Can Housing Booms Elevate Financing Costs of Financial Institutions?*

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Abstract

We provide evidence that house price appreciation elevates financial institutions' financing costs because it can make households invest more in houses and invest less in or require higher returns on other assets. For identification, we employ the unique feature of wealth management products (WMPs, the largest component of China's shadow-banking sector) that the issuing markets are local whereas the markets of some products' underlying assets are national. Stocks, bonds, and deposits do not possess this feature. We find that house price growth raises WMPs' expected returns offered by banks. Household-level analyses further confirm that house purchases reduce households' WMP-investment demands.

Keywords: house price, housing boom, financing costs, financial institution, bank, wealth management products, shadow banking

JEL Codes: G2, G5, R2, R3

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1. Introduction

As many economies have been dramatically driven by their housing market performance (e.g., the U.S., China, Japan, Hong Kong, and Taiwan), understanding the effects of housing market performance on the economy is important. Previous studies have examined the effects of housing booms on several aspects of the economy, such as increasing banks' mortgage lending and decreasing their commercial lending (Chakraborty, Goldstein and MacKinlay, 2018), increasing firms' land investments and reducing their production and innovation investments (Chen, Liu, Xiong and Zhou, 2017), altering households' consumption and borrowing behavior (Campbell and Cocco, 2007; Fan and Yavas, 2020; Cloyne, Huber, Ilzetzki and Kleven, 2019). However, few studies have examined the effect of house price growth rates on the financing costs of financial institutions or firms.

In this paper, we provide empirical evidence on the effect of house price growth on the financing costs of financial institutions. If real estate assets exhibit higher appreciation rates, households will expect greater future house price appreciations and thus invest more of their savings into the housing market and invest less in or require a higher return on other investment opportunities (e.g., deposits, bonds, and stocks), which will increase the financing costs of financial institutions and firms.[1]

One challenge to identify the effect of housing market performance on financing costs in the economy is that although housing markets are local, the markets of other investment tools are usually national: the returns of bonds and stocks are determined by all investors in the country; the deposit rates in China are strictly regulated by the central bank. Consequently, there could be a spurious correlation between the national trend of housing markets and the returns of deposits, bonds, and stocks, but this is far from sufficient to make a causal inference. It is possible that a third macroeconomic factor (e.g., monetary policy) affects both the national trend of housing

[1] Using household-level survey data, Case, Shiller and Thompson (2012) have provided evidence of households' adaptive expectations about house prices, i.e., a higher house price growth rate in the previous year leads to households' higher expectations for future house price growth.

markets and the returns of deposits, bonds, and stocks, and therefore generates this spurious correlation.

In this paper, we employ wealth management products (WMPs), the largest component of China's shadow-banking sector, and examine how housing market performance affects the expected returns (promised yields at issuance) offered by banks for their WMPs. Unlike bonds and stocks, many WMPs have a local market, i.e., they are sold exclusively to a certain city or several cities. To be able to purchase WMPs issued in a certain city, households have to visit a local branch of a bank to open a local account. Accordingly, our identification strategy is that we employ the cross-location and over-time variations both in housing market performance and in expected returns offered by banks on their WMPs to identify the effect of housing market performance on the financing costs of financial institutions.

WMPs are the second-largest type of non-housing investments for households in China, next to stocks. As the largest component of China's shadow-banking sector, WMPs are a very important channel through which households' savings are invested in the real economy. WMPs are a financial innovation that was initiated in 2004 by commercial banks in China. Banks design the terms in the contracts of WMPs (including the promised yields), sell the WMPs to households, and then invest the raised money into underlying assets (including loans, bonds, equities, money-market rates, foreign currencies, and commodities such as gold).[2] Figure 1 displays the investment cash flows among households, WMPs, and the underlying assets. The type of the underlying assets of a WMP is specified in the contract at the time of issuance. Afterward, banks distribute part of the revenue generated from the underlying assets to the WMP buyers as the principal and interest payments according to the agreement. The realized returns of the underlying assets are not visible to the WMP buyers. The risk of WMPs is much lower than

[2] WMPs issued by banks are mainly sold to households. There are other types of asset management products issued by mutual fund companies, trust companies, and other financial intermediaries. These asset management products mainly target institutional investors. Compared with these financial intermediaries, banks have a much larger customer base of households and a more widely distributed network of branches. Therefore, banks have a dominant advantage in attracting funds from households and have significantly lower issuing costs. This paper focuses on the WMPs issued by banks.

that of other investment tools, such as stock and commercial bonds; while the return on WMPs is much higher than that on bank deposits. Each WMP requires a minimum investment for a buyer, usually above RMB 50,000 (approximately USD 7200). Different from receiving deposits and lending loans, selling WMPs and investing the money raised from WMPs belong to banks' off-balance-sheet activities rather than on-balance-sheet activities. At the end of 2017, the total value of outstanding WMPs reached RMB 29.54 trillion (approximately USD 4.25 trillion). During 2017, banks issued 93,500 individual WMPs.

[Insert Figure 1 here]

One concern is that the money raised from WMPs sold in a certain city may be more likely to be invested in local assets, such as the equities and bonds of local firms, loans to local firms, local government bonds, and local real estate markets. The performance of local assets could be positively correlated with local house prices because cities with better economic conditions may perform better in both the local housing markets and other local assets. Therefore, the investment targets of the money raised from WMPs sold in a city with a housing boom are more likely to have a higher return. Accordingly, banks are inclined to offer a higher expected return for those WMPs due to the competition among banks for customers in the local WMP market. To resolve this concern, we restrict the sample to the WMPs of which the investment targets only include assets traded in the national markets (the money market, foreign exchange markets, and commodity markets such as gold) and do not include local assets. The returns of these assets traded in the national markets are determined by national or even international economic conditions instead of local economic conditions.

To summarize, there are two requirements in our identification strategy: first, the issuing market of WMPs should be local; second, the market of the investment target for the money raised from the WMPs should be national. There are many financial products in which households invest their savings and through which financial institutions and nonfinancial firms raise funds, but only the WMPs in China can simultaneously meet these two requirements for identification. The issuing markets of stocks and bonds are national. The deposit market and

deposit rates in China are strictly regulated by the central bank. Although the deposit markets in the U.S. could be local as local banks can determine their interest rates of deposits with a certain degree of freedom[3], the deposits obtained locally are more likely to be invested in local businesses.

To examine the microeconomic mechanism through which housing market performance affects the financing costs of financial institutions, we further conduct household-level analyses by using data from the China Household Finance Survey (CHFS) and provide evidence that housing purchases can crowd out households' WMP investments. We find that a down payment can reduce a household's probability to invest in WMPs within the following one year. We also find that households who currently have mortgage debt are less likely to invest in WMPs than other households regardless of the amount of their current unpaid mortgage balance. Consequently, facing a lower funding supply from the household sector, financial institutions have to offer more promising returns to raise money.

This paper contributes to several important strands of the literature. First, it adds to the literature on the effects of housing booms on non-housing sectors, which has already documented three effects: the collateral effect, speculation effect, and crowding-out effect. The collateral effect refers to the fact that increased property values make firms with real estate assets have a higher value of collaterals to borrow more and then invest more (Gan, 2007; Chaney, Sraer and Thesmar, 2012; Bahaj, Foulis and Pinter, 2020). The speculation effect refers to the fact that housing booms provoke firms to invest more in real estate assets and less in production and innovation activities (Aghion, Reenen and Zingales, 2013; Rong, Wang and Gong, 2016; Kaplan and Minton, 2006; Shi, Wang, Wu and Zhong, 2016; Chen, Liu, Xiong and Zhou, 2017; Stein, 1989 & 2003). The crowding-out effect refers to the fact that housing booms motivate banks to lend more to real-estate-sector firms and hence less to non-real-estate-sector firms (Bleck and Liu, 2018; Chen, Liu, Xiong and Zhou, 2017), and originate more mortgage loans and hence fewer commercial loans (Chakraborty, Goldstein and MacKinlay, 2018).

[3] See Calem and Carlino (1991), Hannan and Adams (2011), and Craig and Dinger (2013).

In contrast, our study shows that housing booms can elevate the funding costs of financial institutions because a higher house appreciation rate can motivate individual investors to invest more money in the housing market and hence allocate less money to or require a higher return on non-real-estate investments.

The second strand of literature we contribute to is the research on the effect of housing purchases on households' investments in non-housing assets (e.g., Yao and Zhang (2005), Cocco (2005), Vestman (2019), and Chetty, Sándor and Szeidl (2017) on stock investments). Different from those studies, our work provides empirical evidence not only for the crowding-out effect of housing purchases on households' non-housing investments but also for the corresponding implication that the financing costs of financial institutions could be elevated due to such crowding-out effect.

We also add to the broad literature on the effects of house prices on other aspects of the economy, including labor markets (Li, Li, Lu and Xie, 2020; Mian and Sufi, 2014; Charles, Hurst and Notowidigdo, 2018 & 2019; Gu, He and Qian, 2018; Meng, Peng and Zhou, 2019), entrepreneurship (Han, Han and Zhou, 2020; Schmarlz, Sraer and Thesmar, 2017; Huang, Lin, Liu and Sheng, 2018; Li and Wu, 2014), and households' consumption and borrowing (Campbell and Cocco, 2007; Fan and Yavas, 2020; Gan, 2010; Cloyne, Huber, Ilzetzki and Klevin, 2019; Mian and Sufi, 2011; Browning, Gørtz and Leth-Petersen, 2013; Mian, Rao and Sufi, 2013; Agarwal and Qian, 2016).

[Insert Figure 2 here]

Figure 2 illustrates our contribution to the literature on the effects of the housing market on the economy. As shown in panel A of Figure 2, most previous studies separately examined the effects of the housing market on households, financial institutions, or firms. In contrast, as shown in panel B, our study examines how the housing market performance affects households' investment choices and then affects the financing costs of financial institutions, which potentially could be passed on to the financing costs of firms and impact the real economy in the end.

In addition, our study contributes to the literature on the determinants of financing costs of

firms and financial institutions. Some previous papers studied the macro-level factors that affect the financing costs of institutions, including capital market imperfection (Carpenter and Petersen, 2002), information asymmetry and information costs (Morellec and Schurhoff, 2011; Greenwood, Sanchez and Wang, 2010; Easley and O'hara, 2004), and monetary policies (Gertler and Karadi, 2015). Other papers examine firm-level or bank-level factors that affect financing costs, including geographic diversification (Levine, Lin and Xie, 2019), financial leverage (Modigliani and Miller, 1958), cash flow volatility (Minton and Schrand, 1999), control/ownership structure (Anderson, Mansi and Reeb, 2003; Boubakri and Ghouma, 2010), firm size (Hennessy and Whited, 2007), underwriting services (Altınkılıç and Hansen, 2015), creditor rights protection (Boubakri and Ghouma, 2010), shareholder rights (Chava, Livdan and Purnanandam, 2009), managerial control of voting rights (Stulz, 1988), onset of credit default swap (CDS) trading (Ashcraft and Santos, 2009), and firm internationalization (Reeb, Mansi and Allee, 2001). Unlike those papers above, we provide evidence that housing market appreciation rates can elevate the financing costs of institutions. Financial institutions and non-housing-sector firms need to compete against housing investment opportunities to capture household savings.

The remaining portion of this paper is organized as follows. Section 2 provides the background information on the WMP market and housing markets in China. Section 3 describes the data. Section 4 conducts WMP-level empirical analyses and provides evidence that banks offer higher expected returns for WMPs issued in cities that recently experienced higher house price appreciation rates. Section 5 addresses some concerns. Section 6 conducts household-level empirical analyses using the CHFS data and provides evidence that households' house purchases can crowd out their' investments in WMPs. In Section 7, we discuss the implication on the potential impact on the real economy. Then, we conclude in Section 8.

2. Background

2.1. The WMP market

WMPs are a financial innovation that was initiated in 2004 by commercial banks in China.

Banks design the terms in the contracts (including the promised yields), sell the WMPs to households, and then invest the raised money into the underlying assets. Afterward, the banks distribute part of the revenue generated from the underlying assets to the WMP buyers as the principal and interest payments according to the agreement. The realized returns of the underlying assets are not visible to the WMP buyers.

The underlying assets of WMPs include stocks, foreign currencies, bonds, commodities, loans, and money market products. In addition, banks can hedge off risk by using financial derivatives related to the underlying assets and make the WMP a structured product. The type of the underlying assets of a WMP is specified in the contract at issuance.

The risk of WMPs is much lower than that of other investment tools, such as stocks and commercial bonds. There are three types of preservation terms: fixed-rate, adjustable-rate with principal guaranteed, and non-principal-guaranteed. For fixed-rate WMPs, investors are guaranteed both the principal and the stated interest rate in the agreement. For the other two types of WMPs, investors are given an expected interest rate (or range of interest rates with upper and lower bounds); the actual payment on the maturity date depends on the performance of the underlying assets (in principle, the actual return rate can be different from the expected rate and investors can even lose part of the principal). If a WMP is principal-guaranteed, investors receive at least the principal; if there is no guarantee, investors receive whatever is left after the management fee is deducted from the market value of the underlying assets. Although only 14% of WMPs are nominally fixed-rate (see Figure 3), among all the WMPs issued by banks, 96.43% finally paid a realized return that is equal to the expected return or the upper bound of the expected return range specified at issuance; only 0.79% paid a realized return that is less than the expected return or the upper bound of the expected return range specified at issuance; the rest 2.78% even paid a higher realized return than the expected return or the upper bound of the expected return range specified at issuance. As required by the China Banking Regulatory Commission (CBRC), investors need to complete an assessment form of risk capacity and risk tolerance. Although banks do not literally offer deposit insurance for WMPs, there had been

almost no default cases in the first 10 years of the WMP history. In practice, WMPs are implicitly guaranteed by the issuing banks, and thus investors usually consider WMPs to be a relatively safe way of investment.

[Insert Figure 3 here]

[Insert Table 1 here]

The returns on WMPs are much higher than bank deposit rates. Given the fact that deposit rates in China are capped by the regulator, WMPs almost always offer much higher expected returns than time deposits with the same maturity. Table 1 shows the average rates of 3-month time deposits and the average returns of WMPs with similar maturities for each year from 2004 to 2016. For investors, WMPs are less liquid than checking accounts. Although there are various terms to maturity that range from one day (or daily renewable) to five years, investors who want to terminate early need to apply during business days and will not receive any interest payment. Moreover, to purchase a WMP, investors are usually required to transfer the money to the WMP account a few days in advance. Meanwhile, each WMP requires a minimum investment for an investor, usually above RMB 50,000 (approximately USD 7200). Appendix B displays a sample document of a WMP provided by the issuing bank.

With the significant increase of M2 growth in China since 2009, households are concerned about how to preserve the value of their money. Given the limited investment choices in China, WMPs have become an important alternative to deposits. The high interest rates with implicit guarantees make WMPs quite attractive for most risk-averse households. Since the initiation of WMPs, the WMP market has experienced skyrocketing growth. The total number of WMP issuances per year by banks dramatically increased from 112 in 2004 to 93,500 in 2017. As shown in Figure 4, the outstanding WMPs at the end of 2017 reached RMB 29.54 trillion (approximately USD 4.25 trillion). The WMP market has become the largest component of China's shadow-banking system.[4]

[4] Because of its importance and unique characteristics, the WMP market has been employed by economists to answer many other research questions of general interest, such as the effect of the monetary policy on shadow banking (Chen, Ren and Zha, 2018), interest rate liberalization (Wang, Wang, Wang

[Insert Figure 4 here]

While absorbing deposits and lending loans belong to banks' on-balance-sheet activities, selling WMPs and investing the money raised from WMPs are categorized as banks' off-balance-sheet activities, except for the WMPs with underlying assets that are loans issued by the same bank.[5] This means that WMPs, unlike deposits, do not need to meet the required reserve ratio, loan to deposit ratio, and other related regulatory requirements, which gives commercial banks much greater flexibility. For example, some firms or projects cannot obtain financing from on-balance-sheet loans because banks need to meet multiple regulation requirements, such as risk control or loan quota, but they can obtain financing from WMPs at a higher interest rate.

While on-balance-sheet interest rates (for deposits and loans) are strictly regulated in China, the off-balance-sheet WMPs provide a playground of interest liberalization. The expected returns specified by banks in the contracts of WMPs at issuance are actually determined by the market. The issuing bank sets the expected return in the contract based on their judgment on the current market conditions. If the bank believes that the demand of local households for WMPs is low but the bank still wants to raise a sufficient amount of money, they will offer a higher expected return.

[Insert Table 2 here]

A WMP can either be issued nationwide (as long as the issuing bank has a local branch in the city) or be issued exclusively in several cities or a single city. As shown in Table 2, 10% of the WMPs have been issued exclusively in a single city. To be able to purchase WMPs issued exclusively in a single city, investors have to physically visit a local branch of the issuing bank in the city and open a local account. Customers of the same bank but with only an account in a different city (which usually can be identified by the account number) are not qualified to

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and Zhou, 2019), liquidity regulations (Hachem and Song, 2016), bank risk (Qian, Acharya, Su and Yang, 2019), and banks' maturity mismatch and regulation evasion (Luo, Fang, Liu and Zhao, 2019).

[5] Starting in 2009, the regulator requires that WMPs with underlying assets of credit assets in the same bank must be shown on the bank's balance sheets (CBRC 2009 No. 111 & No.113 rules).

purchase such WMPs in the current city.[6] Therefore, the markets for these WMPs are local and the buyers are mainly the residents in that city.[7] When setting the expected returns of these WMPs, the issuing banks will consider the demand of households in that city and the competitiveness of the local WMP market.

2.2. China's housing market

China has been experiencing a continuous housing boom along with rapid GDP growth for more than 20 years. House and land prices have been increasing at a tremendous speed. First, China was experiencing rapid urbanization with large-scale migration from rural areas to urban areas and a dramatic transformation of rural areas into urban areas. Many cities were growing in population and spreading in size at an extremely rapid pace, which has generated a massive demand for new housing.

Second, the household income levels in China have significantly increased during the last two decades, and thus they have plenty of extra money to save. Meanwhile, multiple waves of high inflation occurred during the last 20 years. However, investment choices are quite limited for households in China, and the performance of available investment tools such as stocks is not satisfactory. Consequently, housing assets have become the most important investment opportunity for households to preserve the value of their savings. A large amount of money from households therefore has been injected into the housing market, which escalated house prices further.

Although the national trend of house prices in China was increasing continuously, there are large variations across the first-tier (Beijing, Shanghai, Shenzhen, and Xiamen), second-tier

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[6] Unlike the U.S., in China, customers of the same commercial bank but residing in different cities have different local accounts. A local account is affiliated with a city branch of a commercial bank. Many banking services require a local banking account, such as receiving direct deposits for salaries from local employers or social securities from the local government. Some bank services charge higher fees for customers with an account in another city, such as money transfer.

[7] It is possible that a few customers might have a bank account in the concerned city but are not residing in that particular city. However, these customers would not constitute a significant portion of the buyers for the WMPs issued in that city.

(mainly provincial capital cities), and third-tier (other cities) cities. This cross-sectional variation in local housing market performance helps identify the effect of housing market performance on the financing costs of financial institutions. Figure 5 displays the monthly year-on-year growth rates of residential house prices in the top 70 cities in China.

[Insert Figure 5 here]

3. Data

3.1 WMP data

We extract the WMP data from WIND, one of the largest financial data providers in China. The data contain information on each WMP issued by commercial banks from 2004 to 2016, including the WMP's name, issuing bank and date, expected return offered (or the lower and upper bounds of the expected return range), term to maturity, type of underlying assets, issuing region, type of guarantee, minimum investment requirement, realized return at maturity, etc.[8]

There are two possible ways that banks specify the expected returns in the contract at issuance: some WMPs (especially fixed-rate WMPs) specify an expected return; other WMPs specify the upper and lower bounds of an expected range of returns. As 96.43% of the WMPs end up paying a realized return equal to the expected return or the upper bound of the expected range of returns, we treat the upper bound of the expected range of returns as the expected return if the contract specifies an expected range of returns.

Based on the raw data, we construct additional WMP-level variables. We construct the *principal coverage ratio* using the information on the type of guarantee. The *principal coverage* equals 0 for adjustable-rate WMPs without principal guarantee; it equals 100% for adjustable-rate WMPs with principal guaranteed; it equals 100% plus the expected rate of return for fixed-rate WMPs (with principal and interest both guaranteed). We generate a dummy variable "*trust*" based on whether the WMP is issued jointly with a trust. We also generate a dummy variable "*structured product*" based on whether the bank designs the WMP contract with

[8] The sample period is before the announcement of "the new regulatory rules on asset management" in 2018, which could dramatically change the market.

derivatives.

Furthermore, using the WMP issuance data, we construct the following three variables to measure the competitiveness of the local WMP market: the number of WMPs for sale in a city during a month (*num of available WMPs*), number of banks that are selling WMPs in a city-month combination (*num of issuing banks*), and Herfindahl-Hirschman Index (*HHI*) calculated by using the number of WMPs of each bank in a city in a month.

3.2. Data on the housing market in China

We extract the monthly house price index of the top-70 cities during 2006-2016 from the National Bureau of Statistics in China. This index is the most commonly used residential house price index at the city level in China. This house price index is neither a hedonic nor a repeat-sales index. It is constructed simply based on the average price per square meter in a city during a month without controlling for the quality of the houses. Alternatively, Fang, Gu, Xiong and Zhou (2015) constructed a city-level hedonic house price index using mortgage data from a national commercial bank. However, the index only spans from January 2003 to May 2013 and the authors have not made updates. Similarly, Wu, Deng and Liu (2014) constructed a city-level hedonic house price index for 35 cities but the index is only available for 2006-2010. Recently, several research groups are making efforts to construct city-level hedonic or repeat-sales house price indices in China, but those indices are only available for the recent several years. Therefore, the monthly house price index for the top-70 city constructed by the National Bureau of Statistics is still the most commonly used house price index in China in academia, governments, and industries.

While the 70 cities index is widely used in the literature, it provides lower estimates of house price growth than do the indices constructed by Wu, Deng and Liu (2014) and Fang, Gu, Xiong and Zhou (2015). However, the overly smooth characteristics of the 70 cities index do not cause a severe problem to our study and the index is even more appropriate than other indices for our study.

First, given the evidence of households' adaptive expectations about house prices and the high explaining power of the past 12-month house price growth on households' expectations of future growth suggested by Case, Shiller and Thompson (2012), in our study, the variation in the key variable (the past 12-month house price index growth) works as a proxy for the variation in people's expectations on the future house price growth. If households experienced greater house price appreciations in the last year, they tend to expect greater future house price appreciations and thus invest more of their savings into the housing market and invest less in or require a higher return on other investment opportunities. As noted by Case, Shiller and Thompson (2012), people's adaptive expectations underreact to actual house price changes: in their regression of the realized one-year house price change on the expected one-year house price change, the coefficient is much higher than 1; in their regression of the expected one-year change on the lagged actual one-year change, the coefficient is much lower than 1 and is smaller than the coefficient in the regression of the actual one-year change on the lagged actual one-year change.[9]

Second, this 70 cities index constructed based on the average price per square meter and the average price per square meter itself are commonly observable to households. Based on this information that is instantaneously available to the public, households form their judgments on current market conditions and their future expectations, and then make house purchase decisions accordingly. Other house price indices are only available to researchers upon application: households do not observe them, and researchers do not observe them instantaneously.

We also extract the city-level monthly housing sales data of the top-40 cities for new houses from the CEIC (a major economic data provider in China).[10]

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[9] In the literature on expectation formation, the underreaction of people's adaptive expectations to actual changes has also been documented for other economic variables, such as inflation rates (see Malmendier and Nagel, 2016).

[10] There are no reliable sales data on second-hand houses sales in China. Some of the data vendors may provide such data for a limited number of cities, but they are far from accurate. First, it is difficult to trace all the second-hand house transactions in China. Second, for second-hand house transactions, the actual transaction prices may be far different from the registered transaction prices because the sellers of second-hand houses would like to collude with the buyers and underreport the transaction prices for tax evasion purposes (see Agarwal, Li, Qin, Wu and Yan, 2020 and Agarwal, Kuang, Wang and Yang, 2019).

3.3. Bank annual report data

We obtain bank annual report data from WIND. The data contain deposits, wholesale capital market funding, average deposit rates, average loan-deposit spread, and so on.

3.4. Macroeconomic data

We extract multiple macroeconomic variables from the CEIC. The first variable is the Shanghai Interbank Offered Rate *(SHIBOR*), which is an analog to the London Interbank Offered Rate (LIBOR) in China and is commonly used as the baseline interest rate of China's Financial Market. SHIBOR offers different maturities, including one day, one week, two weeks, one month, three months, six months, nine months, and one year. We match the SHIBOR to each WMP by issuing date and maturity to control for the baseline interest rates. We also use the Shanghai Security Composite Index (*SHSCI*) and Shenzhen Security Composite Index (*SZSCI*) from the CEIC to control for returns of households' alternative investment opportunities. We also obtain the required reserve ratio (*RRR*) from the CEIC and the M2 growth rate from the central bank of China because the money supply can affect both the WMP returns and house price appreciations. Finally, we extract the city-level GDP growth rates and deposits from the China City Statistical Year Book.

3.5. China household finance survey data

The CHFS is the best nationally representative survey on household finance in China. Besides detailed demographic information, the survey asks respondents about their consumption, expenditure, borrowing, investment, financial literacy, and risk attitude. Currently, data from four waves of the survey are available: 2011 (8,000 respondents), 2013 (28,000 respondents), 2015 (37,000 respondents), and 2017 (40,000 respondents). We do not use the 2011 data because many informative questions were not asked in that wave. A portion of the respondents are surveyed repeatedly and thus have a panel nature.[11] The survey data have been used in many

[11] Details about the CHFS can be found in Gan, Yin, Jia, Xu and Ma (2013).

economic studies (e.g., Li, Li, Lu and Xie (2020) on the effect of housing wealth on labor supply; Han, Han and Zhou (2020) on the effect of housing booms on entrepreneurship; Clark, Yi and Huang (2019) on subjective well-being; Fisman, Huang, Ning, Pan, Qiu and Wang (2019) on investment risk-taking).

The survey asks households two questions related to WMP investments. The first question is whether the household currently holds WMPs. If the answer is yes, then the household will be asked about the monetary value of the WMPs the household currently holds.

The CHFS also asks several questions related to housing: for example, whether the household is a homeowner or renter; whether they currently have mortgage debt and if so, the current unpaid balance; and when they purchased their house.

The survey data contain rich household-level characteristics, including residence city, income, education, homeownership status, the number of houses owned, gender, age, marital status, household size, net assets, and risk attitude. The survey question related to risk attitude is "if you have a certain amount of money, which type of projects would you like to invest the money in?" The respondents can select one answer from the following 5 choices: 1) high risk and high return; 2) slightly high risk and slightly high return; 3) average risk and average return; 4) slightly low risk and slightly low return; 5) not willing to take any risk. We created the dummy variables *risk_attitude_1*, *risk_attitude_2*, *risk_attitude_4*, *risk_attitude_5* for choices 1, 2, 4, and 5, respectively, and omit choice 3.

[Insert Table 3 here]

Table 3 provides the descriptive statistics for the variables constructed from the data sources discussed above.

4. WMP-level analyses

In this section, we analyze how the local housing market performance affects the expected returns offered by banks for their WMPs issued for the local market.

4.1. Baseline regressions

In equation (1), the dependent variable r_{ict} is the expected return specified in the contract of WMP i issued exclusively in city c in month t. The issuing bank determines r_{ict} based on their judgment on the current WMP market conditions. If the bank believes that the demand of local households for the WMPs is low but the bank still wants to raise a sufficient amount of money, they will set a higher r_{ict}. Empirical evidence shows that 96.43% of the WMPs finally paid a realized return that is equal to the specified expected return at issuance; the realized return of the other 3.57% of WMPs paid a realized return that only slightly deviates from the specified expected return. Therefore, the expected return specified at issuance can be viewed as a proxy for the required return by households and the financing cost to banks.

$$r_{ict} = \theta hpg_{ct} + \beta X_{ict} + \gamma Z_{ct} + \lambda W_t + \omega_{by} + \mu_c + \varepsilon_{ict} \quad (1)$$

The variable of main interest is hpg_{ct}, the house price growth rate of city c during the past 12 months. We control for a rich set of WMP characteristics in X_{ict}, including principal coverage, minimum investment requirement, term to maturity, investment targets of the money raised from the WMP (the type of underlying assets, such as equities, bonds, loans, and money market products), whether the WMP is issued jointly with a trust, and whether the product has a derivative design. In X_{ict}, we also include SHIBOR with the same term to maturity as WMP i's to control for the baseline interest rates. In Z_{ct}, we control for city-level competitiveness measures for the local WMP markets, including the number of WMPs available in city c during month t, number of banks issuing WMPs in city c during month t, and HHI calculated using the number of WMPs of each bank in a city in a month; we also include city-level GDP growth rates to control for local economic conditions. In W_t, we control for the RRR and M2 growth because money supply can affect both WMP returns and house price appreciations. We also add

SHSCI growth and SZSCI growth in W_t to control for returns of households' alternative investment opportunities. In addition, we control for the bank-year fixed effects (ω_{by}) and city fixed effects (μ_c). Standard errors are clustered by city.[12]

[Insert Table 4 here]

We first estimate equation (1) using all the WMPs that were issued exclusively in a single city. The sample period is from 2007 to 2016. The results are reported in column 1 of Table 4. The coefficient of hpg_{ct} in equation (1) is 0.0097, significantly positive at a 1% level, i.e., if a city experienced a higher house price growth rate in the past year, the banks issuing WMPs in the city will offer a higher expected return. The explanation is that households in a city that experienced a higher house price growth rate in the past one year will form a higher expectation for future house price appreciations; thus, they are inclined to invest more money into real estate assets, and accordingly, invest less money into WMPs or require a higher return for WMPs; consequently, banks have to offer higher returns for WMPs in order to raise a sufficient amount of money.

However, one concern is that the money raised from WMPs sold in a city may be more likely to be invested in local assets, such as the equities and bonds of local firms, loans to local firms, local government bonds, and local real estate markets. The performance of local assets could be positively correlated with local house prices because cities with better economic conditions may perform better in both the local housing markets and other local assets. Therefore, the coefficient of hpg_{ct} in equation (1) could be driven by the following two possible effects with opposite directions to each other. First, the investment targets of WMPs sold in a city with a housing boom are more likely to have a higher return and thus banks are inclined to set a higher expected return for those WMPs due to the competition among banks for customers in the local WMP market. Second, given the fact that the investment targets of WMPs sold in a city with a housing boom are more likely to have a better performance, households could believe that

[12] We also cluster the standard errors by bank and the significant levels of the results are similar.

investing in those WMPs should be safer and thus would like to pay a higher price (i.e., require a lower return); consequently, the issuing banks will set a lower expected return.

The first effect tends to make the coefficient of hpg_{ct} in equation (1) more positive, whereas the second effect tends to make it more negative. In column 1 of Table 4, the coefficient of the city-level GDP growth is -0.0002, significantly negative at a 1% level, i.e., banks set lower expected returns for WMPs issued in cities in better economic conditions. This result indicates that the second effect dominates the first one. The dominance of the second effect may also be the reason for the small magnitude of the coefficient of hpg_{ct} (0.0097) in column 1 of Table 4, although the coefficient is still statistically significantly positive.

To make the coefficient of hpg_{ct} not driven by the two effects, we re-estimate equation (1) but restrict the sample to the WMPs of which the investment targets only include assets traded in the national or international markets (money market products, foreign exchanges, and commodities such as gold) and do not include local assets. The returns of these underlying assets are determined by national or even international economic conditions instead of local economic conditions. Column 2 of Table 4 reports the regression results. The coefficient of the city-level GDP growth is no longer significant and is much smaller in magnitude than that in column 1 of Table 4, which indicates that the local economic conditions do not affect the expected return of those WMPs because the returns of their investment targets are determined by national or international markets. More important, the coefficient of hpg_{ct} in column 2 is 0.0380, significantly positive at a level of 1% and much larger in magnitude than that in column 1 of Table 4. This indicates that after we rule out the local confounding factors, an increase in hpg_{ct} by one standard deviation (0.0974) will cause an increase in the expected return of a WMP by 37 basis points (0.0380×0.0974=0.0037), which is a considerable magnitude compared to the standard deviation of all the WMPs' expected returns (107 basis points).

Table 4 also shows that the local WMP markets with more competitiveness (more available WMPs and more issuing banks) tend to have higher expected returns. This result further

confirms that the markets of such single-city WMPs are local.

The coefficients of the other control variables are also consistent with theories or intuition. The coefficients of the baseline interest rate (SHIBOR) is significantly positive. The coefficient of the RRR is significantly positive and the coefficient of the M2 growth is significantly negative, which is consistent with the fact that increases in the money supply will cause WMP returns to drop.[13] [14] WMPs with longer terms to maturity and lower principal coverages have higher expected returns. The coefficients of the equity, loan, and bond dummy variables are higher than the coefficient of the money market product dummy variable because the former underlying assets are riskier and thus households require higher returns.

4.2. Heterogeneities across banks and cities

In column 1 of Table 5, we interact the house price growth rate with a measure of the bank's retail funding share. It is defined as deposits divided by the sum of deposits and wholesale capital market funding. Unlike wholesale funding (e.g., interbank borrowing), deposits and WMP sales are retail funding from individual customers. Banks with a larger deposit funding share have a larger individual customer base and hence have more incentives to be responsive in WMPs promised yields to house price appreciations (WMPs demands) to maintain WMP sales. As WMPs purchasers are required to have a local account of a bank in order to purchase WMPs issued by the bank, they usually have deposits in the bank (in that local account). The estimated coefficient of the interaction term is 0.1796, significantly positive at a level of 1%.[15]

[Insert Table 5 here]

In column 2 of Table 5, we interact the house price growth rate with the HHI of the WMPs

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[13] In column 1 of Table 4, the coefficient of the M2 growth is positive rather than negative. The reason is that it is highly correlated with the RRR and other variables in the regression. If we drop the RRR, the coefficient of the M2 growth will become negative.

[14] In Table A.2 in Appendix A, we further control for the current national house price growth (average of the 70 cities' growth), and the results are robust.

[15] WMP sales belong to the off-balance sheet and there are only a limited number of observations (140) on bank-year level WMP sales in bank annual reports. Following the spirit of Demirgüç-Kunt and Huizinga (2009) and Cornett, McNutt, Strahan and Tehranian (2011), we use deposits divided by the sum of deposits and wholesale capital market funding to measure a bank's retail funding share.

market in the city. The estimated coefficient is -0.0708, significantly negative at a level of 5%. This pattern is consistent with the fact that in more competitive markets, banks need to price more responsively to the house price appreciations in order to compete for WMPs buyers.

5. Concerns

5.1. Two competing effects of house price appreciations on housing demand

One concern is that a higher house price growth rate may have two different effects on households' housing demand. First, a higher growth rate can make households form a higher expectation for future house price appreciations and thus be willing to invest more money in housing assets. Second, a higher growth rate can make houses become less affordable to households with low income or low financial net-worth and reduce their housing purchases, and thus they have more money to invest in other assets (including WMPs); a higher growth rate can even make households consume less and hence save (invest) more in order to afford a house in the future.[16] The first effect tends to make the coefficient of hpg_{ct} in equation (1) positive, while the second effect tends to make it negative.

The significantly positive coefficients of hpg_{ct} in equation (1) shown in Table 4 indicate that the first effect dominates the second effect. In addition, we run regressions of city-level monthly sales growth rates for new residential houses on the local house price growth rates in the past year.[17] As shown in Table 6, the coefficient of the local house price growth rate is significantly positive across different model specifications. This indicates that overall, higher house price growth in the past year will lead to higher growth of housing sales.[18] Because banks

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[16] Rosenzweig and Zhang (2019) found that a high house price can increase young people's savings rates.

[17] We use the sales data for new houses, which do not include second-hand houses. First, as discussed in Subsection 3.2, there are no reliable second-hand house sales data in China. Second, as second-hand sales are highly correlated with new house sales, new house sales data can capture the trend of the total sales. Third, in second-hand house transactions, the money is simply transferred from one household to another; it does not change the total amount of money held by the household sector and hence does not change the demand of WMPs by the household sector. In contrast, in new house transactions, the money is transferred from households to developers.

[18] One concern is whether high house price appreciation rates can make households with houses have

cannot conduct price discrimination based on households' income, financial net-worth, or age when selling WMPs, they can only consider the overall effect of house price growth rates on the market demand for WMPs when they set the expected returns.

[Insert Table 6 here]

5.2. Higher returns required by households or better investment opportunities for banks?

One concern is that the increased returns on WMPs may be caused by higher returns of banks' investment opportunities rather than by higher returns required by households in housing booms, given that higher house price appreciations in a city are usually associated with other better investment opportunities.

While this alternative channel is possible, our results are not entirely driven by it. First, the regression in column 2 of Table 4 only uses WMPs of which the underlying assets are traded in the national or international market. The returns of these underlying assets are not affected by local investment opportunities.

Second, as shown in column 1 of Table 5, banks with a larger retail funding share have a larger increase in WMP returns in response to house price appreciations. This indicates that the reduced WMP demands (or the higher required returns) are more likely to be the driving force for the increases in promised yields than better investment opportunities are. While different banks face similar investment opportunities at a time, banks with a larger retail funding share have a larger individual customer base and hence have more incentives to be responsive in WMPs promised yields to house price appreciations (WMP demands) to maintain WMP sales.

Third, as discussed in Section 4, better investment opportunities in a city for banks may decrease the WMP returns offered in the city rather than increase them. The reason is that for WMPs that potentially have local underlying assets, investors could believe that it is safer to invest their savings in the WMPs issued in cities with better economic conditions and hence

more home equities to borrow against and then invest more in other financial tools. Unlike the U.S., China does not have home equity loans or cash-out refinancing. For ordinary households, the only way to extract home equity is to sell a house to another household, which does not change the total amount of money invested by households in the real estate market.

would like to pay higher prices (i.e., require lower returns). In column 1 of Table 4, the regression sample includes WMPs of which the underlying assets could be local; the significantly negative coefficient of local GDP growth confirms that possibility.

5.3. Spillover effects of WMPs with local underlying assets on WMPs with national underlying assets

The sample for column 2 of Table 4 consists of WMPs with national underlying assets to rule out the possibility that the local economic conditions drive underlying asset returns and hence the promised yields of WMPs. One concern is that if a better local economic condition can raise the promised yields of WMPs with local underlying assets, it may spill over to the promised yields of national-underlying-asset WMPs that are issued within the same city during the same month because sellers need to increase the promised yields of these WMPs to attract customers.

To address this concern, we add the average promised yields of local-underlying-asset WMPs that are issued within the same city during the same month to the regression in column 2 of Table 4. The results are reported in Table A.3 in Appendix A. The coefficient of hpg_{ct} is still significantly positive with a similar magnitude. There could be two reasons for this consistent result. First, local and national underlying assets have different risks and thus households require different returns on the two types of WMPs. Second, besides local-underlying-asset and national-underlying-asset WMPs that are issued exclusively in a single city, there are many other WMPs available in the city that are issued in multiple cities or even nationwide. The returns of these WMPs are not driven by the local economic conditions in the city. Therefore, among WMPs issued exclusively in a single city, the spillover effects of WMPs with local underlying assets on WMPs with national underlying assets are limited.

5.4. Selling agents

One may argue that some WMPs sold at banks are provided by other financial institutions (such as security companies, private-equity firms, and trust companies); banks only serve as selling

agents and charge a fixed commission rate for these products; thus, the increases of the returns required by households on WMPs have no effect on banks' profits. However, first, the market share of this type of WMPs is not big. Second, as the returns of this type of WMPs increase, the financing costs of these nonbank financial institutions (WMP returns plus bank commission rates) will be increased, which potentially can affect the investment decisions of these nonbank financial institutions and impact the real economy.

5.5. Correlation between house prices and bank deposits

One concern is that local house prices and local deposits can both increases as a result of better local economic conditions. Therefore, banks may not necessarily face more pressure of raising funds through WMPs when house prices grow rapidly. However, if this is true, we should observe a negative coefficient of the house price appreciation rate in the regressions of Table 4 rather than a positive one. In fact, based on the city-level deposit data from CEIC and the city-level house price growth rates, we find that the two are negatively correlated (see Table A.4 in Appendix A). Moreover, in next section (Section 6), we run household-level regressions using the CHFS data and find that house purchases significantly reduce households' deposit levels. Even if house prices and deposits increase simultaneously, a larger amount of deposits does not necessarily mean that banks have more sufficient funds because, in better economic conditions, the lending demand is also high; banks could have more funds or bear lower financing costs if house prices are not overinflated.

5.6. Switch to other cities or to other funding sources

One concern is that for a bank with branches in multiple cities, if the funding from a city is crowded out by the local house price growth, the bank can still attract funds in other cities where the house price appreciation is lower. However, first, a drop of funds from one city cannot be fully compensated from other cities because raising more funds from another city will also increase the financing cost in that city; and cities with high house price growth rates are usually

large cities from which a substantial share of banks' funds originate. Second, in China, city-level branches of a bank are relatively independent from its headquarters. Each customer's banking account is affiliated with a city branch and usually city branches only originate loans to local borrowers. Although the lending quota of each city branch is allocated by the headquarters, the quota size partially depends on how much funds the branch can raise from the city. The branch manager is evaluated based on the local performance, including the lending volume, profits, and default rate (see Cao, Fisman, Lin and Wang, 2018).

Another concern is that banks can raise funds from other funding sources when the required returns on WMPs are elevated by housing booms. However, first, switching to other funding sources will increase the demand of other funding sources and hence either elevate the financing costs or cause shortages in other funding sources. Second, it is likely that housing booms can crowd out not only WMP sales but also other funding sources for banks. In next section (Section 6), we run household-level regressions using the CHFS data and find that house purchases significantly reduce households' deposit levels (see Table A.10 in Appendix A). We also find that city-level deposits are negatively related with city-level house price appreciation rates (See Table A.4 in Appendix A).

5.7. Increased mortgage demand and bank profits

Another concern is that given that the required returns on WMPs are elevated by house price appreciations, the lower WMPs demand should be associated with an increased mortgage demand; thus, banks can make more profits from their mortgage business. However, as demanders of WMPs, households supply money to banks, whereas as demanders of mortgages, households borrow money from banks. Housing booms may decrease the total lending volume by banks because the money supply from households to banks is lower. Meanwhile, the mortgage demand increased by housing booms may provoke banks' mortgage lending and hence crowd out their commercial lending to the real economy (such as the manufacturing sector), as found by Chakraborty, Goldstein and MacKinlay (2018).

5.8. Common underlying asset pools and implicit guarantees

One concern is that before April 2013, for a WMP of which the underlying assets are money market products, the money used to repay the promised yield may not necessarily come from the specified underlying assets but from a common underlying asset pool of all the WMPs issued by the commercial bank. Moreover, commercial banks may even use cash from their non-WMP businesses to repay their WMPs.

However, first, the pricing by a commercial bank on a WMP depends on the marginal revenue (the expected return on the specified underlying assets) and the marginal cost (including the promised yield) of the WMP, rather than where the cash for the final principle and interest payment comes from. Similarly, for a manufacturing firm, the money used to pay its supplier for a batch of raw materials may not necessarily come from the revenue of the batch of products using those materials; but a manufacturing firm's pricing on a product still depends on the marginal revenue and marginal cost of the product.

Second, if a commercial bank determines the promised yield of a WMP based on the expected return of a common underlying asset pool instead of the expected return of the WMP's own underlying assets, our regressions using all the single-city WMPs (instead of only WMPs with money market underlying assets) is sufficient to establish the causal effect of housing booms on the funding costs of commercial banks. The reason is that the returns on a common underlying asset pool do not depend on the economic condition of a specific city.

Third, we also run regressions of equation (1) using WMPs issued after April 2013, after which the China Banking Regulatory Commission implemented *the Notice on Relevant Issues concerning Regulating the Investment Operation of Wealth Management Business of Commercial Banks* (referred to as *Document No. 8 [2013] of the China Banking Regulatory Commission*). The regulatory policy prohibits common underlying asset pools and implicit guarantees for WMPs, requiring that the money repaying for a WMP should come from the WMP's own underlying assets. As shown in Table A.5 in Appendix A, the coefficient of house

price growth is still significantly positive and has a similar magnitude.

6. Household-level analyses

To examine the microeconomic mechanism through which housing markets affect the financing costs of financial institutions, we conduct household-level analyses in this section using data from the CHFS. We provide empirical evidence that households' house purchases can crowd out their investments in WMPs. Consequently, facing a lower funding supply from the household sector, financial institutions have to offer more promising returns to raise money.

The CHFS asks households two questions related to WMP investments. The first question is whether the household currently holds WMPs. If the answer is yes, then the household will be asked for the monetary value of the WMPs that the household currently holds.

We conduct household-level analyses for two reasons. First, they can shed light on the crowding-out effect of housing purchases on aggregate WMP sales. We do not directly examine the crowding-out effect on aggregate WMP sales because there is no data on city-level WMP sales.[19] Second, household-level analyses can provide more convincing results than aggregate-level analyses. Given that the crowding-out effect exists, it is still possible that aggregate-level housing purchases and WMP sales both increase as the result of better economic conditions or common time trends; aggregate-level WMPs could have increased even more if there were no such crowding-out effect. In contrast, in household-level analyses, we can examine how an individual's housing purchase affects the individual's WMP investment decision and control a rich set of individual-level characteristics.

6.1. Baseline regressions

We first run a probit regression of households' WMP investment decisions, as displayed in equation (2):

[19] The product-level data do not have information on issuing volumes.

$$Prob\{investWMP_{jct} = 1\} = \Phi\{\theta Housing_{jct} + \beta H_{jct} + \gamma Z_{ct} + \mu_c + \varphi_y\} \quad (2)$$

$investWMP_{jct} = 1$ if household j residing in city c surveyed in month t currently holds WMPs; $investWMP_{jct} = 0$ if the household currently does not hold WMPs. $Housing_{jct}$ represents the housing-related variables of the household, which are of main interest, including $Homeowner_{jct}$ and several other variables. $Homeowner_{jct} = 1$ for homeowners and $Homeowner_{jct} = 0$ for renters. $\Phi(.)$ is the cumulative distribution function for the standard normal distribution.

We control for a rich set of household characteristics in H_{jct}, including the household income, homeownership status, number of houses owned, net asset of the household and the gender, age, education level, and marital status of the household head. In Z_{ct}, we control for the average expected return of WMPs available in city c during t adjusted by their risks, which is denoted as "WMP premium." To construct this measure, we first run a WMP-level regression of the expected returns of all the WMPs on their risk-related characteristics.[20] From the regression, we obtain the residual for each WMP as a measure of its expected return after adjusting for its risk. Then, we aggregate these residuals within a city-month combination as a measure of the WMP premium for the city-month. Households in cities with higher WMP premiums should be more likely to invest in WMPs. In Z_{ct}, we also control for city-level competitiveness measures for the local WMP markets (including the number of WMPs available in city c during month t, number of banks issuing WMPs in city c during month t, and HHI) and city-level per capita GDP. We also control for city fixed effects (μ_c) and year fixed effects

[20] Those risk-related characteristics include principal coverage, minimum investment requirement, term to maturity, investment target categories of the money raised from the WMP, whether issued jointly with a trust, whether the product has a derivative design, and bank fixed effects.

(φ_y).

[Insert Table 7 here]

Column 1 of Table 7 displays the regression results of equation (2). The coefficient of $Homeowner_{jct}$ is -0.5324, negative at a significance level of 1%, which indicates that given that other demographic characteristics are the same, homeowners are less likely to invest in WMPs than renters. There are two possible channels through which homeownership can inhibit households' investment in WMPs. First, when purchasing a house, households need to pay a sizable down payment amount, which can exhaust their free money for other investments.[21] Second, after purchasing a house, households will have large mortgage debt with an interest rate that is generally higher than WMP returns; thus, using their income to repay their mortgage debt has priority over investing their income in WMPs.

6.2. Down payment channel

To provide evidence for the first channel through which homeownership inhibits households' investment in WMPs, i.e., the down payment channel, we add an indicator of whether the household purchased a house in the recent one year ($HousePurchase1_{jct}$) to the regression of equation (2). $HousePurchase1_{jct} = 1$ if household j purchased a house in the recent one year; $HousePurchase1_{jct} = 0$ if household j did not. The coefficient is -0.1127, negative at a significant level of 1% (see column 2 of Table 7). This result indicates that conditional on other factors, homeowners who purchased a house in the recent one year are less likely to invest in WMPs than homeowners who purchased a house more than one year ago, because the former have paid a large down payment recently.

In addition, in column 3 of Table 7, we further add $HousePurchase2_{jct}$, an

[21] The minimum down payment in China is generally higher than that in the U.S. In China, the minimum down payment for the primary residence is usually 30% or higher; the minimum down payment for a second home or investment property is usually 50% or higher. Thorough details of the housing and mortgage markets in China can be found in Fang, Gu, Xiong and Zhou (2015).

indicator of whether the household purchased a house two years ago. We find that the coefficient of $HousePurchase2_{jct}$ is insignificant while the coefficient of $HousePurchase1_{jct}$ is still significantly negative. This result indicates that conditional on other factors, there is no significant difference in the probability of investing in WMPs between homeowners who purchased a house two years ago and homeowners who purchased a house more than two years ago, because neither the former nor the latter have made a large down payment recently.

Furthermore, in columns 4 through 6 of Table 7, we gradually add indicators on whether the household purchased a house three years ago ($HousePurchase3_{jct}$), four years ago ($HousePurchase4_{jct}$), and five years ago ($HousePurchase5_{jct}$), respectively. They are all insignificant; and $HousePurchase1_{jct}$ is always significantly negative. These results indicate that conditional on other factors, there is no significant difference in the probability of investing in WMPs between homeowners who purchased a house three years ago and homeowners who purchased a house more than three years ago, between homeowners who purchased a house four years ago and homeowners who purchased a house more than four years ago, and between homeowners who purchased a house five years ago and homeowners who purchased a house more than five years ago.

[Insert Table 8 here]

In column 1 of Table 8, we also report the estimated marginal effects for the probit regression in column 2 of Table 7. A house purchase in the recent one year can reduce the probability of investing in WMPs by 0.93%, a considerable magnitude compared to the average probability of investing in WMPs of all the surveyed households (5.36%).

The coefficients of the control variables are also consistent with intuition or theories. For example, as shown in column 1 of Table 8, households with higher income, more net assets, higher education levels, and older ages tend to have a higher probability of investing in WMPs. Married households are more likely to invest in WMPs than unmarried households. Larger

households have a lower probability of investing in WMPs because a larger household size incurs more family expenditures. Households with an extremely high or low risk aversion level are less likely to invest in WMPs than those with a moderate risk aversion level. The reason is that WMPs are riskier than bank deposits and safer than other risky assets such as stocks, corporate bonds, and mutual funds.

Next, we run a tobit regression of the values of the WMP assets currently held by those households. Denote v_{jct} as the value of the WMP assets currently held by household j. $v_{jct} = 0$ if household j currently does not hold any WMPs. As v_{jct} has many zeros, we need to estimate a tobit model. Suppose there is a latent demand v^*_{jct} generated by the process defined in equation (3):

$$v^*_{jct} = \theta Housing_{jct} + \beta H_{jct} + \gamma Z_{ct} + \mu_c + \varphi_y + \varepsilon_{jct} \qquad (3)$$

$v_{jct} = v^*_{jct}$ if $v^*_{jct} > 0$; $v_{jct} = 0$ if $v^*_{jct} \leq 0$. We obtain the estimates of those coefficients in equation (3) by maximizing the log likelihood function defined in equation (4):

$$\begin{aligned} \max LogL = \sum_j \{ & investWMP_{jct} \\ & \times \log\left(f\left(\theta Housing_{jct} + \beta H_{jct} + \gamma Z_{ct} + \mu_c + \varphi_y\right)\right) \\ & + (1 - investWMP_{jct}) \\ & \times \log\left(1 - F\left(\theta Housing_{jct} + \beta H_{jct} + \gamma Z_{ct} + \mu_c + \varphi_y\right)\right)\} \end{aligned} \qquad (4)$$

The result of the tobit regression is reported in column 2 of Table 8. A house purchase in the recent one year can crowd out approximately RMB 50K from a household's latent WMP investment demand.

6.3. Unpaid mortgage channel

To provide evidence for the second channel (the unpaid mortgage channel) for the effect of house purchases on WMP investments, we restrict the sample to households with no house

purchases in the recent one year ($HousePurchase1_{jct} = 0$) and run the probit regression of WMP investment on the indicator of whether the household currently has an unpaid mortgage balance ($Mortgage_{jct}$). As shown in column 1 of Table 9, the coefficient of $Mortgage_{jct}$ is -0.0782, significantly negative at a level of 5%. The marginal effect indicates that among households who did not make house purchases and thus made no down payments in the recent one year, conditional on other factors, those with unpaid mortgage balances have a lower probability of investing in WMPs than those without unpaid mortgage balances by 0.63%. This is a considerable magnitude compared to the average probability of WMP investment of all the surveyed households (5.36%).

[Insert Table 9 here]

In column 2 of Table 9, we add unpaid mortgage balance ($UnpaidMtgBlnc_{jct}$) and it is insignificant. This result indicates that given that other factors are fixed and conditional on that there is a nonzero unpaid mortgage balance, the balance amount has no effect on the likelihood of the household's WMP investment. The reason is that for households who do not invest in WMPs because of being in mortgage debt, as long as there is a nonzero unpaid mortgage balance, the priority is to use their income to repay the debt rather than invest their income in WMPs.[22]

In columns 3 and 4 of Table 9, we run tobit regressions in which the dependent variable is the monetary amount of the WMPs currently held by the household. The results are similar: the coefficient of $Mortgage_{jct}$ is significantly negative whereas the coefficient of

[22] This does not necessarily mean that none of the households with a mortgage debt will invest in WMPs. In the sample, among homeowners who currently have a mortgage debt and did not purchase a house in the recent one year, 5.26 % of them currently hold WMPs. One possible reason is that some of them need to hold a diversified asset portfolio, even though they have a mortgage debt with a relatively higher interest rate to repay. Table A.6 in Appendix A reports the subgroup means for WMPs investment probabilities and the demographic characteristics for some of the subgroups. Among homeowners who did not purchase a house in the recent one year, those currently with a mortgage debt actually have a higher average probability of investing in WMPs (5.26%) than those with no mortgage (4.81%). The reason is that those in the former subgroup, on average, have higher family income, education levels, and net assets than the latter subgroup, which contribute to a higher overall probability of investing in WMPs.

$UnpaidMtgBlnc_{jct}$ is insignificant. Based on column 3 of Table 9, for households who did not purchase a house and thus made no down payments in the recent one year, being in mortgage debt can crowd out RMB 40K from a household's latent WMP investment demand.

Comparing Tables 8 and 9, one may find that the down payment effect is larger in magnitude than the unpaid mortgage effect in reducing households' WMP investment demand. However, the down payment effect is only in the short run because a down payment can only affect a household's WMP investment decision within the following one year (see Table 7). In contrast, the unpaid mortgage effect can persist in the long run because a house purchase can put a household in mortgage debt for many years and repaying the mortgage over time will not increase the WMP investment demand as long as the mortgage has not been completely paid off (see the insignificant result on $UnpaidMtgBlnc_{jct}$ in columns 2 and 4 of Table 9). Therefore, a housing boom may crowd out not only households' current investment in other assets but also their future investment in other assets.

In the three waves of the CHFS (2013, 2015, and 2017), some of the respondents were resurveyed and thus appeared multiple times.[23] Exploiting the panel structure of those respondents, we estimate linear probability models with household fixed effects for the regressions in which the dependent variable is whether the household currently invests in WMPs; we also run OLS regressions with household fixed effects in which the dependent variable is the monetary amount of the WMPs currently held by the household.[24] Because we have a short panel, the key regressors lack variation within a household, which makes us tend to underestimate the coefficients or obtain insignificant coefficients. However, we still obtain significant coefficients for some of the key regressors. The results are reported in Appendix A. Tables A.7, A.8, and A.9 are the analogs to Tables 7, 8, and 9, respectively.

[23] The proportions of respondents surveyed once, twice, and three times in the three waves of the CHFS (2013, 2015, and 2017) are 44.12%, 26.26%, and 29.62%, respectively.

[24] Because there are more than 20,000 household fixed effects, we cannot estimate the probit or tobit models.

6.4. Crowding-out effect on other assets

Other than real estate assets and deposits, WMPs are the second largest type of investment for households in China, next to stocks. While this study focuses on WMPs, we also examine the crowding-out effect of housing purchases on households' deposits and stock investments. The results are reported in Table A.10 in Appendix A.

We find that a recent house purchase can cause a dramatic drop in households' deposits (including checking account and time deposits) and the deposit level cannot fully recover within the next several years. Consequently, housing booms may reduce banks' deposit funding supply and hence increase the interest rates of loans to firms, although it is difficult to come up with an identification strategy as clean as the one for WMP returns. We also find that a recent house purchase also makes households less likely to invest in the stock market. Consequently, housing booms may increase firms' financing costs in the equity markets.

In the literature, the effect of housing purchases on households' stock investments is mixed. Using the Panel Study of Income Dynamics (PSID) data in the U.S., Yao and Zhang (2005) and Cocco (2005) found that housing purchases have a negative effect on both households' stock market participation and their equity holdings. Using data in Sweden, Vestman (2019) found that while housing purchases reduce stock holdings conditional on participating, it increases households' stock-market participation.

However, even if housing purchases can increase households' investments in stocks, housing booms can still elevate the overall financing costs of the real economy. The reason is that holding households' savings constant, their housing investments definitely crowd out their non-housing investments. Within non-housing investments, if investments on risky assets (such as stocks) increase, investments on less risky or riskless assets (such as deposits and WMPs) will decrease further. The required returns on less risky or riskless assets are generally lower than those on risky assets. Therefore, even if housing booms might motivate households to partially substitute risky assets for less risky or riskless assets due to portfolio adjustments, households' total investments in non-housing assets will be reduced and their average required returns on

non-housing assets will increase, which could elevate the overall financing costs of the real economy.

7. Implication on the impact to the real economy

7.1. A potential channel

As mentioned in Section 1, the literature has documented three channels through which house prices affect investments in the real economy: the collateral channel, speculation channel, and crowding-out channel. The collateral channel refers to the fact that increased property values make firms with real estate assets have a higher value of collaterals to borrow more and then invest more. The speculation channel refers to the fact that housing booms provoke firms to invest more in real estate assets and less in production and innovation activities. The crowding-out channel refers to the fact that housing booms motivate banks to lend more to real-estate-sector firms and hence less to non-real-estate-sector firms and cause banks to originate more mortgage loans and hence fewer commercial loans.

The results of our study imply the existence of a potential fourth channel through which house price growth affects investments in the real economy: a higher house appreciation rate can motivate individual investors to invest more money in the housing market and hence allocate less money to or require a higher return on non-real-estate investments. Consequently, financial institutions will face a higher financing cost, which could potentially pass through to the financing costs of firms and impact the investment level in the real economy.

While the previous three channels in the literature are driven directly by the decisions of firms or banks, the potential fourth channel implied by the results of this paper is driven by individual investors' decisions and then is passed on to banks and then potentially impact firms.

7.2. Existing theories and evidence

We do not observe at what interest rates the funds raised through WMPs are lent by banks to the real economy. Therefore, we cannot provide direct evidence on the impact of the elevation of

WMP returns by housing booms on the financing costs of firms.

However, textbook microeconomic theories tell that an increase in costs will pass through to prices to certain extent, as long as the demand of the final product is not infinitely elastic. Multiple empirical studies have provided evidence on the cost pass-through in the financial system. Scharfstein and Sunderam (2016) found that mortgage-backed security yields can pass through to mortgage interest rates. Agarwal, Chomsisengphet, Mahoney, and Stroebel (2017) found that banks' funding costs can reduce their marginal propensity to lend. Kahn, Pennacchi and Sopranzetti (2005), Kleimeier and Sander (2006), Mester and Saunders (1995), Van Leuvensteijn, Sørensen, Bikker, and van Rixtel (2013), and Hristov, Hülsewig and Wollmershäuser (2014) found that banks' financing costs can pass through to their lending interest rates.

Moreover, because WMPs, bonds, and stocks are all investment tools for households, given that the required returns on WMPs can be elevated by housing booms, it is natural to suspect that the required returns on bonds and stocks can also be elevated by housing booms (although it is challenging to find an appropriate empirical setting to provide causal identification). The elevation of required returns on bonds and stocks by housing booms is the direct impact of housing booms on firms' financing costs that does not go through financial institutions. The literature has well documented the comovements among investment tools such as stocks, bonds, and money market products (e.g., Campbell and Ammer (1993), Baele, Bekaert and Inghelbrecht (2010), Bernanke and Kuttner (2005), and Patelis (1997)).

7.3. Suggestive evidence on the effect of banks financing costs on their lending rates

Although we cannot provide direct evidence that the elevation of WMP returns by housing booms can pass through to the financing costs of firms, we find some suggestive evidence that the financing costs of banks can elevate their lending interest rates.

First, we run bank-level regressions of average loan-deposit interest spreads on average deposit rates. As shown in Table A.11 in Appendix A, the coefficient of average deposit rates is

much higher than -1. This indicates that if deposit rates increase, banks' average lending rates will also increase. Second, we examine the loans borrowed by publicly listed firms and find that the loan rates are positively correlated with the average deposit rates of the lending banks.[25]

7.4. Higher lending rates or more high-risk investments

One may argue that when the financing costs of banks increase, banks may conduct more high-risk investments to obtain higher interest revenue, rather than increase interest rates of the assets with the same risk level.

While this alternative channel is possible, our results are not entirely driven by it. We restrict the sample to the WMPs of which the underlying assets are money market products and obtain similar results. Unlike equities, bonds, and loans, there is not much heterogeneity in terms of risk within the category of money market product; and we control for SHIBOR (the money market rates).

Moreover, banks cannot freely increase the risk of their investments because they need to meet regulatory standards and their own risk-control requirements. First, for higher-risk loans, banks need to set aside a higher proportion of provision for loan losses, which takes up more funds.[26] Second, higher-risk loans are more likely to default and incur losses. Therefore, investing in higher-risk loans does not necessarily increase returns on assets (ROA).

Even if banks conduct more high-risk investments after their financing costs increase due to housing booms, this is another effect caused by housing booms on the real economy. It may distort resource allocation across sectors and projects with different risk levels.

7.5. Crowding out real estate investments by firms?

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[25] The loan-level data for publicly listed firms are extracted from CSMAR. Note that for many loans in the data, the interest rate is missing. Therefore, we are reluctant to make too much out of it.

[26] Based on the Guidelines of Risk-based Classification of Loans and the Guidance on Provisioning for Loan Losses promulgated by the central bank, commercial banks need to classify their loans into 5 categories based on the loan risk levels; for categories 1 through 5, banks need to set aside 1%, 2%, 25%, 50%, and 100% provisions for loan losses, respectively.

One may argue that a fraction of funds raised by banks through WMPs is lent to firms and firms may invest part of them in the real estate market; therefore, although housing booms crowd out households' investments in WMPs, the reduced WMPs funds lent to firms can also cause reduction of firm investments in the real estate market and hence curb potential misallocation of resources. However, suppose that a firm has a fund amount I to invest and will invest a fixed proportion θ in the real estate market and a fixed proportion $1-\theta$ in production and R&D. If housing booms crowd out households' investments in WMPs, the firm's funds I will decrease; although its investment in the real estate market (θI) will decrease, its investment in production and R&D ($(1-\theta)I$) will also decrease, which is a negative impact on the real economy. Moreover, the high house price appreciations can also increase the fraction of the firm's investment in the real estate market (θ), which further reduces its investment in production and R&D (see Chen, Liu, Xiong and Zhou (2017)).

8. Conclusion

As many economies have been dramatically driven by their housing market performance, understanding the effects of housing market performance on the economy is important. Previous studies have examined the effects of housing booms on several aspects of the economy, especially on the investments of firms and financial institutions (including the collateral, speculation, and crowding-out channels). However, few studies have examined the effect of house price growth on the financing costs of financial institutions or firms.

In this paper, we provide empirical evidence on the effect of house price growth on the financing costs of financial institutions. If real estate assets exhibit higher appreciation rates, households will expect greater future house price appreciations and thus invest more of their savings into the housing market and invest less in or require a higher return on other investment opportunities (e.g., deposits, bonds, and stocks), which will increase the financing costs of

financial institutions and firms. The increase of financing costs could potentially reduce the investment level of firms and hence impact the real economy.

One challenge to identify the effect of housing market performance on the financing costs in the economy is that although housing markets are local, the markets of other investment tools are usually national: the returns of bonds and stocks are determined by all the investors in the country; the deposit rates in China are strictly regulated by the central bank. Consequently, there could be a spurious correlation between the national trend of housing markets and the returns of deposits, bonds, and stocks, but this is far from sufficient to make a causal inference. It is possible that a third macroeconomic factor (e.g., monetary policy) both affects the national trend of the housing markets and the returns of deposits, bonds, and stocks and generates this spurious correlation.

In this paper, we employ WMPs, the largest component of China's shadow-banking sector, and examine how housing market performance affects the expected returns offered by banks for their WMPs. Unlike bonds and stocks, many WMPs have a local market, i.e., they are sold exclusively to one certain city or several cities. Therefore, our identification strategy is that we employ the cross-location and over-time variations both in housing market performance and in expected returns offered by banks on their WMPs to identify the effect of housing market performance on the financing costs of financial institutions.

One concern is that the money raised from WMPs sold in a city may be more likely to be invested in local assets, such as the equities and bonds of local firms, loans to local firms, local government bonds, and local real estate markets. The performance of local assets could be positively correlated with local house prices because cities with better economic conditions may perform better in both the local housing markets and other local assets. Therefore, the investment targets of WMPs sold in a city with a housing boom are more likely to have a higher return and thus banks are inclined to set a higher expected return for those WMPs due to the competition among banks for customers in the local WMP market. To resolve this concern, we restrict the sample to the WMPs of which the investment targets only include assets traded in national or

international markets (money market products, foreign currencies, and commodities such as gold) and do not include local assets. The returns of these assets are determined by national or even international economic conditions instead of local economic conditions.

The results from WMP-level analyses indicate that one standard deviation increase in local house price growth rates (0.0974) will cause a 37 basis-point increase in the expected returns offered by banks for WMPs issued locally, which is a considerable magnitude compared to the standard deviation of all the WMPs' expected returns (107 basis points).

To examine the microeconomic mechanism through which housing markets affect the financing costs of financial institutions, we further conduct household-level analyses using the CHFS data and provide evidence that housing purchases can crowd out households' WMP investments. We find that a down payment can reduce a household's probability of WMP investment within the following one year. We also find that households who currently have mortgage debts are less likely to invest in WMPs than other households regardless of the current unpaid mortgage balance. Consequently, facing a lower funding supply from the household sector, financial institutions have to offer more promising returns to raise funds.

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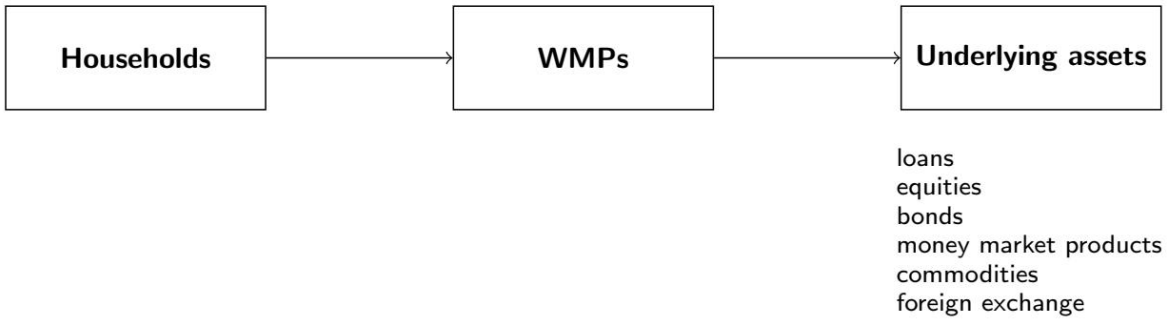
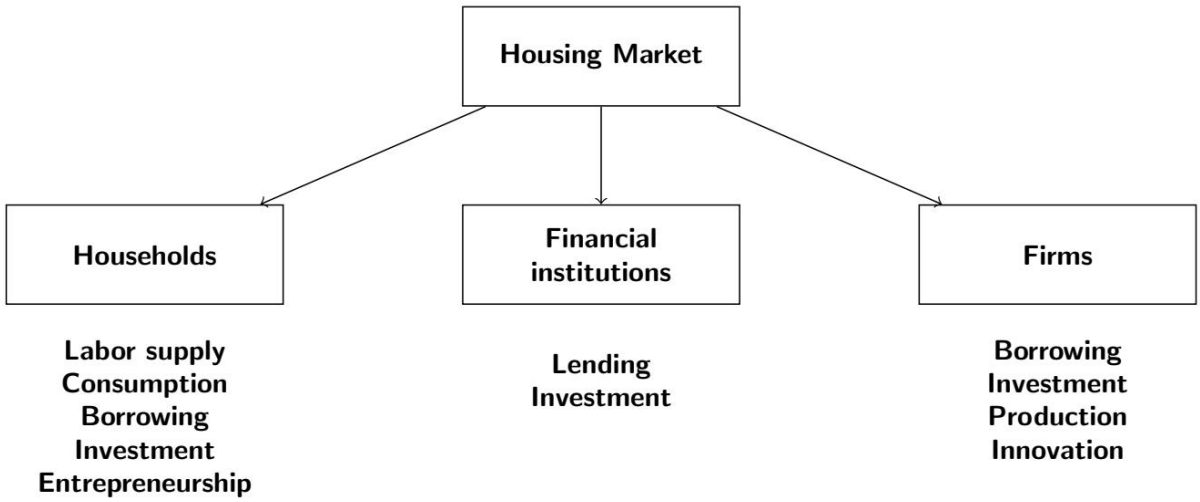


Figure 1. Investment cash flows for WMPs

Panel A. Literature on the effects of housing market on the economy



Panel B. Our study

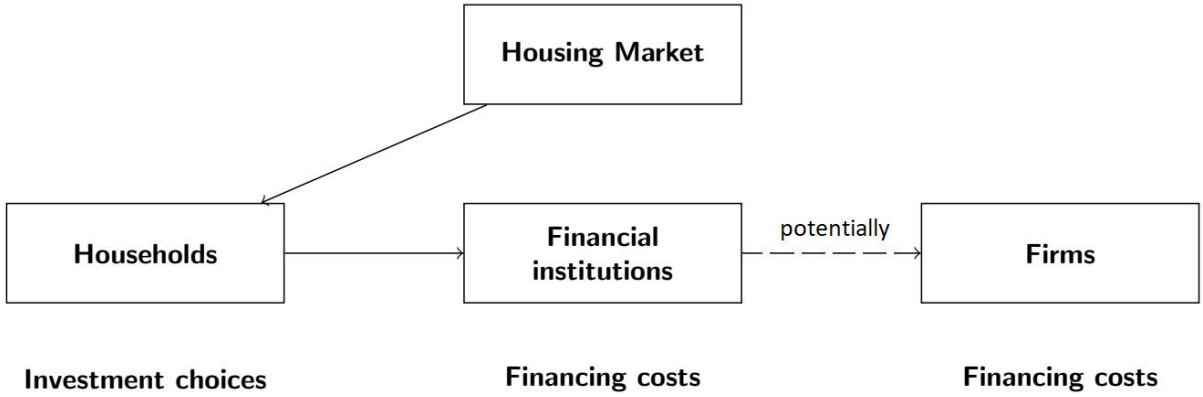


Figure 2. Connection and comparison between literature and our study

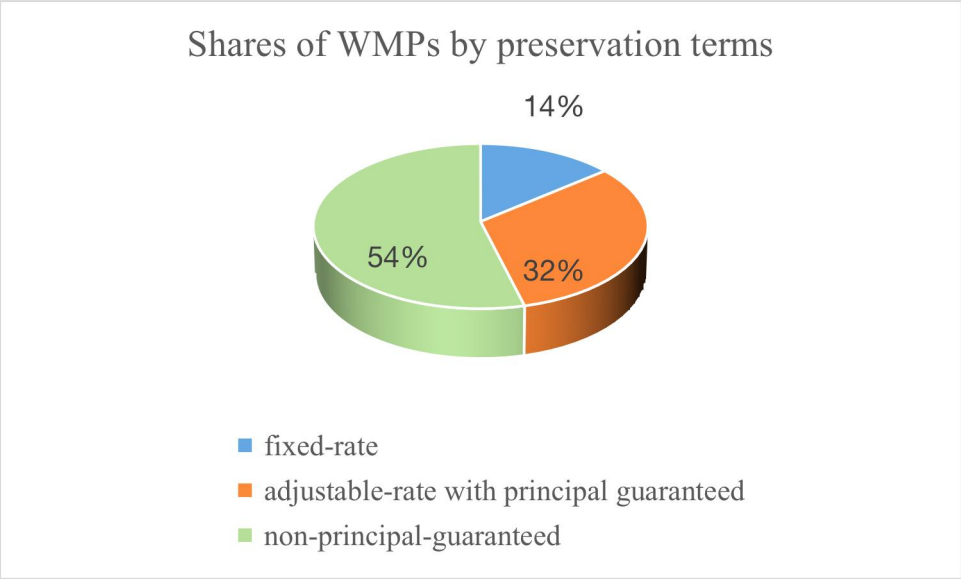


Figure 3. Shares of WMPs by preservation terms

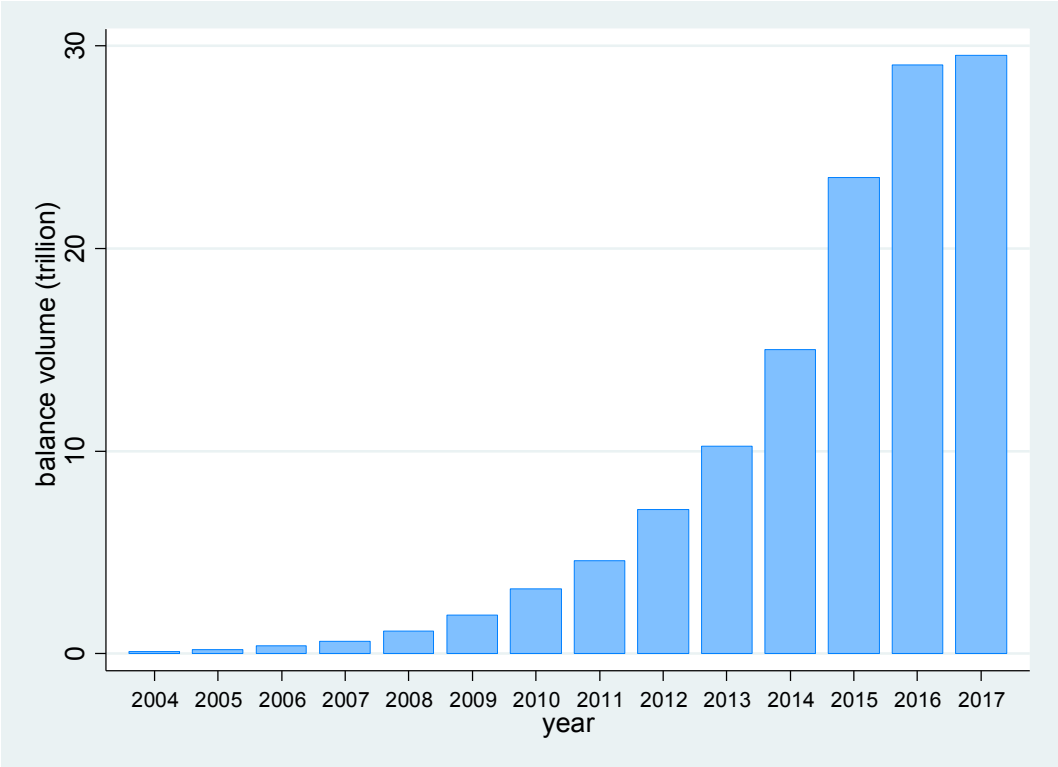


Figure 4. Outstanding balance of WMPs

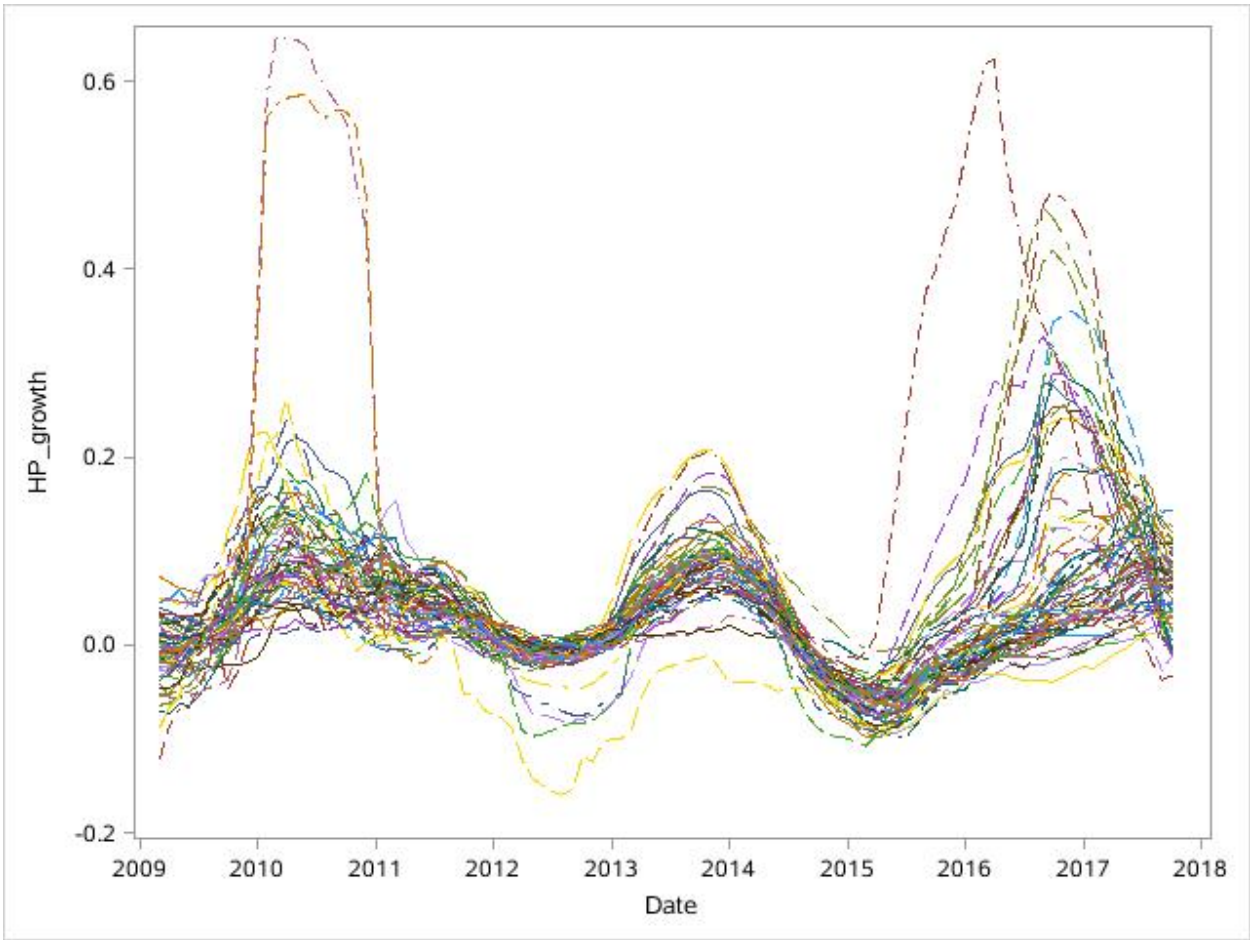


Figure 5. House price growth rates in the top 70 cities. Notes: Each line represents the monthly year-on-year growth rates of residential house prices in a top-70 city in China. The data source is the National Bureau of Statistics. 0.2 indicates 20%.

Table 1. Average expected returns on WMPs

Year	3-month time deposit rate	Expected return of WMP with maturity between 87-93 days			
		State-owned banks	Joint-stock banks	City commercial banks	Overall
2004	1.71	2.23	4.08	---	3.34
2005	1.71	3.26	2.98	3.34	3.09
2006	1.74	4.04	4.15	4.58	4.23
2007	2.31	4.29	4.21	4.14	4.22
2008	3.15	4.48	4.39	4.17	4.36
2009	1.71	1.85	2.18	1.80	1.98
2010	1.76	2.42	2.50	2.35	2.43
2011	2.87	3.73	4.20	4.38	4.06
2012	2.84	3.63	4.30	4.71	4.22
2013	2.60	4.33	4.63	4.89	4.64
2014	2.57	5.02	5.36	5.38	5.28
2015	1.72	4.63	4.84	5.09	4.92
2016	1.10	3.67	3.94	4.05	3.94

Table 2. Locally issued WMPs

	Number of products	Proportion
Products sold in 1 city	33924	0.096479
Products sold in <= 2 cities	39381	0.111998
Products sold in <= 3 cities	43746	0.124412
Products sold in <= 4 cities	49542	0.140896
Products sold in <= 5 cities	56718	0.161304
Products sold in 1 province	51416	0.146226
Products sold in <=10 cities	95334	0.271127
All products	351,621	1
Products sold in all the cities with the issuing banks' branches (nationwide)	279,488	0.794856

Table 3. Variable Definition and Descriptive Statistics

Variable	Definition	Mean	Standard deviation
	Key dependent variable		
WMP interest rate		0.0466	0.0107
	WMP characteristics		
Trust	=1 if issued jointly with a trust; =0 otherwise	0.5109	0.4999
Structure	=1 if with derivative designs in the contract; =0 otherwise;	0.0110	0.1043
Term to maturity (days)		115.2368	99.1212
Principal coverage (%)		34.9167	47.8559
Min investment requirement	Minimum purchase amount (RMB)	3022950	2.79×10^7
Underlying asset categories:			
Loans	=1 if the underlying assets are loans; =0 otherwise	0.0799	0.2712
Equities	=1 if the underlying assets are equities; =0 otherwise	0.0304	0.1718
Bonds	=1 if the underlying assets are commercial or local gov bonds; =0 otherwise	0.5105	0.4999
Money market products	=1 if the underlying assets are money market products; =0 otherwise	0.1746	0.3796
Commodities & foreign exchange	=1 if the underlying assets are commodities (e.g., gold) or foreign exchanges	0.0003	0.0174
Other underlying assets	=1 if other underlying assets	0.0125	0.1110
Unknown	=1 if the type of underlying assets is unknown	0.1708	0.3764
	Key independent variable		
HP growth	City-level year-on-year house price appreciation rates	0.0490	0.0974
	Competitiveness of local WMP markets		
Num of available WMPs	Number of WMPs issued in the city during the month	1,723.9640	913.8171
Num of issuing banks	Number of banks issuing WMPs in the city during the month	23.0225	5.9201
HHI		0.1718	0.1110
	Bank level variables		
Retail funding share	Deposits divided by the sum of deposits and wholesale capital market	0.8241	0.2800

	funding		
	Macroeconomic variables		
City-level			
GDP growth (%)		9.4402	2.6229
WMP premium	Mean of expected returns for WMPs in a city-month after adjusting for risk	0.0002	0.01198
National-level			
SHIBOR	Shanghai Interbank Offered Rate matched by term to maturity	0.0398	0.0130
RRR	Required reserve ratio (%)	18.60	1.70
M2 growth	Broad money growth	0.1530	0.0461
SHSCI growth	Shanghai Security Composite Index growth	0.0090	0.0771
SZSCI growth	Shenzhen Security Composite Index growth	0.0159	0.0943
	Household-level variables from CHFS		
investWMPs	=1 if currently hold WMPs; =0 if not	0.0536	0.2253
WMPs value (RMB10K)	Value of WMPs currently held; =0 if the household does not invest in WMPs	0.9706	7.6041
HousePurchase1	=1 if the respondent purchased a house in the recent one years; =0 if not	0.0472	0.2121
HousePurchase2	=1 if the respondent purchased a house two years ago; =0 if not	0.0292	0.1682
HousePurchase3	=1 if the respondent purchased a house three years ago; =0 if not	0.0253	0.1572
HousePurchase4	=1 if the respondent purchased a house four years ago; =0 if not	0.0284	0.1612
HousePurchase5	=1 if the respondent purchased a house five years ago; =0 if not	0.0310	0.1732
Homeowner	=1 if homeowner; =0 if renter	0.9096	0.2868
Num of houses owned	Number of houses currently owned by the respondent	1.1372	7.6040
Mortgage	=1 if the respondent currently has mortgage debt; =0 if not	0.1430	0.3501
UnpaidMtgBlnc (RMB 10K)	Unpaid mortgage balance	1.0891	6.5942
Income	Family income	77791.7	179166
Household size	Number of family members	3.3962	1.6358
Edu	1 for no education; 2 for elementary school; 3 for junior high;…9 for PhD	3.4359	1.6899
Age	Age of household head	54.4926	14.4147
Male	1 for male; 0 for female	0.7701	0.4208
Marry	=1 if married; =0 if not	0.8554	0.3517

Net assets		959281	1966291
risk_attitude_1	=1 if the risk aversion score is 1; =0 otherwise. Lower score means less risk averse	0.0395	0.1948
risk_attitude_2	=1 if the risk aversion score is 2; =0 otherwise	0.0354	0.1850
risk_attitude_4	=1 if the risk aversion score is 4; =0 otherwise	0.1220	0.3273
risk_attitude_5	=1 if the risk aversion score is 5; =0 otherwise	0.3451	0.4754

The descriptive statistics of product-level variables in this table are for the sample of all the single-city WMPs. The descriptive statistics for all the WMPs and for single-city WMPs with national underlying assets are reported in Table A.1 in Appendix A.

Table 4. Effect of house price growth rates on WMP returns offered by issuing banks

	Column 1	**Column 2**
	All Single-city WMPs	Single-city WMPs with a national market for the investment target
HP growth	**0.0097*** **	**0.0380*** **
	(0.0019)	**(0.0078)**
Num of available WMPs (1000)	0.0001	0.0021***
	(0.0002)	(0.0007)
Num of issuing banks	0.0003***	0.0003
	(0.0001)	(0.0005)
HHI	-0.0001	0.0031
	(0.0013)	(0.0038)
GDP growth	-0.0002***	-0.0001
	(0.0001)	(0.0002)
SHIBOR	0.2286***	0.3080***
	(0.0221)	(0.0420)
Required reserve ratio	0.0026***	0.0047***
	(0.0002)	(0.0008)
M2 growth	0.0176**	-0.0543***
	(0.0086)	(0.0136)
SHSCI growth	-0.0012	-0.0008
	(0.0017)	(0.0087)
SZSCI growth	-0.0005	0.0017
	(0.0012)	(0.0061)
Term to maturity	0.00001***	0.00002***
	(0.00000)	(0.00000)
Principal coverage	-0.00006***	0.00002
	(0.00000)	(0.00002)
Min investment requirement	0.0001	0.0001
	(0.0001)	(0.0001)
Trust	0.0001	-0.0016***
	(0.0006)	(0.0005)
Structure	-0.0017**	-0.0407***
	(0.0007)	(0.0107)
Underlying asset categories:		
Loans	-0.0007	
	(0.0011)	
Equities	-0.0023**	
	(0.0011)	
Bonds	-0.0040***	

	(0.0012)	
Money market products	-0.0048***	-0.0476***
	(0.0010)	(0.0092)
Commodities and foreign exchange	0.0205**	
	(0.0094)	
Other underlying assets	-0.0041***	
	(0.0015)	
City fixed effects	✓	✓
Bank-year fixed effects	✓	✓
R^2	0.86	0.83
N	12,071	1,150

The dependent variable is the WMP expected return offered by the issuing bank at issuance. The sample period is from 2007 to 2016. In column 1, the sample includes all the single-city WMPs that can be matched with the city-level house price growth rates among the top-70 cities. The sample involves 58 cities and 101 issuing banks (5 State-owned banks, 12 joint-stock banks, 72 city commercial banks, and 12 rural commercial banks). The six dummy variables that indicate the underlying asset categories are mutually exclusive, with the "Unknown" category omitted. In column 2, the sample includes the single-city WMPs with a national market for the investment target (money market products, commodities and foreign exchanges). The sample involves 32 cities and 20 issuing banks (5 State-owned banks, 5 joint-stock banks, 8 city commercial banks, and 2 rural commercial banks). The "Commodities and foreign exchanges" category is omitted. Standard errors in parentheses are clustered by city. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table 5. Heterogeneities across banks and cities

	Column 1	Column 2	Column 3
HP growth	-0.1186**	0.0495***	-0.0990*
	(0.0565)	(0.0092)	(0.0570)
HP growth × Retail funding share	**0.1796*** **		**0.1661** **
	(0.0639)		**(0.0636)**
HP growth × HHI		**-0.0708** **	**-0.0482* **
		(0.0334)	**(0.0278)**
Num of available WMPs (1000)	0.0021***	0.0021***	0.0021***
	(0.0007)	(0.0007)	(0.0007)
Num of issuing banks	0.0003	0.0004	0.0004
	(0.0004)	(0.0005)	(0.0004)
HHI	0.0040	0.0036	0.0043
	(0.0029)	(0.0037)	(0.0029)
GDP growth	0.00005	-0.00011	0.00005
	(0.00016)	(0.00015)	(0.00015)
SHIBOR	0.3037***	0.3032***	0.3007***
	(0.0410)	(0.0421)	(0.0410)
Required reserve ratio	0.0048***	0.0048***	0.0049***
	(0.0007)	(0.0007)	(0.0007)
M2 growth	-0.0533***	-0.0505***	-0.0508***
	(0.0136)	(0.0135)	(0.0134)
SHSCI growth	-0.0005	-0.0006	-0.0004
	(0.0084)	(0.0087)	(0.0084)
SZSCI growth	0.0017	0.0019	0.0018
	(0.0058)	(0.0062)	(0.0059)
Term to maturity	0.00002***	0.00002***	0.00002***
	(0.00000)	(0.00000)	(0.00000)
Principal coverage	0.00002	0.00002	0.00002
	(0.00002)	(0.00002)	(0.00002)
Min investment requirement	0.0001	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)
Trust	-0.0013**	-0.0017**	-0.0014**
	(0.0006)	(0.0006)	(0.0006)
Structure	-0.0428***	-0.0412***	-0.0430***
	(0.0098)	(0.0110)	(0.0102)
Money market products	-0.0492***	-0.0483***	-0.0496***
	(0.0084)	(0.0094)	(0.0086)
City fixed effects	✓	✓	✓
Bank-year fixed effects	✓	✓	✓

R^2	0.83	0.83	0.83
N	1,145	1,148	1,148

The sample for this table includes the single-city WMPs with a national market for the investment target (money market products, commodities and foreign exchanges), which is the same as the sample for column 2 of Table 4. The "Commodities and foreign exchanges" category is omitted. The dependent variable is the WMP expected return offered by the issuing bank at issuance. Two interaction terms (HP growth × Retail funding share and HP growth × HHI) are added as independent variables. Retail funding share is deposits divided by the sum of deposits and wholesale capital market funding. Standard errors in parentheses are clustered by city. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table 6. Relation between housing sales growth and house price growth

	Column 1	Column 2	Column 3	Column 4	Column 5
HP growth	**2.2221*** **	**1.1509*** **	**1.3266*** **	**0.6785*** **	**1.2156*** **
	(0.2619)	(0.1265)	(0.1148)	(0.1309)	(0.1169)
GDP growth			-6.5891***		-6.3656***
			(0.3361)		(0.3410)
Population growth				0.0312***	0.0190***
				(0.0038)	(0.0036)
City fixed effects		✓	✓	✓	✓

Notes: The dependent variable is the city-level monthly housing sales. Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table 7. Household-level probit regressions using the CHFS data

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
House purchase in recent 1 year		**-0.1127*** **	**-0.1149*** **	**-0.1141*** **	**-0.1170*** **	**-0.1177*** **
		(0.0422)	**(0.0422)**	**(0.0423)**	**(0.0423)**	**(0.0424)**
House purchase 2 years ago			**-0.0488**	**-0.0481**	**-0.0504**	**-0.0508**
			(0.0490)	**(0.0490)**	**(0.0491)**	**(0.0491)**
House purchase 3 years ago				**0.0235**	**0.0212**	**0.0207**
				(0.0560)	**(0.0560)**	**(0.0560)**
House purchase 4 years ago					**-0.0876**	**-0.0883**
					(0.0565)	**(0.0566)**
House purchase 5 years ago						**-0.0199**
						(0.0533)
Homeowner	**-0.5324*** **	**-0.5327*** **	**-0.5322*** **	**-0.5325*** **	**-0.6318*** **	**-0.5316*** **
	(0.0444)	**(0.0435)**	**(0.0434)**	**(0.0434)**	**(0.0434)**	**(0.0433)**
Num of houses owned	-0.0073	-0.0033	-0.0026	-0.0028	-0.0021	-0.0020
	(0.0115)	(0.0057)	(0.0047)	(0.0049)	(0.0038)	(0.0035)
Log income	0.0840***	0.0851***	0.0852***	0.0852***	0.0853***	0.0853***
	(0.0104)	(0.0105)	(0.0105)	(0.0105)	(0.0105)	(0.0105)
Household size	-0.0683***	-0.0684***	-0.0684***	-0.0684***	-0.0683***	-0.0683***
	(0.0081)	(0.0081)	(0.0081)	(0.0081)	(0.0081	(0.0081)
Education	0.1132***	0.1131***	0.1132***	0.1132***	0.1133***	0.1133***
	(0.0063)	(0.0063)	(0.0063)	(0.0063)	(0.0063)	(0.0063)
Age	0.0078***	0.0076***	0.0075***	0.0076***	0.0075***	0.0075***
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Male	-0.0994***	-0.0996***	-0.0996***	-0.0997***	-0.0995***	-0.0995***
	(0.0222)	(0.0222)	(0.0222)	(0.0222)	(0.0222)	(0.0222)
Married	0.1784***	0.1761***	0.1758***	0.1758***	0.1760***	0.1760***
	(0.0326)	(0.0326)	(0.0326)	(0.0326)	(0.0326)	(0.0326)
risk_attitude_1	-0.1377**	-0.1388**	-0.1387**	-0.1388**	-0.1393**	-0.1393**
	(0.0554)	(0.0553)	(0.0553)	(0.0553)	(0.0553)	(0.0553)
risk_attitude_2	0.1422***	.1421***	0.1423***	0.1422***	0.1413***	0.1411***
	(0.0422)	(0.0422)	(0.0422)	(0.0422)	(0.0422)	(0.0422)
risk_attitude_4	0.1678***	0.1682***	0.1682***	0.1682***	0.1681***	0.1680***
	0.0281)	(0.0281)	(0.0281)	(0.0281)	(0.0281)	(0.0281)
risk_attitude_5	-0.2704***	-0.2702***	-0.2702***	-0.2702***	-0.2701***	-0.2702***
	(0.0283)	(0.0283)	(0.0283)	(0.0283)	(0.0283)	(0.0283)
Log net assets	0.3601***	0.3617***	0.3623***	0.3621***	0.3630***	0.3632***
	(0.0110)	(0.0108)	(0.0108)	(0.0108)	(0.0108)	(0.0108)
WMP premium	-1.0827	-1.0405	-1.0140	-1.0180	-1.0265	-1.0305
	(2.6193)	(2.6193)	(2.6194)	(2.6196)	(2.6200)	(2.6204)
HHI	-0.5995*	-0.5980*	-0.5980*	-0.5968*	-0.5963*	-0.5973*
	(0.3341)	(0.3338)	(0.3340)	(0.3340)	(0.3341)	(0.3341)
Num of available WMPs (1000)	-0.0793	-0.0816	-0.0814	-0.0812	-0.0813	-0.0814

	(0.0698)	(0.0699)	(0.0699)	(0.0699)	(0.0699)	(0.0699)
Num of issuing banks	-0.0025	-0.0028	-0.0028	-0.0027	-0.0031	-0.0031
	(0.0201)	(0.0201)	(0.0201)	(0.0201)	(0.0201)	(0.0201)
Log per capita GDP	-0.2943	-0.2925	-0.2915	-0.2916	-0.2943	-0.2946
	(0.1974)	(0.1974)	(0.1974)	(0.1974)	(0.1973)	(0.1973)
City fixed effects	✓	✓	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	✓	✓
N	66025	66025	66025	66025	66025	66025
Pseudo R^2	0.2446	0.2449	0.2449	0.2449	0.2450	0.2450

Notes: The dependent variable equals 1 if the household currently holds WMPs; and equals 0 if not. Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table 8. Household-level probit and tobit regressions using the CHFS data

	Column 1: probit		Column 2:
	Coefficient	Marginal effect	Coefficient
House purchase in recent 1 year	**-0.1127*** **	**-0.0093*** **	**-5.3544*** **
	(0.0422)	**(0.0035)**	**(1.6178)**
Homeowner	-0.5327***	-0.0439***	-24.2534***
	(0.0435)	(0.0036)	(1.7351)
Num of houses owned	-0.0033	-0.0003	-0.6129
	(0.0057)	(0.0050)	(0.5337)
Log income	0.0851***	0.0070***	3.9287***
	(0.0105)	(0.0009)	(0.3326)
Household size	-0.0684***	-0.0056***	-2.9350***
	(0.0081)	(0.0007)	(0.3369)
Education	0.1131***	0.0093***	4.0417***
	(0.0063)	(0.0005)	(0.2433)
Age	0.0076***	0.0006***	0.3554***
	(0.0007)	(0.0001)	(0.0293)
Male	-0.0996***	-0.0082***	-3.0211***
	(0.0222)	(0.0018)	(0.8561)
Married	0.1761***	0.0145***	7.3649***
	(0.0326)	(0.0027)	(1.2710)
risk_attitude_1	-0.1388**	-0.0114**	-7.1743***
	(0.0553)	(0.0046)	(2.1256)
risk_attitude_2	.1421***	0.0117***	2.2992
	(0.0422)	(0.0035)	(1.5718)
risk_attitude_4	0.1682***	0.0139***	6.4004***
	(0.0281)	(0.0023)	(1.0947)
risk_attitude_5	-0.2702***	-0.0223***	-9.8703***
	(0.0283)	(0.0023)	(1.0827)
Log net assets	0.3617***	0.0298***	16.5301***
	(0.0108)	(0.0009)	(0.4962)
WMP premium	-1.0405	-0.0857	-32.1636
	(2.6193)	(0.2158)	(99.9683)
HHI	-0.5980*	-0.0493*	-34.9534***
	(0.3338)	(0.0275)	(11.9653)
Num of available WMPs (1000)	-0.0816	-0.0067	-0.7242
	(0.0699)	(0.0058)	(2.4637)
Num of issuing banks	-0.0028	-0.0002	-0.3530
	(0.0201)	(0.0017)	(0.7239)
Log per capita GDP	-0.2925	-0.0241	-14.9625**
	(0.1974)	(0.0163)	(7.4287)
City fixed effects	✓	✓	✓
Year fixed effects	✓	✓	✓
N	66025	66025	71505
Pseudo R^2	0.2449		0.1585

Notes: Column 1 is a probit regression of whether the household invests in WMPs. The dependent variable equals 1 if the household currently holds WMPs; and equals 0

if not. If the regressor is a continuous variable, the marginal effect is computed by scaling the probability density evaluated at the sample mean. If the regressor is a dummy variable, the marginal effect is computed as the difference in the fitted probability with the dummy variable equal to one, then zero. Column 2 is a tobit regression of how much the household invests in WMPs. The dependent variable equals the value of the WMP assets that the household currently holds if they invest in WMPs; and equals 0 if the household currently does not invest in WMPs. Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

	Column 1: probit		Column 2: probit		Column 3:tobit	Column 4: tobit
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Coefficient
With mortgage debt	**-0.0782****	**-0.0063****	**-0.1108*****	**-0.0090*****	**-3.9466*****	**-7.8302*****
	(0.0321)	**(0.0026)**	**(0.0419)**	**(0.0034)**	**(1.1945)**	**(1.5633)**
Unpaid mortgage balance			**-0.0004**	**0.0000**		**0.0574**
			(0.0013)	**(0.0001)**		**(0.0388)**
Log income	0.0969***	0.0079***	0.1035***	0.0084***	4.5482***	5.1252***
	(0.0118)	(0.0010)	(0.0124)	(0.0010)	(0.3546)	(0.3775)
Household size	-0.0741***	-0.0060***	-0.0743***	-0.0060***	-3.1196***	-3.2020***
	(0.0084)	(0.0007)	(0.0085)	(0.0007)	(0.3493)	(0.3558)
Education	0.1230***	0.0010***	0.1220***	0.0099***	4.4619***	4.4673***
	(0.0065)	(0.0005)	(0.0066)	(0.0005)	(0.2547)	(0.2591)
Age	0.0062***	0.0005***	0.0060***	0.0005***	0.2964***	0.2850***
	(0.0008)	(0.0001)	(0.0008)	(0.0001)	(0.0305)	(0.0310)
Male	-0.0851***	-0.0069***	-0.0800***	-0.0065***	-2.4189***	-2.3843***
	(0.0230)	(0.0019)	(0.0233)	(0.0019)	(0.8919)	(0.9068)
Married	0.1678***	0.0136***	0.1664***	0.0135***	6.6979***	7.0657***
	(0.0338)	(0.0027)	(0.0342)	(0.0028)	(1.3193)	(1.3447)
risk_attitude_1	-0.1276**	-0.0104**	-0.1342**	-0.0109**	-6.6146***	-6.9107***
	(0.0569)	(0.0046)	(0.0578)	(0.0047)	(2.2021)	(2.2420)
risk_attitude_2	0.1409***	0.0114***	0.1532***	0.0124***	2.1510	2.7150
	(0.0441)	(0.0036)	(0.0445)	(0.0036)	(1.6592)	(1.6915)
risk_attitude_4	0.1738**	0.0141***	0.1806***	0.0147***	6.8018***	7.0880***
	(0.0289)	(0.0023)	(0.0291)	(0.0024)	(1.1328)	(1.1516)
risk_attitude_5	-0.2725***	-0.0221***	-0.2703***	-0.0219***	-9.9587***	-9.8233***
	(0.0289)	(0.0023)	(0.0292)	(0.0024)	(1.1115)	(1.1314)
Log net assets	0.3052**	0.0248***	0.3122***	0.0253***	13.8450***	14.0265***
	(0.0108)	(0.0009)	(0.0111)	(0.0009)	(0.4413)	(0.4559)
WMP premium	-0.9086	-0.0737	-1.2959	-0.1052	-21.8052	-71.4795
	(2.6954)	(0.2187)	(2.7207)	(0.2208)	(104.1735)	(106.9825)
HHI	-0.6927**	-0.0562**	-0.7041**	-0.0572**	-38.2345***	-38.8295***
	(0.3397)	(0.0276)	(0.3414)	(0.0277)	(12.4178)	(12.7496)
Num of available WMPs	-0.0924	-0.0075	-0.0914	-0.0074	-1.2111	-1.8183
(1000)	(0.0718)	(0.0058)	(0.0725)	(0.0059)	(2.5538)	(2.6429)
Num of issuing banks	-0.0048	-0.0004	-0.0053	-0.0004	-0.4987	-0.3181
	(0.0206)	(0.0017)	(0.0208)	(0.0017)	(0.7541)	(0.7825)
Log per capita GDP	-0.3034	-0.0246	-0.3017	-0.0245	-14.6344*	-15.2971*
	(0.2043)	(0.0166)	(0.2058)	(0.0167)	(7.8132)	(8.0285)
City fixed effects	✓	✓	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	✓	✓
N	63228	63228	62067	62067	68562	67309

Table 9. Effect of mortgage debt

Pseudo R^2	0.2436	0.2445	0.1583	0.156

Notes: Columns 1 and 2 are probit regressions of whether the household invests in WMPs. The dependent variable equals 1 if the household currently holds WMPs; and equals 0 if not. If the regressor is a continuous variable, the marginal effect is computed by scaling the probability density evaluated at the sample mean. If the regressor is a dummy variable, the marginal effect is computed as the difference in the fitted probability with the dummy variable equal to one, then zero. Columns 3 and 4 are tobit regressions of how much the household invests in WMPs. The dependent variable equals the value of the WMP assets that the household currently holds if they invest in WMPs; and equals 0 if the household currently does not invest in WMPs. Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Appendix A

Table A.1. Descriptive statistics

	All WMPs		Single-city WMPs with national underlying assets	
Variable	Mean	Standard deviation	Mean	Standard deviation
WMP interest rate	0.0455	0.0096	0.0453	0.0081
Trust	0.3679	0.4822	0.4783	0.4997
Structure	0.0351	0.1841	0.0915	0.2884
Term to maturity (days)	116.4297	97.6178	94.7301	94.9598
Principal coverage (%)	34.5107	47.9727	76.3095	42.5496
Min investment requirement	958018	1.28×10^7	3587498	1.77×10^7
Underlying asset categories:				
Loans	0.0247	0.1553		
Equities	0.0491	0.2161		
Bonds	0.5101	0.4999		
Money market products	0.0749	0.2632	0.9948	0.0719
Commodities & foreign exchange	0.0033	0.0573	0.0052	0.0719
Others	0.0080	0.0890		
Unknown	0.3162	0.4650		

This table reports the descriptive statistics of product-level variables for all the WMPs and for single-city WMPs with national underlying assets, respectively.

Table A.2 Controlling for current national housing market conditions

	Column 1	**Column 2**
	All Single-city WMPs	Single-city WMPs with a national market for the investment target
HP growth	**0.0096*** **	**0.0403*** **
	(0.0018)	**(0.0090)**
Num of available WMPs (1000)	0.0001	0.0022***
	(0.0002)	(0.0007)
Num of issuing banks	0.0003***	0.0002
	(0.0001)	(0.0005)
HHI	0.0000	0.0030
	(0.0012)	(0.0038)
GDP growth	-0.0002***	-0.0001
	(0.0001)	(0.0002)
SHIBOR	0.2279***	0.3074***
	(0.0216)	(0.0419)
Required reserve ratio	0.0026***	0.0048***
	(0.0002)	(0.0008)
M2 growth	0.0166*	-0.0495***
	(0.0088)	(0.0136)
National house price growth	-0.0337	0.1200
	(0.0300)	(0.0833)
SHSCI growth	-0.0010	-0.0008
	(0.0018)	(0.0087)
SZSCI growth	-0.0006	0.0015
	(0.0012)	(0.0061)
Term to maturity	0.00001***	0.00002***
	(0.00000)	(0.00002)
Principal coverage	-0.00006***	0.00002
	(0.00000)	(0.00002)
Min investment requirement	0.0001	0.0001
	(0.0001)	(0.0001)
Trust	0.0001	-0.0016***
	(0.0006)	(0.0006)
Structure	-0.0017**	-0.0400***
	(0.0007)	(0.0105)
Underlying asset categories:		
Loans	-0.0007	
	(0.0011)	
Equities	-0.0023**	
	(0.0011)	
Bonds	-0.0040***	

	(0.0012)	
Money market products	-0.0047***	-0.0467***
	(0.0010)	(0.0089)
Commodities and foreign exchange	0.0205**	
	(0.0094)	
Other underlying assets	-0.0041***	
	(0.0015)	
City fixed effects	✓	✓
Bank-year fixed effects	✓	✓
R^2	0.86	0.83
N	12,071	1,150

The regressions in this table add the current national house price growth (average of the 70 cities' growth) as an additional control variable on top of the regressions in Table 4. The dependent variable is the WMP expected return offered by the issuing bank at issuance. In column 1, the sample includes all the single-city WMPs that can be matched with the city-level house price growth rates among the top-70 cities; the six dummy variables that indicate the underlying asset categories are mutually exclusive, with the "Unknown" category omitted. In column 2, the sample includes the single-city WMPs with a national market for the investment target (money market products, commodities and foreign exchanges); the "Commodities and foreign exchanges" category is omitted. Standard errors in parentheses are clustered by city. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table A.3 Controlling for spillover effects of WMPs with local underlying assets on WMPs with national underlying assets

	Single-city WMPs with a national market for the investment target
HP growth	**0.0270*** **
	(0.0086)
Average return of WMPs with local underlying assets	0.0010*
	(0.0006)
Num of available WMPs (1000)	0.0016**
	(0.0007)
Num of issuing banks	0.0006
	(0.0004)
HHI	0.0033
	(0.0042)
GDP growth	-0.0004
	(0.0002)
SHIBOR	0.3526***
	(0.0593)
Required reserve ratio	0.0040***
	(0.0008)
M2 growth	-0.0556***
	(0.0130)
SHSCI growth	0.0002
	(0.0095)
SZSCI growth	-0.0003
	(0.0069)
Term to maturity	0.00002***
	(0.00000)
Principal coverage	0.00002
	(0.00003)
Min investment requirement	0.00002
	(0.00010)
Trust	-0.0016***
	(0.0006)
Structure	-0.0450***
	(0.0090)
Underlying asset categories:	
Money market products	-0.0525***
	(0.0078)
City fixed effects	✓
Bank-year fixed effects	✓
R^2	0.85
N	940

The regression in this table adds the average return of single-city WMPs with local underlying assets issued in the city during the month as an additional control variable on top of the regression in column 2 of Table 4. The dependent variable is the WMP expected return offered by the issuing bank at issuance. The sample includes the single-city WMPs with a national market for the investment target (money market products, commodities and foreign exchanges); the "Commodities and foreign exchanges" category is omitted. Standard errors in parentheses are clustered by city. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table A.4. House price growth rates and deposits

Dependent variable: Total deposits in the city (100 billion	Column 1	Column 2	Column 3	Column 4
House price growth	-6.6461	-24.0943	-3.8997	-17.2479
	(52.2991)	(22.9545)	(49.3537)	(18.5650)
Intercept	12.4591***			
	(0.2997)			
City fixed effects		✓		✓
Year fixed effects			✓	✓
N	3,796	3,796	3,796	3,796

Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table A.5. Effect of house price growth rates on WMP returns offered by issuing banks after 2013 April

	Column 1	**Column 2**
	All Single-city WMPs	Single-city WMPs with a national market for the investment target
HP growth	**0.0043*** **	**0.0478*** **
	(0.0006)	**(0.0058)**
Controls	✓	✓
R^2	0.80	0.84
N	7,128	844

This table is another version of Table 4 but using only WMPs issued after April 2013 in the regressions. After April 2013, the China Banking Regulatory Commission implemented *Document No. 8 [2013] of the China Banking Regulatory Commission*. The regulatory policy prohibits common underlying asset pools and implicit guarantees for WMPs, requiring that the money repaying for a WMP should come from the WMP's own underlying assets. Standard errors in parentheses are clustered by city. * denotes significance at a 10% level. ** denotes significance at a 5% level.

*** denotes significance at a 1% level.

Table A.6. Subgroup means

Group division	**Homeowner**	**Renter**
Frequency	90.96%	9.04%
Average probability of WMP investment	5.48%	4.12%
Income (RMB)	79799.09	58612.59
Household size	3.48	2.56
Education	3.42	3.60
Age	54.77	52.02
Male	0.78	0.64
Married	0.87	0.68
risk_attitude_1	0.039	0.044
risk_attitude_2	0.035	0.044
risk_attitude_3	0.138	0.159
risk_attitude_4	0.122	0.123
risk_attitude_5	0.344	0.346
Net assets (RMB)	1,040,407	188,672.5

Group division	$\boldsymbol{HousePurchase1_{jct} = 0}$	$\boldsymbol{HousePurchase1_{jct} = 1}$	**Renter**
Frequency	86.24%	4.71%	9.04%
Average probability of WMP investment	5.37%	7.71%	4.12%
Income (RMB)	75516.28	158232.4	58612.59
Household size	3.48	3.57	2.56
Education	3.39	3.98	3.60
Age	55.14	47.97	52.02
Male	0.78	0.78	0.64
Married	0.87	0.86	0.68
risk_attitude_1	0.039	0.043	0.044
risk_attitude_2	0.033	0.060	0.044
risk_attitude_3	0.135	0.181	0.159
risk_attitude_4	0.121	0.129	0.123
risk_attitude_5	0.350	0.242	0.346
Net assets (RMB)	998,395.9	1,809,780	188672.5

Group division	**No mortgage**	**With mortgage**	$\boldsymbol{HousePurchase1_{jct} = 1}$	**Renter**
Frequency	74.22%	12.03%	4.71%	9.04%
Average probability of WMP investment	4.81%	5.26%	7.71%	4.12%
Income (RMB)	70083.06	109,038.4	158232.4	58612.59
Household size	3.46	3.59	3.57	2.56

Education	3.28	4.06	3.98	3.60
Age	55.98	49.93	47.97	52.02
Male	0.78	0.77	0.78	0.64
Married	0.87	0.91	0.86	0.68
risk_attitude_1	0.036	0.052	0.043	0.044
risk_attitude_2	0.029	0.061	0.060	0.044
risk_attitude_3	0.125	0.195	0.181	0.159
risk_attitude_4	0.117	0.150	0.129	0.123
risk_attitude_5	0.348	0.359	0.242	0.346
Net assets (RMB)	940,489	1,355,671	1,809,780	188,672.5

Table A.7. Panel Regression: Linear probability models for whether invest in WMPs

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
House purchase in recent 1 year		**-0.0168*** **	**-0.0177*** **	**-0.0170*** **	**-0.0170*** **	**-0.0168*** **
		(0.0058)	**(0.0059)**	**(0.0059)**	**(0.0059)**	**(0.0059)**
House purchase 2 years ago			**-0.0096**	**-0.0094**	**-0.0095**	**-0.0093**
			(0.0072)	**(0.0072)**	**(0.0073)**	**(0.0073)**
House purchase 3 years ago				**0.0066**	**0.0066**	**0.0074**
				(0.0077)	**(0.0077)**	**(0.0078)**
House purchase 4 years ago					**-0.0007**	**-0.0005**
					(0.0074)	**(0.0074)**
House purchase 5 years ago						**0.0059**
						(0.0070)
Homeowner	-0.0055	-0.0045	-0.0043	-0.0044	-0.0044	-0.0045
	(0.0061)	(0.0061)	(0.0061)	(0.0061)	(0.0061)	(0.0061)
Num of houses owned	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Log income	0.0019***	0.0020***	0.0020***	0.0020***	0.0020***	0.0020***
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Household size	-0.0024**	-0.0024**	-0.0024**	-0.0024**	-0.0024**	-0.0024**
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Education	0.0032*	0.0031*	0.0032*	0.0032*	0.0032*	0.0032*
	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)
Age	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Male	0.0023	0.0023	0.0022	0.0022	0.0022	0.0022
	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)
Married	0.0011	0.0012	0.0012	0.0012	0.0012	0.0011
	(0.0055)	(0.0055)	(0.0055)	(0.0055)	(0.0055)	(0.0055)
risk_attitude_1	-0.0092	-0.0092	-0.0092	-0.0090	-0.0090	-0.0090
	(0.0080)	(0.0080)	(0.0080)	(0.0080)	(0.0080)	(0.0080)
risk_attitude_2	0.0433***	0.0429***	0.0429***	0.0429***	0.0429***	0.0430***
	(0.0083)	(0.0083)	(0.0083)	(0.0083)	(0.0083)	(0.0083)
risk_attitude_4	0.0050	0.0051	0.0051	0.0051	0.0052	0.0052
	(0.0048)	(0.0048)	(0.0049)	(0.0048)	(0.0048)	(0.0048)
risk_attitude_5	-0.0131***	-0.0130***	-0.0129***	-0.0129***	-0.0129***	-0.0130***
	(0.0038)	(0.0038)	(0.0038)	(0.0038)	(0.0038)	(0.0038)
Log net assets	0.0065***	0.0068***	0.0070***	0.0069***	0.0069***	0.0069***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)

WMP premium	-0.0197	-0.0212	-0.0189	-0.0193	-0.0196	-0.0189
	(0.1786)	(0.1786)	(0.1786)	(0.1786)	(0.1786)	(0.1786)
HHI	-0.0353*	-0.0361*	-0.0362*	-0.0361*	-0.0361*	-0.0358*
	(0.0212)	(0.0212)	(0.0212)	(0.0212)	(0.0212)	(0.0212)
Num of available WMPs (1000)	-0.0015	-0.0016	-0.0016	-0.0016	-0.0016	-0.0015
	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0064)
Num of issuing banks	-0.0004	-0.0004	-0.0005	-0.0005	-0.0005	-0.0004
	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)
Log per capita GDP	-0.0211	-0.0207	-0.0206	-0.0207	-0.0207	-0.0207
	(0.0134)	(0.0134)	(0.0134)	(0.0134)	(0.0134)	(0.0134)
Household fixed effects	✓	✓	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	✓	✓
N	54111	54111	54111	54111	54111	54111

Notes: This table is similar to Table 7 but the sample only includes respondents who were surveyed more than once in the three waves of the CHFS, household fixed effects are controlled for, and linear probability models are estimated instead of probit models. The dependent variable equals 1 if the household currently holds WMPs; and equals 0 if not. Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table A.8. Panel Regression: WMP investment amount

	Column 1 Whether invest in WMPs	Column 2 Money invested in WMPs
House purchase in recent 1 year	**-0.0168*****	**-0.6717*****
	(0.0058)	**(0.1990)**
Homeowner	-0.0045	-0.5632***
	(0.0061)	(0.2079)
Num of houses owned	0.0000	-0.0001
	(0.0001)	(0.0041)
Log income	0.0020***	0.0565**
	(0.0007)	(0.0226)
Household size	-0.0024**	-0.0444
	(0.0011)	(0.0381)
Education	0.0031*	0.0891
	(0.0018)	(0.0614)
Age	-0.0002	0.0047
	(0.0002)	(0.0067)
Male	0.0023	0.1644
	(0.0041)	(0.1417)
Married	0.0012	0.1189
	(0.0055)	(0.1869)
risk_attitude_1	-0.0092	-0.5287*
	(0.0080)	(0.2739)
risk_attitude_2	0.0429***	-0.6784**
	(0.0083)	(0.2862)
risk_attitude_4	0.0051	0.0800
	(0.0048)	(0.1637)
risk_attitude_5	-0.0130***	-0.2139*
	(0.0038)	(0.1288)
Log net assets	0.0068***	0.2424***
	(0.0011)	(0.0370)
WMP premium	-0.0212	-2.2228
	(0.1786)	(6.1036)
HHI	-0.0361*	-0.7663
	(0.0212)	(0.7229)
Num of available WMPs (1000)	-0.0016	0.7669***
	(0.0064)	(0.2179)
Num of issuing banks	-0.0004	-0.0768
	(0.0014)	(0.0475)

Log per capita GDP	-0.0207	-0.6671
	(0.0134)	(0.4588)
Household fixed effects	✓	✓
Year fixed effects	✓	✓
N	54111	54009

Notes: This table is similar to Table 8 but the sample only includes respondents who were surveyed more than once in the three waves of the CHFS and household fixed effects are controlled for. Column 1 of this table is the same as column 2 of Table A.7. In column 2 of this table, the dependent variable equals the value of the WMP assets that the household currently holds if they invest in WMPs; it equals 0 if the household currently does not invest in WMPs. The regression is OLS. Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table A.9. Panel Regression: Effect of mortgage debt

	Column 1 Whether invest	Column 2 Whether invest	Column 3 Investment amount	Column 4 Investment amount
With mortgage debt	-0.0001	0.0026	0.1911	-0.4464
	(0.0054)	(0.0084)	(0.1863)	(0.2875)
Unpaid mortgage balance		-0.0001		0.0200*
		(0.0003)		(0.0118)
Log income	0.0019***	0.0018***	0.0541**	0.0561**
	(0.0007)	(0.0007)	(0.0226)	(0.0230)
Household size	-0.0021*	-0.0023**	-0.0499	-0.0600
	(0.0011)	(0.0011)	(0.0383)	(0.0389)
Education	0.0040**	0.0038**	0.0856	0.0852
	(0.0018)	(0.0018)	(0.0624)	(0.0635)
Age	-0.0002	-0.0002	0.0051	0.0040
	(0.0002)	(0.0002)	(0.0068)	(0.0069)
Male	0.0028	0.0032	0.1143	0.1469
	(0.0042)	(0.0043)	(0.1440)	(0.1464)
Married	-0.0029	-0.0024	0.0603	0.0206
	(0.0055)	(0.0056)	(0.1884)	(0.1915)
risk_attitude_1	-0.0107	-0.0116	-0.4342	-0.4936*
	(0.0081)	(0.0082)	(0.2776)	(0.2827)
risk_attitude_2	0.0427***	0.0364***	-0.711**	-0.7769**
	(0.0086)	(0.0088)	(0.2969)	(0.3041)
risk_attitude_4	0.0021	0.0023	0.0002	-0.0161
	(0.0048)	(0.0049)	(0.1662)	(0.1689)
risk_attitude_5	-0.0116***	-0.0123***	-0.1651	-0.1775
	(0.0038)	(0.0038)	(0.1300)	(0.1322)
Log net assets	0.0061***	0.0060***	0.1949***	0.2012***
	(0.0010)	(0.0011)	(0.0349)	(0.0364)
WMP premium	0.0241	0.0169	-1.4287	-1.2208
	(0.1798)	(0.1813)	(6.1583)	(6.2236)
HHI	-0.0317	-0.0257	-0.3505	-0.4517
	(0.0214)	(0.0217)	(0.7347)	(0.7451)
Num of available WMPs (1000)	-0.0001	-0.0001	0.7055	0.7057***
	(0.0064)	(0.0065)	(0.2200)	(0.2249)
Num of issuing banks	-0.0010	-0.0006	-0.0824	-0.0763
	(0.0014)	(0.0014)	(0.0479)	(0.0489)
Log per capita GDP	-0.0315**	-0.0318**	-0.6644	-0.6451
	(0.0135)	(0.0136)	(0.4638)	(0.4680)
Household fixed effects	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓
N	52124	52124	52027	50990

Notes: This table is similar to Table 9 but the sample only includes respondents who were surveyed more than once in the three waves of the CHFS and household fixed effects are controlled for. In columns 1 and

2, the dependent variable equals 1 if the household currently holds WMPs; and equals 0 if not; linear probability models are estimated. In columns 3 and 4, the dependent variable equals the value of the WMP assets that the household currently holds if they invest in WMPs; it equals 0 if the household does not invest in WMPs; the regressions are OLS. Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table A.10. The crowding-out effect of housing purchases on deposits and stock investments

	Deposits		Stock-market participation	
	Pooled probit	Fixed effect	Pooled tobit	Fixed effect
House purchase in recent 1 year	**-3.0480*** **	**-0.2296**	**-0.0679** **	**-0.0036**
	(0.3842)	**(0.2764)**	**(0.0295)**	**(0.0049)**
House purchase 2 years ago	**-2.0772*** **	**-1.1774*** **	**-0.0693***	**-0.0023**
	(0.4775)	**(0.3512)**	**(0.0367)**	**(0.0063)**
House purchase 3 years ago	**-1.4120*** **	**0.0320**	**-0.0681***	**-0.0143** **
	(0.5081)	**(0.3726)**	**(0.0400)**	**(0.0066)**
House purchase 4 years ago	**-0.8715***	**0.0237**	**-0.0541**	**-0.0079**
	(0.4780)	**(0.3513)**	**(0.0382)**	**(0.0063)**
House purchase 5 years ago	**-0.6078**	**0.1446**	**-0.0327**	**0.0041**
	(0.4618)	**(0.3342)**	**(0.0366)**	**(0.0059)**
Homeowner	-9.5228***	-2.6051***	-0.5408***	-0.0167***
	(0.3400)	(0.3012)	(0.0317)	(0.0056)
Num of houses owned	0.0064	-0.0012	0.0003	0.0001
	(0.0098)	(0.0059)	(0.0006)	(0.0001)
Log income	1.6507***	0.2638***	0.0723***	0.0038
	(0.0502)	(0.0322)	(0.0061)	(0.0006)
Household size	-0.8799***	0.0248	-0.0429***	-0.0001
	(0.0611)	(0.0630)	(0.0058)	(0.0012)
Education	0.9302***	-0.0435	0.1692***	0.0057***
	(0.0591)	(0.1060)	(0.0045)	(0.0019)
Age	0.0249***	-0.0175	0.0027***	-0.0002
	(0.0065)	(0.0108)	(0.0005)	(0.0002)
Male	1.6893***	0.1306	-0.0837***	0.0068
	(0.2046)	(0.2442)	(0.0163)	(0.0044)
Married	-0.1157	0.0726	0.2100***	-0.0006
	(0.2579)	(0.2738)	(0.0237)	(0.0051)
risk_1	-0.4591	0.6814**	0.4420***	0.0351***
	(0.4441)	(0.3467)	(0.0303)	(0.0064)
risk_2	1.0581**	0.7089*	0.4519***	0.0492***
	(0.4397)	(0.3678)	(0.0283)	(0.0064)
risk_4	0.6717**	0.1028	-0.0389*	0.0007
	(0.2757)	(0.2183)	(0.0216)	(0.0041)
risk_5	-0.9171***	0.3685**	-0.4004***	-0.0088***
	(0.2181)	(0.1738)	(0.0204)	(0.0034)
Log net assets	4.9289***	1.2761***	0.3186***	0.0104***
	(0.0716)	(0.0568)	(0.0086)	(0.0011)
Log per capita GDP	-1.1598	1.0803*	-0.1871*	-0.0091

	(1.1361)	(0.6188)	(0.1105)	(0.0110)
Household fixed effects	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓
N	97006	73639	82696	64563

In columns 1 and 2, the dependent variable is the household's deposits (including the checking account and time deposits). In column 1, a tobit model is estimated without controlling for household fixed effects; in column 2, an OLS model with household fixed effects is estimated. In columns 3 and 4, the dependent variable equals 1 if the household currently holds stocks; and equals 0 if not. In column 1, a probit model is estimated without controlling for household fixed effects; in column 2, an OLS model with household fixed effects is estimated. Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Table A.11. Bank-level average deposit rates and loan-deposit interest spreads

Dependent variable: Bank-level average loan-deposit interest spread	Column 1	Column 2	Column 3	Column 4
Bank-level average deposit rate	-0.1589***	-0.0572**	-0.1587***	0.0034
	(0.0450)	(0.0226)	(0.0561)	(0.0291)
Intercept	0.0379***			
	(0.0014)			
Bank fixed effects		✓		✓
Year fixed effects			✓	✓
N	1,669	1,669	1,669	1,669

Each observation in the regressions is a bank-year combination. Standard errors are reported in parentheses. * denotes significance at a 10% level. ** denotes significance at a 5% level. *** denotes significance at a 1% level.

Appendix B

A sample document of a WMP provided by the issuing bank

浦发银行——2008年第51期个人专项理财产品票据赢计划1个月　人民币理财产品

基本属性

发行人	浦发银行	币种	人民币
收益类型	保本浮动型	业务模式	信托
投资品种	债券	挂钩标的	-

收益指标

预期年收益率	0%~3.8%	付息方式	到期支付
保本比例	100.00%	封顶收益率	-
实际收益率	3.8000%	实际年化收益率	3.80%

委托期指标

收益起始日	2008-08-15	收益到期日	2008-09-15
委托期	1个月	委托天数	31
剩余委托天数	-	实际收益到期日	2008-09-15
实际委托期（天）	31		

发行指标

发行对象	个人	发行地区	天津,重庆,苏州,合肥,武汉,深圳,哈尔滨
销售起止日期	2008-08-07~2008-08-14	委托起始资金	50000人民币
计划募资金额（亿）	-		

Translation into English

Basic characteristics			
Issuer	Shanghai Pudong Development Bank	**Currency**	RMB
Return type	Floating rate with Principal guarantee	**Business mode**	Trust
Underlying assets	Bonds	**Target**	Pegging
Return			
Expected return	0~3.8%%	**Interest payment mode**	At maturity
Principal guarantee	100.00%	**Return cap**	–
Realized return	3.8000%	**Annualized realized return**	3.8%
Duration			
Effective date	2008-08-15	**Maturity date**	2008-09-15
Term	1 month	**Term in days**	31
Remaining days	–	**Actual maturity date**	2008-09-15
Actual term	1 month		
Issuance			
Buyer type	Individuals	**Issuing areas**	Tianjin, Chongqing, Suzhou, Hefei, Wuhan, Shenzhen, Harbin
Selling period	2008.08.07~2008.08.14	**Minimum investment requirement**	RMB 50,000
Planned selling volume	–		