Capital Flight with Intra-firm Lending

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Abstract

Using a novel administrative dataset, we study the cross-border capital flows related to internal loans of Chinese multinational enterprises. We exploit an exogenous policy change on the RMB exchange rate and provide evidence that the expectation of the RMB exchange rate has a significant impact on capital outflows through intra-firm loans. Anticipating RMB depreciation, multinational firms in China increase internal lending to their foreign affiliates. We find that the results are driven by the flows to tax havens and firms that are relatively less active in international trade, which suggests that internal loans of multinationals in China cannot be explained by reallocation of value-adding activities. Instead, our findings suggest that Chinese multinationals use intra-firm lending to facilitate capital flight under capital controls.

Keywords: Multinationals, RMB Exchange Rate, Internal Debt, Capital Flight

JEL Classification Numbers: O24, F23, F33, G15, G18, G12

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1 Introduction

For decades, China has been one of the leading destinations for foreign direct investments (FDI hereafter). China has also become a major outward investor. According to the World Investment Report 2018, China was the second-largest inward FDI recipient, with $136 billion in recorded inflows, and the third-largest outward investor, with $125 billion in outflows (UNCTAD, 2018). China's large volume of inward and outward FDI activities has drawn researchers' attention (Cheng and Kwan, 2000; Chen et al., 2019; Fan et al., 2018, etc.).

Most of the literature focuses on the establishment of new affiliates. In contrast, the internal capital structure of multinational firms has received scant attention. Intra-company loans have become increasingly important in China's capital account, accounting for almost 30% of overall FDI flows in 2015 and 2016. Therefore, understanding the internal capital structure of multinational firms is crucial to explaining changes in Chinese FDI flows and sheds light on the determinants of China's inward and outward FDI.

Previous studies on the internal borrowing and lending of multinational enterprises (MNEs) have found that imperfect capital markets and profit shifting drive internal lending across borders (Desai et al., 2004 and Dharmapala and Riedel, 2013). As a developing country, China has an emerging capital market and relatively high taxes, including value-added tax. If imperfect capital markets or profit shifting drive the internal lending of MNEs, Chinese MNEs would be net borrowers from their foreign affiliates, leading to net capital inflows from internal lending.

However, according to China's Balance of Payment Table, China instead experiences net intra-firm-loan outflows. In particular, there was USD 180 billion overall in net outflows due to internal lending by Chinese multinationals between 2015 and 2016. These two years coincide with accelerated capital flight due to the increasing expectation of renminbi (RMB) depreciation and other market conditions.

In this paper, we propose a new explanation for internal lending by Chinese multinational firms: to bypass China's capital controls. Chinese MNEs transfer their capital to overseas affiliates when they expect the renminbi to depreciate in the future. There are at least two challenges in testing this explanation empirically: first, measuring cross-border inter-

nal lending, and second, causally identifying what motivates MNEs to move their capital across borders.

To overcome these empirical challenges, we use a transaction-level administrative dataset and exploit an unexpected policy shock to identify spot and expected RMB exchange rates. On August 11, 2015, the People's Bank of China (PBC, hereafter) announced an unexpected policy reform to the central parity quoting mechanism for the RMB exchange rate. The announcement was accompanied by a sharp depreciation of the RMB, which lowered the Chinese yuan against the USD by 2% over a single day.

The offshore RMB (CNH), which could be traded freely, depreciated even more than the onshore RMB (CHY), which is subject to currency controls. The CNH premium, which is the difference in the spot exchange rate between the CNH and the CNY against the USD, immediately dropped by 2.7% and raised expectations of further depreciation of the RMB, triggering an episode of significant capital outflow. We follow McCowage (2018) and use the RMB offshore premium to gauge market expectations of appreciation/depreciation in the RMB exchange rate. In particular, we divide the CNH premium over the CNY by the CNY spot exchange rate against the USD.

Using a fuzzy regression discontinuity (RD) design, we instrument the endogenous variable, the RMB offshore premium, with the exchange-rate policy shock and find that a one percentage point decrease in the RMB offshore premium significantly increases the relative outflows related to MNEs' internal debt by approximately 300 log points, which is mostly driven by outflows rather than inflows. This suggests that Chinese multinationals increase their internal lending to their foreign affiliates when they expect the RMB to depreciate in the future. In particular, on the day of the policy change—when the RMB offshore premium dropped by almost one percentage point—the internal lending by Chinese multinationals to their foreign affiliates was three times more than the previous day's level.

To understand why firms respond to an RMB depreciation expectation by increasing internal lending, we further examine the heterogeneous effects of the offshore premium by different types of counterparty countries and by different types of firms.

First, we find that the result is driven by flows to tax havens. With the expectation of RMB depreciation, Chinese multinationals significantly increase their net lending to their

foreign affiliates in tax havens; in contrast, internal borrowing by non-tax-haven affiliates was not significantly affected.

Second, the increased intra-firm lending was driven by firms that were less active in international trades; we do not find any significant impact on firms active in international trade. A potential reason for this difference is that actively trading firms could use other trade-facilitated ways to transfer capital across borders, such as well-documented trade mis-invoicing (Fisman et al., 2004; Fung et al., 2011).

Our heterogeneous analysis indicates that the relation between the exchange rate and intra-firm lending across borders is unlikely to be driven by reallocating value-adding activities. Instead, the evidence suggests that Chinese MNEs could use internal lending to bypass regulations and transfer capital out of China in late 2015 and 2016, a period that experienced significant capital flight from China.

This paper contributes to the literature that studies the motivations for internal debt for MNEs. A large body of literature focuses on debt-shifting behavior and provides ample empirical evidence (see Altshuler and Grubert, 2003, Buettner and Wamser, 2013, Desai et al., 2004 and Schindler et al., 2013). Other hypotheses are also considered, such as imperfect capital markets (Desai et al., 2004). In contrast to most of the studies that focus on developed countries, our paper fills the gap by studying Chinese MNEs' internal debt flows. We propose an alternative hypothesis whereby Chinese multinationals could exploit internal debt to bypass capital controls. We find empirical evidence that these multinationals increase their internal lending to their foreign affiliates when the RMB is expected to depreciate and is not related to value-adding activities.

This paper also relates to the literature on the determinants of China's FDI (Chen et al., 2019, Fan et al., 2018 etc.). Cheng and Kwan (2000) use realized inward FDI stock obtained from the Ministry of Foreign Trade and Economic Cooperation and find that good policy, infrastructure, and regional markets attract more FDI, while wage cost has a negative impact. Chen and Tang (2014), Tian and Yu (2015), Chen et al. (2019), and Chen et al. (2019) all use the outward FDI dataset obtained from the Chinese Ministry of Commerce to identify the different types of determinants of China's outward FDI, such as minimum wage, firm performance, or institutional differences. However, most of the literature on China's FDI

studies the establishment of FDI instead of the interactions between MNEs and their affiliates. We intend to fill in the gap by focusing on the internal financial arrangements between these firms and shed light on the role tax havens play as popular FDI destinations. Apart from operational considerations, the findings in our paper suggest that establishing their foreign affiliates could enable MNEs to bypass capital controls.

Finally, this paper relates to the literature on regulation evasion in China. One channel, trade misinvoicing, is well documented by both anecdotal and empirical evidence (Fisman and Wei, 2004, Fisman et al., 2008 and Kar and Freitas, 2013). Hu and Yuan (2021) provide empirical evidence that firms used entrepôt trades and letters of credit to circumvent capital controls and conduct interest rate arbitrage. Related to the literature on FDI measurement, Damgaard et al. (2024) find that as much as 40% of reported FDI may be classified as phaeton FDI routed through shell companies in tax havens. Our paper complements these, but instead of focusing on illicit capital flows through current accounts, we provide evidence that firms could also evade capital controls through capital accounts.

The rest of the paper is organized as follows. Section 2 presents a simple conceptual framework. Section 3 describes the data. We provide the relevant background in Section 4 and empirical analysis in Section 5. Section 6 concludes.

2 A Simple Conceptual Framework

We set up a simple model with Firm A based in China, which has a foreign affiliate, Firm B. The expected profits from production for these two firms are π_A (in RMB) and π_B (in USD), respectively. Firm A could borrow from Firm B or lend to Firm B. Let y represent RMB-denominated lending, such that when y is positive, Firm A lends y from Firm B; when y is negative, Firm A borrows $|y|$ from Firm B.

The interest rate for internal loans is denoted by μ. Because of the income tax difference between China and other countries, the actual after-tax rate of the loan between these two firms may diverge. Desai et al. (2004) and Dharmapala and Riedel (2013) provide details on how multinational firms use intra-firm lending to evade corporate income taxes. As explained later, offshore tax havens and low-tax jurisdictions, such as Hong Kong, allow

Chinese firms to engage in tax and regulatory arbitrages. Let's denote the actual after-tax rates of the loan μ_A for Firm A and μ_B for Firm B. If firms use tax-deductible interest payments to shift their tax burden out of China, $\mu_B > \mu_A$. In this model, we focus on the case where $\mu_B > \mu_A$.

We assume that intra-firm transfers are costly. Intra-firm transfers incur cross-border transactions and administrative costs. Moreover, legal risks are also associated with evading China's capital controls. Let C be the cost of intra-firm lending, which is a function of y, denoted as $C(y)$. The marginal risk of getting caught is likely to increase with the magnitude of capital transfers. To represent these costly transfers in a simple and stylized way, we assume $C(y) = \alpha y^2$, where $\alpha > 0$.

Let s be the current exchange rate of RMB, expressed in units of foreign currency per U.S. dollar. An increase in s denotes a depreciation of RMB. Similarly, let $E(s)$ represent the expected future exchange rate of RMB.

The expected returns in China and in Country B are r_A and r_B, respectively. The expected operating profit and loss (PnL) of Firm A, including the interest earned (paid) by lending to (borrowing from) Firm B, is $\pi_A + \mu_A y$; The expected operating PnL of Firm B is $E(s)\pi_B - \mu_B y$. These values are denominated in RMB. The expected PnL of carry trades from the internal cross-border lending is $(E(s)/s)y(1 + r_B) - y(1 + r_A)$. If uncovered interest parity does not hold, the profit or loss from the carried trades is nonzero.

The total expected profits (in RMB) for the firms are:

$$E(\Pi) = \underbrace{\pi_A + \mu_A y}_{\text{PnL in China}} + \underbrace{E(s)\pi_B - \mu_B y}_{\text{PnL in Country B}} + \underbrace{\frac{E(s)}{s} y(1 + r_B) - y(1 + r_A)}_{\text{Carry trade PnL}} - \underbrace{\alpha y^2}_{\text{Cost of Transfers}} \tag{1}$$

The firm's objective is to set y to maximize the expected value of their total profits. The first-order condition of profit maximization with respect to y is:

$$(\mu_A - \mu_B) + \frac{E(s)}{s}(1 + r_B) - (1 + r_A) - 2\alpha y = 0 \tag{2}$$

If uncovered interest parity holds, $(E(s)/s)(1 + r_B) = (1 + r_A)$, or equivalently $(E(s) - s)/s = (r_A - r_B)/(1 + r_B)$, then y is negative, meaning that Firm A in China borrows from Firm B for

the benefits of tax avoidance.

However, there is ample empirical evidence that uncovered interest parity does not hold. See, e.g., Eichenbaum and Evans (1995). Moreover, with capital controls in China, uncovered interest rate parity is unlikely to hold in the short run for the RMB if the expectation of the currency exchange rate changes.

Solving Eq. (2) gives the optimal internal lending:

$$y^* = \frac{1}{2\alpha}\left[\frac{E(s)}{s}(1+r_B) - (1+r_A) - (\mu_B - \mu_A)\right] \tag{3}$$

Eq. (3) means that in the expectation of RMB depreciation, $E(s)$ is increasing with respect to s, and y^* would be increasing. If the gain from depreciation, $E(s)/s(1+r_B) - (1+r_A)$, outweighs the loss in the loan interest due to different tax rates, $\mu_B - \mu_A$, y^* becomes positive, implying that Firm B borrows from Firm A and capital flows out of China.

When the RMB is expected to appreciate, y^* decreases to negative, implying that firm A in China borrows from firm B and capital flows into China instead.

Note that the framework abstract from the firm size such that optimal internal lending given by Eq. (3) is independent of firm size. One may impose a cap of F^* on internal debt flows, for example, due to the limit of cash available or working capital from affiliated firms. The cap may be occasionally binding in a firm' constrained optimization problem. Alternatively, one may interpret internal lending y as a measurement that has been normalized by firm size.

Overall, Eq. (3) suggests that the direction of the capital flows driven by intra-firm loans is related to the expectation of the RMB exchange rate. Oftentimes, affiliated firms could choose their own interest rate for internal debt and could charge low or no interest (Bertrand et al., 2002) to minimize the tax cost. When bypassing capital control is the main consideration, the expected path of the RMB exchange rate may be the main driver of internal lending.

3 Data Description

We obtained our primary dataset from The People's Bank of China. The dataset includes cross-border transactions from 2012 to 2016 for all firms in a coastal province of China, which has one of the largest economies and highest income levels in the country.

Transaction types are classified in detail and coded with 6-digit numbers, with 107 categories under current accounts and 88 under capital accounts. The data includes transaction-level information such as payment and receipt dates, transaction values, settlement means, counterparty country, transaction currency type, firms' identifiers, firms' industry type, and banks' identifiers.

Ninety-three percent of the transactions were settled in USD, while the remaining were settled in other currencies but recorded after conversion to USD. Since we do not have information about the specific exchange rate used to convert other currencies to USD, and considering that USD is the primary settlement currency in China, this paper restricts its analysis to transactions settled in USD.

Table 1 summarizes aggregate inflows and outflows from 2012 to 2016. It also delineates the primary components of these flows, namely, exports and imports, which fall under current accounts. For capital accounts, it outlines inward and outward FDI. Given our paper's emphasis on intra-company loan transactions, we distinguish these from general FDI outflows, including only transactions stemming from capital investment in this category.

Additionally, the capital flows include internal-debt flows from intra-companies established by FDIs. To provide a more detailed analysis, intra-firm loan flows are further broken down by counterparty country type, distinguishing between tax havens and other regions/countries. Following Fan et al. (2018) and Chen et al. (2019), we include 11 urisdictions in the list of tax havens: Hong Kong, Macao, Singapore, Virgin Islands, Cayman Islands, Bermuda Islands, Bahamas, Luxembourg, Monaco, Panama, and Switzerland.

Over the sample period, there has been a decrease in capital investment by foreign countries (inward FDI). Moreover, capital invested in foreign countries (outward FDI) started to increase in 2015 and reached almost 5% of overall outflows in 2016.

The magnitudes of overall intra-firm loan flows during the sample period are nearly as large as those of foreign direct investment. Notably, around 70% of these transactions in-

Table 1: International Trade and Capital Flows

Inflow (Billion USD)						
Year	Overall	Export	Inward FDI	Intrafirm Loan	Tax Haven	Others
2012	255.8	175.04	4.76	0.77	0.57	0.20
		(68.44%)	(1.86%)	(0.30%)	(0.22%)	(0.08%)
2013	295.7	187.23	5.38	1.62	1.23	0.39
		(63.31%)	(1.82%)	(0.55%)	(0.42%)	(0.13%)
2014	313.0	195.84	3.06	4.49	4.01	0.47
		(62.56%)	(0.98%)	(1.43%)	(1.28%)	(0.15%)
2015	269.6	176.15	2.47	1.81	1.31	0.50
		(65.35%)	(0.92%)	(0.67%)	(0.49%)	(0.18%)
2016	257.9	178.18	1.71	1.96	1.61	0.35
		(69.09%)	(0.66%)	(0.76%)	(0.62%)	(0.14%)
Total	1391.9	912.43	17.37	10.65	8.73	1.91
		(65.55%)	(1.25%)	(0.77%)	(0.63%)	(0.14%)
Outflow (Billion USD)						
Year	Overall	Import	Outward FDI	Intrafirm Loan	Tax Haven	Others
2012	119.1	63.74	1.26	2.45	1.65	0.80
		(53.53%)	(1.06%)	(2.06%)	(1.39%)	(0.67%)
2013	133.5	60.58	1.05	1.65	0.97	0.68
		(45.36%)	(0.78%)	(1.24%)	(0.73%)	(0.51%)
2014	140.2	53.54	0.71	3.44	2.49	0.95
		(38.18%)	(0.50%)	(2.45%)	(1.78%)	(0.68%)
2015	128.2	46.49	3.45	4.42	3.59	0.82
		(36.28%)	(2.69%)	(3.45%)	(2.80%)	(0.64%)
2016	109.3	42.81	5.12	4.82	4.37	0.44
		(39.18%)	(4.68%)	(4.41%)	(4.00%)	(0.41%)
Total	630.3	267.15	11.58	16.77	13.08	3.69
		(42.39%)	(1.84%)	(2.66%)	(2.08%)	(0.58%)

Notes: We separate intra-firm loan transactions from general FDI flows and only include transactions from capital investment in the category of Inward FDI or Outward FDI. Numbers in parentheses report the share of flows under each category. The exchange rates for the Chinese yuan per USD onshore (USD/CNY) ranged from 6.041 to 6.956 and averaged 6.311 between 2012 and 2016. The exchange rate for the Chinese yuan per USD offshore (USD/CNH) ranged from 6.020 to 6.976 and averaged 6.314.

volve counterparties in tax-haven regions. The magnitude of internal borrowing by Chinese multinationals (intra-firm loan inflows) fluctuates during the sample period, likely due to a combination of these firms' business performance and tax avoidance activities. Their in-

ternal lending to their foreign affiliates (intra-firm loan outflows) has been increasing since 2013. In 2015 and 2016, the magnitude of these outflows was almost $5.5 billion greater than that of inflows. As we will explain in the next two sections, this surge in intra-firm loan outflows was attributed to the accelerated expectation of RMB depreciation.

We also downloaded the onshore and offshore exchange rates for the Chinese yuan against the USD as well as US Dollar LIBOR interest rates and RMB Shanghai Interbank Offered Rates (SHIBOR) from Bloomberg.

4 Background

4.1 The Exchange Rate and Capital Flight

Capital flight can be broadly defined to encompass all capital outflows from a country due to various factors, such as economic conditions, political risk, and the social environment. Alternatively, it can be narrowly defined to refer to a sudden, abnormal subset of capital outflows from a country that arise from fear or uncertainty (Sicular, 1998).

Capital flight, regardless of its definition, can be legal, typically taking the form of portfolio investments, or illegal, involving other types of investments if the country has capital controls or if the purpose is to move capital out of the country to evade taxes (Pérez et al., 2012). The causes of capital flight can include political risk, corruption, or an overvalued exchange rate (see Alesina and Tabellini, 1989, Gunter, 2017, and Cheung et al., 2016).

Das (2019) and McCowage (2018) document the relationship between changes in RMB exchange rate expectations and trends in capital flows in China over the past 15 years. Since 2005, China has aimed to gradually shift its fixed exchange rate policy to a more flexible one with a central parity mechanism, allowing the exchange rate to float within the trading band. While it is far from a fully floating exchange rate, the RMB experienced managed and gradual appreciation, except for the two years following the financial crisis. This trend coincided with market expectations that the RMB was undervalued and would continue to appreciate.

During this period, the risk of capital flight was low, and capital flowed into China. This was partially due to high expected returns on real investments in China and the anticipation

of RMB appreciation. However, this positive trend lasted only until the end of 2013. Expectations for the exchange rate shifted, with the RMB being considered overvalued, leading to pressure on capital outflows. On average, US$ 750 million flowed into China per quarter in 2013. In contrast, an average of US$ 100 billion per quarter flowed out of China between mid-2014 and mid-2015 (for more details, see Das, 2019).

On August 11, 2015, the People's Bank of China (PBC) unexpectedly announced a policy change in the central parity quoting mechanism[1]. As depicted in Figure 1, this reform shocked the market by depreciating the RMB against the USD by 2% on the same day. Moreover, the sudden change triggered an increasing expectation of further RMB depreciation. Capital outflows accelerated afterward, with the average quarterly capital outflow doubling to US$ 200 billion in the second half of 2015 (for more details, see Das, 2019 andMcCowage, 2018).

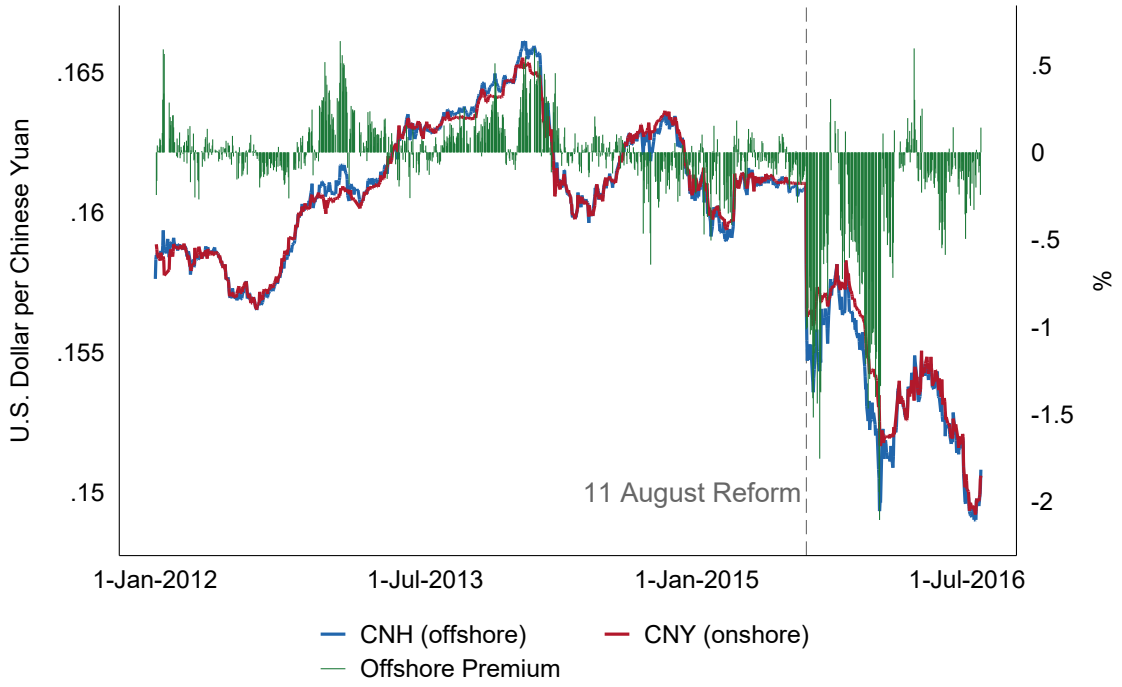

Figure 1: Onshore-offshore Exchange Rates of Chinese Yuan

Notes: This figure plots the onshore and offshore RMB exchange rates. The green spike indicates the RMB offshore premium, calculated as the premium of the offshore RMB/USD exchange rate over the onshore rate. The grey vertical dashed line marks the date of the exchange rate reform in its central parity quoting mechanism.

[1]http://www.pbc.gov.cn/english/130721/2941603/index.html

4.2 The RMB Offshore Premium and the Role of Hong Kong

Apart from the exchange-rate policy changes, another important development in China's currency policy in the past few years is RMB internationalization (Funke et al., 2015). In this process, offshore RMB usage has significantly increased, and the offshore RMB market has expanded rapidly. With supportive policies from Beijing and strong demand, Hong Kong quickly became the center of the RMB offshore market, known as the CNH market, and has maintained a second exchange rate for offshore RMB since July 2010 (Funke et al., 2015).

Offshore and onshore markets are segmented by capital controls, and arbitrage between these two markets exists but is costly (Hu and Yuan, 2021). Due to the 'one country, two systems' policy for Hong Kong, the CNH is more market-driven and can float freely without regulation, while the CNY is restricted by the central parity rate and trading band (Cheung and Rime, 2014 and Funke et al., 2015). Still, Cheung and Rime (2014) found that the CNH has a significant and increasing impact on the CNY and the official RMB central parity rate.

In this paper, we follow McCowage (2018) and use the RMB offshore premium to describe the market appreciation/depreciation expectation for the RMB exchange rate. The RMB offshore premium is calculated as the premium of the offshore RMB/USD exchange rate over the onshore rate, where RMB/USD represents USD per Chinese Yuan.

A positive RMB offshore premium indicates an expectation of RMB appreciation in the free market, while a negative premium signifies a depreciation expectation. Figure 1 shows that the onshore exchange rate is closer to the offshore rate before the August-11 policy shock, with a positive offshore premium most of the time. However, afterward, due to the turbulence the policy created and increasing depreciation expectations, a negative offshore premium with large magnitudes dominates most of the time.

Apart from being the main RMB offshore market, Hong Kong not only intermediates a large portion of China's trades (Feenstra and Hanson, 2004 and Fisman et al., 2008) but is also the hub for outward FDI and round-tripping FDI related to firms in mainland China (Xiao, 2004 and Chen and Tang, 2014). Chen and Tang (2014) tabulates the distribution of outward FDI deals from 1998 to 2009 by destination, and Hong Kong is the main recipient; it accounts for almost 20% of overall deals.

Xiao (2004) lists two main incentives for round-tripping FDI: preferential policies for

FDIs, such as low tax rates, and property rights protections that could explain the large portion of round-tripping FDI to China. Through these channels, firms in mainland China have established a large network of foreign affiliates. Considering that Hong Kong is a well-known tax haven, it is the most popular destination for capital flight from mainland China.

Despite Hong Kong's return to China, it has maintained its status as a free port and a 'foreign' haven, devoid of capital controls (Gunter, 2017). Notably, Hong Kong emerges as the primary destination for intra-firm loan outflows in our dataset from 2012 to 2016, capturing 66% of the total outflows. Figure 2 illustrates weekly outflows by destination before and after the policy shock, revealing that the greatest volumes of capital flight prompted by the fear of depreciation are directed towards Hong Kong.

5 Empirical Analysis

5.1 Identification Strategy and Specification

The exchange rate can be influenced by cross-border capital flows, even in countries like China with strict capital controls. Additionally, it can be affected by other macroeconomic conditions that may potentially impact capital flows. An empirical challenge in estimating the impact of exchange rate expectations on capital flight is disentangling the expectation of RMB depreciation from endogeneity issues arising due to omitted variables and reverse causality.

To identify the impact of exchange-rate expectations on intra-firm loan capital flows, we leverage the exchange-rate policy shock on August 11, 2015, and combine this policy shock with our novel high-frequency, transaction-level data on capital flows. In particular, we employ a RD in Time design, also known as the interrupted time series method (see Davis, 2008; Anderson, 2014; Yuan, 2023 for examples, or Hausman and Rapson, 2018 for a review of this method).

In Figure 3, we plot the RMB offshore premium and net outflows of multinationals' internal loans 40 weeks before and after the policy shock. The horizontal axis represents the number of weeks. The vertical axis on the left represents the weekly RMB offshore

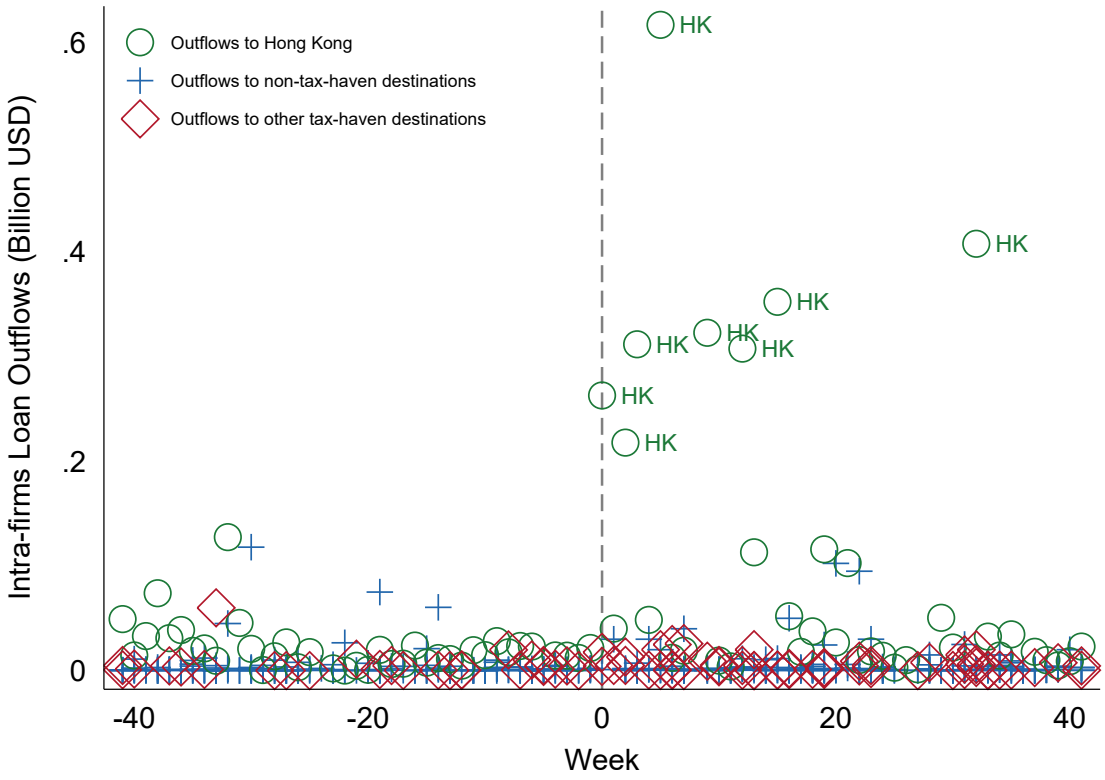

Figure 2: Intra-firm Loan Outflows to Hong Kong

Notes: This figure plots weekly intra-firm loan outflows by destination type around the exchange rate reform. Hollow blue circles represent weekly outflows to Hong Kong, blue pluses indicate outflows to non-tax-haven destinations, and hollow red diamonds represent outflows to tax-haven countries. The horizontal axis denotes the number of weeks since or before the exchange rate reform.

premium, shown by the blue hollow circles. Let S_{on} be the onshore exchange rate in terms of USD per yuan, and S_{off} be the offshore exchange rate of USD per yuan. Then, we define the offshore premium as:

$$\text{premium} = \frac{S_{off} - S_{on}}{S_{on}}$$

where a negative value means that the offshore RMB is cheaper than the onshore RMB and a positive value means the opposite.

The vertical axis on the right represents the volume of the weekly intra-firm loan net outflows, which is shown by the red hollow diamonds. As the graph shows, before the August-11 policy shock, the onshore and offshore exchange rates followed each other closely, and the offshore premium was close to zero. Net capital flows from firms' internal loan arrangements are also close to zero. The policy shock accelerates the expectation of RMB depreciation.

In the meantime, the offshore RMB exchange rate started to diverge, and there was a sharp decline in offshore premiums. Immediately, large volumes of capital in the form of internal-loan transactions flowed out of China. Together, Figure 2 and Figure 3 suggest a fuzzy regression discontinuity (RD) design. In particular, we use the policy shock to instrument the endogenous variable, the RMB offshore premium.

A fundamental identification assumption for our RD design is that potential outcomes and other variables potentially affecting the flows of internal loans are continuously distributed around the policy shock (Cattaneo and Titiunik, 2022). Moreover, in the context of Regression Discontinuity in Time, there should be no sorting or anticipation effects immediately before the policy shock (Hausman and Rapson, 2018).

To assess the validity of this assumption, we plot weekly trade flows (inward and outward) of FDI around the August-11 policy shock. As shown in Figure 4, we do not observe any discontinuity around the policy shock for these variables. Similarly, US Dollar LIBOR interest rates and SHIBOR are continuous around the cutoff.

The lack of sorting and anticipation, as well as muted responses to other macroeconomic variables in the short period around the policy shocks, provides some assurance that the policy shock was unanticipated by firms. Indeed, the policy change was widely reported as a surprise in the financial news media and was evidenced by the market confusion after

the policy change.[2]

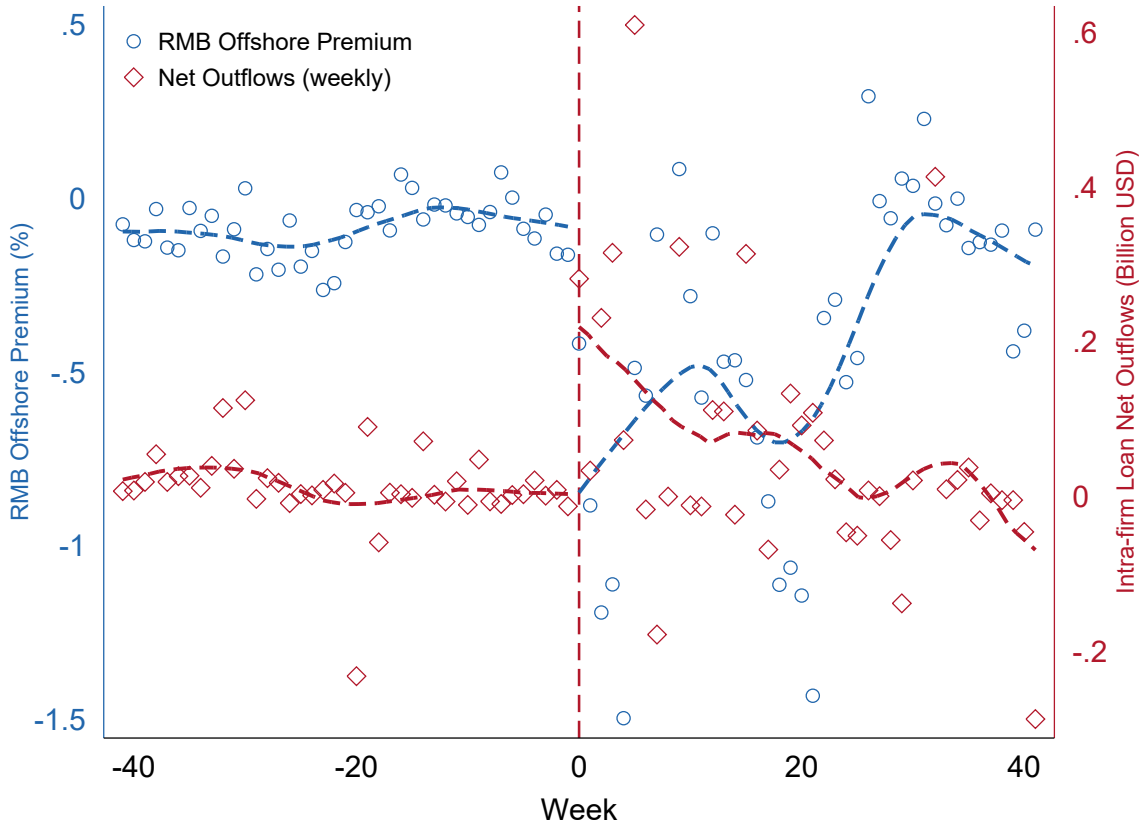

Figure 3: RMB Offshore Premium and Intra-firm Loan Net Outflows

Notes: This figure plots the RMB offshore premium and weekly net outflows from intra-firm loans around the exchange rate reform. Hollow blue circles represent the weekly average of the RMB offshore premium, and hollow red diamonds represent the weekly net outflows driven by intra-firm loans. The horizontal axis indicates the number of weeks since or before the exchange rate reform. The blue and red dashed lines are local linear fits of the blue circles and red diamonds, respectively, on either side of week 0, when the exchange rate reform took place.

We then consider the following specification using date as a running variable.

$$ln(y_t) = \gamma \text{premium}_t + X_t'\beta + f(date_t) + \epsilon_t \tag{4}$$

In the first stage,

$$\text{premium}_t = \eta d_t + X_t'\varphi + g(date_t) + \varepsilon_t \tag{5}$$

[2]See, e.g., "China Rattles Markets With Yuan Devaluation," Bloomberg News, August 11, 2015

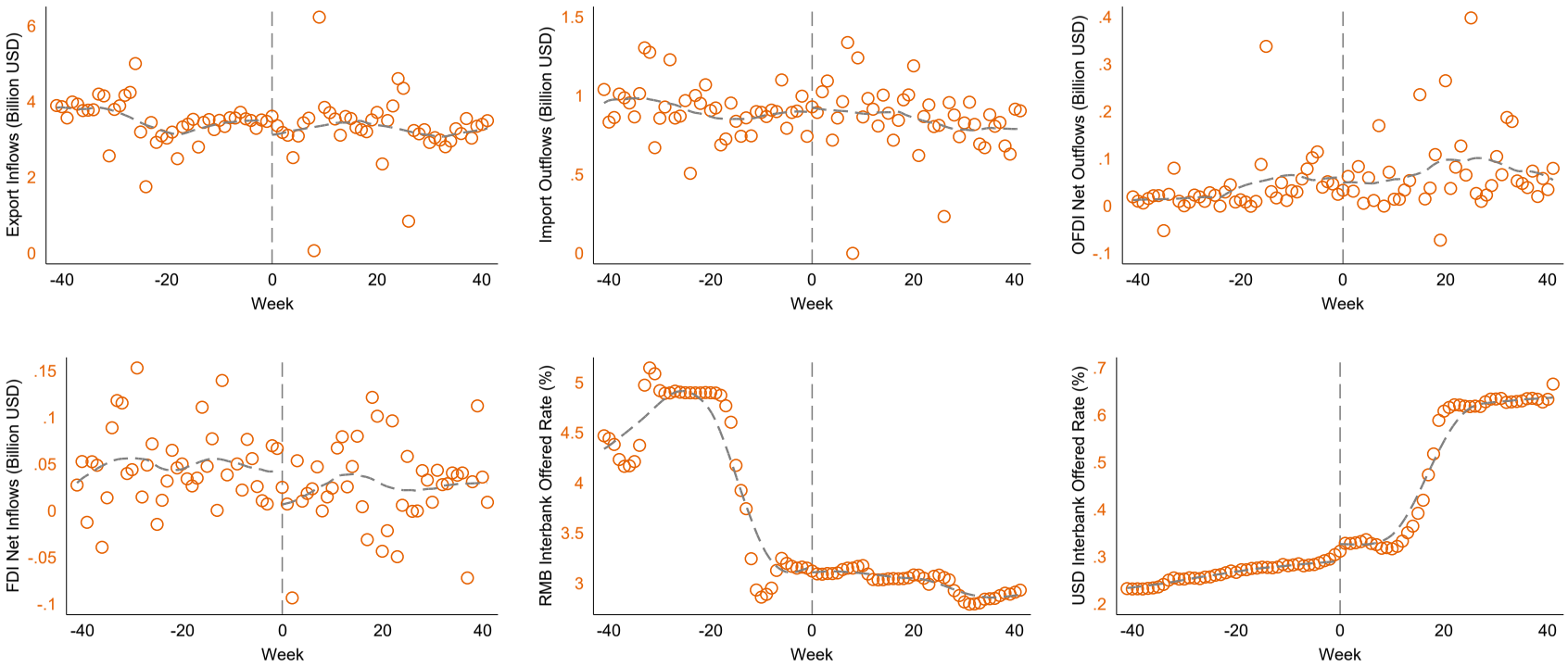

Figure 4: Tests of Continuity of Macroeconomic Variables

Notes: This figure plots weekly flow controls and the weekly average of interest-rate controls around the exchange rate reform. These are export inflows, import outflows, outward FDI outflows, inward FDI inflows, US Dollar LIBOR rates, and RMB SHIBOR, respectively, from the top left subplot to the bottom right. Hollow orange circles indicate weekly corresponding flows. The horizontal axis indicates the number of weeks since or before the exchange rate reform. Grey dashed lines are local linear fits of the orange circles on either side of week 0, when the exchange rate reform took place.

where the dependent variable is the log of intra-firm loan outflows relative to the corresponding inflows. Since net outflows of intra-firm loans could be negative, we take the log of the outflows divided by the inflows to capture the difference in their percentage changes. premium_t is the variable of interest, the RMB offshore premium. d_t is a binary indicator that was switched to one on and after August 11, 2015, when the policy shock took place. X_t is a vector of control variables. $f(date_t)$ and $g(date_t)$ are polynomials of the running variable, date. ϵ_t and ε_t are error terms, and others are the coefficients to be estimated. Heteroskedastic and autocorrelation-consistent (HAC) standard errors are used in all of the regression in this paper.

5.2 Baseline Results

Table 2 reports the impact of the RMB offshore premium on the percentage change in the outflows of internal loans between affiliated firms relative to inflows. The impact is captured by the coefficient γ in equation (4).

In Columns (1) to (3), we control for two quadratic terms of the running variable: one of the values to the left of the policy shock date and the other of the values to the right. Similarly, in Columns (4) to (5), we control for two cubic terms of the running variable. Columns (1) and (4) do not include any control variables. Columns (2) and (5) report the coefficients from regressions that control other daily variables, including export inflows, import outflows, outward FDI outflows, and inward FDI inflows. In addition, we include interest-rate controls in the specifications of Columns (3) and (6). We control interest rates for the USD and RMB, which are measured using US dollar LIBOR rates and SHIBOR, respectively.

The upper panel uses observations with the event window one year before and after the policy cutoff. The estimate from column (1) suggests that an expectation of a one percentage point decrease in the RMB exchange rate against the USD increases intra-firm loan outflows by 345 log points relative to the corresponding inflows. The results are robust to different sets of control variables, and all of the estimates are significant at the 1% level. The magnitude of the coefficients increases slightly under the cubic specification, ranging from 3.9% to 4.4%. The precision of the coefficients decreases slightly but is still significant at the

Table 2: Exchange Rate Gap and Intra-firm Loan Transactions

Running Variable (Date)	Quadratic			Cubic		
	(1)	(2)	(3)	(4)	(5)	(6)
RMB Offshore Premium	-3.447***	-3.373***	-3.740***	-4.359**	-3.918**	-4.336***
	(0.964)	(0.941)	(0.829)	(2.039)	(1.688)	(1.466)
Daily Flow Controls	No	Yes	Yes	No	Yes	Yes
Interest-rate Controls	No	No	Yes	No	No	Yes
Number of Observations	269	269	269	269	269	269
F-stat. (First Stage)	88.55	98.19	207.97	25.68	38.37	104.05
RMB Offshore Premium	-1.837**	-1.862**	-1.886**	-3.454***	-3.418***	-2.943***
	(0.823)	(0.781)	(0.738)	(1.264)	(1.251)	(0.876)
Daily Flow Controls	No	Yes	Yes	No	Yes	Yes
Interest-rate Controls	No	No	Yes	No	No	Yes
Number of Observations	584	584	584	584	584	584
F-stat. (First Stage)	96.04	110.90	74.98	49.17	65.70	177.44

Notes: This table reports the coefficients that estimate the impact of the RMB offshore premium on the percentage change in intra-firm loan outflows relative to inflows. Columns (1) to (3) report coefficients from the regressions with quadratic specification of the running variable, date. Columns (4) to (6) report the ones with cubic specification. The upper panel uses observations with a window 1 year before and after the policy cutoff. The lower panel uses all of the sample period. Daily-Flow Controls include export inflows, import outflows, outward FDI outflows, and inward FDI inflows. Interest-Rate Controls include the US Dollar LIBOR and RMB SHIBOR. $* \ p < 0.10$; $** \ p < 0.05$; $*** \ p < 0.01$.

5% level.

The lower panel uses all of the observations in the sample period. With the quadratic specification, the estimated effects dropped to about 2% and remained significant at the 5% level. This might be because the quadratic terms could not fully capture fluctuations in the RMB offshore premium in the extended sample period. The magnitudes and precision both increase when cubic terms are used, as shown in Columns (4) to (6) in the lower panel.

All of the regressions under different specifications or with different event windows have strong first stages. F statistics from the first stage, which is equation (5), are reported in the table. All of the F statistics are larger than 10, indicating that we have a strong instrument.

In the following empirical analysis, we use the full sample in order to have a larger number of observations. We will report the estimated coefficients from both the quadratic and cubic specifications of the running variable, and both daily flow variables and interest-rate controls will be included.

Furthermore, We separately examine gross inflows and outflows from intra-firm loan transactions. Inflows capture MNEs' net internal borrowing from their foreign affiliates. Outflows, on the other hand, capture MNEs' net internal lending to their foreign affiliates. In Figure 5, we plot weekly outflows around the policy shock in the left subplot and inflows in the right subplot. We find a sharp increase in outflows but no significant discontinuity in inflows.

To quantify the impacts of the RMB offshore premium on inflows and outflows, we replace the dependent variable in equation (4) with the log of intra-firm loan outflows and log inflows. Table 3 reports the coefficients for the RMB offshore premium. Columns (1) and (2) report the impact on outflows under quadratic and cubic terms of the running variable, respectively. Columns (3) and (4) report the impact on inflows.

Both graphical and empirical analyses indicate that the increase in net outflows is driven by the increase in MNEs' internal lending to their foreign affiliates. The expectation of a 1 percentage point decrease in the RMB exchange rate against the USD significantly increases internal lending by more than 272 log points. Internal borrowing is not significantly affected by the exchange rate expectations. These results are consistent with the hypothesis

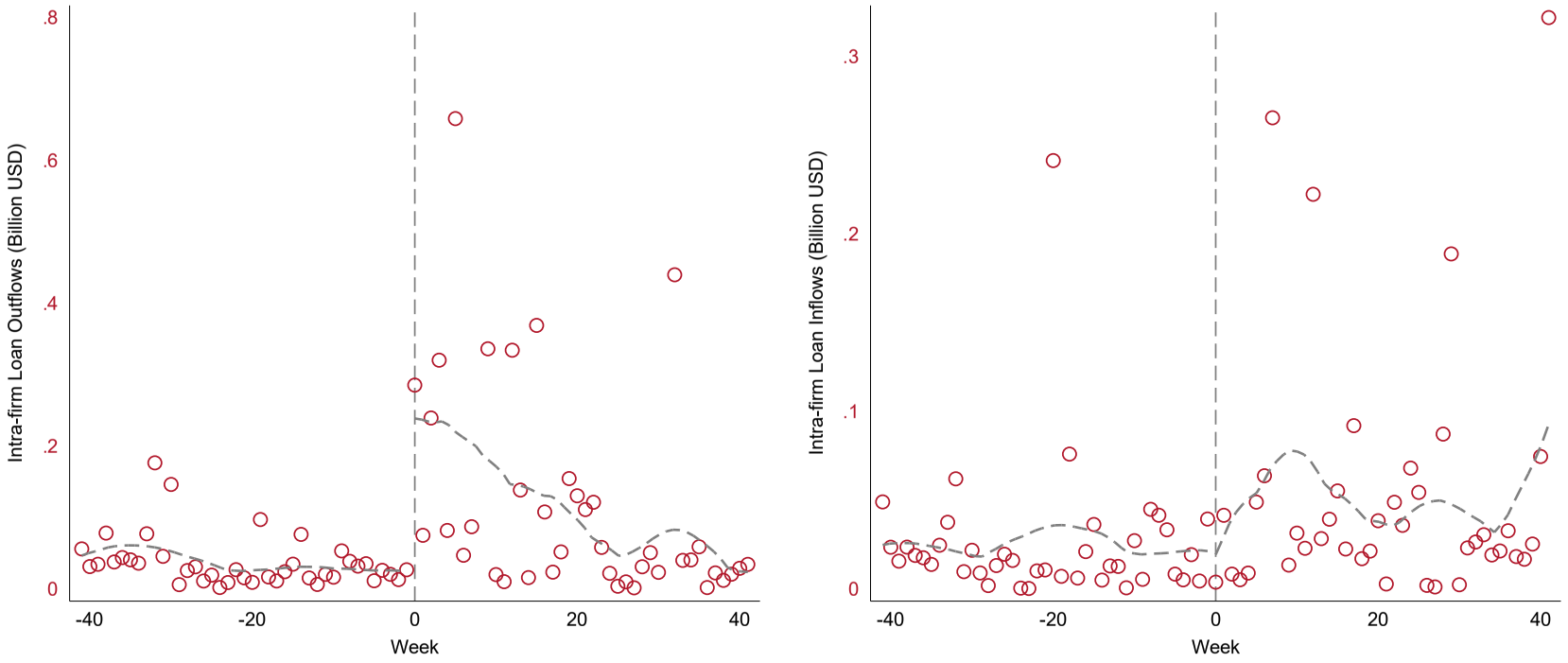

Figure 5: Intra-firm Loan Inflows and Outflows

Notes: This figure plots weekly intra-firm loan outflows in the left subplot and weekly intra-firm loan inflows in the right subplot around the exchange rate reform. Hollow red circles indicate the weekly corresponding flows. The horizontal axis indicates the number of weeks since or before the exchange rate reform. Grey dashed lines are local linear fits of the red circles on either side of week 0, when the exchange rate reform occurred.

we proposed in the previous section: in the face of RMB depreciation expectation, firms use intra-firm loan arrangements to transfer their capital out of the country under capital controls. We will provide more empirical evidence in the next section. The insignificant impact on inflows could be explained by the tax-evasion hypothesis from previous literature. Multinational firms borrow from their foreign affiliates in low-tax countries to shift profits by tax-deductible interest payments (Riedel, 2018 and Desai et al., 2004). Since the corporate income tax rate or value-added tax in China is relatively stable, the volume of inflows from internal borrowing would be related to the business performance of those multinational firms. They are less likely to be affected by exchange-rate expectations.

Table 3: Intra-firm Loan Outflows and Inflows

	Outflow		Inflow	
	(1)	(2)	(3)	(4)
RMB Offshore Premium	-2.906***	-2.721***	-1.020	0.222
	(0.723)	(0.787)	(0.743)	(0.616)
Running Variable	Quadratic	Cubic	Quadratic	Cubic
Daily Flow Controls	Yes	Yes	Yes	Yes
Interest-rate Controls	Yes	Yes	Yes	Yes
Number of Observations	584	584	584	584

Notes: This table reports the coefficient of the RMB offshore premium. The dependent variable for Columns (1) and (2) is the log of intra-firm loan outflows. The dependent variable for Columns (3) and (4) is the log of intra-firm loan inflows. $* \ p < 0.10$; $** \ p < 0.05$; $*** \ p < 0.01$.

5.3 Capital Flight or Relocating Business

Firms engage in horizontal FDI to reallocate production and fragment production internationally through vertical FDI (Aizenman and Marion, 2004). In general, FDI is considered to be a relocation of value-adding activities. To investigate whether the decision on internal lending is driven by production or capital flight, we further examine two types of heterogeneous effects of the RMB offshore premium on net intra-firm loan outflows by destination and firm type.

By Destination

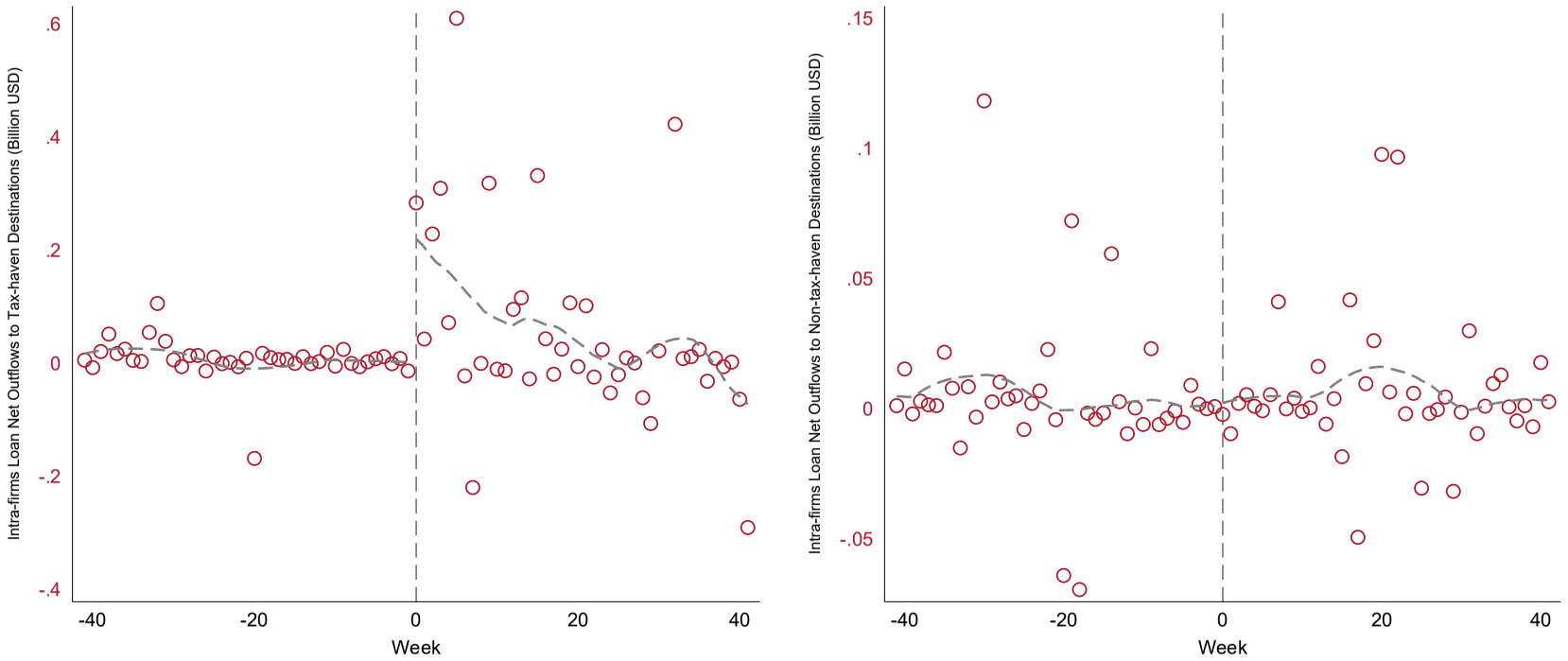

Figure 6: Intra-firm loan Net Outflows to Tax-haven and Non-tax-haven Countries

Notes: This figure plots weekly intra-firm loan net outflows to tax-haven destinations in the left subplot and to non-tax-haven destinations in the right subplot around the exchange rate reform. Hollow red circles indicate weekly corresponding flows. The horizontal axis indicates the number of weeks since or before the exchange rate reform. Grey dashed lines are local linear fits of the red circles on either side of week 0, when the exchange rate reform took place.

We first examine the impact on the intra-firm loan net outflows to tax-haven countries and those to non-tax-haven countries. FDI to non-tax-haven destinations is more likely to be genuine FDI and related to relocating production (Fan et al., 2018). Therefore, should firms want to relocate their business in response to exchange risk, they would have lent money to their foreign affiliates located in non-tax-haven countries or regions. Under such circumstances, the impact of the RMB offshore premium on net intra-firm loan outflows to non-tax-haven destinations would be higher.

In Figure 6, we plot the corresponding weekly net outflows to tax-haven destinations around the policy shock in the left graph and those to non tax-haven destinations in the right graph. We find a sharp increase in net outflows to tax-haven destinations but no significant discontinuity in net outflows to other destinations.

In Table 4, we report coefficients from equation (4) using log of relative outflows to these two types of destinations as dependent variables. Columns (1) and (2) report coefficients that estimate the impact of the RMB offshore premium on relative outflows to tax-haven destinations using quadratic and cubic terms of date, respectively. Both coefficients are significant at the 1% level. The results suggest that a 1 percentage point drop in the RMB offshore premium significantly increases relative intr-firm loan outflows to tax-haven destinations by around 300 log points. Columns (3) and (4) report the impact on net outflows to other destinations. One percentage point drop in the RMB offshore premium only increases relative intra-firm loan outflows to non-tax-haven destinations by around 100 log points, and the estimates are not significant at any conventional level of significance. The difference in the magnitudes and precision in coefficients suggests that the increase in infra-firm loan net outflows is mainly driven by those to tax-haven destinations, which are well-known hubs for money laundering and capital flight. (Pérez et al., 2012).

By Firm Type

Both theoretical and empirical work suggests that FDI and exports could be substitutes and complements (Blonigen, 2005 and Blonigen, 2001). Blonigen (2001) uses production-level data on Japanese automobile parts and finds both a substitution and a complementary effect between exports and foreign affiliate production. Either of these two effects would

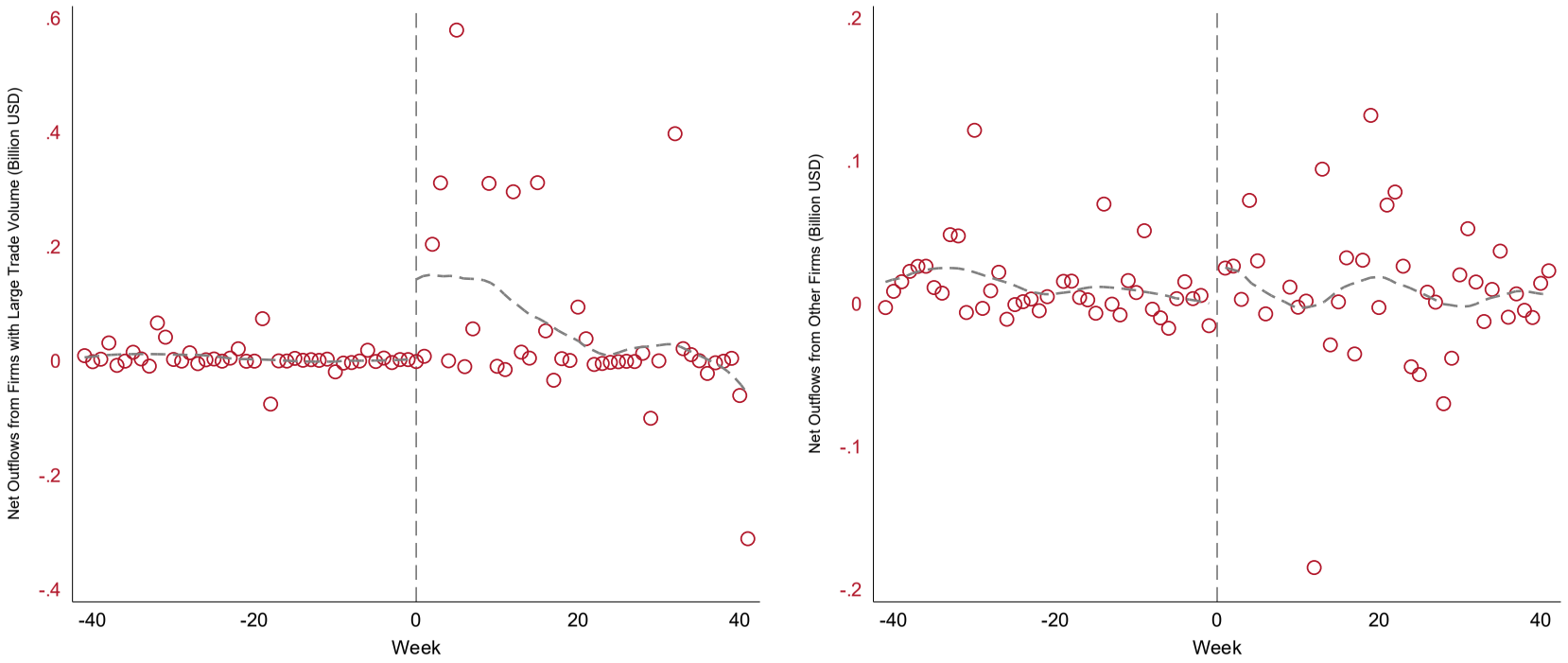

Figure 7: Intra-firm Loan Net Outflows by Firms' International-trade Volume

Notes: This figure plots weekly intra-firm loan net outflows by firms with above-median trade volume in the left subplot and firms with below-median trade volume in the right subplot around the exchange rate reform. Hollow red circles indicate weekly corresponding flows. The horizontal axis indicates the number of weeks since or before the exchange rate reform. Grey dashed lines are local linear fits of the red circles on either side of week 0, when the exchange rate reform took place.

Table 4: Tax-haven Countries and Non-tax-haven Countries

	Tax-haven Countries		Non-tax-haven Countries	
	(1)	(2)	(3)	(4)
RMB Offshore Premium	-2.775***	-3.582***	-0.876	-1.310
	(0.932)	(1.049)	(0.917)	(0.918)
Running Variable	Quadratic	Cubic	Quadratic	Cubic
Daily Flow Controls	Yes	Yes	Yes	Yes
Interest-rate Controls	Yes	Yes	Yes	Yes
Number of Observations	287	287	287	287

Notes: This table reports the coefficient of the RMB offshore premium. The dependent variable for columns (1) and (2) is the log of intra-firm loan outflows relative to inflows to/from tax-haven counties. The dependent variable for columns (3) and (4) is the log of intra-firm loan outflows relative to inflows to/from non tax-haven counties. $* \ p < 0.10$; $** \ p < 0.05$; $*** \ p < 0.01$.

imply that firms with more international trade activity are more related to foreign production and more likely to relocate capital between affiliates for genuine production purposes in response to exchange-rate shocks.

To identify the heterogeneous effect by firm type, We first identify those firms that participate in intra-firm loan activity during the sample period. Then we categorize the firms into three groups by their overall export and import volume from 2012 to before the policy shock: less-trade- active firms (below export median volume and import median volume), export-active firms (above export median volume) and import-active firms (above import median volume). We aggregate firm-daily transactions into three daily flow sub samples according to their corresponding firm categories and report the heterogeneous effects in Table 5.

Columns (1) and (2) report the impacts of the RMB offshore premium on the flows from export-active firms. Columns (3) and (4) report the impacts on the flows from import-active firms. Columns (5) and (6) report the impacts on the flows from less-trade-active firms. Columns (1), (3), and (5) use quadratic specifications of running variables. Columns (2), (4), and (6) use cubic specifications.

In the upper panel, we use the log of relative intra-firm loan outflows as the dependent variable to be consistent with the previous analysis. Both of the impacts on the flows from either export or import active firms are quantitatively small and insignificant, as shown in

Table 5: Results by Volume of International Trade

	By Export Volume (Above Median)		By Import Volume (Above Median)		By Export and Import Volume (Both Below Median)	
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intra-firm Loan Net Outflow	1.000	-0.777	0.131	-1.108	-3.715*	-5.216*
	(1.207)	(1.130)	(1.354)	(1.196)	(2.188)	(2.758)
Running Variable	Quadratic	Cubic	Quadratic	Cubic	Quadratic	Cubic
Daily Flow Controls	Yes	Yes	Yes	Yes	Yes	Yes
Interest-rate Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	357	357	381	381	110	110
Intra-firm Loan Outflow	-0.204	0.458	-0.574	-0.326	-4.364***	-4.206**
	(0.629)	(0.585)	(0.476)	(0.558)	(1.495)	(1.871)
Running Variable	Quadratic	Cubic	Quadratic	Cubic	Quadratic	Cubic
Daily Flow Controls	Yes	Yes	Yes	Yes	Yes	Yes
Interest-rate Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	689	689	669	669	348	348

Notes: This table reports the coefficients that estimate heterogeneous impacts of the RMB offshore premium by firms' volume of international trade. The upper panel uses the log of intra-firm loans relative outflows as the dependent variable. The lower panel uses the log of intra-firm loan outflows as the dependent variable. Columns (1) and (2) report the impact on flows from firms with above-median export volume. Columns (3) and (4) report the impact on flows from firms with above-median import volume. Columns (5) and (6) report the impact on flows from firms with below-median trade volume. $* \ p < 0.10$; $** \ p < 0.05$; $*** \ p < 0.01$.

Columns (1) to (4). In contrast, a 1 percentage point decrease in the RMB offshore premium significantly increases flows from less-trade-active firms by 372 log points, as shown in Column (5) in the upper panel under the quadratic specification. However, the coefficient is only significant at the 10% level. The magnitude of the impact increases to 522 log points under cubic terms, as shown in Column (6), and the significance level is close to 5%. The low precision of the estimators is mainly due to a small number of observations.

In general, intra-firm loan flows from less-trade-active firms are smaller compared with those from trade-active firms. Moreover, since we use the log of relative outflows to inflows as the dependent variable, observations with either no intra-firm loan inflows or outflows would be dropped from the regression. In Figure 7, We plot weekly net outflows from firms that are less active in trade in the left subplot and compare weekly net outflows from trade-active firms in the right subplot. Before the policy shock, intra-firm loan net outflows from those less-trade-active firms are close to zero. However, right after the policy shock, there is a sudden increase in these net outflows. The discontinuity suggests that these firms were not active in intra-firm loans until the exchange rate shock. In contrast, net outflows from trade-active firms fluctuate slightly above zero. There is no sudden change after the policy shock, apart from slightly increased volatility. The difference in these two subplots is consistent with our empirical findings in the upper panel in Table 5. To avoid having too few observations from the less-trade-active firms, we instead use the log of intra-firm loan outflows as the dependent variable. Based on the previous decomposition analysis, the impact of the RMB offshore premium is mainly driven by intra-firm loan outflows.

The lower panel in Table 5 reports the impacts on outflows from the three groups of firms. The results are robust to the upper panel. We have a larger number of observations, and therefore greater precision. The impact on outflows from less-trade-active firms is significant at the 1% level using the quadratic terms of the running variable, as shown in column (5). Under cubic terms, it is still significant at the 5% level, as shown in column (6). Overall, Table 5 and Figure 7 suggest that intra-firm loan flows from trade-active firms are less likely to be affected by expectation of the RMB exchange rate. One possible reason is that trade-active firms could use mis-invoicing to evade taxes or capital controls, which is well documented by previous literature (Fisman and Wei, 2004 and Fung et al., 2011).

The results from these two types of heterogeneous effect analysis indicate that the impact of the RMB offshore premium on the intra-firm loan flows can not be explained by genuine production decisions. Instead, they provide strong evidence that firms in China use intra-firm loan arrangements to facilitate capital flight and evade capital controls.

6 Concluding Remarks

The policy reform on August 11 has sparked increasing speculation about RMB depreciation, and the subsequent large volume of capital flight has garnered attention from the media and economists worldwide. Around $200 billion flowed out of China during the turbulent period in August 2015, according to a report from the *Financial Times*.[3] China became the second largest home economy of FDI outflows for the first time in 2016, with overall outward FDI flows of $83 billion - 44% more than the flows in 2015 (UNCTAD, 2017).

Our paper provides empirical evidence that the surge in internal lending by Chinese MNEs contributes to the increase in outward FDI flows. In particular, we use this exogenous policy shock as an instrument to estimate the impact of exchange rate expectation on intra-firm loan capital flows. We find that Chinese MNEs increase lending to their foreign affiliates in tax havens, under an expectation of RMB depreciation. Those MNEs that are less trade active are less likely to transfer capital abroad through mispricing or other trade-related methods, and therefore are more likely to resort to internal loan arrangements. Our findings suggest that a substantial portion of internal lending from Chinese MNEs to their foreign affiliates is capital flight in disguise.

Reacting to capital flight during 2015-2016, the Chinese government implemented various policies, such as stabilizing the exchange rate and imposing more restrictive regulations on capital controls, to limit capital-outflow pressure (McCowage, 2018, UNCTAD, 2018 and Das, 2019). However, internal loans by MNEs are legitimate and do not require the approval of the Chinese Ministry of Commerce. It might be operationally hard to impose further regulations on intra-firm loans. Due to data limitation, it is beyond our sample period to study whether capital transactions through intra-firm loans between MNEs and their foreign af-

[3] https://www.ft.com/content/84aa4dbe-76a3-11e5-933d-efcdc3c11c89

filiates were affected during the stringent-policy period in 2017. We leave this question for future studies.

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