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# Surges and Instability: The Maturity Shortening Channel*

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## Abstract

Capital inflow surges destabilise the economy through a maturity shortening mechanism. The underlying reason is that firms tend to make their debt redeemable on demand in order to accommodate the potential liquidity needs of global investors, which makes international borrowing endogenously fragile. Based on a theoretical model and empirical evidence at both firm level and macro level, our main findings are threefold. First, corporate debt maturity shortens substantially during surges, especially for firms with foreign bank relationships. Second, surges change the shape of the interest rate term structure and lead to a more flattened yield curve. Third, the probability of a crisis following surges with a flattened yield curve is significantly larger than following surges without one. Our work suggests that debt maturity is key to understanding the consequences of capital inflow bonanzas.



*Keywords: capital inflow surges, corporate maturity structure, systemic financial crisis, term structure*

*JEL classification: F32, F34, F38, F65, G32*



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# 1 Introduction

One of the open questions in the international finance literature is whether policymakers should restrict capital inflow windfalls. The benefits are apparent: foreign capital inflows can ease financial constraints (e.g., Laeven, 2003), promote productivity growth (e.g., Henry, 2003; Varela, 2018), and reduce domestic credit misallocation (e.g., Larrain and Stumpner, 2017). However, the potential costs are ambiguous. Although most capital inflow surges eventually end in crisis (Ghosh, Ostry and Qureshi, 2016), it is unclear why this happens, as the existing literature has not established a consensus on the underlying mechanism. In addition, the 2008 global financial crisis and the global imbalance that preceded it have shown that capital inflow surges could even bring instability to advanced economies. Possible explanations include excessive lending (Caballero, 2016) and asset price bubbles (Calvo, 2012; Aizenman and Jinjarak, 2009). This paper shows that capital inflow surges destabilize the economy through a corporate maturity shortening channel. In addition, we argue that policymakers should pay serious attention to capital inflow bonanzas with a flattening yield curve, which is a strongly informative predictor of future financial crises.

This paper consists of a simple theoretical model and several accompanying empirical studies. The model discusses the firm's optimal choice in an environment where it can choose to borrow from global or local banks in either long-term debt or short-term demandable debt. The fundamental difference between global and local banks is that global banks may receive liquidity shocks arising from cycles in global financial market conditions. Meanwhile, with demandable debt, even before the project matures, banks can demand corporate assets' liquidation value. Our model shows that firms have strong incentives to make debt demandable for international borrowing, as it is more attractive to global banks who face liquidity shocks. In other words, firms choose to issue demandable and short-term debt especially when borrowing from global banks with potential liquidity needs, because the price advantage of demandability (Donaldson and Piacentino, 2020) increases corporate debt capacity. As a result, capital inflow surges with an endogenous shortening on corporate maturity. However, the increased demandability of corporate debt will make domestic firms fragile as a sudden change in global financial market condition can generate debt runs and sudden stops, thus increasing the aggregated economic instability. Our model implies a deep connection between capital inflow bonanzas and economic instability through the endogenous corporate maturity structure.

We conduct empirical exercises at both the firm level and macro level to test whether our model implications actually hold in the data. In line with the literature, throughout our main analysis, surges are defined as episodes when the detrended net capital inflows in real per capita terms are larger than one standard deviation.[1] First, we use a cross-country firm-bank

[1]Detailed explanations of the surge measurement can be found in Section 3.1. Our main findings

matched dataset to examine the effects of surges on the corporate maturity structure and instability. Specifically, using a large sample of over 8 million firm-year observations in 14 European countries from 1994 to 2015, we find that surges are significantly associated with a relative increase in the use of short-term debt, which results in a shorter debt maturity. In particular, the maturity shortening effect is significantly more pronounced for firms that have foreign bank lending relationships, and have higher redeployability and longer time-to-build. Specifically, we employ a difference-in-difference (DID) specification to compare corporate debt maturity structures in the six-year window around the surge, and compare the results for firms with high and low redeployability and time-to-build. We see that firms with foreign bank relationships are significantly more likely to be affected by surges than firms with only domestic bank relationships. Moreover, we examine the impact on firm insolvency probability proxied by Z-score, and we find a significant decrease in soundness for firms with a shortened debt maturity after surges, compared to those with a lengthened maturity. These findings are consistent with the prediction from the model. Furthermore, we discuss the heterogeneous impacts across different categories of credits and capital inflows.

Second, employing a long-run macrohistory dataset covering twelve countries from 1870 to 2016 compiled by Jordà, Schularick and Taylor (2017), we document two important empirical patterns. First, capital inflow surges lead to a flattened yield curve. Second, the combination of surge and flattened yield curve is a strong predictor for future systemic financial crises. Specifically, we use an augmented inverse propensity score weighted (AIPW) estimator to study the average treatment effect (ATE) of a capital inflow surge on the change in short-term interest rate, long-term interest rate, and term spread[2]. In line with the theoretical implication, we find that massive capital inflows result in a significantly positive ATE of short-term rate, which essentially alters the interest rate term structure and causes a flattened yield curve. Then we use a conventional logit model to test whether surges increase the probability of systemic financial crises, and we also make a distinction between surges with and without flattened yield curve. We find that the unconditional probability of crises in Jordà, Schularick and Taylor (2017)'s data sample is 3.4%. Surges alone can increase the crisis likelihood to a level of 11.0%. More importantly, the probability of crises significantly increases to 32.6% if surges are accompanied by a flattened yield curve. Thus, we complete our argument that the maturity shortening is an important underlying channel linking surges and instability.

Our maturity shortening story of international capital flows can date back to Rodrik and Velasco (1999), which also studies the impacts of short-term capital flows on financial instability. They build a model with simultaneous determination of debt maturity and the term

hold when we use alternative definitions of surges based on criteria of two standard deviations, on top 20th percentile inflows, on inflows in GDP ratio terms instead of real per capita terms, and on gross instead of net inflows.

[2]In this paper, we use the terms "term spread", "term structure", and "yield curve" interchangeably.

structure of interest rates to explain that short-term debt leaves borrowing countries vulnerable to sudden shifts in lender expectations. Our paper is in the same spirit as Rodrik and Velasco (1999) in that it links short-term debt with vulnerability and crises, but our work is different in the following ways. First, theoretically, our model shows that international borrowing is associated with a maturity shortening because foreign investors need to bear more liquidity shocks. In contrast, in Rodrik and Velasco (1999)'s model, costs of long-term debt depend on the expected probability of runs in the intermediate stages. However, whether firms actually use excessive short-term debt is unclear in their model because it depends on to what extent lenders can distinguish among investors in the same country and how much local investors internalize their behaviors. Second, we use firm-level data to provide evidence of shortened corporate debt maturity and increased instability, and further examine the heterogeneous effect based on redeployability and time-to-build. In contrast, Rodrik and Velasco (1999) use only country-level data on short-term capital flows and crises to test their theoretical model. Third, using matched firm-bank data, we focus on the role of relationships with foreign banks, which is the key characteristic we use to identify the impacts from foreign credit booms compared to the domestic ones. Another closely related work is Broner, Lorenzoni and Schmukler (2013), where the authors argue that emerging countries tend to borrow in short-term debt because it is cheaper. However, our work here differs from theirs in three aspects. First, they investigate the sovereign debt while we are interested in corporate debt. Second, their explanation is from the asset pricing perspective: emerging countries need to pay a higher risk premium on long-term than on short-term bonds. In contrast, our underlying model is based on the relationship between liquidity needs and short-term debt in banking theory literature. Third, their model implication is that government issues shorter maturities during crises. However, we want to argue that debt maturity shortens during capital inflow surges, and the root of financial crises lies in the booms.

Taken together, our findings have important implications. For policymakers concerned with the impacts of capital inflows on financial stability, our paper shows that the shape of the interest rate term structure is an important indicator to pay attention to. International borrowing is likely to be associated with substantial changes in corporate maturity structure as global investors face an entirely different liquidity condition from local investors. More importantly, future theoretical works attempting to investigate the macro-finance consequences of large capital inflows should consider the interest rate term structure and introduce endogenous debt maturity to the existing small open economy framework à la Uribe and Schmitt-Grohe (2017) and Croce, Jahan-Parvar and Rosen (2020).

**Related literature** Our paper is closely related to three branches of literature. First, our work builds on the literature investigating the relationship between international capital surges and crises. For instance, Reinhart and Reinhart (2008) and Caballero (2016) show that capital inflow surges are significantly associated with a higher likelihood of economic crises, and such outcomes are largely driven by portfolio flows. Similarly, Ghosh, Ostry and Qureshi (2016) document that surges in foreign direct investment (FDI) are less likely to lead economies to crash than other types of large inflow episodes. Although the literature has reached a consensus that large capital inflows are not just scaled-up normal flows, the underlying mechanism is ambiguous. The common hypothesis is that surges are linked to future crises through excessive lending booms. However, the empirical findings are quite inconclusive. Furceri, Guichard and Rusticelli (2012) show that the domestic credit-to-GDP ratio increases by two percentage points in the two years following the beginning of a capital inflow surge while the effect reverses after seven years. Amri, Richey and Willett (2016) document that countries with an independent currency can keep surges from generating credit booms by at least partially sterilizing capital inflows. In addition, Gourinchas, Valdes and Landerretche (2001), Elekdag and Wu (2011), and many other works have also failed to find a robust relationship between inflow surges and credit booms. In contrast, our paper explores the maturity shortening mechanism and uses it to explain the destabilizing effect of surges on the financial system.[3]

Second, our paper is also connected to the global financial cycle literature. Since Rey (2018)'s seminal idea, there has been a growing interest in exploring the impacts of global financial market conditions on local economic performance. For instance, using micro-level data from a single emerging market, Baskaya et al. (2017) document a strong and positive relationship between international capital inflow and local credit supply. Miranda-Agrippino and Rey (2020) show that monetary policy shocks from the U.S. can generate strong co-movements in the international financial variables such as asset price, global credit, capital inflows, and the leverage of financial intermediaries. In addition, many studies (e.g. Jorda et al., 2019; Born et al., 2020*b*) document that U.S. monetary policy is a powerful driver of global risk aversion and hence risk premia in different countries. Finally, Bruno and Shin (2015) have formulated a model linking exchange rates and financial stability through the endogenous build-up of leverage in the banking sector. In their model, currency appreciation can lead to stronger balance sheets for banks, which reduce credit risk and therefore lead to banks' greater risk-taking behaviors. In contrast, our paper contributes to this literature by investigating how booms in global financial conditions bring both capital inflow surges and instability to the local economies.

Third, our paper contributes to the interdisciplinary research between international fi-

[3] There is another branch of literature focusing on international capital flows and credit allocation. Generally, in the existing literature, there are three kinds of credit reallocation effects from international capital flows: capital flowing from tradable to nontradable industries (e.g., Benigno, Converse and Fornaro, 2015), from nonfinancial business to the household sector (e.g., Samarina and Bezemer, 2016), and from low-performing to high-performing firms (e.g., Larrain and Stumpner, 2017).

nance and corporate finance. In terms of theoretical works, Jeanne (2009) shows that due to incomplete contract friction, the prevalence of short-term debt induces the government to choose policies that meet foreign creditors' interests but also makes the country vulnerable to crises arising from coordination failure between creditors. In addition, Tirole (2003) explains the excessive foreign borrowing phenomenon from a dual- and common-agency perspective. Both borrowers and lenders have no incentive to internalize the negative consequences of their private financing for sovereign welfare, thus making a country worse off after globalization. Similarly, using an imperfect contract enforcement channel, Broner and Ventura (2016) argue that the effects of financial globalization are not homogeneous and depend on the level of development, the quality of institutions, and so on. This paper's underlying theory relies on the discussion on the dark side of short-term debt in corporate finance literature. Previous studies in this branch of literature mainly focus on the coordination-based bank runs (e.g. Diamond and Dybvig, 1983; Goldstein and Pauzner, 2005). Some recent works start to investigate why firms or banks have incentives to create demandable short-term debt in the first place. For instance, Donaldson and Piacentino (2020) present a model to show that banks choose to issue demandable debt because of the price effect of demandability. Intuitively speaking, it means that demandable debt is liquid in the secondary market, and therefore it trades at a high price. As a result, it can increase banks' debt capacity in the primary market when issuing demandable debt. However, the money-like characteristic of bank debt is the fundamental reason why it is fragile. In terms of empirical studies, Schmukler and Vesperoni (2006) investigate the impact of capital account liberalization on corporate debt maturity and find that the results are substantially different between firms relying on domestic financing and firms with actual access to the international financial market. Reinhart and Smith (2002), De Gregorio, Edwards and Valdés (2000), and Cárdenas and Barrera (1997) use the policy event in Chile and Colombia in the 1990s to find that capital inflow controls shift the composition toward longer maturity. In addition, by using a firm-bank-sovereign matched database, Kalemli-Ozcan, Laeven and Moreno (2018) find that firms with a higher leverage ratio and shorter debt maturity reduce their investment by a larger magnitude after the euro crisis. Such negative impacts on corporate investment are more substantial if firms rely on banks with higher exposures to sovereign risk. In contrast, our paper attempts to investigate the effects of international capital inflow surges on the corporate maturity structure and shortened debt maturity as a mechanism leading to financial instability.

Finally, our paper is related to several recent studies attempting to re-evaluate the benefits and costs of financial globalization and rethink international financial architecture reform.[4] For instance, using both cross-country macro and sectoral datasets, Furceri, Loungani and Ostry

[4] Erten, Korinek and Ocampo (2021) provide a systemic literature review on capital controls and financial globalization.

(2019) find that financial globalization has contributed to the global decline in the labor share and the rise in inequality. In addition, Larrain (2015) finds that capital account liberalization is likely to increase domestic wage inequality, as capital is more substitutable for unskilled workers and more complementary for skilled workers. Teimouri and Zietz (2018) document that net private capital inflow surges significantly affect the output and employment shares of manufacturing. For middle-income countries, they find that international capital inflows might accelerate the speed of premature deindustrialization. In addition, a recent work done by Shen (2020) discusses an interesting "double adverse selection channel" when firms can borrow from both global and local banks.[5] In contrast, our paper here points out the importance of actively managing capital inflow bonanzas when there is a flattening yield curve, as it is a powerfully informative predictor of future financial crises.

The remainder of the article is structured as follows. Section 2 builds a simple model to derive some testable predictions for the following empirical investigations. Section 3 describes the data sources and variable construction for our empirical analysis. Sections 4 and 5 present and discuss the empirical findings based on firm-level and macro-level data, respectively. Finally, Section 6 concludes.

# 2 A Simple Model

## 2.1 Model setup

Consider a discrete-time infinite-horizon economy with three types of agents: firms, local banks, and global banks. Each agent has a unit-measure continuum of individuals, and all of them are risk-neutral. Each firm $i$ has a profitable investment project that pays off $y_i \geq 1$ when the project matures. However, they need to borrow a fixed amount of money $\bar{B}$ to finance their projects externally. For simplicity, we normalized $\bar{B}$ to be 1. There is no asymmetric information on $y_i$, and it is observable to all agents in this economy. However, the project's exact finishing time is uncertain and arrives with an exogenous intensity $\zeta_i \in (0, 1]$. In other words, we assume that the expected investment horizon for the firm $i$ is set to be $\frac{1}{\zeta_i}$. Before the project matures, firm $i$ can choose to liquidate their projects early with a liquidation ratio of $\frac{l_i}{y_i} \in [0, 1]$, where $l_i$ refers to firm $i$'s asset liquidation value. Accordingly, the key friction in this model is not informational asymmetry, financial constraint, or bank's market power. Instead, our story

[5] More specifically, as global and local banks differ in their specialization in assessing companies' global and local risk exposures, in equilibrium, firms with higher expected return based on global (local) factors relative to local (global) factors are more likely to borrow from global (local) banks. Therefore, Shen (2020) argues that despite all the benefits of international borrowing, it can possibly lead to a problem of double adverse selection: each bank lends to the worst firms in terms of the unobserved risk profile.

in this paper comes from the borrower's asset liquidation costs (or technological illiquidity) and the lender's possible liquidity needs.

In terms of financing choices, each firm can choose one type of debt instrument to borrow from either local banks or global banks. We first explain the difference between local banks and global banks. Then we turn to explain the firm's choices on borrowing instruments. The difference between local banks and global banks is twofold. First, their funding costs are different, i.e., $r_G \neq r_L$. In addition, the global bank's funding cost $r_G$ depends on the global financial market condition $\theta$. Fluctuations in $\theta$ can be interpreted as the global financial cycle. As argued in Rey (2018) and many other related works, there is a global financial cycle in international capital flows and the global bank's activities. More importantly, this cycle mainly comes from some exogenous global factors such as risk, liquidity, monetary policy, and the core economy's growth. Therefore, throughout this paper, we assume all the global market environment can be summarized as $\theta$, and its changes are outside the model and exogenous to the economy we are interested in. Second, we assume that global banks need to bear liquidity shocks while local banks do not.[6] Following the seminal Diamond and Dybvig (1983) paper, we model liquidity shocks as the individual bank's desire to consume at different periods. More specifically, we assume that global bank's liquidity needs might arrive at each period with an intensity of $\chi$. Based on the existing empirical literature on global financial cycles (e.g. Avdjiev et al., 2020; Eickmeier, Gambacorta and Hofmann, 2014), we assume that $\chi$ is a function of global market condition $\theta$. This way of modeling is also consistent with Forbes and Warnock (2012*a*)'s finding that the explanatory power of global volatility is strong for capital flow surges. Throughout the paper, we assume that both $r_G$ and $\chi$ are decreasing in $\theta$, which means that if the global financial condition is good, then global banks have lower funding costs $r_G$ and a smaller probability of liquidity shocks $\chi$. However, there could be a sudden and unexpected deterioration in the global financial market, which could vastly raise the values of $r_G$ and $\chi$.

At the same time, we assume that firms can choose one of two debt instruments to finance their investment. The first instrument is long-term debt, which means that the lenders can only get a payoff when the project matures. Before that time, even if a liquidity shock hits the investors, investors cannot get anything back. The second borrowing instrument is a demandable short-term debt. Similarly, the lenders can get a payoff when the project matures. In addition, with demandable debt, even before the project matures, the investors can demand the liquidation value if they have the liquidity needs. The expected maturity of demandable debt is $min\{\frac{1}{\chi}, \frac{1}{\zeta}\}$ while that of long-term debt is $\frac{1}{\zeta}$. The setup here follows the work of Donaldson and Piacentino (2020). Finally, we assume that firms need to pay a small fixed cost $f$

[6] In addition, we assume that there is only a global liquidity shock in the model simply because we want to simplify the model and highlight the role of the global liquidity condition in international borrowing. In reality, both local and global liquidity conditions matter for corporate financing.

when issuing demandable debt. As we will see, this fixed cost $f$ is not essential to the key mechanism in this paper.[7]

## 2.2 Preliminary analysis

To begin with, we investigate how the value and cost of debt differ when firms choose different investors and borrowing instruments. At any time $t$, if firm $i$ chooses to borrow from local banks with a long-term debt contract, then the value of its debt $v^{L,l}$ can be written as in the following recursive form:

$$v_{i,t}^{L,l} = \zeta_i y_i + \frac{1}{r_L}\left(1-\zeta_i\right) v_{i,t+1}^{L,l} \tag{1}$$

The above equation states that if the project matures at time $t$ and the ex-ante probability is $\zeta_i$, then investors can get $y_i$ in return. If the project does not mature this period, the local banks can get a discounted value of the next period's debt value $v_{i,t+1}^{L,l}$.

At the same time, if firm $i$ choose to borrow from local banks with demandable debt, then the value of such borrowing to local banks $v^{L,d}$ is

$$v_{i,t}^{L,d} = \zeta_i y_i + \frac{1}{r_L}\left(1-\zeta_i\right) v_{i,t+1}^{L,d} \tag{2}$$

These two equations are exactly the same because the local banks do not face any liquidity shocks. Therefore, local banks will never value the option of demandability written in the debt contract.

In contrast, if firm $i$ chooses to borrow from global banks in a long-term debt contract, then the value of its debt $v^{G,l}$ to global investors is

$$v_{i,t}^{G,l} = \zeta_i y_i + \frac{1}{r_G}\left(1-\zeta_i\right)\left(1-\chi\right) v_{i,t+1}^{G,l} \tag{3}$$

Finally, if firm $i$ choose to borrow from global banks with demandable debt, then the value of its borrowing $v^{G,d}$ can be computed as follows

$$v_{i,t}^{G,d} = \zeta_i y_i + \left(1-\zeta_i\right)\chi l_i + \frac{1}{r_G}\left(1-\zeta_i\right)\left(1-\chi\right) v_{i,t+1}^{G,d} \tag{4}$$

As we mentioned before, $r_G$ depends on the global market condition and is a function of $\theta$. Comparing equation (4) to equation (3), we can find that the critical difference between long-term debt and demandable debt for global banks come from the situation where a liquidity shock hits investors while the project has not matured yet. The expected probability of such a case is $\left(1-\zeta_i\right)\chi$, and global banks can get $l_i$ in return if the debt is demandable.

[7] The reason is to pin down the firm's optimal decision uniquely when it is indifferent between issuing long-term or short-term debt.

Following Donaldson and Piacentino (2020), throughout this paper, we focus on the stationary equilibrium where $v_t = v_{t+1}$. Therefore, the stationary debt values can be written as follows:

$$v_i^{j,k} = \begin{cases} \frac{r_L \zeta_i y_i}{r_L - 1 + \zeta_i} & \text{if} \quad j = L; k = l \\ \frac{r_L \zeta_i y_i}{r_L - 1 + \zeta_i} & \text{if} \quad j = L; k = d \\ \frac{r_G \zeta_i y_i}{r_G - (1-\zeta_i)(1-\chi)} & \text{if} \quad j = G; k = l \\ \frac{r_G \zeta_i y_i + r_G (1-\zeta_i)\chi l_i}{r_G - (1-\zeta_i)(1-\chi)} & \text{if} \quad j = G; k = d \end{cases} \tag{5}$$

The maximization problem for all the firms in this economy is simply to choose the best way to minimize their expected financing costs $c_i = \frac{y_i}{v_i} + f$, which can be computed as follows[8]:

$$c_i^{j,k} = \begin{cases} \frac{r_L - 1 + \zeta_i}{r_L \zeta_i} & \text{if} \quad j = L; k = l \\ \frac{r_L - 1 + \zeta_i}{r_L \zeta_i} + f & \text{if} \quad j = L; k = d \\ \frac{r_G - (1-\zeta_i)(1-\chi)}{r_G \zeta_i} & \text{if} \quad j = G; k = l \\ \frac{r_G - (1-\zeta_i)(1-\chi)}{r_G \zeta_i + \frac{r_G (1-\zeta_i)\chi l_i}{y_i}} + f & \text{if} \quad j = G; k = d \end{cases} \tag{6}$$

In summary, all the firms in this economy will choose the cheapest way of financing among these four choices shown in Equation (6), given its individual characteristics on profitability $y_i$, liquidation value $l_i$, expected investment horizon $\frac{1}{\zeta_i}$, and global market condition $\theta$.

## 2.3 Model implications

In this section, we first look at how borrowing from global banks gives firms incentives to shorten their debt maturity. After that, we discuss how results will be different for firms with different asset liquidation values and investment horizons. Finally, we investigate how global market changes bring capital inflow surges, variations in the yield curve's shape, and financial instability. All the following conclusions can be formally proved with some simple calculations. However, we choose to use numerical results so that we can clearly illustrate our main idea.

Throughout the paper, we assume that there are two possible global market conditions. In a good market environment, we assume that the funding cost and probability liquidity shock for global banks are $r_G = 1.1$ and $\chi = 0.2$, respectively. Meanwhile, if the global market environment deteriorates, then we assume $r_G = 1.4$ and $\chi = 0.8$. In contrast, local banks' funding cost is always $r_L = 1.5$ and does not depend on the global financial cycle. The transition matrix

[8]The results are the same if we assume the firm's optimization problem is to maximize its borrowing capacity.

of global market condition $\theta$ is set to be the following:

$$\mathbf{P} = \begin{array}{c} \\ good \\ bad \end{array} \begin{array}{c|cc|} & good & bad \\ \hline & 0.6 & 0.4 \\ & 0.4 & 0.6 \end{array} \tag{7}$$

The transition matrix above indicates that if the current global market condition is good (bad), then the probability of a good (bad) market condition next period is 0.6, and the probability of a bad (good) market condition next period is 0.4.

As mentioned before, we assume that the unit-measure firms have two dimensions of heterogeneity in both $\frac{l}{y} \in [0, 1]$ and $\zeta \in [0.1, 1]$. Here we assume that all the firms are evenly distributed.[9] The tiny fixed cost of issuing demandable debt $f$ is set to be 0.01. Again, different choices of these parameters in the model will only affect our conclusions quantitatively, but not qualitatively.

### 2.3.1 Incentives of maturity shortening for international borrowing

First of all, based on Equation (6), with any small and positive fixed cost $f$, we can clearly see that when firms choose to borrow from local banks, it is never optimal for them to issue demandable debt. The underlying reason is that the local banks do not value the demandability, as here we assume that they do not face any liquidity shocks. Therefore, local banks are indifferent between these two financing instruments. In addition, issuing demandable debt incurs additional fixed costs, which makes it never optimal for firms to do when they decide to borrow from local banks.

Similarly, according to Equation (6), when borrowing from global banks, firms will always issue demandable debt unless their asset liquidation-to-profitability ratios are very small and close to zero. Such a result shows up in the model because we assume that global banks face possible liquidity shocks. Therefore, if firms make their debt demandable and short-term, it will be more attractive to global investors, which reduces the required return of borrowing.

[Figure 1 here]

Finally, whether firms choose to borrow from global banks or local banks will be jointly determined by its liquidation-to-profitability ratio $\frac{l_i}{y_i}$, expected investment horizon $\frac{1}{\zeta_i}$, and the global market condition $\theta$. Figure 1 presents our main result with the numbers we have chosen for the parameters. The main conclusions from these four graphs in Figure 1 are twofold. First, companies' incentives of international borrowing largely depend on the global financial

[9] The exact distribution only matters quantitatively for our finding.

market condition. When the global market condition is good, i.e., global banks have lower funding costs and a smaller probability of receiving liquidity shocks, it is optimal for all the domestic firms to borrow from global banks in short-term debt, regardless of their individual characteristics. During this period, the capital inflows will be massive, and the debt maturity will be shortened substantially. In contrast, when the global market condition is relatively bad, international borrowing costs will only be lower for firms with relatively higher liquidation values and longer investment horizons. As for firms with lower liquidation-to-profitability ratio $\frac{l_i}{y_i}$ and shorter investment horizon $\frac{1}{\zeta_i}$, it is optimal for them to choose to borrow locally in long-term debt. During this period, the magnitude of capital inflows will be relatively low. At the same time, the degree of maturity shortening will also be relatively lower.

The second important conclusion we can draw from Figure 1 is that firm-level characteristics also matter a lot for their endogenous choice on international borrowing and debt maturity. Given the global market condition, firms with higher asset redeployability values and longer expected investment horizons are more likely to borrow in the short term from global investors. The underlying reason behind is that these firms can benefit more by making their debt demandable. One caveat on this conclusion is that we assume firms only want to minimize the financing cost of their investment. As we will see later, using demandable debt will increase the probability of project failure. In reality, companies need to consider the trade-off between the cost and risk of their financing.

Our empirical implications from the model in this part can be summarized as follows.

**Empirical Prediction 1.** *Assuming that global investors face more liquidity shocks, international borrowing is associated with corporate debt maturity shortening. Firms with higher asset liquidation values and longer expected investment horizons are more likely to borrow in short-term debt from global investors.*

### 2.3.2 Surges, yield curve and instability

Now we use this model to investigate the economy-wide impacts of international short-term borrowing. More specifically, we will examine the consequences of different global market conditions on three aspects:

1. the amount of international borrowing, which is computed as the fraction of firms in this economy that chooses to borrow from global banks

2. the shape of interest rate term structure, which is defined to be the average interest rate difference between the long-term debt and the demandable short-term debt, regardless of the money is borrowed from global or local investors

3. economic instability, which is calculated as the fraction of firms liquidating their projects before they mature next period

Figure 2 presents our key results on the macroeconomic impacts of global financial cycles. Our main conclusions are twofold. First, Figure 2 shows that the levels of capital inflows and economic instability are higher in good times than the bad times of the global financial market. In other words, our model implies that the root of economic instability actually builds during the boom phase of the global financial cycle. Second, the build-ups of instability can be inferred from changes in the shape of interest rate term spreads. More and more risky firms with relatively low liquidation values can get financed during capital inflow surges in the model. As global banks face liquidity shocks, all these international borrowings are in the form of short-term debt, which significantly increases the average short-term interest rate while generates no sizable impacts on the long-term end. Therefore, the yield curve becomes flattened during capital inflow surges. Taken together, our two model implications here indicate that policymakers should pay close attention to the shape of the interest rate term structure during massive capital inflows. The role of global capital flows should not be merely considered to equalize the interest rate differences between domestic and international financial markets. As global investors face an entirely different liquidity condition from local investors, international borrowing is likely to be associated with substantial changes in corporate maturity structure and the shape of the yield curve, making the country more exposed to global market conditions and destabilizing the local economy.[10] Therefore, although in our simple model the local production is not synchronized with global conditions, corporate financing is endogenously linked to global financial cycles. The benefits of international borrowing come from the reduction in financing costs. Meanwhile, the costs come from the increasing financial and economic instability in the future.

[Figure 2 here]

Our key empirical predictions on the aggregate effects of surges can be summarized as follows.

**Empirical Prediction 2.** *Global market condition drives capital flows and changes corporate maturity structure, which reflects on changes in the current yield curve's shape and the probability of a crisis in the future.*

[10] The reason why we do not include rollover risk in this paper is that we want to focus on the underlying reason why firms have incentives to issue demandable debt when borrowing internationally. Despite the importance of rollover risk in reality, we abstract it from the model to mainly investigate the origins, instead of consequences, of issuing short-term debt.

# 3 Data and Variables

The rest of the paper examines whether the predictions derived from the model hold in the data. Our empirical investigation consists of two parts: one using firm-level data and the other macro-level data. Before presenting our main empirical findings, we start with explaining our data sources and variable construction in this section.

## 3.1 Surge identification

To identify capital inflow surges, we essentially follow Caballero (2016) and many other related works by defining surges as periods when detrended capital inflows in real per capita terms are one standard deviation above the long-run mean. Specifically, we identity all capital inflow surges using the following steps. To begin with, we deflate the net capital inflows for each country and divide them by the total population to obtain per capita real capital inflows. Then, we use the Hodrick-Prescott filter to obtain the cyclical component of capital inflows and calculate its standard deviations. In this step, we require a minimum time span of ten years and set the smoothing parameter to 6.25 for annual data. Finally, we define a specific period as a surge episode if the de-trended capital inflows are larger than its standard deviation. In terms of data sources, we use the capital flow data from the IMF Financial Flows Analytics (FFA) Database to identify surges for the 14 European countries used in the firm-level analysis,[11] and the current account balance data from the Jordà-Schularick-Taylor Macrohistory Database (Jordà, Schularick and Taylor, 2017) to identify surges for the countries used in the macro-level analysis.

Several things are worth noting in our definition of surges. First, there are some debates in the existing literature on whether we should use net or gross capital inflows to measure surges (Forbes and Warnock, 2012*a*, 2020; Broner et al., 2013). By definition, gross inflows are capital coming to domestic economy by foreign residents and gross outflows are the capital leaving the economy by domestic residents, and net inflows are the difference between gross capital inflows by foreign residents and gross capital outflows by domestic residents. In our baseline empirical investigation, we use net capital flows for three main reasons. First, most existing studies on surges and crisis use net instead of gross capital flows data (e.g., Caballero, 2016; Benigno, Converse and Fornaro, 2015; Reinhart and Reinhart, 2008). We want to bring

[11] In the IMF FFA database, in addition to total capital inflows, we have granular data for five different categories of capital inflows: foreign direct investment (FDI), portfolio equity, portfolio debt, other investment to corporate sector, and other investment to bank sector. We do not use flows of financial derivatives and other investment flows to the official sector because of the small scale of the former and different character of the latter. We can also measure both gross and net inflows for each category. We provide an analysis of debt maturity shortening by categories of surges in Section 4.3. In addition, we present the average scale of different categories of flows during surge and nonsurge episodes in Figure A3 in the appendix.

in the innovative channel of debt maturity shortening based on the same surge measurement. Second, as we will see later, the long-term macro-history dataset used in this paper does not contain gross capital inflows information. Therefore, it will be more consistent if we also use net capital inflows when conducting our firm-level empirical exercise. Third, using net inflow measure is more appropriate here because compared to gross capital flows, changes in the net flows are essential to any movements in the yield curve's shape. However, main conclusions in this paper do not rely on the choice of net or gross capital inflows and we report the findings of gross surges when necessary.

Besides, in our definition, the choice of the one-standard-deviation criterion is relatively *ad hoc*. Therefore, we also use two standard deviations or the top 20th percentile as alternative criteria. Although these changes might lead to fewer observations of surges, our main findings are still robust, and the estimated economic significance becomes even stronger. Finally, in addition to rescaling capital flows by population, we can also express capital flows in terms of the GDP percentage to identify the surges, and the main findings still hold.

Table 1 reports the identified surge years for each country used in this paper. We underline the surge years when we use the two- instead of one-standard-deviation criterion. Besides surge years, we also present the financial crises and sample period for each country.[12] We observe that the occurrence of a crisis is quite plausible within one or two years after a surge.

[Table 1 here]

## 3.2 Firm-level data

Our firm-level investigation aims to examine whether capital inflow surges cause companies to shorten their debt maturity. Our firm-level dataset is obtained from *Orbis*, a database provided by Bureau van Dijk (BvD). Other widely used firm-level databases, such as *Compustat* and *Worldscope*, consist mainly of large listed companies. In contrast, most firms in *Orbis* are small and medium-sized enterprises (SMEs). Many studies, including Kalemli-Ozcan et al. (2015) and Gopinath et al. (2017), have already shown that *Orbis* dataset has a good national coverage, especially for European countries where such reporting is mandated even for small private firms. In our sample dataset, 98% of the firms are SMEs, which are the primary driver of employment and economic growth in these economies.

For this paper, the main advantages of using *Orbis* are threefold. First, SMEs are more informationally opaque and more dependent on external financing. Therefore, these firms are more likely to be domestically financial constrained and thus greatly affected by capital inflow surges. Using an international dataset with a good coverage of SMEs matters a lot in evaluating

[12] Figures A4 and A5 in the appendix show the detailed time series of capital inflows, surges, and crisis for each country.

the effects of surges on economic fundamentals.[13] Second, *Orbis* has detailed information on the corporate capital structure and thus we can distinguish between long-term debt, short-term loans, and other types of short-term debt. Third, with *Orbis*, we can match firms with their related banks and see whether a firm has a foreign bank relationship, which is extremely helpful for our empirical investigations on the underlying mechanism.

We clean the *Orbis* data following the guidelines of Kalemli-Ozcan et al. (2015) and Gopinath et al. (2017), along with some conventional accounting rules. The detailed steps are provided in online appendix Section A1. To ensure cross-country comparability, we express all financial variables in real 2005 dollars.[14] In addition, we drop all the firms in financial sectors and keep only nonfinancial corporations. Our final dataset covers 14 European countries with high data quality, including eight emerging countries in the east (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Poland, Romania, and Ukraine), three slow-growing countries in the south (Italy, Spain, and Portugal), two core economies (France and Germany), and one mature economy in the north (Norway).

To measure the corporate debt maturity structure, we mainly use debt maturity, defined as the share of long-term debt in total debt,[15] and leverages of different maturities, i.e., the short-term debt-to-asset ratio, long-term debt-to-asset ratio, and total debt-to-asset ratio. With the *Orbis* database, our definition of long-term debt is financial debt (loans and credits) to credit institutions and bonds that mature in more than one year, and our definition of short-term debt is the sum of short-term loans, including financial debt to credit institutions and the part of long-term financial debt payable within a year, and current liabilities. We do not include trade credit in our short-term debt measure, as it has very different characteristics from loans and other liabilities. However, we provide a formal analysis on the impacts on trade credit in the extended discussion section.

As our theoretical model shows, the effects of surges hinge on the difference between

[13] Using the European Commission criteria that small enterprises are those with fewer than 50 persons employed, medium-sized enterprises are those with 50-249 persons employed, and large enterprises are those with 250 or more persons employed, the Eurostat statistics show that small and medium-sized enterprises (SMEs) play a crucial role in the economy by accounting for more than 99% of firms, 67% of employment and 56% of value-added in the EU 28 countries.

[14] We first convert all nominal financial variables into nominal official local currencies and then deflate all financial variables using the country-level GDP deflator on the base year 2005 obtained from the WDI. Then, we divide the data by the exchange rate of the corresponding country's official currency with the US dollar in the year 2005.

[15] In the existing literature, there are two different approaches to measuring debt maturity: the first is to use the actual years to maturity of the debt issuance, and the second is to use the information from the corporate balance sheet and calculate the share of total debt that matures in the long term. As we do not observe the actual years of debt maturity in the *Orbis* database, we follow the second approach and use the ratio of long-term debt in total debt as the proxy for debt maturity. This measure is also widely used in the literature (Barclay, Marx and Smith Jr, 2003; Brockman, Martin and Unlu, 2010; Fan, Titman and Twite, 2012; Kim and Kung, 2016).

global and local banks. Thus, it is important to have information on firms' lending relationship with foreign banks and domestic banks so that we can investigate the impacts of surges on corporate debt maturity depending on the precise firm-bank relationship. This information is available in *Orbis* because it provides the names of main banks that the firm has borrowed from, which enable us to match firm-level data in *Orbis* to bank-level data in either *Bankscope* or *BankFocus*.[16]

However, two issues are worth noting. First, unlike firm-level financial variables, which were compiled from different vintages of *Orbis*, we have only historical bank information by the end of the last year of our sample for each firm, so the firm-bank link is time-invariant. Second, bank names are the only information available, and there are no consistent identification codes for us to link different datasets. More importantly, the reported bank names in *Orbis* are not necessarily the same as those in *Bankscope* or the more up-to-date *BankFocus* database.

The first issue is less concerning, as many studies using the same database (e.g., Giannetti and Ongena, 2012; Kalemli-Ozcan, Laeven and Moreno, 2018) have shown that bank-firm relationships are sticky and do not vary greatly over time.[17] Therefore, most of the existing literature also uses these time-invariant firm-bank relationships. The second issue is more problematic and requires a great deal of manual work. More specifically, our matching process consists of three steps. First, we drop all the most common words in bank names, such as "Bank", "Corporation", "LTD", and "Group", to reduce these unnecessary distractions. Second, we use the fuzzy match program (*matchit*) in Stata to match the bank names in two different databases with the *bigram* approach and log weights. Finally, we manually review all the matching results to ensure that they are paired correctly. If not, we go through all the remaining unpaired bank names one by one manually. We mainly use the *Bankscope* dataset for bank name matches, but *BankFocus* is also used when we cannot find a successful match in *Bankscope*. Our final matching rate is quite high: 97% of the bank names reported in *Orbis* are successfully matched to their corresponding entries in the *Bankscope* or *BankFocus* database.

With the firm-bank matched dataset, the variable of greatest interest to us is whether one of the firm's main banks is a foreign bank. To identify firm's foreign bank relationships, we extract the country codes for firms and their related banks using the first two letters in the firm identification code and the bank identification code, which is based on the firms' ultimate ownership, and classify banks as foreign banks if their country codes are different from

[16] For most firms in Bulgaria, Czech Republic, Italy, Norway, Romania and Ukraine, the reported bank information is either inadequate or unavailable. Therefore, we do not include these countries in our firm-bank analysis.

[17] This fact does not contradict our previous model. In the model, we simplify the firm's optimal decision by assuming they need to make a binary choice. However, in reality, companies always use different ways to finance their investment. Therefore, our simple model shows companies' incentives to use more short-term debt during capital inflow surges.

those of the related firms. Then, we generate a time-invariant dummy to indicate that the firm has a foreign bank relationship if at least one of its associated banks is a foreign bank. The lower availability of the foreign bank variables results in fewer observations for the firm-bank matched data in the later analysis.

For other firm-level controls, we use the following variables that are considered important determinants of the corporate capital structure: firm size, defined as the natural logarithm of total assets; the sales growth rate, calculated as the difference in log sales between the current and previous year; cash flow, defined as the sum of current profits and depreciation divided by total assets; tangibility, defined as the ratio of tangible fixed assets to total assets; and the SA index based on firm size and age, as a proxy of financial constraints (Hadlock and Pierce, 2010).

[Table 2 here]

Panel A in Table 2 provides summary statistics for the firm-level variables used in this paper.[18] It shows that on average, 37.64% of the total debt is in long term. The average short- and long-term leverage levels are 0.32 and 0.20, respectively, and average total leverage is 0.51. For firm-bank relationship, on average, each firm has 1.8 reported main banks and approximately 4.5% of firms in our sample have a lending relationship with foreign banks. We also report the summary statistics of key variables of firm debt maturity structure and foreign bank relationships country by country in appendix Table A2, which shows that there are rich variations in these key variables across different countries.[19] A list of number of firms and observations of each country is presented in the appendix Table A3.

## 3.3 Macro-level data

We use macro-level data to verify our model prediction that surges lead to larger instability through a flattened yield curve. In order to achieve such goal, we need to conduct two sets of empirical exercises. First, we need to test whether surges lead to a decrease in term spread. Second, we should examine whether the changes in yield curve arising from capital inflow surges will increase economic instability. Our main data source here is the Jordà-Schularick-Taylor (JST) Macrohistory Database (Jordà, Schularick and Taylor, 2017). We choose this database mainly because it is a cross-country dataset covering a very long period and providing macro

[18] A detailed description of variable definitions is provided in the appendix Table A1.

[19] For instance, the average debt maturity proxied by the fraction of long-term debt lies between 32.1% in France and 63.6% in Latvia, and the short-term leverage is as high as 0.37 in Spain and as low as 0.13 in Latvia. Hungarian firms have the highest number of main banks, while most firms in France and Poland only have one main bank relationship in our sample. For foreign bank reliance, firms in Portugal almost have zero reliance on foreign banks (all domestic banks), while Latvian firms have the highest degree of foreign bank reliance.

and financial variables for a group of countries from 1870 to 2016. Since financial crises are relatively rare events, such long-term dataset with reasonable country coverage will be extremely helpful. In addition, the JST database contains all the three key variables that we need for our empirical investigation, which are surges, term spread, and systemic financial crisis.

When using this long-term macro-history database, we adopt the same approach as we did in the firm-level analysis to identify surges: we define surges when real net inflows per capita are one standard deviation above the trend.[20] As we use the opposite of current account balance to capture capital inflows, therefore, only net inflow surges can be identified here. For term spread, we use the difference between the long-term interest rate and the short-term interest rate. The main indicator of short-term interest rates is three-month interbank rate and that of long-term interest rates is ten-year government bond yield. The tenors of the two interest rates sometimes differ across countries and periods due to data availability, though the database aims for within-country consistency to the greatest extent possible. Thus, we cautiously use the change in term spread in the later analysis, as we believe that the annual change in the difference between long-term and short-term interest rates within a country will be less problematic in terms of consistency. Moreover, we see these two rates bear little default risk and their difference is a good proxy of term spread of corporate borrowing cost, as Neumeyer and Perri (2005) suggest a very strong co-movement between interest rates on government debt and those of the private sector. For systemic financial crises, we simply use the dummy variable based on the JST definition. The authors define financial crises as "events during which a country's banking sector experiences bank runs, sharp increases in default rates accompanied by large losses of capital that result in public intervention, bankruptcy, or forced merger of financial institutions". For other control variables, we use GDP per capita, GDP growth rate, trade openness, pegged exchange rate dummy, and depreciation.

Panel B of Table 2 presents the summary statistics of all the variables used in the macro-level analysis based on JST dataset. It shows that the probabilities of surges and systemic financial crises during the long-run history of 1870-2016 are 9.9% and 3.4%, respectively. Besides, the average term spread is 0.79 percentage points. Finally, in Figure A5 in the online appendix, we present our identified results of surges and financial crises for each country with this macrohistory data.

# 4 Firm-level Empirical Evidence

We first use the firm-level dataset to test our model predictions. Specifically, we examine whether surges are associated with shortened debt maturity, whether this effect is stronger for firms with higher asset liquidation values and longer expected investment horizon, and

[20] To obtain the net inflow per capita using the JST database, we first deflate the current account amount using the CPI (1990=100) and then divide by the population.

whether surges lead to higher instability through the debt maturity shortening channel. We use the compiled Orbis firm-bank matched data in this section.

## 4.1 Surges and shortened corporate debt maturity

In order to investigate the causal relationship between capital inflow surges and corporate debt maturity, we adopt a difference-in-difference (DID) empirical strategy. More specifically, we exploit the matched firm-bank dataset and the heterogeneous impacts of surges on firms with different foreign bank relationships. According to our theoretical model, debt maturity shortening takes place when firms borrow from global banks during surges. Thus, in the data, we expect that firms having a lending relationship with foreign banks are more affected by surges and they will show a more shortened debt maturity. In addition, the before- and after- comparison and event study approach is conventionally used in the surge literature (e.g., Benigno, Converse and Fornaro, 2015; Reinhart and Reinhart, 2008). Combining the firm-level foreign bank characteristics and the before-after surge comparison, the DID specification fits well in our setting.

Our empirical model specification can be written as in the following equation:

$$Debt_{ijct} = \alpha + \beta Post\ Surge_{ct} \times Foreign\ Bank_i + \Gamma X_{ijct} + \gamma_i + \gamma_{jct} + \epsilon_{ijct} \tag{8}$$

where $i, j, c$, and $t$ indicate the firm, sector, country, and year, respectively. $Debt_{ijct}$ is one of the four variables representing the firm's debt maturity structure: the share of long-term debt in total debt (*Maturity*), short-term leverage (*Short*), long-term leverage (*Long*), or total leverage (*Total*). The last three variables are calculated as the debt-to-asset ratios. We use not only the *Maturity* variable but also short- and long-term leverage to test whether the shortening in maturity is driven by the increased use of short-term borrowing, instead of by a decreased use of long-term debt but no significant change in short-term debt. $Post\ Surge_{ct}$ is a dummy indicating a post-surge period if equal to one. In our baseline empirical analysis, we use surge years identified based on the one-standard-deviation-above-trend method and net capital inflow data in real per capita terms. However, adopting alternative definitions of surges do not alter our main conclusions. $Foreign\ Bank_i$ is a dummy variable indicating that firms are related to foreign banks if equal to one. $X_{ijct}$ is an array of firm-level control variables that are found to be related to the corporate maturity structure in the literature, including firm size, sales growth, cash flow, tangibility, and a financial constraint indicator (the SA index). We also include firm fixed effects $\gamma_i$ and sector×country×year fixed effects $\gamma_{jct}$ in the estimation to saturate unobserved factors in these levels, where the sector is classified according to four-digit NACE code. Throughout all the firm-level estimations, we cluster the standard error at both the firm and country-year level.

The time window for our DID estimation are seven years centered around the surge year, i.e., three years before and three years after the surge. In addition, we use only surge episodes that are not followed by another surge episode within three years or preceded by one within three years. If there are multiple consecutive surges for the same country, we set the surge year as the earliest one and treat them as one surge episode.[21] By doing so, we ensure a more clearly classified surge event shock, though at the cost of losing a large number of observations. In summary, our estimates in this DID specification assess the difference in the three-year average of the maturity structure variables between post-surge and before-surge periods.

[Table 3 here]

We present our main results of this simple DID investigation in Table 3. The key message from this table is that firms do shorten their debt maturity after capital inflow surges, and it is mainly through the increasing use of short-term debt. In the first two columns in Table 3, the estimated coefficients $\beta$ are both negative and significant at the 95% confidence level. This result reveals that compared to firms having domestic bank relationships only, firms having foreign banks will reduce their debt maturities more by 0.83 (without controls) or 0.62 (with controls) percentage points after capital inflow surges. In addition, according to our estimation results in columns (3) - (8), the decrease in debt maturity is mainly driven by the increasing use of short-term debt. For instance, the estimated result in column (6) tells that after surges, the difference in long-term debt leverage between firms with foreign bank relationships and those without is only 0.004. In contrast, column (4) shows that the relative increase in the short-term leverage after surges is 0.014, which is more than threefold the long-term debt leverage increase.

[21]For instance, as shown in Table 1, foreign capital inflows surged in 2003, 2006, 2009, and 2011 in France, and in 2006, 2007, and 2008 in Estonia; thus, *Post Surge*$_{ct}$ in the case of France is 1 for 2003-2006 and 0 for 2000-2002 and in the case of Estonia is 1 for 2006-2009 and 0 for 2003-2005. As a result, we use the following surges in the DID specification: Czech Republic (surge years: 1995 and 2002; pre-surge years: 1994 and 1999-2001; post-surge years: 1996-1998 and 2003-2005), Estonia (surge year: 2006; pre-surge years: 2003-2005; post-surge years: 2007-2009), France (surge year: 2003; pre-surge years: 2000-2002; post-surge years: 2004-2006), Germany (surge year: 2000; pre-surge years: 1997-1999; post-surge years: 2001-2003), Hungary (surge year: 2008; pre-sure years: 2005-2007; post-surge years: 2009-2011), Italy (surge year: 2010; pre-surge years: 2007-2009; post-sure years: 2011-2013), Latvia (surge year: 2006; pre-surge years: 2003-2005; post-surge years: 2007-2009), Portugal (surge year: 2008; pre-sure years: 2005-2007; post-surge years: 2009-2011), Spain (surge years: 1996, 2007; pre-surge years: 1994-1995 and 2004-2006; post-surge years: 1997-1999 and 2008-2010), and Ukraine (surge years: 2005, 2013; pre-surge years: 2002-2004 and 2010-2012; post-surge years: 2006-2008 and 2014-2015). Some early or late years, e.g., 1993 or 2016, are not included because of the start and end of sample period. Also, the results shown below only include countries that have experienced surges in our sample; countries that did not see a surge (e.g., Bulgaria, Norway, Poland, and Romania have no surges of total net inflows) are excluded. However, including these countries by assigning zero to *Post Surge*$_{ct}$ does not significantly change the estimates in both magnitudes and statistical significance, if not making them stronger.

Next, we extend the simple DID specification into a dynamic one so that we can better understand the whole picture of how surges impact corporate debt maturity. Our strategy here is to investigate the change in corporate maturity structure in each of the three years before and each of the three years after surges, in relative to that in the surge year. More specifically, we construct a variable named "distance to surge", which ranges from $-3$ to $+3$ by definition. In addition, we omit the surge year to estimate the relative effects in the $k_{th}, k \in \{-3, -2, -1, +1, +2, +3\}$ year to surge. In summary, we estimate the following dynamic DID specification:

$$Debt_{ijct} = \alpha + \Sigma_{k=-3}^{-1} \beta^k k \textit{ Year to Surge}_{ct} \times \textit{Foreign Bank}_i + \Sigma_{k=+1}^{+3} \beta^k k \textit{ Year to Surge}_{ct} \times \textit{Foreign Bank}_i + \Gamma X_{ijct} + \gamma_i + \gamma_{jct} + \epsilon_{ijct} \quad (9)$$

where the dummy indicating the surge year ($0 \textit{ Year to Surge}_{ct}$) is absorbed by construction. With equation (9), the coefficients $\beta^k$ can be interpreted as the effects on the firm maturity structure relative to the surge year. Specifically, the estimated coefficients $\beta^{-3}$, $\beta^{-2}$, and $\beta^{-1}$ are the effects on firms that have foreign bank relationships in relative to those that do not in the three years, two years, and one year before the surge compared with the surge year, and $\beta^{+1}$, $\beta^{+2}$, and $\beta^{+3}$ are the relative effects one, two, and three years after the surge in comparison to the surge year.

[Table 4 here]

Table 4 shows the results from our dynamic DID specification. To begin with, there are no pre-trends in the data. Specifically, we can see that the differences in debt maturity, short- and long-term leverage, and total leverage between firms with and without foreign bank relationships are all insignificant in each of the three years before the surge in comparison to the surge year. This finding is crucial as it validates our DID model specification. Moreover, it is also consistent with some existing studies suggesting that external factors, or push factors in advanced economies instead of pull factors in recipient countries, are the main driving forces of surges (Reinhart and Reinhart, 2008; Forbes and Warnock, 2012*a*; Fratzscher, 2012).[22] At the same time, the estimated coefficients on debt maturity and short-term debt and total leverage become significant for each of the three years after the surge, while those on long-term debt leverage remain insignificant. For instance, based on the results shown in column (2), the relative debt maturity decreases by the largest scale (1.26 percentage points) in the first year after the surge and then stabilizes in the second and third post-surge years. For short-term and total leverage, the impact is stable and persistent in the three years after surge. We visualize the

[22]We show this finding again in Section 5.1 where we use a probit model to estimate the probability of surges based on global factors and domestic factors.

dynamic estimates shown in the even columns in Figure 3, and we can clearly observe that capital inflow surges induce a shortened corporate debt maturity structure, particularly for firms with foreign bank relationships.

[Figure 3 here]

According to the empirical prediction 1, our model indicates that maturity shortening incentives are stronger for firms with higher asset liquidation values and longer expected investment horizons. To test whether this prediction actually holds in the data, we conduct similar empirical investigations but employ the sector-level redeployability and time-to-build measures as proxies for firms' asset liquidation value and investment horizons, respectively.

Specifically, we adopt the redeployability measure from Kim and Kung (2016), which use the Bureau of Economic Analysis (BEA) capital flow table that breaks down capital expenditures into a variety of asset categories for a broad cross-section of industries to construct a variable indicating the extent to which assets have alternative uses. A higher redeployability value indicates that firms' assets in this sector are used by more firms in the economy. Also, we adopt the time-to-build measurement from Koeva (2000). Koeva (2000) collects newspaper and trade journal articles for a sample of Compustat firms and analyzes the number of months which elapses between the decision to build a plant and the end of construction in different sectors. A higher time-to-build value indicates a longer investment horizons. The construction of both measurements is based on US data and we apply them to the European firms in our sample by matching the sectors.[23] We divide our full sample dataset into low- and high-redeployability or time-to-build subsamples based on the median value and then re-estimate the dynamic DID specification for each subsample.

We present the results in Figures 4 and 5.[24] Again, we find the maturity shortening effect in all the subsamples. In addition, the impacts arising from international capital surges are stronger in sectors with higher redeployability and longer time-to-build. Specifically, our esimates show that in the post-surge years, for firms with higher redeployability and higher time-to-build values, the average magnitudes of relative decrease in debt maturity are 36% and 26% larger than those with relative low values. Such heterogeneous impacts of surge on different firms are consistent with our model prediction. More importantly, our empirical exercise here implies that surges do exacerbate corporate maturity mismacth problem. As we will show in the next section, it will also bring instability to the corporate sector.

[23] This practice is consistent with a broad literature treating the external finance dependence constructed from US data as a sector-level characteristic and applying it to other countries (Rajan and Zingales, 1998).

[24] The full estimates on exploiting industry heterogeneity on redeployability and time-to-build are reported in the appendix in Table A4 and A5, respectively.

[Figure 4 here]

[Figure 5 here]

## 4.2 Surges and instability at the firm level

In this section we use firm-level dataset to test the argument that the maturity shortening arising from surges can lead to more economic instability. Specifically, we investigate whether surges could fundamentally change firm health by looking at the Z-score indicator.

We revise the simple DID specification in equation (8) by changing the dependent variable to $Instability_{ijct}$, which is a firm-level instability measurement, and estimate it separately for firms that shorten or lengthen debt maturity after surges. For each firm, we compute its average debt maturity in the three years before the surge ($Maturity_i^{before}$) and in the three years after the surge ($Maturity_i^{after}$), and then obtain the difference ($Maturity_i^{after} - Maturity_i^{before}$). We assign the firm to the maturity-shortened subsample if the difference is negative, otherwise it is assigned to the maturity-lengthened subsample.

$$Instability_{ijct} = \alpha + \beta Post\ Surge_{ct} \times Foreign\ Bank_i + \Gamma X_{ijct} + \gamma_i + \gamma_{jct} + \epsilon_{ijct} \tag{10}$$

In equation (10), $Instability_{ijct}$ is a variable capturing firm's instability and we use Z-score as a proxy. Z-score is calculated as a function of five financial ratios based on the seminal papers by Altman (1968) and Altman (1983).[25] It is widely used in the literature as an insolvency predictor. We use its natural logarithm form because of its high skewness. A higher Z-score indicate more soundness and less likely of insolvency of the firm.

Table 5 presents the results. The first two columns show that instability tend to increase for firms with foreign bank relationships after the surges, as there is a significant decrease in their Z-score. Moreover, comparing columns (3)-(4) with columns (5)-(6), we find that the increased instability arises only from the firms which shortened debt maturity after surges. In other words, if firms lengthen debt maturity, then there will be no significant increase in instability. These results are strong evidence that surges increase instability through debt maturity shortening.

[Table 5 here]

## 4.3 Further discussion

The above results establish our key findings that surges are associated with increased instability through the debt maturity shortening channel. In this section, we provide further discus-

[25]For private firms, $Z\text{-}score = 0.717 \times \frac{Working\ Capital}{Assets} + 0.847 \times \frac{Retained\ Earning}{Assets} + 3.107 \times \frac{EBIT}{Assets} + 0.420 \times \frac{Book\ Value\ of\ Equity}{Book\ Value\ of\ Liability} + 0.998 \times \frac{Sales}{Assets}$.

sion on the heterogeneous impacts of different categories of surges on different firm credits.

Specifically, we distinguish between five types of capital inflow surges: foreign direct investment (FDI), portfolio equity, portfolio debt, other investment to corporate sector, and other investment to bank sector. This detailed categorical capital flow data is also obtained from the IMF Financial Flows Analytics Database, and we apply the same methodology of identifying surges as we did before. Moreover, we distinguish between four kinds of firm credits: long-term debt, short-term loan, other short-term debt, and trade credit. We express all of them as the ratio to total assets. As explained in Section 3, our measure of short-term debt is the sum of short-term loan and other short-term debt. Trade credit is not included in our definition of (short-term) debt.

We repeat our baseline regression function (8). We use each of the five categories of capital inflow surges to construct our main independent variable $\textit{Post Surge}_{ct}$, and adopt each of the four different measures of firm credits as our dependent variable $\textit{Debt}_{ijct}$. This approach gives us twenty different regressions to evaluate the heterogeneous impacts of different types of surges. We summarize all the twenty estimated coefficients $\beta$ of the interaction term $\textit{Post Surge}_{ct} \times$ *D(Has Foreign Bank)* in Table 6.

[Table 6 here]

The key message from Table 6 is that we do observe different impacts when surges arise from different categories of capital inflows. Our main findings are threefold. First, debt-creating inflow surges have stronger impact on raising companies' demand for short-term borrowing. Compared to non-debt-creating flows such as FDI and portfolio equity, which are usually long-term financing with aims at gaining ownership, debt-creating surges such as portfolio debt and other investment to corporate sector have insignificant impacts on long-term debt with respect to firms' foreign bank lending relationship, but they significantly increase both short-term loan and other short-term debt if the firm has a foreign bank. Our finding here is consistent with Forbes and Warnock (2012*b*) on the different natures of debt- and equity-led capital flows.

Second, the substantial increase in short-term borrowing is mainly from the increase in other current liabilities. In contrast, the impacts of surges on short-term loan are very limited. Surges in the other investment to bank sector is associated with the largest increase in the other short-term debt (0.028) but with a significant decrease in short-term loans (-0.007). Meanwhile, surges in the other investment to corporate sector is associated with the largest increase in the use of short-term loans (0.003). Our interpretation on these findings is that surges in the bank sector are largely composed of capital flows to domestic banks, while surges in the corporate sectors are largely composed of capital directly flowing to private sectors and plausibly channeled by foreign banks. Thus, the impact of surges to the banking sector on short-term loan is likely stronger for firms with only domestic bank relationships, as the funding is channeled through domestic banks; on the other hand, the impact of surges to the corporate sector on loans is likely to be limited for firms with only domestic banks, as this funding needs to be channeled through foreign banks.

Finally, based on Table 6, we can see that the impacts of surges on trade credit are quite different from those on corporate debt. For most cases, the estimated coefficient is significantly negative, which means that capital inflow surges reduce the firm's use of trade credits. This result is in fact consistent with our model implication that international borrowing likely takes the form of liquid demandable debt. In practice, trade credit is usually considered as the easiest and most important source of short-term finance for firms. Therefore, the negative coefficients represent the fact that firms tend to substitute their use of trade credit with international borrowing during these surge episodes.

# 5 Macro-level Empirical Evidence

Now we turn to macro-level data to validate our prediction that capital inflow surges lead to a more flattened yield curve and higher probability of crisis. First, we show that capital inflow surges will flatten the yield curve. We find that surges significantly increase short-term interest rates but only generate a very small or insignificant increase in long-term interest rate, thus reduce the magnitude of term spread. Second, we show that the probability of having a future financial crisis is significantly higher during surges with a flattened yield curve. This finding provides some complementary evidence for the existing surges and crisis literature. As mentioned before, we mainly use the Jordà, Schularick and Taylor (2017)'s long-run macrohistory data, which includes all the key variables used here, including net capital inflow surges, short-term and long-term interest rates, and financial crisis indicators. The JST database covers the long-run history from 1870 to 2016. After excluding US, UK, Japan, and Germany, i.e., the countries that are likely to drive the global financial cycle, we have 12 countries in the the macro-level analysis.[26] In order to show the robustness of our empirical findings, we also conduct a similar empirical investigation with an alternative dataset with broader country coverage but shorter time span.

## 5.1 Surges and term spreads

We start with explaining the methodology used for empirically investigating the impact of surges on term spread. We interpret surge as a treatment and adopt a matching-based, aug-

[26]The twelve countries are Australia, Belgium, Denmark, Finland, France, Italy, Netherlands, Norway, Portugal, Spain, Sweden, and Switzerland. Canada is not included because its data on housing returns is missing. Besides, we keep Germany in the firm-level analysis because its global economic impact is smaller in the post-1990s period than that in the long-run history of 1870-2016.

mented inverse propensity score weighted (AIPW) estimator (Rosenbaum and Rubin, 1983) to estimate the average treatment effect (ATE) of surges on the term spread. More specifically, first, we estimate a probit model to explain the likelihood for a country to experience surges, and use the predicted value as the propensity scores. Next, based on the propensity scores of surges, we calculate the AIPW estimates combined with local projections (Jordà, 2005) to show the dynamic effects of surges on term spread. Such AIPW estimator is double-robust so long as the regression for the outcome is properly specified *or* the propensity score is properly specified (Imbens, 2004). It has not been widely used in macroeconomic studies until recently. For instance, Jordà and Taylor (2016) and Born et al. (2020*a*) use the AIPW estimator to examine the impacts of fiscal austerity and shocks to credit spread. The details of our estimation process are described as follows.

To begin with, we estimate the propensity score of experiencing a surge conditional on a group of covariates. Specifically, we estimate:

$$Pr(D_{i,t} = 1 | X_{i,t}) = G(\beta X_{i,t}) \tag{11}$$

where $D_{i,t}$ is a dummy that takes value of one if country $i$ is experiencing a capital inflow surge at time $t$, $X_{i,t}$ is a vector of determinants of surges, and $\beta$ is the corresponding coefficients estimated from the cumulative distribution function (CDF) of the standard normal distribution denoted by $G$. Based on the existing literature on potential determinants of surges (Reinhart and Reinhart, 2008; Forbes and Warnock, 2012*a*; Avdjiev et al., 2020), in $X_{i,t}$ we include the contemporaneous, one period lagged term, and two period lagged term of global factors, i.e., global short-term interest rates, liquidity, and growth measured by averaging that of the US, UK, Japan and Germany, and domestic factors, i.e., real GDP growth, exchange rate depreciation, exchange rate regime of pegging or floating, and housing returns. We report the details of the estimation in this step in the appendix Table A6. Using the area under the receiver operating characteristic (AUROC) statistics to judge the fitness of model, we obtain a value of 0.742 with a standard error of 0.022, suggesting a good performance of the model. We obtain the propensity score of surges ($\hat{p}_t$) using the predicted value from the model.

Next, with the propensity score at hand, we can compute the AIPW estimator. Following Jordà and Taylor (2016) and Born et al. (2020*a*), we use the following equation for calculating the AIPW estimator:

$$ATE^h_{AIPW} = \frac{1}{N}\Sigma_t \Big\{ \Big[ \frac{D_t(y_{t+h} - y_{t-1})}{\hat{p}_t} - \frac{(1-D_t)(y_{t+h} - y_{t-1})}{(1-\hat{p}_t)} \Big] - \frac{(D_t - \hat{p}_t)}{\hat{p}_t(1-\hat{p}_t)} \left[ (1-\hat{p}_t) m^h_1(X) + \hat{p}_t m^h_0(X) \right] \Big\} \tag{12}$$

We omit country index $i$ for simplicity of notations. This AIPW estimator enables us to provide an estimate of the average treatment effect (ATE) of the treatment ($D_t$) on the change in dependent variable ($y$) at each horizon $h$. For the dependent variable, we are mostly interested in the change in term spread ($y_{t+h} - y_{t-1}$), but we also show the results of the different changes in short-term and long-term interest rates. As we expect the surges in the current period can affect the current term structure, we set the reference period to time $t - 1$ and the horizon $h$ starts from 0. We show the impact till eight years after the surges. $\hat{p}_t$ is the estimated propensity score of surges by estimating equation (11) and it is used in the denominator in the first term to achieve a re-randomization of the occurrence of surges and nonsurges. The second term is a regression adjustment component, where $m_1^h(X)$ and $m_0^h(X)$ is the estimated conditional mean (conditional on the set of controls $X$ as described above) of $y_{t+h} - y_{t-1}$ in treated and control subpopulation based on regression. We adopt a general form of regression and do not impose the constraint that the regression coefficients for the two subpopulation are equal. Lastly, we rely on a sandwich estimator of the variance (Lunceford and Davidian, 2004) to compute clustered robust standard errors.

We report the accumulative impulse responses on the changes in term spread, short-term rates, and long-term rates in Figure 6.[27] We observe that surges do cause an average treatment effect of a reduction in term spread and an increase in short-term interest rate, and this price effect is the strongest one year after the surge. Specifically, term spread is significantly lower than the pre-surge level by 0.45 and 0.49 percentage points in the surge year and one year after, then the effect fades away after two years. Moreover, the flattening of term spread comes mainly from a significant increase in the short-term rates: the short-term rate increases by 0.71 and 0.84 percentage points at impact and one year after surge, and then gradually returns to pre-surge level. In comparison, the long-term rate does not show significant change.

[Figure 6 here]

Furthermore, we also make a distinction between good and bad global market conditions, and exploit the different impacts of them. More specifically, we define a period of good global market when the change in the global short-term rate is non-positive and the global liquidity growth is positive, indicating a loose monetary environment in the core economies.[28] Figure 7 demonstrates that the impact of decreased term spread is more pronounced when the global market condition is good, as the reduction in term spread reaches over 0.5 percentage points in the first two years and the increase in the short-term rate is almost 1 percentage points and remains significant at 0.56 percentage points in the third year after the surge. In contrast, in the

[27] We show the results using propensity score without truncation, as Jordà and Taylor (2016) show that a truncation of propensity score is not necessary for the AIPW estimator, and we indeed find that the results using the non-truncated and truncated propensity scores (at 0.1 and 0.9) do not show much difference.

[28] We use the change instead of level of global short-term rate and liquidity in this definition to mitigate the influence of time trends.

bad global market condition, the impact is much smaller, and there is no significant change in the term spread compared to the pre-surge. In addition, we provide the results distinguishing between good and bad global market conditions using the post World War II sample (1946-2016) in the appendix Figure A6, which document similar findings.

[Figure 7 here]

To sum up, in this section we establish the results that capital inflow surges lead to an increase in short-term interest rates, both in the level and in relative terms to long-term interest rate, thus a reduced term spread. Moreover, these effects are especially stronger when the global market condition is good. These findings confirm our model prediction that surges induce more demand of short-term borrowing and push the yield curve to flatten.

Possible concerns regarding this part of analysis include the country sample which consists of only 12 developed economies and the annual frequency which might be low for price effect. We conduct a robustness check to mitigate these concerns. Specifically, we manually collect quarterly short-term and long-term interest rates for 72 countries, of which 39 are emerging economies and 33 are advanced economies, covering 1970Q1-2016Q4. Then we match it with the quarterly capital flow data from the IMF, on which we apply the same definition to identify surge quarters for each country. Using the IMF capital flow dataset, we can further distinguish between gross and net capital inflow and thus gross and net surges as suggested by Forbes and Warnock (2012*a*, 2020). We show the details of the AIPW estimates using this sample in the appendix Section A2. Results show the same finding that surges induce a large increase in short-term rate and a reduction in term spread, and the effect lasts for four to six quarters, which is consistent to the one to two years we have found before. In addition, these effects are stronger for the good global financial market condition (as compared to the bad one) and for using gross surges measures (as compared to using net surges measures). Generally speaking, these additional robustness checks further confirm our previous findings.

## 5.2 Surges and instability at the aggregate level

Having established the link between surges and debt maturity shortening, as reflected in a flattened term spread and an excessive use of short-term debt, now we turn to looking at how the maturity shortening channel contributes to financial instability. Specifically, we examine whether the surge's predictive power on crisis is affected by the shape of the interest rate term structure.

Following Caballero (2016), we adopt the following random-intercept logit model to estimate the likelihood of a systemic financial crisis:

$$Crisis^*_{ct} = \alpha + \gamma_1 Surges\ with\ Flattened\ Yield\ Curve_{ct} + \gamma_2 Surges\ without\ Flattened\ Yield\ Curve_{ct} + \beta\prime X_{ct} + \xi_c + \delta_{ct} \quad (13)$$

In the equation above, $Crisis^*_{ct}$ is a continuous latent variable for the binary response variable $Crisis_{ct}$, which indicates the start of a crisis in country $c$ and year $t$. If equal to one, the dummy variable *Surge with Flattened Yield Curve*$_{ct}$ means that country $c$ is experiencing a capital inflow surge and a much flattened yield curve. Note that we use a similar method to identify a flattening in the yield curve as that for a surge, which means that we say a yield curve flattening happens when there is a substantial reduction in term spread for this variable. The reason is that the average change in term spread in the dataset is around zero, and it is necessary to distinguish between a small reduction in most cases and a large reduction associated with surges. Therefore, we create a dummy to indicate episodes of flattened yield curve when the cyclical component of term spread is lower than one negative standard deviation. Moreover, the variable *Surge with Flattened Yield Curve*$_{ct}$ takes a value of one if both the surge dummy and the dummy of flattened yield curve equal to one. In contrast, if its value equals one, the dummy variable *Surge without Flattened Yield Curve*$_{ct}$ means that country $c$ is experiencing a capital inflow surge in year $t$ but is not in the period of low term spread.[29] Finally, $X_{ct}$ in equation (13) is a set of control variables including real GDP per capita, GDP growth rate, trade openness, a pegged exchange rate dummy, depreciation, private credit to GDP ratio, and housing returns.

We are interested in both the economic and statistical significance of the coefficients $\gamma_1$ and $\gamma_2$, which show the likelihood of a systemic financial crisis during surges with and without a flattened yield curve relative to the likelihood in non-surge periods. According to our model predictions, we expect $\gamma_1$ to be significantly positive and, more importantly, $\gamma_1 > \gamma_2$. Following Caballero (2016) and references therein, we employ random effects estimation with country means of all covariates (i.e., Mundlak (1978)'s adjustment) to address the possible endogeneity issues between covariates and country-specific intercepts.

[Table 7 here]

We report the main results in Table 7, where the coefficients are all exponentiated, and the corresponding $z$ statistics are provided in parentheses. We calculate the AUROC to measure the model's predictive power. For better interpretation, at the bottom of the table, we also report the computed probability of having a future financial crisis under different scenarios. In the first four columns in Table 7, we present our estimated results for the full sample period

[29] Here we consider a world with three states: (i) surge with flattened yield curve; (ii) surge without flattened yield curve; (iii) no surges. In (iii) no surge, we can further separate two states: no surge but have flattened yield curve and no surge and no flattened yield curve. We consider this more granular classification and look into the role of the flattened yield curve as a robustness check. Results are shown in the appendix Table A7, where we include the dummy *Flattened Yield Curve without Surge*. Results show that a flattened yield curve is also significantly associated with a higher probability of crises, but our main finding that surges with flattened yield curve are stronger than surges without flattened yield curve in predicting crisis remains.

1870-2016, while in the last four columns, we provide the results for the post-World War II subsample. In columns with odd numbers, we do not include any additional control variables. In columns with even numbers, we add the set of country-level controls mentioned above.

Based on Table 7, two findings are worth noting. First, with this long-term macrohistory dataset, the estimated results in columns (1), (2), (5) and (6) confirm a common finding in the existing literature that surges are significantly associated with a higher probability of crises (Reinhart and Reinhart, 2008; Caballero, 2016). With various model specifications, the estimated coefficients are robustly positive and significant. More importantly, the economic significance of international capital inflow surges is also quite considerable. For instance, in the full sample, the unconditional probability of a financial crisis is 3.4% in the long run. Based on our model specification in column (2), if there were an inflow surge episode, the likelihood of a financial crisis would go up to 11.0%. The magnitudes of the effects are even more pronounced if we focus on the post-World War II subsample. As shown in column (6), inflow surges increase the likelihood of crisis from 2.1% to 15.4%.

Second, the shape of the interest rate term structure does play a significant role in predicting financial crises. With different model specifications and other sample choices, the estimated coefficient $\gamma_1$ is different from zero at the 1% significance level, which indicates that inflow bonanzas with a very flat yield curve are associated with a greater probability of a systemic financial crisis. According to column (4), after we add the set of chosen covariates, the probability of having a systemic financial crisis is 32.6% if a country is experiencing a surge and a flattening yield curve at the same time. This number is almost ten times the unconditional probability of 3.4% and triples the likelihood with surges without distinguishing the change in the term spread of 11.0%. Meanwhile, if surges happen without a flattened yield curve, the probability of a crisis is only 1.8%. According to columns (7) and (8), our conclusion holds using the post-World War II subsample. The probability of crisis now becomes 39.6% if a country sees inflow surges and a flattening yield curve at the same time. In contrast, the likelihood of crisis is only 2.7% if a country receives inflow surges but doe not witness a large decrease in term spread. All these results indicate that our proposed maturity shortening channel could indeed be an important underlying mechanism behind surges and crises.

In addition, our key findings are robust when we account for the role of credit booms (Schularick and Taylor, 2012). It is a plausible concern that credit booms mainly drive the importance of the term spread. Therefore, in Table 8, we redo all the empirical investigations that we have done in Table 7 but additionally consider the impacts of credit booms on crises. Our approach here is to introduce interaction terms between credit booms and all the variables that we are interested in.[30] More specifically, the empirical model specification can be written

[30] Another way to account for the role of credit boom is to test whether surges with flattened yield curve are associated with higher probability of credit booms. Thus, we replace the dependent variable

as follows:

$$Crisis^*_{ct} = \hat{\alpha} + \hat{\gamma}_1 Surges\ with\ Flattened\ Yield\ Curve_{ct} \times Credit\ Boom_{ct} + \hat{\gamma}_2 Surges\ without\ Flattened\ Yield\ Curve_{ct} \times Credit\ Boom_{ct} + \hat{\gamma}_3 No\ Surge_{ct} \times Credit\ Boom_{ct} + \hat{\beta}\prime X_{ct} + \xi_c + \delta_{ct} \quad (14)$$

Our goal here is to see whether $\hat{\gamma}_1$ remains positively significant even after considering the effects of credit booms. Again, we use a similar method to identify credit boom, and the dummy $Credit\ Boom_{ct}$ takes the value of one if the total loans to non-financial private sector in real per capita terms is one standard deviation above its trend. The results in Table 8 echo the finding in the literature that the credit booms are a strong predictor of systemic financial crises. Across different model specifications, the conditional probability of a crisis with a credit boom and no surges varies from 9.0% to 18.8%, which means that a credit boom does indicate possible overheating of the economy. More importantly, after we control for the effects of lending booms, the estimated coefficient $\hat{\gamma}_1$ remains highly significant at the 1% level. This means that even after we consider the presence of a credit boom, there is still a robust association between surges with a flattening yield curve and crises: our maturity shortening story is still there. The economic significance is the following based on results shown in columns (2) and (4). In the full sample, the unconditional probability of a financial crisis is still 3.4%. The conditional probability of a crisis with surges and credit booms is 35.6%; the calculated probability of a crisis with surges, credit booms, and no large decrease in term spread is 9.6%; and the computed likelihood of a crisis with surges, credit booms, and a flattened yield curve increase substantially to 57.2%. These results indicate that the independent effect of yield curve changes during surges can substantially increase the probability of a crisis.

[Table 8 here]

# 6 Conclusion

This paper argues that capital inflow surges increase the probability of financial crises through a maturity shortening mechanism. Based on a theoretical model and empirical tests at both the firm-level and macro-level, our main findings are threefold. First, surges are significantly associated with an increase in the use of short-term debt and a reduction in the corporate debt maturity. Specifically, this maturity shortening effect is substantially more pronounced for

of equation (13) with credit booms and report the results in the appendix Table A8. Results show that surges with flattened yield curve are twice likely to be associated with a credit boom than surges without flattened yield curve.

firms with foreign bank relationships and in sectors with higher redeployability and longer time-to-build. Second, driven by the strong demand for short-term debt, surges lead to an increase in short-term interest rate in relative to long-term interest rate, thus a flattened yield curve. Third, the flattened yield curve significantly increases the likelihood of a systemic financial crisis conditional on a surge event.

Our findings have important implications for both policymakers and theorists. Policymakers should pay close attention to the windfalls of capital and restrict foreign capital inflows when the yield curve becomes strongly flattened in receiving countries. For theorists, we point out the importance of accounting for the endogenous term spread and debt maturity in the small open economy framework.

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# Figures and Tables

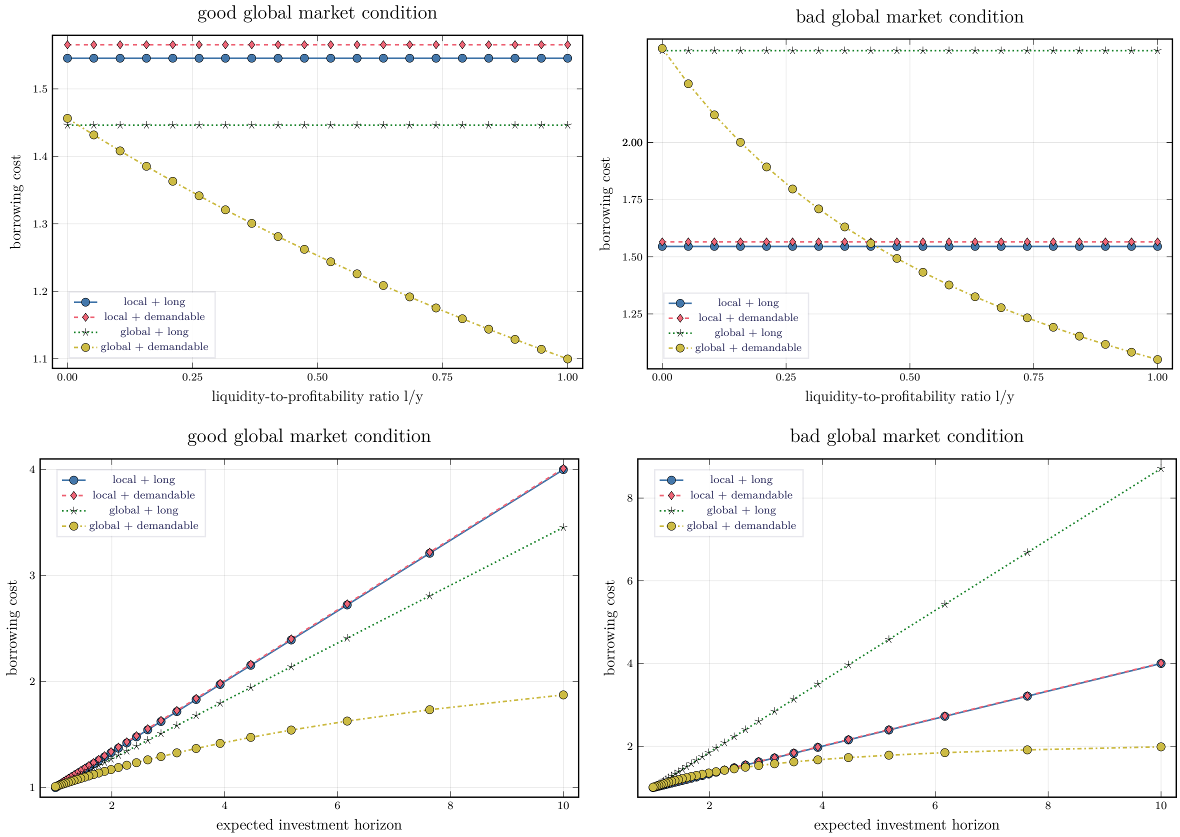



**Figure 1:** Borrowing Costs for Different Debt Instruments

Note: This figure calculates the borrowing costs based on Equation (6) for borrowing from local banks in long-term debt, borrowing from local banks in demandable debt, borrowing from global banks in long-term debt, and borrowing from global banks in demandable debt. We assume that there are two possible global market conditions for this numerical exercise: boom and bust. In the boom phase, the funding cost and probability of liquidity shock for global banks are set to be $r_G = 1.1$ and $\chi = 0.2$, respectively. Meanwhile, during the global financial market's bust phase, we assume that $r_G = 1.4$ and $\chi = 0.8$. In contrast, local banks' funding cost is always $r_L = 1.5$ and does not depend on the global financial cycle. We assume that the unit-measure firms have two dimensions of heterogeneity in both $\frac{l}{y} \in [0, 1]$ and $\zeta \in [0.1, 1]$. The small fixed cost of issuing demandable debt $f$ is set to be 0.01.

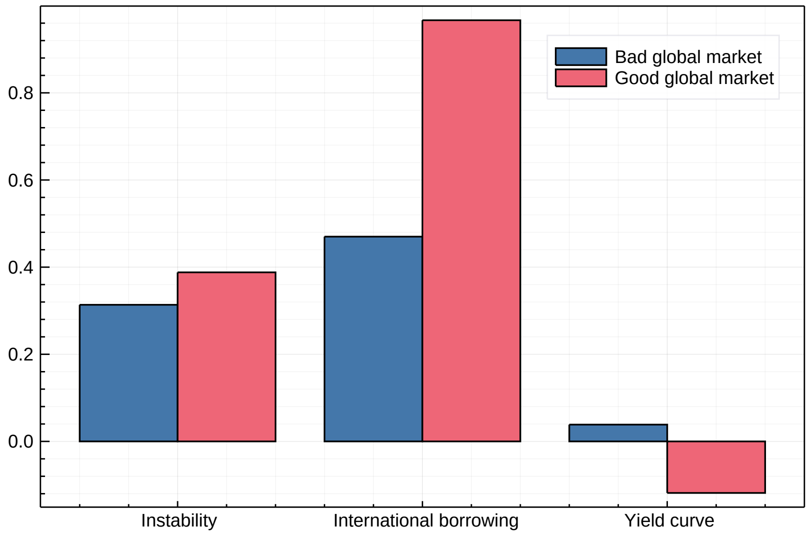



**Figure 2:** Surges, Yield Curve, and Instability

Note: This figure presents the computed economy-wide impacts of international short-term borrowing in our model. The amount of international borrowing is the fraction of firms in this economy that chooses to borrow from global banks. The shape of the interest rate term structure is the average interest rate difference between the long-term debt and the demandable short-term debt. The economic instability is calculated as the fraction of firms liquidating their projects before they mature next period. The parameters used for this figure are the same as those used in Figure 1.

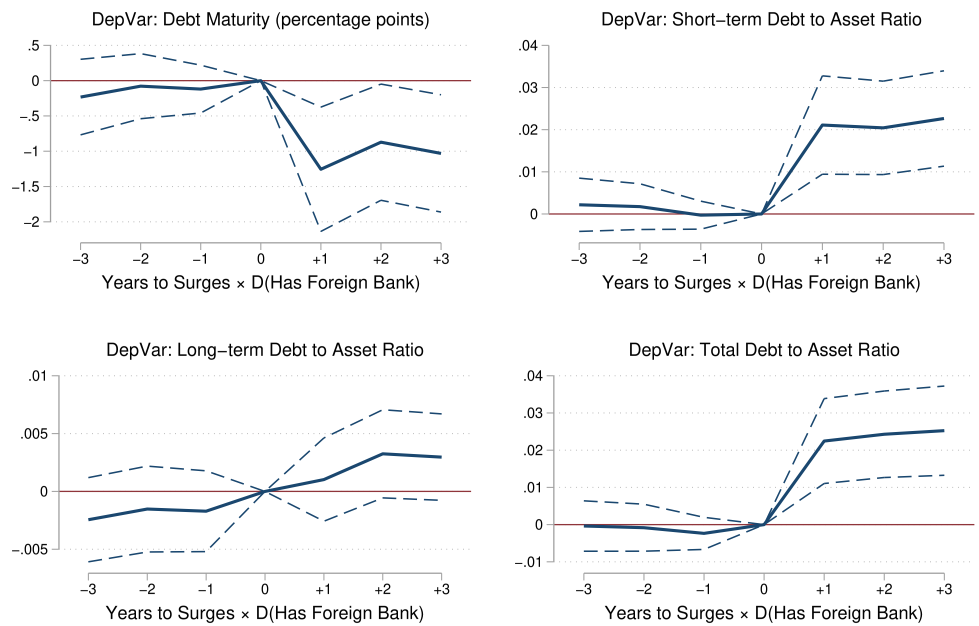



**Figure 3:** Surges and Corporate Debt Maturity: Dynamic Effects

Note: This figure plots the results regressing the firm-level debt maturity defined as the share of long-term debt in total debt, the short-term debt to asset ratio, the long-term debt to asset ratio, or the total debt to asset ratio on the interaction term between the years to surge and the dummy indicating the firm has a lending relationship with foreign banks. By limiting the sample to the three years before and the three years after the surge, the estimates are the relative effects compared with the surge year. The solid line are the estimated coefficients of the difference between firms with and without foreign bank relationship compared to that in the surge year, and the dashed lines are the 95% confidence intervals. The full results are shown in Table 4.

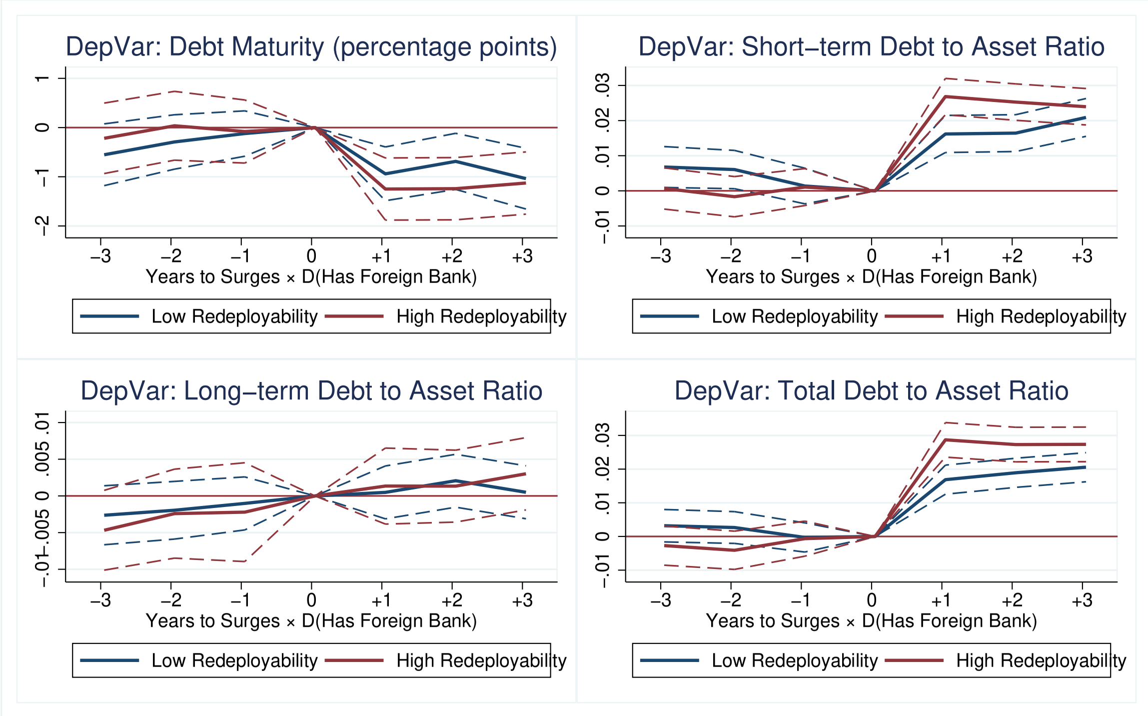



**Figure 4:** Surges and Corporate Debt Maturity: Heterogeneity of Redeployability

Note: This figure plots the results using the low- and high-redeployability subsamples to regress the firm-level debt maturity defined as the share of long-term debt in total debt, the short-term debt to asset ratio, the long-term debt to asset ratio, or the total debt to asset ratio on the interaction term between the years to surge and the dummy indicating the firm has a lending relationship with foreign banks. By limiting the sample to the three years before and the three years after the surge, the estimates are the relative effects compared with the surge year. The solid line are the estimated coefficients of the difference between firms with and without foreign bank relationship compared to that in the surge year, and the dashed lines are the 95% confidence intervals. Lines in maroon present the results of the high-redeployability subsample and lines in navy present that of the low-redeployability subsample. The full results are shown in the appendix.

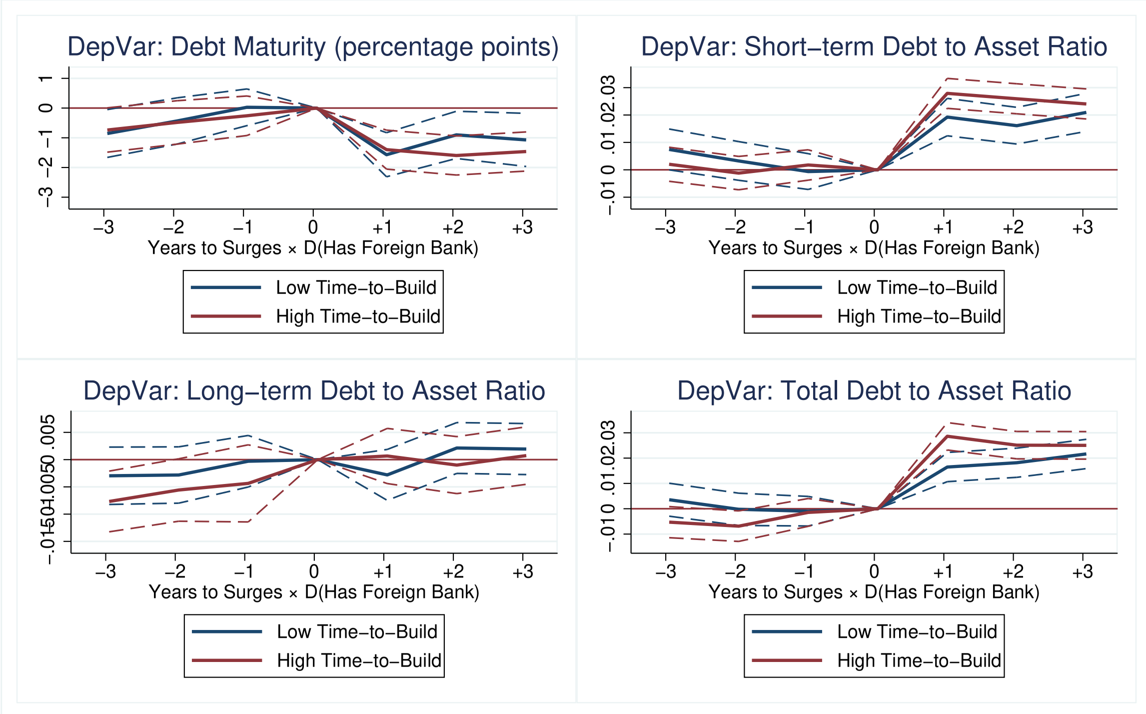



**Figure 5:** Surges and Corporate Debt Maturity: Heterogeneity of Time-to-Build

Note: This figure plots the results using the low- and high-time-to-build subsamples to regress the firm-level debt maturity defined as the share of long-term debt in total debt, the short-term debt to asset ratio, the long-term debt to asset ratio, or the total debt to asset ratio on the interaction term between the years to surge and the dummy indicating the firm has a lending relationship with foreign banks. By limiting the sample to the three years before and the three years after the surge, the estimates are the relative effects compared with the surge year. The solid line are the estimated coefficients of the difference between firms with and without foreign bank relationship compared to that in the surge year, and the dashed lines are the 95% confidence intervals. Lines in maroon present the results of the high-time-to-build subsample and lines in navy present that of the low-time-to-build subsample. The full results are shown in the appendix.

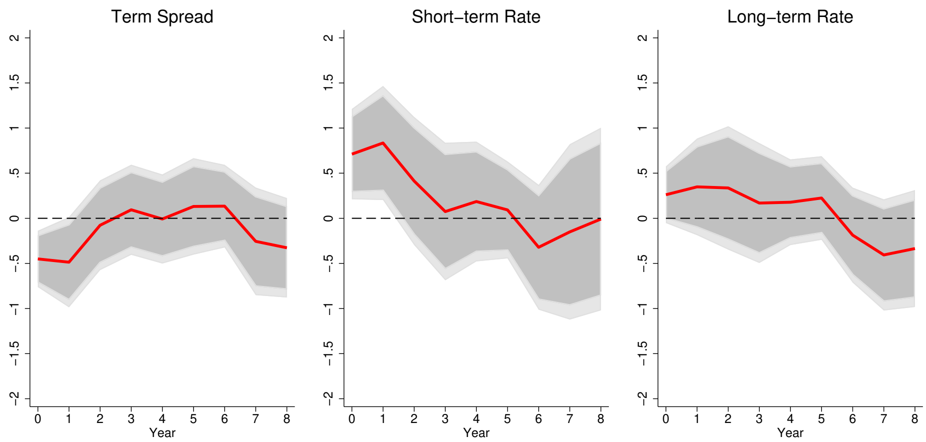
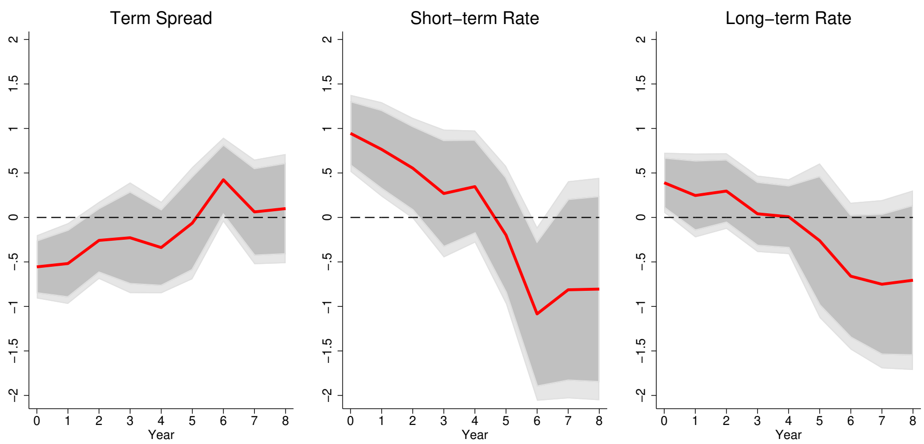



**Figure 6:** Accumulated Impulse Responses of Surges on Term Structure

Note: The red lines show the AIPW point estimates of the average treatment effect (ATE) of capital inflow surges on term spread, short-term interest rate, and long-term interest rate, over the eight-year horizon. The dark and light shades correspond to the 90% and 95% confidence intervals.

**((A))** Good Global Market




**((B))** Bad Global Market

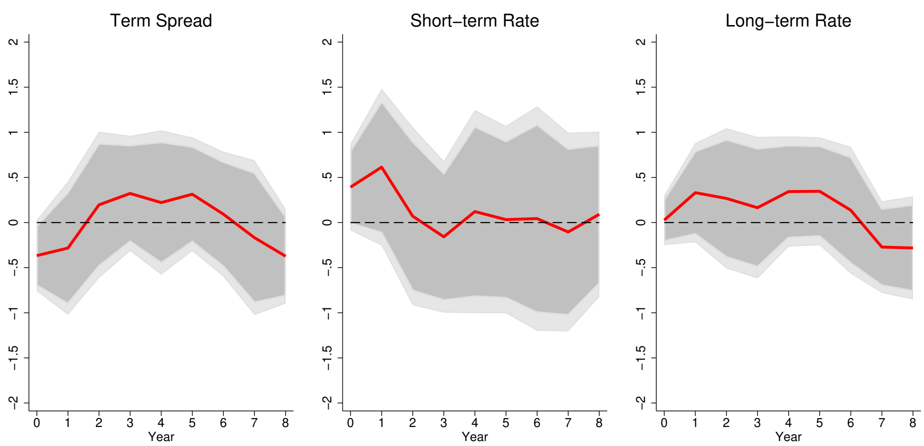



**Figure 7:** Surges on Term Structure: By Global Market Condition

Note: The upper panel shows the AIPW estimates of surges on term spread, short-term and long-term interest rates with a good market condition, and the lower panel shows that with a bad global market condition. The global market condition is proxied by the global monetary policy rate and liquidity. It is good if the change in global short-term rate proxied by the average of US, UK, Japan, and Germany, is nonpositive and the global broad money growth rate is positive, otherwise it is in a bad condition. The red lines show the AIPW point estimates over the eight-year horizon. The dark and light shades correspond to the 90% and 95% confidence intervals.

# **Table 1:** Surge Years and Crisis Years

| Country | Surge Year | Systemic Financial Crisis Year | Sample Year |
|---|---|---|---|
| | | *Panel A: Countries in Firm-level Analysis* | |
| Bulgaria | | 1996 | 1994-2015 |
| Czech Republic | 1995; 2002 | 1996 | 1994-2015 |
| Estonia | 2006; 2007; 2008 | | 1998-2015 |
| France | 2003; 2006; 2009; 2011; 2012 | 2008 | 1995-2015 |
| Germany | 2000 | 2008 | 1994-2015 |
| Hungary | 2008 | 2008 | 1997-2015 |
| Italy | 2010; 2011 | 2008 | 1994-2015 |
| Latvia | 2006; 2007 | 2008 | 1999-2015 |
| Norway | | | 2005-2015 |
| Poland | | | 1994-2015 |
| Portugal | 2008 | 2008 | 1995-2015 |
| Romania | | 1998 | 1996-2015 |
| Spain | 1996; 2007; 2008 | 2008 | 1994-2015 |
| Ukraine | 2005; 2007; 2013 | 1998; 2008; 2014 | 1998-2015 |
| | | *Panel B: Countries in Macro-level Analysis* | |
| Australia | 1916; 1921; 1927; 1930; 1942; 1943; 1947; 1951; 1955; 1960; 1974; 1989; 1995; 1999; 2007; 2012; 2015 | 1893; 1989 | 1870-2016 |
| Belgium | 1907; 1913; 1930; 1946; 1953; 1980; 1981; 2008; 2009; 2011; 2014 | 1870; 1885; 1925; 1931; 1934; 1939; 2008 | 1870-2016 |
| Denmark | 1946; 1950; 1954; 1962; 1970; 1976; 1979; 1985; 1986; 1998 | 1877; 1885; 1908; 1921; 1931; 1987; 2008 | 1874-2016 |
| Finland | 1940; 1952; 1956; 1974; 1975; 1980; 1983; 1989; 1990; 1991; 1992; 2011; 2012 | 1877; 1900; 1921; 1931; 1991 | 1870-2016 |
| France | 1919; 1920; 1948; 1956; 1957; 1969; 1974; 1976; 1982; 2008 | 1882; 1889; 1930; 2008 | 1870-2016 |
| Italy | 1917; 1963; 1974; 1976; 1980; 1981; 1990; 1991; 2000; 2008; 2010; 2011 | 1873; 1887; 1893; 1907; 1921; 1930; 1935; 1990; 2008 | 1870-2016 |
| Netherlands | 1949; 1956; 1957; 1966; 1978; 1980 | 1893; 1907; 1921; 1939; 2008 | 1870-2016 |
| Norway | 1976; 1977; 1986; 1987; 1988; 1998 | 1899; 1922; 1931; 1988 | 1870-2016 |
| Portugal | 1961; 1974; 1976; 1977; 1981; 1982; 1988; 1999; 2000; 2001; 2008; 2009; 2010 | 1890; 1920; 1923; 1931; 2008 | 1870-2016 |
| Spain | 1974; 1975; 1976; 1981; 1982; 1983; 1990; 1992; 2000; 2006; 2007; 2008 | 1883; 1890; 1913; 1920; 1924; 1931; 1977; 2008 | 1870-2016 |
| Sweden | 1919; 1920; 1947; 1970; 1974; 1976; 1977; 1980; 1982; 1985; 1990; 1992; 1993 | 1878; 1907; 1922; 1931; 1991; 2008 | 1870-2016 |
| Switzerland | 1975; 1976 | 1931; 1991; 2008 | 1921-2016 |

Note: This table presents the years of surge, systemic financial crisis, and sample period for the countries used in the firm-level analysis in Panel A and macro-level analysis in Panel B. The firm-level data is from the *Orbis* database and the macro-level data is from the Jordà-Schularick-Taylor Macrohistory Database. Surges are identified when the net capital inflow in real per capita terms are one standard deviation above its trend. The underlined are the surges when we use the two standard deviations criteria instead of one standard deviation. The systemic financial crisis years in Panel A are from the database in Laeven and Valencia (2018) and those years in Panel B are from Jordà, Schularick and Taylor (2017).

## **Table 2:** Summary Statistics

| | Mean | Standard Deviation | Min | Max | N |
|---|---|---|---|---|---|
| | | *A: Firm-level Analysis* | | | |
| Surge | 0.168 | 0.374 | 0.000 | 1.000 | 8178925 |
| Surge-FDI | 0.135 | 0.342 | 0.000 | 1.000 | 8178925 |
| Surge-Portfolio Equity | 0.214 | 0.410 | 0.000 | 1.000 | 8178925 |
| Surge-Portfolio Debt | 0.200 | 0.400 | 0.000 | 1.000 | 8178925 |
| Surge-Other Investment to Corporate Sector | 0.235 | 0.424 | 0.000 | 1.000 | 8177912 |
| Surge-Other Investment to Bank Sector | 0.250 | 0.433 | 0.000 | 1.000 | 8177912 |
| Debt Maturity(%) | 37.642 | 28.063 | 0.000 | 100.000 | 8178925 |
| Short-term Debt to Asset Ratio | 0.315 | 0.217 | 0.001 | 0.961 | 8178925 |
| Long-term Debt to Asset Ratio | 0.197 | 0.191 | 0.000 | 0.831 | 8178925 |
| Total Debt to Asset Ratio | 0.511 | 0.243 | 0.003 | 0.986 | 8178925 |
| Firm Size | -0.233 | 1.599 | -6.409 | 5.605 | 8178925 |
| Sale Growth | 0.026 | 0.387 | -1.803 | 1.723 | 8178925 |
| Cash Flow | 0.098 | 0.120 | -0.137 | 0.664 | 8178925 |
| Tangibility | 0.285 | 0.250 | 0.000 | 1.000 | 8178925 |
| SA Index | -0.227 | 1.391 | -4.449 | 6.329 | 8178925 |
| Foreign Bank Relationship | 0.045 | 0.207 | 0.000 | 1.000 | 2869391 |
| Number of Bank Relationship | 1.826 | 1.234 | 1.000 | 20.000 | 3014378 |
| | | *B: Macro-level Analysis* | | | |
| Surge | 0.099 | 0.298 | 0.000 | 1.000 | 1236 |
| Term Spread | 0.794 | 1.741 | -10.925 | 14.150 | 1222 |
| Change in Term Spread | 0.001 | 1.213 | -10.550 | 11.098 | 1217 |
| Global Short-term Interest Rates | 4.221 | 3.084 | 0.090 | 16.390 | 1236 |
| Global Liquidity Growth | 10.052 | 21.842 | -11.630 | 250.893 | 1236 |
| Global Growth Rate | 11.063 | 44.393 | -13.731 | 518.979 | 1236 |
| Surge with Flattened Yield Curve | 0.026 | 0.159 | 0.000 | 1.000 | 1236 |
| Surge without Flattened Yield Curve | 0.070 | 0.255 | 0.000 | 1.000 | 1236 |
| Systemic Financial Crises | 0.034 | 0.181 | 0.000 | 1.000 | 1236 |
| Credit Boom | 0.100 | 0.299 | 0.000 | 1.000 | 1236 |
| Real GDP per capita (index, 2005=100) | 47.171 | 32.552 | 4.932 | 112.520 | 1236 |
| GDP Growth | 7.359 | 9.319 | -27.360 | 124.336 | 1236 |
| Trade Openness | 50.818 | 34.180 | 5.678 | 297.395 | 1236 |
| Strict Peg Dummy | 0.540 | 0.499 | 0.000 | 1.000 | 1236 |
| Depreciation | 1.633 | 14.031 | -40.451 | 194.745 | 1236 |
| Private Credit to GDP | 67.351 | 37.609 | 2.244 | 204.516 | 1236 |
| Housing Return | 11.452 | 10.786 | -23.448 | 136.314 | 1236 |

Note: This table presents the summary statistics of variables used in this study. Panel A covers the variables used in the firm-level analysis based on Orbis firm-bank matched data; Panel B covers the variables used in the macro-level analysis based on the JST dataset. Detailed definitions and sources for each variable are shown in Table A1 in the online appendix.

## **Table 3:** Surges and Debt Maturity: Simple DID

| | Maturity | | Short | | Long | | Total | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Post Surge × D(Has Foreign Bank) | -0.827*** | -0.615** | 0.015*** | 0.014*** | 0.002 | 0.004** | 0.018*** | 0.019*** |
| | (0.277) | (0.265) | (0.004) | (0.004) | (0.002) | (0.001) | (0.004) | (0.004) |
| Firm Size | | 12.867*** | | -0.004 | | 0.121*** | | 0.110*** |
| | | (0.879) | | (0.013) | | (0.006) | | (0.013) |
| Sale Growth | | -1.259*** | | 0.027*** | | -0.002*** | | 0.025*** |
| | | (0.075) | | (0.001) | | (0.001) | | (0.002) |
| Cash Flow | | -9.142*** | | -0.129*** | | -0.113*** | | -0.250*** |
| | | (0.407) | | (0.006) | | (0.003) | | (0.006) |
| Tangibility | | 32.179*** | | -0.164*** | | 0.212*** | | 0.046*** |
| | | (0.912) | | (0.007) | | (0.007) | | (0.005) |
| SA Index | | 9.379*** | | 0.011 | | 0.090*** | | 0.090*** |
| | | (1.205) | | (0.018) | | (0.008) | | (0.018) |
| Constant | 34.684*** | 29.765*** | 0.359*** | 0.424*** | 0.192*** | 0.173*** | 0.548*** | 0.590*** |
| | (0.009) | (0.673) | (0.000) | (0.009) | (0.000) | (0.005) | (0.000) | (0.009) |
| Observations | 1284309 | 1284309 | 1284309 | 1284309 | 1284309 | 1284309 | 1284309 | 1284309 |
| R-Square | 0.713 | 0.730 | 0.766 | 0.772 | 0.737 | 0.757 | 0.796 | 0.803 |
| Firm Controls | NO | YES | NO | YES | NO | YES | NO | YES |
| Firm FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Country × Sector × Year FE | YES | YES | YES | YES | YES | YES | YES | YES |

Note: This table shows the role of having foreign bank relationship in the effect of surges on corporate debt maturity in a difference-in-difference specification. The dependent variables are debt maturity defined as the share of long-term debt in total debt in columns (1)-(2), the ratio of short-term debt to total asset in columns (3)-(4), the ratio of long-term debt to total asset in columns (5)-(6), and the ratio of total debt to total asset in columns (7)-(8). The dummy variable *Post Surge* is equal to one if a capital inflow surge has occurred in the current year or at most three years ago, and it is equal to zero if a capital inflow surge occurs in the next one to three years. The dummy variable *D(Foreign Bank Relationship)* is equal to one if the firm has at least one foreign bank in its main bank relationships. Definitions of the other control variables are in Table A1 in the online appendix. Data used in this table is at firm-year level. Odd columns show the results without including firm-level control variables, and even columns show the results including them. Standard errors are in parentheses. *, **, and *** represent results significant at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at firm and country-year level.

# **Table 4:** Surges and Debt Maturity: Dynamic DID

| | Maturity | | Short | | Long | | Total | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| -3 Years to Surge × D(Has Foreign Bank) | -0.117 | -0.233 | 0.002 | 0.002 | -0.001 | -0.002 | 0.000 | -0.000 |
| | (0.290) | (0.273) | (0.003) | (0.003) | (0.002) | (0.002) | (0.003) | (0.003) |
| -2 Years to Surge × D(Has Foreign Bank) | 0.064 | -0.078 | 0.001 | 0.002 | -0.000 | -0.002 | -0.001 | -0.001 |
| | (0.250) | (0.235) | (0.003) | (0.003) | (0.002) | (0.002) | (0.003) | (0.003) |
| -1 Years to Surge × D(Has Foreign Bank) | -0.035 | -0.119 | -0.001 | -0.000 | -0.001 | -0.002 | -0.002 | -0.002 |
| | (0.185) | (0.173) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| +1 Years to Surge × D(Has Foreign Bank) | -1.449*** | -1.255*** | 0.022*** | 0.021*** | -0.000 | 0.001 | 0.022*** | 0.022*** |
| | (0.475) | (0.449) | (0.006) | (0.006) | (0.002) | (0.002) | (0.006) | (0.006) |
| +2 Years to Surge × D(Has Foreign Bank) | -1.054** | -0.872** | 0.021*** | 0.020*** | 0.002 | 0.003* | 0.024*** | 0.024*** |
| | (0.431) | (0.420) | (0.006) | (0.006) | (0.002) | (0.002) | (0.006) | (0.006) |
| +3 Years to Surge × D(Has Foreign Bank) | -1.086** | -1.031** | 0.023*** | 0.023*** | 0.003 | 0.003 | 0.025*** | 0.025*** |
| | (0.429) | (0.424) | (0.006) | (0.006) | (0.002) | (0.002) | (0.006) | (0.006) |
| Firm Size | | 12.868*** | | -0.004 | | 0.121*** | | 0.110*** |
| | | (0.878) | | (0.013) | | (0.006) | | (0.013) |
| Sale Growth | | -1.259*** | | 0.027*** | | -0.002*** | | 0.025*** |
| | | (0.075) | | (0.001) | | (0.001) | | (0.002) |
| Cash Flow | | -9.142*** | | -0.129*** | | -0.113*** | | -0.250*** |
| | | (0.407) | | (0.006) | | (0.003) | | (0.006) |
| Tangibility | | 32.176*** | | -0.164*** | | 0.212*** | | 0.046*** |
| | | (0.912) | | (0.007) | | (0.007) | | (0.005) |
| SA Index | | 9.380*** | | 0.011 | | 0.090*** | | 0.090*** |
| | | (1.202) | | (0.018) | | (0.008) | | (0.018) |
| Constant | 34.687*** | 29.775*** | 0.359*** | 0.424*** | 0.192*** | 0.173*** | 0.548*** | 0.590*** |
| | (0.009) | (0.674) | (0.000) | (0.009) | (0.000) | (0.005) | (0.000) | (0.009) |
| Observations | 1284309 | 1284309 | 1284309 | 1284309 | 1284309 | 1284309 | 1284309 | 1284309 |
| R-Square | 0.713 | 0.730 | 0.766 | 0.772 | 0.737 | 0.757 | 0.796 | 0.803 |
| Firm Controls | NO | YES | NO | YES | NO | YES | NO | YES |
| Firm FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Country × Sector × Year FE | YES | YES | YES | YES | YES | YES | YES | YES |

Note: This table shows the role of having foreign bank relationship in the effect of surges on corporate debt maturity in a dynamic difference-in-difference specification. The dependent variables are debt maturity defined as the share of long-term debt in total debt in columns (1)-(2), the ratio of short-term debt to total asset in columns (3)-(4), the ratio of long-term debt to total asset in columns (5)-(6), and the ratio of total debt to total asset in columns (7)-(8). The dummy variables *-3 Years to Surge*, *-2 Years to Surge*, and *-1 Years to Surge* are equal to one if a capital inflow surge occurs in the next three, two, and one year, respectively.The dummy variables *+1 Years to Surge*, *+2 Years to Surge*, and *+3 Years to Surge* are equal to one if a capital inflow surge has occurred in the one, two, and three years ago, respectively. The dummy variable *D(Foreign Bank Relationship)* is equal to one if the firm has at least one foreign bank in its main bank relationships. Definitions of the other control variables are in Table A1 in the online appendix. Data used in this table is at firm-year level. Odd columns show the results without including firm-level control variables, and even columns show the results including them. Standard errors are in parentheses. *, **, and *** represent results significant at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at firm and country-year level.

## **Table 5:** Surges and Instability

| | Full | | Maturity Shortened | | Maturity Lengthened | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Post Surge × D(Has Foreign Bank) | -0.010** | -0.012** | -0.024*** | -0.022*** | -0.006 | -0.008 |
| | (0.005) | (0.005) | (0.005) | (0.004) | (0.006) | (0.005) |
| Firm Size | | -0.315*** | | -0.280*** | | -0.328*** |
| | | (0.018) | | (0.008) | | (0.020) |
| Sale Growth | | 0.172*** | | 0.169*** | | 0.175*** |
| | | (0.003) | | (0.001) | | (0.004) |
| Cash Flow | | 1.672*** | | 1.678*** | | 1.656*** |
| | | (0.026) | | (0.007) | | (0.030) |
| Tangibility | | -0.459*** | | -0.423*** | | -0.451*** |
| | | (0.010) | | (0.005) | | (0.012) |
| SA Index | | -0.001 | | 0.033*** | | -0.019 |
| | | (0.023) | | (0.011) | | (0.026) |
| Constant | 0.691*** | 0.800*** | 0.673*** | 0.792*** | 0.703*** | 0.797*** |
| | (0.000) | (0.013) | (0.001) | (0.006) | (0.000) | (0.015) |
| Observations | 1063975 | 1063975 | 426787 | 426787 | 637188 | 637188 |
| R-Square | 0.738 | 0.809 | 0.747 | 0.814 | 0.739 | 0.809 |
| Firm Controls | NO | YES | NO | YES | NO | YES |
| Firm FE | YES | YES | YES | YES | YES | YES |
| Country × Sector × Year FE | YES | YES | YES | YES | YES | YES |

Note: This table shows the role of having foreign bank relationship in the effect of surges on instability in a difference-in-difference specification. The dependent variables are firm soundness proxied by Z-score following (Altman, 1968, 1983). A lower Z-score indicates higher instability. The subsamples of maturity shortened firms and maturity lengthened firms are identified by calculating the average debt maturity before and after surges for each firm and assigning the firm to the former (latter) group if the after-before difference is negative (positive). The dummy variable *Post Surge* is equal to one if a capital inflow surge has occurred in the current year or at most three years ago, and it is equal to zero if a capital inflow surge occurs in the next one to three years. The dummy variable *D(Foreign Bank Relationship)* is equal to one if the firm has at least one foreign bank in its main bank relationships. Definitions of the other control variables are in Table A1 in the online appendix. Data used in this table is at firm-year level. Odd columns show the results without including firm-level control variables, and even columns show the results including them. Standard errors are in parentheses. *, **, and *** represent results significant at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at firm and country-year level.

**Table 6:** Further Discussion by Categories of Surges and Credits

| | Coefficients of *Post Surge* × *D(Has Foreign Bank)* | | | |
|---|---|---|---|---|
| *DepVar:* | Long-term Debt | Short-term Loan | Other Short-term Debt | Trade Credit |
| | By Different Categories of Surges | | | |
| *A: FDI Surge* | 0.003** | -0.000 | 0.019*** | -0.014*** |
| | (0.001) | (0.002) | (0.004) | (0.003) |
| Observations | 1488074 | 1488074 | 1488074 | 1488074 |
| R-Square | 0.756 | 0.685 | 0.783 | 0.755 |
| *B: Portfolio Equity Surge* | 0.003*** | 0.002 | 0.011*** | -0.008*** |
| | (0.001) | (0.002) | (0.003) | (0.003) |
| Observations | 1797871 | 1797871 | 1797871 | 1797871 |
| R-Square | 0.757 | 0.691 | 0.794 | 0.795 |
| *C: Portfolio Debt Surge* | 0.002 | 0.002** | 0.010** | -0.010** |
| | (0.001) | (0.001) | (0.005) | (0.005) |
| Observations | 1951907 | 1951907 | 1951907 | 1951907 |
| R-Square | 0.756 | 0.669 | 0.767 | 0.777 |
| *D: Other Investment to Corporate Sector Surge* | 0.002 | 0.003** | 0.007** | -0.004 |
| | (0.001) | (0.001) | (0.003) | (0.003) |
| Observations | 1589640 | 1589640 | 1589640 | 1589640 |
| R-Square | 0.755 | 0.703 | 0.795 | 0.800 |
| *E: Other Investment to Bank Sector Surge* | 0.003** | -0.007*** | 0.028*** | -0.027*** |
| | (0.001) | (0.001) | (0.005) | (0.004) |
| Observations | 1909980 | 1909980 | 1909980 | 1909980 |
| R-Square | 0.761 | 0.669 | 0.754 | 0.776 |

Note: This table summarizes the estimates of the interaction term between surge and having foreign bank relationship in a difference-in-difference specification. The dependent variables are long-term debt to asset ratio, short-term loan to asset ratio, other short-term debt to asset ratio, and trade credit to asset ratio as shown in the column titles. The five panels refer to five categories of surges, and the dummy variable *Post Surge* is equal to one if a capital inflow surge, in FDI flow, portfolio equity flow, portfolio debt flow, other investment to corporate sector flow, or other investment to bank sector flow for each panel respectively, has occurred in the current year or at most three years ago, and it is equal to zero if a capital inflow surge occurs in the next one to three years.The dummy variable *D(Foreign Bank Relationship)* is equal to one if the firm has at least one foreign bank in its main bank relationships. The estimates shown here include a full set of firm-level control variables. Standard errors are in parentheses. *, **, and *** represent results significant at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at firm and country-year level.

## **Table 7:** Macrohistory Evidence of the Maturity Shortening Channel

| | Sample Period: 1870-2016 | | | | Sample Period: 1946-2016 | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Surge | 2.685*** | 3.500*** | | | 9.719*** | 8.557*** | | |
| | (2.579) | (2.973) | | | (4.517) | (3.882) | | |
| Surge with Flattened Yield Curve | | | 10.170*** | 13.755*** | | | 39.683*** | 30.689*** |
| | | | (5.718) | (5.565) | | | (6.608) | (5.674) |
| Surge without Flattened Yield Curve | | | 0.403 | 0.528 | | | 1.482 | 1.281 |
| | | | (-0.893) | (-0.617) | | | (0.369) | (0.227) |
| Obs | 1236 | 1236 | 1236 | 1236 | 814 | 814 | 814 | 814 |
| Countries | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Crises | 42 | 42 | 42 | 42 | 17 | 17 | 17 | 17 |
| Loglik | -180.475 | -153.952 | -171.951 | -146.079 | -73.980 | -61.592 | -66.630 | -54.833 |
| WaldTestChi2 | 0.580 | 7.752 | 0.508 | 6.964 | 1.193 | 3.249 | 2.193 | 4.671 |
| WaldTestPval | 0.446 | 0.458 | 0.776 | 0.641 | 0.275 | 0.918 | 0.334 | 0.862 |
| AUROC | 0.572 | 0.808 | 0.585 | 0.808 | 0.793 | 0.883 | 0.583 | 0.549 |
| seAUROC | 0.034 | 0.036 | 0.036 | 0.034 | 0.047 | 0.037 | 0.037 | 0.052 |
| Control | NO | YES | NO | YES | NO | YES | NO | YES |
| *Unconditional Probability* | 3.4% | 3.4% | 3.4% | 3.4% | 2.1% | 2.1% | 2.1% | 2.1% |
| *Probability Conditional on Surge* | 8.6% | 11.0% | | | 17.2% | 15.4% | | |
| *Probability Conditional on Surge with Flattened Yield Curve* | | | 26.3% | 32.6% | | | 45.8% | 39.6% |
| *Probability Conditional on Surge without Flattened Yield Curve* | | | 1.4% | 1.8% | | | 3.1% | 2.7% |

Note: This table shows the effects of surge and the role of flattened yield curve on the probability of systemic financial crisis. The dependent variable is the dummy which is equal to one if a systemic financial crisis occurs in the JST macrohistory database. The dummy variable *Surge* is equal to one if the net capital inflow in real per capita terms is one standard deviation above the trend. The dummy variable *Surge with Flattened Yield Curve* is equal to one if a surge occurs and at the same time the change in term spread, which calculated as the difference between long-term and short-term interest rates, is one standard deviation below its trend. The dummy variable *Surge without Flattened Yield Curve* is equal to one if a surge occurs and at the same time the change in term spread is not largely flattened, i.e., is above the one-standard-deviation-below-the-trend line. Control variables include real GDP per capita, GDP growth rate, trade openness, pegged exchange rate dummy, depreciation, private credit to GDP ratio, and housing return. Definitions of the control variables are in Table A1 in the online appendix. Data used in this table is at country-year level. We exclude US, UK, Japan and Germany as these countries are potentially drivers of the global financial cycle. Columns (1)-(4) show the results using the sample period from 1870 to 2016, and columns (5)-(8) show the results using the post WWII sample period from 1946 to 2016. The estimates shown here are exponentiated, and z statistics are in parentheses. *, **, and *** represent results significant at the 10%, 5%, and 1% levels, respectively.

## **Table 8:** Macrohistory Evidence of the Maturity Shortening Channel with Credit Boom

| | Sample Period: 1870-2016 | | | | Sample Period: 1946-2016 | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Surge × Credit Boom | 9.655*** | 15.732*** | | | 69.921*** | 40.061*** | | |
| | (5.454) | (4.932) | | | (6.798) | (5.367) | | |
| No Surge × Credit Boom | 2.803** | 5.029*** | 2.889** | 4.998*** | 9.381*** | 4.990** | 10.890*** | 5.019** |
| | (2.252) | (2.848) | (2.320) | (2.833) | (3.296) | (2.178) | (3.502) | (2.184) |
| Surge with Flattened Yield Curve × Credit Boom | | | 30.381*** | 38.017*** | | | 293.914*** | 374.262*** |
| | | | (7.688) | (6.043) | | | (8.320) | (5.914) |
| Surge without Flattened Yield Curve × Credit Boom | | | 1.568 | 3.034 | | | 8.639* | 3.075 |
| | | | (0.436) | (1.003) | | | (1.897) | (0.916) |
| Obs | 1236 | 1236 | 1236 | 1236 | 814 | 814 | 814 | 814 |
| Countries | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Crises | 42 | 42 | 42 | 42 | 17 | 17 | 17 | 17 |
| Loglik | -171.920 | -146.789 | -165.608 | -142.379 | -60.003 | -53.799 | -52.639 | -45.478 |
| WaldTestChi2 | 0.168 | 3.790 | 0.019 | 6.856 | 1.976 | 3.420 | 4.020 | 4.195 |
| WaldTestPval | 0.920 | 0.925 | 0.999 | 0.739 | 0.372 | 0.945 | 0.259 | 0.938 |
| AUROC | 0.570 | 0.849 | 0.601 | 0.853 | 0.876 | 0.904 | 0.860 | 0.910 |
| seAUROC | 0.043 | 0.031 | 0.043 | 0.031 | 0.048 | 0.036 | 0.059 | 0.036 |
| Control | NO | YES | NO | YES | NO | YES | NO | YES |
| *Unconditional Probability* | 3.4% | 3.4% | 3.4% | 3.4% | 2.1% | 2.1% | 2.1% | 2.1% |
| *Probability Conditional on Surge and Credit Boom* | 25.4% | 35.6% | | | 59.9% | 46.1% | | |
| *Probability Conditional on Surge with Flattened Yield Curve and Credit Boom* | | | 51.7% | 57.2% | | | 86.2% | 88.9% |
| *Probability Conditional on Surge without Flattened Yield Curve and Credit Boom* | | | 5.2% | 9.6% | | | 15.6% | 6.2% |
| *Probability Conditional on No Surge but Credit Boom* | 9.0% | 15.0% | 9.2% | 15.0% | 16.7% | 9.6% | 18.8% | 9.7% |

Note: This table shows the effects of surge and the role of flattened yield curve on the probability of systemic financial crisis, after taking account into the credit boom. The dependent variable is the dummy which is equal to one if a systemic financial crisis occurs in the JST macrohistory database. The dummy variable *Surge* is equal to one if the net capital inflow in real per capita terms is one standard deviation above the trend. The dummy variable *No Surge* is equal to one if a surge does not occur. The dummy variable *Surge with Flattened Yield Curve* is equal to one if a surge occurs and at the same time the change in term spread, which calculated as the difference between long-term and short-term interest rates, is one standard deviation below its trend. The dummy variable *Surge without Flattened Yield Curve* is equal to one if a surge occurs and at the same time the change in term spread is not largely flattened, i.e., is above the one-standard-deviation-below-the-trend line. The dummy variable *Credit Boom* is equal to one if the total loans to non-financial private sector in per capita real terms is one standard deviation above the trend. Control variables include real GDP per capita, GDP growth rate, trade openness, pegged exchange rate dummy, depreciation, private credit to GDP ratio, and housing return. Definitions of the control variables are in Table A1 in the online appendix. Data used in this table is at country-year level. We exclude US, UK, Japan and Germany as these countries are potentially drivers of the global financial cycle. Columns (1)-(4) show the results using the sample period from 1870 to 2016, and columns (5)-(8) show the results using the post WWII sample period from 1946 to 2016. The estimates shown here are exponentiated, and z statistics are in parentheses. *, **, and *** represent results significant at the 10%, 5%, and 1% levels, respectively.

# Internet Appendix

# A1 Orbis Data Clean Process

The original data are denominated in current US dollars. In the following basic cleaning steps before deflation, we do not change the currency units because we use criteria based on ratios and do not rely on absolute values. However, in the deflation part, we convert all financial variables to local official currencies[1] and then deflate using the country-sector-level or country-level price index. Finally, we convert them into 2005 US dollars by multiplying by the 2005 exchange rate.

1. We limit the sample to unconsolidated accounts with or without a consolidated companion and deal with firm-year duplicates.

    - We require consolidation codes equal to U1 or U2 due to the double counting problem when both a consolidated account of the parent (with all its subsidiaries) and an unconsolidated account of the parent (without subsidiaries) are reported.
    - Then, we address the firm-year duplicates using the following steps: (1) For duplicates in firm ID and the specific close date, we use the flow variable operating revenue to keep the observation with the largest values. (2) We generate the year from the close date by using the current year if the month is later than June and using the previous year if the month is earlier than June. (3) Then, for each firm-year, we keep the observation with the latest reporting date; if there are still duplicates, then we keep the one with the largest operating revenue.

2. We clean basic reporting mistakes.

    - We drop observations that have missing information on total assets, operating revenues, sales and employment simultaneously.
    - We drop firms for which any one of the following variables is negative in any year: total assets, employment, sales or tangible fixed assets.
    - We drop firms in which the number of employees exceeds two million in any year.
    - We drop observations with missing, zero or negative values for operating revenue or total assets.

3. We check the internal consistency of the balance sheet information.

[1] Note that the original reporting currencies in one country may differ across firms, and thus this step is not done by directly using the exchange rate in the original Orbis dataset but by using the exchange rate of the local currency against the US dollar, which is obtained externally. In this paper, we use the exchange rate from Factset.

- We exclude extreme values by dropping observations that are below the 0.1 percentile or above the 99.9 percentile of the distribution of each of the following ratios: (1) fixed assets (the sum of tangible fixed assets, intangible fixed assets and other fixed assets) to total fixed assets; (2) the sum of stocks, debtors and other current assets to total current assets; (3) the sum of fixed assets and current assets to total assets; (4) the sum of capital and other shareholder funds to total shareholder funds; (5) the sum of long-term debt and other noncurrent liabilities as a ratio of total noncurrent liabilities; (6) the sum of loans, creditors and other current liabilities to total current liabilities; (7) the sum of noncurrent liabilities, current liabilities and shareholder funds to total shareholder funds and liabilities.

4. We further check the data quality in the following ways.

   - We drop firms implying nonpositive age values in any year.
   - We calculate liabilities as the difference between total shareholder funds and liabilities and shareholder funds; then, we drop the observations if the value is negative or zero. In another way, liabilities can be computed as the sum of current liabilities and noncurrent liabilities. We generate the ratio of the two variables of liabilities and drop the observations if the ratio is greater than 1.1 or lower than 0.9.
   - We drop observations with negative current liabilities, noncurrent liabilities, current assets, loans, creditors, other current liabilities or long-term debt.
   - We drop observations if their long-term debt is higher than the liability.
   - We construct net worth as the difference between total assets and liability and then drop the observations if net worth does not equal shareholder funds.
   - We drop observations with missing, zero or negative values for the wage bill variable.
   - We drop observations with negative values for intangible fixed assets and observations with missing or zero values for tangible fixed assets.
   - We calculate the ratio of tangible fixed assets to total assets and drop the observations if the ratio is greater than one.
   - We drop observations with negative depreciation values.
   - We calculate the capital-labor ratio, where capital stock is the sum of tangible and intangible fixed assets, and drop firms if they have a capital-labor ratio in the bottom 0.1 percentile and firm-year observations with a capital-labor ratio higher than the 99.9 percentile or lower than the 0.1 percentile.

- We drop observations with negative shareholder funds and observations with a ratio of other shareholder funds to total assets in the bottom 0.1 percentile.
- We calculate two leverage indicators–the ratio of tangible fixed assets to shareholder funds and the ratio of total assets to shareholder funds–and then drop extreme values in the bottom 0.1 or top 99.9 percentiles of the distribution of the two ratios.
- We calculate the value added as the difference between operating revenues and material costs and then drop observations with negative value of value added.
- We construct the ratio of wage bills to value added and drop extreme values in the bottom 1 percentile or the top 99 percentile if the ratio exceeds 1 at the 99th percentile or change the extreme threshold to the 0.1 percentile and 99.9 percentile if the ratio does not exceed 1 at the 99th percentile. We also drop observations with ratios higher than 1.1.

# A2 Surges and Term Spread Using Alternative Macro-level Data

In addition to the JST dataset used in the main analysis, we supplement the examination of surges on the yield curve by using an alternative dataset. Compared with the JST long-run macrohistory data, this dataset comes at a much shorter time coverage, but it expands the country coverage to include more emerging economies, it is available at quarterly instead of annual frequency, and it enables the distinction between gross and net surges. We re-calculate the AIPW estimator based on the alternative data and show that the main results that surges reduce yield curve still hold.

First, we manually collect the country-quarterly data of short-term and long-term interest rates, and then calculate the term spread as their differences. For short-term rates, we mainly use the three-month interbank rates; for long-term rates, we mainly use the ten-year government bond rates. We choose these two series because they are consistent with the definitions used in the JST dataset and they are available in most countries. When the three-month and ten-year tenors are not available for a country, we choose the available ones with the closest duration whenever possible. For data sources, we rely on the Datastream and supplement from CEIC which compiles the data from various national statistic bureaus. We only keep the country-quarters when both short-term and long-term rates are available. In total, we obtain 5,630 observations, of which 3,488 are for 33 advanced economies and 2,142 are for 39 emerging economies. The time coverage is from 1970Q1 to 2016Q4.

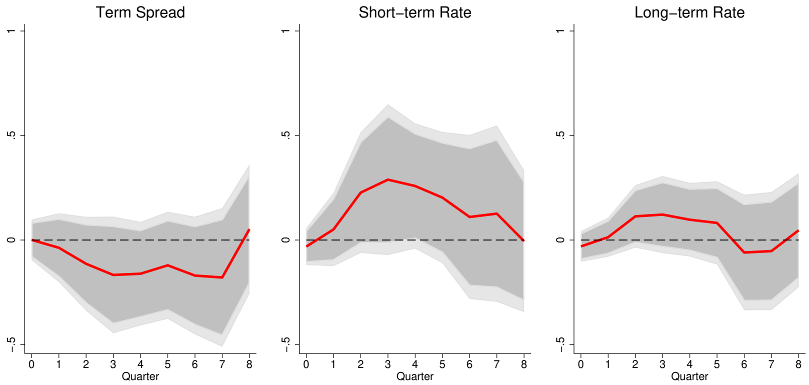
Second, we match the term spread data with quarterly surge data and obtain the propensity score of surges. We use the quarterly capital flow dataset from the IMF FFA Database, and re-identify surges for each country based on the same definition, i.e., one standard deviation above the trend of capital inflows in real per capita terms. Note here that we can follow Forbes and Warnock (2012*a*, 2020) to make a distinction between gross and net surges. Gross surges refer to a substantial increase of gross capital inflows by foreign residents without accounting for the decrease in outflows by domestic residents, and net surges refer to a substantial increase of net capital inflows which is the difference between gross capital inflows by foreign residents and gross capital outflows by domestic residents. Then we obtain the propensity score of surges using a logit model by including global factors and domestic factors. Due to different variable availability, the choice of these determinants are slightly different from that in the JST dataset. Specifically, for global factors we control for oil price, US federal funds rate, and US liquidity growth because US is the dominating economy in the post-1970 world, and for domestic factors we control for domestic GDP growth and international reserves.

Lastly, with the propensity scores at hand, we calculate the average treatment effect of surges on term spread, short-term interest rate, and long-term interest rate using the AIPW estimator.

Results are shown in Figure A1. It demonstrates that net surges tend to have the effect of decreased term spread and increased short-term interest rate but with a low significance level, meanwhile, gross surges significantly causes a more flattened yield curve and higher short-term interest rates. Note that net surges are due to the combined effects of a sharp increase of foreigners' funding flowing in and a sharp decrease of domestic residents' funding flowing out, and gross surges are the separate effect of a large increase of foreigners' funding flowing in. The more pounced and significant effect from the gross surges is in consistent with the predictions from our model. Specifically, term spread is significantly lower than the pre-surge level by 0.24 percentage points three quarters after the surge and then stabilizes before becoming statistically indifferent from the pre-surge level five quarters after. Moreover, the flattening of term spread comes mainly from a significant increase in the short-term rates, as we observe that the short-term rate increases by 0.43 percentage points four quarters after capital inflow surge and the impact of a higher short-term rate lasts for six quarters. In comparison, the long-term rate also shows a increase but in a much smaller magnitude. The magnitudes of the impact are comparable to that in the main analysis. In particular, we find that the effects last for four to six quarters after surge, and this corresponds to the one to two years in the main analysis.

Lastly, we also separate two bins of good and bad global market condition and find that the effect of surges on term structure is stronger when the global market is in a good condition. Similar to the main analysis, we define a good global condition when the change in US federal funds rate is nonpositive and the US liquidity growth is positive. Figure A2 shows the results of gross surges on term structure in good and bad global conditions. We observe that both the

**((A))** Net Surge




**((B))** Gross Surge

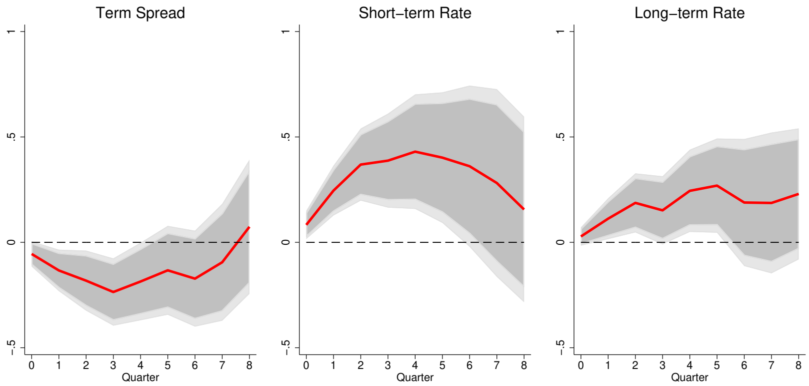
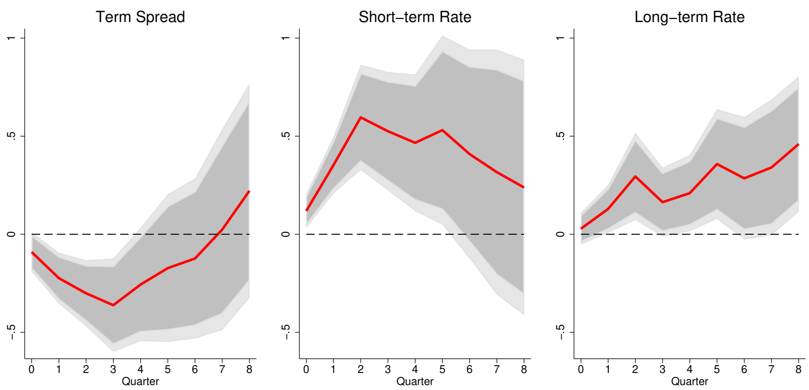



**Figure A1:** Accumulated Impulse Responses of Surges on Term Structure Using Alternative Data

Note: This figure shows the AIPW estimates of surges on term spread, short-term interest rate, and long-term interest rate. The upper panel shows the results using net surges and the lower panel shows that using gross surges. The red lines show the AIPW point estimates of the average treatment effect (ATE) over the eight-quarter horizon. The dark and light shades correspond to the 95% and 90% confidence intervals.

magnitudes and statistical significance of the impact are stronger when the global market is in good condition and thus faces a smaller liquidity shock. Again, this is in line with the findings in the main analysis.

**((A))** Good Global Market




**((B))** Bad Global Market

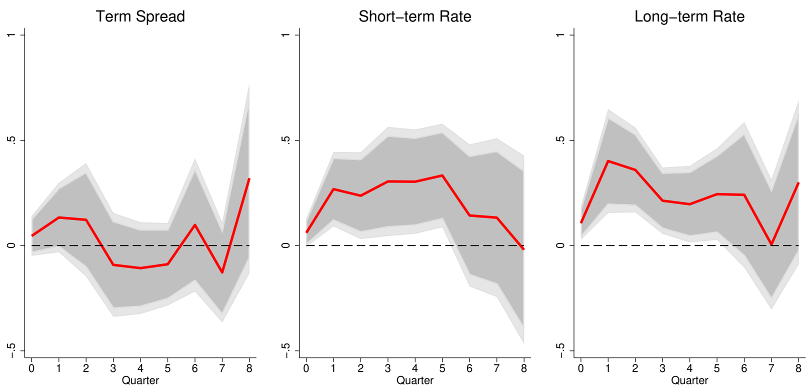



**Figure A2:** Surges and Term Structure by Global Market Condition Using Alternative Data

Note: This figure shows the AIPW estimates of surges on term spread, short-term interest rate, and long-term interest rate. We use gross surges in the estimation for this figure. The upper panel shows the results with a good market condition and lower panel shows that with a bad global market condition. The global market condition is proxied by the US monetary policy rate and liquidity. It is good if the change in US federal funds rate is nonpositive and the US broad money growth rate is positive, otherwise it is in a bad condition. The red lines show the AIPW point estimates of the average treatment effect (ATE) over the eight-quarter horizon. The dark and light shades correspond to the 95% and 90% confidence intervals.

# A3 Additional Figures and Tables

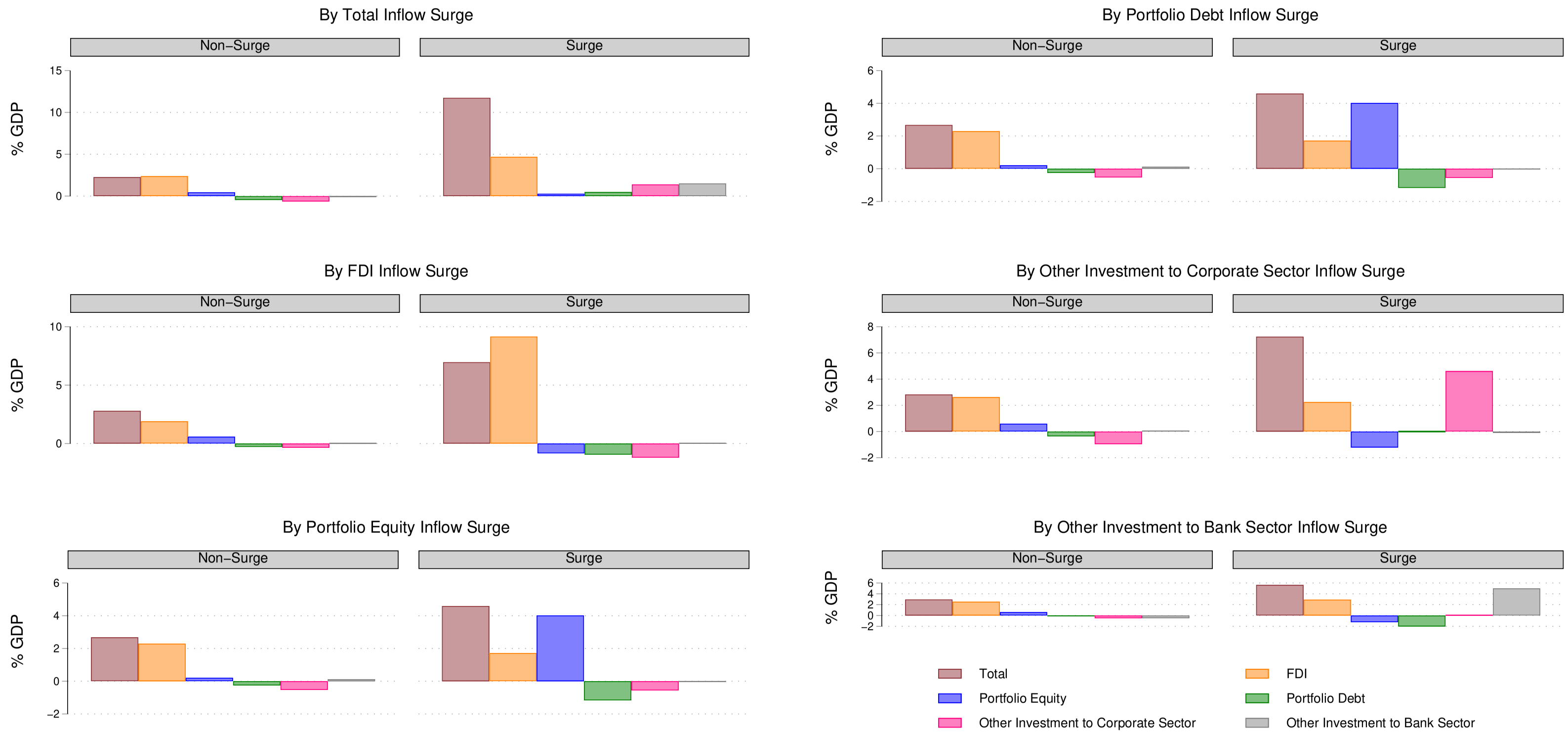



**Figure A3:** Capital Inflows During Surges and Non-surges

Note: This figure shows the net inflows of different categories of capital during non-surges (on the left) and surges (on the right). From top to bottom, surges are defined when the net inflows of total capital, FDI, portfolio equity, portfolio debt, other investment to corporate sector, and other investment to bank sector (all in real per capita terms) is one standard deviation above the trend, respectively.


**Figure A4:** Time Series of Surge and Crises in Countries Used in Firm-level Analysis

Note: This figure shows the time series of the net capital inflow in real per capita terms in the blue line and the sum of its trend and one standard deviation of its cyclical component in the maroon line, for each country used in firm-level analysis. A surge is identified is the blue lines are above the maroon lines. The units of the y-axis are different across countries, as the capital inflows are in local currencies and expressed in different units. The red vertical lines indicate the occurrence of systemic financial crises. The capital flow data is from IMF Financial Flows Analytics Database, and the systemic crisis data is from Laeven and Valencia (2018).

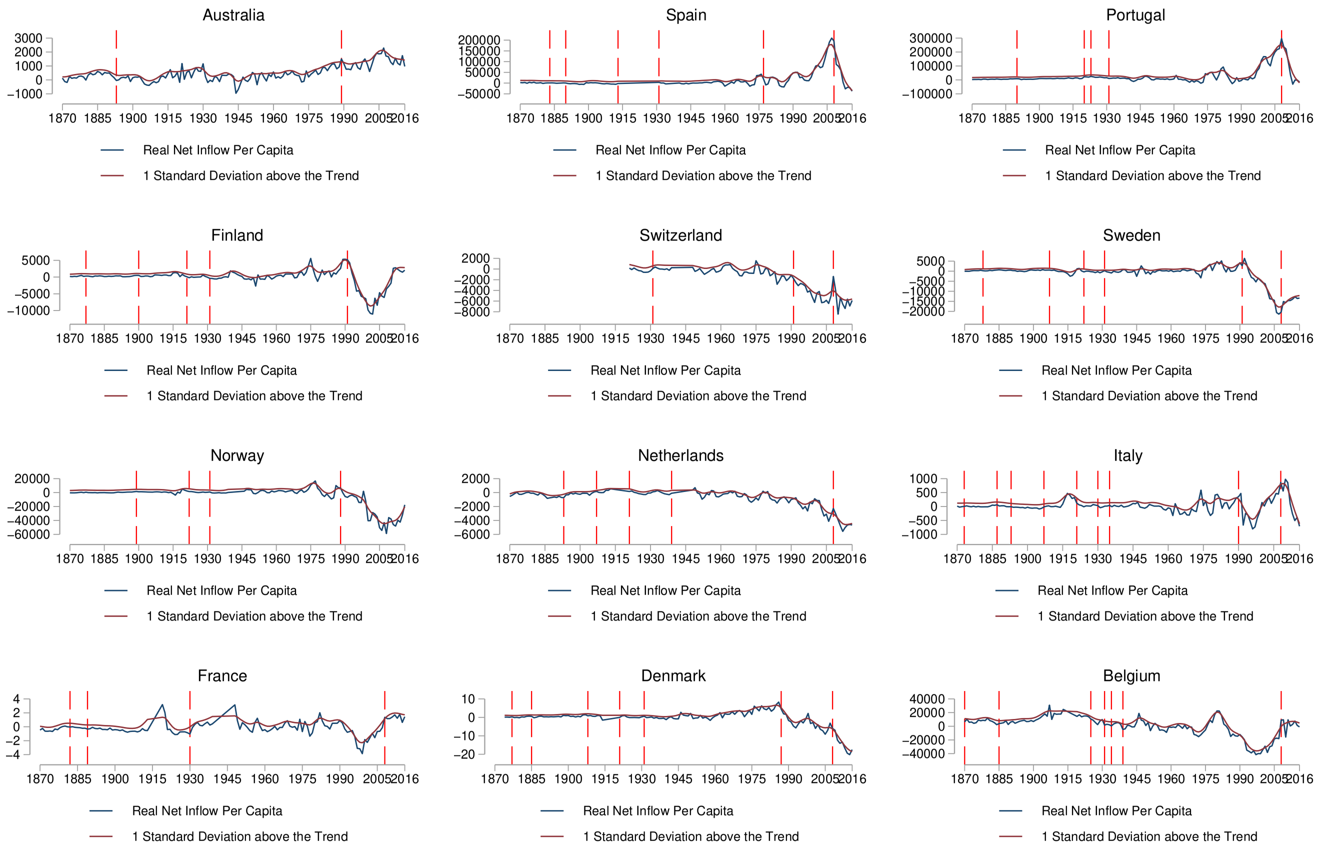
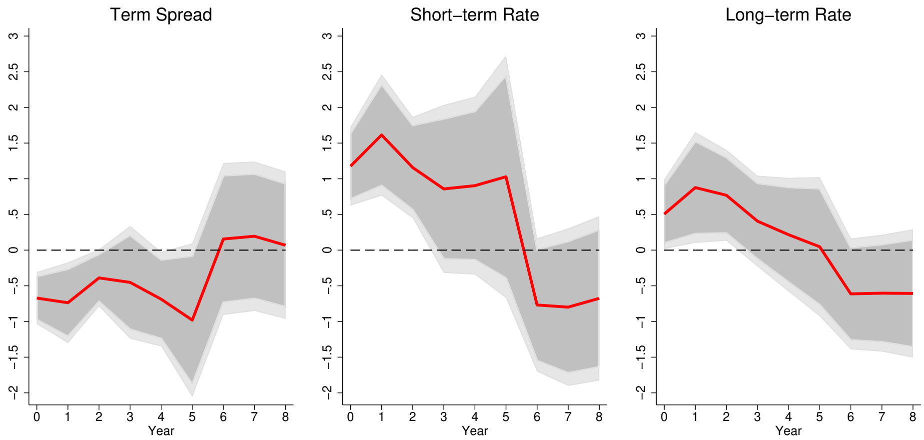



**Figure A5:** Time Series of Surge and Crises in Countries Used in Macro-level Analysis

Note: This figure shows the time series of the net capital inflow in real per capita terms in the blue line and the sum of its trend and one standard deviation of its cyclical component in the maroon line, for each country used in macro-level analysis. A surge is identified is the blue lines are above the maroon lines. The units of the y-axis are different across countries, as the capital inflows are in local currencies and expressed in different units. The red vertical lines indicate the occurrence of systemic financial crises. Both capital flow and crisis data is from the JST macrohistroy database (Jordà, Schularick and Taylor, 2017).

**((A))** Good Global Market




**((B))** Bad Global Market

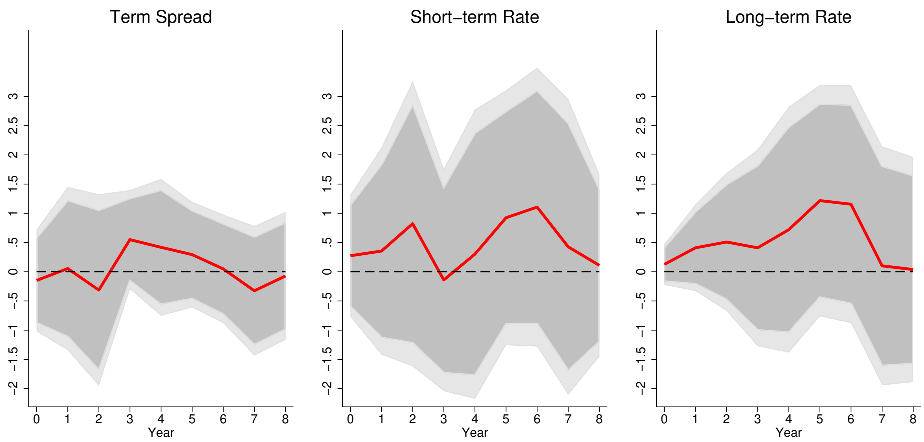



**Figure A6:** Surges on Term Structure: By Global Market Condition (Post WWII sample: 1946-2016)

Note: The results shown in this figure is based on the sample of 1946-2016. The upper panel shows the results with a good market condition and lower panel shows that with a bad global market condition. The global market condition is proxied by the global monetary policy rate and liquidity. It is good if the change in global short-term rate proxied by the average of US, UK, Japan, and Germany, is nonpositive and the global broad money growth rate is positive, otherwise it is in a bad condition. The red lines show the AIPW point estimates of the average treatment effect (ATE) of capital inflow surges on term spread, short-term interest rate, and long-term interest rate, over the eight-year horizon. The dark and light shades correspond to the 95% and 90% confidence intervals.

# **Table A1:** Variable Definitions

| Variable | Definition | Source |
|---|---|---|
| | *A: Firm-level Analysis* | |
| Surge | A dummy that has a value of 1 if the cyclical component of the net total capital inflows (in per capita real terms) is one standard deviation above the trend. For the annual data, the smoothing parameter is set to 6.25 to separate the cyclical and trend components of capital inflows | IMF Financial Flows Analytics (FFA) Database, 1994-2015 |
| Surge-FDI | A dummy that has a value of 1 if the cyclical component of the net direct capital inflow (in per capita real terms) is one standard deviation above the trend | IMF Financial Flows Analytics (FFA) Database, 1994-2015 |
| Surge-Portfolio Equity | A dummy that has a value of 1 if the cyclical component of the net portfolio equity capital inflow (in per capita real terms) is one standard deviation above the trend | IMF Financial Flows Analytics (FFA) Database, 1994-2015 |
| Surge-Portfolio Debt | A dummy that has a value of 1 if the cyclical component of the net portfolio debt capital inflow (in per capita real terms) is one standard deviation above the trend | IMF Financial Flows Analytics (FFA) Database, 1994-2015 |
| Surge-Other Investment to Corporate Sector | A dummy that has a value of 1 if the cyclical component of the net other investment to the private corporate sector (in per capita real terms) is one standard deviation above the trend | IMF Financial Flows Analytics (FFA) Database, 1994-2015 |
| Surge-Other Investment to Bank Sector | A dummy that has a value of 1 if the cyclical component of the net other investment to the private bank sector (in per capita real terms) is one standard deviation above the trend | IMF Financial Flows Analytics (FFA) Database, 1994-2015 |
| Debt Maturity(%) | The share of long-term debt in the sum of long-term debt and short-term debt | *Orbis*, 1994-2015 |
| Short-term Debt to Asset Ratio | The ratio of short-term debt, i.e., sum of short-term loans (financial debt to credit institutions and the part of long-term financial debt payable within a year), and the current liabilities, to total asset | *Orbis*, 1994-2015 |
| Long-term Debt to Asset Ratio | The ratio of long-term debt, i.e., financial debt (loans and credits) to credit institutions and bonds that mature in more than one year, to total asset | *Orbis*, 1994-2015 |
| Total Debt to Asset Ratio | The ratio of total debt, i.e, the sum of short-term debt and long-term debt, to total asset | *Orbis*, 1994-2015 |
| Firm Size | The natural logarithm of total assets | *Orbis*, 1994-2015 |
| Sale Growth | The difference in log sales between the current and previous year | *Orbis*, 1994-2015 |
| Cash Flow | The sum of the current profits and depreciation divided by total assets | *Orbis*, 1994-2015 |
| Tangibility | The ratio of tangible fixed assets to total assets | *Orbis*, 1994-2015 |
| SA Index | The Hadlock and Pierce (2010) Size-Age index of financial constraints | *Orbis*, 1994-2015 |
| Foreign Bank Relationship | A dummy that has a value of 1 if one of the main banks the firm has lending relationship with is a foreign bank | *Orbis* and *Bankscope* (or *BankFocus*), 1994-2015 |
| Number of Bank Relationship | The number of main banks the firm has lending relationship with | *Orbis* and *Bankscope* (or *BankFocus*), 1994-2015 |
| | *B: Macro-level Analysis* | |
| Surge | A dummy that has a value of 1 if the cyclical component of the net capital inflow (in per capita real terms), measured by the opposite of current account balance, is one standard deviation above the trend | JST Macrohistory Database, 1870-2016 |
| Term Spread | The difference between long-term and short-term interest rate, where long-term interest rate is mostly 10-year government bond yield and short-term interest rate is mostly 3-month interbank interest rate, different tenors might be adopted to ensure long-run coverage | JST Macrohistory Database, 1870-2016 |
| Change in Term Spread | The annual difference in the term spread | JST Macrohistory Database, 1870-2016 |
| Global Short-term Interest Rate | The average short-term rate of the US, UK, Japan and Germany | JST Macrohistory Database, 1870-2016 |
| Global Liquidity Growth | The average broad money growth rate of the US, UK, Japan and Germany | JST Macrohistory Database, 1870-2016 |
| Global Growth Rate | The average GDP rate of the US, UK, Japan and Germany | JST Macrohistory Database, 1870-2016 |
| Surges with Flattened Yield Curve | A dummy that has a value of 1 if (i) the surge dummy is 1 and (ii) the cyclical component of term spread is lower than one negative standard deviation | JST Macrohistory Database, 1870-2016 |
| Surges without Flattened Yield Curve | A dummy that has a value of 1 if (i) the surge dummy is 1 and (ii) the cyclical component of term spread is higher than one negative standard deviation | JST Macrohistory Database, 1870-2016 |
| Systemic Financial Crises | A dummy that has a value of 1 if the country is in a systemic financial crisis | JST Macrohistory Database, 1870-2016 |
| Credit Boom | A dummy that has a value of 1 if the total loans to non-financial private sector (in per capita real terms) is one standard deviation above the trend | JST Macrohistory Database, 1870-2016 |
| Real GDP per capita | An index with 2005=100 for the real GDP per capita | JST Macrohistory Database, 1870-2016 |
| GDP Growth | Year-over-year GDP growth rates (in decimal) | JST Macrohistory Database, 1870-2016 |
| Trade Openness | The sum of imports an exports divided by GDP | JST Macrohistory Database, 1870-2016 |
| Strict Peg Dummy | A dummy that has a value of 1 if the country has a strictly pegged exchange rate | JST Macrohistory Database, 1870-2016 |
| Depreciation | Year-over-year change in the exchange rate per US dollar | JST Macrohistory Database, 1870-2016 |
| Private Credit | The ratio of the total loans to non-financial private sector to GDP | JST Macrohistory Database, 1870-2016 |
| Housing Return | The nominal total return of housing assets | JST Macrohistory Database, 1870-2016 |

## **Table A2:** Summary Statistics of Debt Maturity and Bank Relationships by Country

| | (1) Debt Maturity | (2) Short-term Debt/Asset | (3) Long-term Debt/Asset | (4) Total Debt/Asset | (5) Number of Bank Relationships | (6) Having Foreign Bank Relationship |
|---|---|---|---|---|---|---|
| Bulgaria | 55.91 | 0.162 | 0.212 | 0.372 | | |
| | (30.41) | (0.172) | (0.191) | (0.230) | | |
| Czech Republic | 39.64 | 0.210 | 0.146 | 0.355 | | |
| | (30.73) | (0.195) | (0.172) | (0.234) | | |
| Estonia | 46.34 | 0.228 | 0.220 | 0.448 | 1.400 | 0.100 |
| | (27.14) | (0.176) | (0.196) | (0.239) | (0.656) | (0.299) |
| France | 32.14 | 0.303 | 0.162 | 0.464 | 1.011 | 0.004 |
| | (25.55) | (0.174) | (0.168) | (0.205) | (0.105) | (0.059) |
| Germany | 51.02 | 0.240 | 0.271 | 0.509 | 2.269 | 0.036 |
| | (31.50) | (0.213) | (0.234) | (0.251) | (1.345) | (0.187) |
| Hungary | 32.65 | 0.281 | 0.153 | 0.425 | 2.359 | 0.085 |
| | (26.37) | (0.197) | (0.182) | (0.231) | (1.038) | (0.279) |
| Italy | 33.94 | 0.304 | 0.159 | 0.461 | | |
| | (25.26) | (0.186) | (0.156) | (0.208) | | |
| Latvia | 63.60 | 0.132 | 0.253 | 0.382 | 1.415 | 0.212 |
| | (27.36) | (0.143) | (0.201) | (0.224) | (0.685) | (0.409) |
| Norway | 46.28 | 0.285 | 0.270 | 0.555 | | |
| | (28.40) | (0.179) | (0.214) | (0.192) | | |
| Poland | 44.34 | 0.183 | 0.160 | 0.343 | 1.097 | 0.0172 |
| | (29.16) | (0.150) | (0.163) | (0.198) | (0.323) | (0.130) |
| Portugal | 54.12 | 0.208 | 0.264 | 0.470 | 2.291 | 0.002 |
| | (29.22) | (0.179) | (0.209) | (0.224) | (1.474) | (0.045) |
| Romania | 38.26 | 0.301 | 0.190 | 0.468 | | |
| | (27.55) | (0.237) | (0.195) | (0.254) | | |
| Spain | 38.08 | 0.368 | 0.223 | 0.590 | 2.082 | 0.072 |
| | (28.40) | (0.248) | (0.205) | (0.260) | (1.299) | (0.259) |
| Ukraine | 49.38 | 0.189 | 0.199 | 0.376 | | |
| | (31.57) | (0.205) | (0.212) | (0.259) | | |
| Total | 37.64 | 0.315 | 0.197 | 0.511 | 1.826 | 0.045 |
| | (28.06) | (0.217) | (0.191) | (0.243) | (1.234) | (0.207) |

Note: This table shows the summary statistics of firms' key variables of debt maturity and bank relationship by country. Debt Maturity is the share of long-term debt in total debt. Short-term Debt/Asset, Long-term Debt/Asset, and Total Debt/Asset are the ratio of short-term, long-term debt, and total debt to total asset, respectively. Number of bank relationship is the count of main banks the firms have lending relationship with. Having foreign bank relationship is a dummy that has a value of one if at least one of the main banks are foreign banks. We do not have banker information for firms in Bulgaria, Czech Republic, Italy, Norway, Romania and Ukraine, because the reported banker info is either too few or the bank names are not available.

**Table A3:** Number of Firms and Observations by Country

| | All | | High Redeployability | | Low Redeployability | | High Time-to-Build | | Low Time-to-Build | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) Firms | (2) Obs | (3) Firms | (4) Obs | (5) Firms | (6) Obs | (7) Firms | (8) Obs | (9) Firms | (10) Obs |
| Bulgaria | 31015 | 105313 | 13945 | 43976 | 18721 | 61337 | 7254 | 24548 | 9698 | 33272 |
| Czech Republic | 31421 | 123078 | 14491 | 48383 | 17437 | 74695 | 7400 | 26489 | 8538 | 35268 |
| Estonia | 17531 | 89946 | 8250 | 38301 | 9303 | 51645 | 3100 | 16134 | 3778 | 21969 |
| France | 569816 | 2306916 | 255790 | 893496 | 363770 | 1413420 | 77639 | 308867 | 88186 | 371301 |
| Germany | 41504 | 139533 | 18570 | 56938 | 25638 | 82595 | 8914 | 29974 | 10199 | 33206 |
| Hungary | 10831 | 38702 | 4845 | 16025 | 6134 | 22677 | 3130 | 11516 | 2948 | 10804 |
| Italy | 308186 | 1278428 | 148492 | 572109 | 162780 | 706319 | 67803 | 290720 | 80679 | 375507 |
| Latvia | 1122 | 3746 | 235 | 613 | 905 | 3133 | 119 | 337 | 184 | 530 |
| Norway | 25884 | 72712 | 9546 | 26760 | 16355 | 45952 | 3619 | 10433 | 4784 | 14402 |
| Poland | 27386 | 119496 | 12672 | 51034 | 15116 | 68462 | 6978 | 19347 | 13670 | 50973 |
| Portugal | 123313 | 567315 | 62300 | 267452 | 67076 | 299863 | 24496 | 122742 | 26436 | 134447 |
| Romania | 12118 | 24906 | 5248 | 9579 | 7032 | 15327 | 3267 | 6511 | 4088 | 9120 |
| Spain | 490506 | 3276520 | 214363 | 1214429 | 324446 | 2062091 | 99706 | 728381 | 103350 | 773718 |
| Ukraine | 14652 | 50193 | 4303 | 12449 | 10474 | 37744 | 981 | 1929 | 7338 | 25410 |

Note: This table reports the number of firms and firm-year observations by country. High and low redployability (time-to-build) are classified based on the median value of sector-level redeployability (time-to-build).

## **Table A4:** Sectoral Heterogeneity: Redeployability

| | Maturity | | Short | | Long | | Total | |
|---|---|---|---|---|---|---|---|---|
| | (1) Low | (2) High | (3) Low | (4) High | (5) Low | (6) High | (7) Low | (8) High |
| -3 Years to Surge × D(Has Foreign Bank) | -0.552* | -0.218 | 0.007** | 0.001 | -0.003 | -0.005* | 0.003 | -0.003 |
| | (0.320) | (0.365) | (0.003) | (0.003) | (0.002) | (0.003) | (0.002) | (0.003) |
| -2 Years to Surge × D(Has Foreign Bank) | -0.292 | 0.037 | 0.006** | -0.002 | -0.002 | -0.002 | 0.003 | -0.004 |
| | (0.282) | (0.357) | (0.003) | (0.003) | (0.002) | (0.003) | (0.002) | (0.003) |
| -1 Years to Surge × D(Has Foreign Bank) | -0.121 | -0.080 | 0.001 | 0.001 | -0.001 | -0.002 | -0.000 | -0.001 |
| | (0.235) | (0.327) | (0.003) | (0.003) | (0.002) | (0.003) | (0.002) | (0.003) |
| +1 Years to Surge × D(Has Foreign Bank) | -0.940*** | -1.249*** | 0.016*** | 0.027*** | 0.000 | 0.001 | 0.017*** | 0.029*** |
| | (0.279) | (0.322) | (0.003) | (0.003) | (0.002) | (0.003) | (0.002) | (0.003) |
| +2 Years to Surge × D(Has Foreign Bank) | -0.687** | -1.242*** | 0.016*** | 0.025*** | 0.002 | 0.001 | 0.019*** | 0.027*** |
| | (0.291) | (0.323) | (0.003) | (0.003) | (0.002) | (0.002) | (0.002) | (0.003) |
| +3 Years to Surge × D(Has Foreign Bank) | -1.038*** | -1.127*** | 0.021*** | 0.024*** | 0.000 | 0.003 | 0.021*** | 0.027*** |
| | (0.315) | (0.323) | (0.003) | (0.003) | (0.002) | (0.003) | (0.002) | (0.003) |
| Firm Size | 13.575*** | 9.091*** | 0.001 | -0.014*** | 0.119*** | 0.079*** | 0.113*** | 0.064*** |
| | (0.808) | (0.357) | (0.003) | (0.003) | (0.002) | (0.008) | (0.002) | (0.003) |
| Sale Growth | -0.971*** | -0.917*** | 0.027*** | 0.027*** | -0.001* | -0.003*** | 0.026*** | 0.024*** |
| | (0.100) | (0.063) | (0.001) | (0.001) | (0.000) | (0.001) | (0.000) | (0.001) |
| Cash Flow | -8.148*** | -5.686*** | -0.121*** | -0.143*** | -0.094*** | -0.068*** | -0.223*** | -0.215*** |
| | (0.409) | (0.285) | (0.002) | (0.002) | (0.001) | (0.005) | (0.002) | (0.002) |
| Tangibility | 29.047*** | 34.317*** | -0.143*** | -0.187*** | 0.188*** | 0.211*** | 0.043*** | 0.024*** |
| | (0.661) | (0.221) | (0.002) | (0.002) | (0.001) | (0.015) | (0.001) | (0.002) |
| SA Index | 8.925*** | 5.867*** | 0.018*** | -0.020*** | 0.082*** | 0.055*** | 0.087*** | 0.032*** |
| | (1.134) | (0.481) | (0.004) | (0.004) | (0.002) | (0.010) | (0.003) | (0.004) |
| Constant | 23.646*** | 20.042*** | 0.421*** | 0.393*** | 0.144*** | 0.110*** | 0.557*** | 0.501*** |
| | (0.638) | (0.250) | (0.002) | (0.002) | (0.001) | (0.007) | (0.002) | (0.002) |
| Observations | 982680 | 675784 | 982680 | 675784 | 982680 | 675784 | 982680 | 675784 |
| R-Square | 0.746 | 0.767 | 0.765 | 0.790 | 0.767 | 0.782 | 0.816 | 0.825 |
| Firm Controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Country × Sector × Year FE | YES | YES | YES | YES | YES | YES | YES | YES |

Note: This table shows the role of having foreign bank relationship in the effect of surges on corporate debt maturity in a dynamic difference-in-difference specification, for sectors with low and high redeployability separately. The dependent variables are debt maturity defined as the share of long-term debt in total debt in columns (1)-(2), the ratio of short-term debt to total asset in columns (3)-(4), the ratio of long-term debt to total asset in columns (5)-(6), and the ratio of total debt to total asset in columns (7)-(8). The dummy variables *-3 Years to Surge*, *-2 Years to Surge*, and *-1 Years to Surge* are equal to one if a capital inflow surge occurs in the next three, two, and one year, respectively.The dummy variables *+1 Years to Surge*, *+2 Years to Surge*, and *+3 Years to Surge* are equal to one if a capital inflow surge has occurred in the one, two, and three years ago, respectively. The dummy variable *D(Foreign Bank Relationship)* is equal to one if the firm has at least one foreign bank in its main bank relationships. Redeployability is from the measurement constructed by Kim and Kung (2016) with a higher value indicating that the assets of firms in this industry are used by more firms in the economy. The division of the low- and high-redeployability subsamples is based on the median value. Odd columns show the results in the low-redeployability subsample, and even columns show the results in the high-redeployability subsample. Definitions of the other control variables are in Table A1 in the online appendix. Data used in this table is at firm-year level. Standard errors are in parentheses. *, **,and *** represent results significant at the 10%, 5%, and 1% levels, respectively.

## **Table A5:** Sectoral Heterogeneity: Time-to-Build

| | Maturity | | Short | | Long | | Total | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Low | High | Low | High | Low | High | Low | High |
| -3 Years to Surge × D(Has Foreign Bank) | -0.855** | -0.738* | 0.007** | 0.002 | -0.003 | -0.008*** | 0.004 | -0.005* |
| | (0.411) | (0.381) | (0.004) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| -2 Years to Surge × D(Has Foreign Bank) | -0.433 | -0.482 | 0.003 | -0.001 | -0.003 | -0.006* | -0.000 | -0.007** |
| | (0.396) | (0.373) | (0.004) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| -1 Years to Surge × D(Has Foreign Bank) | 0.027 | -0.258 | -0.001 | 0.002 | -0.000 | -0.004 | -0.001 | -0.001 |
| | (0.315) | (0.340) | (0.003) | (0.003) | (0.002) | (0.004) | (0.003) | (0.003) |
| +1 Years to Surge × D(Has Foreign Bank) | -1.570*** | -1.398*** | 0.019*** | 0.028*** | -0.003 | 0.001 | 0.016*** | 0.029*** |
| | (0.378) | (0.335) | (0.003) | (0.003) | (0.002) | (0.003) | (0.003) | (0.003) |
| +2 Years to Surge × D(Has Foreign Bank) | -0.901** | -1.596*** | 0.016*** | 0.026*** | 0.002 | -0.001 | 0.018*** | 0.025*** |
| | (0.405) | (0.335) | (0.003) | (0.003) | (0.002) | (0.003) | (0.003) | (0.003) |
| +3 Years to Surge × D(Has Foreign Bank) | -1.071** | -1.461*** | 0.021*** | 0.024*** | 0.002 | 0.001 | 0.022*** | 0.025*** |
| | (0.456) | (0.336) | (0.004) | (0.003) | (0.002) | (0.003) | (0.003) | (0.003) |
| Firm Size | 11.054*** | 9.090*** | 0.009** | -0.001 | 0.086*** | 0.062*** | 0.091*** | 0.058*** |
| | (0.891) | (0.399) | (0.004) | (0.003) | (0.002) | (0.006) | (0.003) | (0.003) |
| Sale Growth | -0.890*** | -0.857*** | 0.038*** | 0.036*** | 0.003*** | -0.002 | 0.041*** | 0.034*** |
| | (0.122) | (0.083) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Cash Flow | -4.886*** | -5.831*** | -0.157*** | -0.186*** | -0.075*** | -0.068*** | -0.234*** | -0.258*** |
| | (0.545) | (0.356) | (0.003) | (0.003) | (0.002) | (0.006) | (0.003) | (0.003) |
| Tangibility | 31.390*** | 41.490*** | -0.139*** | -0.210*** | 0.203*** | 0.261*** | 0.064*** | 0.050*** |
| | (0.869) | (0.264) | (0.002) | (0.002) | (0.002) | (0.012) | (0.002) | (0.002) |
| SA Index | 5.168*** | 5.632*** | 0.037*** | 0.006 | 0.042*** | 0.037*** | 0.073*** | 0.038*** |
| | (1.196) | (0.542) | (0.005) | (0.005) | (0.003) | (0.008) | (0.004) | (0.004) |
| Constant | 18.356*** | 14.843*** | 0.435*** | 0.426*** | 0.101*** | 0.072*** | 0.531*** | 0.494*** |
| | (0.761) | (0.306) | (0.003) | (0.003) | (0.002) | (0.006) | (0.002) | (0.003) |
| Observations | 469352 | 533662 | 469352 | 533662 | 469352 | 533662 | 469352 | 533662 |
| R-Square | 0.736 | 0.729 | 0.759 | 0.791 | 0.750 | 0.750 | 0.815 | 0.828 |
| Firm Controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Country × Sector × Year FE | YES | YES | YES | YES | YES | YES | YES | YES |

Note: This table shows the role of having foreign bank relationship in the effect of surges on corporate debt maturity in a dynamic difference-in-difference specification, for sectors with low and high time-to-build separately. The dependent variables are debt maturity defined as the share of long-term debt in total debt in columns (1)-(2), the ratio of short-term debt to total asset in columns (3)-(4), the ratio of long-term debt to total asset in columns (5)-(6), and the ratio of total debt to total asset in columns (7)-(8). The dummy variables *-3 Years to Surge*, *-2 Years to Surge*, and *-1 Years to Surge* are equal to one if a capital inflow surge occurs in the next three, two, and one year, respectively.The dummy variables *+1 Years to Surge*, *+2 Years to Surge*, and *+3 Years to Surge* are equal to one if a capital inflow surge has occurred in the one, two, and three years ago, respectively. The dummy variable *D(Foreign Bank Relationship)* is equal to one if the firm has at least one foreign bank in its main bank relationships. Time-to-Build is from the measurement constructed by Koeva (2000) with a higher value indicating a longer investment horizon for the firms in this sector. The division of the low- and high-time-to-build subsamples is based on the median value. Odd columns show the results in the low-time-to-build subsample, and even columns show the results in the high-time-to-build subsample. Definitions of the other control variables are in Table A1 in the online appendix. Data used in this table is at firm-year level. Standard errors are in parentheses. *, **,and *** represent results significant at the 10%, 5%, and 1% levels, respectively.

**Table A6:** Logit Estimation and Propensity Scores of Surges

| | *D(Surge)* |
|---|---|
| Δ Global Short-term Rate | -0.111* |
| | (0.058) |
| L.Δ Global Short-term Rate | 0.039 |
| | (0.063) |
| Global Liquidity Growth | -0.058 |
| | (0.041) |
| L.Global Liquidity Growth | 0.084** |
| | (0.038) |
| Global Growth | -0.006 |
| | (0.034) |
| L.Global Growth | 0.082** |
| | (0.036) |
| Domestic Real Growth | -0.023 |
| | (0.033) |
| L.Domestic Real Growth | 0.022 |
| | (0.033) |
| Depreciation | 0.024*** |
| | (0.008) |
| L.Depreciation | -0.004 |
| | (0.008) |
| Peg | -0.363 |
| | (0.522) |
| L.Peg | 0.324 |
| | (0.523) |
| Δ Housing Return | -0.010 |
| | (0.009) |
| L.Δ Housing Return | -0.000 |
| | (0.008) |
| Constant | -2.641*** |
| | (0.406) |
| Obs | 1243 |
| Surges | 117 |
| Loglik | -347.079 |
| WaldTestChi2 | 24.102 |
| WaldTestPval | 0.012 |
| AUROC | 0.742 |
| seAUROC | 0.022 |

Notes: This table shows the effects of global and domestic factors on the probability of capital inflow surges using a logit model. The dependent variable is the *Surge* dummy which is equal to one if the net capital inflow in real per capita terms is one standard deviation above the trend. We use its predicted value as the propensity score in calculating the AIPW estimator. Δ *Global Short-term Rate*, *Global Liquidity*, and *Global Growth* are global factors measured as the average short-term rate, broad money growth rate, and GDP growth rate of US, UK, Japan, and Germany. *Real Growth*, *Depreciation*, *Peg* , and Δ *Housing Return* are domestic factors measured as the real GDP growth rate, exchange rate depreciation against US dollar, a dummy indicating pegged exchange rate regime of the domestic economy, and the change in housing returns. Data used in this table is at country-year level from the JST macrohistory database. Standard errors are in parentheses. *, **, and *** represent results significant at the 10%, 5%, and 1% levels, respectively. The coefficients indicate that global factors do play an important role to account for the presence of surge and we do not observe significant differences for domestic factors except for the exchange rate depreciation. In particular, surges are more likely to happen when the core economies' monetary policy is easing and global liquidity is high.

## **Table A7:** Surges and Crisis: Robustness Check on Flattened Yield Curve

| | Sample Period: 1870-2016 | | Sample Period: 1946-2016 | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Surge with Flattened Yield Curve | 12.507*** | 23.185*** | 84.634*** | 60.009*** |
| | (6.003) | (6.157) | (6.469) | (5.600) |
| Surge without Flattened Yield Curve | 0.499 | 0.854 | 3.069 | 2.266 |
| | (-0.679) | (-0.151) | (0.992) | (0.704) |
| Flattened Yield Curve without Surge | 3.565*** | 7.376*** | 9.282*** | 7.787*** |
| | (3.219) | (4.429) | (3.296) | (2.940) |
| Obs | 1236 | 1236 | 814 | 814 |
| Countries | 12 | 12 | 12 | 12 |
| Crises | 42 | 42 | 17 | 17 |
| Loglik | -167.323 | -138.004 | -61.062 | -50.679 |
| WaldTestChi2 | 1.876 | 9.846 | 4.426 | 5.235 |
| WaldTestPval | 0.598 | 0.454 | 0.219 | 0.875 |
| AUROC | 0.666 | 0.838 | 0.607 | 0.563 |
| seAUROC | 0.037 | 0.031 | 0.036 | 0.051 |
| Control | NO | YES | NO | YES |
| *Unconditional Probability* | 3.4% | 3.4% | 2.1% | 2.1% |
| *Probability Conditional on Surge with Flattened Yield Curve* | 30.6% | 44.9% | 64.4% | 56.1% |
| *Probability Conditional on Surge without Flattened Yield Curve* | 1.7% | 2.9% | 6.1% | 4.6% |
| *Probability Conditional on Flattened Yield Curve without Surge* | 11.1% | 20.6% | 16.5% | 14.2% |

Note: This table shows the effects of surge and the role of flattened yield curve on the probability of systemic financial crisis. The dependent variable is the dummy which is equal to one if a systemic financial crisis occurs in the JST macrohistory database. Compared to Table 7, here we additionally separate the case of no surges to (i) no surges but have flattened yield curve and (ii) no surges and no flattened yield curve, the latter of which is omitted as the base case. The dummy variable *Surge with Flattened Yield Curve* is equal to one if a surge occurs and at the same time the change in term spread, which calculated as the difference between long-term and short-term interest rates, is one standard deviation below its trend. The dummy variable *Surge without Flattened Yield Curve* is equal to one if a surge occurs and at the same time the change in term spread is not largely flattened, i.e., is above the one-standard-deviation-below-the-trend line. The dummy variable *Flattened Yield Curve without Surge* is equal to one if a surge does not occur and at the same time the change in term spread is one standard deviation below its trend. Control variables include real GDP per capita, GDP growth rate, trade openness, pegged exchange rate dummy, depreciation, private credit to GDP ratio, and housing return. Definitions of the control variables are in Table A1 in the online appendix. Data used in this table is at country-year level. We exclude US, UK, Japan and Germany as these countries are potentially drivers of the global financial cycle. Columns (1)-(2) show the results using the sample period from 1870 to 2016, and columns (3)-(4) show the results using the post WWII sample period from 1946 to 2016. The estimates shown here are exponentiated, and z statistics are in parentheses. *, **, and *** represent results significant at the 10%, 5%, and 1% levels, respectively.

## **Table A8:** Surges and Credit Booms

| | Sample Period: 1870-2016 | | | | Sample Period: 1946-2016 | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Surge | 5.167*** | 4.456*** | | | 4.658*** | 4.771*** | | |
| | (8.157) | (6.541) | | | (7.380) | (6.675) | | |
| Surge with Flattened Yield Curve | | | 7.349*** | 5.330*** | | | 6.717*** | 6.812*** |
| | | | (6.496) | (4.927) | | | (6.092) | (5.377) |
| Surge without Flattened Yield Curve | | | 4.816*** | 4.086*** | | | 3.886*** | 4.064*** |
| | | | (6.711) | (5.394) | | | (5.447) | (5.113) |
| Obs | 1236 | 1236 | 1236 | 1236 | 814 | 814 | 814 | 814 |
| Countries | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Booms | 123 | 123 | 123 | 123 | 120 | 120 | 120 | 120 |
| Loglik | -373.244 | -275.952 | -370.670 | -275.265 | -318.945 | -258.966 | -317.692 | -258.035 |
| WaldTestChi2 | 5.313 | 20.073 | 7.189 | 20.528 | 1.527 | 18.974 | 1.435 | 19.045 |
| WaldTestPval | 0.021 | 0.010 | 0.027 | 0.015 | 0.216 | 0.015 | 0.488 | 0.025 |
| AUROC | 0.674 | 0.880 | 0.671 | 0.882 | 0.615 | 0.825 | 0.658 | 0.882 |
| seAUROC | 0.026 | 0.012 | 0.026 | 0.012 | 0.028 | 0.017 | 0.025 | 0.012 |
| Control | NO | YES | NO | YES | NO | YES | NO | YES |

Note: This table shows the effects of surge and the role of flattened yield curve on the probability of a credit boom. The dependent variable is the dummy which is equal to one if a credit boom occurs in the JST macrohistory database. Credit boom is identified when the total loans to non-financial private sector in real per capita terms is one standard deviation above its trend. The dummy variable *Surge* is equal to one if the net capital inflow in real per capita terms is one standard deviation above the trend. The dummy variable *Surge with Flattened Yield Curve* is equal to one if a surge occurs and at the same time the change in term spread, which calculated as the difference between long-term and short-term interest rates, is one standard deviation below its trend. The dummy variable *Surge without Flattened Yield Curve* is equal to one if a surge occurs and at the same time the change in term spread is not largely flattened, i.e., is above the one-standard-deviation-below-the-trend line. Control variables include real GDP per capita, GDP growth rate, trade openness, pegged exchange rate dummy, depreciation, private credit to GDP ratio, and housing return. Data used in this table is at country-year level. We exclude US, UK, Japan and Germany as these countries are potentially drivers of the global financial cycle. Columns (1)-(4) show the results using the sample period from 1870 to 2016, and columns (5)-(8) show the results using the post WWII sample period from 1946 to 2016. The estimates shown here are exponentiated, and z statistics are in parentheses. *, **, and *** represent results significant at the 10%, 5%, and 1% levels, respectively.

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