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CHINA'S OVERSEAS LENDING IN GLOBAL FINANCE CYCLE

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ABSTRACT

China's rising presence in international finance, which has long lagged behind its prominence in international trade, is now reshaping global financial dynamics. Using a large sample of developing countries, this paper documents that countries more reliant on China's lending are less exposed to the global financial cycle in exchange rates, equity prices, bond yields, and capital flows. These countries were not less exposed before China became a major lender, and trade linkages to China do not explain these results. Since China lends primarily in dollar, the exposure reduction is not through the traditional channel of mitigating currency mismatch. These findings suggest that international lending plays a unique role in insulating developing countries from global shocks, and through this channel U.S. and Chinese policies interact to shape global financial outcomes.

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1 Introduction

The global financial cycle drives strong comovements in exchange rates, asset prices, and capital flows. As Rey (2015); Miranda-Agrippino and Rey (2015) document, U.S. monetary policy is a key driving force: when it tightens, foreign currencies depreciate, asset prices decline, and capital flows retrench around the globe. This global cycle is a critical issue for developing countries, as it weakens their ability to maintain independent monetary policy.

This paper is motivated by a recent development that potentially impacts the global financial cycle's transmission: China has become a major international lender to developing countries (Horn, Reinhart, and Trebesch, 2021). Figure 1 plots the amount of China's outstanding overseas loans, which has increased significantly since 2010. The majority of the lending is in dollar terms, as opposed to RMB or local currency terms.

Could China's overseas lending mitigate funding shortage faced by developing countries, thereby providing a backstop to the adverse effects they experience during global monetary tightening episodes? If so, China's rising presence in international finance, which has long lagged behind its prominence in international trade, has already had large spill-over effects to developing countries, shaping global financial outcomes jointly with U.S. monetary policy.

Using a large sample of developing countries from 2010 to 2024, I find consistent evidence

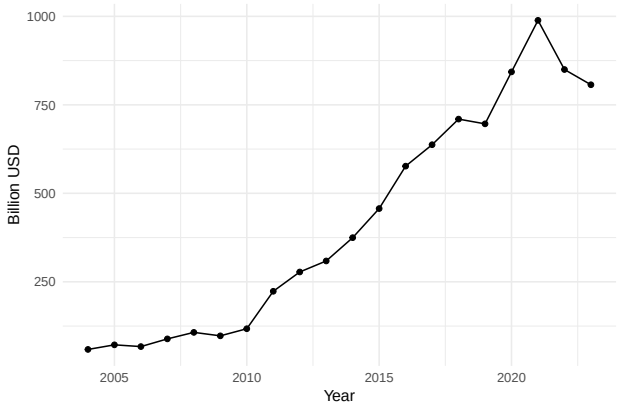


Figure 1: China's Overseas Lending

that countries more reliant on China's lending are indeed less exposed to U.S. monetary policy shocks. Take the taper tantrum period in 2013 as an example, during which many developing countries experienced financial stress and currency depreciation. In Figure 2, I sort developing countries into four quartiles based on their amount of borrowing from China relative to local GDP. The figure plots the mean exchange rate movement for the top and bottom quartiles. We can see that countries with the least borrowing from China experienced 7% currency depreciation, while countries with the most borrowing from China experienced 3% depreciation, which was much less severe.

To further isolate the effect of U.S. monetary policy shocks, I use a high-frequency identification strategy based on policy surprises around FOMC announcements (Kuttner, 2001; Gürkaynak et al., 2005; Nakamura and Steinsson, 2018; Jarociński and Karadi, 2020). Consistent with the finding in the taper tantrum period, while a 1% U.S. monetary policy shock depreciates foreign currencies by 5.4 percentage points for an average developing country, borrowing 10% of annual GDP from China lowers the exchange rate response by 4.7 percentage points. In other words, developing countries that borrow more from China tend to experience less currency depreciation during U.S. monetary tightening episodes.

Applying this high-frequency identification strategy to equity markets, I find that U.S. mon-

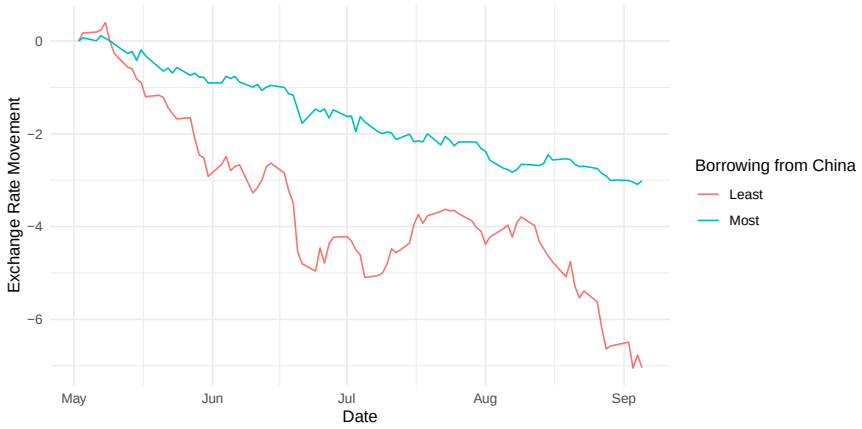


Figure 2: Foreign Currency Depreciation during 2013 Taper Tantrum

Notes: Exchange rate depreciation against the dollar from 2013-05-02 to 2013-09-05 is plotted against the amount of borrowing from China normalized by local GDP. Dates are from Harikrishnan et al. (2023).

etary policy shocks also affect foreign equity prices. A 1% U.S. monetary policy shock reduces foreign equity prices by 8.5 percentage points in local currency units for an average developing country. Along with the negative exchange rate effect, U.S. monetary tightening lowers the valuation of foreign equities from a global investor's perspective. Similarly, developing countries that borrow more from China tend to experience less severe equity price declines, as borrowing 10% of annual GDP from China mitigates the equity price response by 16 percentage points in local currency units.

Similar results are also found in bond markets, although data are only available at quarterly frequency. While a 1% cumulative U.S. monetary policy shock in a given quarter increases an average developing country's Treasury yield by 1.2 percentage points and its money market rate by 2.6 percentage points, borrowing 10% of local GDP from China lowers the Treasury yield and money market rate responses by 0.52 and 2.0 percentage points, respectively.

Moreover, De Leo, Gopinath, and Kalemli-Özcan (2024) document that, despite developing countries' efforts to lower policy rates in response to U.S. monetary tightening, their market interest rates tend to rise. This divergence between policy rates and market rates makes the global financial cycle a particularly challenging issue for developing countries. In this context, I find that China's overseas lending is also associated with lower policy rates, creating space for developing countries to align their policy rate and market rate responses.

Finally, the effects of U.S. monetary policy shocks and China's overseas lending also manifest themselves in capital flow data. I obtain annual inflows of debt and equity portfolio investments at the country level from the IMF. These inflows capture foreign investors' net purchases of local debt and equity securities, which can be negative if foreign investors are net sellers of these assets. Consistent with the prior literature, I find that positive U.S. monetary shocks tend to reduce foreign capital flows into developing countries, often known as sudden stops. At the same time, countries that borrow more from China tend to experience less severe reductions in both debt and equity inflows.

These findings in currency, equity, and bond markets are consistent with the hypothesis that in-

ternational lending helps developing countries stabilize their financial markets during global monetary tightening episodes. A competing hypothesis is that international lenders select countries that are less exposed to U.S. monetary shocks for other reasons. In this case, lending is not the mechanism, but merely a proxy of the underlying fundamental factor.

I consider several robustness tests to address this concern. I compare the same countries' exposures to U.S. monetary shocks before and after China became a major international lender. While funding from China mitigated the exchange rate, stock price, and interest rate responses after 2010, countries that subsequently borrowed more from China did not appear to be less exposed before 2010, which suggests that the effect on risk exposures is unlikely to be driven by persistent country-level characteristics.

Moreover, China has been a major player in international trade long before its recent rise in international lending. I run a similar regression using each country's trade relationship to China. Unlike lending relationship, trade relationship does not consistently explain variations in developing countries' exposures to U.S. monetary shocks. Similarly, participation in the Belt and Road Initiative (BRI), which also connects developing countries to China through infrastructure investment, does not explain variations in their financial exposures, either.

Finally, while China's overseas lending is widely spread across the continents, the findings may still be driven by China's lending to specific regions that are distant from the U.S. in geographical or economic terms. The currency and equity samples offer enough variations to control for region-time fixed effects, which allow me to compare countries that borrow from China to those that do not within the same region and time period. The results remain robust, suggesting that China's overseas lending is likely the direct mechanism influencing developing countries' exposures to the global financial cycle.

These results are surprising for two reasons. First, most of China's official overseas loans are denominated in U.S. dollar. Therefore, this result is not driven by substituting dollar-denominated debt with local currency debt in these countries' external liabilities, which is the traditional way of thinking about reducing currency mismatch risk (Eichengreen and Hausmann, 1999; Aguiar,

2005; Kalemli-Ozcan, Kamil, and Villegas-Sanchez, 2016). Second, from a developing country's perspective, the dollar's appreciation is sometimes regarded as an exogenous shock driven by U.S. monetary policy, which impacts local asset prices and financial conditions. The findings in this paper show that the U.S.-local bilateral exchange rate response is also endogenous to the amount of local borrowing from China, suggesting a two-way feedback loop between the bilateral exchange rate and local financial conditions.

To reconcile these results, I propose a small open economy model of exchange rate and local financial conditions, which builds on a large literature on constrained financial intermediaries. The purpose of this model is to provide a concrete setting for discussing and illustrating the mechanism that is potentially consistent with the empirical results. As the result, the model is highly stylized in order to obtain intuitive and tractable analytical results.

The model gives rise to a supply curve and a demand curve for dollar liquidity available to a developing country. On the supply side, dollar liquidity is generated by local firms that borrow in dollar. Their borrowing capacity determines the amount of safe dollar debt available in the local market. Specifically, when dollar appreciates, local firms that borrow in dollar suffer losses in their net worth. This currency exposure on their balance sheets reduces their borrowing capacity, which tightens the supply of dollar liquidity. On the demand side, local investors have a downward-sloping demand for safe dollar assets. A shortage of dollar liquidity increases their marginal utility from holding dollar safe assets, which appreciates the dollar.

Given these supply and demand curves, a global monetary shock that appreciates the dollar exchange rate triggers a feedback loop by generating losses for local firms and tightening their supply of dollar liquidity, which further appreciates the dollar and depreciates the local currency. Building on this financial accelerator mechanism in Jiang, Krishnamurthy, and Lustig (2023), the model in this paper introduces international lending and studies how it affects the equilibrium in the dollar liquidity market. Specifically, overseas funding reverses the accelerator mechanism by boosting the local firms' production, cash flow collateral, and hence their borrowing capacity in the private credit market, even when the funding is denominated in dollar. This in turn creates

ample dollar liquidity in the local market and stabilizes the exchange rate. The model predicts that international lending strengthens local firms' net worth and appreciates the local currency, which is consistent with the empirical results.

Moreover, the currency exposure on firm balance sheets gives rise to a unique feature: both demand and supply curves are downward-sloping. To the extent that the demand curve has a curvature, which arises when investors become more desperate for dollar liquidity as liquidity shortage worsens, the demand and supply curves may cross at multiple equilibria. In the benign equilibrium, the local currency is strong, and local firms are well-capitalized and supply ample dollar liquidity. In the crisis equilibrium, the local currency weakens, local firms suffer significant losses due to currency mismatch, and dollar liquidity is scarce.

This multiplicity of equilibria explains why international lenders' promise or goodwill alone can stabilize developing economies, if the lenders are committed to providing credit in the crisis equilibrium. In this case, international lenders' off-equilibrium promise helps select the benign equilibrium, which does not require them to provide more credit on the equilibrium path. As a result, during global monetary tightening episodes, countries with established ties to international lenders may experience less severe adverse effects than countries without, even when we do not observe international lenders providing more credit right away.

The paper proceeds as follows. Section 2 describes the data and the empirical setting. Section 3 presents the empirical results. Section 4 discusses the mechanism through the lens of a small open economy model. Section 5 concludes.

Literature. The results in this paper contribute to our understanding of three important issues in the international financial system. First, while China's role in international trade has received a lot of attention, its role in international finance is less well understood despite its growing importance (Bahaj and Reis, 2020, 2024; Clayton, Dos Santos, Maggiori, and Schreger, 2022; Lerner, Liu, Moscona, and Yang, 2024). Research about China's international lending focuses on its *scale and pricing*. Horn, Reinhart, and Trebesch (2021) document that China's international lending is often

more expensive than other official creditors, but cheaper than private creditors. Horn et al. (2021) is also concerned about the opaqueness of the lending terms. In comparison, this paper focuses on a different dimension of *risk exposure*, which suggests a countervailing benefit of international lending. To be clear, this finding is not necessarily inconsistent with the concerns raised by Horn et al. (2021, 2022), because the benefit is about smoothing the global monetary cycle during the credit boom phase, while the concerns are about a potential credit bust in the future. Ultimately, the benefit of international lending in the risk dimension has to be weighed against the potential costs in a comprehensive trade-off analysis.

Second, the global financial cycle is an important monetary phenomenon because flexible exchange rates cannot insulate foreign countries from its influence (Rey, 2015; Bräuning and Ivashina, 2020; Hofmann, Patel, and Wu, 2022; Acalin, 2023; Fontanier, 2023; Boehm and Kroner, 2023; Kalemli-Özcan and Unsal, 2023; Oskolkov, 2024). A major channel is funding shortage caused by U.S. monetary tightening, especially in the overseas dollar credit market (Jiang et al., 2023). The results in this paper suggest that funding from international creditors may help mitigate the shortage. The external creditor is China in this particular case, but it could also be other countries or international organizations. As such, coordination in international lending could uplift developing countries that are severely affected by the global financial cycle, and international organizations such as the IMF could play important roles in facilitating such coordination.

Third, a growing recent literature studies coordination and hegemony in global economic and financial activities (Farhi and Maggiori, 2018; He, Krishnamurthy, and Milbradt, 2019; Egorov, Mukhin, et al., 2019; Fontanier, 2023; Auray, Devereux, and Eyquem, 2024; Acharya, Jiang, Richmond, and Von Thadden, 2024; Jiang and Richmond, 2023; Pflueger and Yared, 2024; Ding and Jiang, 2024). For example, Clayton, Maggiori, and Schreger (2023, 2024b); Clayton, Dos Santos, Maggiori, and Schreger (2024a) develop a theoretical framework to study how countries use their financial and trade resources to achieve geopolitical and economic goals. Broner, Martin, Meyer, and Trebesch (2024) propose a theory to describe the strategic interplay between a hegemon and a challenger in economic activities. My paper documents different roles played by the U.S. and

China in the global financial cycle, and how their roles interact to influence developing countries. This setting provides a useful lab for applying and examining these theories.

Finally, this paper studies the cross-country heterogeneity in exposures to the global financial cycle. In prior works, Kalemli-Özcan (2019) studies how developed and developing countries respond differently to U.S. monetary policy shocks. Ambrocio, Hasan, and Li (2024) study how exposures to the global financial cycle depend on the countries' political ties with the U.S. While these papers explore what makes certain countries more exposed to the global financial cycle, my paper focuses on how international lending mitigates the exposure. My paper is also related to Miranda-Agrippino, Nenova, and Rey (2020), who document that China's monetary policy transmits mainly through international trade and commodity prices. My paper complements their analysis by showing that China's overseas lending, which is potentially affected by its own policies, has important financial stability implications for developing countries.

2 Data and Empirical Setting

2.1 Data Sources

To focus on the period in which China becomes a major international lender, the main sample is from 2010-01 to 2024-06. Horn et al. (2021) cover China's overseas lending amounts to 144 developing countries, 1950–2017. To avoid overlap with the Fed's tightening cycle that started in 2016, I pick 2015 as a representative year to construct the amount of China's lending that each country receives relative to its GDP, henceforth the China-debt-to-GDP ratio.[1]

Foreign exchange rate and equity price index data at daily frequency are obtained from Global Financial Data and Bloomberg, respectively. Treasury yield, money market rate, and policy rate data at quarterly frequency are obtained from the IMF's International Financial Statistics and the BIS database. After merging with the China-debt-to-GDP data, I obtain 50 countries in the floating exchange rate sample, 87 countries in the equity sample, 33 countries in the Treasury yield sample,

[1]Appendix B.1 reports the empirical results using the latest data in 2017; results remain robust.

27 countries in the money market rate sample, and 42 countries in the policy rate sample.

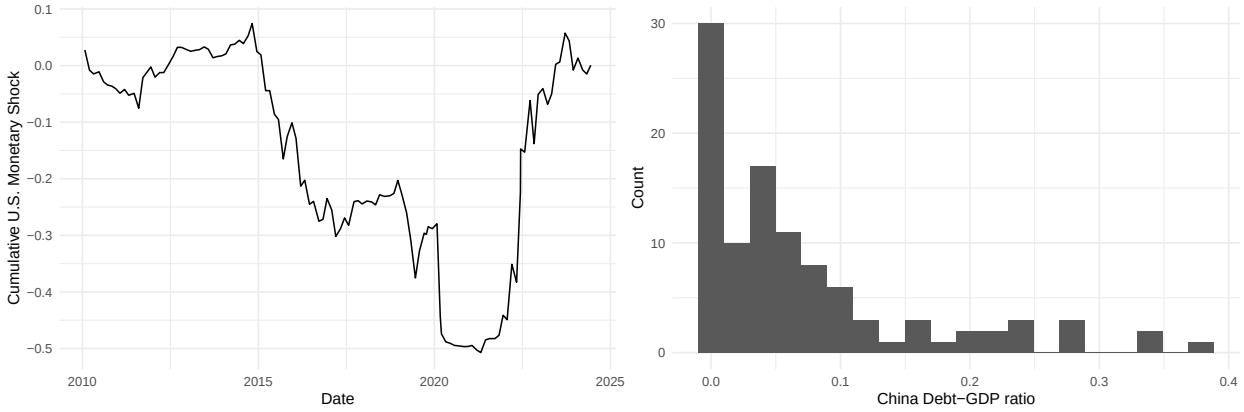
The U.S. monetary policy shock is obtained from Jarociński and Karadi (2020), which is the 1st principal component of the surprises in interest rate derivatives with maturities from 1 month to 1 year (MP1, FF4, ED2, ED3, ED4). The surprises are computed over a 30-minute window spanning 20 minutes before and 10 minutes after the FOMC announcements.

2.2 Summary Statistics

The empirical analysis relies on two key explanatory variables: the common U.S. monetary policy shock MP_t^{US} and each developing country's China-debt-to-GDP ratio $Debt_i^{CN}$. Figure 3(a) plots the time series of the U.S. monetary policy shock MP_t^{US}. For readability, the shock is cumulated over the 2010–2024 period. Overall, the U.S. monetary policy had positive surprises during the taper tantrum in 2013, whereas the surprises became negative during the 2015–2019 rate hike. After the pandemic, the U.S. monetary policy surprises turned positive again. Within each rate environment, there are also rich variations across FOMC meetings.

Figure 3(b) plots the histogram of the China-debt-to-GDP ratio $Debt_i^{CN}$ in 2015. Many countries borrowed less than 10% of their GDP, but there are also countries that borrowed between 10% and 40% of their GDP. The average China-debt-to-GDP ratio is 7.2% and the standard deviation is 8.6%. The five countries with the highest China-debt-to-GDP ratios are Djibouti (38%), Kyrgyzstan (35%), Congo (34%), Tonga (27%), Cambodia (27%). In comparison, the five countries with the highest dollar amounts of China debt are Russia (61.43 Bn$), Angola (17.50 Bn$), Brazil (15.96 Bn$), Pakistan (15.29 Bn$), Ecuador (10.54 Bn$). Therefore, while major emerging countries such as BRICS also receive significant amounts of lending from China, smaller developing countries tend to borrow more relative to their GDP.

Figure 4 plots the geographical distribution of the China-debt-to-GDP ratio $Debt_i^{CN}$. This figure shows that China's lending is not concentrated in countries nearby, but is instead widely spread across the continents. For example, Cambodia received a lot more funding relative to its GDP than Vietnam, Peru more than Colombia, and Sudan more than Egypt.



(a) Cumulative U.S. Monetary Policy Surprise (b) Distribution of China's Overseas Lending

Figure 3: Cumulative U.S. Monetary Policy Surprise and the Histogram of China-Debt-to-GDP Ratio

Notes: Panel (a) plots the cumulative U.S. monetary policy surprise from Jarociński and Karadi (2020). Panel (b) plots the histogram of the China-debt-to-GDP ratio in 2015 across developing countries from Horn et al. (2021).

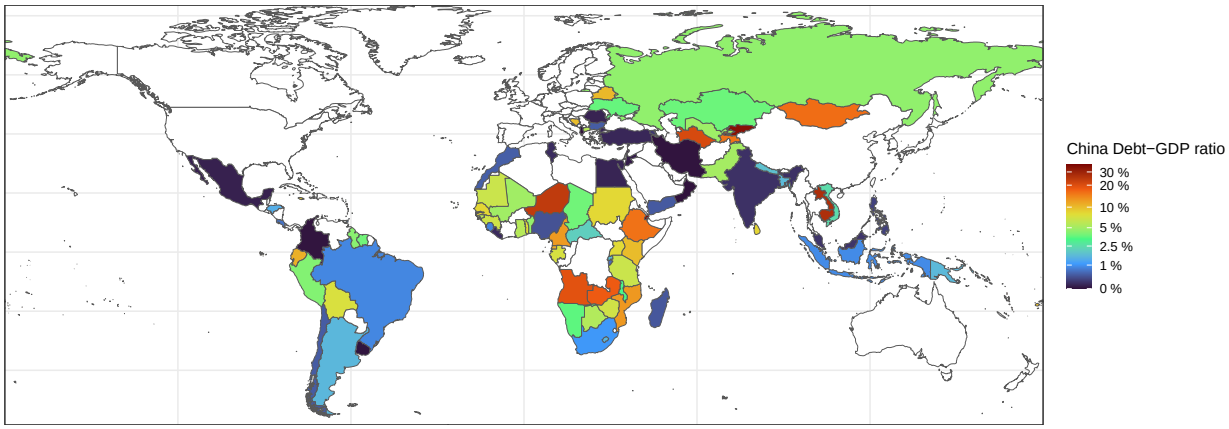


Figure 4: Geographical Distribution of China's Overseas Lending

Notes: This figure plots the China-debt-to-GDP ratio in 2015 across developing countries from Horn et al. (2021).

3 Empirical Results

In this section, I document the heterogeneity in the responses of different developing countries' exchange rates, asset prices, and capital flows to U.S. monetary policy shocks. The main regression specification is

$$\Delta y_{i,t} = \alpha + \beta MP_t^{US} + \gamma Debt_i^{CN} + \delta MP_t^{US} \times Debt_i^{CN} + \varepsilon_{i,t}, \tag{1}$$

where the outcome variable of foreign country i, $\Delta y_{i,t}$, is regressed on the U.S. monetary policy shock, MP_t^{US}, the China-debt-to-GDP ratio, $Debt_i^{CN}$, and their interaction term. Each period t corresponds to an FOMC announcement event. For high-frequency tests, the outcome variable $\Delta y_{i,t}$ is constructed as the difference between its value two days after the announcement and its value one day before the announcement.

3.1 Responses in Foreign Exchange Rates

I begin my analysis with foreign exchange rates. For this exercise, I remove countries that fix their exchange rates. I use the classification in Ilzetzki et al. (2019) to exclude countries that are classified as peggers for at least one year in the 2010–2016 period covered by this dataset.

Table 1 reports the regression results of Eq. (1). A positive value of the outcome variable means foreign currency appreciation against the dollar. Throughout the paper, I report Driscoll and Kraay (1998) standard errors for panel settings to account for time-series and cross-sectional dependence.

Column (1) shows that a 1% U.S. monetary policy shock, which represents U.S. monetary tightening, tends to appreciate the dollar by 5 percentage points against developing countries' currencies. This result is consistent with the prior literature. For example, using different approaches, both Curcuru (2017) and Jiang, Richmond, and Zhang (2022) report that a 1% increase in the U.S. interest rate tends to appreciate the dollar by 3 percentage points against foreign currencies in developed countries.

	(1)	(2)
U.S. Monetary Policy Surprise	-5.38^{**}	-7.62^{**}
	(2.11)	(3.07)
China Debt-to-GDP Ratio		-0.37
		(0.36)
Interaction		46.53^{**}
		(20.46)
Num. obs.	4345	4345
R^2	0.00	0.00

Table 1: U.S. Monetary Policy Shock and Foreign Exchange Rate Responses

Notes: The dependent variable is the change in the foreign exchange rate. The explanatory variables are the U.S. monetary policy shock, the ratio of China's overseas lending that each country receives relative to its GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Column (2) introduces China debt-to-GDP ratio and the interaction term as additional explanatory variables. It shows that countries that borrow more from China tend to have lower exchange rate exposures to the U.S. monetary policy shock. Quantitatively, if a country borrows 16% of its GDP from China, which is within the plausible range of the lending data shown in Figure 3(b), its exchange rate movement with respect to the U.S. dollar has zero exposure to the U.S. monetary policy shock.

3.2 Responses in Stock Prices

Table 2 reports the results using the foreign equity price index as the outcome variable. A negative value means equity price decline in local currency units. Column (1) shows that a positive U.S. monetary policy shock tends to reduce foreign equity prices. The response in the local-price equity index is even stronger than the response in the exchange rate: a 1% U.S. monetary policy shock reduces foreign equity prices by 8.5 percentage points on average. Since this price change is in local currency terms, U.S. monetary tightening presents a double blow to emerging market equities from a global investor's perspective. It not only weakens local currencies but also drives down local equity prices. As a result, the investor's portfolio loss in dollar terms reflects the combined impact

	(1)	(2)
U.S. Monetary Policy Surprise	-8.51^{**}	-13.22^{***}
	(3.85)	(4.48)
China Debt-to-GDP Ratio		2.46
		(1.79)
Interaction		163.97^{***}
		(39.38)
Num. obs.	3636	3636
R^2	0.01	0.01

Table 2: U.S. Monetary Policy Shock and Foreign Equity Price Responses

Notes: The dependent variable is the change in the foreign equity price index in local currency units. The explanatory variables are the U.S. monetary policy shock, the ratio of China's overseas lending that each country receives relative to its GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

of currency depreciation and declining equity values.

Column (2) introduces the China debt-to-GDP ratio and the interaction term as additional explanatory variables. It shows that a country that borrows from China has a lower equity price exposure to the U.S. monetary policy shock. Quantitatively, if the country borrows 8% of its GDP from China, its equity price movement exposure with respect to the U.S. monetary policy shock is muted.

3.3 Responses in Bond Yields and Policy Rates

I also study the responses in foreign interest rates. I use Treasury yields and money market rates obtained from IMF and BIS websites. Since most developing countries do not have yield data at daily frequency, which makes it difficult to run the same regression around FOMC announcement windows, I aggregate the U.S. monetary surprises at the quarterly frequency by taking the sum across FOMC events. Moreover, the interest rate responses tend to occur in one or two quarters after the U.S. monetary policy shock, which makes it more informative to focus on the yield change

from the end of quarter $t-1$ to the end of quarter $t+2$ as the outcome variable:

$$y_{i,t+2} - y_{i,t-1} = \alpha + \beta MP_t^{US} + \gamma Debt_i^{CN} + \delta MP_t^{US} \times Debt_i^{CN} + \varepsilon_{i,t}, \tag{2}$$

where MP_t^{US} is the sum of all U.S. monetary policy shocks in quarter t. If I regress the change in the U.S. 1-year Treasury yield, $y_{US,t+2} - y_{US,t-1}$, on the quarterly sum of the U.S. monetary policy shock, I obtain a coefficient of 5.0.

Table 3 reports the results. Column (1) shows that a positive U.S. monetary policy shock tends to increase foreign Treasury yields. Quantitatively, when the U.S. monetary policy shock raises the U.S. Treasury yield by 1%, the foreign Treasury yields rise by 1.2 percentage points on average. Column (2) shows that a foreign country that borrows from China again has a lower yield exposure to the U.S. monetary policy shock. If the country borrows 27% of its GDP from China, its Treasury yield exposure with respect to the U.S. monetary policy shock is muted.

Column (3) and (4) report similar results using foreign money market rates as the outcome variable. When the U.S. monetary policy shock raises the U.S. Treasury yield by 1%, the foreign money market rates rise by 2.6 percentage points on average. If the country borrows 17% of its

	(1)	(2)	(3)	(4)	(5)	(6)
	Treasury Yield		Money Market Rate		Policy Rate	
U.S. Monetary Policy Surprise	6.01*	7.01**	13.29***	17.22***	9.12***	10.88***
	(3.07)	(3.23)	(3.72)	(4.51)	(2.55)	(3.10)
China Debt-to-GDP Ratio		0.02		−1.39		−0.28
		(1.38)		(2.82)		(1.67)
Interaction		−26.21**		−100.57**		−42.73**
		(10.04)		(43.77)		(16.78)
Num. obs.	1786	1786	1471	1471	2280	2280
R^2	0.01	0.01	0.02	0.02	0.02	0.02

Table 3: U.S. Monetary Policy Shock and Foreign Interest Rate Responses

Notes: The dependent variable is the change in the foreign Treasury yield. The explanatory variables are the U.S. monetary policy shock aggregated at the quarterly frequency, the ratio of China's overseas lending relative to local GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

GDP from China, its money market rate exposure with respect to the U.S. monetary policy shock is muted.

These results show that the market interest rates in developing countries also respond to the global financial cycle, but the response is weaker for countries that borrow from China. Moreover, the U.S. monetary policy shock also affects foreign countries' policy rates. De Leo, Gopinath, and Kalemli-Özcan (2024) document that, while developed countries tend to synchronize their monetary policy stances with the U.S., developing countries do the opposite: they tend to adopt a more expansionary monetary policy in a few quarters after U.S. monetary tightening. However, their market interest rates still increase due to risk premium effects, which drives a disconnect between the policy rates and the market interest rates.

Motivated by this observation, I also study the responses in foreign policy rates, and report the results in columns (5) and (6) of Table 3. A positive U.S. monetary policy shock tends to increase developing countries' policy rates, but countries that borrow from China have lower policy rate exposures. This result complements Kalemli-Özcan and Varela (2021); De Leo et al. (2024), which emphasize the rate difference between developing and developed countries. My result emphasizes the heterogeneity within developing countries: countries that borrow from China can manage to run a more countercyclical monetary policy with respect to the global financial cycle. When the U.S. tightens its monetary policy, these countries can lower their policy rates to cushion its financial market effects, while their market interest rates also decrease. As a result, these countries manage to keep their market interest rates in line with their own policy rates, which makes their monetary policy more effective in stabilizing the economy.

3.4 Responses in Capital Flows

The global financial cycle drives global comovements in not only asset prices, but also capital flows. I use capital flows data from the IMF's Balance of Payments and International Investment Position Statistics (BoP/IIP). While data are available at quarterly frequency, the annual series have better quality. I focus on debt and equity inflows, defined as the foreigners' net purchases of local

assets. I only keep countries that have at least 5 annual observations since 2010, and obtain 71 developing countries in the sample of debt flows and 71 countries in the sample of equity flows.

I aggregate the U.S. monetary surprises at the annual frequency by taking the sum across FOMC events. The regression specification is

$$\frac{Inflows_{i,t}}{GDP_{i,t}} - \frac{Inflows_{i,t-1}}{GDP_{i,t-1}} = \alpha + \beta MP_t^{US} + \gamma Debt_i^{CN} + \delta MP_t^{US} \times Debt_i^{CN} + \varepsilon_{i,t}, \qquad (3)$$

where $Inflows_{i,t}$ is the annual inflows in year t, and MP_t^{US} is the sum of all U.S. monetary policy shocks in year t.

Table 4 reports the results. Column (1) shows that a positive U.S. monetary policy shock tends to reduce debt inflows to developing countries. Quantitatively, when the U.S. monetary policy shock raises the U.S. Treasury yield by 1%, developing countries' debt inflows fall by 2.7 percentage points of local GDP on average. Column (2) shows that countries that borrow from China tend to be less exposed to the U.S. monetary shock. If a country borrows 18% of its GDP from China, its debt inflows' exposure with respect to the U.S. monetary policy shock is muted.

Columns (3) and (4) report similar results using equity inflows as the outcome variable. A

	(1)	(2)	(3)	(4)
	Debt Inflows		Equity Inflows	
U.S. Monetary Policy Surprise	-2.66^{**}	-3.87^{***}	-2.38^{**}	-2.71^{**}
	(0.95)	(0.86)	(0.90)	(1.05)
China Debt-to-GDP Ratio		0.19		-0.00
		(1.45)		(0.37)
Interaction		22.04^{***}		6.04^{*}
		(5.91)		(3.04)
Num. obs.	869	869	867	867
R^2	0.01	0.01	0.00	0.00

Table 4: U.S. Monetary Policy Shock and Capital Flow Responses

Notes: The dependent variable is the annual changes in debt and equity inflows/GDP ratio. The explanatory variables are the U.S. monetary policy shock aggregated at the annual frequency, the ratio of China's overseas lending relative to local GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

positive U.S. monetary policy shock tends to reduce equity inflows to developing countries, while countries that borrow more from China tend to have lower exposures in equity inflows as well. These results suggest that capital inflows to countries that rely more on China's overseas lending tend to be less exposed to the global financial cycle, which is consistent with the previous result that their exchange rates, asset prices, and interest rates also tend to be less exposed.

3.5 Is China's Lending the Mechanism or a Proxy for Something Else?

Focusing on the 2010–2024 sample in which China emerges as a major international lender, the results so far suggest that borrowing from China is associated with less exposure to the global financial cycle in developing countries' currency, equity, and bond markets. This result can be interpreted in two ways. First, China's overseas lending directly affects developing countries' risk exposures. More funding from international lenders gives developing countries more financial resources to stabilize their exchange rates and asset prices. Alternatively, China's overseas lending may serve as a proxy for country characteristics that influence risk exposure. For instance, Chinese lenders might favor countries with stronger economic fundamentals, which are inherently more resilient to the global financial cycle regardless of overseas lending. In this case, lending itself is not the causal mechanism but rather an indicator of underlying economic strength.

This subsection presents several robustness tests that support the view that China's overseas lending serves as the direct mechanism.

Pre- and Post-2010. Figure 1(a) shows that China became a major international lender after 2010. While China's overseas lending stayed below 100 billion USD before 2010, it increased to over 800 billion USD in 2020. Therefore, if China's lending is the direct mechanism, it would have much stronger effects on the developing countries' risk exposures after 2010 than before.

Table 5 tests this hypothesis by re-running the regression (1) in the 1990–2009 sample. The $Debt_i^{CN}$ variable is still constructed using post-2010 data. The table collects results using exchange rates, equity prices, bond yields, and policy rates as the dependent variables. In the pre-2010

sample, foreign exchange rates and equity prices still respond to the U.S. monetary policy shock on average. However, the interaction term is no longer statistically significant, which suggests that a country that borrowed from China in 2015 is no less exposed to the global financial cycle in the pre-2010 sample. In other words, it is unlikely that the Chinese lenders were selecting on certain persistent country-level characteristics which are associated with less exposure to the global financial cycle throughout the sample period.

	(1) FX	(2) Equity	(3) Treasury Yield	(4) Money Market	(5) Policy Rate
U.S. Monetary Policy Surprise	-1.68^{*}	-5.91^{**}	0.32	-178.63	-211.03
	(0.96)	(2.51)	(1.72)	(144.79)	(170.10)
China Debt-to-GDP Ratio	0.07	-4.58^{**}	6.70^{*}	264.36	419.94
	(0.28)	(2.26)	(3.98)	(271.77)	(424.14)
Interaction	-3.44	32.74	-3.67	1024.86	1058.62
	(5.47)	(42.49)	(16.06)	(801.36)	(874.99)
Num. obs.	5337	2860	1943	1409	1783
R^2	0.01	0.01	0.00	0.00	0.00

Table 5: U.S. Monetary Policy Shock and Responses, 1990–2009

Notes: The dependent variables are the change in the foreign exchange rate, equity price index, Treasury yield, money market rate, and policy rate. The explanatory variables are the U.S. monetary policy shock, the ratio of China's overseas lending relative to local GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Trade Linkage. China's overseas lending might be correlated with its trade linkages: a developing country is more likely to borrow from China if it trades more with China. If so, trade linkages could be the mechanism that directly affects the risk exposures. To address this concern, I obtain bilateral trade data from World Bank's World Integrated Trade Solution. I construct a new variable $Trade_i^{CN}$ as the ratio of each country's exports from and imports to China relative to its GDP in 2015. I run a similar regression:

$$\Delta y_{i,t} = \alpha + \beta MP_t^{US} + \gamma Trade_i^{CN} + \delta MP_t^{US} \times Trade_i^{CN} + \varepsilon_{i,t}.$$

Table 6 presents the results: trade linkages with China have no significant effect on the risk exposures of exchange rates, equity prices, or Treasury yields. While trade linkages do significantly influence money market and policy rates, they are unlikely to be the only channel. China may be playing an additional role in the international lending market.

	(1) FX	(2) Equity	(3) Treasury Yield	(4) Money Market	(5) Policy Rate
U.S. Monetary Policy Surprise	2.29	-8.80^{*}	3.40^{*}	21.43^{***}	11.02^{***}
	(5.06)	(4.49)	(1.75)	(5.51)	(2.99)
China Trade-to-GDP Ratio	1.70^{*}	-1.37^{***}	0.85	-2.81	-0.12
	(1.03)	(0.37)	(2.06)	(2.36)	(0.93)
Interaction	-74.28	4.04	41.08	-92.76^{***}	-20.65^{***}
	(60.95)	(15.86)	(29.46)	(30.37)	(6.72)
Num. obs.	4275	3636	1786	1471	2280
R^2	0.00	0.01	0.01	0.03	0.02

Table 6: Comparison to Trade

Notes: The dependent variables are the change in the foreign exchange rate, equity price index, Treasury yield, money market rate, and policy rate. The explanatory variables are the U.S. monetary policy shock, the ratio of imports and exports with China relative to local GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Belt and Road Initiative. Similarly, the effect could be driven by China's Belt and Road Initiative (BRI), a large-scale infrastructure development project that correlates with China's overseas lending. I consider a similar regression specification that replaces the China-debt-to-GDP ratio with an indicator of whether the country participates in the Belt and Road Initiative. Table 7 reports the results: the Belt and Road Initiative does not significantly reduce the risk exposures to the global financial cycle.

Controlling for Regional Factors. Another concern is that China's overseas lending is concentrated in regions that are distant from the U.S. in geographical or economic terms. However, Figure 4 shows that recipient countries are not clustered in a specific region. Instead, they are not confined to a specific region. Instead, they are distributed across multiple continents, particularly in Africa,

	(1) FX	(2) Equity	(3) Treasury Yield	(4) Money Market	(5) Policy Rate
U.S. Monetary Policy Surprise	1.28	−6.17	5.21	14.65***	11.84**
	(3.09)	(5.52)	(3.22)	(5.10)	(4.56)
Belt and Road Initiative	0.18	−0.27***	0.11	−0.23	0.05
	(0.21)	(0.10)	(0.19)	(0.34)	(0.29)
Interaction	−18.33	−4.29	2.76**	−4.05	−5.70
	(11.66)	(4.25)	(1.28)	(5.07)	(4.63)
Num. obs.	4345	3636	1786	1471	2280
R^2	0.00	0.01	0.01	0.02	0.02

Table 7: Comparison to Belt and Road Initiative

Notes: The dependent variables are the change in the foreign exchange rate, equity price index, Treasury yield, money market rate, and policy rate. The explanatory variables are the U.S. monetary policy shock, the indicator of whether the country is in the Belt and Road Initiative, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Southeast Asia, Central Asia, and South America.

To further address this concern, I introduce region-time fixed effects to account for common regional variations. The regions follow the 18 Global Environment Outlook major regions (GEO3), which include Arabian Peninsula, Caribbean, Central Africa, Central Asia, Central Europe, Eastern Africa, Eastern Europe, Mashriq, Meso-America, North Africa, NW Pacific and East Asia, South America, South Asia, South Pacific, Southeast Asia, Southern Africa, Western Africa, and Western Indian Ocean. This specification enables a more precise comparison of the risk exposures between countries that borrow from China and those that do not, within the same region and time period.

Table 8 reports the results for exchange rate and equity price responses. In this specification, variations in the U.S. monetary policy surprise are absorbed by region-time fixed effects, so the coefficient on the U.S. monetary policy surprise is omitted. The coefficient on the interaction term remains positive and significant, suggesting that countries borrowing from China continue to exhibit lower exposures to the global financial cycle even after accounting for regional factors.

For bond yields and policy rates, the limited number of countries, with several regions represented by only one country, results in weak statistical power. Although the point estimates remain

consistent with previous findings, these results are not reported.

	(1) Exchange Rate	(2) Equity Price
Belt and Road Initiative	0.84	2.18
	(1.21)	(1.42)
Interaction with U.S. Monetary Policy Surprise	83.81**	124.63***
	(34.48)	(44.09)
Num. obs.	4345	3636
R^2	0.23	0.51

Table 8: Controlling for Regional Factors

Notes: The dependent variables are the change in the foreign exchange rate and equity price index. The explanatory variables are the ratio of China's overseas lending relative to local GDP, its interaction with the U.S. monetary policy shock, and the region-time fixed effect. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

4 Discussion of Mechanism

The empirical results suggest that borrowing from China is associated with a lower exposure to the global financial cycle, which is surprising for two reasons. First, most of China's official overseas loans are denominated in U.S. dollar (Horn et al., 2021). Therefore, this result is not driven by substituting dollar-denominated debt with local currency debt, which is the traditional way of thinking about reducing currency exposures on external balance sheets (Caballero and Krishnamurthy, 2003; Schneider and Tornell, 2004; Bruno and Shin, 2015; Bocola and Lorenzoni, 2020; Akinci and Queralto, 2024).

Second, in response to U.S. monetary tightening, the dollar's appreciation against the local currency is sometimes regarded as an exogenous external shock from a developing country's perspective, which transmits to the local economy by tightening financial conditions and generating losses on their external liabilities. The results in this paper suggest that developing countries' exchange rate responses are endogenous to their borrowing from China. Therefore, exchange rates may respond to local economic and financial conditions, suggesting a two-way feedback loop.

To make sense of these two empirical features, I develop a model of a small open economy. This model builds on Jiang, Krishnamurthy, and Lustig (2023), which features a financial accelerator mechanism (Bernanke, Gertler, and Gilchrist, 1996). In this section, I introduce international official lending into the model, and study how it interacts with financial frictions to shape exchange rates and asset prices in developing countries.

4.1 Model Set-up

I consider a small open economy that takes the dollar interest rate as given. In this economy, a unit mass of identical firms produce goods subject to financial constraints. The firms take capital k_t and labor ℓ_t as input. Production takes one period, and the production function is

$$y_{t+1} = a(k_t + \ell_t),$$

which implies that labor and capital are perfect substitutes. Capital and consumption goods can be freely converted into each other, so that labor and capital always have a price of 1 in the unit of local goods.

The firms have a net worth of n_t, borrow b_t in the private credit market, and borrow m_t from international official lenders. All these quantities are in local currency units. The firms' budget constraint is

$$n_t + b_t + m_t \geq \ell_t + k_t.$$

As a starting point, I assume that firm borrowing is in local currency units, and that firms can only pledge a fraction θ of their expected output as collateral. They face the following borrowing constraint:

$$b_t(1 + r) \leq \theta \mathbb{E}_t[y_{t+1}],$$

which states that the bond repayment on the left-hand side should be less than the fraction of expected output in the next period that can be pledged as collateral. As a result, firms can borrow at most

$$b_t = \frac{\theta a(n_t + m_t)}{1 + r - \theta a} \tag{4}$$

from the private credit market, which is increasing in the amount of official lending m_t they receive. Therefore, official lending has positive externality by raising the firms' pledgeable cash flows and hence their borrowing capacity in the private credit market.

Firms' production and net worth in the next period are given by

$$\begin{aligned} y_{t+1} &= a(\ell_t + k_t) = a\frac{1+r}{1+r-\theta a}(n_t + m_t), \\ n_{t+1} &= \frac{(1+r)(1-\theta)a}{1+r-\theta a}n_t + \frac{(1+r)(a-1-r)}{1+r-\theta a}m_t. \end{aligned}$$

Assume $a > 1 + r > \theta a$, so that productivity a is high enough for the firms to have an incentive to borrow, but not too high which leads to infinite borrowing capacity. Under this parameterization, official lending m_t also boosts production and firms' net worth:

$$\frac{\partial y_{t+1}}{\partial m_t} > 0, \qquad \frac{\partial n_{t+1}}{\partial m_t} > 0.$$

4.2 Dollar Debt

Next, we consider the case in which firms borrow in dollar. Let e_t denote the exchange rate between the dollar and the local currency, which increases when the dollar appreciates. Let $b_t^{\$}$ denote the quantity of the dollar private debt and let $m_t^{\$}$ denote the quantity of the official lending in dollar. The firms' budget constraint becomes

$$n_t + b_t^{\$} e_t + m_t^{\$} e_t \geq \ell_t + k_t.$$

The firms can pledge a fraction θ of their expected output as collateral, which has to exceed the expected repayment on the dollar debt. The borrowing constraint becomes

$$b_t^{\$}(1+r^{\$})\mathbb{E}_t[e_{t+1}] \leq \theta \mathbb{E}_t[y_{t+1}] = \theta a(n_t + b_t^{\$} e_t + m_t^{\$} e_t).$$

Solving for the debt quantity yields the following counterpart to Eq. (4):

$$b_t^{\$} = \frac{\theta a(n_t + m_t^{\$} e_t)}{(1+r^{\$})\mathbb{E}_t[e_{t+1}] - \theta a e_t}. \tag{5}$$

Similar to the previous case with local currency debt, international official lending $m_t^{\$}$ also boosts the local firms' capacity to borrow in the private credit market. Moreover, a higher U.S. interest rate $r_t^{\$}$ has the opposite effect: by raising the discount rate, it reduces the present value of the pledgeable future cash flow. The decline in collateral value tightens the borrowing constraint, leading to less borrowing in the private credit market.

Assume the agents expect the exchange rate follows a random walk: $\mathbb{E}_t[e_{t+1}] = e_t$ and $\mathbb{E}_t[e_{t+2}] = e_{t+1}$. To emphasize the variations in quantities in period $t+1$, I adopt the following notation for period-t variables: $e_t = \bar{e}$, $n_t = \bar{n}$, and $m_t^{\$} = \bar{m}^{\$}$. Then, we obtain the following net worth and debt supply function in the next period:

$$\begin{aligned} n_{t+1} &= \bar{y} - (\bar{b}^{\$} + \bar{m}^{\$})(1+r^{\$})e_{t+1}, \\ b_{t+1}^{\$} e_{t+1} &= \frac{\theta a(n_{t+1} + m_{t+1}^{\$} e_{t+1})}{(1+r^{\$}) - \theta a}. \end{aligned} \tag{6}$$

Eq. (6) shows how the amount of dollar debt issuance $b_{t+1}^{\$}$ varies with firm net worth n_{t+1} and official lending $m_{t+1}^{\$}$. It contains two separate channels through which the supply of dollar debt depends on the dollar strength e_{t+1}. First, firms are exposed to currency risk on their balance sheets: a stronger dollar e_{t+1} increases the local currency value of the dollar debt, which lowers the firms' net worth n_{t+1} and contracts their borrowing capacity. Second, if the international official lender commits to a fixed amount of dollar lending $m_{t+1}^{\$}$, a stronger dollar increases its

local currency value and hence expands the firms' borrowing capacity. Both channels give rise to a linear relationship between the dollar strength e_{t+1} and the debt quantity $b^{\$}_{t+1}e_{t+1}$, but with different signs. The overall slope coefficient is determined by

$$\gamma = \frac{\partial e_{t+1}}{\partial(b^{\$}_{t+1}e_{t+1})} = \frac{(1+r^{\$}-\theta a)^2\bar{e}}{\theta a}\left[m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a) - \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - \theta a\bar{n}(1+r^{\$})\right]^{-1}.$$

From this expression, we can see that, unless the current official lending $m^{\$}_{t+1}$ greatly exceeds its previous level $m^{\$}_t = \bar{m}^{\$}$, the currency mismatch channel dominates and the slope coefficient is negative. More precisely, unless

$$m^{\$}_{t+1} > \frac{\bar{m}^{\$}\bar{e}(1+r^{\$})^2 + \theta a\bar{n}(1+r^{\$})}{\bar{e}(1+r^{\$}-\theta a)} > \bar{m}^{\$},$$

then $\gamma < 0$, which implies that the amount of borrowing $b^{\$}_{t+1}e_{t+1}$ in the private credit market is decreasing in the strength of the dollar e_{t+1}.

4.3 Liquidity Demand and Dollar Strength

To close the model, I assume that firms' dollar debt is held by local investors as liquid dollar assets. The amount of dollar debt issued by firms determines the supply of dollar liquidity in the local economy. Local investors, in turn, have a downward-sloping demand function for liquidity:

$$e_{t+1} = \bar{e} - \beta(b^{\$}_{t+1}e_{t+1} - \bar{b}^{\$}\bar{e}), \tag{7}$$

so that a greater quantity of dollar liquidity weakens the dollar exchange rate. This expression is a reduced-form representation of how the quantity of dollar liquidity determines the liquidity premium on dollar debt, and how the liquidity premium affects dollar strength. Jiang et al. (2023) provide details and confirm that the more elaborate setting also gives rise to a similar expression.

In this way, we obtain a linear demand function (7) and a linear supply function (6) governing the equilibrium dollar strength e_{t+1} and dollar debt quantity $b^{\$}_{t+1}e_{t+1}$. Figure 5 plots these two

functions with a simple calibration detailed in Appendix A.2. Their intersection indicates the equilibrium. Interestingly, not only the demand curve, but also the supply curve is downward-sloping, because a stronger U.S. dollar lowers the firms' net worth, which tightens the borrowing constraint and reduces their dollar debt supply.

In this figure, we consider an increase in the provision of official lending $m^{\$}_{t+1}$, which shifts (and slightly rotates) the credit supply curve to the right. In doing so, it relaxes the firms' borrowing constraint and increases the dollar debt quantity for a given exchange rate level. The new equilibrium is characterized by a weaker dollar exchange rate, a higher firm net worth, and a greater dollar debt quantity. We can generalize this result in the following proposition.

Proposition 1. *If the slope of the demand curve (7) is flatter than that of the supply curve (6), i.e., $-\beta > \gamma$, or if the supply curve is upward sloping, i.e., $\gamma > 0$, an increase in official lending $m^{\$}_{t+1}$ leads to a weaker dollar exchange rate e_{t+1}, a higher local firm net worth n_{t+1}, and a greater dollar debt quantity $b^{\$}_{t+1}$.*

The proof is presented in Appendix A.1. This proposition emphasizes the two-way feedback loop between the dollar strength and the provision of dollar liquidity. International official lending sets off a virtuous cycle by expanding firms' cash flow collateral and hence borrowing capacity in

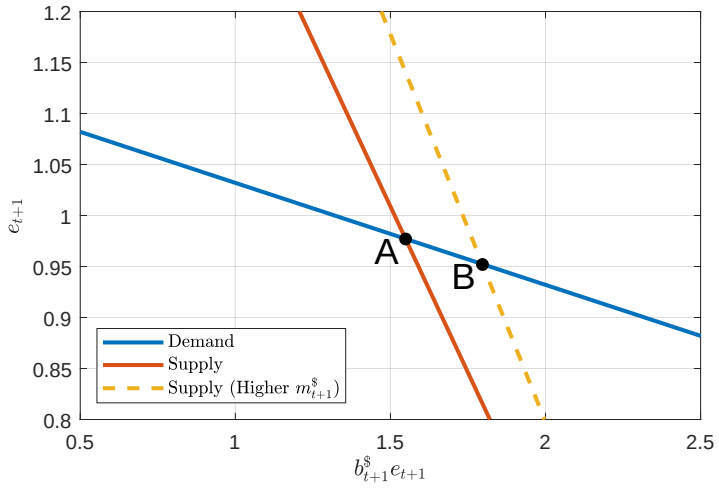


Figure 5: Dollar Debt Equilibrium

the private credit market, which allows them to issue more dollar debt. As local investors' liquidity demand for dollar debt is satiated, this leads to a stronger local currency, which in turn boosts the firms' net worth and borrowing capacity. As a result, countries that receive more international lending, even when it is dollar-denominated, have higher firm net worth and stronger local currencies, which is consistent with the empirical results in this paper.

4.4 Multiple Equilibria and the Role of Expectations

Our baseline setting above makes simplifying assumptions to obtain linear supply and demand curves in the dollar debt market. In this final subsection, let us consider a variant of the model in which the demand curve for dollar liquidity is not only downward-sloping, but also non-linear. This curvature in the demand curve interacts with the downward-sloping supply curve, which can give rise to multiple equilibria.

Figure 6 plots the demand curve which relates the dollar strength to an exponential function of the quantity of dollar liquidity. This specification assumes that the marginal value of the dollar liquidity is increasing as dollar liquidity becomes more scarce. In this case, the demand and supply curves have two intersections: there is a benign equilibrium (point A) in which the local currency

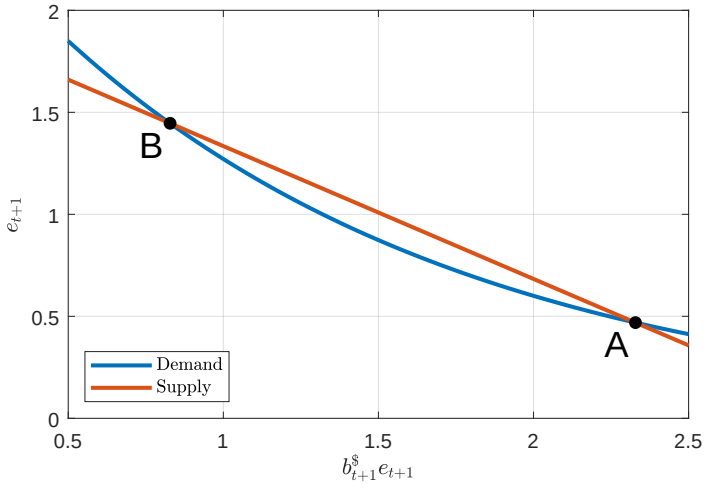


Figure 6: Dollar Debt Equilibrium with Non-linear Demand Curve

is strong and there is ample dollar liquidity, and a crisis equilibrium (point B) in which the local currency is weak and there is scarce dollar liquidity. This multiplicity is similar to the safety trap in Caballero and Farhi (2018), but the mechanism is different.

This multiplicity creates room for international official lenders to play an important role in equilibrium selection. For example, if international official lenders promise to provide additional funding in the crisis equilibrium and private investors expect this to happen, then, market participants will coordinate on the benign equilibrium. As such, promises from international lenders can help stabilize developing countries' financial markets by preventing them from falling into the liquidity trap. Notably, since the dollar amount of official credit $m^{\$}_{t+1}$ is identical in the benign and crisis equilibria, equilibrium selection does not require the international lenders to provide more funds up front.

As a result, developing countries with established ties to an international lender who shows willingness to intervene in the crisis equilibrium can avoid the crisis equilibrium altogether. This channel strengthens the positive effect of marginally increasing international lending as we characterized in Proposition 1. This creates space for international organizations such as the IMF to coordinate with lender and borrower countries and achieve better economic outcomes during global monetary tightening episodes.

5 Conclusion

This paper documents how China's overseas lending mitigates developing countries' exposures to the global financial cycle. In response to U.S. monetary policy tightening, countries that borrow more from China experience (1) less depreciation in their exchange rates and equity prices, (2) less increase in their bond yields and policy rates, and (3) less severe decline in capital inflows, often known as sudden stops. These results are consistent with the view that international official lending during crisis periods can help mitigate financial constraints.

These results also highlight China's growing presence in the global financial system. While

the U.S. monetary policy still has a global impact on financial and monetary outcomes, China's overseas lending affects its transmission to developing countries. As developing countries have heterogeneous degrees of financial ties to China, U.S.' and China's policies interact to create distributional effects across developing countries.

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Appendix

A Proof

A.1 Proposition 1

Proof. Eq. (6) and (7) imply

$$e_{t+1} = \frac{a\beta\theta(\bar{n} + \bar{m}^{\$}\bar{e})\left((a-1)(1+r^{\$}) + a\theta\right) - \bar{e}(1+r^{\$}-\theta a)^2}{a\beta\theta[a\theta\bar{n}(r^{\$}+1) + \bar{m}^{\$}\bar{e}(r^{\$}+1)^2 - m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a)] - \bar{e}\,(1+r^{\$}-\theta a)^2}\bar{e}, \tag{A.1}$$

and

$$b^{\$}_{t+1} = \left(\bar{b}^{\$} + \frac{1}{\beta}\right)\frac{\bar{e}}{e_{t+1}} - \frac{1}{\beta}, \tag{A.2}$$

$$n_{t+1} = a\frac{(1+r^{\$})}{(1+r^{\$})-\theta a}(\bar{n} + \bar{m}^{\$}\bar{e}) - \frac{\theta a\bar{n} + \bar{m}^{\$}(1+r^{\$})\bar{e}}{(1+r^{\$})\bar{e} - \theta a\bar{e}}(1+r^{\$})e_{t+1}. \tag{A.3}$$

Substitute n_{t+1} in Eq. (7) to obtain

$$\begin{aligned} b^{\$}_{t+1}e_{t+1} &= \frac{\theta a}{(1+r^{\$})-\theta a}\left[m^{\$}_{t+1} - \frac{\theta a\bar{n} + \bar{m}^{\$}(1+r^{\$})\bar{e}}{(1+r^{\$})\bar{e} - \theta a\bar{e}}(1+r^{\$})\right]e_{t+1} \\ &\quad + \frac{\theta a^2}{(1+r^{\$})-\theta a}\frac{(1+r^{\$})}{(1+r^{\$})-\theta a}(\bar{n} + \bar{m}^{\$}\bar{e}) \\ &= \frac{\theta a}{(1+r^{\$}-\theta a)^2\bar{e}}\left[m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a) - \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - \theta a\bar{n}(1+r^{\$})\right]e_{t+1} \\ &\quad + \frac{\theta a^2}{(1+r^{\$})-\theta a}\frac{(1+r^{\$})}{(1+r^{\$})-\theta a}(\bar{n} + \bar{m}^{\$}\bar{e}). \end{aligned}$$

i.e.,

$$\begin{aligned} e_{t+1} = \frac{(1+r^{\$}-\theta a)^2\bar{e}}{\theta a}&\left[m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a) - \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - \theta a\bar{n}(1+r^{\$})\right]^{-1} b^{\$}_{t+1}e_{t+1} \\ &- a(1+r^{\$})(\bar{n} + \bar{m}^{\$}\bar{e})\left[m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a) - \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - \theta a\bar{n}(1+r^{\$})\right]^{-1}\bar{e}. \end{aligned}$$

The difference between the slope of the demand curve and that of the supply curve is

$$\begin{aligned}\beta^{diff} &:= -\beta - \frac{(1+r^{\$}-\theta a)^2\bar{e}}{\theta a}\left[m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a) - \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - \theta a\bar{n}(1+r^{\$})\right]^{-1} \\ &= \frac{a\theta\beta[a\theta\bar{n}(1+r^{\$}) + \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a)] - \bar{e}(1+r^{\$}-\theta a)^2}{\theta a\left[m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a) - \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - \theta a\bar{n}(1+r^{\$})\right]}\end{aligned}$$

Note that the slope of the supply curve can be positive or negative, hence there are two cases.

Case 1: the supply curve is downward sloping, i.e.,

$$\left[m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a) - \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - \theta a\bar{n}(1+r^{\$})\right] < 0.$$

$\beta^{diff} > 0$ if and only if

$$a\theta\beta[a\theta\bar{n}(1+r^{\$}) + \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a)] - \bar{e}(1+r^{\$}-\theta a)^2 < 0.$$

Compare with Eq. (A.1). The strict positivity of exchange rate e_{t+1} thus implies

$$a\beta\theta(\bar{n}+\bar{m}^{\$}\bar{e})\left((a-1)(1+r^{\$}) + a\theta\right) - \bar{e}(1+r^{\$}-\theta a)^2 < 0.$$

Since $(1+r^{\$}-\theta a) > 0$, e_{t+1} is decreasing in $m^{\$}_{t+1}$. By Eq. (A.2) and (A.3), $b^{\$}$ is increasing in $m^{\$}_{t+1}$ while n_{t+1} is decreasing in $m^{\$}_{t+1}$.

Case 2: the supply curve is upward sloping, i.e.,

$$\left[m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a) - \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - \theta a\bar{n}(1+r^{\$})\right] > 0.$$

As a result, $\beta^{diff} < 0$ always holds, i.e.,

$$a\theta\beta[a\theta\bar{n}(1+r^{\$}) + \bar{m}^{\$}\bar{e}(1+r^{\$})^2 - m^{\$}_{t+1}\bar{e}(1+r^{\$}-\theta a)] - \bar{e}(1+r^{\$}-\theta a)^2 < 0.$$

Following the same proof in Case 1, we obtain that e_{t+1} is decreasing in $m^{\$}_{t+1}$, $b^{\$}$ is increasing in

$m^{\$}_{t+1}$ and n_{t+1} is decreasing in $m^{\$}_{t+1}$. This concludes the proof. □

A.2 Model Parameter Values

The model uses the following parameter values: the U.S. interest rate $r^{\$} = 5\%$, and the productivity $a = 1.1$. These values imply that firms always find it profitable to expand their production, because output is above the interest expense: $a > 1+r^{\$}$. However, firms are subject to a leverage constraint: $\theta = 50\%$ means that firms can only pledge 50% of their output in the next period as collateral, which limits their borrowing.

In period t, the exchange rate level is $\bar{e} = 1$, firms' net worth is $\bar{n} = 1$, and the quantity of official lending is $\bar{m}^{\$} = 0.2$. These parameter values imply that the equilibrium quantity of firm borrowing in the private credit market is $\bar{b}^{\$}\bar{e} = 1.32$.

The slope coefficient of the liquidity demand curve $\beta = 0.1$. Given the steady-state amount of dollar debt issuance of $\bar{b}^{\$}\bar{e} = 1.32$, this means that a 10% increase in the supply of dollar liquidity weakens the dollar exchange rate by 1.32%.

B Additional Empirical Results

B.1 Use China's Lending Data in 2017

In this section, we report the main empirical tables using the amount of China's overseas lending in 2017, which is the most recent year with available data. The results are similar to those using the main sample.

	(1)	(2)
U.S. Monetary Policy Surprise	-5.38^{**}	-7.48^{**}
	(2.11)	(3.25)
China Debt-to-GDP Ratio (2017)		-0.67
		(0.49)
Interaction		43.69^{*}
		(24.51)
Num. obs.	4345	4345
R^2	0.00	0.00

Table B.1: U.S. Monetary Policy Shock and Foreign Exchange Rate Responses

Notes: The dependent variable is the change in the foreign exchange rate. The explanatory variables are the U.S. monetary policy shock, the ratio of China's overseas lending that each country receives relative to its GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

	(1)	(2)
U.S. Monetary Policy Surprise	-8.51^{**}	-12.10^{***}
	(3.85)	(4.60)
China Debt-to-GDP Ratio (2017)		1.03
		(1.73)
Interaction		128.00^{***}
		(47.01)
Num. obs.	3636	3636
R^2	0.01	0.01

Table B.2: U.S. Monetary Policy Shock and Foreign Equity Price Responses

Notes: The dependent variable is the change in the foreign equity price index in local currency units. The explanatory variables are the U.S. monetary policy shock, the ratio of China's overseas lending that each country receives relative to its GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

	(1)	(2)	(3)	(4)	(5)	(6)
	Treasury Yield		Money Market		Policy Rate	
U.S. Monetary Policy Surprise	6.01^{*}	7.52^{**}	13.29^{***}	17.98^{***}	9.12^{***}	11.25^{***}
	(3.07)	(3.14)	(3.72)	(4.96)	(2.55)	(3.20)
China Debt-to-GDP Ratio (2017)		-0.20		-0.84		-0.18
		(1.23)		(3.23)		(1.60)
Interaction		-33.80^{***}		-98.69^{*}		-47.34^{***}
		(9.09)		(56.09)		(16.96)
Num. obs.	1786	1786	1471	1471	2280	2280
R^2	0.01	0.01	0.02	0.02	0.02	0.02

Table B.3: U.S. Monetary Policy Shock and Foreign Interest Rate Responses

Notes: The dependent variable is the change in the foreign Treasury yield. The explanatory variables are the U.S. monetary policy shock aggregated at the quarterly frequency, the ratio of China's overseas lending relative to local GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

	(1)	(2)	(3)	(4)
	Debt Inflows		Equity Inflows	
U.S. Monetary Policy Surprise	-2.66^{**}	-3.61^{***}	-2.38^{**}	-3.02^{**}
	(0.95)	(0.79)	(0.90)	(1.18)
China Debt-to-GDP Ratio (2017)		0.03		-0.01
		(1.41)		(0.58)
Interaction		16.30^{**}		11.23^{*}
		(7.41)		(5.23)
Num. obs.	869	869	867	867
R^2	0.01	0.01	0.00	0.00

Table B.4: U.S. Monetary Policy Shock and Capital Flow Responses

Notes: The dependent variable is the annual changes in debt and equity inflows/GDP ratio. The explanatory variables are the U.S. monetary policy shock aggregated at the quarterly frequency, the ratio of China's overseas lending relative to local GDP, and their interaction. Driscoll-Kraay standard errors are reported in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.