FinTech as a Financial Liberator*

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Abstract

Interest rate caps on household savings are a common form of financial repression in developing countries and typically benefit banks at the expense of households. Using proprietary data from a leading Chinese FinTech company, we investigate FinTech's role in alleviating financial repression through shadow bank deposit competition. Exploiting geographical heterogeneity in the adoption of a major FinTech money market fund with deposit-like features but no binding interest rate cap, we find greater deposit outflows and lower deposit growth among banks with more FinTech-exposed depositors. Exposed banks respond to FinTech competition by offering similar market-rate deposit substitutes. FinTech thus facilitates bottom-up interest rate liberalization.

Keywords: FinTech, digital payments, fast payments, bank deposits, money market funds, ceiling regulation, financial repression

JEL classification: G21, G23, G28, G51, E42, O16, O23

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1 Introduction

Financial instruments are essential for households worldwide to achieve their economic objectives (Campbell, 2006; Badarinza, Campbell, and Ramadorai, 2016). However, households' access to finance is often inhibited, particularly in developing countries by regulation or powerful incumbent institutions (Badarinza, Balasubramaniam, and Ramadorai, 2019). One common regulatory impediment takes the form of ceilings on deposit interest rates, which act as an effective tax on household savings (Giovannini and de Melo, 1991; Bai et al., 2001; Chari et al., 2020). Such interest rate caps are a salient feature of financial repression—a classical phenomenon first documented by McKinnon (1973) and Shaw (1973)—and has recently regained academic attention in the context of developed countries (e.g., Drechsler et al., 2020, 2023).

This paper investigates the role of financial technologies (FinTech) outside the traditional banking sector in promoting bottom-up financial liberalization through the introduction of market-rate savings products with deposit-like fast payment features ("deposit substitutes"). Payments, one of the essential functions of money and money-like claims, have become increasingly disrupted by FinTech. Mobile, cashless, and digital payments provide convenient and inclusive payment options for households (e.g., Jack, Ray, and Suri, 2013; Jack and Suri, 2014; Bachas, Gertler, Higgins, and Seira, 2018; Brunnermeier, James, and Landau, 2019; Ouyang, 2021; Crouzet, Gupta, and Mezzanotti, 2023; Brunnermeier, Limodio, and Spadavecchia, 2023). Recently, instant payment systems have enabled banks to offer "instantly available funds and real-time payments to their customers," reshaping competition and promoting credit expansion (Alok et al., 2024; Sarkisyan, 2024).[1] However, little is known about how products combining these instant pay-

[1]For instance, over 300 million Indians use the Unified Payments Interface (UPI) to instantly settle transactions (Alok et al., 2024). Brazil's Pix provides an instant payment solution to more than 120 million users (Sarkisyan, 2024). In the United States, the Federal Reserve recently introduced FedNow, a new instant payment infrastructure that allows businesses and individuals to send and receive instant payments through participating financial institutions.

ment features with savings and investment features, particularly those provided by non-bank financial institutions, impact traditional deposit markets. This impact is potentially even more salient in settings characterized by top-down financial repression of deposit interest rates.

Our paper fills this gap by providing the first systematic analysis of how instant payments transform traditional investment products and reshape deposit competition from outside the banking sector. We study one of the first tech-enabled money market funds (MMFs) with instant payment features in developing countries, Yu'ebao, (meaning "treasures of e-wallet balance") in China. Introduced in June 2013 by Alipay,[2] a leading and well-trusted digital payment platform in China, Yu'ebao is a liquid savings account that provides uncapped, market interest rates accessible to the general public.[3] Critically, Yu'ebao allows investors to redeem shares and receive money instantaneously to pay for daily transactions.[4] Yu'ebao quickly proved immensely popular, attracting 40 million users and over 185 billion RMB (approximately 28 billion USD) in assets under management within six months. In 2017Q1, it surpassed the JP Morgan US Government MMF to become the world's largest, with assets under management of nearly 1.7 trillion RMB ($268 million USD) at its peak. Given the explosive growth of these liquid MMFs, China's central bank started to incorporate retail MMFs into its M2 measure in January 2018.

China provides an ideal empirical setting for investigating FinTech's liberating role

[2]Incorporated in 2004, Alipay is the leading third-party digital payment platform in China. According to iResearch (http://news.iresearch.cn/zt/207283.shtml) as of 2013Q2, Alipay led the web-based third-party payment market with a market share of 48.7%, while Tencent's WeChat Pay ranked second with 20%, followed by UnionPay with 10%. Alipay's market dominance increased to 60.7% in the then-burgeoning third-party mobile payment market.

[3]Consumers can open a Yu'ebao account conveniently through Alipay's interface, which is essentially purchasing MMFs from partner fund companies.

[4]In particular, Yu'ebao enables consumers to use their shares to pay for any transactions via Alipay, including online shopping, grocery foods, and street vendor purchases. The ability to pay for goods directly with shares echoes the concept of "demandable equity". In Jacklin (1987)'s setting, there is a secondary market for investors of different liquidity needs to trade equity shares, which achieves the optimal risk sharing in Diamond and Dybvig (1983) without introducing the bad equilibrium of bank runs. Different from Jacklin (1987), the demandable equity in our paper requires investors in liquidity needs to redeem shares with the fund company, which provides instantaneous T+0 liquidity either by netting redemption and purchase flows or by borrowing from banks.

under financial repression. Like many developing countries (and some developed countries under civil law, such as Germany and Japan), China's financial system is characterized by a large and highly concentrated banking industry. Benefiting from the deposit rate ceiling regulation, incumbent banks in the status quo had little incentive to push for policy reforms or pursue financial innovation on their own. Moreover, traditional MMFs in China were not viable competitors with bank deposits for a decade since the inception in 2003, because they lacked the payment features needed to act as deposit substitutes.[5] Beyond their technical limitations, the spread of MMFs was limited by the fact that they were traditionally distributed by banks, who lacked incentives to aggressively push or innovate on these products for fear of cannibalizing their deposit franchise. Lack of broad financial literacy and high investment minimums further limited their spread. Against this backdrop of financial repression of traditional deposits and a lack of market rate alternatives, Big Tech companies like Alipay emerged as major providers of digital payments in China and achieved high adoption rates among households in their payments businesses. Thus, when Alipay introduced Yu'ebao, its adoption was facilitated not only by its instant payment and market rate features, but also Alipay's near-ubiquitous presence and distribution network.

To study how the rise of tech-enabled MMFs impacts the traditional deposit market, we assemble a purpose-built dataset combining both proprietary data from Alipay and publicly available information on digital payments, tech-enabled MMFs, bank deposits, and the traditional MMF industry. We construct a FinTech instant payment adoption measure utilizing city-level penetration ratios of Alipay prior to the introduction of Yu'ebao, i.e., the number of Alipay users divided by the local population as of 2012. We then exploit this geographical variation in FinTech adoption to identify the impact of the FinTech MMF via a long difference method, which removes macroeconomic factors common to all market participants such as interest rate spikes. We also include a series of control vari-

[5] This is in contrast to the United States, where MMFs in the 1980s started to provide checking functions.

ables, such as GDP, population size, and density of bank branches, to account for local economic conditions and households' access to bank services.

We first document the synergies between instant digital payments and the adoption of tech-enabled MMFs. Unlike a standard MMF, Yu'ebao was connected to Alipay, a near-ubiquitous presence in China that had existed for a decade at the time of its introduction. We find that the adoption rate of Alipay predicts the take-up of the Yu'ebao MMF in a statistically significant way: a 1% increase in the adoption of instant payments leads to a 1.1% increase in the adoption of tech-enabled MMFs in the following year. This pattern is also consistent with the fact that Yu'ebao came with significant brand recognition and trust. In particular, Big Tech platforms enable FinTech innovations to rapidly gain market share among users already in the ecosystem. By exploiting the staggered adoption of various distribution channels of Chinese mutual funds, we show that distribution through a large, well-known, and convenient tech platform like Alipay leads to significantly greater fund asset growth, which provides direct evidence for the importance of this tech-enabled distribution channel.

Next, at the city level, we test whether the uptake of Yu'ebao translates into actual fund flows into MMFs. Since the minimum investment threshold of Yu'ebao is very small (1 RMB, or 0.15 USD), one possibility is that household adoption of Yu'ebao on the *extensive* margin does not materialize into quantitatively significant migration from deposits into Yu'ebao in aggregate. However, we find that those cities with a greater Yu'ebao adoption rate experience more significant fund flows into Yu'ebao. Specifically, a 1% increase in the adoption of Yu'ebao leads to a 1-1.5% increase in fund flows into tech-enabled MMFs in the following 12 months. We find similar patterns when examining the city-level balance of the Yu'ebao MMF as of May 2014, indicating that the impact persists.

We then ask how effective such a FinTech-driven approach is in effecting liberalization and study how incumbent banks are affected in terms of deposit growth, profit, and loan

risk. We exploit both the geographical heterogeneity in FinTech adoption, and the heterogeneity across banks in pre-Yu'ebao branch locations to measure their exposure to the competition of Yu'ebao. We find that those banks with the most exposed deposit bases saw the greatest deposit outflows into Yu'ebao and the lowest deposit growth. Notably, the negative impact of Yu'ebao on bank deposits primarily affects household demand deposits. Other categories of deposits, such as corporate deposits, were almost unaffected. These findings corroborate our hypothesis that the tight connection between Alipay's fast payment feature and the Yu'ebao MMF creates a close substitute for household demand deposits.

To strengthen our argument that Yu'ebao exposure had a *causal* impact as opposed to the reverse (e.g., that for other reasons, deposits left the local banking system and flowed into a natural alternative, Yu'ebao), we adopt two instrument variables (IVs)—the pre-Yu'ebao instant payment adoption and the distance to the tech company headquarters—to address potential endogeneity concerns. The instant payment instrument's relevance results from the fact that Yu'ebao adoption is much less costly for users already using the Alipay platform for other purposes. Moreover, the instrument addresses the primary identification concern of simultaneity because users had already adopted the Alipay platform well before it offered a substitute for bank deposits.[6]

We further utilize the geographical distance to Alipay's headquarter in Hangzhou city to exploit the gradual spread of the Yu'ebao, that is, the roll-out and marketing of Yu'ebao were more convenient for Ant Group in markets closer to its headquarter. As with the case of pre-Yu'ebao Alipay adoption, the instrument overcomes the primary identification concern because Alibaba and Ant Group's headquarters (and therefore any market's distance from it) was established in 1999, far predating Yu'ebao's introduction in 2013. Hence, these instruments predict Yu'ebao uptake without being related to unobservable

[6] Additionally, we run placebo tests by varying the timing of the treatment to make sure that the effect corresponds to the launch of Yu'ebao and not from an unobserved association between Alipay take-up and the financial health of the banks. The placebo tests confirm our interpretation.

factors that would cause deposit outflows for other reasons, e.g., local bank health.

Additionally, we find that as household deposits left the banking sector for the FinTech competitor, banks' endogenous response to competition led to further financial liberalization. In particular, banks with greater exposure to Yu'ebao flows were more likely to invest in defensive innovation, i.e., launching their own deposit-like MMF products to fend off the competition from Yu'ebao. Importantly, while banks are compelled to launch these MMF products, we find little evidence of reduced revenues, increased costs, or increased risky bank lending as a result of increased competition. Thus, pessimistic predictions around bank profitability and stability largely fail to materialize, and the effects of increased competition materialize mostly as increased innovation. Thus, while Yu'ebao's rise did siphon deposits away from banks, these competitive pressures caused the most exposed banks to innovate rather than suffer losses to their profitability and stability. The ultimate effect appears to be financial liberalization that benefited households without markedly worse bank performance. Our interpretation of these findings is that FinTech, and in particular, the introduction of Yu'ebao, has aided in reducing financial repression in China without generating financial instability.

Finally, we explore the impact of FinTech innovation on financial inclusion. Utilizing data from the 2012 and 2014 waves of the China Household Finance Survey (CHFS), we construct a panel dataset of 21,702 households across 161 cities in 29 provinces in China to investigate which groups of households are more affected. We find that households' exposure to Yu'ebao in the early stages of its roll-out significantly predicts their participation rates in FinTech MMFs more broadly. These effects are larger among households with lower income, greater financial attention, and lower financial literacy, which suggests that the advent of Yu'ebao increased financial literacy, particularly for the most ex-ante unsophisticated groups of households. Overall, both direct and indirect effects of FinTech competition pass through more market interest rates to households, thus facilitating a bottom-up interest rate liberalization and promoting financial inclusion. While our

setting is in China, our results have broad implications for financial development more broadly, particularly for those under repressive pressure. While in our setting, financial repression arose due to direct government regulation, such bottom-up liberalization led by industry outsiders is also relevant for cases of financial repression arising implicitly out of, e.g., the exercise of bank market power in a highly concentrated banking industry.

Our paper makes several contributions to the literature. First, we offer new insights into the synergies between payments and investments in creating money-like claims. Payment markets, which demonstrate significant network externalities (Crouzet, Gupta, and Mezzanotti, 2023; Higgins, 2024), benefit from technologies such as debit cards, mobile money, cashless payments, and digital currencies. Previous studies have examined the impact of FinTech payments on lending (Suri, Bharadwaj, and Jack, 2021; Parlour, Rajan, and Zhu, 2022), consumption (Jack and Suri, 2014; Agarwal et al., 2024), and business growth (Agarwal et al., 2020; Higgins, 2024). Relatively few papers investigate the impact on household savings (Bharadwaj and Suri, 2020; Bachas et al., 2018, 2021). Interestingly, in our setting, these synergies are most consequential among *non-banks*, thereby raising questions regarding banks' fundamental "specialness" (e.g., Jiang et al., 2020). We highlight the importance of payment technologies for the adoption of MMFs and the creation of "demandable equity."[7] Chen and Jiang (2022) corroborate our findings by showing a 42 times size increase among MMFs with digital payments via Alipay, which corresponds to a 1%-1.7% liquidity premium.

Second, our analysis of tech-enabled MMFs with fast payment features provides novel empirical evidence of the impact of FinTech competition on retail deposits, as well as banks' response to such FinTech disruption. Previous studies have documented households' deposit migration to nonbank sectors in a non-FinTech context (Drechsler et al.,

[7]This focus on the bundling of MMF and payment services distinguishes our paper from those examining the impact of FinTech distribution on non-MMF risky assets without payment features (e.g., Hong, Lu, and Pan, 2024). Notably, a near-ubiquitous, well-trusted digital payment platform like Alipay helps households to overcome barriers to accessing uncapped interest rates, potentially followed by investing in risky assets as evidenced by Hong, Lu, and Pan (2020).

2017; Xiao, 2020; Yao and Wang, 2022).[8] Complementing this line of research, our paper highlights the transformative impact of fast payments on traditional MMFs and the interaction between NBFI and banks in the FinTech era. Recently, Alok, Ghosh, Kulkarni, and Puri (2024) and Sarkisyan (2024) examine how fast payment systems reshape deposit competition among banks. We differ by investigating the competitive forces from outside the banking sector, i.e., MMFs with instant payment features enabled by Big Tech platforms. Di Maggio, Ghosh, Ghosh, and Wu (2024) show that increased CBDC usage is associated with a notable decrease in cash and bank deposits. In addition to CBDCs, stablecoins, and fast payment systems, low-cost FinTech payment service providers could offer improvements over legacy payment services maintained by commercial banks and gain significant adoption, as exemplified by recent developments in China (Duffie, Foucault, Veldkamp, and Vives, 2022).

Additionally, we examine how FinTech competition induces banks to introduce similar products. Although an extensive literature has examined competitive effects of FinTech on banks, few have examined the responses of traditional banks (e.g., Boot, 2017; Vallee and Zeng, 2019). Recently, Jiang, Tang, Xiao, and Yao (2021) investigate the labor demand responses of banks to FinTech shocks. Puri, Qian, and Zheng (2024) show that banks navigate FinTech competition through venture investments in FinTech startups. Our paper echoes with these studies by showing that banks respond to FinTech competition through product innovation, i.e., introducing deposit-like retail investment products that they may not have offered due to cannibalization concerns.

Third, our paper brings issues around FinTech and shadow banking to the literature on financial repression. Financial repression is an important phenomenon in both de-

[8] Prominently, Drechsler et al. (2017) present the deposit channel of monetary policy transmission, showing that deposits flow out of the banking system when the Fed funds rate increases. Xiao (2020) also demonstrates how MMFs attract more deposits during monetary tightening cycles by passing through rate hikes to a more yield-sensitive clientele. Yao and Wang (2022) find that the rising market power of shadow banks in the auto loan market significantly increases banks' responses to the rate hike.

veloping and developed countries (McKinnon, 1973; Shaw, 1973; Fry, 1980a,b, 1997).[9] Prominently, Drechsler et al. (2020) and Drechsler et al. (2023) study the binding deposit rate ceilings under Regulation Q in the United States and examine the effect of the imposition and repeal of these ceilings on savings return, aggregate demand, inflation, and bank lending. Notably, bank deposits are compensated with much lower interest rates than wholesale money-market rates (low deposit beta) and pass through less interest rate spikes to households (Drechsler, Savov, and Schnabl, 2017, 2021; Xiao, 2020). In the context of China's ceiling regulation on deposit rates, our paper underscores the liberating role of deposit competition via FinTech, which often emerges from outside the traditional financial system (Goldstein et al., 2019), in alleviating financial repression and lifting ceiling regulation. Our paper also build on the important literature on the private-interest of (de)regulation and how political factors drive the removal of major financial regulations (Peltzman, 1976; Kane, 1988; Kroszner and Strahan, 1999) by demonstrating how tech-driven financial innovations alter the value of the restrictions to the affected parties. Finally, our paper joins Xiong (2018) and Brunnermeier et al. (2020) in demonstrating the potential benefits of shadow banking in a distorted financial system.[10]

Our paper proceeds as follows: Section 2 introduces the institutional background of financial repression, banking, and FinTech development in China. Section 3 details the data and presents our empirical methodology. In Section 4, we provide city-level evidence on synergies between digital payment adoption and households' participation in tech-enabled MMFs. In Section 5, we examine the impact of Yu'ebao on deposit growth

[9] Oppositely, Diaz-Alejandro (1985) point out that financial liberalization may trigger unintended consequences such as bubbles and crashes. Stiglitz (1993); Hellmann et al. (2000) argue that financial repression can provide benefits in some circumstances. Kaminsky and Schmukler (2008) show that the long-run gains outweigh the short-run pains. Financial repression also makes its resurgence in the past decades, with rising public debts crowding out corporate lending after the 2007-2009 financial crisis (Reinhart, 2012) and the European sovereign debt crisis (Becker and Ivashina, 2018).

[10] Our findings echo previous studies examining the migration of traditional bank activities away from regulated depository institutions and towards less regulated shadow banks. For instance, Gennaioli, Shleifer, and Vishny (2013) and Moreira and Savov (2017) build theoretical models on shadow banking; Buchak, Matvos, Piskorski, and Seru (2018), Jiang, Matvos, Piskorski, and Seru (2020), and Zhang (2021) empirically examine the rise of shadow banking in the context of residential mortgage lending.

and banks' response. Section 6 investigates bank balance sheet outcomes and financial inclusion. We discuss our findings and conclude in Section 7.

2 Background and Empirical Setting

2.1 Financial Repression and Deposit Interest Ceiling Regulation

A major element of financial repression involves the interest ceiling regulation on household deposits, which is essentially an implicit tax on depositors. One prominent example is Regulation Q in the United States, which was established by the Banking Acts of 1933 and 1935. Regulation Q prohibited the payment of interest on demand deposits and authorized the Federal Reserve to set interest rate ceilings on time and savings deposits paid by commercial banks. It was eventually phased out in 1986 against the backdrop of financial disintermediation and the rise of MMFs. Lucas (2013) emphasizes that Regulation Q triggered the development of deposit substitutes, like Eurodollars, money market deposit accounts, and sweeps, which are "simple work-arounds designed to evade the restrictions imposed by Regulation Q."

China also has a long history of strict restrictions on deposit and lending rates. Particularly, under the planned economy regime, the government purposefully suppressed the interest rates paid on deposits to enable state-owned banks to extend low-interest loans to state-owned firms, thereby contributing to the financing of China's industrialization. Morck and Steier (2005) document that civil law countries historically relied heavily on the state supply of finance, bank nationalization, and state investment companies to promote economic growth and resolve crises. In countries with financial underdevelopment, state-owned banks facilitate the financing of projects that otherwise cannot be financed by the market, particularly public infrastructures vital to economic development. Despite these benefits, government ownership of banks becomes a burden in normal cir-

cumstances (La Porta et al., 2002), often associated with slower subsequent financial development and economic growth. Therefore, the deregulation experience in China has general implications for other countries, especially those with a large banking sector.

Since the Reform and Opening-Up in 1978, China has been transitioning toward a market economy, with several financial reforms to reduce price controls and liberalize interest rates. In 1993, the Third Plenary Session of the 14th CPC Central Committee issued the Decision on Several Issues Concerning the Establishment of a Socialist Market Economic System, marking the formal start of a market-oriented interest rate reform.[11] The interest rate liberalization follows a gradual process that started with the wholesale market and then the retail market: China lifted the floors and ceilings of inter-bank market rates in 1996, making the market rates reflect the supply of and demand for funds by institutional investors. However, the reforms on retail rates remained relatively stagnated.

Figure 1 illustrates the dual-track interest rate system in China, with stark differences between market interest rates and repressed deposit rates in China. We emphasize two key features of the financial repression. First, the ceiling regulation on deposit interest rates always binds in recent decades. During our sample period, the interest rate ceiling on demand deposits is approximately 0.35%, whereas the 3-month time deposit ceiling ranges from 1.8% to 3%. In comparison, the 3-month Shanghai Inter-Bank Offered Rates (SHIBOR), the most commonly used reference rate in China, increased from 2% to over 6% and later hovered around 4%, significantly above the deposit rate cap. The fact that interest rate ceilings on deposits almost always fall below market interest rates is similar to the U.S. case in the 1970s, when the Regulation Q becomes binding due to sharp increases in market interest rates (Gilbert, 1986). Second, the interest rate ceilings seldom change. The central bank changed the deposit rate ceilings fewer than ten times in over twenty years and often by a small amount. Hence, despite daily fluctuations in the uncapped

[11] The Decision indicates that "the central bank shall adjust the benchmark interest rate in a timely manner according to the supply and demand of funds, and allow the deposit and loan interest rates of commercial banks to float freely within the prescribed range."

SHIBOR, deposit interest rate caps show no sensitivity to market conditions.

2.2 Tech-Enabled Innovations in the MMF Industry

FinTech has greatly changed the competitive landscape in the payments industry, which was once dominated by banks, paving ways for further innovations in other financial services. The focal tech-enabled innovation of our paper is Yu'ebao, the first product combining FinTech-enabled fast payments with a market-rate MMF. In May 2013, Alipay announced its partnership with the then-small Tianhong Asset Management to launch Yu'ebao on June 14, 2013. Alipay is one of the two major providers of low-cost FinTech payments in China, where 94% of mobile payments are now processed by Alipay and WeChatPay and 90% of residents of China's largest cities adopt these services as their primary method of payment.[12] As a comparison, payments providers in the United States such as Paypal, Venmo, and Zelle are relatively limited in payment use cases, therefore their adoption rates are "not yet significant relative to those of more conventional bank-railed payments" (Duffie, Foucault, Veldkamp, and Vives, 2022).

Connected to a namesake MMF uniquely designed for and sold on Alipay, Yu'ebao achieves instant payments easily accessible to the public through three innovative features: First, the T+0 fast redemption feature, which allows investors to redeem MMF shares within seconds rather than the T+1 or T+2 redemption in normal cases.[13] Second, the share payment function, which enables investors to use MMF shares in Yu'ebao to pay for transactions via Alipay. Third, a minimum investment threshold as low as 0.1 yuan, which is accessible to all households. Instant payments have substantially enhanced liq-

[12]"Alipay retains leadership position with 55% market share in China's mobile payments market", Business Today, July 9, 2020. https://www.businesstoday.com.my/2020/07/09/alipay-retains-leadership-position-with-55-market-share-in-chinas-mobile-payments-market/.

[13]The first exchange-traded MMF with the T+0 redemption feature was launched by Huitianbao in October 2012. As indicated in the name, this type of T+0 MMF is subscribed and redeemed in the exchange and is therefore limited to stock market account holders. This type of MMFs is vastly different from Yu'ebao, which provides free T+0 services for all investors with an Alipay account for daily expenditures.

uidity provision of MMFs for retail investors, enabling them to become close substitutes to bank demand deposits. Notably, Yu'ebao investors are mostly consumers adopting Alipay for digital payments. Since consumption needs are more diversified and less sensitive to interest rate changes than regular investment needs, the unique investor composition of Yu'ebao helps to reduce liquidity risks faced by the underlying MMFs.[14] Yu'ebao has gained mass popularity since its launch in June 2013. As of June 2015, Yu'ebao had over 200 million, with small, individual shareholders accounting for 99.25% of shares with an average balance of 2,717.32 RMB. It became the world's largest MMF in 2017, with a size of nearly 1.7 trillion RMB or 258 million USD as of December 2017.[15]

Combining instant payments and uncapped money market yields, Yu'ebao brought competitive pressure to traditional banks. As shown in Figure 1, the yield of Yu'ebao comoves with SHIBOR rather than following the deposit rate ceiling. It is worth mentioning that when Yu'ebao was launched in June 2013, a liquidity crunch drove up the spread between the market interest rate and the capped deposit rate. Yu'ebao benefited from this large divergence, which further fueled the popularity of Yu'ebao relative to bank deposits. During its first two years (from mid-2013 to mid-2015), the yield on Yu'ebao was higher than that of 3-month time deposits by over 200 basis points and higher than that of demand deposits by strikingly 500 basis points. This phenomenon is consistent with Drechsler, Savov, and Schnabl (2017) and Xiao (2020) that MMFs pass through more interest rate spikes to households than banks.

[14]Furthermore, payments for online purchases will not be transferred to sellers until consumers' confirmation of receiving the goods and services, which usually takes ten to 30 days (automatic confirmation). This transaction protection scheme also helps alleviate redemption pressure induced by large amounts of purchases via Alipay. For offline transactions, given users' trust in Alipay and the various scenarios where sellers can use their Alipay balance for payments, people also have little incentive to withdraw money to their bank accounts.

[15]However, to comply with the regulation and contain the size of the Tianhong Yu'ebao MMF, Alipay has introduced more MMFs to the Yu'ebao interface since 2017. Due to tightened regulation and diverted fund flows to other MMFs, the size of the Tianhong Yu'ebao MMF decreased but still remained at approximately 500 billion RMB. Panel A of Figure A1 depicts the size of the top 20 MMFs in China, sorting based on total shares as of December 2018. The size of the Yu'ebao MMF is almost ten times that of the second-largest MMF in China.

The financial liberation role of tech-enabled MMFs in China echoes MMFs' role in driving financial disintermediation in the 1980s in Europe and the United States. The phenomenal growth of MMFs, which was fueled by interest rate hikes and deposit interest ceiling regulation in the 1970s, attracts households' savings and weakens banks' importance relative to non-bank financial intermediaries. Nevertheless, the traditional MMF industry in China did not constitute viable competition to bank deposits prior to the FinTech disruption as it did not provide checking options. That is, the mere possibility of regulatory arbitrage alone does not naturally lead to a more liberalized financial system. Figure 2 shows the absolute and relative sizes of the MMF industry compared to the size of household deposits in banks since 2003, when the first MMF was founded in China. By the end of 2012, household deposits reached 40.6 trillion yuan, with 15.8 trillion yuan in the form of demand deposits and 24.8 trillion yuan in time deposits,[16] equivalent to roughly 30 percent of China's GDP in 2012.[17] In comparison, household investments in all MMFs totaling less than 1% of household bank deposits.[18]

Our context is also applicable to other countries experiencing FinTech disruption in the financial industry. Notably, Yu'ebao shares many similarities with the PayPal MMF, which was offered by PayPal in 2002 but eventually closed in 2011 given the nearly-zero interest rate environment.[19] Both products are MMFs not insured by the deposit insur-

[16]Sources & Uses of Credit Funds of Financial Institutionsby Sectors, the People's Bank of China.

[17]China's GDP in 2012 was 53.9 trillion yuan, as released by the National Bureau of Statistics.

[18]It is important to point out that the lack of familiarity and trust with mutual funds by Chinese households before the introduction of Yu'ebao is also important in this story. The high barriers to the adoption of mutual fund investment before Yu'ebao translate into a high degree of stickiness of bank deposits (low sensitivity to interest rate). Banks take advantage of this deposit stickiness and found no reason to market MMF products to their deposit customers. Thus, while offering uncapped market yields, these funds experienced only modest growth and remained at a neglectible level compared to bank deposits, until the introduction of Yu'ebao in 2013, the first fast-payment, money-like MMF in China.

[19]The PayPal Money Market Fund is designed primarily as an automatic sweep investment for uninvested cash balances in PayPal customer accounts. PayPal customers may choose to have their free cash balances swept into the Fund to earn income until the cash is used. Shares of the Fund will be automatically redeemed to pay for transactions such as payments, purchases and other electronic money transfers from PayPal customer accounts. See https://www.sec.gov/Archives/edgar/data/1088143/000095015607000293/paypal-485bpos_tagged.htm. Shares of the money market are offered through a partnership with Barclays Global Investors. As of October 10, 2002, the fund's seven-day average yield was 1.79 percent.

ance fund. Both are embedded in leading digital payment platforms and enable users to earn a rate of return on their funds without losing the convenience of facilitating transactions. More importantly, both are introduced amid regulatory concerns over illegal banking.[20] The competitive pressure imposed by PayPal MMFs on banks also spurred wide discussion on the media. However, few studies have quantified the causal impact in the context of the PayPal MMF. Furthermore, the offline transactions are still dominated by cash, credit, and debit cards, therefore PayPal does not achieve a user base as wide as Alipay, of which the latter makes a ubiquitous presence in households' daily lives. Therefore, the FinTech-driven competition is likely to be more exemplified in our context of Yu'ebao, where fast payment technologies become more advanced and more penetrated.

2.3 Responses from the Banking Industry

Similar to many civil-law countries with high reliance on indirect financing and government ownership of banks (La Porta et al., 1997, 2008), the banking industry, mainly state-owned, dominates China's financial system, accounting for over 80% of credit and households' financial assets. Benefiting from the deposit rate ceiling regulation is a large and highly concentrated banking industry. The largest six state-owned banks control 61.8% of the branches and have a nationwide branch network. In addition, they have a common shareholder - the state-owned Central Huijing Company - that typically holds 70% or more of the shares and appoints all the most senior officers in each of these banks. The remainder of the banking sector consists mainly of local banks, 95% of which locate at least 80% of their branches in a single city. The diverse spatial location of branches enables

[20]For example, the states of California, Idaho, Louisiana, and New York initiated investigations questioning "whether PayPal's practice of allowing customers to leave money in prepaid accounts for use in future transactions constituted illegal banking," i.e., "receipt of deposits without a bank charter" in 2003. Similarly, Alipay, emerged as a leading peer-to-peer Internet payment tool in China, is also subject to regulatory scrutiny regarding the money customers are parking in their Alipay e-wallets. Therefore, allowing users to sweep their money in formal financial products helps PayPal and Alipay to avoid being declared as illegally accepting deposits and primarily serve as an agent in banking transactions.

large banks to provide payment convenience for households, making it difficult for small- and medium-sized banks (SMBs) to compete. Given the deposit ceiling restrictions, these SMBs cannot compete by raising deposit interest rates either, which helps cement large banks' dominance in the retail funding market.

Panel B of Figure 1 plots each bank's dependence on deposit funding against its branch market share as of May 2013. Deposits are a major source of bank funding, accounting for over 60% of the interest-bearing liabilities for the vast majority of banks. This ratio increases to over 80% for state-owned banks. Thus, banks with the largest market share are among the most reliant on deposits for funding. Crucially, these deposits were subject to an interest rate cap—similar to Regulation Q in the United States—that constrained interest rates far below the unconstrained market rate on similar, unregulated funding sources. Interest rate caps, therefore, lower the cost of the most important source of funding for Chinese banks. Given significant concentration in the deposit market, banks had little incentive to introduce or innovate in unregulated products that could cannibalize their inexpensive deposit funding.[21]

We argue that the FinTech competition studied in this paper creates the first crack in the deposit rate ceiling. By attracting household deposits away from bank branches to demandable MMFs, Yu'ebao increases banks' funding costs and making the ceiling regulation obsolete. Facing the competitive threat to their business models, commercial banks mounted substantial resistance and push-back against Yu'ebao. Notably, during the joint annual sessions of the National People's Congress (NPC) and the Chinese People's Political Consultative Conference (CPPCC) in March 2014, the largest annual political event in China, some senior officers of state-owned banks proposed to the central government that

[21] Besides tremendous market power, state-owned banks are also politically resourceful: top officials of regulatory authorities including the People's Bank of China (PBOC), China Banking and Insurance Regulatory Commission (CBIRC), and China Securities Regulatory Commission (CSRC), often come from large state-owned banks. Hence, state-owned banks can have both substantial influence over regulation policies and strong incentives to resist interest rate liberalization. Thus, politically connected incumbents may impede liberalization efforts to uncap rates, making top-down reforms difficult.

restrictions should be imposed on Yu'ebao. Some banks placed restrictions on the ability of their deposit customers to use Yu'ebao, such as a daily limit on the amount of money depositors can move from their bank accounts to Yu'ebao. Some bank headquarters ordered their branches not to deal with Yu'ebao and other MMFs.[22] In the media, news reports appeared calling Yu'ebao "the vampire sucking blood from banks," referring to the fact that the majority of Yu'ebao MMF assets take the form of negotiated deposits with banks, paying well above the capped deposit rate.

However, FinTech development also had its sympathizers in the government: both Premier Li Keqiang and central bank governor Zhou Xiaochuan would not want to ban Yu'ebao. In fact, the Government Work Report in 2014 recognized the importance of developing "internet finance." Unsuccessful in lobbying for a ban on their FinTech competitors, banks started to offer Yu'ebao-like retail products through cooperation with other MMFs. Figure 2 shows that Yu'ebao spawned the launch of products combining MMFs with payment features, known popularly in China as *bao* products. The number of unique banks offering *bao* products exceeds 20 in 2014 and doubles to 40 by the end of 2016. In subsequent sections, we will make the case that the emergence of Yu'ebao has *caused* the growth of the MMFs and effectively spelled the end of financial repression for Chinese households. Once enough banks offer deposit-like MMF products, the need to defend financial repression has diminished substantially. The ceilings on deposit interest rates were eventually phased out in October 2015.[23]

[22] See, for instance, the news report in 2014 (http://finance.sina.com.cn/money/bank/bankvsyuebao/). However, these measures can also alienate their customers and potentially drive them towards other banks that maintain a relationship with Alipay/Yu'ebao.

[23] Our paper focuses on FinTech's role in ending this particular dimension of financial repression. There is still an unofficial "self-disciplinary organization" that monitors interest rates offered by commercial banks, meaning that deposit rates should not be regarded as completely unregulated even after the ceiling was officially lifted. Still, the availability of mutual fund products through FinTech platforms means that Chinese households now have easy access to market interest rates on their savings.

3 Data and Empirical Methodology

This section outlines our data sources and empirical methodology. From account usage and transaction data, we calculate measures of Yu'ebao and Alipay adoption, as well as deposit flows at the city and bank levels. We then examine how outcomes at cities and banks—principally deposit flows, bank profitability, and bank innovation, respectively—vary cross-sectionally among cities and banks with exposure to tech-enabled MMFs.

3.1 Data Sample

Our empirical analysis utilizes five sources of data: (1) FinTech payment adoption from Alipay; (2) tech-enabled MMF data, including adoption ratios of and fund flows into Yu'ebao; (3) deposits and financial statement data on banks in China; (4) MMF and non-MMF mutual fund data, including their yields, size, and distribution network; and (5) city-level economic data, which serve as important control variables in our analyses.

FinTech data. Our unique data from Ant Group include the city-month-level number of active Yu'ebao (FinTech MMF) and Alipay (FinTech payment) users. With this data, we are able to track the adoption ratios of both Yu'ebao and Alipay, and the number of active users on each. Additionally, we observe transaction-level Yu'ebao purchase records starting from its launch date. Since Yu'ebao is embedded in Alipay, investors must first register to become Alipay users if they have not done so. Critically for our research, we observe for each transaction the time stamp, the Yu'ebao purchase amount, whether it comes from a bank card, and the user's residence city, which enables us to construct the city-level FinTech MMF adoption measure.

Bank data. Our sample consists of all state-owned ("big"), joint-stock ("gufen"), and city commercial banks while excluding rural commercial banks, village banks ("cunzhen"), privately-owned banks ("minying"), and foreign banks. We remove banks with-

out any branches and those founded after December 2011 from our sample. The yields a total of 145 banks operating 138,231 branches. Our data on commercial banks and their registered branches come from CBIRC (formerly CBRC and CIRC), the official regulatory authority of the banking and insurance industry in China. Banks are required by law to obtain CBIRC's approval before opening a new branch. The registration form lists each branch's full name, address, head office name, approval date, and exit date.

Our bank financial statement data come from WIND, CSMAR, and RESSET, the most comprehensive financial and economic data sets in China. The bank-level data compilation includes (1) basic registration information, such as the full name, inception date, bank type, and headquarters city; (2) bank-year-level deposits data, including six subcategories, namely, demand versus time deposits, household versus firm deposits, and household demand versus household time deposits; (3) bank balance sheet data, including total assets, interest expenses, net interest margin (NIM), net interest spread (NIS), nonperforming loan ratio, and risky asset ratio.

We hand collect information on all *bao*-type products, defined as Yu'ebao-like MMFs with fast payment features, from public announcements made by mutual fund companies.[24] We identify the precise date when a bank offers *bao*-type products by searching for keywords in all MMF announcements compiled by WIND.[25] The keywords include variations of "T+0 fast redemption" and exclude words such as "halt", "pause", "adjust", and "change". Our keyword search covers the period from 2003, the inception year of the first MMF in China, to 2017, four years after the launch of Yu'ebao when the regulatory authority started to restrict the T+0 redemption practice in the MMF industry. We

[24]When a commercial bank sells a MMF product, it often includes the word "*bao*" in the product name, apparently designed to suggest its similarity to Yu'ebao. The launch of such a *bao*-type product needs an agreement between the bank and the mutual fund company that supplies the MMF and is typically accompanied by an announcement by the fund company.

[25]WIND, a popular financial database, also provides a list of bao products, but the information on the product launching dates is missing. The founding date of the MMF behind a bao product is in general different from the actual bao-product launching date. For instance, a MMF founded in October 2005 may not start to offer T+0 redemption through a bank until May 2014. Hence, it is important to use *bao* launch announcement dates rather than MMF founding dates.

cross-check these dates with news releases on banks' official websites and in the media.

We further complement our bank-level data with information on wealth management products (WMPs), which are not subject to interest rate ceiling regulation and require a high investment minimum. We obtain detailed product-level information on each WMP issued by commercial banks, including the product name, issuing date, issuing bank, investment type, target clients, investment threshold, expected yield, realized yield, and guarantees. This analysis enables us to compare the differentiated impact of FinTech competition across product categories offered by banks.

Mutual fund data. We obtain distribution and quarterly report data of all mutual funds (including MMFs) in China during the period between 2004Q2 and 2019Q4 from WIND. We focus on MMFs, bonds, equities, and mixed funds. We exclude real estate investment trust (REIT), qualified domestic institutional investors (QDIIs) and commodity funds from our sample. Our compiled dataset contains three types of information: (1) fund-level information including fund name, fund code, fund type, inception date, fund company, custodian bank, and fund fees (including management, custodian, and sales service fee rates); (2) information on each fund-distributor pair, including the date when a distribution agency starts/stops selling a fund, distributor name, distributor type, the date when the distribution agency's license is approved by the regulator, the registration city of the distribution agency; (3) fund quarterly report data as of the report date, including the net asset value (NAV), yield, profit, the number of fund shares, fund purchases, fund redemption, the number of shareholder accounts, and the ratio of shares held by institutional investors and individual investors.

City-level and macroeconomic data. The administrative system in mainland China contains five tiers: the central government, provinces (including 4 mega municipalities and 5 autonomous regions), prefecture-level cities, counties, and townships. In this paper, we use "city" to refer to the 4 mega municipalities (Beijing, Shanghai, Tianjin, Chongqing)

and 337 prefecture-level cities in mainland China. We obtain city-year-level data, such as local GDP and population, from CSMAR and WIND. We combine these data with administrative city-level information, such as full name, province, longitude, and latitude, available from the Ministry of Civil Affairs and the National Bureau for Geographics. The benchmark policy interest rates come from the PBOC. The interbank market rate SHIBOR comes from chinamoney.com, the official website for the China Interbank Market.

3.2 Key Variable Definition

City-level variables. Our main independent variables of interest are the FinTech MMF adoption ratios, and as instrumental variables, the FinTech payment adoption ratios and the geographical distance to the FinTech headquarter. We define the FinTech MMF (payment) adoption ratio as the number of active users of Yu'ebao (Alipay) divided by the local population and the distance to the FinTech headquarter as city c's great-circle distance to Hangzhou, the headquarter of Alipay and Yu'ebao:

$$E_{ct}^{YEB} = \frac{\#Users_{ct}^{YEB}}{\#Population_{ct}} \tag{1}$$

$$E_{ct}^{ALI} = \frac{\#Users_{ct}^{ALI}}{\#Population_{ct}} \tag{2}$$

$$HZDistance_c = \text{Distance of city } c \text{ to Hangzhou} \tag{3}$$

Our city-level monthly time series begin in January 2012, with E_{ct}^{YEB} equals zero for months prior to Yu'ebao's introduction in June 2013. For confidentiality reasons, we are required to normalize the raw adoption ratios to an index using the values in January 2014 in Hangzhou as the benchmark (i.e., $E_{HZ,Jan2014}^{YEB} = E_{HZ,Jan2014}^{ALI} = 100$). As shown in Figure 3, we find a diverse distribution of Alipay users (scaled by local population) in locations prior to the introduction of Yu'ebao, with higher penetration ratios closer to Alipay's headquarter in eastern China.

Additionally, we use transaction data of Yu'ebao MMF to calculate the city-level cumulative fund flows into Yu'ebao and the users' net Yu'ebao position as of May 2014, i.e., the first twelve months of Yu'ebao. In particular, we define for city c,

$$FundFlow_c = \text{Cumulative Yu'ebao flows from banks, June 2013 – May 2014} \quad (4)$$

$$Balance_c = \text{Yu'ebao net position as of May 2014} \quad (5)$$

Bank-level variables. We exploit banks' variations in the pattern of branch locations to aggregate city-level FinTech adoption rates into bank-level FinTech exposures. First, we define city c's importance to bank b, ω_{bct}, as the number of bank b's branches in city c in month t divided by bank b's total branches in all cities in month t:

$$\omega_{bct} = \frac{\#Branches_{bct}}{\sum_k \#Branches_{bkt}} \quad (6)$$

where k sums over cities. A high ω_{bct} indicates that a greater share of bank b's branches are located in city c, which approximates a larger clientele base in city c and, hence, a greater exposure to FinTech competition when city c is penetrated.

Intuitively, a bank with a high Yu'ebao (Alipay) exposure has a large share of its branches in cities with many Yu'ebao (or Alipay) users relative to local population. We then aggregate Yu'ebao and Alipay exposure to the bank level as follows

$$E_{bt}^{YEB} = \sum_c \omega_{bct} E_{ct}^{YEB} \quad (7)$$

$$E_{bt}^{ALI} = \sum_c \omega_{bct} E_{ct}^{ALI} \quad (8)$$

We aggregate other city-level variables to bank-level following the same approach:

$$X_{bt} = \sum_c \omega_{bct} X_{ct} \quad (9)$$

Where X_{ct} includes a series of city-level variables including the distance to Hangzhou (log scale), GDP (log scale), and local GDP growth.

3.3 Empirical Design

We examine the impact of the launch of Yu'ebao on several outcomes: deposit flows, banks' competitive response, and ultimately, banks' profitability and risk-taking activities. Our identification exploits geographical variation in Alipay and Yu'ebao adoption. For the cross-sectional analysis, we focus on Alipay adoption E_c^{ALI} fixed as of May 2013, one month before Yu'ebao's introduction, and Yu'ebao adoption E_c^{YEB} as of December 2013, six months after its launch. Other city-level controls, as well as bank-city-level branch weights, are fixed to corresponding values in May 2013 to ensure that they are predetermined relative to the outcome variables.

OLS baseline specifications. Our primary specification exploits variation in Yu'ebao adoption as of December 2013 to examine the impact of FinTech exposure on a number of outcome variables. In particular, at the city and bank levels, respectively, we regress:

$$Y_c = \beta_0 + \beta_1 \log E_{c,2013}^{YEB} + X_c'\beta + \epsilon_c \tag{10}$$

$$Y_b = \beta_0 + \beta_1 \log E_{b,2013}^{YEB} + X_b'\beta + \epsilon_b \tag{11}$$

where Y_c and Y_b are city-level or bank-level outcomes, which include deposit outflows and deposit growth rates. At the bank level, we also examine the financial performance variables and the introduction of competing *bao* products.[26] X_c' and X_b' represent a number of the city- or bank-level controls, including GDP per capita, log GDP growth, log population, and an indicator for whether the city is a provincial capital.

A notably absent control from our analysis is the level of deposit interest rates. While

[26] As a robustness check, we run the *bao* introduction specification as a hazard model, which we detail in a later section. Our results are robust.

one might expect spreads between Yu'ebao and deposit rates to drive household responses, there is no cross-sectional variation since all bank interest rates are constrained at the same cap.[27]

Observe further that our empirical design is cross-sectional in differences. By looking at city- or bank-level changes, we implicitly difference out time-invariant characteristics such as the baseline level of development of the city, or bank size, between June 2013 and May 2014. This is equivalent to running a panel regression in levels with city or bank fixed effects. One caveat is that we are unable to identify the time-series aggregate effect of Yu'ebao's introduction on the amount of bank deposits.

IV specifications. We aim to examine how the entry of competing FinTech products causes changes at banks. A potential concern with our OLS approach is that the adoption of Yu'ebao is caused by consumers wanting to exit banks for other reasons. In other words, we could be picking up a reduction of consumer demand in the household deposit market that substitutes the MMF market. The variation that we seek, rather, runs the other way: an exogenous shift in the availability of a competitor product that reduces the demand for household bank deposits.

To address this endogeneity concern, we adopt two instrumental variable strategies that utilize pre-Yu'ebao Alipay adoption and the city's distance (or the bank's branch-weighted distance) to the Alipay headquarter in Hangzhou. The justification for these instruments is that they shift consumers' access to Yu'ebao in a way unrelated to the local banking market. In the case of Alipay adoption, instrument relevance comes from the fact that adopting Yu'ebao is easier, more natural, and less costly for users who already have the payment app to which Yu'ebao is connected and offers the greatest convenience benefits for pairing payments and saving technology. Instrument exogeneity comes from

[27] In the US context, Ho and Ishii (2011) estimate own-price elasticity for deposits to be roughly 1. The Yu'ebao interest rate at launch was higher than the capped interest rate by roughly 4 percentage points. While this led to a quantitatively large amount of flows from bank deposits into Yu'ebao, our empirical methodology cannot directly calculate the elasticity.

the timing restriction: We use Alipay adoption at a time well before the introduction of Yu'ebao, thus precluding any reverse causality related to shifting demand for household bank deposits. The Hangzhou distance measure carries these ideas further back in time: The roll-out of Alipay was faster in cities near Ali's headquarters, which was fixed far predating the launch of Yu'ebao.

The IV analogs to the OLS specifications for the city-level regression, (10), and the bank-level regression, (11), are as follows:

$$Y_c = \beta_0 + \beta_1 \log \hat{E^{YEB}}_{c,2013} + X_c'\beta + \epsilon_c \tag{12}$$

$$Y_b = \beta_0 + \beta_1 \log \hat{E^{YEB}}_{b,2013} + X_b'\beta + \epsilon_b \tag{13}$$

where $\log \hat{E^{YEB}}_{c,2013}$ and $\log \hat{E^{YEB}}_{b,2013}$ are the predicted city- and bank-level FinTech adoption/exposure given the Alipay IV, the Hangzhou distance IV, or when both IVs are used simultaneously.

It is possible that local GDP, local population, and local income per capita are correlated with Alipay penetration. We control for these explicitly in both the first-stage and main regressions. Since log GDP per capita is a linear combination of log GDP and lop population, we only need to control for any two of the three variables.

We briefly discuss additional identification concerns with our instruments. At a high level, Alipay adoption (and Hangzhou distance) are unlikely to be completely random, but our identifying assumption requires only that they be uncorrelated with our main outcomes except through the effect of Yu'ebao. We make three arguments in favor of this assumption. First, unlike Yu'ebao, the FinTech payment technology, Alipay, does not *per se* compete with bank deposits: As FinTech payment users still need to link bank cards with their Alipay accounts to make payments, the use of Alipay does not obviate the need for a bank account. Thus, one should not expect Alipay to have been rolled out in areas where banks are weak (so Yu'ebao will be relatively strong).

Second, if our IVs are correlated with unobservable drivers of the level of deposit demand, our specification that uses changes rather than levels of the deposit removes persistently unobserved demand factors. Additionally, having two instruments allows us to run overidentification tests, and as we show, in most cases we cannot reject that errors are uncorrelated with our instruments. Finally, we run pre-trend or placebo tests of our main specifications using pre-Yu'ebao changes and find no significant effects. These results further suggest that our main findings are driven by the Yu'ebao competition channel and not by some unobserved component of deposit demand.

4 Instant Payments and the Adoption of Tech-enabled MMFs

We begin by showing the value of fast payment technologies to Yu'ebao's popularity. Panel A of Figure 4 shows that the expansion of the Yu'ebao user base in December 2013 was closely correlated with the existing geographical patterns of existing Alipay users. These findings suggest a striking synergy between the adoption of FinTech MMF and the use of a general-purpose digital payment platform.

Additionally, distance matters for technology diffusion. For instance, Keller (2002) finds that the geographical distance severely limits the scope of technology diffusion. Comin et al. (2012) find that technology diffuses more slowly to locations farther away from adoption leaders. As shown in Panel B of Figure 4, we find a negative correlation between the predetermined geographical distance to Yu'ebao's headquarter and the Yu'ebao penetration ratios, consistent with our hypothesis that distance matters for the diffusion and marketing of FinTech products and hence the FinTech adoption rates.

To quantify the correlations, we run the following city-level first-stage regressions:

$$\log E^{YEB}_{c,2013} = \beta_0 + \beta_1 \log E^{ALI}_{c,2013} + X'_c\beta + \epsilon_c \tag{14}$$

$$\log E^{YEB}_{c,2013} = \beta_0 + \beta_1 \log HZdistance_{c,2013} + X'_c\beta + \epsilon_c \tag{15}$$

$$\log E^{YEB}_{c,2013} = \beta_0 + \beta_1 \log E^{ALI}_{c,2013} + \beta_2 \log HZDistance_{c,2013} + X'_c\beta + \epsilon_c \tag{16}$$

Panel A of Table 2 summarizes the regression results. Columns (1) and (2) present significantly positive results using pre-Yu'ebao Alipay penetration as the instrument for Yu'ebao penetration. In the univariate regression in Column (1), a one-percentage-point increase in Alipay penetration ratios leads to a significant 1.14-percentage-point increase in Yu'ebao penetration. The estimate remains at a similar level with a value of 1.11 when we add city-level controls in Column (2), with the adjusted R-squared values slightly increasing from 0.950 to 0.958. These findings show that the ex-ante use of FinTech payment strongly predicts the adoption of Yu'ebao, even after controlling for other city-level characteristics. Columns (3) and (4) replace the IV with Hangzhou distance. These results are somewhat weaker than those using the Alipay instrument, but remain significantly negative. Specifically, a 1% greater distance from Hangzhou corresponds to a -0.579% and -0.352% lower Yu'ebao penetration for specifications with and without controls, respectively. We include both IVs in the first-stage regressions in Columns (5) and (6) and find the results robust. The coefficients on Alipay penetration and Hangzhou distance are significant and have the same signs when used separately as instruments.

Before moving on, we remark that the negative coefficients on $ln(city\_branchshare)$, the log value of each city's share in the national bank branch network, demonstrate the inclusiveness of FinTech banking: Yu'ebao gains more popularity in cities with fewer traditional bank branches, other things being equal. FinTech helps meet the demand for financial services not fully provided by traditional brick-and-mortar bank branches. Our results echo previous findings on FinTech adoption and financial inclusion, such as Hau

et al. (2019); Philippon (2019); Suri et al. (2021); Yang and Zhang (2022).

4.1 Yu'ebao's Impact on Deposit Flows

One concern is that registering a Yu'ebao account does not necessarily lead to actual fund investment into the Yu'ebao MMF. We then examine Yu'ebao purchases (i.e., investing in the Yu'ebao-linked MMF) via withdrawing funds from bank cards, which are what ultimately reflect depositors' preferences for Yu'ebao-linked fund over household deposits.

The first outcome variable we consider is household deposit flows into Yu'ebao, which we track at the city level within the first twelve months following the introduction of Yu'ebao. We also examine the total city-level Yu'ebao balance as of May 2014. Panel A of Figure 5 shows that Yu'ebao user penetration predicts city-level fund flows into Yu'ebao from banks during the 12 months following Yu'ebao's introduction. Additionally, there is a positive relationship between Yu'ebao user penetration and city-level Yu'ebao balance as of May 2014 (one year since its launch), as shown in Panel B of Figure 5.

Table 3 presents the city-level cross-sectional regressions results. We begin with specification (10) using fund flows as the outcome variable. Column (1) shows the univariate baseline OLS results using the log value of the Yu'ebao penetration ratios as the regressor. This regression shows that a one percent increase in Yu'ebao penetration is associated with a 1.5 percent greater deposit flow into Yu'ebao from banks.

However, these results may be an over- or underestimation due to omitted variables; e.g., cities with larger Yu'ebao penetration may have other characteristics in common, such as higher GDP, which result in higher deposits and deposit outflows. We then include a set of city characteristics as control variables to account for factors that affect both FinTech user penetration and future fund flows into Yu'ebao, such as provincial capital dummies, GDP (log scale), population (log scale), and the share of the city's bank branches in the national bank branch network ($branchshare$), all fixed at pre-Yu'ebao val-

ues in 2012. As shown in Column (2), controlling for these city characteristics neither affects the sign nor the statistical significance of the coefficients while reducing the economic magnitude to 1.10.

As for the effects of the other covariates, we find that cities with higher GDP or larger population experience a larger deposit outflow to Yu'ebao, but otherwise no significant difference for provincial capitals. Interestingly, cities with more traditional bank branches (represented by a larger share in the national bank branch network) exhibit a greater deposit outflow holding other observables constant. A possible interpretation is that cities with more bank branches had more severe financial repression before Yu'ebao since a larger fraction of funding would have been kept in regulated deposit accounts prior to Yu'ebao. As Yu'ebao is an important competitor to bank deposits, it is not surprising that these cities experience larger fund outflows after Yu'ebao is launched.

Again, a reverse causality concern applies to these OLS specifications. Hence, we utilize our two instrumental variables discussed earlier. We present the results for the Alipay exposure IV, the Hangzhou distance IV, and the (overidentified) combination of the two in Columns (3), (4), and (5), respectively. Reassuringly, these instruments yield qualitatively similar and statistically robust results that are similar to the baseline specifications. Finally, Table 3 Panel B replicates the preceding regressions using total Yu'ebao balances as of May 2014 in the place of cumulative flows as the left-hand side variable. This variable measures a similar quantity, and the results in Panel B are quite similar to the preceding findings. In both panels, over-identification tests suggest there is some correlation between the instruments and regression errors. While this suggests caution in cleanly interpreting our results as causal. As we show, later, however, these concerns largely vanish at the bank level, which is our primary setting of interest.

To summarize, greater Yu'ebao penetration in a city robustly leads to greater flows out of bank deposits and into Yu'ebao. This finding is true in both the OLS setting and

the quasi-experimental setting using either pre-Yu'ebao Alipay penetration or distance from Hangzhou as instruments. The city-level analysis demonstrates the competitive relationship between Yu'ebao and bank deposits and highlights the importance of FinTech payment to the expansion of Yu'ebao's user base.

5 FinTech Competition and Banks' Response

In this section, we examine deposits at the bank level and study the banks' response to FinTech competition. We begin our bank-level analysis by examining how deposit growth changes by customer type and product type: household versus firm deposits and demand versus time deposits. This approach allows for a more detailed study of which deposit products are more affected by the FinTech competition.

5.1 Impacts on Bank Deposit Growth

We use the variation in city locations of bank branches to construct each bank's exposure to FinTech competition. Mechanically, the FinTech exposure of banks is a linear combination of the city-level FinTech exposure, and likewise, the Hangzhou distance of a bank is the linear combination of city-level distances from Hangzhou. Thus, we expect the relationship between Yu'ebao's penetration and the two instruments to remain intact. Panel B of Table 2 shows the results of bank-level first-stage regressions. As shown in Columns (1) and (2), banks with a 1% greater Alipay exposure are associated with a 1.182% and 1.204% greater Yu'ebao exposure, respectively. Columns (3) and (4) demonstrate that banks with a greater distance from Hangzhou have less exposure to Yu'ebao, where a 1% lower distance to Hangzhou is associated with a 0.630% and 0.411% greater Yu'ebao exposure, respectively. The instruments are statistically significant and robust both when used alone and together, as shown in Columns (5) and (6), respectively. The findings are

similar to our city-level first-stage results.

We decompose the growth rates of bank deposits by household and firm deposits and regress them on banks' exposure to FinTech competition. Yu'ebao offers immediate liquidity through a platform oriented towards retail users, making it a close substitute, particularly for household demand deposits. Therefore, the launch of Yu'ebao should mainly affect the growth rate of personal/household deposits rather than that of corporate/firm deposits and have a larger impact on retail demand deposits than retail time deposits.

The regression results in Table 4 are consistent with our hypothesis. We find the effects of FinTech competition to be significantly negative for the growth rate of household deposits, as shown in Panel A, but insignificant for the growth rate of firm deposits, as shown in Panel B, even after we include the initial level of household and firm deposits to control for the mean reversion effect. Specifically, a 1% increase in Yu'ebao exposure leads to a 7-9% decrease in household deposit growth. The effect is economically large relative to, e.g., own-price elasticities of demands estimated in other contexts, which tend to be around 1 (see, e.g., Ho and Ishii, 2011). Our IV results are strong and robust, as reported in Columns (2)–(4). Since Yu'ebao is not designed to compete with corporate deposits, the regression on corporate deposits can be regarded as a placebo test as these two types of savings cater to different clientele.

Breaking down the categories of household deposits further, Panels C and D of Table 4 show that Yu'ebao competition depresses household demand deposit growth but not household time deposit growth. These findings support our argument that the FinTech-payment-enabled MMF is a close substitute to banks' demand deposits, imposing significant competitive pressure on the retail end of banking. Recall that Yu'ebao is the closest substitute for household (as opposed to firm) and demand (as opposed to time) deposits. Thus, we expect a stronger relationship between household demand deposit growth and

Yu'ebao than all other deposit segments. We additionally examine the differentiated impact on banks with different characteristics, such as bank size, bank branch share, and banks' reliance on deposits for funding. Finally, when taking advantage of our two instruments to run over-identification tests, we cannot reject the null hypothesis that one of the two instruments is exogenous to the unobserved errors.

So far, an unaddressed identification concern is that banks with higher exposure to FinTech competition are systematically different from those with lower exposure in terms of deposit growth. In other words, deposit growth may be on a different pre-trend for the most exposed versus leased exposed banks. To rule out this possibility, we run a placebo test of the preceding regressions by changing the time period of the outcome variable from 2012-2014 to 2010-2012. A significant result here would indicate important differences in deposit growth that are not plausibly related to the Yu'ebao competition mechanisms we have in mind.

Panel A of Table 5 shows the regression results of this placebo test. All coefficients before the FinTech exposure (including the IV results) are insignificant, which supports our argument that deposit-like FinTech products' introduction leads to a decline in banks' deposit growth rather than a merely fortuitous correlation with some unobserved driver of deposit growth. Furthermore, the null result in this placebo test shows that the effect is not driven solely by the entry of a new FinTech *payments* system. In other words, it is not simply the fact that banks lose business to a competing payment technology that causes bank deposits to flow out of the banking system because the Alipay has existed for about a decade by then. Rather, exposure to FinTech matters for deposits only around the introduction of Yu'ebao, which bundles payments with more competitive, unrepressed interest rates.

To examine the longer-run impact of FinTech competition on deposit growth, we expand the horizon in the baseline regression that examines deposit growth rates between

2012 and 2014. Panels B and C of Table 5 present the regression results of deposit growth rates between 2012-2015 and between 2012-2016, respectively. Similar to our baseline results, the coefficients are significantly negative on household deposits and insignificant on corporate deposits. The competitive effect of Yu'ebao on bank deposits seems long-lasting. Finally, in all cases, our results pass the over-identification tests.

To summarize, the negative effect of Yu'ebao on deposit growth is concentrated in the segment for which it offers the best substitute, household demand deposits. These results support the FinTech competition channel: (1) FinTech creates a close substitute to bank demand deposits through the combination of payment features and market-determined interest rates, which is a major selling point of the FinTech product; (2) the competition between Yu'ebao and bank deposits is strongest for retail depositors, rather than the wholesale or institutional clientele since the low investment threshold and no cash-out fee features of Yu'ebao appeal mainly to retail investors.

5.2 Banks' Retail Product Innovation

The previous section has highlighted significant deposit outflows—particularly among household demand deposits, which are close substitutes for Yu'ebao—from the banks most exposed to Yu'ebao. In this section, we examine banks' responses. In particular, we ask whether the exposed banks begin to offer competing *bao* products - those with a market interest rate and payment features through T+0 no-cost redemption.

While Yu'ebao was the first of its kind, the banks could respond by introducing their own *bao* products. In fact, banks in China could have offered and aggressively marketed their own market-rate products to households by enabling payment features of MMFs prior to the FinTech competition. However, they did not. We posit that incumbent banks in China chose not to undertake this regulatory arbitrage before Yu'ebao's introduction because they collectively benefited from the low interest rate cap, and the regulation

may serve as a coordination device for them not to deviate from the repressive interest rate. Owing to their considerable concentration in the deposit market, introducing MMFs would have cannibalized their own lower interest rate deposit base.

Using our hand-collected dataset of *bao* products, we define a dummy for whether bank b offers a competing Yu'ebao-like MMF by the end of 2017, roughly four-and-a-half years after Yu'ebao's introduction, around the time that Yu'ebao crossed the one-trillion yuan assets-under-management mark. We then test whether banks with greater Yu'ebao exposure were more likely to introduce these products than other banks, regressing the dummy variable bao_b on Yu'ebao exposure and bank-level controls.

We find strong affirmative evidence through the linear regressions, as summarized in Panel A of Table 6. Column (1) shows the baseline OLS result with control variables. A one percent increase in Yu'ebao exposure is associated with a roughly 12% greater likelihood of the bank introducing a *bao* product within the time frame. Columns (2)–(4) instrument Yu'ebao exposure with Alipay penetration, Hangzhou distance, and both, respectively. Across these instrumental variable specifications, we find robust evidence that exposure to Yu'ebao competition causes banks to introduce competing *bao* products. Banks facing more Yu'ebao competition tend to respond by rolling out their own products with a market interest rate, enabling their deposit customers to access market interest rates on their savings, even if they do not actually move their money to Yu'ebao yet.

The control variables in these regressions provide additional insight into which banks introduced *bao* products beyond their differential exposure to Yu'ebao. Other things being equal, larger banks and those relying more on deposit funding are more likely to launch *bao*-type products. Interestingly, banks with more branches are less likely to keep up with the FinTech competition, although the strength of this association is weak. Several potential explanations exist. One is the replacement cost: banks with more brick-and-mortar bank branches may find it more expensive to introduce innovations that would

attract fund flows away from bank deposits. Another explanation is clientele differentiation: banks with more brick-and-mortar branches may have deposit customers of the type (e.g., older people) that differ from the target users of FinTech products.

As a robustness check, we run the preceding analysis with a hazard model, which allows us to take advantage of the time-dependent structure of the starting time of the *bao* products. The hazard specification uses the (potentially truncated) time to introduce bao products as the outcome variable, and we follow a standard hazard specification modeling the hazard rate $\lambda(t; X)$ as

$$\lambda(t; X) = \lambda_0(t) \exp(\beta_0 + \beta_1 \log E^{YEB}_{b,2013} + X'_b\beta) \tag{17}$$

where $\log E^{YEB}_{b,2013}$ is the bank's direct or instrumented exposure to Yu'ebao, and X'_b represents the bank-level controls. As shown in Panel B of Table 6, the coefficients from the hazard model strongly confirm the earlier linear probability models' findings, and as before, the IV results are consistent with the baseline. In other words, the likelihood that a bank rolls out a *bao* product rises with the extent of the exposure to Yu'ebao competition. The FinTech competition helps to end the financial repression for bank customers. In addition, banks with a larger size and fewer brick-and-mortar branches are more likely to launch *bao* products.

5.3 Understanding the Mechanisms

To shed more light on the mechanisms that made Yu'ebao such a strong competitor to bank deposits, we study two channels by collecting additional detailed fund-level information (beyond money market funds and Alipay). First, we hypothesize that digital technology-enabled convenience has played a significant role in the successful distribution of Yu'ebao compared to MMFs distributed through banks. Second, we hypothesize

that the deposit-like features of Yu'ebao—the T+0 redemption feature and low minimum investment amounts—made it a strong competitor to traditional bank deposits.

To examine the role of the tech-enabled distribution channel in Yu'ebao's growth, we study how the growth of *all* mutual fund products—not only Yu'ebao—varies with the funds' distribution channel. We consider three different distribution channels: through Ant, through non-Ant tech platforms such as WeChat (Tencent) or fund.eastmoney.com (also known as Tiantian Fund Net), and through traditional banks. We exploit the fact that funds add distribution channels over time to run a staggered DID analysis and dynamic event study with the following specifications:

$$\begin{aligned} Y_{it} &= \beta_1 Post_{it} + \beta_2 Post_{it} \times MMF_i \\ &\quad + Fund_i + D_t \times FundCompany_i + D_t \times FundType_i + \epsilon_{it} \end{aligned} \tag{18}$$

$$\begin{aligned} Y_{it} &= \sum_{\tau \neq -1} \beta_{tau} AdoptionLag(\tau)_{i\tau t} \\ &\quad + Fund_i + D_t \times FundCompany_i + D_t \times FundType_i + \epsilon_{it} \end{aligned} \tag{19}$$

Y_{it} is the outcome of interest, primarily $\log(Net\ Asset\ Value)$, although we examine fund yields to rule out other changes to the fund at the time of the distribution change. In the difference-in-difference specification, $Post_{it}$ is a zero-one indicator for whether the fund is being offered through the distribution channel of interest. In the difference-in-difference specification, we also include an interaction with whether the fund is an MMF, MMF_i, to examine whether the effect is particularly pronounced for these funds that are close substitutes for bank deposits. $Fund_i$ is a fund fixed effect. $D_t \times FundCompany_i$ is a date-cross-fund-company fixed effect that controls for contemporaneous fund company events, such as increased marketing that may coincide with a change in the distribution channel. $D_t \times FundType_i$ is a date-cross-fund fixed effect that controls for contemporaneous changes in consumer demand for certain fund types that may coincide with a change

in the distribution channel. In the event study specification, $AdoptionLag(\tau)_{i\tau t}$ is an indicator for whether fund i's adoption of a particular channel occurred τ years from date t, with $\tau = -1$ quarters as the base year. We use a five-quarter event window. Identification in this regression comes through the fact that a single fund company has multiple funds with different distribution channels that change at different times. The key identifying assumption is parallel trends in the absence of the treatment, and we examine pre-trends in the dynamic event study to verify that this is plausible.

Table 7 shows the regression results, with Panels A, B, and C examining when funds adopt Ant, another tech platform, or a bank as a distribution channel, respectively. The main outcome of interest is shown in Column (1), which examines the logarithm of fund NAV. We find that around the time that the fund adds Ant as a distribution channel, fund NAV increases by roughly 10% for non-MMF funds, while fund NAV increases by an additional 87.5% for MMF funds, for a combined effect of nearly 100%. Panel (b) shows a larger effect for non-MMF funds for non-Ant tech platforms, with a smaller incremental effect on MMF funds, netting out to roughly the same total increase for MMF funds. In contrast, Panel C shows no significant effect from adding a bank distribution channel for non-MMF funds and only a modest increase for MMF funds.

Figure 6 shows the event studies without conditioning on the fund type. For Ant and non-Ant tech distribution, we find no evidence of pretrends, with a sharp increase in fund NAV following digital channel adoption. In contrast, we find no such effect for banks. In sum, the digital technology-enabled channels have a significant edge over banks in promoting the adoption of mutual fund products by Chinese households, and the effect is especially strong for MMFs.

A potential concern is that funds change in other ways contemporaneous to switching distribution channels. These other changes could drive fund NAV growth rather than the new distribution channel *per se*. For example, mutual fund companies may offer more

attractive yields for products sold on tech-enabled platforms. To rule out this alternative channel, we utilize the same empirical framework to test whether fund benchmark yield or excess yield also changes. A significant effect here would suggest that some non-distribution channel is at work. We show these results in Columns (2)-(3) of Table 7. Consistent with the distribution channel explanation, we find no significant effects on these characteristics around fund distribution channel changes.

Note that almost all tech-enabled platforms, including Ant, would take advantage of their lower operating costs (than banks) by offering a discount on the purchasing fees to their investors for non-MMF mutual fund companies. In other words, a lower purchasing fee on tech platforms is a choice of the tech platforms, not mutual fund companies. This likely has played a role in promoting the sale of these funds on the tech platforms. However, since money market funds have no purchasing fees to start with, there is no difference in the purchasing fees across different channels. Therefore, particularly in the case of MMFs, tech platforms' convenience appears to be primarily responsible for their success in distributing mutual funds.

To summarize, Yu'ebao's distribution channel—through a large, well-known, and convenient tech platform, was instrumental in its growth, particularly for MMFs, which are a close substitute to bank deposits. Broadly, funds distributed through tech platforms like Ant see sharp inflows, while funds distributed through traditional bank channels see much smaller effects. Our results, which show the biggest effect on MMFs distributed by Ant, highlight the importance of fast payment features for the adoption of MMFs.

Second, to show that Yu'ebao's deposit-like features were critical in its growth, we examine banks' competitive response among WMPs that do not have these features. WMPs are retail investment products issued by banks to target wealthy households. These products offer yields close to the market rate but do not support T+0 redemption and instant payments. Most importantly, WMPs require a high minimum investment level, typically

in excess of 10,000 RMB during our sample period, making them inaccessible to most ordinary households. If the channel for our findings is through the competitive pressures on demand deposits held by almost all households, we may find little effect of the Yu'ebao exposure on the issuance and yields of those WMPs.

Our argument is confirmed in Table A2. Contrary to their response in rolling out *bao* products, banks do not appear to change WMP issuance and yields according to their exposure to FinTech. This result is consistent with our main idea that it is the FinTech competition that induces banks to innovate and launch *bao* products, which benefits households with higher market interest rates and facilitates interest rate liberalization reform in China. While previous studies focus on shadow bank products tailored to wealthy clients (e.g., WMPs) and the period around the 2008 financial crisis,[28] we investigate the financial inclusion in household savings achieved through tech-enabled MMFs and how the rapid development of mobile payments in the past decade facilitate the process. We note that the regression results in this table also serve as a placebo test that helps to rule out the possibility that those banks more exposed to Yu'ebao competition happen to be the types of banks that would have issued mutual fund products generally anyway. In addition to serving as a successful placebo test, over-identification tests in these tables do not reject that the instruments are uncorrelated with errors in the regressions.

6 Further Analysis

In this section, we analyze the impact of the entry of FinTech competition on traditional bank profitability and risk-taking activities. We examine the impact on bank balance sheet measures of profitability and costs, including net interest margin, risky asset ratio, and

[28] Prominently, Acharya et al. (2024) find that deposit competition due to the fiscal stimulus and branch expansion of a large, state-owned bank increased other smaller banks' reliance on shadow banking. Particularly, banks exposed to this deposit competition issued Wealth Management Products (WMPs)—off-balance-sheet substitutes for deposits with high investment thresholds and a major component of China's shadow banking system.

bad loan ratios.

6.1 FinTech's Impact on Bank Performance

The previous analysis suggests that banks and cities most exposed to Yu'ebao see reduced deposit growth—particularly among the products for which Yu'ebao is the closest substitute, household demand deposits. This presents a potential policy concern in that these deposit outflows may negatively impact bank profitability and financial stability. To assess the economic significance of this effect, we use the bank-level OLS and IV specifications to examine changes in bank financials from 2012 to 2014.[29]. We examine changes in net interest margin, profits, revenues, and costs. The empirical strategy exactly mirrors that used before for the bank-level analysis, and so we move directly to the results.

While a large outflow from the banking system is a potential cause for concern among banking regulators, we find that, surprisingly, cross-sectional differences in outflows had little differential impact on bank balance sheets. As shown in Panel A of Table 8, the most exposed banks saw no greater changes in performance measured as net interest margins (NIMs), suggesting that the deposit outflows did not significantly hamper banks' ability to engage in traditional spread lending. Most of the variation in NIMs is absorbed by the initial values, i.e., the starting value in 2012, suggesting significant mean reversion in these measures but little cross-sectional differences related to exposure to Yu'ebao. These findings are robust to alternative measures of banks' profitability associated with interest rates, such as the net interest spread (NIS) shown in Panel B of Table 8.

[29]There was a regulatory change in the reporting standard of commercial bank balance sheets in 2013. However, to the extent that the impact of the reporting standard change is not proportional to banks' exposure to the Yu'ebao shock, our regression results are unaffected by this change.

6.2 Transmission to Bank Lending

One interesting question to explore is whether the FinTech competition in the deposit market leads to changes in the lending market (e.g., Drechsler, Savov, and Schnabl, 2023). Notably, Yu'ebao does not provide direct lending to households and firms. Rather, it mainly holds assets in the form of certificate of deposits and bonds issued by banks, i.e., the funding attracted by Yu'ebao largely flows back to the banking sector, with interest rate liberalization and distributional implications. In Table A3, we regress bank-level loan growth rates on their exposure to Yu'ebao and find negative coefficients. Panel A shows that a one-standard-deviation increase in FinTech exposure reduces banks' corporate loan growth rate by $0.21 * 30.995 = 6.5$ percentage points, which is statistically significant at the 95% confidence interval. Translating into economic significance, the coefficient is equivalent to a $6.5/22.34 = 30\%$ reduction in loan growth rate. We further decompose the growth rate by the size of borrowing firms in Panels B-D and find the effects most pronounced among small firms. These findings are consistent with the deposit-loan transmission mechanism, suggesting that banks adjust their lending strategy to cope with increased competitive pressure in the deposit market.

We next examine whether the most exposed banks differentially increased the risk of their assets as measured as bad loan ratios or the share of risky assets in total assets. As shown in Panel C of Table 8, those banks with greater exposure to Yu'ebao do not experience a significant increase in their bad loan ratios from 2012 (the year before Yu'ebao) to 2014 (one and a half years after the launch of Yu'ebao). Similarly, there is no evidence that those banks more exposed to Yu'ebao competition raise their share of risky loans in total assets. If anything, there is some evidence that they might have lowered their exposure to risky loans. In no case do over-identification tests reject that the instruments are uncorrelated with regression errors. Thus, the Yu'ebao competition does not appear to induce banks to engage in more on-balance-sheet risk-taking activities.

To summarize, the exit of bank deposits from the traditional banking system is potentially a concern for regulators. One possibility is that facing greater deposit competition, banks become less profitable and the stability of the financial system is undermined. However, we find that the banks most exposed to Yu'ebao did not see compressed net interest margins or reduced profitability. Rather, the most exposed banks responded by launching their competing products. Our results suggest that innovation and efficiency improvement by exposed banks can help them avoid large losses and further alleviate financial repression in the retail deposit market.

We flag several limitations in our approach. First, our analysis is cross-sectional and therefore cannot cleanly identify aggregate, time-series effects. However, given the robustly insignificant results on bank profitability in the face of significant cross-sectional heterogeneity in the treatment and deposit outflows, it is unlikely that aggregate effects on bank profitability could be large. Second, our paper focuses on Yu'ebao in its early stages without analyzing the longer-term impact of FinTech competition on traditional banks. This is particularly relevant for outcomes around bank risk-taking. While we found no effects on loan riskiness or ex-post performance, these effects may take longer to materialize than we would be able to detect in our analysis window. Third, the impact of FinTech products in their early stages may differ from those in their mature stages. In April 2017, Yu'ebao became the largest money-market fund in the world, with assets under management totaling $165.5 billion. This surpassed even JP Morgan Chase's US Government market fund with assets under management (AUM) of $150 billion. This unprecedented size could bring significant liquidity and systematic risks that have yet to materialize.

With these concerns, regulators in China have begun to enhance regulations on MMFs, for example, by restricting the use of T+0 redemption and limiting the size of any single MMF. Examining the long-term impact of FinTech competition is therefore a meaningful and fruitful path for future research.

6.3 FinTech Innovation and Financial Inclusion

Looking back at history, one criticism of Regulation Q is about its impact on wealth distribution, as deposit interest rate ceilings discriminate against relatively less wealthy savers. When market interest rates were above the ceiling rates, the wealthier investors shifted their deposits to money market securities. Moreover, deposits in denominations of $100,000 or more were exempted from Regulation Q in June 1970.

We find similar patterns in China. For wealthy and financially sophisticated customers, banks offer wealth management products (WMPs) with market returns even before the arrival of Yu'ebao. These products typically had a high minimum investment requirement that exceeded what a typical Chinese household's demand deposit savings. The typical investment threshold of WMPs is approximately 50,000 RMB, much higher than the median financial assets of 6,000 RMB held by Chinese households as of 2011. To put these numbers in perspective, the annual disposable income in China was 18,311 RMB per capita in 2013, according to the National Bureau of Statistics.[30] In per capita terms, the middle 20% Chinese households earn a gross income of 24,531 RMB and spend 20,447 RMB in 2012, leaving only 4,084 RMB for potential savings.[31] In comparison, Yu'ebao is an inclusive financial innovation with virtually no minimum requirement, with individual shareholders accounting for 99.25% in shares and the average holding of each shareholder being 2,717.32 RMB.

To further explore the financial inclusion effect of Yu'ebao, we utilize the China Household Finance Survey (CHFS), run by the Southwestern University of Finance and Economics, with a nationally representative sample (e.g., Badarinza, Balasubramaniam, and Ramadorai, 2019) of 28,141 and 37,194 households in the 2012 and 2014 waves, respectively. We construct a panel data set of 21,702 households present in both waves of CHFS

[30] Statistical Bulletin on National Economic and Social Development in 2013, https://www.stats.gov.cn/sj/zxfb/202302/t20230203_1898455.html.

[31] Basic Information of Urban Households by Income Level (2012), National Bureau of Statistics, https://www.stats.gov.cn/sj/ndsj/2013/html/Z1106C.htm.

and from 161 cities in 29 provinces.[32] We then ask which types of households are more likely to adopt tech-enabled MMFs as of 2015. We classify people into different categories based on their characteristics in 2012, which include self-reported annual income $Income$, whether a household pays attention to financial news $FAttention$,[33] and whether a household has ever heard of stocks or equity funds $FLiteracy$.[34] We expect FinTech innovations like Yu'ebao, with low investment thresholds and a convenient interface, to more significantly benefit people with fewer incomes, lower financial literacy levels, and less access to the financial markets.

Table 9 reports the marginal effects of logit regressions on household characteristics. Our primary outcome variable is households' participation in FinTech MMFs, represented by Yu'ebao of Alipay and Licaitong of Tencent, as of the 2014 survey time (Yes = 1). We measure Yu'ebao exposure as the Yu'ebao penetration ratio as of December 2013 in the household's city of residence using a publicly available index established by Peking University and the Ant Group. We find that households' exposure to Yu'ebao in the early stage significantly predicts their participation rates in FinTech MMFs. As shown in Column 1, while wealthy households are more likely to purchase FinTech MMFs, households who earn lower incomes benefit more from local exposure to Yu'ebao. We find similar patterns for people with little financial literacy (Column (2)). Additionally, those households who pay more attention to financial news also increase their FinTech MMF participation by a larger extent, suggesting that actively searching for financial news expands households' investment options. In Column (4), we include all heterogeneity features into one

[32] In Mainland China, there are 330 prefecture-level cities distributed among 31 province-level geographic regions (including five autonomous regions and four municipalities), plus Hong Kong, Macau, and Taiwan.

[33] We construct this financial attention measure using households' answers to Question A4002, "To what extent do you pay attention to economic and financial news?" $FAttention$ equals one if households chose "Extremely" or "Very" and zero for "So-so," "Seldom," and "Never."

[34] We construct this financial literacy measure using households' answers to Question A4007, "Do you think that generally speaking, buying a single company's stock is riskier than buying a stock fund?" $FLiteracy$ equals one if households chose "Yes" and zero for answering "No," "I have not heard of stocks," "I have not heard of stock funds," and "I have not heard of either."

regression and find the coefficients are still statistically significant. These findings resonate with a broader literature documenting that FinTech is disproportionately used in places with fewer bank branches, lower incomes, and less privileged households (e.g., Erel and Liebersohn, 2022).

7 Conclusion

We provide the first systematic investigation into the potential of FinTech to be a bottom-up liberalizing force in developing economies that are potentially hampered by financial repression. We examine the equilibrium effect of a new FinTech entrant that competes directly with bank household demand deposits in China, where the interest rates of bank deposits are constrained far below the apparent laissez-faire level by government-imposed interest rate caps. The entry of Yu'ebao, China's first MMF that offers deposit-like services through FinTech payment combined with market rates, has the effect of siphoning deposits out of the traditional banking system. Cities and banks with the greatest exposure to Yu'ebao faced the most significant deposit outflows. We employ several instrumental variable strategies to draw a causal relationship. Interestingly, banks exposed to FinTech competition responded by launching their own competing products and did not experience compressed net interest margins or reduced profitability. Our findings highlight both the direct effect of deposit-like FinTech products that were not subject to interest rate caps and the indirect effect of banks' competition-induced innovation on mitigating financial repression in the retail deposit market.

Taking a more global view, our research is relevant to other cases of explicit (i.e., government-led) or implicit (i.e., arising because of bank market power) financial repression, and how outsiders can effect bottom-up liberalization. For example, in the case of Regulation Q in the United States, outsider thrifts and savings and loan companies were exempt. These smaller, exempt players played a similar role to Yu'ebao in our paper's

context, even though they still existed within the financial sector. In the Chinese case, we highlight the competition from outside the traditional financial sector and the key role of tech companies in leapfrogging and adopting cutting-edge technologies. As digital payment and other non-traditional financial services grow worldwide, the Chinese experience—where the rise of FinTech did not destabilize the traditional banking system but rather spurred competitive innovation—holds important lessons for understanding the efficiency and stability consequences of FinTech innovations in other countries.

References

Acharya, V. V., Q. Jun, Y. Su, and Z. Yang (2024). Fiscal Stimulus, Deposit Competition, and the Rise of Shadow Banking: Evidence from China. *Management Science*.

Agarwal, S., P. Ghosh, J. Li, and T. Ruan (2024). Digital Payments and Consumption: Evidence from the 2016 Demonetization in India. *Review of Financial Studies 37*(8), 2550–2585.

Agarwal, S., W. Qian, Y. Ren, H.-T. Tsai, and B. Y. Yeung (2020). The Real Impact of FinTech: Evidence from Mobile Payment Technology.

Alok, S., P. Ghosh, N. Kulkarni, and M. Puri (2024). Does Open Banking Expand Credit Access? *Working Paper*.

Bachas, P., P. Gertler, S. Higgins, and E. Seira (2018). Digital Financial Services Go a Long Way: Transaction Costs and Financial Inclusion. *AEA Papers and Proceedings 108*, 444–448.

Bachas, P., P. Gertler, S. Higgins, and E. Seira (2021). How Debit Cards Enable the Poor to Save More. *Journal of Finance 76*(4), 1913–1957.

Badarinza, C., V. Balasubramaniam, and T. Ramadorai (2019). The Household Finance Landscape in Emerging Economies. *Annual Review of Financial Economics 11*(Volume 11, 2019), 109–129.

Badarinza, C., J. Y. Campbell, and T. Ramadorai (2016). International Comparative Household Finance. *Annual Review of Economics 8*(Volume 8, 2016), 111–144.

Bai, C.-E., D. D. Li, Y. Qian, and Y. Wang (2001). Financial repression and optimal taxation. *Economics Letters 70*(2), 245–251.

Becker, B. and V. Ivashina (2018). Financial Repression in the European Sovereign Debt Crisis*. *Review of Finance 22*(1), 83–115.

Bharadwaj, P. and T. Suri (2020). Improving Financial Inclusion through Digital Savings and Credit. *AEA Papers and Proceedings 110*, 584–588.

Boot, A. W. (2017). The future of banking: From scale & scope economies to fintech. *European Economy*.

Brunnermeier, M. K., H. James, and J.-P. Landau (2019). The Digitalization of Money. *Working paper*.

Brunnermeier, M. K., N. Limodio, and L. Spadavecchia (2023). Mobile Money, Interoperability, and Financial Inclusion. *NBER Working Paper*.

Brunnermeier, M. K., M. Sockin, and W. Xiong (2020). China's model of managing the financial system. Working Paper, National Bureau of Economic Research.

Buchak, G., G. Matvos, T. Piskorski, and A. Seru (2018). Beyond the balance sheet model of banking: Implications for bank regulation and monetary policy. Working Paper, National Bureau of Economic Research.

Campbell, J. Y. (2006). Household Finance. *Journal of Finance 61*(4), 1553–1604.

Chari, V. V., A. Dovis, and P. J. Kehoe (2020). On the Optimality of Financial Repression. *Journal of Political Economy 128*(2), 710–739.

Chen, Z. and Z. Jiang (2022). The Liquidity Premium of Digital Payment Vehicle. *Working Paper*.

Comin, D. A., M. Dmitriev, and E. Rossi-Hansberg (2012). The Spatial Diffusion of Technology. *Working Paper*.

Crouzet, N., A. Gupta, and F. Mezzanotti (2023). Shocks and Technology Adoption: Evidence from Electronic Payment Systems. *Journal of Political Economy 131*(11), 3003–3065.

Di Maggio, M., P. Ghosh, S. K. Ghosh, and A. Wu (2024). Impact of Retail CBDC on Digital Payments, and Bank Deposits: Evidence from India. *NBER Working Paper*.

Diamond, D. W. and P. H. Dybvig (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy 91*(3), 401–419.

Diaz-Alejandro, C. (1985). Good-bye financial repression, hello financial crash. *Journal of Development Economics 19*(1), 1–24.

Drechsler, I., A. Savov, and P. Schnabl (2017). The Deposits Channel of Monetary Policy*. *The Quarterly Journal of Economics 132*(4), 1819–1876.

Drechsler, I., A. Savov, and P. Schnabl (2020). The Financial Origins of the Rise and Fall of American Inflation. *Working paper*.

Drechsler, I., A. Savov, and P. Schnabl (2021). Banking on Deposits: Maturity Transformation without Interest Rate Risk. *Journal of Finance 76*(3), 1091–1143.

Drechsler, I., A. Savov, and P. Schnabl (2023). Credit Crunches and the Great Stagflation. *Working paper*.

Duffie, D., T. Foucault, L. Veldkamp, and X. Vives (2022, May). *Technology and Finance*. CEPR Press.

Erel, I. and J. Liebersohn (2022). Can FinTech reduce disparities in access to finance? Evidence from the Paycheck Protection Program. *Journal of Financial Economics 146*(1), 90–118.

Fry, M. J. (1980a). Money and Capital or Financial Deepening in Economic Developments? In W. L. Coats and D. R. Khatkhate (Eds.), *Money and Monetary Policy in Less Developed Countries*, pp. 107–113. Pergamon.

Fry, M. J. (1980b). Saving, investment, growth and the cost of financial repression. *World Development 8*(4), 317–327.

Fry, M. J. (1997). In Favour of Financial Liberalisation. *Economic Journal 107*(442), 754–770.

Gennaioli, N., A. Shleifer, and R. W. Vishny (2013). A model of shadow banking. *Journal of Finance*.

Gilbert, R. A. (1986). Requiem for Regulation Q: What It Did and Why It Passed Away. *Federal Reserve Bank of St. Louis Review 68*, 22–37.

Giovannini, A. and M. de Melo (1991). Government Revenue from Financial Repression. *NBER Working Paper*.

Goldstein, I., W. Jiang, and G. A. Karolyi (2019). To FinTech and beyond. *Review of Financial Studies 32*(5), 1647–1661.

Hau, H., Y. Huang, H. Shan, and Z. Sheng (2019). How FinTech Enters China's Credit Market. *AEA Papers and Proceedings 109*, 60–64.

Hellmann, T. F., K. C. Murdock, and J. E. Stiglitz (2000). Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough? *American Economic Review 90*(1), 147–165.

Higgins, S. (2024). Financial Technology Adoption: Network Externalities of Cashless Payments in Mexico. *American Economic Review 114*(11), 3469–3512.

Ho, K. and J. Ishii (2011). Location and competition in retail banking. *International Journal of Industrial Organization 29*(5), 537–546.

Hong, C. Y., X. Lu, and J. Pan (2020). FinTech Adoption and Household Risk-Taking. *NBER Working Paper*.

Hong, C. Y., X. Lu, and J. Pan (2024). Fintech Platforms and Mutual Fund Distribution. *Management Science*.

Jack, W., A. Ray, and T. Suri (2013). Transaction Networks: Evidence from Mobile Money in Kenya. *American Economic Review 103*(3), 356–361.

Jack, W. and T. Suri (2014). Risk Sharing and Transactions Costs: Evidence from Kenya's Mobile Money Revolution. *American Economic Review 104*(1), 183–223.

Jacklin, C. J. (1987). Demand deposits, trading restrictions, and risk sharing. *Contractual Arrangements for Intertemporal Trade 1*, 26–47.

Jiang, E., G. Matvos, T. Piskorski, and A. Seru (2020). Banking without deposits: Evidence from shadow bank call reports. Technical report, National Bureau of Economic Research.

Jiang, W., Y. Tang, R. J. Xiao, and V. Yao (2021). Surviving the Fintech Disruption. *NBER Working Paper*.

Kaminsky, G. L. and S. L. Schmukler (2008). Short-Run Pain, Long-Run Gain: Financial Liberalization and Stock Market Cycles*. *Review of Finance 12*(2), 253–292.

Kane, E. J. (1988). Interaction of Financial and Regulatory Innovation. *American Economic Review 78*(2), 328–334.

Keller, W. (2002). Geographic Localization of International Technology Diffusion. *American Economic Review 92*(1), 120–142.

Kroszner, R. S. and P. E. Strahan (1999). What Drives Deregulation? Economics and Politics of the Relaxation of Bank Branching Restrictions. *Quarterly Journal of Economics 114*(4), 1437–1467.

La Porta, R., F. Lopez-De-Silanes, and A. Shleifer (2002). Government Ownership of Banks. *Journal of Finance 57*(1), 265–301.

La Porta, R., F. Lopez-de Silanes, and A. Shleifer (2008). The Economic Consequences of Legal Origins. *Journal of Economic Literature 46*(2), 285–332.

La Porta, R., F. Lopez-De-Silanes, A. Shleifer, and R. W. Vishny (1997). Legal Determinants of External Finance. *Journal of Finance 52*(3), 1131–1150.

Lucas, R. E. (2013). Glass-Steagall: A Requiem. *American Economic Review 103*(3), 43–47.

McKinnon, R. I. (1973). *Money and Capital in Economic Development*. Brookings Institution Press.

Morck, R. K. and L. Steier (2005). The Global History of Corporate Governance: An Introduction. *NBER Working Paper*.

Moreira, A. and A. Savov (2017). The macroeconomics of shadow banking. *Journal of Finance*.

Ouyang, S. (2021). Cashless Payment and Financial Inclusion. *Working Paper*.

Parlour, C. A., U. Rajan, and H. Zhu (2022). When FinTech Competes for Payment Flows. *Review of Financial Studies 35*(11), 4985–5024.

Peltzman, S. (1976). Toward a More General Theory of Regulation. *Journal of Law and Economics 19*(2), 211–240.

Philippon, T. (2019). On Fintech and Financial Inclusion. *NBER Working Paper*.

Puri, M., Y. Qian, and X. Zheng (2024). From Competitors to Partners: Banks' Venture Investments in Fintech. *Working paper*.

Reinhart, C. (2012). The Return of Financial Repression. *Working paper*.

Sarkisyan, S. (2024). Instant Payment Systems and Competition for Deposits. *Working paper*.

Shaw, E. S. (1973). *Financial Deepening in Economic Development*. Oxford University Press, New York.

Stiglitz, J. E. (1993). The Role of the State in Financial Markets. *The World Bank Economic Review 7*(suppl_1), 19–52.

Suri, T., P. Bharadwaj, and W. Jack (2021). Fintech and household resilience to shocks: Evidence from digital loans in Kenya. *Journal of Development Economics 153*, 102697.

Vallee, B. and Y. Zeng (2019). Marketplace lending: A new banking paradigm? *Review of Financial Studies*.

Xiao, K. (2020). Monetary transmission through shadow banks. *Review of Financial Studies*.

Xiong, W. (2018). The mandarin model of growth. *Working Paper*.

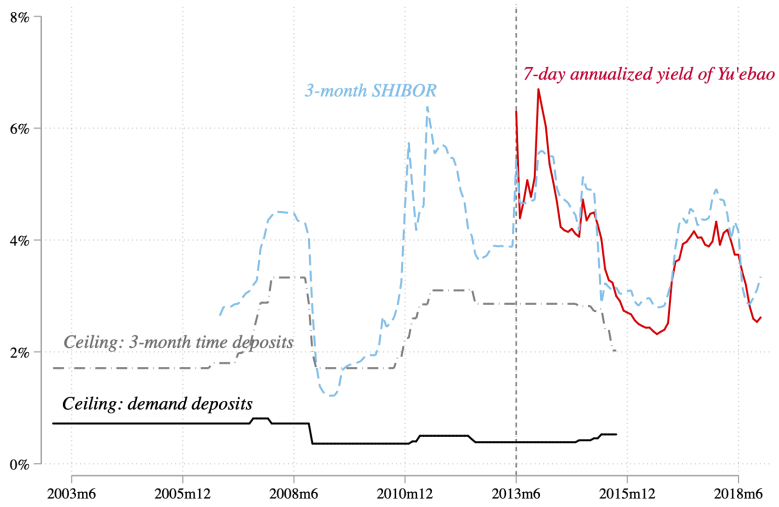
Yang, T. and X. Zhang (2022). FinTech adoption and financial inclusion: Evidence from household consumption in China. *Journal of Banking & Finance 145*, 106668.

Yao, V. and Q. Wang (2022). Fintech, Market Power and Monetary Transmission. *Working Paper*.

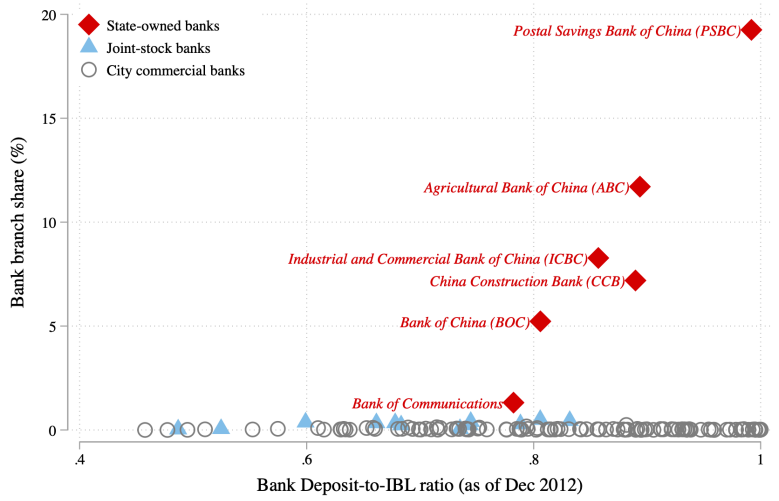
Zhang, A. T. (2021). Estimation of high-dimensional dynamic games: Fintech lenders and bank branch closures.

Figure 1: Financial Repression in China

Note: This figure illustrates the financial repression in China, which is characterized by interest rate ceiling regulations and a highly-concentrated banking industry. Panel A shows the regulated interest rates of bank deposits and the market interest rates in the money market fund (MMF) industry in China during 2010-2018. The red solid line represents the 7-day annualized yield of Yu'ebao, the first FinTech MMF in China; the blue dashed line refers to the 3-month Shanghai Inter-bank Offered Rates (SHIBOR); the grey dash-dot line is the maximum interest rate on 3-month time deposits; the black solid line is the interest rate cap on demand deposits. The grey dashed vertical line marks the launching month of Yu'ebao in June 2013. Panel B demonstrates the concentration and the reliance on deposit funding in China's banking industry. The horizontal axis plots each bank's deposit-to-interest-bearing-liabilities ($depositIBL$) ratios as of December 2012. The vertical axis is each bank's market share measured by the number of its branches divided by all banks' branches as of May 2013. We include three types of banks in our sample: large state-owned banks (red diamonds), joint-stock banks (blue triangles), and city commercial banks (circles).



(a) Dual-Track Interest Rates under Ceiling Regulation



(b) Banking Industry Concentration and Reliance on Deposit Funding

Figure 2: When FinTech Enters into the MMF Industry

Note: This figure depicts the size of the money market fund (MMF) industry in China since 2003, when the first MMF was introduced. The red bars demonstrate the absolute size of MMFs (left axis) while the blue line represents the relative size of MMFs compared to bank deposits (right axis). The gray dashed vertical line marks the launching month of Yu'ebao, the first FinTech MMF in China, in June 2013.

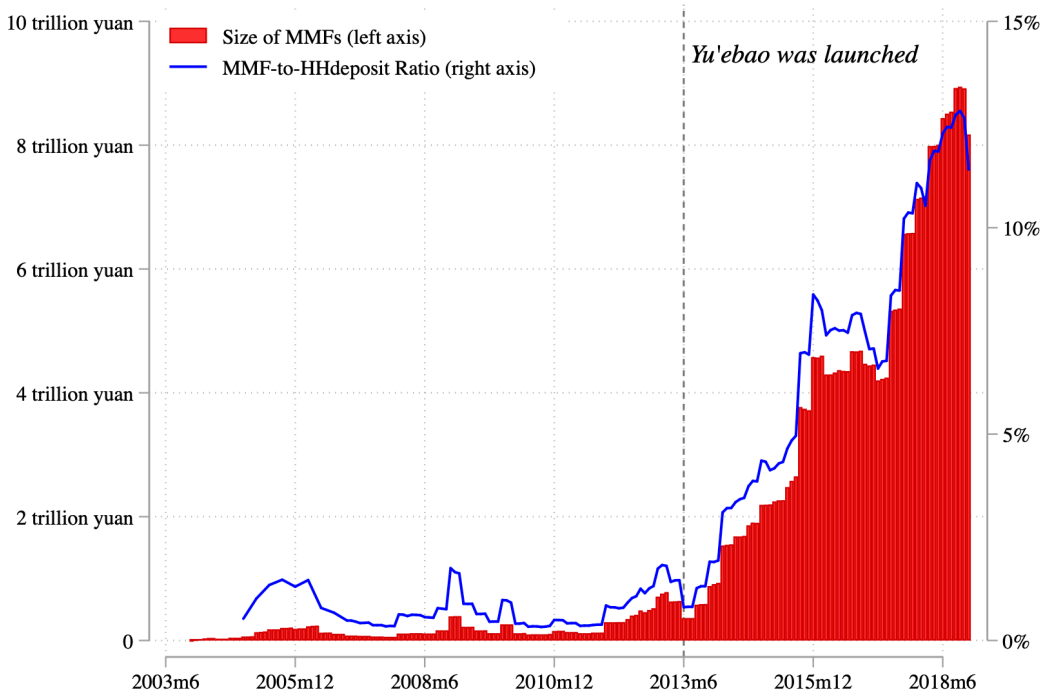
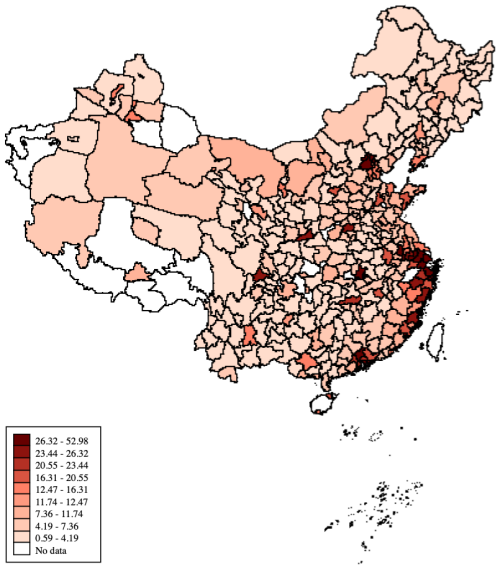
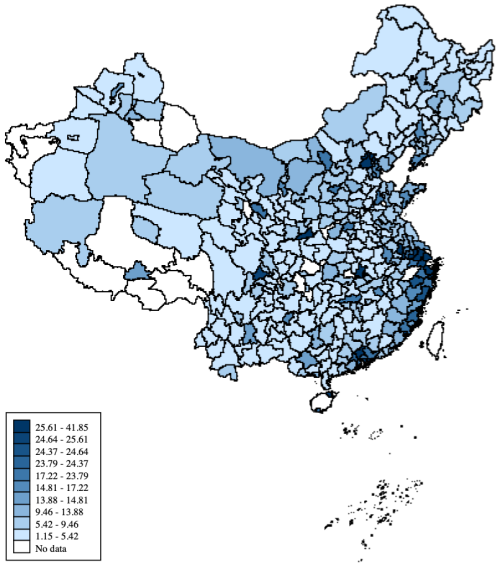


Figure 3: Geographical Variation in FinTech Adoption

Note: The figure uses gradient maps to demonstrate the geographical variation in city-level FinTech adoption, defined as the number of active mobile-end FinTech users divided by local population. Panel A shows the adoption rates of FinTech MMFs (Yu'ebao) in December 2013, six months since its introduction, while Panel B shows the adoption rates of FinTech Payment (Alipay) in May 2013, one month before the introduction of Yu'ebao.



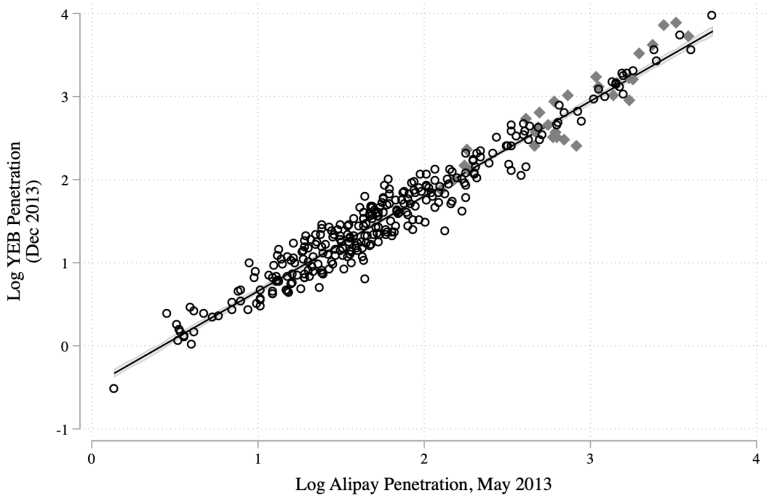
(a) FinTech MMF (Yu'ebao) Adoption, December 2013



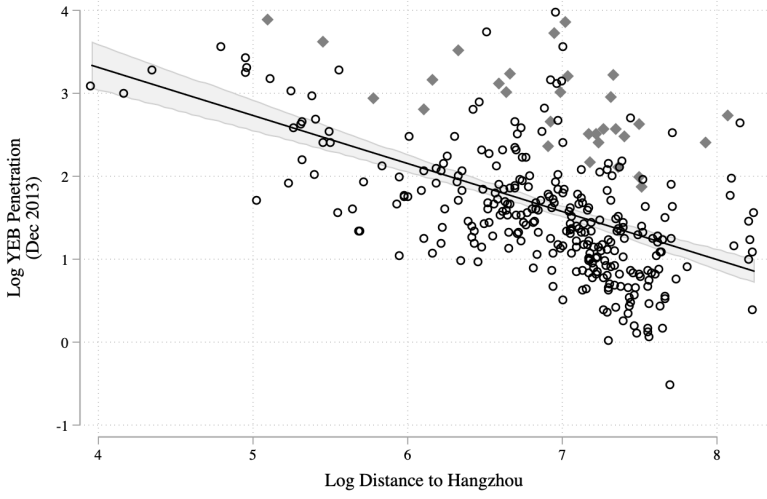
(b) FinTech Payment (Alipay) Adoption, May 2013

Figure 4: FinTech Adoption and Distance to Hangzhou

Note: This figure depicts the correlation between the key inependent variable, the city-level FinTech MMF (Yu'ebao) adoption ratios as of December 2013 (y-axis, log value), and two instrumental variables: the FinTech payment (Alipay) adoption ratios as of May 2013 (x-axis, log value) in Panel A and the distance to the FinTech headquarter in Hangzhou (x-axis, log value) in Panel B. Provincial capital cities are plotted as diamonds and non-provincial capital cities are circles. The fitted lines are accompanied with 90% confidence intervals plotted in grey area.



(a) FinTech MMF Adoption and Lagged FinTech Payment Adoption

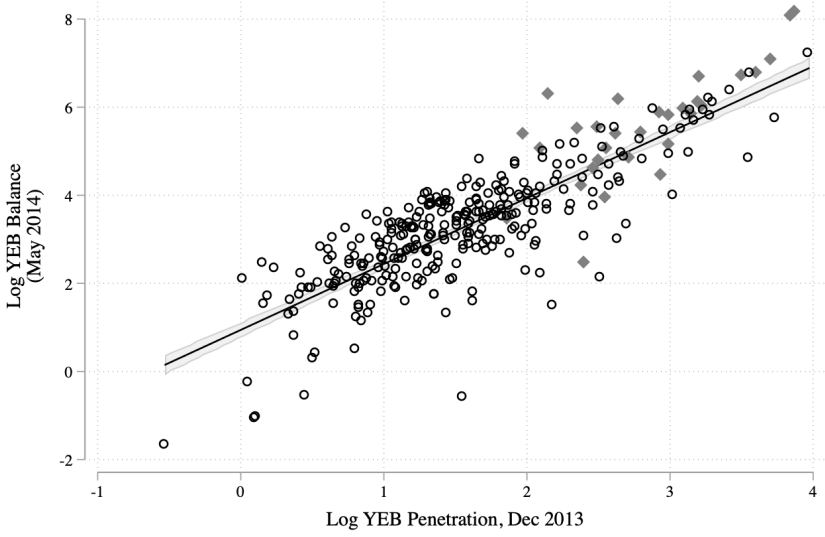


(b) FinTech MMF Adoption and Distance to Hangzhou

Figure 5: FinTech MMF Adoption and City-level Deposit Outflows Per Capita

Note: This figure plots the correlation between the key independent variable, FinTech MMF adoption ratios as of December 2013, and two city-level outcome variables: city-level deposit flows into the FinTech MMF (Yu'ebao) in Panel A and city-level FinTech MMF balance as of May 2014 (one year since the launch of Yu'ebao) in Panel B. The solid lines are the best-fit regressions with the gray region showing the 90% confidence interval.

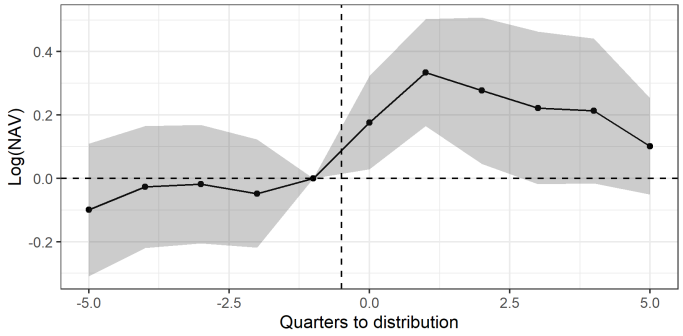
(a) FinTech MMF Adoption and City-level Deposit Flows into Yu'ebao



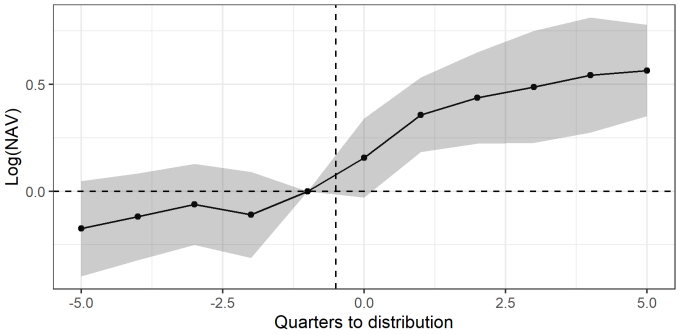
(b) FinTech MMF Adoption and City-level Balance of Yu'ebao

Figure 6: Mutual Fund Growth and Distribution Channel

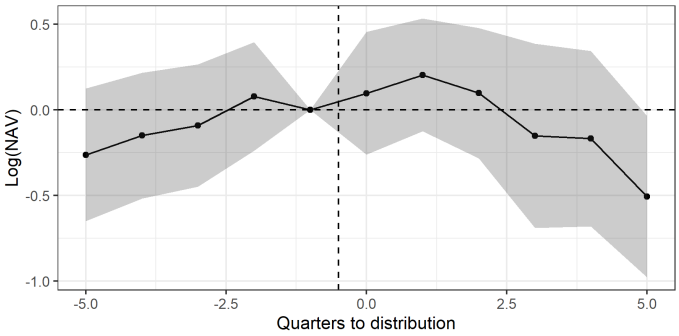
Note: This figure shows the growth of mutual fund NAVs around their inclusion in new distribution channels. In each figure, the y-axis shows the dynamic difference in difference coefficient for log fund net asset value around the time ($t = 0$) that the fund adopts a new distribution channel with fund, quarter times fund type, and quarter times fund company fixed effects. Panel (a) shows when the fund is distributed by Ant; (b) shows when the fund is distributed by another tech platform (e.g., Tencent or JD); (c) shows when the fund is distributed by a bank. The gray region shows the 95% confidence interval clustered at the fund type-quarter level.



(a) Fund NAVs around Ant distribution adoption



(b) Fund NAVs around non-Ant tech platform distribution



(c) Fund NAVs around bank distribution

Table 1: Summary Statistics

Note: This table presents the summary statistics of main variables in city-level (Panel A) and bank-level (panel B) cross-sectional data. In Panel A, *adoption_YEB* (*adoption_Alipay*) is the FinTech MMF (payment) adoption index based on active mobile-end Yu'ebao (Alipay) users in a city divided by local population as of December 2013 (May 2013). *HZdistance* is a city's great-circle distance to Hangzhou city, the FinTech headquarter. *fundflow* and *balance* refer to the standardized city-level cumulative fund flows from bank accounts to Yu'ebao and Yu'ebao's net position, respectively, as of May 2014. *provincial_capital* equals one if a city is a provincial capital city and zero otherwise. *branchshare* is a city's share in the national bank branch network; i.e., the number of bank branches in a city divided by total bank branches nationwide. *gdp*, *population*, and *gdppc* are city-level GDP, population, and GDP per capita as of December 2012, respectively. *grgdp* (*grgdppc*) is the average annual growth rate of a city's GDP (per capita) between 2012-2014. In Panel B, *bank_grdeposit* refers to bank-level average annual growth rate of deposits between 2012-2014. *bao* indicates whether a bank has launched bao-type products by December 2017 ($= 1$ if yes and $= 0$ otherwise). *exposureYEB* (*exposureAlipay*) measures a bank's exposure to FinTech MMF (payment) using branch-weighted sum of city-level Yu'ebao (Alipay) adoption as of December 2013 (May 2013). *bank_lnHZdistance* is a bank's weighted sum of city-level distance to Hangzhou city using the banks branch network as of May 2013. *bank_branchshare* is the market share using the number of a bank's branches divided by all banks' branches as of May 2013. *deposit* is bank-level deposits, *size* is the bank size proxied by total assets, *bank_lngdppc* (*bank_grgdppc*) is banks' branch-weighted sum of city-level *lngdppc* (*grgdppc*), *NIM* is the net interest margin, *NIS* is the net interest spread, *ratio_badloans* is the non-performing loan ratio, and *ratio_riskyassets* is the risky assets divided by total assets. All bank-level financial statement variables are 2012 year-end value.

	count	mean	sd	min	max
Panel A: City-level sample					
adoption_YEB	323	7.507	8.106	0.589	52.975
adoption_Alipay	323	8.371	7.086	1.148	41.849
HZdistance	365	1296.285	791.381	52.348	3849.885
fundflow	323	100.000	285.940	0.108	3280.213
balance	323	100.000	302.821	0.188	3509.093
provincial_capital	365	0.082	0.275	0.000	1.000
branchshare	334	0.296	0.313	0.001	3.372
gdp	333	1750.607	2415.745	25.630	20181.721
population	313	399.770	332.359	0.100	2945.000
gdppc	312	4.131	2.806	0.769	18.594
grgdp	333	8.241	5.068	-16.648	20.249
Panel B: Bank-level sample					
exposureYEB	143	14.076	11.035	0.718	45.889
exposureAlipay	143	13.852	8.708	0.654	36.974
bank_lnHZdistance	143	6.672	0.807	4.183	8.201
bank_grdeposit	131	17.154	9.688	0.224	66.740
bank_branchshare	143	0.492	2.446	0.002	22.277
bank_lngdppc	143	1.581	0.470	0.029	2.809
bank_grgdppc	141	6.360	3.204	-5.533	17.725
lnsize	131	16.105	1.732	13.204	21.285
lndeposit	132	15.769	1.693	12.734	21.034
ratio_demanddeposit	41	42.751	9.887	20.734	68.501
ratio_hhdeposit	39	27.564	12.398	8.246	59.117
depositIBL	131	81.470	13.572	45.762	100.000
Net interest margin (NIM)	126	3.387	1.017	1.592	7.488

Table 2: FinTech Adoption and Distance to Hangzhou: First-stage Regressions

Note: This table presents the first-stage regression results at the city level (Panel A) and the bank level (Panel B). We use lagged Alipay adoption/exposure (May 2013 value) as IV for Yu'ebao adoption/exposure (December 2013 value) in Columns (1) and(2), distance-to-Hangzhou as IV in Columns (3) and (4), and both IVs in Columns (5) and (6). Results without and with controls are shown in odd and even columns, respectively. City- and bank-level controls take the values in December 2012. Robust standard errors are reported in the parentheses. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

	***Y* = Yu'ebao Adoption (December 2013, log value)**					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(adoption_Alipay)	1.143***	1.105***			1.098***	1.045***
	(0.014)	(0.027)			(0.016)	(0.030)
ln(HZdistance)			-0.579***	-0.352***	-0.097***	-0.090***
			(0.051)	(0.034)	(0.016)	(0.016)
provincial_capital		0.006		0.721***		0.092**
		(0.038)		(0.088)		(0.039)
ln(branchshare)		-0.053		0.103		-0.078**
		(0.033)		(0.084)		(0.032)
ln(gdp)		0.046		0.799***		0.077**
		(0.040)		(0.064)		(0.039)
ln(population)		0.071*		-0.769***		0.038
		(0.037)		(0.066)		(0.035)
N	323	302	323	302	323	302
adj. R^2	0.950	0.958	0.256	0.783	0.955	0.961

(a) City-Level First Stage

	***Y* = Bank Exposure to Yu'ebao (December 2013, log value)**					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(exposureAlipay)	1.182***	1.204***			1.116***	1.065***
	(0.036)	(0.038)			(0.041)	(0.046)
bank_lnHZdistance			-0.630***	-0.411***	-0.097***	-0.116***
			(0.060)	(0.039)	(0.023)	(0.023)
ln(size)		0.123***		0.339***		0.125***
		(0.031)		(0.069)		(0.027)
ln(bank_branchshare)		-0.102***		-0.235***		-0.096***
		(0.033)		(0.073)		(0.028)
depositIBL		0.003*		-0.008**		0.001
		(0.001)		(0.004)		(0.001)
bank_lngdppc		-0.092*		0.525***		-0.039
		(0.050)		(0.072)		(0.043)
N	143	130	143	130	143	130
R^2	0.951	0.964	0.385	0.808	0.957	0.972

(b) Bank-Level First Stage

Table 3: Tech-enabled MMF Adoption: From Account Opening to Investments

Note: This table presents the city-level cross-sectional regression results of the impact of FinTech MMF adoption on a city's fund flows into the FinTech MMF between June 2013 and May 2014 in Panel A and on a city's FinTech MMF balance as of May 2014 in Panel B. Columns (1) and (2) show the OLS regression results while Columns (3) through (5) use FinTech payment adoption $adoption\_Alipay$, great-circle distance to the FinTech headquarter $HZdistance$, and both variables, respectively, to instrument for $adoption\_YEB$. Control variables include $provincial\_capital$, $ln(branchshare)$, $ln(gdp)$, $ln(population)$, $grgdp$. We include a constant in all regressions. Robust standard errors are presented in the parentheses. Our overidentification tests report the p-value of the Hansen J statistic. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

	Baseline		*IV*		
	w/o controls	*w/ controls*	*Alipay*	*HZdistance*	*Both*
	(1)	(2)	(3)	(4)	(5)
Panel A: *Y* = City-level funds into the Yu'ebao MMF (June 2013 - May 2014)					
ln(adoption_YEB)	1.527***	1.013***	0.987***	1.175***	0.999***
	(0.063)	(0.034)	(0.037)	(0.068)	(0.035)
Controls	No	Yes	Yes	Yes	Yes
N	323	302	302	302	302
adj. R^2	0.68	0.98	0.98	0.98	0.98
Overid. test	–	–	–	–	0.01
Panel B: *Y* = City-level Yu'ebao MMF balance (as of May 2014)					
ln(adoption_YEB)	1.496***	1.006***	0.968***	1.133***	0.979***
	(0.059)	(0.027)	(0.028)	(0.053)	(0.028)
Controls	No	Yes	Yes	Yes	Yes
N	323	302	302	302	302
adj. R^2	0.71	0.98	0.98	0.98	0.98
Overid. test	–	–	–	–	0.00

Table 4: FinTech MMF Exposure and Bank Deposit Growth

Note: This table presents the bank-level cross-sectional regression results of the impact of FinTech MMF exposure on bank's deposit growth separated by deposit segment: household deposit in Panel A, firm deposit in Panel B, household demand deposit in Panel C, and household time deposit in Panel D. Column (1) shows the baseline OLS regression results while Columns (2) through (4) use banks' exposure to FinTech payment $exposureAlipay$, banks' distance to the FinTech headquarter $bank\_HZdistance$, and both variables, respectively, to instrument for $exposureYEB$. Control variables include $ln(size)$, $ln(bank\_branchshare)$, $depositIBL$, $bank\_lngdppc$, $bank\_grgdppc$ between 2012-2014, and the initial levels of the corresponding deposits. We include a constant in all regressions. Robust standard errors are presented in the parentheses. Our overidentification tests report the p-value of the Hansen J statistic. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

	OLS	*IV*		
		Alipay	*HZdistance*	*Both*
	(1)	(2)	(3)	(4)
Panel A: *Y* = Household Deposit Growth, 2012-2014				
ln(exposureYEB)	-7.206	-8.456*	-9.003*	-8.524*
	(5.104)	(4.698)	(5.268)	(4.634)
N	39	39	39	39
adj. R^2	0.34	0.33	0.33	0.33
Panel B: *Y* = Firm Deposit Growth, 2012-2014				
ln(exposureYEB)	1.315	1.088	3.070	1.354
	(2.300)	(2.196)	(2.447)	(2.110)
N	39	39	39	39
adj. R^2	0.37	0.37	0.35	0.37
Panel C: *Y* = HH Demand Deposit Growth, 2012-2014 (%)				
ln(exposureYEB)	-11.799	-13.770*	-9.662	-13.096*
	(8.136)	(7.140)	(8.141)	(7.209)
N	37	37	37	37
adj. R^2	0.21	0.21	0.21	0.21
Panel D: *Y* = HH Time Deposit Growth, 2012-2014 (%)				
ln(exposureYEB)	-4.265	-5.296	-8.361	-5.732
	(5.998)	(5.478)	(5.139)	(5.217)
N	38	38	38	38
adj. R^2	0.30	0.30	0.28	0.30
All Panels				
Controls	Yes	Yes	Yes	Yes

Table 5: FinTech MMF Exposure and Bank Deposit Growth: Placebo Tests and Longer Horizons

Note: This table presents the bank-level cross-sectional regression results of the impact of FinTech MMF exposure on bank's deposit growth during three different sample periods: 2010-2012 in Panel A, 2012-2015 in Panel B, and 2012-2016 in Panel C, respectively. We show the results for household deposits in Columns (1)-(4) and for firm deposits in Columns (5)-(8). Control variables include $ln(size)$, $ln(bank\_branchshare)$, $depositIBL$, $bank\_lngdppc$, $bank\_grgdppc$ during corresponding sample periods, and the initial levels of the corresponding deposits. We include a constant in all regressions. Robust standard errors are presented in the parentheses. Our overidentification tests report the p-value of the Hansen J statistic. We use * for p<0.10, ** for p<0.05, and *** for p<0.010

	Y = Household Deposit Growth				*Y = Firm Deposit Growth*			
	Baseline		*IV*		*Baseline*		*IV*	
	w/ controls	*Alipay*	*HZdistance*	*Both*	*w/ controls*	*Alipay*	*HZdistance*	*Both*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Sample period: 2010-2012								
ln(exposureYEB)	2.241	2.612	1.995	2.573	-2.391	-2.116	-0.731	-2.022
	(5.178)	(4.396)	(6.802)	(4.466)	(2.796)	(2.380)	(2.939)	(2.333)
N	38	38	38	38	38	38	38	38
adj. R^2	0.09	0.09	0.09	0.09	0.48	0.48	0.48	0.48
Overid. test	–	–	–	0.89	–	–	–	0.60
Panel B: Sample period: 2012-2015								
ln(exposureYEB)	-8.313	-10.228*	-10.702*	-10.292*	3.335	3.614	6.730	4.080
	(5.946)	(5.600)	(6.013)	(5.399)	(6.935)	(6.332)	(6.839)	(6.236)
N	39	39	39	39	39	39	39	39
adj. R^2	0.45	0.44	0.44	0.44	0.14	0.14	0.12	0.13
Overid. test	–	–	–	0.92	–	–	–	0.61
Panel C: Sample period: 2012-2016								
ln(exposureYEB)	-9.096	-10.848*	-7.726	-10.431*	6.066	7.381	11.184	7.956
	(6.168)	(5.703)	(8.016)	(5.664)	(10.201)	(9.089)	(13.775)	(9.191)
N	39	39	39	39	39	39	39	39
adj. R^2	0.57	0.57	0.57	0.57	0.14	0.14	0.13	0.13
Overid. test	–	–	–	0.43	–	–	–	0.72
All Panels								
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: Probability of Banks Distributing Yu'ebao-like Products

Note: This table summarizes the results for banks' probabilities of distributing bao products (Yu'ebao-like MMFs) versus their exposure to Yu'ebao. Panel A and Panel B use a linear model and a hazard model on the time interval from Yu'ebao's introduction to Banks' (possible) launch of bao products, respectively. The observation window is between May 2013 and December 2017. In each Panel, Column (1) uses banks' exposure to Yu'ebao directly; Column (2), (3) and (4) are the "instrumented" results using predicted Yu'ebao exposure based on Alipay exposure, banks' synthesized Hangzhou distance, and both, respectively. Controls include $ln(size)$, $ln(bank\_branchshare)$, $depositIBL$, $bank\_lngdppc$. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

	Baseline	*IV*		
	w/ controls	*exposureAlipay*	*HZdistance*	*Both*
	(1)	(2)	(3)	(4)
Panel A: *Y* = Prob. of banks offering bao-type products, OLS model				
ln(exposureYEB)	0.124**	0.125*	0.152	0.129**
	(0.062)	(0.065)	(0.092)	(0.065)
ln(size)	0.220***	0.220***	0.207**	0.218***
	(0.074)	(0.074)	(0.081)	(0.074)
ln(bank_branchshare)	−0.093	−0.092	−0.083	−0.091
	(0.074)	(0.074)	(0.078)	(0.074)
depositIBL	0.005	0.005	0.005	0.005
	(0.003)	(0.003)	(0.003)	(0.003)
bank_lngdppc	−0.058	−0.059	−0.076	−0.062
	(0.080)	(0.081)	(0.091)	(0.081)
N	130	130	130	130
adj. R^2	0.422	0.422	0.421	0.422
Panel B: *Y* = Prob. of banks offering bao-type products, hazard model				
ln(exposureYEB)	1.469**	1.579**	0.774*	1.497**
	(0.585)	(0.633)	(0.410)	(0.583)
ln(size)	1.089**	1.209***	1.453***	1.216***
	(0.431)	(0.421)	(0.413)	(0.418)
ln(bank_branchshare)	−0.495	−0.583	−0.771*	−0.579
	(0.426)	(0.421)	(0.412)	(0.419)
depositIBL	0.018	0.020	0.010	0.017
	(0.026)	(0.026)	(0.025)	(0.026)
bank_lngdppc	−0.654	−0.767	0.296	−0.701
	(0.817)	(0.846)	(0.678)	(0.829)
N	130	130	130	130
R^2	0.427	0.426	0.409	0.427

Table 7: Mutual Fund Growth and Distribution Channel

Note: This table examines fund-level outcomes after adding a new distribution channel. $Post_{it}$ is an indicator for whether the fund has added the relevant distribution channel, Ant in Panel A, a Non-Ant tech platform in Panel B, and a bank in Panel C. MMF_i is an indicator for whether the fund is a money-market fund. Log(NAV) is the logarithm of the fund net asset value. Benchmark yield is the fund's benchmark yield in percentage points; Excess yield is the fund's excess yield over the benchmark. Each column includes Fund, Quarter × Fund Type (e.g., equity, bond) fixed effects and Quarter × Fund Company fixed effects. Data run from 2004 through 2019; the event window examines five quarters around channel adoption. Standard errors are clustered at the fund level and are presented in the parentheses. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

	log(NAV)	*Benchmark yield*	*Excess yield*
	(1)	(2)	(3)
Panel A: Ant distribution			
$Post_{it}$	0.106*	−0.013	−0.260
	(0.060)	(0.251)	(0.227)
$Post_{it} \times MMF_i$	0.875***	0.021	0.128
	(0.130)	(0.200)	(0.193)
N	44,815	44,427	44,475
R^2	0.828	0.912	0.518
Panel B: Non-Ant tech platform distribution			
$Post_{it}$	0.341***	0.022	−0.285
	(0.081)	(0.250)	(0.313)
$Post_{it} \times MMF_i$	0.603***	0.048	0.182
	(0.126)	(0.218)	(0.268)
N	41,015	40,636	40,684
R^2	0.831	0.919	0.536
Panel C: Bank distribution			
$Post_{it}$	−0.068	0.108	−0.305
	(0.165)	(0.194)	(0.346)
$Post_{it} \times MMF_i$	0.680***	0.030	0.285
	(0.230)	(0.220)	(0.300)
N	8,131	8,112	8,112
R^2	0.825	0.860	0.478
All Panels			
Fund F.E.	Yes	Yes	Yes
Quarter × Fund Type F.E.	Yes	Yes	Yes
Quarter × Fund Company F.E.	Yes	Yes	Yes

Table 8: FinTech Exposure, Bank Profitability, and Loan Risks

Note: This table presents the bank-level cross-sectional regression results of the impact of FinTech MMF exposure on bank's profitability and risks. We examine banks' changes between 2012 and 2014 in net interest margin (NIM) in Panel A, in net interest spread (NIS) in Panel B, in bad loan ratios in Panel C, and in risky asset ratios in Panel D. Column (1) shows the OLS regression results while Columns (2) through (4) use banks' exposure to FinTech payment $exposureAlipay$, banks' distance to the FinTech headquarter $bank\_HZdistance$, and both variables, respectively, to instrument for banks' exposure to the FinTech MMF $exposureYEB$. Control variables include $ln(size)$, $ln(bank\_branchshare)$, $depositIBL$, $bank\_lngdppc$, $bank\_grgdppc$, and the initial levels of the corresponding profitability and risk-taking measures. We include a constant in all regressions. Robust standard errors are presented in the parentheses. Our overidentification tests report the p-value of the Hansen J statistic. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

	Baseline	*IV*		
	w/ controls	*exposureAlipay*	*HZdistance*	*Both*
	(1)	(2)	(3)	(4)
Panel A: Y = Changes in NIM, 2012-2014 (%)				
ln(exposureYEB)	0.128	0.040	0.129	0.054
	(0.186)	(0.168)	(0.244)	(0.174)
N	123	123	123	123
adj. R^2	0.23	0.23	0.23	0.23
Overid. test	–	–	–	0.57
Panel B: Y = Changes in NIS, 2012-2014 (%)				
ln(exposureYEB)	0.196	0.148	0.277	0.167
	(0.223)	(0.204)	(0.285)	(0.206)
N	123	123	123	123
adj. R^2	0.16	0.16	0.16	0.16
Overid. test	–	–	–	0.53
Panel C: Y = Changes in bad loan ratio, 2012-2014 (%)				
ln(exposureYEB)	-0.012	-0.064	0.074	-0.043
	(0.114)	(0.120)	(0.166)	(0.121)
N	117	117	117	117
adj. R^2	0.01	0.01	0.01	0.01
Overid. test	–	–	–	0.22
Panel D: Y = Changes in risky asset ratio, 2012-2014 (%)				
ln(exposureYEB)	-3.263**	-3.967**	-3.204	-3.873**
	(1.568)	(1.650)	(2.521)	(1.641)
N	87	87	87	87
adj. R^2	0.37	0.37	0.37	0.37
Overid. test	–	–	–	0.72
All Panels				
Controls	Yes	Yes	Yes	Yes

Table 9: Financial Inclusion

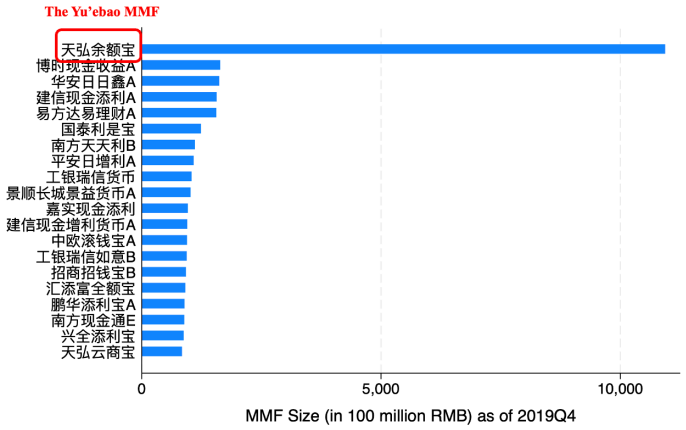
Note: This table reports the margins of logit regressions using the China Household Finance Survey (CHFS) data for 2012 and 2014. Our main outcome variable is households' participation in FinTech MMFs, such as Yu'ebao by Alipay and Licaitong by Tencent, as of 2015 survey time (Yes = 1). Yu'ebao Exposure refers to the city-level Yu'ebao penetration ratio as of December 2013 using a publicly available index established by Peking University and the Ant Group. Our heterogeneity variables include self-reported income $Income$, whether a household pays attention to financial news $FAttention$, and whether a household has ever heard of stocks or equity funds $FLiteracy$, all from the 2012 wave. We restrict our sample to households surveyed in both the 2012 and 2014 waves of CHFS. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

Y = FinTech MMF Participation in 2015 (dummy)				
	(1)	(2)	(3)	(4)
Yu'ebao Exposure	0.243***	0.038**	0.070***	0.233***
	(0.083)	(0.015)	(0.017)	(0.083)
Yu'ebao Exposure × ln(Income)	-0.021***			-0.018**
	(0.007)			(0.008)
ln(Income)	0.056***			0.048***
	(0.006)			(0.006)
Yu'ebao Exposure × FAttention		0.053**		0.054***
		(0.020)		(0.020)
FAttention		-0.007		-0.029*
		(0.017)		(0.017)
Yu'ebao Exposure × FLiteracy			-0.050***	-0.040**
			(0.016)	(0.016)
FLiteracy			0.089***	0.062***
			(0.013)	(0.013)
N	13264	13264	13264	13264
Controls	Yes	Yes	Yes	Yes

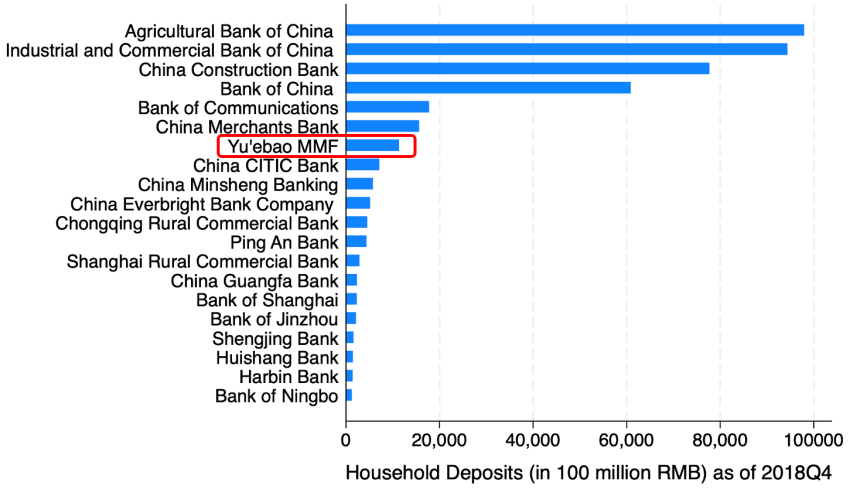
A Online Appendix

Figure A1: Size Comparison: Yu'ebao MMF Shares and Bank Deposits

Note: This figure compares the size of the Yu'ebao MMF with those of other MMFs (Panel A) and with those of household deposits in commercial banks in China (Panel B). We measure the size of Yu'ebao using the total shares of assets under management and compare it with the household deposits held by major commercial banks in China as of 2018Q4. THe MMF share and bank deposit data come from CSMAR and WIND.



(a) Largest MMFs (in Fund Shares) in China



(b) Largest Banks (in Household Deposits) in China

Table A1: Robustness: FinTech Competition and Bank Deposit Growth

Note: This table replicates our baseline results using publicly available data. We calculate an alternative measure of bank-level exposure to Yu'ebao competition, $ln(exposureYEB\_alt)$, using the branch-weighted sum of the city-level Yu'ebao penetration index made available by Peking University and Ant Group. Column (1) shows OLS regression results, while Columns (2)-(3) are IV specifications using Alipay exposure, banks' synthesized Hangzhou distance, and both as instruments, respectively. Control variables include bank type $btype$ (=1 for large banks and joint-venture banks, =0 otherwise), bank-level total assets $ln(size)$ in 2012, market share in branches $ln(bank\_branchshare)$ in 2012, deposit-to-interest-bearing-liabilities ratio $depositIBL$ in 2012, branch-weighted local GDP $bank\_lngdppc$ in 2012, and branch-weighted local GDP growth rate between 2012 and 2014 $bank\_grgdppc\_1012$. We include a constant in all regressions. Robust standard errors are presented in the parentheses. Our overidentification tests report the p-value of the Hansen J statistic. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

Dep. Var.	*OLS*	*IV*		
Bank deposit growth rate, 2012-2014 (%)		*exposureAlipay*	*HZdistance*	*Both*
	(1)	(2)	(3)	(4)
Panel A: Household Deposit				
ln(exposureYEB_alt)	-23.714	-27.094*	-25.642**	-26.734**
	(15.717)	(13.904)	(12.682)	(13.192)
Mean of Y	15.63	15.63	15.63	15.63
N	43	43	43	43
Adjusted R-squared	0.34	0.33	0.34	0.34
Panel B: Firm Deposit				
ln(exposureYEB_alt)	4.343	1.930	-8.163	-0.572
	(7.718)	(7.837)	(10.505)	(8.024)
Mean of Y	14.29	14.29	14.29	14.29
N	43	43	43	43
adj. R^2	0.33	0.32	0.27	0.32
Panel C: HH Demand Deposit				
ln(exposureYEB_alt)	-53.443**	-61.161***	-33.157*	-54.746***
	(23.719)	(21.986)	(18.965)	(21.201)
Mean of Y	10.84	10.84	10.84	10.84
N	46	46	46	46
Adjusted R-squared	0.20	0.19	0.16	0.20
Panel D: HH Time Deposit				
ln(exposureYEB_alt)	-13.890	-16.758	-25.877*	-18.976
	(17.844)	(16.985)	(14.246)	(15.620)
Mean of Y	18.21	18.21	18.21	18.21
N	47	47	47	47
adj. R^2	0.33	0.33	0.31	0.33
All Panels				
Controls	Yes	Yes	Yes	Yes
Mean of $ln(exposureYEB\_alt)$	5.03	5.03	5.03	5.03
Std. of $ln(exposureYEB\_alt)$	0.21	0.21	0.21	0.21

Table A2: Placebo Tests: High-End Market-Rate Products Offered by Banks

Note: This table shows the impact of Yu'ebao exposure on the yields (Panel A) and issuance (Panel B) of banks' wealth management products (WMPs) that require high minimum investment requirement and do not offer instant payment functions. Column (1) regresses changes in bank WMP yields (WMP issuance) between 2012-2014 on Yu'ebao exposure while Columns (2)-(3) are IV specifications using Alipay exposure, banks' synthesized Hangzhou distance, and both as instruments, respectively. Controls include the initial levels of WMP yields or issuance in 2012, $ln(size)$, $ln(bank\_branchshare)$, $depositIBL$, $bank\_lngdppc$, $bank\_grgdppc\_1012$. We include a constant in all regressions. Robust standard errors are presented in the parentheses. Our overidentification tests report the p-value of the Hansen J statistic. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

	Baseline	*IV*		
	w/ controls	*exposureAlipay*	*HZdistance*	*Both*
	(1)	(2)	(3)	(4)
Panel A: *Y* = Changes in bank WMP yield, 2012-2014 (%)				
ln(exposureYEB)	-0.041	-0.049	0.018	-0.040
	(0.072)	(0.071)	(0.100)	(0.068)
N	81	81	81	81
adj. R^2	0.34	0.34	0.33	0.34
Overid. test	–	–	–	0.48
Panel B: *Y* = Changes in bank WMP issuance, 2012-2014 (%)				
ln(exposureYEB)	6.046	2.524	3.885	2.708
	(8.053)	(7.419)	(10.677)	(7.398)
N	83	83	83	83
adj. R^2	0.46	0.46	0.46	0.46
Overid. test	–	–	–	0.86
All Panels				
Controls	Yes	Yes	Yes	Yes

Table A3: Credit Crunch? FinTech Competition and Bank Loan Growth

Note: This table reports the impact of FinTech MMF competition on bank lending using the bank-level annual newly-issued loan data from the People's Bank of China. We calculate an alternative measure of bank-level exposure to Yu'ebao competition, $ln(exposureYEB\_alt)$, using the branch-weighted sum of the city-level Yu'ebao penetration index made available by Peking University and Ant Group. Column (1) shows OLS regression results, while Columns (2)-(3) are IV specifications using Alipay exposure, banks' synthesized Hangzhou distance, and both as instruments, respectively. Control variables include bank type $btype$ (=1 for large banks and joint-venture banks, =0 otherwise), bank-level total assets $ln(size)$ in 2012, market share in branches $ln(bank\_branchshare)$ in 2012, deposit-to-interest-bearing-liabilities ratio $depositIBL$ in 2012, branch-weighted local GDP $bank\_lngdppc$ in 2012, and branch-weighted local GDP growth rate between 2012 and 2014 $bank\_grgdppc\_1012$. We include a constant in all regressions. Robust standard errors are presented in the parentheses. Our overidentification tests report the p-value of the Hansen J statistic. We use * for p<0.10, ** for p<0.05, and *** for p<0.010.

Dep. Var.	*OLS*	*IV*		
Bank loan growth rate, 2012-2014 (%)		*exposureAlipay*	*HZdistance*	*Both*
	(1)	(2)	(3)	(4)
Panel A: Loans to All Firms				
ln(exposureYEB_alt)	-30.995**	-40.102**	-39.233**	-39.273**
	(15.020)	(18.198)	(18.081)	(16.844)
Mean of Y	22.34	22.34	22.34	22.34
N	170	170	168	168
Adjusted R-squared	0.13	0.13	0.12	0.12
Panel B: Loans to Large Firms				
ln(exposureYEB_alt)	11.418	15.192	-3.737	15.524
	(33.864)	(37.292)	(35.162)	(34.289)
Mean of Y	26.58	26.58	26.58	26.58
N	169	169	167	167
Adjusted R-squared	0.06	0.06	0.06	0.06
Panel C: Loans to Medium-Sized Firms				
ln(exposureYEB_alt)	-27.265	-34.824	-36.385*	-34.385*
	(18.705)	(22.348)	(21.122)	(20.710)
Mean of Y	22.26	22.26	22.26	22.26
N	170	170	168	168
Adjusted R-squared	0.09	0.09	0.08	0.08
Panel D: Loans to Small Firms				
ln(exposureYEB_alt)	-35.574**	-46.856***	-46.622***	-46.724***
	(14.336)	(16.571)	(16.020)	(15.143)
Mean of Y	22.39	22.39	22.39	22.39
N	170	170	168	168
Adjusted R-squared	0.14	0.14	0.13	0.13
All Panels				
Controls	Yes	Yes	Yes	Yes
Mean of $ln(exposureYEB\_alt)$	5.03	5.03	5.03	5.03
Std. of $ln(exposureYEB\_alt)$	0.21	0.21	0.21	0.21