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Interaction between Non-standard Debt and Wealth Management Products in China

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Abstract

This paper investigates the interaction between non-standard debt investment (NSDI) and non-principal-guaranteed wealth management products (WMPs) of commercial banks in China after controlling the influences of several bank-specific and regulatory determinants. A credit switching model is employed to illustrate the mechanism in which special interest vehicles (SIVs) serve as the conduits for parent banks to conduct regulatory arbitrage by trade-off between on-balance-sheet funding strategy NSDI and off-balance-sheet financing via consignment of WMPs. Using a panel data set of 10 state-owned and joint-stock listed commercial banks over a period of six years (from 2013H2 to 2019H1), our results indicate there exists some statistically significant mutual promotion effects between NSDI and WMPs for Chinese banking and shadow banking system. We also find significant liquidity shock from WMPs to the interbank market. On average, the liquidity need is 4.6% of the WMPs' total balance. This study provides a new perspective to interpret the mechanism of the causes and consequences of shadow banking in China.

JEL classification numbers: C33 G21 G28
Keywords: Non-standard Debt, Wealth Management Product, Liquidity Shock, Shadow Banking

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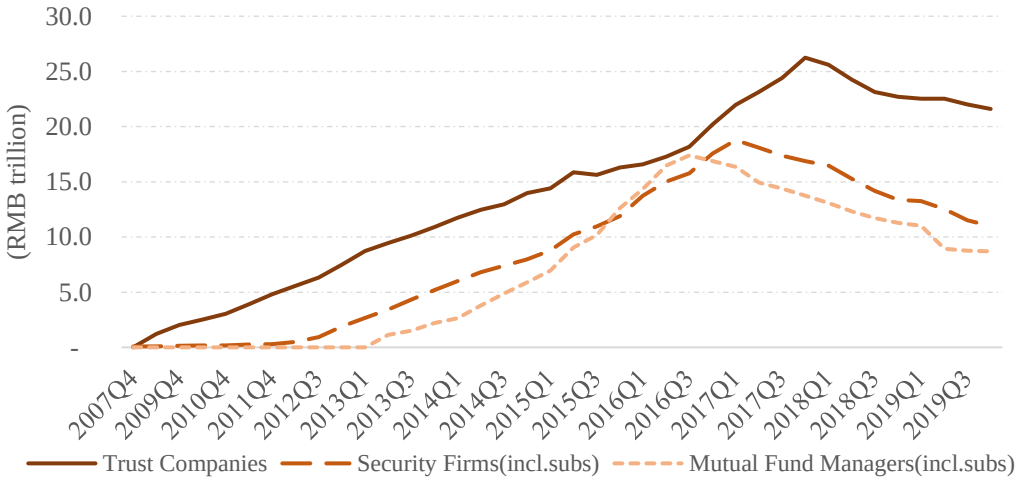
1. Introduction

Shadow banking is not a new concept around the world, even in China it has been studied extensively. Since Pozsar et al. (2010) published their famous paper on shadow banking, and after the 2007-2009 global financial crisis, literatures about the causes and consequences of shadow banks have been like bamboo shoots after a spring rain. It is noticeable that Financial Crisis Inquiry Committee (FCIC, 2011) also attributed the crisis to the unregulated shadow banking in the United States. So, why should we perform such a study on the relationship between non-standard debt and wealth management products in China? We argue that the interaction is essential to understand the rise of shadow banking in China.

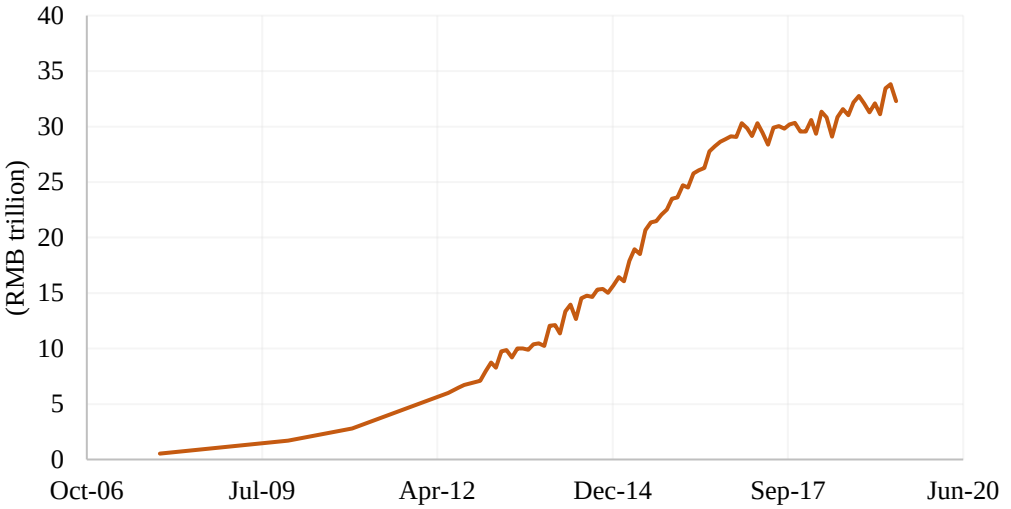


Note: The data is from Asset Management Association of China, China Trustee Association, and WIND database.

Figure 1: The trend of asset management industry development in China

It is well known that in the past 10 years, the Chinese shadow banking sector surged significantly, both in terms of transaction volume between commercial banks (interbank activities) and that between banking sector and non-bank financial firms (bank-to-shadow banks activities). Both the on-balance-sheet asset allocation and those off-balance-sheet items changed dramatically for Chinese financial system. As is shown in Figure 1 and Figure 2, the asset under management (AUM) of mutual fund managers (including subsidiaries) peaked at RMB 17.4 trillion in 2016Q3, the AUM of security firms reached the apex at RMB 18.8 trillion in 2017Q1, and the total balance of all WMPs also came to a turning point at RMB 30.3 trillion in 2017Q1. The AUM of trust companies continued to climb up the hill before it reached the high point at RMB 26.2 trillion in 2017Q4. Therefore, WMPs and non-standard debt investment of Chinese banks show similar pace and pattern, indicating

there must be some certain relationship between WMPs development and asset allocation strategy for Chinese banking sector. This interactive relationship may be helpful in explaining the causes and consequences of shadow banking in China, which has not drawn the attention of the academic due to data unavailability. This paper tries to study the mutual impacts between the on-balance-sheet non-standard debt and the off-balance-sheet wealth management products based on a new panel data set of 10 listed banks, which will be necessary and meaningful to the understanding of the rise, risk and regulation of Chinese shadow banking.



Note: From 2018 on, ChinaWealth, an affiliation of CBRC in charge of the registration and information disclosure of WMPs, no longer reports the total outstanding balance of all WMPs, but only discloses the non-principal-guaranteed WMPs. Hence, the monthly total balances from Jan 2018 are estimated using the percentage of non-principal-guaranteed WMPs at the end of 2018.

Figure 2: Balance outstanding of all wealth management products in China

It is widely accepted that the growing shadow banking sector is a key risk factor and threat to the financial stability of Chinese financial system. Recently, the regulatory authorities including China Banking and Insurance Regulation Committee (CBIRC, a government agency consolidated by former China Banking Regulation Committee and China Insurance Regulation Committee) and the People's Bank of China (PBC, the central bank) have issued several new guidelines and policies on the supervision and regulation of interbank activities and shadow banking activities. The new policy regime tries to build general regulatory standards for asset management business and wealth management products. It is called the structural deleveraging, part of the Financial Supply-side Reform Program.

From a perspective of financial reporting, there are two types of shadow banking in

China. One is financial innovation between monetary financial institutions such as repos on non-standard financial assets and implicit guarantees through off-balance-sheet items including bankers' acceptance, letter of credit and letter of guarantee, which are the main stream of shadow banking before 2013. After the Document No.8 issued by CBRC in March 2013, a policy that restricted the investment in non-standard financial assets and the use of proceeds from WMPs' consignment, the interbank shadow banking was limited. Some of the interbank repos on non-standard debts are reclassified into Investments Classified as Receivables (ICRs) and the rest are transferred into off-balance-sheet items, which are now very popular. This is the second type of shadow banking in China: NSDI and WMPs with special interest vehicles (SIVs) as their common conduits. In this case, NSDI and WMPs are two kinds of funding sources that go through SIVs to clients with financial needs that cannot be met in the traditional loan market.

Within my scope of reading, there are few literatures on the causes and consequences of second type of shadow banking in China, which will be studied in this paper. A credit switching model is developed to illuminate the intuition and mechanism of the interactive relationship between on-balance-sheet NSDI and off-balance-sheet WMPs, and then we demonstrate the promotion effect dominates by regressing a multivariant panel data model on a sample of 10 listed big banks covering a period from 2013H2 to 2019H1. Our findings suggest that the mutual effects of NSDI and WMPs interaction are the engine of shadow banking development in China, which provides a new perspective for the understanding of the causes and consequences of Chinese shadow banks.

The rest of the paper are structured as follows. Section 2 reviews the related literatures, section 3 establishes the credit switching framework, testing hypothesis and econometric model, illustrating the intuition and theoretical details. Empirical results are reported and discussed in section 4, and finally we conclude in section 5.

2. Literature

There are three strands of literatures about the shadow banking in China. The first strand focuses on the financial products of shadow banking activities. Allen et al. (2019) conduct a large-scale transaction-level study of an important component of Chinese shadow banking system: the entrusted loans made by listed firms. An and Yu (2018) study the guaranteed off-balance sheet items (including banker's acceptance, letter of credit, and letter of guarantee, together guaranteed OBS) to find that the Desirability Lending Policy (DLP) of People's Bank of China, the China's central bank, rather than the traditional regulatory constraints (such as reserve requirements, loan-to-deposit ratio, LDR) is the unique driving force of the shadow banking development in China. Huang and Shen (2019) investigates the impact of Chinese-style interbank activities on the banks' credit ratings. This class of literatures typically concentrate their research on a specific section of the shadow banking system, and to my knowledge, does not involve in the study of mutual relationship between non-standard debt and wealth management products.

The second strand pays much attention to the risk and return of shadow banks in China. Li et al. (2014) discuss the institutional risks comprehensively. Luo et al. (2019) address the maturity mismatch problem of the structured WMPs and find that the outstanding balance of WMP is positively correlated to NPLR. Because small banks are more constrained by liquidity and capital, the higher the bank's NPLR, the more pressure on capital adequacy and a stronger incentive for the bank to move toxic assets out of its balance sheet to meet the regulatory requirements. Luo et al. (2019) highlight the mechanism that sponsored banks issue WMPs to purchase asset management product (AMP) whose underlying assets are those non-performing loans moved out of their balance sheets. Huang et al. (2019) study the implicit guarantee from the parent bank to their unconsolidated structured entities-the off-balance-sheet shadow banking conduits, most of which are WMPs. The riskier banks are more spurred to offer implicit guarantees and should be charged higher risk-weight for their off-balance-sheet activities. Although the associated risk is high, Hou et al. (2018) find that shadow banking activities help Chinese banks to reach greater cost efficiency. However, the relationship between NSDI and WMPs is not covered in those literatures.

The third strand investigates the causes and consequences of shadow banking, trying to establish some theoretical model to address the mechanism why Chinese banks tend to conduct regulatory arbitrage. Acharya et al. (2019) study the rise and risk of bank-issued wealth management products in China. They find that under the regulation of ceilings on both deposit interest rates and loan-to-deposit ratio (LDR), banks with higher LDRs issue more WMPs, especially when the spread between the market rate and deposit rate ceiling is high, consistent with the regulatory arbitrage hypothesis. They argue that the Big Four state-owned banks easing loan standard in the 4 trillion RMB stimulus in 2009 trigger a competition in the banking industry. As a result, the small-and-medium-sized banks are selling more WMPs to raise off-balance-sheet money to expand their business, which give rise to the shadow banking in China. Hachem and Song (2015) uses a similar regulatory setting to Acharya et al. (2019) but argues that the big four state-owned banks, including ICBC, ABC, CCB, and BOC, are the key players that contributed to the shadow banking development in China. To find an edge in the asymmetric competition with the medium-and-small-sized banks and keep deposits in their accounts, the larger state-owned banks place pricing pressure in the interbank market by influencing the repo rate or interbank lending rate to raise the funding cost for their competitors' WMP issuance. The higher yields on WMPs attract investors and encourage them to convert their deposits into investment in WMPs, fueling the shadow banking in China. Wang et al. (2019) provides an interpretation of shadow banking development in China from the perspective of dual-track interest rate liberalization, arguing that shadow banking system finances the more productive private enterprise sector which traditionally has less access to funding from banks and has less support from the government compared to the state-owned ones, which will reach a Kaldor-Hicks improvement, and a Pareto improvement is possible if the gains outweigh the expected default loss of the private sector. Both Hachem and Song (2015) and Wang

et al. (2019) indicate that WMPs' spread over deposit rate may be an exploratory factor in the rapid growth of WMPs. Some other researchers share the similar idea on banking competition to interpret the mechanism of shadow banking in China, such as Tan (2017). Literatures in this class generally concentrate on the factors that encourage banks to perform regulatory arbitrage. Among those regulatory constraints, capital adequacy ratio and loan-to-deposit ratio are two most important factors (Acharya et al., 2019; Wang et al., 2019; Hachem and Song, 2015; Wu and Shen, 2019; Liu and Xie, 2019; Yang et al., 2019). However, to the knowledge of the author, the interactive relationship between on-balance-sheet non-standard debt investment and off-balance-sheet wealth management product consignment of Chinese banks is still unclear.

In this paper, we will establish a credit switching model illustrating the intuition and hypothesis about the substitution and promotion effects on the interaction of NSDI and WMPs. We try to determine whether promotion effect dominates using a multivariant panel regression after controlling the studied regulatory and bank specific variables.

3. Framework, Hypothesis and Model

3.1 The Framework

In March 2013, the China Banking Regulatory Committee (CBRC) announced a new regulation policy in Document No.8 (2013) that each bank's total WMP investment in non-standard financial assets is limited to 35% of all WMP outstanding balance or 4% of total assets. This policy forced the bank to reclassify some of its NSDI into balance sheet. It was the first time for the Chinese regulatory authority to define the non-standard financial assets as all debt financial instruments which are not tradeable in the interbank market, Shanghai and Shenzhen stock exchanges, including but not limited to loans and advances, trust loans, entrusted loans, banker's acceptance, letter of credit, receivables, and equity investment with repurchase agreement. In this paper, loans are treated as traditional banking business, while the later five classes of debt instruments to be NSDI.

Today, there is more and more concern about the structured entities (SEs) invested, managed and sponsored by Chinese commercial banks. Some SEs are treated as Investment Classified as Receivables (ICRs) and reported on the balance sheet while most of them are off-balance sheet items, totally different from the so called guaranteed OBS as studied in An and Yu (2018). Non-principal-guaranteed wealth management product is the main component of such off-balance-sheet SEs. The common underlying assets are special interest vehicles (SIVs) such as trust management plans or asset management plans. As a result, the stylized structure for on- balance sheet and off-balance sheet items of Chinese banks is depicted as below in Figure 3.

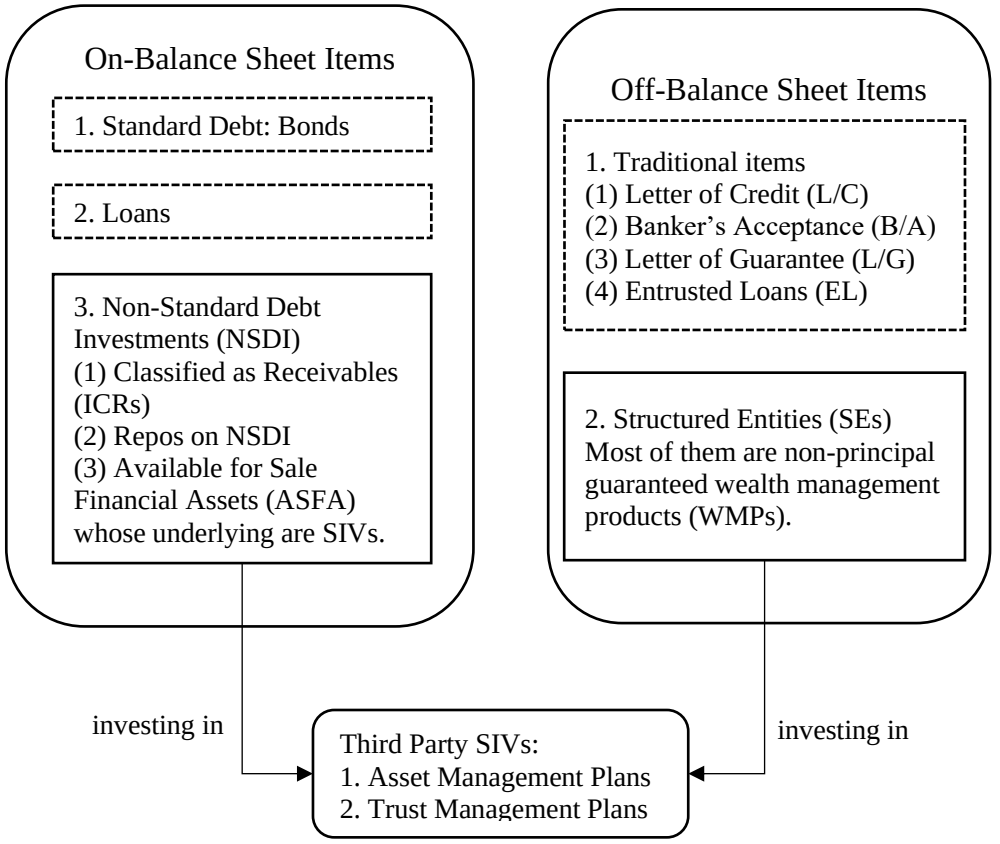


Figure 3: Stylized structure of on-balance sheet and off-balance sheet items for Chinese banks

SIVs are asset management plans sponsored and managed by security firm, mutual fund managers and their wholly owned special subsidiaries and insurance asset managers, or trust management plans sponsored by trust companies. These SIVs, serving as conduits for parent banks to finance those companies or special sectors that are prohibited from bank loans and other normal financing subject to the regulatory constraints, constitute the backbones of the shadow banking system in China. The real estate sector, the local government financing agencies and some industry with excess production capacity such as steels, ship manufacturing, and construction materials, are the special clients of Chinese shadow banking sector. When granting credit approval, the bank uses a credit switch model (which will be studied in detail in the next section) to allow its business unit to arbitrage between the on-balance sheet strategy in the form of NSDI and the off-balance sheet funding strategy in the way of WMPs. This is what we did when I was head of the investment banking department of a branch in one of the 10 sample banks.

According to the new financial reporting rules of China, there are two kinds of SEs reported in the footnotes of annual report of commercial banks since 2013. The first

are unconsolidated structured entities sponsored and managed by third parties, including wealth management product of other banks (or interbank WMPs), investment management products managed by securities companies and their wholly owned subsidiaries, trust management plans, asset-backed securities, and investment funds. Most of these are sorted as Investments Classified as Receivables (ICRs) and reported on balance sheet. For example, at the end of 2018, China CITIC Bank has 699 billion SIVs recorded on its balance sheet, accounting for 11.5% of the total asset. The second are unconsolidated structured entities sponsored and managed by the group. More than 90% of this type of asset are non-principal guaranteed wealth management products. As at 31 December 2018, the total assets invested by these outstanding non-principal guaranteed wealth management products issued by China CITIC Bank amounted to RMB 1.06 trillion, 17.5% of the total asset. Therefore, there are two funding ways in the credit switching mechanism for Chinese banks to take advantage of regulatory arbitrage and make profit. And there are also two corresponding ways for financial reporting: one is NSDI on balance sheet and the other unconsolidated off-balance-sheet WMPs. As the common underlying structure for NSDI and WMPs, SIVs are the risk contagion channels between off-balance-sheet items and on-balance-sheet activities. They contribute to the rise and development of Chinese shadow banking system.

3.2 The Hypothesis

Two effects associated with the wealth management products and on-balance sheet NSDI are identified: substitution effect and promotion effect.

Substitution Effect: A credit switching model is employed to investigate the regulatory arbitrage problem of Chinese banking sector. There are many business units or branches in the bank across the country, each of which faces two options when providing finance to its clients: Option A, the on-balance sheet funding strategy using NSDI, and Option B, finance the project via proceeds from wealth management product issuing, as shown in Figure 4. In the short term, the business unit of the bank makes the decision to arbitrage between the direct credit via balance sheet items such as Investments Classified as Receivables and off-balance sheet wealth management product consignment. When the bank chooses to finance the project by WMP consignment, the need for balance sheet financing reduces, thus constitutes an effect of substitution. Similarly, when the business unit uses money from WMP consignment to support the project, on-balance-sheet credit demand will also drop.

Promotion Effect: When the profit from WMP issuance is attractive enough, the bank will choose to finance the project via WMP consignment, since balance sheet funding is subject to strict regulations and supervisions including but not limited to LDR controls, capital adequacy requirements and liquidity constraints. In the long run, the trade-off between NSDI and WMPs will promote the expansion of NSDI.

Our hypothesis is that the substitution effect and promotion effect between NSDI and WMPs are both the drivers of the rise and fast development of shadow banking

in China. We will determine whether the substitution effect or promotion effect dominates by estimating a multivariant panel data model using a sample of 10 listed big Chinese banks covering a period of six years (from 2013H2 to 2019H1). Some regulation indicators and bank specific determinants which have already been studied in the literature will be introduced as control variables.

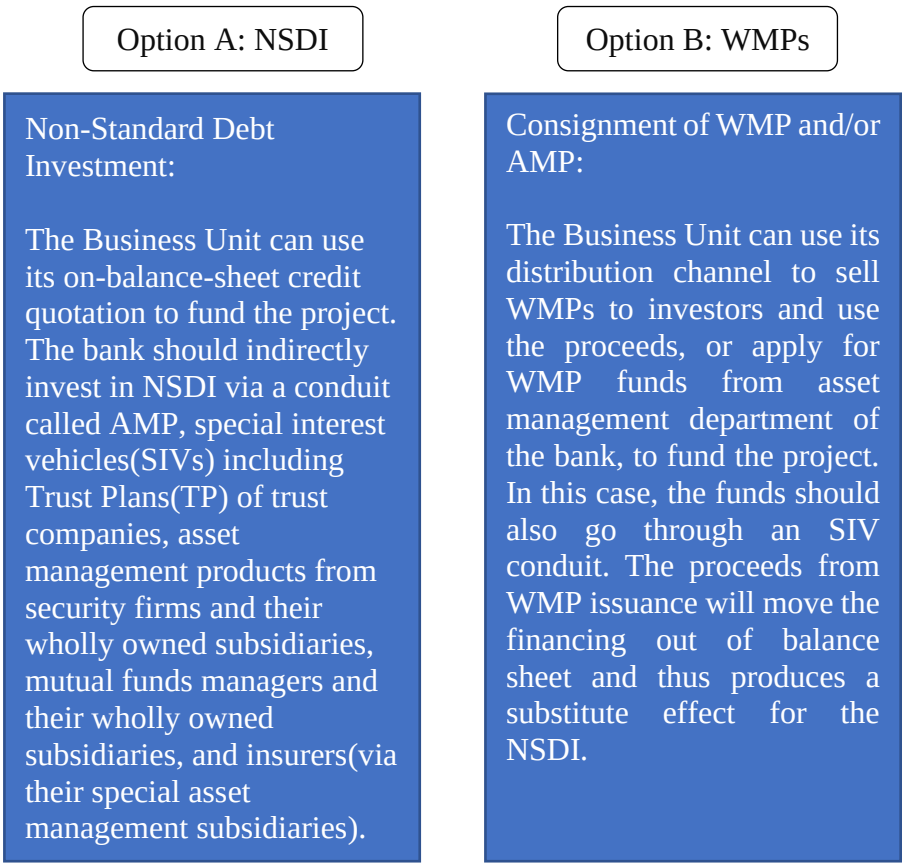


Figure 4: Regulatory arbitrage in a credit switching model

3.3 The Model

We estimate the following model using a panel data set to test whether the substitution effect or the promotion effect plays the leading role:

$$\log(W_i) = (\alpha + \alpha_i) + \beta_1 NSDI_i + \beta_2 LDR_i + \beta_3 K_i + \beta_4 S_i + \beta_5 NIS_i + \beta_6 NPLR_i + \varepsilon_i \quad (1)$$

Where W_i is the outstanding balance of non-principal-guaranteed wealth management products of bank i, $NSDI_i$ the non-standard debt investment in total asset for bank i, and the rest control variables: loan-to-deposit ratio (LDR), Capital

adequacy ratio (K), spread between the annualized yield of 3-month WMPs and one-year deposit rate (S), net interest spread between loans and deposits (NIS), and non-performing loan ratio (NPLR). The control variables are taken into the model since these indicators have been thoroughly studied. For instance, Wang et al. (2019), Acharya et al. (2019) and Hachem and Song (2015) all find that LDR is a key factor in explaining the rise of Chinese shadow banking; Luo et al. (2019) reports the positive correlation between NPLR and WMP maturity mismatch; Wu and Shen (2019), Acharya et al. (2019), Wu and Shen (2019), among others, all find that capital adequacy contributes to the development of Chinese shadow banking sector. These determinants are incorporated into our model as control variables. If the coefficient on NSDI in the model is negative with statistical significance, substitution effect dominates, or else the promotion effect plays a prominent role.

4. Main Results

4.1 Data

We employ a sample of 10 listed big banks in China covering data from 2013H2 to 2019H1, including four of the five state-owned big banks and other six joint-stock commercial banks. Please refer to appendix A for more details. The total asset of sample banks accounts for more than 50% of the Chinese banking system. Data are collected from their annual reports, semi-annual reports or WIND database. Statistics are shown in Table 1.

Table 1: Data statistics

Variable	#Obs	Mean	Median	Std.	Min	Max
log(W)	120	9.05	9.06	0.65	7.12	10.19
K	120	12.85	12.57	1.25	10.80	15.75
LDR	120	79.62	77.73	10.22	61.17	109.98
NIS	120	2.10	2.15	0.35	1.27	2.77
NPLR	120	1.48	1.51	0.33	0.74	2.40
S	120	2.70	2.69	0.59	1.36	4.48
NSDI	120	10.38	9.82	7.98	0.35	28.01

Note: The data is from annual report, semi-annual report and WIND database. This table reports the descriptive statistics of the sample data. Dependent variable log(W) is the log value of WMPs' balance outstanding for each bank. Others are independent and/or control variables. Their mean, median, standard deviation, minimum and maximum value are shown. Please notice that except for log(W), all other variables are counted in percentage.

4.2 The impact of NSDI expansion on WMPs' growth

After taking into account for the heteroscedasticity and autocorrelation problem, model (1) is estimated and results are shown in Table 2. All regressed coefficients are significant at the 1% level, and the adjust R2(weighted) is 0.989. Hausman test indicates a fixed effect model should be implemented.

Table 2: The impact of non-standard debt development on WMPs

Dependent Variable	$\log(W_i)$
Common Constant α	5.577^{***}
	(27.393)
$NSDI_i$	0.014^{***}
	(4.169)
LDR_i	1.077^{***}
	(5.850)
K_i	0.080^{***}
	(8.675)
S_i	0.097^{***}
	(6.875)
NIS_i	-0.105^{***}
	(-2.885)
$NPLR_i$	0.949^{***}
	(33.814)
Bank	Individual fixed effect α_i
ICBC	1.039
ABC	0.136
PAB	-0.682
SPDB	-0.148
CMB	0.582
BOC	0.345
CMBC	-0.350
CEB	-0.304
BC	-0.245
CITIC	-0.373
Adj.R^2(Weighted)	0.989
R^2(Unweighted)	0.878

Notes: This table reports regression results for $\log(W_i)$ with a panel sample of 10 banks from 2013H2 to 2019H1. Independent variable is the $\log(W_i)$. T-statistics are reported in parentheses. *, ** and *** represents significance at 10%, 5% and 1% levels, respectively.

As can be seen from Table 2, while controlling for loan-to deposit ratio LDR, capital adequacy ratio K, return spread between WMPs with a maturity of three month and the deposit rate, net interest spread and non-performing loan ratio NPLR, the NSDI still counts for the growth of off-balance sheet WMPs in the 10 big banks' panel sample covering data from 2013H2 to 2019H1. On average, the share of NSDI in total asset rises one percentage, the growth in off-balance sheet WMPs will increase by 1.4%, which is greater than zero with statistical significance at 1% level, indicating that the promotion effect dominates. In other words, even controlled for the studied factors that have explanatory influences on the rise of Chinese shadow banking, financial innovation and investment in non-standard debt instruments still enhance the growth of WMPs. The more the bank invest in non-standard debts, the greater the outstanding balance its non-principal-guaranteed wealth management products.

When analyzing the control variables, it is apparent that WMPs' growth is positively correlated to the loan-to-deposit ratio, capital adequacy ratio, WMPs' spread over deposit rate, and non-performing loan ratio, while is negatively correlated to net interest spread between loan and deposit. These findings suggest that banks with higher LDR, greater capital adequacy, higher NPLR and more attractive yield on WMPs will issue more non-principal-guaranteed wealth management products to fund their clients. These discoveries are in line with Acharya et al. (2019) except for the capital adequacy, in which they find that banks with lower capital adequacy (and hence higher risk) are willing to raise more money by WMP consignment. We argue that as an effective way to transfer assets out of balance sheet, WMP issuance can hide the true risk of a bank and lower its risk-weighted asset (RWA), thus increasing the apparent capital adequacy. The negative coefficient on NIS suggests that there is also a substitution effect between loans and WMPs. The intuition is self-evident: when NIS is high, the profit of providing a loan is greater than that of off-balance sheet funding via WMPs and this reduce the need for WMP consignment.

4.3 The impact of WMPs' growth on NSDI

To investigate the impact of WMPs' growth on the bank's NSDI decision, the following model is regressed using the same panel data set as described in section 4.1. Control variables LDR, K, S NIS and NPLR are introduced, and heteroscedasticity and autocorrelation considered. Results are reported in Table 3.

$$NSDI_i = (\alpha + \alpha_i) + \beta_1 \log(W_i) + \beta_2 LDR_i + \beta_3 K_i + \beta_4 S_i + \beta_5 NIS_i + \beta_6 NPLR_i + \varepsilon_i \quad (2)$$

There are three main findings as discussed below. First, the higher the LDR, the capital adequacy, the WMP spread and net interest spread, the smaller the willingness for the sample banks to do NSDI. The intuition is that, when the bank has enough capital to issue loans, or the yield on its WMPs is less attractive compared to peers, the WMP consignment of the bank will be slower. NSDI is a

substitute for loans, so the low NSDI level is coexisting with the higher LDR. However, NSDI is similar to bank loans when calculating capital requirements, so it is rational that the higher the NSDI, the lower the capital adequacy.
Second, banks with higher NPLR or WMP growth will also invest more money in non-standard debt instruments. This shows a mutual promotion effect between NSDI and WMPs, and that riskier banks are more encouraged to issue WMPs to move their position out of balance sheet and hide the risk.

Table 3: The impact of WMPs' growth on non-standard debt investment

Dependent Variable	**$NSDI_i$**
Common Constant α	49.403^{***}
	(28.744)
$\log(W_i)$	0.718^{***}
	(2.639)
LDR_i	-41.294^{***}
	(-31.068)
K_i	-0.341^{***}
	(-5.967)
S_i	-0.980^{***}
	(-21.293)
NIS_i	-3.186^{***}
	(-13.241)
$NPLR_i$	0.725^{**}
	(2.089)
Bank	Individual fixed effect α_i
ICBC	-12.049
ABC	-13.512
PAB	3.566
SPDB	11.666
CMB	2.710
BOC	-9.424
CMBC	6.617
CEB	8.015
BC	-4.727
CITIC	7.339
Adj.R^2(Weighted)	0.984
R^2(Unweighted)	0.933
Notes: Notes: This table shows regression results for NSDI using a panel sample of 10 banks from 2013H2 to 2019H1. NSDI is the independent variable, while log(Wi) the dependent variable, and the rest control variables. T-statistics are reported in parentheses. *, ** and *** represents significance at 10%, 5% and 1% levels, respectively.	

Finally, it is interesting to notice that, the four state-owned banks, including ICBC, ABC, BOC, and BC, have negative individual fixed effects over the common constant. The fixed effects for ICBC, ABC, BOC and BC are -12.049, -13.512, -9.424 and -4.727, respectively. We argue that the state-ownership has some potential impact on the asset allocation strategy and limit the banks' incentive to expand investment in non-standard debt. Government is the biggest shareholder, and the senior managers of such banks are determined and appointed by the government, meaning that banking corporate governance plays a role in non-standard debt regulation, lowering the banks' incentive to conduct regulatory arbitrage compared to other joint-stock banks in the sample. On the contrast, after taking into consideration of the control variables, the other six joint-stock commercial banks in the data set have a higher fixed effect in non-standard debt investment, showing totally different asset allocation strategy compared to the larger state-owned banks. From this point of view, the joint-stock commercial banks, not the larger state-owned ones, are the key players in the financial innovation and product development of non-standard debt, which forms and shapes the Chinese shadow banking sector.

4.4 Liquidity shock from WMPs

SIVs serve as the conduit for parent banks to conduct regulatory arbitrage, as well as the channel for risk contagion. Because the maturity mismatch problem in WMP structure, the sponsored bank usually provides short-term funding via interbank lending or repo agreement to the WMPs, although it is not necessary for the banks to do so according to the WMP legal documents. For instance, the mean maturity of such funding from Agricultural Bank of China is five days, while the average maturity of Ping An Bank is about 2 days. Most of the sample banks disclose no specific maturity but indicate "very short-term funding" to WMPs in the footnote section of their financial reports. The maturity mismatch in WMP will induce liquidity risk, and those shocks will be transmitted into interbank market by interbank lending and repos.

To study the liquidity shock effect, we estimate the following model using a panel data set from 2013H2 to 2018H1:

$$L_i = (\delta + \delta_i) + \gamma W_i + \varepsilon_i \tag{3}$$

Where γ represents the liquidity need arising from maturity mismatch of WMPs, L_i and W_i are the short-term funding from parent bank i and the total balance of its unconsolidated WMPs, respectively. Regression results are provided in Table 4. As expected, the liquidity shock from WMPs is huge and statistically significant. On average, the liquidity shock is about 4.6% of the total outstanding balance, meaning that the temporary liquidity demand for the WMP balance of RMB 22 trillion as at the end of June 2019 will exceed RMB 1 trillion, accounting for 20% to 25% of the repo balance of the Chinese banking system. This makes WMPs one of the biggest

borrower for short-term funds in the interbank market.

Luo et al. (2019) studied the maturity mismatch problem from another perspective. They found that the higher the non-performing loan ratio, the greater the incentive for the bank to issue WMPs and use the proceeds to transfer their toxic asset out of balance sheet, and the greater the extent of the maturity mismatch in WMPs' structure. Due to the lack of data, Luo et al. (2019) investigated the liquidity problem indirectly by regressing the WMP's yield and those of bonds since near half of WMPs' funds are invested in bond market. Then they use the R2 of the regression as an indicator for maturity mismatch. On contrast, banks specifically report their direct funding to WMPs under the liquidity support program and the corresponding outstanding balance in our data set, which enables us to directly analyze the liquidity shock originated from maturity mismatch. Findings reported in Table 4 show a great liquidity shock from WMPs to the conventional interbank market, which is about 4.6% of WMPs' total balance outstanding.

Table 4: Liquidity shock measure for WMPs

Dependent Variable	$\mathbf{L_i}$
Common Constant δ	272.333^{**}
	(2.395)
W_i	0.046^{***}
	(4.270)
Bank	Individual fixed effect δ_i
ICBC	744.17
ABC	669.68
PAB	-280.44
SPDB	-520.50
CMB	844.21
BOC	-508.07
CMBC	-500.61
CEB	-449.24
BC	126.39
CITIC	-112.93
Adj.R^2 (Cross-section)	0.741

Notes: This table presents regression results for liquidity shock from WMP, L_i, using a panel sample of 10 banks from 2013H2 to 2018H1. It is noticeable that since the financial reporting rules changed in 2018, some of the sample banks on longer report the detailed information on the liquidity funding to WMPs, so the sample period is terminated at 2018H1. L_i is the independent variable, while Wi the dependent variable. T-statistics are reported in parentheses. *, ** and *** represents significance at 10%, 5% and 1% levels, respectively.

Another interesting finding is that the big four state-owned banks in the sample exhibit a greater incentive to provide repo funding to meet the liquidity need of the WMPs. The individual fixed effects for ICBC, ABC, BOC, and BC are positive while the same effects for other banks in the sample are negative. This may suggest the bigger banks would employ a more mismatched maturity structure when issuing WMPs since they have larger individual customer base and business network with more selling channels.

Similar to Huang et al. (2019) which studied the implicit guarantee problem of the WMPs, our findings suggest there exists an implicit insurance on the liquidity support to WMPs, although the sponsored banks have no legal duty to do so, as discussed in the footnote section of their financial reports. The liquidity shock measured in equation (3), γ, can be seen as the price of the parent bank to pay for such an implicit insurance policy, which will keep the structured entities functioning normally. Therefore, the average implicit insurance premium is about 4.6% of the total balance of WMPs, meaning that a bank in the sample is willing to pay 4.6% of the outstanding balance of their wealth management products to continue the off-balance-sheet shadow banking game.

5. Conclusion

Our panel data regression analysis reveals that non-standard debt investment co-develops with WMPs for Chinese banks. Controlled for the bank-specific factors including loan-to-deposit ratio, capital adequacy ratio, the spread between WMP yield and deposit rate, the net interest spread between loan and deposit, and the non-performing loan ratio, we still find that the mutual promotion effect of WMPs and NSDI dominates in the long run. This can explain why the Chinese banks expand their balance sheets through non-standard debt investment while at the mean time issue large amount of non-principal-guaranteed wealth management products. The interaction between NSDI and WMPs, the two kinds of financial innovation, may be one new mechanism to interpret the rise and development of shadow banking in China. We also find that maturity mismatch produces liquidity shock to the interbank market and may introduce systemic risk to the financial system. This kind of liquidity shock measure is in its nature a proxy for the implicit insurance premium that the parent bank will pay to keep the off-balance-sheet WMPs in operation. On average, the liquidity shock of or the premium for implicit guarantee on the structured WMPs is 4.6% of the total balance outstanding.

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Appendix

Appendix A: List of sample banks

Bank Type	**Bank Names**
Big Five Commercial Banks (4)	Industrial and Commercial Bank of China (ICBC); Agricultural Bank of China (ABC); Bank of China (BOC); Bank of Communications (BC).
Joint-stock Commercial Banks (6)	Shanghai Pudong Development Bank (SPDB); China Minsheng Bank (CMBC); China Everbright Bank (CEB); China Citic Bank (CITIC); Ping An Bank (PAB); China Merchants Bank (CMB).
Note: China Construction Bank reports no data of SIVs so it is omitted from the group of Big Five Banks.	