter t. Firms can be included or excluded periodically, as explained above, and there is often a lag between the announcement date and effective

[15] A major concern is that firms that were chosen to be connected could be different from those that remained outside, and that these differences are correlated with outcomes like financing costs and investment sensitivity to foreign shocks. For example, politically connected firms for which financing costs are already low(er) may have been the ones that lobbied for inclusion. In principle, many of the (unobservable) characteristics that may confound identification are those that vary across firms but are fixed over time. Our difference-in-differences method of controlling for this unobserved heterogeneity is conventional.

date for a firm to be included (see Table A.1). Thus, we make the dummy 1 (0) for all quarters of the year in which the firm is first included in (removed from) the Connect.[16] The controls Z_{it} include both firm-level and macro-level variables that could potentially affect corporate investment decisions. Following the literature, we use lagged Tobin's Q, cash flows, sales growth and firm size at the firm level to control for firm heterogeneity. We also use the quarterly change of nominal GDP at the provincial level to control for local economic cycles, with the firm's headquarter address identifying its location.[17] We add both firm and year fixed effects to control for unobserved individual and year effects, and quarterly dummies to adjust for seasonality. Standard errors are clustered at both firm and year level (see Petersen (2009)). To control for regional time-variation, we also include interaction terms between regions and year indicators as an alternative specification and find that our results are robust.[18] Those results are highly robust and available on request.

5.2 Validity of Empirical Strategy

We begin by evaluating the validity of our difference-in-differences regression framework. To this end, we evaluate sample selection and conduct a parallel trends test.

5.2.1 Sample Selection

Unsurprisingly, firms in the Connect were not chosen randomly, as would be ideal for our econometric objectives. Instead, firms were selected based on whether they belong to the constituent indexes, as described above. Table 1 provides a comparison of ex-ante observable differences between connected and unconnected firms for the two big waves of the Connect, for twelve variables: Investment, Size, Tobin's Q, Cash Flow, Sales Growth, Market to Book ratio, Cash holdings, Age, Sales Growth, Global Cov (the historical covariance of firm i's stock return with the MSCI world market return), DIFCOV (the difference

[16] Our results still hold if we don't make this adjustment. We prefer the adjustment for an additional reason. The periodic in-and-out of the Connect is due to adjustment of the stock indices that are typically done in June or December each year (selection criteria can be found at the official website of the Shanghai and Shenzhen Stock Exchanges). The announcement of inclusion and exclusion can happen several months before implementation. Our adjustment to the Connect dummy captures this announcement effect. See Table S.3 and S.4 in the Online Appendix when we 1) do not do this adjustment; 2) eliminate all the periodic changes to the indexes and only keep the two big waves in 2014 Q4 and 2016 Q4.

[17] In Table S.5 of the Online Appendix, we also include lagged year-over-year M2 growth rate and the 7-day Repo rate in China to control for Chinese monetary policy. Our main results are robust.

[18] Geographic regions in China can be classified into six areas based on the National Census Bureau: Bohai, Central, Northeast, Northwest, Southeast, Southwest. We use firm headquarters to identify region.

Table 1 Summary Statistics: Connected vs. Unconnected Firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)
	Connected (a)			Unconnected (b)			Difference (a)-(b)		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean Diff		T-test
Panel A: One Quarter before Shanghai- Hong Kong Connect (2014Q3)									
Investment	0.035	0.026	0.032	0.023	0.013	0.030	0.012	***	5.09
Size	23.104	22.969	1.337	21.750	21.763	1.180	1.354	***	14.26
Tobin's Q	1.756	1.463	1.049	2.332	1.594	2.045	-0.575	**	-4.96
Cash Flow	0.036	0.030	0.032	0.007	0.007	0.038	0.029	***	11.43
M/B	2.848	2.248	2.168	4.995	2.887	6.082	-2.147	***	-6.60
Cash	0.152	0.124	0.099	0.143	0.110	0.117	0.009		1.15
Age	12.821	13.000	5.498	14.467	15.000	4.773	-1.646	***	-4.24
Sales growth	0.538	0.522	0.145	0.546	0.510	0.220	-0.008		-0.59
Global Cov%	0.068	0.069	0.057	0.069	0.065	0.060	-0.001		-0.15
DIFCOV%	0.317	0.313	0.108	0.349	0.346	0.104	-0.032	***	-4.03
Return Volatility	0.020	0.019	0.007	0.021	0.020	0.006	-0.001	***	-2.96
Market Cap	23.171	23.011	0.856	22.189	22.057	0.616	0.981	***	16.87
Panel B: One Quarter before Shenzhen- Hong Kong Connect (2016Q3)									
Investment	0.032	0.021	0.033	0.025	0.016	0.029	0.007	***	4.04
Size	22.476	22.342	0.991	21.545	21.525	0.870	0.932	***	17.65
Tobin's Q	3.724	3.048	2.548	3.692	3.049	2.617	0.032		0.22
Cash Flow	0.039	0.034	0.038	0.020	0.019	0.034	0.019	***	9.38
M/B	4.788	4.033	3.106	5.158	4.215	3.962	-0.370	*	-1.84
Cash	0.181	0.134	0.148	0.165	0.133	0.130	0.017	**	2.15
Age	9.881	7.000	5.808	9.567	6.000	6.088	0.314		0.94
Sales growth	0.576	0.552	0.172	0.589	0.554	0.203	-0.013		1.25
Global Cov%	0.130	0.131	0.078	0.127	0.131	0.083	0.004		0.82
DIFCOV%	1.180	1.071	0.513	1.220	1.129	0.501	-0.040		-1.40
Return Volatility	0.020	0.019	0.005	0.022	0.022	0.006	-0.002	***	-7.49
Market Cap	23.324	23.217	0.598	22.484	22.430	0.391	0.840	***	28.39

NOTE: summary statistics of key variables for connected and unconnected firms used in our sample. Detailed definitions can be found in Appendix A.5. Panel A includes firms only listed on the Shanghai Exchange in 2014 Q3. Panel B includes firms listed on Shenzhen Stock Exchange in 2016 Q3. All variables are winsorized at the top and bottom 1%. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

between the historical covariance of firm i's return with local market and its covariance with the MSCI world market), Return Volatility and Market Cap. See Appendix A.5 for data sources.

As seen in Table 1, connected firms invest more, are larger, younger, and have lower stock return volatility. This heterogeneity motivates us to investigate a Heckman Two-Stage estimation and propensity score matching method to control for observed firm heterogeneity. Private conversations with a governor at the SSE suggest that the authorities select stocks into the Connect primarily based on the composite indexes. However, there is no simple rule for constructing such indexes that we could mechanically plug into an empirical

selection model. From our reading of the public information concerning index construction and the ex-ante firm differences in Table 1, we include stock return volatility, market cap, leverage, age and dividend payout decision in our first stage Probit model regression, controlling for industry, province and exchange fixed effects.

5.2.2 Parallel Trends Assumption

The validity of difference-in-difference estimation relies on the parallel trends assumption: before the Connect, treated firms exhibit a similar pattern of investment sensitivity to MPS^{US} as control firms. To test this, we introduce seven dummies, Connect (-3), Connect (-2), Connect (-1), Connect (0) (the year when Connect Program was effective), Connect (1), Connect (2) and Connect (3+), to flag the years relative to the effective year. For example, Connect (3+) refers to years beyond three years after the connection. We then re-estimate our baseline regression by replacing the Connect dummy with these seven indicators and interact them with MPS^{US} shocks. If the parallel trends assumption holds, we should expect that interaction terms with Connect (-3), Connect (-2), Connect (-1) have a relatively smaller magnitude and less significance than the other interaction terms.

Table 2 reports the regression results and Figure 2 displays the coefficients from column (2).[19] The coefficients on the interaction term between pre-trend dummies (i.e. Connect (-3), Connect (-2), Connect (-1)) and MPS^{US} are close to zero and not statistically significant, satisfying the parallel trends assumption. These results have three implications. First, the Shanghai (Shenzhen)-Hong Kong Connect could not be anticipated by the treated firms. Furthermore, even though some firms might be able to anticipate the possible outcome after the Connect, they cannot react before the Connect actually took place. Second, the negative response of corporate investment to the MPS^{US} only shows up after the Connect. Furthermore, the coefficients on the interaction between MPS^{US} and Connect (0) (Connect (1)) are statistically significant. The coefficients on the interaction term between Connect (3+) and MPS^{US} are twice larger than the interaction term between Connect (1) and MPS^{US}, suggesting that the effect of MPS^{US} on corporate investment takes time to materialize. Our findings indicate that the effect of U.S. monetary policy shocks on corporate investment is both negative and long lasting for connected firms.

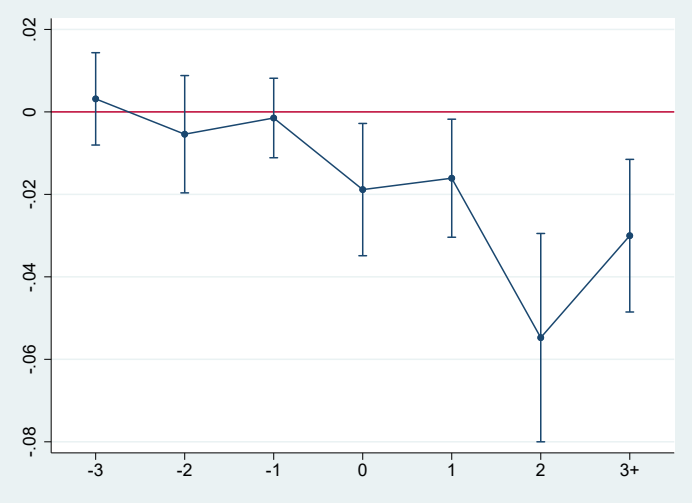
[19] Because results throughout are robust to the calculation of the monetary policy shock, we display results using only the equal weighted measure of MPS^{US}. Results using value weighted MPS^{US} are available upon request.

Table 2 Parallel Trends Assumption

Investment		
	(1)	(2)
MPS^{US}*Connect (-3)	-0.001	0.003
	(0.004)	(0.006)
MPS^{US}*Connect (-2)	-0.002	-0.005
	(0.006)	(0.007)
MPS^{US}*Connect (-1)	-0.004	-0.001
	(0.005)	(0.005)
MPS^{US}*Connect (0)	-0.024***	-0.019**
	(0.009)	(0.008)
MPS^{US}*Connect (1)	-0.016**	-0.016**
	(0.007)	(0.007)
MPS^{US}*Connect (2)	-0.050***	-0.055***
	(0.012)	(0.013)
MPS^{US}*Connect (3+)	-0.034***	-0.030***
	(0.009)	(0.009)
MPS^{US}	-0.007*	-0.011**
	(0.004)	(0.004)
Connect	0.002*	0.001
	(0.001)	(0.001)
Size		0.005***
		(0.001)
Lag Tobin's Q		0.002***
		(0.000)
Cash Flow		0.173***
		(0.011)
Sales Growth		0.001***
		(0.000)
GDP Growth		0.024
		(0.015)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Quarter Dummy	Yes	Yes
Observations	87740	87740
Adjusted R^2	0.387	0.410

NOTE. The dependent variable is corporate investment, defined as quarterly capital expenditure scaled by the beginning-of-quarter book value of total assets. We use seven Connect dummies to interact with MPS^{US}, Connect (-3), Connect (-2), Connect (-1), Connect (0) (the year when Connect Program was effective), Connect (1), Connect (2) and Connect (3+), to flag the years relative to the effective year. Other firm level controls can be found at A.5. All standard errors are clustered at both firm and year level and reported in the parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Figure 2 Corporate Investment Sensitivity to MPS^{US}: Parallel Trends Assumption



NOTE. The figure plots corporate investment sensitivity to MPS^{US} of connected firms relative to unconnected firms — coefficient estimates and 95 % confidence interval from column (2) in Table 2.

5.3 Benchmark Results for Chinese Investment

Table 3 reports the regression results that form the backbone of our paper. We begin with estimates of the Probit model of Connect selection, as motivated above. What follows are estimates from three different approaches: panel OLS in columns (1)-(3), Heckman Second-Stage regressions in columns (4)-(6), and Propensity Score Matching (PSM) in columns (7)-(8). These establish robustness of our evidence to different attempts to tackle sample selection issues. As discussed above, the selection of connected firms is not random.[20] We follow the literature in employing the Heckman and PSM correction methods, but because of recent critiques of both, we put equal stock in the OLS results (see Tucker (2010) and Wolfolds and Siegel (2019)). Results are highly robust.

Panel OLS Columns (1)-(3) present the panel OLS regression results. The first column, which excludes the foreign spillover terms, shows the positive effect of the Connect on

[20]The China Security Index Company is responsible for composition of the SSE 180 and SSE 380. According to their disclosure, stocks are selected into SSE 180 based on their market cap, under the conditions that they show good performance and have no serious financial problems or large price volatility. For the SSE 380, authorities select stocks based on revenue growth, return on net assets, turnover, and total market value. Detailed information can be found at http://www.csindex.cn/en/indices/index-detail/000010 and http://www.csindex.cn/en/indices/index-detail/000009.

Table 3 Baseline Results: U.S. Monetary Policy, Chinese Corporate Investment, and the Connect

Panel A: First Stage Probit Model		Panel B: Investment							
	Connect Dummy		Panel OLS Regression			Heckman Two-Stage			Propensity Score Matching	
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Stock Volatility	-15.396***	Connect	0.001*	0.002*	0.001	0.017***	0.034***	0.017***	0.031***	0.013***
	(0.594)		(0.001)	(0.001)	(0.001)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)
Market Cap	0.758***	MPS^{US}*Connect		-0.020**	-0.019**		-0.028**	-0.024**	-0.020***	-0.013**
	(0.007)			(0.010)	(0.009)		(0.012)	(0.011)	(0.006)	(0.005)
Leverage	-0.357***	MPS^{US}		-0.008*	-0.011**		-0.009**	-0.011***	-0.010***	-0.009***
	(0.045)			(0.004)	(0.004)		(0.004)	(0.004)	(0.003)	(0.003)
Age	0.058***	IMR				-0.009***	-0.020***	-0.010***	-0.018***	-0.007***
	(0.001)					(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Dividend Dummy	-0.019	Size	0.004***		0.004***	0.003***		0.003***		0.005***
	(0.019)		(0.001)		(0.001)	(0.001)		(0.001)		(0.001)
		Lag Tobin's Q	0.001***		0.002***	0.001***		0.001***		0.002***
			(0.000)		(0.000)	(0.000)		(0.000)		(0.000)
		Cash Flow	0.172***		0.173***	0.169***		0.170***		0.154***
			(0.011)		(0.011)	(0.012)		(0.012)		(0.015)
		Sales Growth	0.001***		0.001***	0.001***		0.001***		0.005***
			(0.000)		(0.000)	(0.000)		(0.000)		(0.001)
		GDP Growth	0.018		0.024	0.020		0.026		-0.007
			(0.016)		(0.015)	(0.017)		(0.016)		(0.030)
Industry FE	Yes	IMR	No	No	No	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exchange FE	Yes	Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Dummy	Yes	Quarter Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	85486	Observations	87740	87740	87740	85486	85486	85486	20003	20003
Pseudo R^2	0.313	Adjusted R^2	0.409	0.387	0.410	0.411	0.393	0.413	0.521	0.543

NOTE. The dependent variable is corporate investment, defined as quarterly capital expenditure scaled by the beginning-of-quarter book value of total assets. Other firm level controls can be found at A.5. For column (1)-(6) (column (7)-(8)), the standard errors are clustered at both firm and year (region-year) level and reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Chinese corporate investment (row 1). This is consistent with previous literature on stock market liberalization (Henry (2000b) and Chari and Henry (2008)). Our results suggest that average quarterly corporate investment increased by 2.86% once a firm was included in the Connect, which is statistically significant and economically large.[21] We explore the channels of this effect in the following sections, while noting here that this result is evidence in favor of our hypothesis 3, which we return to below in detail.

Columns (2)-(3) present our baseline results for testing hypothesis 1. We use simple aggregation of MPS^{US} across months in a quarter as our benchmark while noting that our results are robust to using the value (date) weighted sum to construct the U.S. monetary policy shock. In column (2), we report the regression of corporate investment on MPS_t^{US}, Connect_{it} and the interaction term, with firm and year fixed effects, and quarter dummies, while column (3) adds firm characteristics: Tobin's Q, cash flow, sales growth, size, and provincial GDP growth. Consistent with our hypothesis, the interaction term is negative and both economically and statistically significant. The reduction in conditional investment is around 0.02, meaning that a 1 percent unexpected increase in the US monetary policy shock reduces corporate investment by 0.02 percent on average for firms included in the Connect compared to firms not in the Connect, after controlling for investment opportunities and economic conditions.[22] In terms of economic magnitudes, these coefficients translate into a reduction of 2.80 % based on the average investment rate and MPS_t^{US}.[23]

Heckman-Two Stage Results For the Heckman Two-Stage approach, we first estimate the Probit model that gives us determinants of the Connect dummy: stock volatility (standard deviation of the daily stock return in each quarter), market cap measured as the natural logarithm of market capitalization, leverage, firm age, and an indicator for whether a firm pays cash dividends. We also include industry, province, and exchange fixed effects in the first-stage. The results suggest that firms more likely to be selected into the Connect are those with: lower stock volatility, larger size, lower leverage, older, and a non-dividend payer. These are consistent with the objectives of the index selection procedure. We then re-estimate our baseline regression (4) adding as an explanatory variable the inverse Mills ratio (IMR): the Probit model's probability density function divided by the cumulative dis-

[21] The calculation of economic magnitude is as follows: 0.001/0.035 = 2.86%.

[22] The coefficient on the interaction term is larger when using value weighted series than equal weighted. This is because the value weighted series takes into account the fact that investment might be slow to respond to external shocks and thus gives more weight to shocks happening earlier in the quarter.

[23] The calculation is as follows: 0.020*0.049/0.035 = 2.80%.

tribution function. Columns (4)-(6) present the results of re-estimating the baseline model after correcting for selection in this way. Clearly, the impact of the Connect on firm investment is stronger both economically and statistically. Estimates of the interaction term are consistent with the panel OLS results.

Propensity Score Matching Another concern is that the effect of the Connect may not be homogeneous across firms, but may vary as a function of firm characteristics. Simple difference-in-differences estimates may be biased if there are some firms which were connected but there are no comparable firms which were left unconnected, and vice-versa. Matching methods eliminate this potential source of bias by pairing Connect (treated) with unconnected (control) firms that have similar observed attributes. Using observations in the treatment and control groups over the "region of common support" eliminates this source of bias. In general, conventional matching methods assume that, conditional on the observed variables, the counterfactual outcome distribution of the treated firms is the same as the observed outcome distribution of firms in the control group (see Heckman et al. (1997)).

The strategy is thus to construct a new group by finding unconnected firms with observables similar to those of connected firms. We then examine robustness of the baseline estimates to those estimated only on the observations that lie on the common support. We first use a logit regression to estimate the probability of a firm being connected, by including sets of variables and industry, province, exchange market fixed effects. We then exclude (1) unconnected-firm observations whose propensity scores are less than the propensity score of the connected stocks at the first percentile of the treatment propensity score distribution and (2) all treatment observations whose propensity score is greater than the propensity score of the control observation at the ninety-ninth percentile of the untreated distribution. Re-estimating the difference-in-differences model with these "nearest neighbors" on the common support region allows us to analyze the extent of this source of bias. As seen in columns (7) and (8), our results are robust: the interaction term between the U.S. monetary policy shock and the Connect dummy remains significantly negative. Because the PSM exercise substantially reduces the sample size, from over 85,000 to 20,000, we revert back to the full sample of observations in the remainder of the regressions.

Table 4 Corporate Investment and FOMC Shocks: Global Financial Cycles

	Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: VIX Index from CBOE S&P 500				*Panel E: News-based Economic Uncertainty Index from BBD*		
MPS^{US}*Connect	-0.023**	-0.022**	-0.025**	MPS^{US}*Connect	-0.019*	-0.019*	-0.025**
	(0.010)	(0.009)	(0.011)		(0.011)	(0.010)	(0.011)
Log(VIX)*Connect	-0.006***	-0.005**	-0.002	EPU*Connect	0.001	0.000	-0.001
	(0.002)	(0.002)	(0.003)		(0.003)	(0.003)	(0.003)
Connect	0.019***	0.014***	0.023***	Connect	0.000	0.000	0.019***
	(0.005)	(0.005)	(0.006)		(0.004)	(0.004)	(0.005)
Observations	87740	87740	85486	Observations	87740	87740	85486
Adjusted R^2	0.387	0.410	0.413	Adjusted R^2	0.387	0.410	0.413
Panel B: Dollar Index Return				*Panel F: Global Economic Policy Uncertainty Index from BBD*		
MPS^{US}*Connect	-0.016**	-0.016**	-0.021***	MPS^{US}*Connect	-0.020*	-0.020*	-0.025**
	(0.008)	(0.008)	(0.008)		(0.011)	(0.011)	(0.011)
Dollar Return*Connect	-0.038	-0.036	-0.042**	GEPU *Connect	-0.000	-0.001	-0.003
	(0.025)	(0.023)	(0.020)		(0.002)	(0.002)	(0.002)
Connect	0.002**	0.001	0.018***	Connect	0.002	0.002	0.022***
	(0.001)	(0.001)	(0.004)		(0.003)	(0.004)	(0.006)
Observations	87740	87740	85486	Observations	87740	87740	85486
Adjusted R^2	0.387	0.410	0.413	Adjusted R^2	0.387	0.410	0.413
Panel C: Exchange Rate Return of RMB - USD				*Panel G: World Uncertainty Index from ABF*		
MPS^{US}*Connect	-0.016*	-0.017*	-0.023**	MPS^{US}*Connect	-0.013**	-0.012**	-0.013**
	(0.008)	(0.009)	(0.010)		(0.006)	(0.005)	(0.005)
RMBUSD *Connect	-0.005	-0.014	-0.014	WUI *Connect	0.004	0.002	-0.002
	(0.049)	(0.045)	(0.039)		(0.005)	(0.006)	(0.006)
Connect	0.002**	0.001	0.017***	Connect	0.001	0.000	0.019***
	(0.001)	(0.001)	(0.004)		(0.002)	(0.002)	(0.005)
Observations	87740	87740	85486	Observations	87740	87740	85486
Adjusted R^2	0.387	0.410	0.413	Adjusted R^2	0.387	0.411	0.414
Panel D: Monetary Policy Uncertainty Index from HRS				*Panel H: TED rate*		
MPS^{US}*Connect	-0.025***	-0.024**	-0.029**	MPS^{US}*Connect	-0.020**	-0.020**	-0.023**
	(0.009)	(0.010)	(0.012)		(0.010)	(0.010)	(0.010)
MPU*Connect	-0.002	-0.001	-0.002	TED rate *Connect	0.010	0.010	0.002
	(0.002)	(0.003)	(0.002)		(0.012)	(0.012)	(0.013)
Connect	0.004	0.003	0.019***	Connect	-0.001	-0.002	0.017***
	(0.004)	(0.004)	(0.006)		(0.003)	(0.004)	(0.005)
Observations	85797	85797	83611	Observations	87740	87740	85486
Adjusted R^2	0.391	0.415	0.417	Adjusted R^2	0.387	0.410	0.413
IMR	No	No	Yes	IMR	No	No	Yes
Firm Controls	No	Yes	Yes	Firm Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Year FE	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes	Quarter Dummy	Yes	Yes	Yes

NOTE: the dependent variable is corporate investment. Panel A adds the VIX index and its interaction with Connect. Panel B adds a dollar index return and its interaction with Connect. Panel C adds the bilateral exchange rate return between the dollar and RMB and its interaction with Connect. Panel D adds a monetary policy uncertainty index (MPU) identified by Husted et al. (forthcoming) and its interaction with Connect. Panel E adds a news-based economic policy uncertainty index (EPU) from Baker et al. (2016) and its interaction with Connect. Panel F adds a GDP-weighted average of national EPU indices for 16 countries that account for two-thirds of global output (GEPU) and its interaction with Connect (see Davis (2016) for details). Panel G adds a world uncertainty index from Ahir et al. (2018). Panel H uses the TED spread measured as the difference between interest rates on interbank loans and short-term U.S. government debt. All standard errors are clustered at both firm and year level and reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

5.4 Additional Robustness Checks

Potpourri In Panel A of Appendix Table S.1, we replace firm fixed effect with industry fixed effects. Panel B drops the dual-listed stocks, including A-B dual listed and A-H dual listed, in order to see whether these already-opened firm shares are driving our baseline results. Panel C adds the interaction term of firm size and U.S. monetary policy shock to alleviate the concern that firm size affects the investment sensitivity to U.S. monetary policy shock. In all three robustness exercises, the coefficients on the interaction term are quantitatively similar to our baseline results. Panel D uses the alternative measure of U.S. monetary policy shocks estimated by Bu et al. (2019).[24] Results are consistent with our baseline, but with a relatively smaller magnitude and less significance. Panel E adds lagged investment to the baseline specification. The new coefficient is insignificantly positive, suggesting that investment is persistent, while the interaction term remains statistically significant. Panel F introduces a lag of MPS^{US} and its interaction with Connect, to see if investment responds slowly to external shocks. The coefficients on the lagged interaction term are insignificant, however.

Other measures of external shocks We also include different measures of external shocks to examine whether our results relying on MPS^{US} are robust. Table 4 presents the results. Panel A adds the VIX index and its interaction with Connect. Panel B adds a U.S. dollar index return and its interaction with Connect. Panel C adds the bilateral exchange rate change between dollar and RMB and its interaction with Connect. Panel D adds the monetary policy uncertainty index of Husted et al. (forthcoming) and its interaction with Connect. Panel E adds the news-based economic policy uncertainty index from Baker et al. (2016) and its interaction with Connect. Panel F adds a GDP-weighted average of national EPU indices for 16 countries that account for two-thirds of global output and its interaction with Connect (see Davis (2016)). Panel G adds a world uncertainty index from Ahir et al. (2018) and its interaction with Connect, and Panel H does the same with the TED spread. In all cases, the interaction between the MPS^{US} shock and Connect remains statistically significant and similar in magnitude to our baseline results.

(Placebo) effect of Chinese monetary policy Our baseline results suggest that being connected makes corporate investment more sensitive to external shocks. However, because both connected and unconnected firms are exposed to Chinese monetary policy shocks,

[24] This measure applies a Fama-MacBeth procedure to the response of the full maturity spectrum of interest rates to FOMC announcements. The measure compares favorably to alternatives in the literature.

there should be no different responses to these domestic policy shocks. To formally test this, we use the Chinese monetary policy shock estimated by Chen et al. (2018) and re-estimate our baseline regression.[25] The results in Appendix Table S.2 show that there is no significant difference by these two types of firms in their response to Chinese monetary policy shocks. Furthermore, we also "horse race" the Chinese monetary policy shock with the U.S. monetary policy shock. Our main results still hold.

6 Firm Heterogeneity

6.1 Risk-sharing (Risk-premium) Channel

Our conceptual framework implies that the global financial cycle can affect all firms through a cost of funding channel, but also that connected and unconnected firms are affected differently. In addition, firms on the connect — with higher covariance with the global market — should be more sensitive to U.S. monetary policy shocks because their risk-premiums are more responsive to the global financial cycle. To formally test firm heterogeneity through the risk-sharing (risk premium) channel, we multiply our connect dummy, $Connect_{it}$ by a firm-level variable *Global Cov*, i.e. $cov(r_i, r_W)$, the historical covariance of firm i's stock return r_i with the global market return r_W. This produces a continuous measure which captures both the extensive and intensive margin of the risk-sharing channel: it equals zero when the firm cannot be traded by foreign investors but varies with the firm's sensitivity to the global market for a firm in the Connect program. We then replace the connect dummy in our baseline regression with Global Cov $*$ Connect$_{it}$ to assess this heterogeneity.

Table 5 presents the results. Consistent with our baseline results, the coefficient on the Global Cov $*$ Connect is significantly positive. Furthermore, the interaction term between Global Cov $*$ Connect and the U.S. monetary policy shock is significantly negative, implying that the spillover effects from the global financial cycle are stronger after the Connect. Thus, firms with higher covariance with the global market enjoy higher benefits after the Connect along with greater sensitivity to the global financial cycle, after inclusion.

[25] We are grateful for the data shared by Chen et al. (2018). The Chinese monetary policy shock is an estimated shock to Chinese M2 growth rate, a quantity measure of monetary policy and thus different from our U.S. monetary policy shock, which is a price measure.

Table 5 Corporate Investment and FOMC Shocks: Risk-Sharing (Risk-premium) Channel

	Investment		
	(1)	(2)	(3)
(Global Cov*Connect)	0.019***	0.014***	0.031***
	(0.006)	(0.005)	(0.010)
(Global Cov*Connect)* MPS^{US}	-0.131**	-0.106*	-0.106*
	(0.057)	(0.056)	(0.063)
MPS^{US}	-0.009*	-0.012***	-0.012***
	(0.004)	(0.004)	(0.004)
Size		0.005***	0.004***
		(0.001)	(0.001)
Lag Tobin's Q		0.002***	0.001***
		(0.000)	(0.000)
Cash Flow		0.171***	0.172***
		(0.012)	(0.012)
Revenue Growth		0.001***	0.002***
		(0.000)	(0.000)
GDP Growth		0.025	0.026*
		(0.015)	(0.015)
IMR	No	No	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes
Observations	86447	86447	84202
Adjusted R^2	0.389	0.413	0.415

NOTE: the dependent variable is corporate investment. Global Cov is the historical covariance of an individual stock return with the MSCI world market return (exchange rate adjusted), estimated using a 36-month rolling window. Detailed information can be found at A.5. All standard errors are clustered at both firm and year level and reported in the parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

6.2 External Financing Channel

We explore whether firms relying on more external financing for investment are more sensitive to U.S. monetary policy shocks.[26] To this end, we implement sub-sample tests exploring firm heterogeneity in the treatment group. For example, we divide our full sample into two groups in each quarter based on measures of external financing. We then re-estimate our baseline regression on the two sub-samples separately. To the extent that the global financing cycle affects domestic investment through the cost of funding, one should expect that firms with different external financial conditions respond differently. We formally test this by dividing firms according to their equity dependence to investment or long-term debt to investment in Table 6. Firms with greater reliance on external financing, equity or long-term debt, are more sensitive to US monetary policy shocks after inclusion.

[26] We explore other types of firm heterogeneity in online Appendix S.6, for example whether firms with more exposure to the external sector, as measured by tradable vs. non-tradable sector or the share of foreign

Table 6 External Financing Channel

Investment									
Panel A: Equity Dependence to Investment					Panel B: Long-term Debt to Investment				
	High	Low	High	Low		High	Low	High	Low
MPS^{US}*Connect	-0.030**	-0.012	-0.033**	-0.018*	MPS^{US}*Connect	-0.027***	-0.011	-0.032***	-0.015
	(0.014)	(0.008)	(0.014)	(0.009)		(0.010)	(0.009)	(0.011)	(0.010)
MPS^{US}	-0.011**	-0.010**	-0.011**	-0.011**	MPS^{US}	-0.009**	-0.012***	-0.009**	-0.012***
	(0.005)	(0.004)	(0.005)	(0.004)		(0.004)	(0.004)	(0.004)	(0.004)
Connect	0.003	0.001	0.015***	0.021***	Connect	0.001	0.002*	0.013***	0.020***
	(0.002)	(0.001)	(0.005)	(0.005)		(0.001)	(0.001)	(0.005)	(0.005)
Observations	39870	47769	39008	46389	Observations	42778	44861	41758	43639
Adjusted R^2	0.484	0.400	0.486	0.403	Adjusted R^2	0.457	0.461	0.459	0.465
Firm Controls	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
IMR	No	No	Yes	Yes		No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
H_0: $\beta^H = \beta^L$									
χ^2 Test	8.19***		5.57**			6.26**		6.15**	
P-value	0.004		0.018			0.012		0.013	

NOTE: the dependent variable is corporate investment. Panel A divides firms into two groups according to the median level of equity dependence to investment in each quarter. Panel B divides firms into two groups according to the median level of their long-term debt to investment in each quarter. All standard errors are clustered at both firm and year level and reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

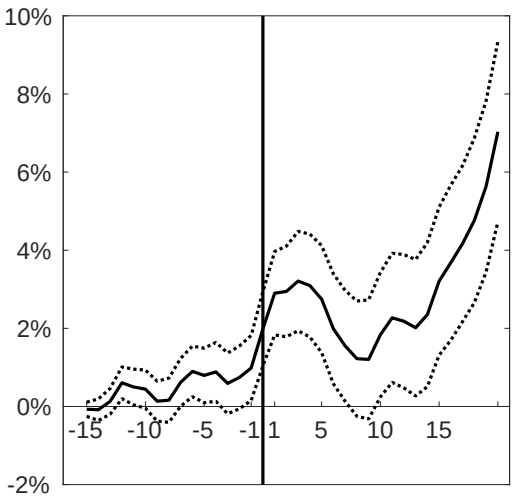
7 Positive Effects of the China Connect

If the primary effect of the Connect were that connected firms' investment becomes more sensitive to U.S. monetary policy, we would expect that firms would prefer to remain unconnected; this suggests that connected firms enjoy many positive effects from inclusion. In addition, our conceptual framework motivates us to explore considerations like the predicted positive short-run effects of the Connect.

Ceterus paribus, the effect of being in the Connect is to boost firm investment, as seen from the positive coefficient on the Connect dummy in our baseline results of Table 3. Furthermore, those effects are very persistent, lasting for 7-8 quarters after the Connect according to Appendix Figure S.1. Consistent with the previous literature, we also find that those effects occur through a risk-sharing channel in Table 7, as measured by our DIFCOV term (see Chari and Henry (2008)). Another positive effect of the Connect can be seen through event study analysis, which indicates that connected stocks experience a significant value appreciation, compared with unconnected ones, upon announcement of the

sales in total sales, respond differently. We do not find large differences along these dimensions, perhaps because Chinese firms issue very little dollar denominated debt.

Figure 3 Cumulative Abnormal Returns Around Announcement Day:
Connected Firms relative to Unconnected Firms



NOTE. The figure plots the difference in cumulative abnormal returns between connected and unconnected stocks around the announcement window (days -15, 20) in the Shanghai-Hong Kong Stock Connect program. The 95% confidence interval is plotted in the dashed lines. The vertical line marks the announcement date for the list of eligible stocks to be included in the Connect, November 10, 2014.

program. Figure 3 shows the cumulative abnormal returns difference between connected and unconnected stocks surrounding the event date.[27] The rising, positive effect on stock returns for connected firms relative to unconnected firms is statistically significant and economically large. Furthermore, we find a risk-sharing channel in Table 8, consistent with our theoretical motivation and previous literature (Chari and Henry (2004)).[28]

Moreover, in Table 9, we present the effects of the Connect on measures of firm performance and financing costs. As seen in columns (1)-(4), returns on assets (ROA) and equity (ROE) are significantly higher for those in the Connect than those outside. Furthermore, financing costs such as the cost of debt and dividend to price ratio are lower for connected

[27] We only consider stocks listed on the Shanghai Stock Exchange since the first Connect is between Shanghai and Hong Kong, which is regarded as an unexpected event to investors. We choose Nov. 10, 2014 (rather than Nov. 17, 2014) as our announcement day because the list of eligible stocks (to be included in the Connect from Nov 17) was announced on Nov. 10.

[28] We use the market model to calculate the cumulative abnormal return. A 250-day estimation window is used to estimated the β coefficient between the market return and stock return. A 30-day gap between the estimation window and event window is required. Moreover, we require at least 100 days return data in the estimation window. We also estimate a Fama-French three-factor and Carhart four-factor model, and find robust results.

Table 7 Investment, Risk Sharing, and the China Connect

	Investment		
	(1)	(2)	(3)
DIFCOV * Connect	0.006**	0.007**	0.004*
	(0.003)	(0.003)	(0.002)
DIFCOV	-0.002	0.000	-0.001
	(0.003)	(0.003)	(0.003)
Connect	0.000	-0.005**	-0.023***
	(0.003)	(0.003)	(0.007)
Size		0.002***	0.004***
		(0.001)	(0.001)
Lag Tobin's Q		0.000	0.001**
		(0.000)	(0.000)
Cash Flow		0.223***	0.232***
		(0.019)	(0.018)
Sales Growth		0.002***	0.002***
		(0.001)	(0.001)
GDP Growth		0.033*	0.035**
		(0.017)	(0.017)
IMR	No	No	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes
Observations	86447	86447	84202
Adjusted R^2	0.190	0.236	0.239

NOTE; the dependent variable is corporate investment. DIFCOV is measured by defined as cov(r_i, r_M)-cov(r_i, r_W), where r_i is the stock return for firm i, r_M is the domestic stock return and r_W is the global market return. All standard errors are clustered at both industry and year level and reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 8 Stock Price Revaluations for Connected and Unconnected Firms

	Month [0] Window			Month [0,+1] Window		
	(1)	(2)	(3)	(4)	(5)	(6)
DIFCOV * Connect	0.242***	0.276***	0.273***	0.431***	0.574***	0.573***
	(0.046)	(0.046)	(0.047)	(0.095)	(0.091)	(0.091)
DIFCOV	0.074***	0.085***	0.096***	-0.099***	-0.043	-0.040
	(0.017)	(0.017)	(0.019)	(0.025)	(0.026)	(0.029)
Connect	-0.038*	-0.053**	-0.057***	0.005	-0.057	-0.058
	(0.016)	(0.016)	(0.016)	(0.034)	(0.033)	(0.033)
Market Cap		0.000**	0.000**		0.001**	0.001**
		(0.000)	(0.000)		(0.000)	(0.000)
Turnover		-0.003***	-0.004***		-0.017***	-0.017***
		(0.001)	(0.001)		(0.002)	(0.002)
SHSE			0.011			0.003
			(0.006)			(0.012)
Constant	0.008	0.012	0.006	0.025	0.046**	0.045**
	(0.009)	(0.009)	(0.010)	(0.014)	(0.014)	(0.016)
Observations	2309	2309	2309	2309	2309	2309
Adjusted R^2	0.054	0.063	0.064	0.127	0.179	0.179

NOTE: the dependent variable is the log stock return. Columns (1)–(3) use the stock return in the connection month while Columns (4)–(6) use the stock return in both the connection month and the following month. DIFCOV is defined as cov(r_i, r_M)-cov(r_i, r_W), where r_i is the stock return for firm i, r_M is the domestic stock return and r_W is the global market return. Market cap is the natural logarithm of the market capitalization of total assets. Turnover is the average individual turnover rate within a month. SHSE is a dummy variable indicating that a firm listed on the Shanghai Stock Exchange, and zero if listed on the Shenzhen Stock Exchange.*, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

firms (columns (5)-(8)).[29]Thus, the Connect firms exhibit sizable stock price revaluations, increased growth rate of capital stock, and better firm performance, consistent with Chari and Henry (2004, 2008), which coincides with a reduction in financing costs.

Finally, we consider implications for an economy whose corporate investment expenditures are more sensitive to external shocks. Table S.7 shows that firms in the Connect hold less cash after the connection, consistent with our baseline results on the investment since cash and investment are substitute. But firms in the Connect are more sensitive to U.S. monetary policy shocks and increase their cash holdings following a contractionary U.S. monetary policy shock (row (2)). This reinforces the notion that U.S. monetary policy has large spillover effects, especially considering China's tight capital controls (see Kalemli-Ozcan (2019)). One potential downside of the extra sensitivity to U.S. monetary policy relates to the independence of Chinese monetary policy. In light of the (additional) foreign spillover effects working through the Connect, Chinese monetary policy might have

[29]The coefficient on Connect is negative but not significant in the cost of debt regression. This may occur because we have an aggregate measure for cost of debt, rather than firm-specific. Wei and Zhou (2019) use loan level data to measure cost of debt and find that stock market liberalization reduces firms cost of debt.

Table 9 Firm Performance, Financing Costs, and the China Connect

	ROA		ROE		Cost of Debt (%)		Change of ln(D/P) (%)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Connect	0.001***	0.005***	0.005***	0.023***	-0.041	-0.016	-0.024***	-0.354***
	(0.000)	(0.001)	(0.001)	(0.007)	(0.031)	(0.100)	(0.006)	(0.023)
Lag Tobin's Q	-0.001***	-0.001***	-0.000	-0.000	0.012	0.012	0.019***	0.024***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)	(0.009)	(0.001)	(0.001)
Cash Flow	0.915***	0.914***	1.652***	1.653***	0.050	0.057	-0.256***	-0.153***
	(0.006)	(0.006)	(0.054)	(0.054)	(0.187)	(0.189)	(0.052)	(0.047)
Sales Growth	-0.003***	-0.003***	-0.002*	-0.002**	0.022*	0.019	0.060***	0.062***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.012)	(0.012)	(0.009)	(0.009)
GDP growth	-0.008**	-0.008**	0.048*	0.043	0.912*	0.954*	0.456***	0.434***
	(0.004)	(0.004)	(0.026)	(0.027)	(0.528)	(0.526)	(0.136)	(0.142)
Size	-0.000	-0.001*	-0.005**	-0.007***	0.275***	0.267***	0.015***	0.047***
	(0.000)	(0.000)	(0.002)	(0.002)	(0.026)	(0.027)	(0.003)	(0.004)
Leverage	-0.010***	-0.009***	0.046***	0.052***	1.845***	1.845***	0.082***	0.003
	(0.001)	(0.001)	(0.009)	(0.009)	(0.106)	(0.108)	(0.016)	(0.016)
IMR	No	Yes	No	Yes	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	87740	85486	87737	85484	87740	85486	80271	78161
Adjusted R^2	0.929	0.928	0.437	0.438	0.522	0.523	0.014	0.018

NOTE: the dependent variable is return on assets (ROA) in columns (1)-(2), return on equity (ROE) in columns (3)-(4), cost of debt (%) measured by borrowing cost in columns (5)-(6), and change of dividend to price ratio, ln(D/P) (%) in columns (7)-(8). All standard errors are clustered at firm level and reported in parentheses. Detailed information on the controls can be found in Appendix A.5. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

to respond to U.S. monetary policy in a way that deviates from its domestic mandate.[30]

8 Conclusion

We exploit an important and unique capital account liberalization in China, the Shanghai (Shenzhen)-Hong Kong stock Connect, to jointly test hypotheses concerning spillover effects from external shocks and the efficacy of capital controls. The Connect allows certain stocks to be eligible for foreign investors while restricting other shares to remain available only to domestic investors, and is a natural experiment to study transmission of external shocks. We devote considerable attention to sample selection issues concerning connected firms, issues that are important above and beyond the "natural-ness" of the experiment.

We find two main results. First, Chinese firms are more negatively affected by contractionary U.S. monetary policy shocks after trading in their shares became open to foreigners

[30]For example, during events like the 2013 Taper Tantrum, Chinese monetary policy would have to ease in order to stabilize the domestic economy.

than are unconnected firms. Firms whose stock returns have a higher covariance with the global market return are affected more. Our results indicate that firms relying more on external financing are important in driving our results. If these were the only effects of the Connect, we expect that Chinese firms would act to remain outside of it. Furthermore, to the extent that Chinese monetary policy transmission and independence are diminished by increased sensitivity to US shocks, we would expect Chinese authorities to pull back on the Connect. Investigating further leads to our second main finding: firms in the Connect had higher investment expenditures, enjoyed lower financing costs, and earned higher returns on equity (ROE) and assets (ROA) than firms outside of the Connect. This suggests that connected firms are able to hedge the negative consequences concerning increased sensitivity to external shocks. Our findings have strong policy implications. U.S. monetary policy shocks, the crucial driver in the literature on Global Financial Cycles, have important spillover effects working through the partial opening of the Chinese stock market, even with tight overall capital controls. Nevertheless, our results indicate that capital controls are still effective in curbing the negative spillovers onto Chinese firm investment, thus preserving a degree of monetary policy independence relative to fully open capital markets.

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Appendix: Data Description Tables

Table A.1 Shanghai (Shenzhen)-Hong Kong Stock Connect Program Overview

Effective Date	Announcement Date	Number of stocks added	Number of stocks on list
Nov 17, 2014	Apr 10, 2014	416	416
Dec 5, 2016	Aug 16, 2016	676	1092

NOTE: Number of stocks included in the Shanghai (Shenzhen)-Hong Kong Connect program in our sample.

Table A.2 U.S. Monetary Policy Shock: Summary Statistics

	Daily	**Quarterly Sum**	**Quarterly Value-weighted**
Mean	-0.022	-0.049	-0.026
Median	-0.005	-0.018	-0.003
Std	0.119	0.164	0.105
Min	-0.582	-0.571	-0.555
Max	0.295	0.326	0.196
Num	250	112	112

NOTE. The original data is from Rogers et al. (2018). The quarterly sum column takes the simple sum of their FOMC announcement day measure within a quarter to construct the quarterly frequency series. The quarterly value-weighted column takes the value weighted sum within a quarter where the weight is given by the number of days left in the quarter.

Table A.3 Firm-level Variables: Summary Statistics

	Obs	Mean	Std.Dev.	Min	Max
Investment	87740	0.035	0.045	-0.069	0.426
Size	87740	21.781	1.275	11.911	28.526
Tobin's Q	87740	2.624	1.94	0.741	26.39
Cash Flow	87740	0.036	0.046	-0.331	0.315
Sales Growth	87740	0.413	0.8	-0.978	6.173

NOTE. This table reports descriptive statistics for key variables used in our sample from 2002 to 2017. Investment denotes the capital expenditure divided by the book value of total assets. Size is the natural logarithm of total assets. Tobin's Q is the ratio of book value of total assets minus the book value of equity plus the market value of equity by book value of total assets. Cash flow is measured as earnings before interest and taxes (EBIT) plus depreciation and taxes scaled by lagged total assets. Sales growth is defined as the growth rate of sales. All variables are winsorized at the top and bottom 1% to rule out outliers.

Table A.4 Data Sample: Industry and Year Distribution

Panel A: Industry Distribution				**Panel B: Year Distribution**			
Industry	**#Obs**	**#Firm**	**Percentage**	**Year**	**#Obs**	**#Firm**	**Percentage**
Automobiles & Components	4523	107	4.9%	2002	1293	755	3.1%
Capital Goods	17683	467	21.5%	2003	2495	843	3.4%
Commercial Services & Supplies	3051	63	2.9%	2004	2929	946	3.8%
Communications Equipment	2020	54	2.5%	2005	3012	951	3.8%
Computer & Electronic Equipment	5562	161	7.4%	2006	2975	959	3.9%
Computer Application	3836	118	5.4%	2007	4397	1195	4.8%
Consumer Durables & Apparel	5499	144	6.6%	2008	4810	1289	5.2%
Consumer Services	1645	34	1.6%	2009	5031	1322	5.3%
Energy	2988	70	3.2%	2010	5918	1644	6.6%
Food & Staples Retailing	319	8	0.4%	2011	7197	1953	7.9%
Food, Beverage & Tobacco	5547	128	5.9%	2012	8168	2151	8.7%
Health Care Equipment & Services	773	24	1.1%	2013	8520	2172	8.8%
Household & Personal Products	470	10	0.5%	2014	8350	2172	8.8%
Materials	17394	416	19.1%	2015	7936	2169	8.8%
Media	2096	56	2.6%	2016	8022	2173	8.8%
Medical Biology	7031	162	7.5%	2017	6687	2055	8.3%
Retailing	2902	57	2.6%				
Semiconductors	456	9	0.4%				
Telecommunication Services	175	4	0.2%				
Transportation	3770	82	3.8%				
Total	**87740**	**2174**	**100%**	**Total**	**87740**		**100%**

Table A.5 Variable Construction and Data Sources

Variable	Definition	Source
Panel A: Firm-level Variables		
Connect	A dummy variable indicating whether the firm *i* is included in the Connect program in quarter *t*.	Hong Kong Stock Exchange
Investment	Capital expenditure divided by the book value of total assets measured at the end of quarter t-1 (lagged total assets).	CSMAR
Size	The natural logarithm of the book value of total assets measured at the end of quarter t.	CSMAR
Market Cap	The natural logarithm of the close price at quarter end multiplied by the share outstanding at the end of quarter *t*.	CSMAR
Tobin's Q	The book value of total assets minus the book value of equity plus the market value of equity scaled by the book value of total assets at the end of quarter t.	CSMAR
Cash Flow	The income before extraordinary items plus depreciation and amortization divided by the book value of assets, measured at the end of quarter t.	CSMAR
Sales Growth	A firm's quarterly sales growth rate	CSMAR
Leverage	The book value of debt divided by the book value of total assets measured at the end of quarter t.	CSMAR
ROA	Net income divided by the book value of total assets measured at the end of quarter t-1 (lagged total assets)	CSMAR
ROE	Net income divided by the book value of shareholders' equity measured at the end of quarter t-1(lagged total assets)	CSMAR
Dividend Dummy	A dummy variable equals to one if a firm pays cash dividend on common stock at quarter t, and zero otherwise.	CSMAR
Cash	Cash and cash equivalents divided by the book value of total assets measured at the end of quarter t-1 (lagged total assets).	CSMAR
Cost of Debt	The sum of short-term market borrowing rate multiplied by short-term corporate leverage ratio and long-term borrowing rate multiplied by long-term corporate debt ratio.	CSMAR
Change of ln(D/P) (%)	The change of aggregated yield for each firm within quarter.	CSMAR, Henry (2003)
DIFCOV	The difference between the historical covariance of firm i's stock return with local market index and its covariance with the MSCI world stock market index (We convert all the returns to RMB). We use 36-month rolling window to construct DIFCOV at each quarter end.	CSMAR, MSCI, WIND
Global Cov	The historical covariance of firm i's stock return with the MSCI world stock market index (We convert all the returns to RMB). We use 36-month rolling window to construct global covariance at each quarter end.	MSCI, WIND
Stock Volatility	The standard deviation of daily stock return within a quarter. Note that we require at least 20 trading days to construct this variable.	CSMAR
M/B	The ratio of market value of assets divided by book value of net assets.	CSMAR
Turnover	Average individual turnover rate within a month.	CSMAR
Age	The number of years since IPO.	CSMAR
Panel B: Macro Variables		
MPS^{US}	A measure for unexpected U.S. Monetary Policy Surprises on each FOMC announcement.	Rogers et al. (2018)
MPS^{China}	A measure for unexpected Chinese M2 growth rate	Chen et al. (2018)
Repo Rate	7-day Repo rate in China.	Chang et al. (2016)
M2 Growth	Year-over-year M2 growth rate.	Chang et al. (2016)
Local GDP Growth	Quarterly provincial nominal GDP growth rate	CEIC

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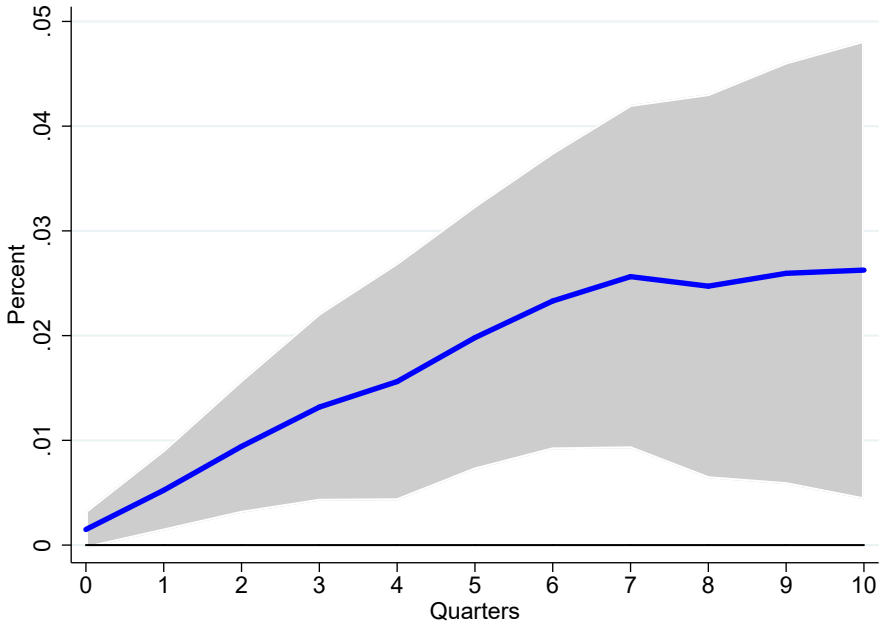
Figure S.1 Dynamic Impact of Connect on Investment



NOTE. The impulse response function is estimated through a local projection method as in Jordà (2005).

$$\sum_{h=0}^{H} Y_{it+h} = \alpha_i + \beta^H \text{Connect}_{it} + \Gamma Z_{it} + \varepsilon_{it}$$

where $H = 1, 2, \cdots$ is the horizon and Z_{it} is the firm-level control for investment equation. The blue line is the estimation parameter for β^H. The gray area is the 90% confidence interval. All standard errors are clustered at both firm and year level.

Table S.1 Corporate Investment and FOMC Shocks: Robustness

	Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Industry Fixed Effect				*Panel D: Alternative Measure of Monetary Surprise*		
MPS^{US}*Connect	-0.022*	-0.024*	-0.019*	BRW*Connect	-0.015*	-0.015*	-0.018*
	(0.013)	(0.013)	(0.010)		(0.008)	(0.008)	(0.010)
MPS^{US}	-0.008**	-0.011**	-0.011***	BRW	-0.006*	-0.008**	-0.008**
	(0.004)	(0.004)	(0.004)		(0.003)	(0.003)	(0.003)
Connect	0.004**	-0.001	-0.024***	Connect	0.003**	0.002*	0.018***
	(0.002)	(0.002)	(0.006)		(0.001)	(0.001)	(0.004)
Observations	87740	87740	85486	Observations	87740	87740	85486
Adjusted R^2	0.168	0.219	0.224	Adjusted R^2	0.386	0.410	0.412
Panel B: Drop Dual-listed Stocks				*Panel E: Including Lagged Dependent Variable*		
MPS^{US}*Connect	-0.020**	-0.019**	-0.025**	MPS^{US}*Connect	-0.019**	-0.019**	-0.024**
	(0.010)	(0.009)	(0.011)		(0.010)	(0.009)	(0.010)
MPS^{US}	-0.008*	-0.011**	-0.011**	MPS^{US}	-0.008*	-0.010***	-0.010***
	(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)
Connect	0.002**	0.001	0.019***	Connect	0.002**	0.001	0.018***
	(0.001)	(0.001)	(0.004)		(0.001)	(0.001)	(0.004)
				Lag DV	0.007	0.007	0.007
					(0.006)	(0.006)	(0.006)
Observations	81151	81151	79006	Observations	82532	82532	80347
Adjusted R^2	0.382	0.405	0.408	Adjusted R^2	0.399	0.422	0.425
Panel C: Size				*Panel F: Including Lagged Monetary Policy Shock*		
MPS^{US}*Connect	-0.017*	-0.016*	-0.021**	MPS^{US}*Connect	-0.021**	-0.022**	-0.026**
	(0.010)	(0.009)	(0.010)		(0.010)	(0.009)	(0.010)
MPS^{US}*Size	-0.002	-0.002	-0.002	MPS^{US}	-0.009*	-0.012**	-0.012**
	(0.003)	(0.002)	(0.003)		(0.005)	(0.005)	(0.005)
MPS^{US}	0.040	0.029	0.034	Lag MPS^{US} * Connect	-0.002	-0.006	-0.002
	(0.067)	(0.054)	(0.057)		(0.004)	(0.004)	(0.006)
Connect	0.001	0.001	0.017***	Lag MPS^{US}	-0.004	-0.004	-0.004
	(0.001)	(0.001)	(0.004)		(0.005)	(0.005)	(0.005)
Size	0.004***	0.004***	0.003***	Connect	0.002*	0.001	0.017***
	(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	(0.004)
Observations	87740	87740	85486	Observations	87740	87740	85486
Adjusted R^2	0.388	0.410	0.413	Adjusted R^2	0.387	0.410	0.413
Firm Controls	No	Yes	Yes	Firm Controls	No	Yes	Yes
IMR	No	No	Yes	IMR	No	No	Yes
Firm FE	Yes	Yes	Yes	Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Year FE	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes	Quarter Dummy	Yes	Yes	Yes

NOTE: the dependent variable is corporate investment, defined as quarterly capital expenditure scaled by the beginning-of-quarter book value of total assets. Panel A use industry fixed effects instead of firm fixed effects. Panel B drops A-H and A-B dual listed stocks. Panel C controls for the size on the investment sensitivity to U.S. monetary policy shock. Panel D uses an alternative monetary policy shock (BRW) identified by Bu et al. (2019). Panel E controls for lagged corporate investment. Panel F controls for a lagged monetary policy shock. All standard errors are clustered at both firm (industry) and year level and reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table S.2 Corporate Investment and Chinese Monetary Policy Shocks

	Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
MPS^{China}*Connect	-0.130	-0.170	-0.146	-0.129	-0.160	-0.137
	(0.192)	(0.212)	(0.225)	(0.159)	(0.177)	(0.172)
MPS^{China}	0.091	0.121*	0.134*	0.056	0.073	0.088
	(0.070)	(0.073)	(0.073)	(0.078)	(0.083)	(0.081)
Connect	0.002**	0.001	0.017***	0.001	0.000	0.017***
	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)	(0.004)
MPS^{US}*Connect				-0.021**	-0.021**	-0.026**
				(0.010)	(0.009)	(0.011)
MPS^{US}				-0.007	-0.010**	-0.010**
				(0.005)	(0.005)	(0.005)
Size		0.004***	0.003***		0.005***	0.003***
		(0.001)	(0.001)		(0.001)	(0.001)
Lag Tobin's Q		0.002***	0.001***		0.002***	0.001***
		(0.000)	(0.000)		(0.000)	(0.000)
Cash Flow		0.172***	0.169***		0.173***	0.170***
		(0.011)	(0.012)		(0.011)	(0.012)
Sales Growth		0.001***	0.001***		0.001***	0.001***
		(0.000)	(0.000)		(0.000)	(0.000)
GDP Growth		0.023	0.026		0.026*	0.029*
		(0.017)	(0.017)		(0.016)	(0.016)
IMR	No	No	Yes	No	No	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	87740	87740	85486	87740	87740	85486
Adjusted R^2	0.386	0.409	0.412	0.387	0.410	0.413

NOTE: the dependent variable is corporate investment. The Chinese monetary policy shock MPS^{China} is the quarter-over-quarter (QoQ) change of M2 growth rate shock identified by Chen et al. (2018). Detailed information on the controls can be found in Appendix A.5. All standard errors are clustered at both firm and year level and reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table S.3 Corporate Investment, U.S. Monetary Policy Shocks, and the China Connect: Alternative Definition of Connect Dummy

	Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
Connect	0.003**	0.003***	0.004***	0.002*	0.002**	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
MPS^{US}*Connect				-0.017*	-0.018*	-0.019*
				(0.009)	(0.010)	(0.010)
MPS^{US}				-0.009*	-0.011**	-0.011***
				(0.004)	(0.004)	(0.004)
Size		0.004***	0.004***		0.005***	0.004***
		(0.001)	(0.001)		(0.001)	(0.001)
Lag Tobin's Q		0.002***	0.001***		0.002***	0.002***
		(0.000)	(0.000)		(0.000)	(0.000)
Cash Flow		0.172***	0.173***		0.173***	0.174***
		(0.011)	(0.011)		(0.011)	(0.011)
Sales Growth		0.001***	0.001***		0.001***	0.001***
		(0.000)	(0.000)		(0.000)	(0.000)
GDP Growth		0.019	0.020		0.024	0.026*
		(0.016)	(0.016)		(0.015)	(0.015)
IMR	No	No	Yes	No	No	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	87740	87740	85486	87740	87740	85486
Adjusted R-squared	0.386	0.409	0.411	0.386	0.410	0.412

NOTE: the dependent variable is corporate investment, defined as quarterly capital expenditure scaled by the beginning-of-quarter book value of total assets. $Connect_{it}$ equals 1 if a firms i is in the Connect for quarter t and 0 otherwise. Detailed information on the controls can be found in Appendix A.5. All standard errors are clustered at both firm and year level and reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table S.4 Corporate Investment, U.S. Monetary Policy Shocks, and the China Connect: Eliminate Periodic Adjustment to Indexes

	Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
Connect	0.002*	0.003**	0.004**	0.002	0.002*	0.004**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
MPS^{US}*Connect				-0.015*	-0.017*	-0.017*
				(0.009)	(0.010)	(0.009)
MPS^{US}				-0.009*	-0.011***	-0.011***
				(0.004)	(0.004)	(0.004)
Size		0.004***	0.004***		0.004***	0.004***
		(0.001)	(0.001)		(0.001)	(0.001)
Lag Tobin's Q		0.001***	0.001***		0.002***	0.001***
		(0.000)	(0.000)		(0.000)	(0.000)
Cash Flow		0.165***	0.166***		0.166***	0.167***
		(0.011)	(0.011)		(0.011)	(0.012)
Sales Growth		0.001**	0.001**		0.001***	0.001***
		(0.000)	(0.000)		(0.000)	(0.000)
GDP Growth		0.029	0.031*		0.035**	0.037**
		(0.018)	(0.018)		(0.017)	(0.016)
IMR	No	No	Yes	No	No	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	76309	76309	74363	76309	76309	74363
Adjusted R-squared	0.392	0.413	0.414	0.392	0.414	0.415

NOTE: the dependent variable is corporate investment. We keep only stocks that are added to the Connect in 2014 Q4 and 2016 Q4 and stocks that are never added to the Connect. Detailed information on the controls can be found in Appendix A.5. All standard errors are clustered at both firm and year level and reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table S.5 Corporate Investment, U.S. Monetary Policy Shocks, and the China Connect: with Macro Controls

	Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
Connect	0.002**	0.001*	0.016***	0.002*	0.001	0.017***
	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)	(0.004)
MPS^{US}*Connect				-0.021**	-0.020**	-0.025**
				(0.009)	(0.009)	(0.010)
MPS^{US}				-0.007*	-0.010**	-0.010**
				(0.004)	(0.004)	(0.004)
Lag Repo Rate	0.206*	0.189	0.170	0.166	0.129	0.106
	(0.118)	(0.124)	(0.124)	(0.117)	(0.127)	(0.128)
Lag M2 Growth	0.013	0.005	0.000	0.017	0.011	0.005
	(0.024)	(0.028)	(0.029)	(0.024)	(0.027)	(0.026)
Size		0.004***	0.003***		0.005***	0.003***
		(0.001)	(0.001)		(0.001)	(0.001)
Lag Tobin's Q		0.002***	0.001***		0.002***	0.001***
		(0.000)	(0.000)		(0.000)	(0.000)
Cash Flow		0.171***	0.168***		0.173***	0.169***
		(0.011)	(0.012)		(0.011)	(0.012)
Sales Growth		0.001***	0.001***		0.001***	0.001***
		(0.000)	(0.000)		(0.000)	(0.000)
GDP Growth		0.022	0.025		0.023	0.026
		(0.019)	(0.019)		(0.018)	(0.019)
IMR	No	No	Yes	No	No	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	87740	87740	85486	87740	87740	85486
Adjusted R-squared	0.386	0.409	0.412	0.387	0.410	0.413

NOTE: the dependent variable is corporate investment. Macro controls include the M2 growth rate and 7-day Repo rate in addition to the local GDP growth rate. Detailed information on the controls can be found in Appendix A.5. All standard errors are clustered at both firm and year level and reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table S.6 Corporate Investment and FOMC Shocks: Firm Heterogeneity

Investment									
Panel A: Tradable (High) v.s. Non-tradable (Low)					*Panel B: Foreign Sales>25% (High)*				
	High	Low	High	Low		High	Low	High	Low
MPS^{US}*Connect	-0.021**	-0.016*	-0.026**	-0.020*	MPS^{US}*Connect	-0.008	-0.018*	-0.010	-0.024**
	(0.009)	(0.009)	(0.011)	(0.010)		(0.010)	(0.010)	(0.013)	(0.011)
MPS^{US}	-0.012**	-0.009**	-0.012**	-0.009**	MPS^{US}	-0.011	-0.011***	-0.011	-0.011***
	(0.005)	(0.004)	(0.005)	(0.004)		(0.007)	(0.004)	(0.007)	(0.004)
Connect	0.001	0.002	0.019***	0.014***	Connect	0.004**	0.001	0.027***	0.018***
	(0.001)	(0.001)	(0.005)	(0.005)		(0.002)	(0.001)	(0.007)	(0.004)
Observations	58466	29274	56929	28557	Observations	6826	79584	6644	77524
Adjusted R^2	0.410	0.414	0.413	0.417	Adjusted R^2	0.435	0.415	0.439	0.418
Firm Controls	No	No	Yes	Yes		No	No	Yes	Yes
IMR	No	No	Yes	Yes		No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
H_0: $\beta^H = \beta^L$									
χ^2	0.49		0.91			0.93		1.59	
P-value	0.484		0.339			0.336		0.208	

NOTE. The dependent variable is corporate investment. Panel A divides the firms into tradable and non-tradable sectors. Panel B divides the firms into two groups according to the median level of foreign sales share, defined as the share of foreign sales to total sales, at each quarter. All standard errors are clustered at both firm and year level and reported in the parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table S.7 Cash Holdings and FOMC Shocks

	Δ Cash Holdings		
	(1)	(2)	(3)
Connect	-0.003***	-0.002**	-0.046***
	(0.001)	(0.001)	(0.004)
MPS^{US}*Connect	0.036***	0.038***	0.048***
	(0.011)	(0.011)	(0.011)
MPS^{US}	-0.001	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)
Size		0.005***	0.010***
		(0.001)	(0.001)
Cash Flow		0.288***	0.293***
		(0.015)	(0.015)
Lag Tobin's Q		0.005***	0.006***
		(0.000)	(0.000)
Leverage		0.060***	0.051***
		(0.003)	(0.003)
Invest		-0.111***	-0.102***
		(0.012)	(0.012)
Dividend		0.002	0.001
		(0.001)	(0.001)
IMR	No	No	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Quarter Dummy	Yes	Yes	Yes
Observations	80337	80337	78225
Adjusted R-squared	0.006	0.030	0.032

NOTE: Cash holdings are defined as quarterly cash holdings scaled by the beginning-of-quarter book value of total assets. The dependent variable is the quarterly change of cash holdings. Detailed information on the controls can be found in Appendix A.5. All standard errors are clustered at firm level and reported in the parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

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