Banking without Deposits: Evidence from Shadow Bank Call Reports

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Abstract

Is bank capital structure designed to optimally resolve frictions or extract deposit subsidies? We address this question by studying capital structure decisions of shadow banks: intermediaries that provide banking services but are not funded by deposits. We assemble, for the first time, call report data for shadow banks which originate one quarter of all US household debt. Shadow banks use twice as much equity capital as equivalent banks, suggesting that deposit subsidies drive higher bank leverage. Leverage across shadow banks is substantially dispersed, rejecting the argument that homogeneity in leverage across banks is driven by value creating activities. Like banks, shadow banks finance themselves primarily with short-term debt and originate long-term loans. However, shadow bank debt is provided primarily by informed and concentrated lenders. This result suggests that fragility by design and informational insensitivity are not fundamental reasons for bank debt. Shadow bank leverage increases substantially with size, and the capitalization of the largest shadow banks is similar to banks of comparable size. While bank leverage does not change with size, the composition varies dramatically with large banks funding themselves with a larger share of uninsured deposits. The cost of uninsured debt declines with size both for shadow banks and banks. These results suggest that "too big to fail" does not drive capital structure decisions of banking and that small banks are the recipients of deposit subsidies. These facts question established theories of banking.

Keywords: Shadow Banks, Banking, Capital Requirements, Leverage, Fragility, Equity

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Section 1: Introduction

Traditional banks have substantially more leverage than non-financial firms: the average bank funds about 80% of their assets with short term debt. Capital requirements and other restrictions on bank leverage are based on the premise that unconstrained banks would borrow excessively because debt is subsidized through deposits insurance and implicit "Too Big To Fail" (TBTF) policies.[1] The alternative view is that capital requirements are inefficient. High bank leverage is necessary to efficiently provide financial intermediation services, such as extending loans to individuals or firms, the creation of safe and liquid debt, or more broadly, for maturity and liquidity transformation.[2] Understanding the extent to which subsidies determine bank leverage is therefore essential for setting banking regulation and is a hotly disputed topic. We approach this question by studying leverage choices of shadow banks. These financial intermediaries provide banking services, but cannot fund themselves with insured deposits, and are not subject to capital requirements. These intermediaries provide a close approximation of how banks would be funded if they did not have access to subsidized deposits nor were subject to capital requirements. We compare their financing structure to banks who engage in similar activities to assess whether bank capital structure is designed to optimally resolve frictions or extract deposit subsidies.

To investigate financing choices of shadow banks, we construct, for the first time, shadow bank "Call Reports" from 2011 onwards using the Freedom of Information Act (FOIA) requests from state regulators. Our shadow bank call reports contain detailed information on the balance sheets of shadow banks that are active lenders in the $10 trillion US residential mortgage market. Shadow banks play a prominent role in this market and currently account for more than half of new originations after their market share more than doubled following the Great Recession (see Buchak et al. 2018a).[3] We observe a detailed structure of liabilities, both paid in and retained capital, as well as individual credit lines: who provides shadow bank debt and the amounts drawn. We also observe the asset side of the balance sheets, which we match to the individual loans (mortgages) originated by shadow banks. Our sample comprises more than four hundred largest shadow banks which originated more than $4 trillion of mortgages during 2011-2007, comprising about 80% of shadow bank loans originated during this period.

This paper has two goals. First, we compare the capital structure decisions of shadow banks with those of banks over our sample period and document five main facts about differences and similarities in the capital structures of shadow banks and banks. Second, we discuss the implications of these findings for established theories of banking.

Fact 1: Shadow banks have substantially more equity capital—i.e., lower leverage—than banks.

[1] See for instance, Dwyer (1981), Pyle (1984), Admati et al (2013), Admati and Helwing (2014), Egan et al (2017).
[2] See for instance, Diamond and Rajan (2001), DeAngelo and Stulz (2005), Deng et al (2017).
[3] This amounts to about 1/3rd of the household debt in the U.S.

The average equity to asset ratio for shadow banks is approximately 25%. This is more than twice the capitalization of banks, which have an average asset to equity ratio of approximately 11%. Only 0.5% of banks have more capital than the average shadow bank.

Ideally, we would want to compare shadow banks to banks, which engage in similar activities. Shadow banks in our data are primarily in the mortgage origination business. Notably, mortgage origination business constitutes an important part of bank business as real estate loans account on average for about 80% of bank loans and half of their assets. Nevertheless, to achieve a tighter comparison between banks and shadow banks, we next focus on banks who are primarily in the mortgage origination business and construct "synthetic mortgage banks": banks that engage only in mortgage related activities. The leverage of these synthetic mortgage banks is very similar to that of the average bank, as is any other bank comparison group we construct. This is not surprising; despite significant differences in the business model and asset holdings across banks, the amount of capital across banks is quite homogeneous (Hanson et al. 2015). Overall, across specifications and controls, including adjustment for "risk weights" for shadow banks, we find a very robust pattern. Shadow banks have more than twice as much equity financing than deposit-taking banks, despite no capital requirement for shadow banks. Interestingly, the median shadow bank equity capitalization matches well with capital structure of banks in the pre-FDIC era (see Admati and Hellwig (2014)).

Fact 2: Leverage across shadow banks is substantially dispersed than banks

Banks leverage is quite homogenous: the difference in the equity to asset ratio between 90th percentile most capitalized bank and the 10th percentile least capitalized bank is 6 percentage points. Shadow banks' capitalizations, on the other hand, differ widely: the 90^{th} percentile shadow bank has about 31 percentage point higher equity to asset ratio than the 10^{th} percentile least capitalized shadow bank. This fact is even more surprising because shadow banks' business models are substantially more homogenous than those of banks. Recall that the shadow banks in our sample are primarily engaged in residential real estate mortgage origination. Banks specialization, on the other hand, may vary substantially. Some banks may specialize in commercial real estate, others in residential loans, still others in industrial loans or consumer loans. While several of our subsamples directly account for this heterogeneity, the fact remains across various samples we consider: shadow banks are much more capitalized than banks, and the shadow bank capitalization is substantially more dispersed than that of banks. This finding of dispersion in capital structure of shadow banks relative to banks, despite similar core activity by these entities, casts doubt on theories that suggest that homogeneity in capital structure across banks is driven by value creation on the asset side.

Fact 3: Shadow banks finance themselves primarily with short-term debt and originate long term loans, similar to banks. Shadow bank debt is much more concentrated than bank deposits and is provided primarily by, potentially informed, large banks in the form of credit lines.

Several theories have rationalized the short-term fragile nature of bank funding by dispersed uninformed parties (see for instance, Diamond and Dybvig (1983), Diamond and Rajan (2001)). Shadow banks also obtain funding primarily with short-term debt. As a comparison, almost 90% of shadow bank debt funding is short-term comparable to short-term funding of banks at about 85%. Since shadow banks originate long maturity mortgages using short-term debt funding, they engage in liquidity and maturity transformation like banks. However, the structure of short-term debt differs significantly. By definition, all shadow banks short-term debt is uninsured, and thus potentially prone to runs. In comparison, approximately half of bank deposits are insured. Moreover, the majority of bank short-term debt funding is provided by dispersed depositors. Shadow banks' short-term debt, on the other hand, takes the form of credit lines provided by, on average, 2 to 3 lenders. The main provider of shadow bank short term funding are large banks, which provide more than 90% of shadow bank debt. Therefore, while shadow banks fund themselves predominantly with short-term debt, this debt differs dramatically from deposit funding of banks. It is concentrated and extended by potentially informed parties. These results raise questions on theories that suggest that short-term debt is a result of deposit subsidies. They also question theories that suggest that fragility of bank capital structure might be an optimal market response to banking activity.

Fact 4: Shadow bank leverage increases substantially with size, and the capitalization of the largest shadow banks is similar to that of large banks of comparable size. Bank leverage, on the other hand, hardly changes with size.

The smallest 10th percentile shadow bank equity to asset ratios are 36%, which is more than three times larger than the capitalization of banks of equal size (10%). The capitalization of the largest, 90th percentile shadow banks, on the other hand, is 17%, which is comparable (and in fact statistically indistinguishable) from the capitalization of banks of similar size (12%). If we take the leverage decisions of large banks and shadow banks as being optimal, we would conclude that distortions in leverage might be primarily occurring for smaller banks through deposit subsidies.

Fact 5: The average interest rate paid on uninsured debt decreases with size as uninsured leverage increases for both banks and shadow banks. Large banks fund themselves with a larger share of uninsured to insured deposits than small banks.

The first result points out that *uninsured* debt increases with bank size even though overall leverage does not. In other words, large banks fund themselves with a larger share of uninsured to insured deposits than small banks: small banks have around 20% uninsured deposits while large banks have more than half of their deposits uninsured. Recall that large shadow banks have higher leverage than small shadow banks, with all of the leverage uninsured. Therefore, the positive uninsured leverage/size relationship is not a phenomenon unique to shadow banks but extends to banks as well. Second, we find that the average interest rate paid by shadow banks on their debt *decreases* with size. A similar phenomenon exists among banks: larger banks pay lower interest rates on uninsured deposits, although the decline is much smaller. Together, these results suggest that banks and shadow banks exhibit same patterns with respect to uninsured debt: uninsured debt

increases with size and interest rates paid on this debt decreases with size. These findings combined with earlier one, that distortions in capital structure of banks reside with smaller banks, suggest that optimal capital structure of banks might be one with more uninsured deposits.

We conclude by noting several implications of our facts, which we discuss in greater detail in Section 5. First and foremost, shadow banks' much higher capitalization suggests that access to subsidized deposits at least partially drives banks' high leverage. The high dispersion in shadow bank leverage suggests that (private) value creation on banks' liability side is to a large degree driven by subsidized insured deposits. Banks take advantage of the subsidy and their leverage ratios are to a first-order pinned down by capital requirements.

Second, common wisdom suggests that large banks' leverage choices are distorted more than those of small banks. While both types receive deposit subsidies, Too Big To Fail (TBTF) additionally increases large banks' incentives to borrow. Our results cast doubt on that assertion, at least in the post 2011 period. Mortgage shadow banks, which we examine, are likely not subject to TBTF or benefit from such guarantees on a much smaller degree. Nevertheless, large shadow banks' leverage is quite similar to that of similarly sized banks, suggesting that the same force is likely driving leverage choices for both.[4] Small bank leverage, on the other hand, is much larger than that of corresponding shadow banks. These results suggest that small banks benefit more from insured deposits than large banks.

Third, the short maturity of shadow bank debt suggests that funding short-term is essential to the functioning of financial intermediation. Because bank deposits are subsidized and have short maturity, the subsidies could be driving the maturity structure of debt. Since shadow banks' debt is tilted towards short term debt even more than for banks, our results are more consistent with theories in which short-term debt is a necessary outcome of financial intermediation.

Lastly, our results suggest that there are economies of scale in short-term, uninsured debt funding for financial intermediaries, both for banks and shadow banks. The cost of short-term uninsured debt declines with size for large financial intermediaries, both banks and shadow banks. These findings suggest that a substantial increase in shadow bank leverage along with size may be related to economies of scale in short-term, uninsured debt funding. These findings also suggest that optimal capital structure of banks might be one with more uninsured deposits.

Section 2: Data and Empirical Methodology

2.A Institutional Background

The two main groups of mortgage originators in the US are banks and shadow banks (non-bank lenders). Banks (traditional banks and credit unions) rely on their insured deposit base as part of their capital. Shadow banks do not take deposits. Banks face substantially higher regulatory burdens than shadow banks, including capital requirements, enhanced supervision from a wide set

[4] There is a caveat to this argument. It is possible that without capital requirements large banks would be even more highly levered in the presence of TBTF.

of regulators, such as the FDIC, FED, OCC, and state regulators, as well as extensive compliance and rules. The nature of lenders in the mortgage market changed substantially in the last decade. Buchak et al. (2018) document a decline in traditional bank originations and the growth of shadow banks. The authors provide evidence that both the increasing regulatory burden faced by traditional banks and growth of technology can account for a substantial part of this trend.

2.B Shadow Bank Call Reports

We construct a novel data set containing balance sheet information of shadow banks in the US residential mortgage origination market from 2011 to 2017. We use FOIA requests to collect data from shadow banks' quarterly call report filings to state regulators. Pursuant to the S.A.F.E. Mortgage Licensing Act of 2008, shadow banks that hold a state license or state registration to conduct mortgage origination are required to file a call report in each state in which they perform lending activities since 2011. We access these data through FOIA requests of Washington state and Massachusetts, the two states, which complied with our request. As long as a shadow bank is registered or licensed in either of these states, we obtain information on all its operations across all states. Therefore, as we discuss below, even sampling two states allows for extensive coverage, especially among the largest shadow banks.

Each shadow bank has a unique ID in the National Mortgage License System (NMLS ID), which is used as identifiers in the call reports. The call report contains two components, Financial Condition (FC) and Residential Mortgage Loan Activity (RMLA). In Table 1 we provide as an example the summary of information of the quarterly call report for Quicken Loans' balance sheet and income statement in the most recent period in our data (2017 Q4). We choose Quicken Loans, because it was the largest residential mortgage lender in the United States in terms of the number of loans originated (based on HMDA) by the end of 2017.

2.B.1 Financial Condition Information

The FC collects data on the balance sheet and the income statement at the company level.

Balance Sheet Information:

Assets: Quicken Loans reports total assets of $13.1 billion (Panel A of Table 1). We obtain a detailed composition of assets. Here, we list the major categories. As one would expect, the largest asset categories are mortgage related: Mortgages held for sale comprise 55% of assets; Mortgages held for investment less than 1%. Servicing rights comprise 19% of assets. The FC also contains information on other assets, for example, Cash, which comprises 10% of Quicken's assets, Derivatives' which comprise 2%, or Buildings and properties at 1.4%.

Liabilities: The liabilities side of the balance sheet contains detailed information on the financing structure of shadow banks. It contains the composition of equity as well as debt funding. As we observe from Panel A of Table 1, equity funds about 21% of Quicken's assets. We can observe the share of equity that is Preferred stock, Non-control interest; how much is Retained Earnings, and how much Common Stock. Almost all equity of Quicken Loans represents retained earnings

accounting for about 20% of all assets with a small reminder representing common stock. On the debt side of the balance sheet, we observe the composition of long-term and short-term liabilities. We note that virtually all liabilities of Quicken are short-term, with short-term debt accounting for about 82% of total liabilities and essentially all of its debt. Since Quicken Loans is shadow bank it has no deposit financing, hence all its short term debt is uninsured.

Income Statement: Panel B of Table 1 shows an income statement of Quicken Loans. Sales of mortgages in the secondary market account for about 85% of Quicken's gross income, which reflects the fact that vast majority of mortgages originated by shadow banks are subsequently sold in the secondary loan market (see Buchak et al 2018a, b). Mortgage servicing accounts for most of the remaining income of Quicken. On the expense side, personnel expenses account for about 43% of all expenses. Interest expenses account for about 9% of total expenses of which about 45% constitutes interest payments on warehouse credit lines. The (RMLA) Section, which we describe in the next subsection contains further details on the composition of debt.

2.B.2 Residential Mortgage Loan Activity (RMLA)

The RMLA contains detailed information about individual debt facilities. For each debt item, we observe the provider (lender) name, the credit limit, and the amount of remaining limit that has not been drawn on each credit line. As we describe above, the vast majority of Quicken's debt is short term funding. The RMLA statement displayed in Panel C of Table 1 shows that this founding comes in the form of warehouse lines of credit by eleven debt providers. Warehouse lines of credit are credit lines which are secured with the mortgages originated by the lender, and generally have to be repaid in less than a year. As of December 2017, Quicken Loans had about $13.6 billion of available warehouse credit of which it used about $8.5 billion. We note that warehouse credit borrowing accounts for almost all of Quicken's short-term debt and majority of its total liabilities.

Quicken's lenders fall into two categories, Government Sponsored Entities (GSE), Fannie Mae and Freddie Mac, which together provide 25% of available credit line funding, and banks, such as Credit Suisse First Boston, JPMorgan Chase, and Bank of America that provide, respectively, about 16%, 13%, and 7% of available credit line funding. In terms of credit used, Fannie Mae is the largest provider accounting for about 25% of warehouse credit used ($2.03 out of $8.55 billion) followed by JPMorgan Chase that accounts for 18% of the warehouse credit used ($1.58 out of $8.55 billion). For a more detailed analysis of credit lines to shadow banks, see Jiang (2019).

2.B.3 Regulatory Capital "Equivalent" for Shadow Banks

Shadow banks are not subject to capital requirements, and are thus not required to report regulatory measures of capital, or to use risk-weights when evaluating the amount of capital. We therefore need to construct regulatory capital equivalents for the tier 1 capital for each shadow bank in our sample.

We compute the tier 1 capital, by adding up common stock, paid-in capital, retained earnings, preferred stock, and noncontrolling interest. We have insufficient information to construct precise risk weighted assets.[5] As a result we construct bounds on these risk weighted assets.

The lower bound of the risk-weighted assets assigns 20% to residential mortgages that are guaranteed or insured by the government (FHA, VA, or RHS), 50% to non-government insured mortgage loans, 250% to mortgage servicing rights, 0% to cash, securities, deferred tax assets, and goodwill and other intangible assets, and 100% to all other assets, such as receivables and property, equipment and other fixed assets. The upper bound is computed by assigning 100% weight to non-government insured mortgage loans while assigning the same weights as in the calculation of the lower bound on all other assets. We then compute the upper (lower) bound of the tier 1 capital ratio by dividing the tier 1 capital by the lower (upper) bound of the risk-weighted assets.

2.C Linking Shadow Bank Call Reports to Loan Level Data

Our paper brings together a number of datasets which we describe below.

We merge shadow bank call reports with loan-level data from the Home Mortgage Disclosure Act (HMDA) database, which captures the vast majority of residential mortgages orignated in the United States. Each shadow bank has a unique ID in the National Mortgage License System (NMLS ID), which is used as identifiers in the call reports. However, the NMLS ID is not publicly disclosed in the Home Mortgage Disclosure Act (HMDA) database. To link the two data sets, we construct a crosswalk table between HMDA institution ID and NMLS ID by using the NMLS Consumer Access platform, where consumers can search for shadow bank registration information using company name and address.

We obtain quarterly data on bank capital structure and interest expenses from bank regulatory call report filings, Form 031 and Form 041, publicly available on the *Federal Financial Institutions Examination Council (*FFIEC) website. Since the regulatory filing requirements changed several times post crisis, we check the historical 031 and 041 forms year by year to ensure the consistency of our data.

HMDA: The Home Mortgage Disclosure Act (HMDA) collects the vast majority of mortgage applications in the United States, along with their approval status. In addition to the application outcome, the data includes loan type, purpose, amount, year of origination, and location information down to the applicant's census tract. It further contains demographic information on the applicant, including race and income. Important for this analysis, it includes the originator's identity, which we link manually across years. Finally, it documents whether the originator sells the loan to a third party, and if so, whether the loan purchaser is a GSE. An important caveat with the sales data is that if the originator retains the loan through the end of the calendar year and sells it in the subsequent year, it is recorded in HMDA as a non-sale.

[5] We do not observe the exact proportion of Category 1 and Category 2 residential mortgage loans.

2.D Sample Representativeness

Our data covers all shadow banks, which originated loans in the states of Massachusetts and Washington. Since the majority of lending is done by large banks, which are registered in practically all states, including Massachusetts and Washington, we cover a substantial share of the shadow bank mortgage market. Our sample also overweighs large relative to small shadow banks. As we show later, large shadow banks' capital structure is more similar to that of banks, so our sample averages understate the differences between shadow banks and banks.

Specifically, our data contain 429 shadow banks that originated about $4 trillion of residential mortgages from 2011 to 2017 accounting for about third of all mortgage originations during this period and 76% of total shadow bank mortgage originations. Panel (a) of Figure 1 compares our sample coverage to total loan origination by years. Except for 2011, about 80% (77.6% ~ 81.5%) of total shadow bank mortgage origination in each year is covered by our sample. Since the call reports were not enforced in Massachusetts in 2011, our sample coverage in 2011 is not as comprehensive as in later years. Even so, our sample still covers more than 40% of the total shadow bank origination in 2011.

Panel (b) of Figure 1 compares our sample to the entire shadow bank population recorded by HMDA. Our data set contains most shadow banks on the right tail of the entire shadow bank size distribution. We obtain data on 171 out of 240 largest U.S. shadow banks identified in Buchak et al. (2018a), and observe all shadow banks among the top 10 mortgage lenders in 2017. Small local shadow banks in states other than Washington and Massachusetts are underrepresented in our data set. 464 small local shadow banks recorded in HMDA in 2017 are missing from our sample. The average loan origination volume of these missing small shadow banks is $371 million in 2017.

2.E "Synthetic" Mortgage Bank Comparison Sample

The central exercise in the paper is to compare the funding structure of shadow banks to banks. Ideally, such a comparison would use banks, who engage in identical activities as shadow banks. The primary activities of shadow banks in our sample are mortgage lending and servicing. Banks, on the other hand, engage in a broader set of activities though, as we already noted, mortgage origination business constitutes an important part of bank business as real estate loans account on average for about half of banks assets (based on bank call reports available at FFIEC). As we show in Section 3 and 4, how one constructs the comparison group of banks is close to irrelevant, because differences in capital structure across banks are small despite significant differences in the business model and asset holdings (Hanson et al. 2015). Nevertheless, we construct a comparison group of synthetic banks, whose only assets are mortgage loans.

The idea is the following. Suppose mortgage activities require different types of funding than non-mortgage activities. Then banks, which are primarily engaged in mortgage lending should have different capital structures than banks, which are engaged in other activities. We then use variation across banks to extrapolate the capital structure of banks. We use two normalizations, the share of mortgages to assets, and the share of mortgages to all loans made by the bank.

We estimate the following specification:

$$Ratio_i = \alpha + \beta MortgageShare_i + \Gamma X_i + \epsilon_i \quad (1)$$

where $MortgageShare_i$ is the residential mortgage asset share of total assets, and X_i includes the logarithm of total assets, cash to total assets ratio, security to total asset ratio, fixed assets to total assets, non-residential real estate asset to assets, commercial and industrial loans to assets, agricultural loans to assets, individual loans to assets, and other loans to assets. We then find the capital structure ratios of synthetic banks whose total *assets* are entirely made up of mortgage loans. To do so, we compute the predicted $Ratio_i$ for each bank while assigning 100-percent weight on mortgage assets and zero on other assets, i.e.

$$\hat{Ratio}_i = \alpha + \hat{\beta} \times 100\% + \hat{\Gamma} X_i + \hat{\epsilon_i}, \quad (2)$$

which yields us 4,822 synthetic mortgage banks. Throughout the paper we will use this group of synthetic mortgage banks as a primary comparison group for the shadow banks.

We also confirm that all our results are robust to other comparison groups (in Section 3 and 4). First, we re-estimate the specification (1), in which we compute $MortgageShare_i$ and controls as a function of total loans, rather than assets, so $MortgageShare_i$ in this specification is the residential mortgage to total loan ratio, and X_i includes commercial and industrial loans to total loans, agricultural loans to total loans, individual loans to total loans, and other loans to total loans. We than compute the alternative synthetic comparison group of mortgage banks by replacing all bank loans with mortgage loans while keeping all the other assets fixed. Second, for robustness, we also compare key funding ratios of shadow banks to all banks regardless of their exposure to mortgage origination business.

Finally, as we discuss in greater detail in Section 3 and 4, we will also conduct our comparisons of shadow bank and bank funding ratios while accounting for a rich array of observable characteristics. These include, among others, time fixed effects as well as lending institution and local economic controls, including size, asset growth, the share of refinanced loans out of total loan origination portfolio, the share of government-insured loans out of total loan origination portfolio, and the logarithm of the weighted average of income per capita in states of operation.

Section 3: Shadow Bank Capitalization

In this section, we document capitalization decisions of shadow banks and compare their capitalization to banks. The idea behind this exercise is simple. Banks are notoriously thinly capitalized, with the average bank equity to asset ratio of about 11% and Tier 1 capital ratio of about 16% (Table 3 and 4). Shadow banks perform similar activities to banks, but do not enjoy access to subsidized deposits, nor are they subject to capital regulation. We therefore view their capitalization as indicative of what bank capitalization would be in the absence of deposit insurance and capital regulation. We document two main facts about the difference in capitalization between banks and shadow banks

3.A *Fact 1: Shadow Banks Have Substantially More Capital—Lower Leverage—than Banks*

We start by comparing capitalization of shadow banks and banks. Table 2 shows the shadow bank liability and equity composition. Panel A shows the results for the entire sample (2011-2017) while Panel B shows these statistics for the most recent quarter in our data (2017 Q4). The first four columns show meant, 25th percentile, median, and 75th percentile of these statistics for the entire sample of shadow banks, while the last four columns show the results restricted to sample of shadow banks whose mortgage servicing rights (MSR) share of total assets are in the top quartile.

As we observe from Panel A of Table 2, shadow banks have a mean equity to asset ratio equal to 24.89%. The retained earnings account for the largest portion of equity, about 45% on average, followed by common stock and paid-in-capital with each accounting for about fifth of equity. Among the MSR institutions, the capitalization is higher and equal to 34.65% on average. Again, retained earnings account for the largest portion of equity followed by common stock and paid-in-capital. Panel B shows similar evidence when we restrict our attention to last quarter of our data.

Table 3 compares the funding composition of shadow banks (Column 1) to banks (Column 2). Similar to Table 2, Panel A shows the results for the entire sample (2011-2017) while Panel B shows these statistics for the most recent quarter in our data (2017 Q4). Panel A of Table 3 shows that shadow banks are on average about 2.3 times more capitalized than banks based on their equity to asset ratio (24.89% vs 10.92%). We find almost identical results when we compare shadow bank capitalization to those of banks focused on mortgage lending (Column 3) where a bank is a focused mortgage bank if its total loan to total asset ratio is above the sample median and if its real estate loans to total loans ratio is above the sample median.

Column (4) shows the equity to asset ratio in our main synthetic bank comparison group constructed by replacing all bank assets with mortgages as described in Section 2. Again we find that shadow banks are more than twice as capitalized as mortgage banks (24.89% vs 11.88%). We obtain very similar results when we compare shadow bank equity to asset ratio to those of alternative synthetic bank comparison group constructed by replacing all bank loans with mortgages while keeping their other assets fixed (Column 5).

Figure 2 illustrates this finding visually by comparing the distribution of equity to asset ratio among shadow banks and our primary mortgage banks comparison (see also Table 4). Figure A1 and A2 in the Appendix present very similar evidence when we compare distribution of equity to asset ratio of shadow banks to, respectively, all banks and alternative synthetic mortgage bank comparison group based on replacing all loans with residential mortgages, while keeping other assets fixed. Finally, Panel B of Table 3 shows similar evidence when we just focus on the most recent quarter of our data (Q4 2017).

Overall, regardless of the bank comparison group we focus on we find that shadow banks have on average more than twice as large equity to asset ratio as banks. To analyze this further, we estimate the following specification

$$Ratio_{i,t} = \alpha + \beta_1 ShadowBank_i + X'_{i,t}\Gamma + \mu_t + \epsilon_{i,t}, \quad (3)$$

where $Ratio_{i,t}$ is the equity to asset ratio of institution *i* at time *t*. The key variable of interest is the shadow bank indicator, $ShadowBank_i$, that takes the value of one if a lender is shadow bank and is zero otherwise. $X_{i,t}$ contains institution and local economic controls, including size, asset growth, the share of refinanced loans out of total loan origination portfolio, the share of government-insured loans out of total loan origination portfolio, and the logarithm of the weighted average of income per capita in states of operation. μ_t is the time fixed effect (year-quarter) while $\epsilon_{i,t}$ is the residual term. We estimate this specification using a panel data set that covers quarterly observations of 415 shadow banks and 4820 synthetic mortgage banks, which are constructed by replacing assets with residential mortgages, from 2011 to 2017. For robustness, we also estimate this specification with all banks and with synthetic mortgage banks that are constructed by replacing all loans with residential mortgages, while keeping other assets fixed. In all regressions, the standard errors are clustered by institutions.

Column (1) of Table 5 shows the OLS estimates of the shadow bank dummy in the specification (3) when we do not include any other controls but time fixed effects. We note that mortgage market undergone significant changes during our sample period (2011-2017) including more than doubling of shadow bank market share (Buchak et al. 2018a). Yet as we observe from Column (1) throughout our sample period shadow banks have on average 10 percentage points higher equity to asset ratio compared to banks (about twice as large). This indicates that a substantially higher capitalization of shadow bank is not confined to a specific point of time. Column (2) shows very similar results when in addition we control for a host of institution characteristics described above including region specific controls: shadow banks capitalization rate is about 10 percentage point higher than those of banks.

Tables A1 and A2 in the Appendix show very similar evidence when we compare shadow banks, respectively, to all banks and the alternative synthetic mortgage bank comparison group. This along with prior evidence indicates that our finding of much lower shadow bank leverage compared to those of banks cannot be accounted for by differences in observable characteristics across intuitions and is not confined to a specific region or period of time.

While capitalization (leverage) of banks is interesting in itself, regulatory attention is frequently focused on risk-based capital ratios. Since shadow banks do not report risk-based tier 1 capital ratios, we compute this ratio by applying Basel III risk-based tier 1 capital ratio formula. Since we do not observe the detailed risk profiles for each type of assets held on mortgage companies' balance sheet, we calculate the upper bound and lower bounds as described in Section 2.

Table 4 shows that shadow banks have substantially higher tier 1 capital ratio than mortgage banks: 29% (lower bound) to 37% (upper bound) compared to 21% for banks. Figure 3 illustrates this visually by plotting the distributions of tier 1 capital ratio for shadow banks and synthetic mortgage banks. As we observe, shadow banks are much more capitalized based on this metric. Figures A3

and A4 in the Appendix show very similar evidence when we compare shadow banks, respectively, to all banks and the alternative synthetic mortgage bank comparison group.

Table 5 confirms this finding more formally by showing the estimation results of the specification (3) with the tier 1 capital ratio as a dependent variable. Panel A shows results when we use upper bound for the shadow bank tier 1 capital ratio while panel B shows the corresponding results for the lower bound. As we observe from Column (1), shadow banks have tier 1 capitalization ratio is between 5 (lower bound) to 15 percentage points higher (upper bound) relative to synthetic mortgage banks. Column (2) shows similar results when we control for a host of observable risk characteristics. Table A3 and A4 in the Appendix show similar evidence when we compare shadow banks, respectively, to all banks and the alternative bank comparison group. Overall, across all specifications and controls, we find a very robust pattern: shadow banks on average have much more equity financing (capitalization) and hence much lower leverage than deposit-taking banks.

3.B *Fact 2: Leverage across shadow banks is substantially dispersed than banks*

Banks' capitalization is remarkably homogenous despite large differences in their business models, which differentiates them from non-financial firms. One potential explanation of this fact is that leverage is a first order determinant of banks' value generation, which arises from the optimal provision of intermediary services. Therefore, the optimal amount of leverage across banks is similar. In other words, financial intermediation is a prototypical example for target leverage theories. If financial intermediation demands pin down a specific leverage ratio, we should observe very high homogeneity in capital structures across shadow banks, because differences in their business models are much smaller than differences across banks.

We first confirm that bank capitalization is quite homogenous: the 90^{th} percentile most capitalized mortgage bank has an equity to asset ratio of about 6 percentage points higher than 10^{th} percentile least capitalized bank (Table 4). Shadow banks' capitalizations, on the other hand, differ widely: the 90^{th} percentile shadow bank has about 41 percentage point higher equity to asset ratio than the 10^{th} percentile least capitalized shadow bank. Panel (c) of Figure 2 and Figures A1 and A2 in the Appendix illustrate visually this substantial relative difference in the dispersion of capitalization across shadow banks and banks regardless of which bank comparison group we focus on. We obtain very similar inference when we focus on dispersion of tier 1 capital ratios. Panel (c) of Figure 2 and Figures A3 and A4 in the Appendix illustrate visually that tier 1 capital ratios vary much more widely across shadow banks compared to various bank comparison groups.

Overall, we find that the differences in capitalizing and leverage between shadow banks are substantially larger than differences in leverage and capitalization between banks. This fact is striking because shadow banks' business models are substantially more homogenous than those of banks. Recall that the shadow banks in our sample are primarily engaged in residential real estate mortgage origination. Commercial banks, on the other hand, vary substantially their specialization: some banks tilt substantially to commercial real estate, others towards residential loans, still others to industrial loans or consumer loans.

3.C *Fact 3: Shadow Bank and Bank Debt Structure*

We next turn our attention to the structure of liabilities of shadow banks. Panel A of Table 3 shows that like banks, shadow banks finance themselves primarily with short-term liabilities: on average about 88% of shadow bank liabilities are of the short-term compared to about 86% for banks. The vast majority of short-term liabilities for both banks and shadow banks consists of short-term debt.

Short-term debt plays even more important role in the debt structure of shadow banks compared to banks: almost 100% of shadow bank debt is short-term compared to about 70% for mortgage banks (Table 4).[6] Figure 4 and Figure A5 and A6 in the Appendix illustrate this visually by comparing the distribution of short-term debt to debt across shadow banks to synthetic mortgage banks formed by, respectively, replacing all assets with residential mortgages and replacing all loans with residential mortgages, while keeping other assets fixed, as well as to all banks.

Table 4 shows that, because of the stronger reliance on short-term debt, shadow banks have higher (Short-term Debt)/(Debt and Equity) ratio than banks despite being more capitalized (66% for shadow banks vs 60% for banks). Panel A of Table 7 illustrates this more formally by estimating the specification of the form (3) with the short-term debt to debt and equity ratio on a shadow bank dummy and host of controls in the sample composed of shadow banks and synthetic mortgage banks. Column (1)-(2) shows that shadow banks have about 6 to 8 percentage points higher short-term debt to debt and equity ratio.

Panel B of Table 7 shows that this is largely due to much larger reliance of shadow banks on short-term debt in their debt funding structure: shadow banks have about 30 percentage points higher short-term debt to debt ratio than mortgage banks (Column 1) and this finding is robust to controlling for a host of observable risk characteristics (Column 2). Tables A5 and A6 in the Appendix show a very similar evidence when we compare shadow banks, respectively, to all banks and the alternative synthetic mortgage bank comparison group.

Overall, this evidence indicates that shadow banks appear to be even more reliant on short-term debt than banks. Since shadow banks originate long maturity mortgages using short-term debt funding, they engage in liquidity and maturity transformation like banks. However, the structure of short-term debt differs significantly. Unlike shadow banks, banks have access to insured deposit financing and this form of financing constitutes the major form of debt funding for banks. Panel A of Table 3 shows that insured deposits account on average for, respectively, about 65% of all short-term liabilities of banks and more than half of all bank liabilities. Uninsured deposits account for about third of bank short-term liabilities and about 30% of total liabilities. In contrast, all shadow bank short-term debt is uninsured, and thus potentially prone to runs.

[6] Total debt excludes all trade-related liabilities, such as account payable and tax liabilities. Specifically, total debt includes debt facilities, commercial papers, mortgage debt, advanced federal home loans, and trusted preferred securities for shadow banks and it includes total deposits (for banks), repo, and an item called other borrowed money in the call report (such as FHLB advances or commercial papers).

To illustrate these differences visually Figure 5 shows the distribution of short-term debt to debt and equity ratios, uninsured and insured, across both shadow banks and synthetic mortgage banks. As we observe, shadow banks have on average higher short-term debt to debt and equity ratio (panel a) and *much higher* uninsured short-term debt to debt and equity ratio (panel c). Figure A7 and A8 in the Appendix show very similar pattern when we compare shadow banks to, respectively, all banks and alternative synthetic bank comparison group based on replacing all loans with residential mortgages, while keeping other assets unchanged.

Finally, we note that the majority of short-term bank debt funding is provided by depositors who are typically quite dispersed. Shadow banks' short-term debt, on the other hand, takes the form of credit lines provided by, on average, two to four lenders with a mean number of creditors equal to 3.43. The main provider of shadow bank short term funding are large banks, which provide substantial chunk of shadow bank debt. Therefore, while banks and shadow banks fund themselves predominantly with short-term debt, the structure of shadow-bank debt fundamentally differs in two important aspects from those of banks: (i) shadow bank debt is uninsured and (ii) shadow bank debt is highly concentrated among few creditors.

Section 4: Funding and Size across Shadow Banks and Banks

So far, we have demonstrated that shadow banks are on average much more capitalized than banks and that they predominately rely on uninsured short-term debt for their funding. Moreover, the differences in leverage/capitalization between shadow banks are substantially larger than differences in leverage/capitalization between banks.

In this section we explore how these differences relate to size of financial institution. We use two primary measures of bank size: the lender's loan origination volume and the lender's asset size.

4.A Fact 4: Capitalization, Leverage and Size

To investigate how funding ratios change with size, we estimate the following specification of form (3) when in addition we include interactions of shadow bank dummy with size measures:

$$Ratio_{i,t} = \alpha + \beta_1 ShadowBank_i + \beta_2 ShadowBank_i \times Size_{i,t} + X'_{i,t}\Gamma + \mu_t + \epsilon_{i,t} \qquad (4)$$

The key variables of interest are the shadow bank indicator, $ShadowBank_i$, and its interaction with size. Specifically, we are interested in four funding ratios: equity to asset ratio, tier 1 capital ratio, short-term debt to debt and equity ratio, and short-term debt to debt ratio. As before $X_{i,t}$ contains institution and local economic controls, including size, asset growth, the share of refinanced loans out of total loan origination portfolio, the share of government-insured loans out of total loan origination portfolio, and the logarithm of the weighted average of income per capita in states of operation. μ_t is the time fixed effect (year-quarter) while $\epsilon_{i,t}$ is the residual term. We estimate this specification using a panel data set that covers quarterly observations of 415 shadow banks and 4820 synthetic mortgage banks, which are constructed by replacing assets with residential mortgages, from 2011 to 2017. As in Section 3, we also estimate this specification with all banks and with synthetic mortgage banks that are constructed by replacing all loans with

residential mortgages, while keeping other assets fixed. In all regressions, the standard errors are clustered by institutions.

Columns (3) to (7) of Table 5 show that the estimated shadow bank dummy for equity to asset ratio is positive while its interaction terms with two measures of size are negative and generally statistically and economically significant. In other words, shadow banks are on average more capitalized than mortgage banks, but this difference diminishes with size. Columns (3) to (7) of Tables 6 provide corresponding evidence for risk-based tier 1 capital ratios. Again, we find that shadow banks have on average higher tier 1 capital ratios than mortgage banks but this difference declines with both size measures. We find similar evidence when instead we compare shadow banks to all banks (Table A1 and A3 in Appendix) and to alternative mortgage bank comparison group based on replacing all loans with residential mortgages (Table A2 and A4 in Appendix).

Columns (3) to (7) of Table 7 perform similar analysis for short-term debt to debt and equity ratio (Panel A) and short-term debt to debt ratio (Panel B). Table A5 and A6 in the Appendix provides corresponding evidence when we compare, respectively, shadow banks to all banks and to alternative mortgage bank comparison group based on replacing all loans with residential mortgages. Panel B of Table 7 shows that as size grows the ratios of short-term debt to debt and become more similar between shadow banks and mortgage bank (expect the specification in Column (7) when the interaction terms of shadow bank dummy with two size measures have opposite estimated signs). Panel A of Table 7 generally indicates that short-term debt to equity and debt ratios become more similar between banks and shadow banks as their size grows (again expect the specification in Column 7 where the interaction terms of shadow bank dummy with two size measures have opposite estimated signs).

To explore these patterns visually, Figure 6 and 7 plot the estimated relation between funding ratios and the log of loan origination volume for synthetic mortgage banks and shadow banks along with the 95% confidence interval. Specifically, using a panel data set of quarterly observations from 2011 to 2017, we estimate the following specification for banks and shadow banks, respectively:

$$Ratio_{i,t} = \Sigma_b \gamma_b I\left(Size_{i,t} \in Bin_b\right) + \epsilon_{i,t} \quad (5)$$

where $Ratio_{i,t}$ is the funding ratio, $I(Size_{i,t} \in Bin_b)$ is an indicator of whether bank (shadow bank) i's size falls within size bucket Bin_b. The coefficients of interest, γ_b, show how funding ratios vary non-parametrically across the size distribution. Figure 6 and 7 plot γ_b versus the size bin Bin_b, where size is measured by the logarithm of mortgage origination volume in Figure 6 and by the logarithm of total assets in Figure 7. Each size bin covers an incremental value of 0.25 in the size distribution. In other words, the difference between the largest firm's size and the smallest firm's size in each size bin is 0.25. In the main analysis, we compare shadow banks to primary synthetic mortgage bank comparison group (Figure 6 and 7). For robustness we also compare shadow banks to all banks and to alternative synthetic mortgage banks comparison group (Appendix A9-A12). Panel (a) plots equity to assets ratios. Panel (b) and (c) plot, respectively,

upper and lower bound of risk-based tier 1 capital ratios as defined in Section 2. Panel (d) plots the short-term debt to debt and equity ratios. Panel (e) plots short-term debt to debt ratios. The shaded area shows the 95% confidence interval.

Figure 6 shows that shadow bank leverage (capitalization) increases (decreases) substantially with size measured by log of loan origination volume and the leverage of the largest shadow banks is similar to that of large banks of comparable size. This is clearly seen in patterns of equity to asset ratio as well as risk-based tier 1 capital ratios. Bank leverage and so their capitalization, on the other hand, hardly changes with size. Finally, on the liability side we also find evidence that short/term debt to debt and equity ratio and short-term debt to debt ratio become more similar between shadow banks and banks as size increases. Again, we find broadly similar evidence when we compare distribution of funding ratios of shadow banks across loan origination volume to those of all banks (Figure A9 in the Appendix) and alternative mortgage bank comparison group based on replacing all loans with residential mortgages (Figure A10 in the Appendix).

Figure 7 shows that we observe broadly similar pattern (with the exception of short-term debt to debt and equity ratio) when we use the asset value as a measure of size. Again, we find similar evidence when we compare distribution of funding ratios of shadow banks across asset size with those of all banks (Figure A11 in the Appendix) and alternative mortgage bank comparison group (Figure A12 in the Appendix).

4.B Fact 5: Uninsured Leverage, Debt Funding Cost, and Size

We conclude this section by investigating the relation between the short-term debt funding composition and its cost with size. We recall from Section 3 that both banks and shadow banks primary rely on short-term debt financing though in the case of shadow banks all this debt is uninsured while in the case of banks majority of short-term debt funding is funded though insured deposits. Moreover, as we discussed in prior section, the (uninsured) leverage of shadow banks increases with size.

Interestingly, as Figure 8 demonstrates, the positive uninsured leverage/size relationship is not a phenomenon unique to shadow banks. This figure compares insured and uninsured funding ratios using the methodology underlying specification (5). The sample consists of quarterly observations from 2011 to 2017 of 420 shadow banks and 4,442 commercial banks. Panel (a) and (b) plot short-term insured funding and short-term uninsured funding against total loan origination volume. Panel (c) and (d) short-term insured funding and short-term uninsured funding against total assets. The shaded area shows the 95% confidence interval. As we observe as the size of the bank increases so its reliance on uninsured short-term debt. In other words, the *uninsured* debt ratio increases with bank size even though overall leverage does not.

We next turn our attention to debt funding cost. Table 8 reports the summary statistics of the average interest rate (pp) as measured by interest expense divided by debt outstanding for both bank and shadow banks across size. Panel (a) reports statistics for interest rates on bank insured

debt (insured deposits). Panel (b) reports statistics for interest rates on bank uninsured debt. Panel (c) reports the average interest rate on debt for shadow banks, which is all uninsured.

As expected, Table 8 shows that banks pay lower interest rate on insured debt compared to uninsured debt in the order of 50 to 180 basis points depending on the size bin. Moreover, shadow banks on average pay higher interest rate on uninsured debt than banks. Interestingly, the cost of uninsured debt declines with size for both banks and shadow banks, though the uninsured leverage increases with size for both types of institutions.

To illustrate it more formally, in Panel A of Table 9 we use panel data set of 429 shadow banks from 2011 to 2017 and estimate the following specification:

$$Rate_{i,t} = \alpha + \beta Size_{i,t} + X'_{i,t}\Gamma + \mu_t + \epsilon_{i,t} \quad (6)$$

$Rate_{i,t}$ is the average interest rate shadow bank *i* pays on its debt in year *t,* calculated using shadow bank *i*'s total interest expense in year *t* divided by its total debt outstanding in year *t*. $Size_{i,t}$ is our independent variable of interest, which is measured by the logarithm of total assets and the logarithm of mortgage origination volume. $X_{i,t}$ is a vector of institution and local economic controls, including asset illiquidity index, the share of refinanced mortgages in shadow bank *i*'s mortgage origination portfolio, the share of government-insured mortgages in shadow bank *i*'s mortgage origination portfolio, and the logarithm of the weighted average of income per capita in shadow bank i's states of operation. We include the year fixed effect in our regressions and cluster the standard errors by shadow banks.

Consistent with Table 8, Panel A of Table 9 shows significant and negative association between cost of shadow bank debt and size (except Column 3 corresponding to the specification with full set of controls and size measured by assets where the coefficient is positive and statically insignificant).

To compare shadow banks' funding cost to banks' cost of uninsured debt, we estimate the following specification in Panel B of Table 9 in the sample of banks and shadow banks:

$$Rate_{i,t} = \alpha + \beta_1 ShadowBank_i + \beta_2 Size_{i,t} + \beta_3 ShadowBank_i \times Size_{i,t} + X'_{i,t}\Gamma + \mu_t + \epsilon_{i,t} \quad (7)$$

Since loans to shadow banks are not insured, if institution *i* is a shadow bank, $Rate_{i,t}$ is the average interest rate shadow bank *i* pays on its total debt outstanding. If institution *i* is a bank, $Rate_{i,t}$ is the average interest rate bank *i* pays on its uninsured debt, including uninsured deposits, foreign deposits, repos, other borrowed money and subordinated debt. The coefficient of interest is β_3, which shows how funding costs change differently with size for banks and shadow banks. As in the specification above, $Size_{i,t}$ is measured by the logarithm of total assets and the logarithm of mortgage origination volume, and $X'_{i,t}$ is the same set of institution and local economic controls. We include the year fixed effect and cluster the standard errors by institutions.

Consistent with Table 8, Panel B of Table 9 shows that across specifications we find that the cost of uninsured debt generally declines with size for *both* banks and shadow banks. This decline appears to be relatively faster for shadow banks when size is defined by loan origination volume.

Figure 9 confirms these patterns visually by showing the average interest rate (in %) for short-term insured versus uninsured deposits by bank loan origination volume and asset size. As we observe as size increases the average interest rate on uninsured short-term bank debt declines and becomes similar to those of those of insured deposits (Panel A and B). The largest banks appear to pay very similar interest rates on both types of debt. We observe the same pattern for shadow bank debt along the loan origination volume. The cost of shadow bank short-term debt declines with size measured by loan origination volume and the largest shadow banks appear to pay statistically indistinguishable interest rates on their debt to interest rates charged on insured and uninsured deposits of similarly-sized large banks. As we discuss in the next section these results suggest that there are economies of scale in short-term, uninsured debt funding for financial intermediaries, both for banks and shadow banks.

Section 5: Discussion and Conclusion

Is bank capital structure designed to optimally resolve frictions or extract deposit subsidies? We address this question by studying capital structure decisions of shadow banks: intermediaries that provide banking services but are not funded by deposits. We assemble, for the first time, call report data for shadow banks which originate one quarter of all US household debt.

Shadow banks use twice as much equity capital as equivalent banks, suggesting that deposit subsidies drive higher bank leverage. Leverage across shadow banks is substantially dispersed, rejecting the argument that homogeneity in leverage across banks is driven by value creating activities. Like banks, shadow banks finance themselves primarily with short-term debt and originate long-term loans. However, shadow bank debt is provided primarily by informed and concentrated lenders. This result suggests that fragility by design and informational insensitivity are not fundamental reasons for bank debt. Shadow bank leverage increases substantially with size, and the capitalization of the largest shadow banks is similar to banks of comparable size. While bank leverage does not change with size, the composition varies dramatically with large banks funding themselves with a larger share of uninsured deposits. The cost of uninsured debt declines with size both for shadow banks and banks.

We discuss some first order implications of our facts. First and foremost, shadow banks' much higher capitalization, for all but the very large shadow banks, suggests that access to subsidized deposits at least partially drives banks' high leverage. If extremely high leverage were fundamental to the provision of financial intermediation services, we should have found shadow banks' leverage to be as high as those of deposit-taking banks. Instead, the average capitalization of modern shadow banks (25%) is very similar to the 24% capitalization of banks prior to deposit insurance (see Admati and Hellwig (2014)).

This suggests that lower leverage of financial intermediaries with no access to insured deposit financing is not necessarily an impediment to lending, which is also consistent with significant recent expansion of shadow bank lending (see Buchak et al. 2018a). This observation, of course, needs to be interpreted with caution for several reasons. One, a liquid secondary mortgage market – currently provided by Government Sponsored Entities -- is essential for operations of shadow banks (see Buchak et al. 2018b). It is unclear how the capital structure of shadow banks would evolve in absence of GSEs. Moreover, shadow banks indirectly rely on insured deposit financing since banks are the key providers of short term debt financing to shadow banks.

Second, our findings can speak to two alternative explanations of why banks' leverage choices are so similar despite differing business models. One is that banks are a prototypical example for target leverage theories. The argument is that banks differ from non-financial firms. Target leverage is a first order determinant of banks' value generation, which arises from the optimal provision of intermediary services. Therefore, the optimal amount of leverage across banks is similar. The alternative view is that deposit subsidies provide large incentives for leverage, so banks take up as much debt as capital requirements allow. Under this view, capital requirements lead to homogeneous bank leverage. Our result that there exists a high dispersion in shadow bank leverage for intermediaries doing similar activities like banks implies that value creation on banks' liability side may be driven by subsidized deposit insurance to a large degree. Banks take advantage of the subsidy, and their leverage ratios are to a first order pinned down by capital requirements.[7]

Third, common wisdom suggests that large banks' leverage choices are distorted more than those of small banks. While both types receive deposit subsidies, TBTF additionally increases large banks' incentives to borrow. Our results cast doubt on that assertion, at least in the post 2011 period. Mortgage shadow banks, which we examine, are likely not subject to TBTF or benefit to a much smaller degree. Nevertheless, large shadow banks' leverage is quite similar to that of similarly sized banks, suggesting that the same force is driving leverage choices for both. Small bank leverage, on the other hand, is much larger than that of corresponding shadow banks. These results suggest that small banks benefit more from insured deposits than large banks. Our findings are consistent with the recent literature, which has found a significant decline in TBTF premia in the recent period (see Berndt, Duffie, and Zhu 2018).

Fourth, the short maturity of shadow bank debt suggests that funding short term is essential to the functioning of financial intermediation. Because bank deposits are subsidized and have short maturity, the subsidies could be driving the maturity structure of debt. Since shadow banks' debt is tilted towards short-term debt even more than for banks, our results are more consistent with theories in which short-term debt is a necessary outcome of financial intermediation.

Last, our results suggest that there are economies of scale in the short term, uninsured debt funding for financial intermediaries, both for banks and shadow banks. The cost of short-term uninsured

[7] Ratcheting models in the presence of capital requirements can also lead all banks to choose capital levels close to the constraint and leave them with heterogeneous and lower capitalization in the absence of such requirements (see Demarzo 2019, AFA presidential address).

debt declines with size for large financial intermediaries, both banks and shadow banks. While we do not directly measure the cost of equity, our results imply that the cost of uninsured debt declines faster than the costs of equity or those of insured debt. Viewed through the lens of trade-off models and capital structure models with frictions[8], these results suggest higher bankruptcy (resolution) costs, agency frictions or monitoring costs for smaller financial intermediaries. Lower interest rates of large shadow banks are certainly consistent with explanation. Such economies of scale would also arise if monitoring by run-prone debtholders was relatively more important for large intermediaries (Diamond and Rajan 2001). It is worth emphasizing that these results do not imply economies of scale in the size of banks. In other words, the results have implications for the funding of banks, rather than bank size.

One issue, which remains unclear is whether the capital structure of shadow banks, especially large ones, are more or less fragile than that of banks. On the one hand, large shadow banks have similar capital ratios to banks, but have a much higher ratio of potentially run prone uninsured debt, suggesting their capital structure is more fragile than that of banks. However, the debt holdings of shadow banks are very concentrated and held by informed lenders (large banks). In the canonical Diamond and Dybvig (1983) setup fragility of deposit funded banks arises to a large degree because (uninformed) individual small depositors do not internalize the impact of their withdrawals on banks survival. Resolving whether such considerations shape the optimal capital structure of banks remains an area of future research.

[8] See, for example, Jensen and Mackling (1976), Townsend (1979), Bolton and Scharfstein (1990), Diamond (1991), Leland (1994), Diamond and Rajan (2000), Hart and Moore (1998), DeMarzo and Fishman (2007).

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Table 1: Shadow Bank Call Report --- Quicken Loans

This table reports the balance sheet composition of Quicken Loans (panel a), its income statement (panel b), and its warehouse funding sources (panel c) in 2017 Q4. Quicken Loans is the shadow bank lender that by the end of 2017 became the largest residential mortgage lender in the United States in terms of the number of loans originated (based on HMDA).

Panel A: Quicken Loans Balance Sheet

Asset (% of Total Assets)		Liability (% of Total Assets)	
Cash	10.12%	Short-term Liabilities	78.75%
Receivable	1.75%	Debt Facilities	65.15%
Securities	0	Deposits	0%
Mortgage Held for Sale	54.86%	Commercial Papers	0%
Mortgage Held for Investment	0.04%	Other Account Payables	0.11%
Mortgage Servicing Rights	18.73%	Accrued Expenses	1.18%
Real Estate Owned	0.01%	Other Short-term Liabilities	6.67%
Building and Properties	1.41%	Long-term Liabilities	0.43%
Good will and Intangible Assets	0.04%	Mortgage Debt	0%
Derivatives	1.93%	Trust Preferred Securities	0%
Technology Capital	0.77%	Other Long-term Liabilities	0%
		Servicing Liabilities	0%
		Derivative Liabilities	0.05%
		Repurchase Reserves	0.38%
		Subordinated Debt	0
		Total Liability	$10.4 Billion
		Preferred Stock	0%
		Common Stock (Partner's Capital)	0.86%
		Paid-in Capital	0%
		Non-control Interest	0%
		Other Comprehensive Income	0%
		Retained Earnings	19.96%
		Treasury Stocks	0%
Total Asset	$13.1 Billion	Total Equity	$2.72 Billion

Table 1: Shadow Bank Call Report --- Quicken Loans
[continued]

Panel B: Quicken Loans Income Statement

Gross Income	$1.01 Billion	**Total Expenses**	$0.79 Billion
Total Interest Income	4.74%	Total Interest Expenses	8.87%
Mortgage Held for Sale	4.61%	Warehouse Interest Expense	3.93%
Mortgage Held for Investment	0.00%	MBS Prepayment Interest Shortfall	2.21%
Securities	0.00%	MSR Assets	0.00%
Other Interest Income	0.13%	Debt Issuance	2.77%
Total Origination-Related Income	-4.95%	Other Interest Expense	-0.04%
Origination Fees	2.33%	Total Personnel Expenses	43.78%
Fees Received from Correspondents	0.02%	Total Origination Compensation	22.50%
Other Origination-Related Income	-7.30%	Total Servicing Compensation	1.24%
Total Secondary Marketing Gains on Sale	85.85%	Other Personnel	7.71%
Mortgages Sold with Servicing Retained	67.32%	Total Other Non-Interest Expenses	47.35%
Capitalized Servicing Rights	24.08%	Equipment Depreciation	4.93%
Mortgages Sold with Servicing Released	5.66%	Technology-Related Expenses	1.22%
Other Gains from Loan Sale	-11.22%	Consulting/Legal Fees	4.12%
Total Servicing-Related Non-Interest Income	13.26%		
Servicing Fees	17.40%		
Subservicing Fees	0.18%		
Late Fees	0.45%		
Change in MSR Value	-4.75%		
MSR Sale	0.00%		
		Net Income	$0.22 Billion

Panel C: Quicken Loans Wearhouse Line Funding Providers

Provider	Limit ($ Billion)	Used ($ Billion)
Bank of America	1	0.64
Credit Suisse First Boston	2.2	0.45
Fannie Mae	2.5	2.03
Freddie Mac	1	0.33
Fifth Third Bank	0.18	0.18
JP Morgan Chase	1.75	1.58
Morgan Stanley	0.75	0.29
Rock Holdings	0.3	0
Royal Bank of Canada	0.65	0.52
USB	1	0.27
Various	2.26	2.29
Total	13.59	8.55

Table 2: Summary Statistics --- Shadow Bank Liability and Equity Composition

This table reports the liability and equity composition of shadow banks in the US mortgage market. Panel (a) displays the balance sheet statistics of the entire sample ranging from 2011 Q1 to 2017 Q4. Panel (b) displays the balance sheet composition as of December 31, 2017. We restrict attention to mortgage companies that are required to file HMDA reports and originate mortgage loans. Removing companies that do not show up in HMDA database, this restriction leaves us with 429 shadow banks that have a license in the two states that provide us data. The table shows the average liability and equity shares and 25th, median and 75th percentiles for liability and asset shares. The first four columns show the summary statistics for all shadow banks. The last four columns show the statistics for shadow banks whose mortgage servicing rights share of total assets are in the top quartile.

Panel A: Summary Statistics for the Entire Sample (2011-2017)

	Full Sample				MSR Institutions			
	Mean	25th	Median	75th	Mean	25th	Median	75th
Total Liabilities	74.98	69.6	80.9	87.19	65.33	56.78	70.42	78.68
Short-term Liabilities	66.19	56.91	75.46	83.8	54.23	42.32	59.65	71.53
Debt Facilities	59.43	48.28	69.46	78.83	46.59	31.53	52.43	64.93
Deposits	0	0	0	0	0	0	0	0
Commercial Papers	0	0	0	0	0	0	0	0
Other Account Payables	1.32	0	0.02	1.23	1.63	0	0.1	1.77
Accrued Expenses	2.69	1.13	2.3	3.77	2.44	1.01	1.97	3.22
Other Short-term Liabilities	1.15	0	0.24	1.46	1.65	0	0.59	2.32
Long-term Liabilities	6.99	0.55	1.91	5.44	9.14	0.89	3.56	11.54
Mortgage Debt	0.21	0	0	0	0.39	0	0	0
Trust Preferred Securities	0	0	0	0	0	0	0	0
Other Long-term Liabilities	1.73	0	0	0.8	2.66	0	0	2.86
Servicing Liabilities	0.12	0	0	0	0.13	0	0	0
Derivative Liabilities	0.22	0	0	0.24	0.21	0	0	0.22
Repurchase Reserves	0.83	0	0.34	1.17	1	0	0.46	1.47
Subordinated Debt	0	0	0	0	0	0	0	0
Total Equity	24.89	12.66	19	30.32	34.65	21.17	29.58	43.22
Preferred Stock	0.04	0	0	0	0.04	0	0	0
Common Stock (Partner's Capital)	5.67	0	0.1	8.77	7.7	0	0.2	16.12
Paid-in Capital	5.31	0	0.71	5.18	7.82	0	0.68	9.3
Non-control Interest	0	0	0	0	0	0	0	0
Other Comprehensive Income	0.01	0	0	0	0	0	0	0
Retained Earnings	11.33	0	8.73	17.84	14.72	0	13.95	24.48
Treasury Stocks	-0.01	0	0	0	-0.01	0	0	0
No. of Institutions	429				149			

Table 2: Summary Statistics --- Shadow Bank Liability and Equity Composition [continued]

Panel B: Summary Statistics as of 2017 Q4

	Full Sample				MSR Institutions			
	Mean	25th	Median	75th	Mean	25th	Median	75th
Total Liabilities	74.91	70.2	80	86.03	69.1	63.81	73.3	79.33
Short-term Liabilities	67.61	59.9	75.26	82.7	58.7	52.34	62.83	73.41
Debt Facilities	60.32	52.64	68.48	78.13	50.79	43.79	55.06	65.2
Deposits	0	0	0	0	0	0	0	0
Commercial Papers	0	0	0	0	0	0	0	0
Other Account Payables	1.11	0	0	0.87	1.02	0	0.02	1.05
Accrued Expenses	2.92	1.25	2.48	4	2.59	1.15	2.11	3.43
Other Short-term Liabilities	1.3	0	0.35	1.63	2.06	0.05	0.9	3.19
Long-term Liabilities	5.98	0.25	1.45	4.21	9.11	0.6	2.69	13.34
Mortgage Debt	0.23	0	0	0	0.57	0	0	0
Trust Preferred Securities	0	0	0	0	0	0	0	0
Other Long-term Liabilities	1.71	0	0	0.92	2.81	0	0.07	3.36
Servicing Liabilities	0.13	0	0	0	0.15	0	0	0.01
Derivative Liabilities	0.07	0	0	0.07	0.08	0	0	0.08
Repurchase Reserves	0.61	0	0.28	0.89	0.69	0.04	0.42	0.93
Subordinated Debt	0	0	0	0	0	0	0	0
Total Equity	25.09	13.97	20	29.8	30.91	20.67	26.7	36.19
Preferred Stock	0.04	0	0	0	0.04	0	0	0
Common Stock (Partner's Capital)	6.25	0	0.11	10.33	7.39	0	0.19	15.25
Paid-in Capital	5.15	0	0.32	5.37	5.56	0	0.12	4.33
Non-control Interest	0	0	0	0	0	0	0	0
Other Comprehensive Income	0.01	0	0	0	0	0	0	0
Retained Earnings	11.05	0	8.31	18.33	14.73	0	15.65	24.13
Treasury Stocks	-0.02	0	0	0	-0.01	0	0	0
No. of Institutions	317				80			

Table 3: Summary Statistics --- Shadow Bank versus Bank Funding Composition

This table compares funding composition of shadow banks and banks. The top part shows these statistics for the entire sample while the bottom part for 2017 Q4. We restrict attention to mortgage companies that are required to file HMDA reports and originate mortgage loans. Removing companies that do not show up in HMDA database, this restriction leaves us with 429 shadow banks that have a license in the two states that provide us data. Column (1) shows the statistics for the shadow bank sample, Column (2) for the full bank sample, Column (3) for the mortgage bank sample where a bank is a mortgage bank if its total loan to total asset ratio is above the sample median and if its real estate loan to total loan ratio is above the sample median, Column (4) for the synthetic mortgage bank sample (sample constructed based on assets), and Column (5) for the alternative synthetic mortgage bank sample (sample constructed based on loans).

Panel A: Funding composition of shadow banks and banks (2011-2017)

	(1)	(2)	(3)	(4)	(5)
	Shadow Bank Sample	Bank Full Sample	Mortgage Bank Sample	Synthetic Mortgage Bank I	Synthetic Mortgage Bank II
Total Liabilities	74.98	89.08	89.1	88.12	88.15
Short-term Liabilities	66.19	76.45	72.03	60.72	69.22
Debt Facilities	59.43	73.07	68.23	54.59	64.6
Insured (Short-term Deposits)	0	49.65	48.78	50.39	54.2
Uninsured	59.43	23.41	19.47	4.3	10.2
Other Short-term Liabilities	1.26	3.32	3.71	6.06	4.45
Long-term Liabilities	6.99	12.57	17.03	27.19	18.68
Equity	24.89	10.92	10.9	11.88	11.85
Preferred Stock	0.04	0.05	0.07	0.01	0
Common Stock	5.67	0.97	0.96	-1.18	-0.59
Paid-in Capital	5.31	4.99	4.48	0.76	2.34
Retained Earnings	11.33	4.78	5.34	12.48	10.09
Other Equity	0.03	0.11	0.05	-0.2	-0.05
No. of Institutions	429	4,822	4,822	4,822	567

Panel B: Funding composition of shadow banks and banks (2017 Q4)

	(1)	(2)	(3)	(4)	(5)
	Shadow Bank Sample	Bank Full Sample	Mortgage Bank Sample	Synthetic Mortgage Bank I	Synthetic Mortgage Bank II
Total Liabilities	74.91	88.87	88.8	87.9	87.98
Short-term Liabilities	67.61	78.22	73.81	63.36	71.21
Debt Facilities	60.32	74.18	68.68	56.71	65.99
Insured (Short-term Deposits)	0	47.28	45.55	48.36	51.7
Uninsured	60.32	26.93	23.13	8.43	14.16
Other Short-term Liabilities	7.23	3.98	5.05	6.57	5.06
Long-term Liabilities	5.98	10.58	14.9	24.3	16.5
Equity	25.09	11.13	11.2	12.1	12.02
Preferred Stock	0.04	0.01	0.01	-0.03	-0.04
Common Stock	6.25	0.59	0.72	-1.54	-0.93
Paid-in Capital	5.15	4.37	3.6	0.18	1.8
Retained Earnings	11.05	6.25	6.89	13.88	11.38
Other Equity	0.06	-0.11	-0.07	-0.41	-0.26
No. of Institutions	317	3,054	3,054	3,054	360

Table 4: Funding Heterogeneity – Mortgage Banks versus Shadow Banks

This table compares the funding ratio distributions of mortgage banks and shadow banks. Synthetic mortgage banks are constructed by replacing all bank assets with residential mortgages.

	Bank			Shadow Bank		
	Mean	S.D.	90th-10th	Mean	S.D.	90th-10th
Equity/Asset	11.9	2.8	6.1	24.9	18.3	41.1
Risk-Based Tier 1 Ratio (Upper)	21.1	5.0	10.2	37.1	19.4	48.9
Risk-Based Tier 1 Ratio (Lower)	21.1	5.0	10.2	28.9	18.4	42.0
Short-term Debt/(Debt+Equity)	60.4	8.2	20.4	66.2	27.0	75.8
Short-term Debt/Debt	68.8	8.8	21.8	98.4	6.0	0.2

Table 5: Equity to Asset Ratio --- Shadow Banks versus Mortgage Banks

This table reports results of a pooled OLS regression of capital structure on shadow bank indicator, its interaction with size, which is measured by the logarithm of mortgage origination volume and the logarithm of asset size, and the institution controls. The sample consists of shadow banks and synthetic mortgage banks which are constructed by replacing all bank assets with residential mortgages. Institution controls include loan origination growth, the share of refinanced mortgages out of total mortgage origination volume, the share of government-insured mortgages out of total mortgage origination volume, and the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i, as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	9.962***	10.185***	54.329***	31.896***	56.672***	36.826***	60.521***
	(0.67)	(0.86)	(7.18)	(5.09)	(7.50)	(5.48)	(7.46)
Ln(Loan Volume)		0.050	-0.012		0.173**	-0.177**	
		(0.08)	(0.02)		(0.07)	(0.07)	
Ln(Asset)		-0.265***		-0.028	-0.206**	0.174**	-0.078
		(0.10)		(0.03)	(0.10)	(0.07)	(0.05)
Shadow Bank×Ln(Loan Vol.)			-3.233***		-3.372***		-2.971***
			(0.51)		(0.53)		(0.60)
Shadow Bank×Ln(Asset)				-1.219***		-1.400***	-0.426
				(0.27)		(0.29)	(0.32)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	YesYes	Yes	Yes	Yes
Observations	115,175	109,419	115,175	115,175	109,419	109,419	109,419
R2	0.223	0.230	0.273	0.244 5	0.280	0.250	0.281

Table 6: Tier 1 Capital Ratio --- Shadow Banks versus Mortgage Banks

This table reports results of a pooled OLS regression of risk-based tier 1 capital ratio on shadow bank indicator, its interaction with size, which is measured by the logarithm of mortgage origination volume and the logarithm of asset size, and the institution controls. Panel (a) shows the results for the upper bound of tier 1 capital ratio, while Panel (b) shows the correspond results for the lower bound. The sample consists of shadow banks and synthetic mortgage banks which are constructed by replacing all bank assets with residential mortgages. Institution controls include loan origination growth, the share of refinanced mortgages out of total mortgage origination volume, the share of government-insured mortgages out of total mortgage origination volume, and the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i, as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Tier 1 Capital Ratio (Upper Bound)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	15.829***	14.858***	57.345***	39.911***	56.691***	46.514***	64.897***
	(0.82)	(1.05)	(7.66)	(6.04)	(8.09)	(6.25)	(7.70)
Ln(Loan Volume)		-0.007	-0.438***		0.104	-0.276***	
		(0.11)	(0.04)		(0.11)	(0.09)	
Ln(Asset)		-0.926***	-0.691***	-0.872***	-0.405***	-0.600***	
		(0.13)		(0.05)	(0.14)	(0.10)	(0.09)
Shadow Bank×Ln(Loan Vol.)			-2.909***		-3.034***		-2.444***
			(0.55)		(0.57)		(0.72)
Shadow Bank×Ln(Asset)				-1.399***		-1.664***	-0.908**
				(0.33)		(0.34)	(0.43)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,175	109,419	115,175	115,175	109,419	109,419	109,419
R2	0.238	0.272	0.270	0.276	0.290	0.284	0.292

Panel B: Tier 1 Capital Ratio (Lower Bound)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	5.984***	4.833***	47.880***	21.675***	43.859***	28.984***	48.192***
	(0.71)	(0.90)	(6.99)	(4.95)	(7.71)	(5.17)	(7.07)
Ln(Loan Volume)		-0.186*	-0.439***		-0.082	-0.391***	
		(0.10)	(0.04)		(0.09)	(0.09)	
Ln(Asset)		-0.715***		-0.692***	-0.665***	-0.317***	-0.521***
		(0.12)		(0.05)	(0.12)	(0.10)	(0.09)
Shadow Bank×Ln(Loan Vol.)			-2.937***		-2.831***		-2.656***
			(0.50)		(0.53)		(0.68)
Shadow Bank×Ln(Asset)				-0.934***		-1.269***	-0.479
				(0.27)		(0.27)	(0.36)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,175	109,419	115,175	115,175	109,419	109,419	109,419
R2	0.054	0.094	0.101	0.096	0.115	0.104	0.116

Table 7: Short-Term Debt --- Shadow Banks vs Mortgage Banks

This table reports results of a pooled OLS regression of short-term liabilities to assets (panel a) and short-term debt to debt on shadow bank indicator, its interaction with size, which is measured by the logarithm of mortgage origination volume and the logarithm of asset size, and the institution controls. The sample consists of shadow banks and synthetic mortgage banks which are constructed by replacing all bank assets with residential mortgages. Institution controls include loan origination growth, the share of refinanced mortgages out of total mortgage origination volume, the share of government-insured mortgages out of total mortgage origination volume, and the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i, as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Short-term Debt to Debt and Equity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	8.754***	6.353***	-63.466***	29.116**	-66.432***	12.137	-43.185***
	(1.17)	(1.75)	(11.29)	(11.61)	(11.82)	(12.00)	(13.36)
Ln(Loan Volume)		0.830***	0.649***		0.638***	0.781***	
		(0.17)	(0.06)		(0.15)	(0.14)	
Ln(Asset)		0.168		1.037***	0.074	0.263*	0.847***
		(0.24)		(0.08)	(0.22)	(0.16)	(0.13)
Shadow Bank×Ln(Loan Vol.)			5.091***		5.279***		7.302***
			(0.81)		(0.83)		(0.86)
Shadow Bank×Ln(Asset)				-1.034		-0.304	-2.576***
				(0.64)		(0.66)	(0.70)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,167	109,411	115,167	115,167	109,411	109,411	109,411
R2	0.059	0.088	0.109	0.076	0.117	0.088	0.130

Panel B: Short-term Debt to Debt

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	29.202***	28.451***	31.885***	60.830***	36.245***	54.324***	49.736***
	(0.31)	(0.71)	(4.07)	(3.05)	(4.69)	(3.63)	(4.51)
Ln(Loan Volume)		0.545***	0.728***		0.564***	0.340***	
		(0.09)	(0.06)		(0.09)	(0.10)	
Ln(Asset)		0.438***		1.149***	0.448***	0.835***	0.881***
		(0.11)		(0.08)	(0.11)	(0.13)	(0.13)
Shadow Bank×Ln(Loan Vol.)			-0.395		-0.563*		0.890***
			(0.29)		(0.33)		(0.33)
Shadow Bank×Ln(Asset)				-1.648***		-1.363***	-1.559***
				(0.17)		(0.19)	(0.22)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	114,941	109,212	114,941	114,941	109,212	109,212	109,212
R2	0.407	0.421	0.420	0.425	0.421	0.424	0.424

Table 8: Summary Statistics --- Shadow Bank versus Bank Funding Cost

This table reports the summary statistics of the average interest rate (pp) as measured by interest expense divided by debt outstanding. Panel A reports statistics of bank insured short-term debt (deposits) interest rates. Panel B reports statistics of bank uninsured short-term debt (deposit) interest rates. Panel C reports the average interest rate for shadow bank (uninsured) short-term debt. The sample consists of the full bank sample for Panels (a)-(b) and the shadow bank sample for Panel (c).

Panel A: Bank Insured Deposits Interest Rate (pp)

	Mean	25th	Median	75th
Size Bin 1	0.99	0.51	0.85	1.35
Size Bin 2	1.04	0.57	0.94	1.40
Size Bin 3	1.12	0.63	1.01	1.53
Size Bin 4	1.15	0.64	1.06	1.58

Panel B: Bank Uninsured Deposits Interest Rate (pp)

	Mean	25^{th}	Median	75th
Size Bin 1	2.83	1.41	2.36	3.95
Size Bin 2	2.59	1.28	2.10	3.51
Size Bin 3	2.20	0.99	1.74	2.94
Size Bin 4	1.71	0.78	1.31	2.20

Panel C: Shadow Bank Debt Interest Rate (pp)

	Mean	25^{th}	Median	75th
Size Bin 1	5.82	2.74	3.93	10.45
Size Bin 2	4.66	2.81	3.48	4.74
Size Bin 3	3.91	2.55	3.14	3.76
Size Bin 4	3.57	2.18	2.84	3.54

Table 9: Debt Funding Cost and Size --- Shadow Banks vs Banks

Panel (a) of this table reports regression results of average interest rate on uninsured short-term shadow bank debt on size as measured by Ln(Asset) and Ln(Loan Origination), respectively. Panel (b) reports regression results of average interest rate on size as measured by Ln(Asset) and Ln(Loan Origination), respectively. The sample in panel (b) consists of the full bank and the shadow bank. Institution controls include asset illiquidity index, refinance share, government-insured loan share, and log of average state income per capita. Ln(income per capita) is the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Debt Funding Cost and Size --- Shadow Banks

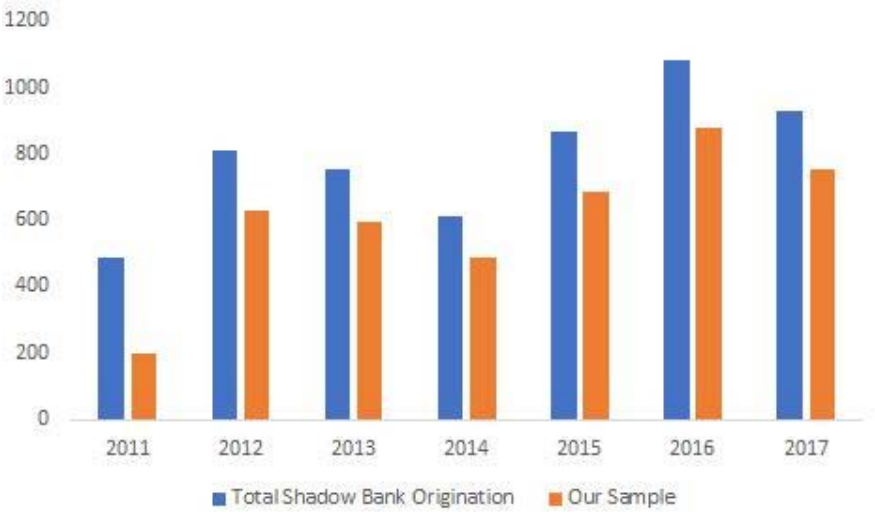
	Average Interest Rate (pp) on Uninsured Debt (pp)			
	(1)	(2)	(3)	(4)
Ln(Asset)	-0.155***		0.030	
	(0.04)		(0.04)	
Ln(Loan Origination)		-0.569***		-0.220***
		(0.06)		(0.06)
Institution Controls			x	x
Year FE	x	x	x	x
Observations	2,018	2,018	2,018	2,018
R2	0.030	0.081	0.165	0.172

Panel B: Debt Funding Cost and Size --- Shadow Banks vs Banks

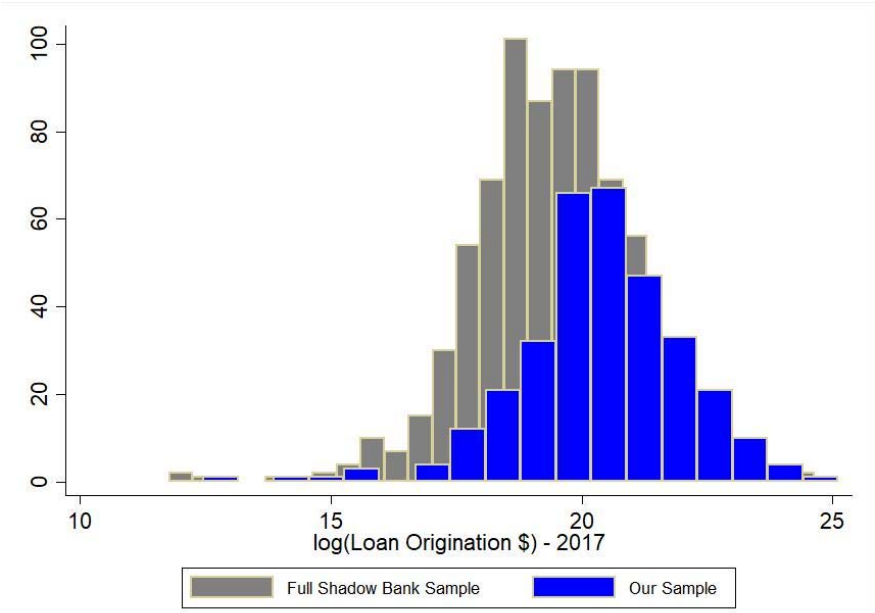
	Average Interest Rate on Uninsured Debt (pp)					
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(Asset)	-0.263***		-0.263***		-0.287***	-0.236***
	(0.01)		(0.01)		(0.01)	(0.02)
Ln(Loan Origination)		-0.112***		-0.113***	0.025**	0.023*
		(0.00)		(0.01)	(0.01)	(0.01)
Shadow Bank	-0.135	8.920***	-0.104	9.033***	-0.531	7.904***
	(0.76)	(0.83)	(0.74)	(0.83)	(0.75)	(0.81)
(Shadow Bank × Ln(Asset)	0.113***		0.123***		0.141***	
	(0.04)		(0.04)		(0.04)	
Shadow Bank × Ln(Origination)		-0.458***		-0.460***		-0.437***
		(0.06)		(0.06)		(0.06)
Institution Controls			x	x	x	x
Year FE	x	x	x	x	x	x
Observations	29,288	29,288	29,201	29,201	29,201	29,201
R2	0.322	0.314	0.327	0.319	0.327	0.333

Figure 1: Sample Coverage

This figure compares our sample coverage to the shadow bank loan origination coverage recorded in the HMDA data. Panel (a) plots the total shadow bank loan origination with the loan origination from our sample coverage, by year. Panel (b) plots the histograms of the size of shadow banks in our sample as well as shadow banks in the HMDA data.



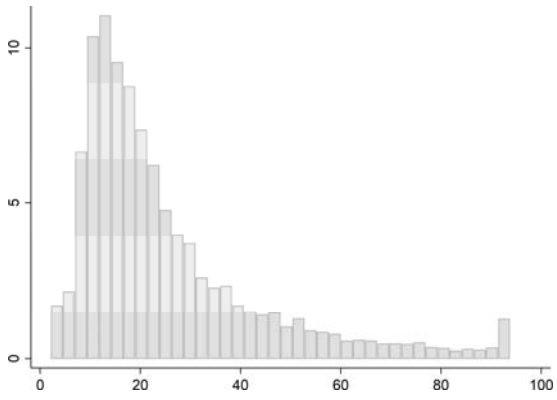
(a) Sample Coverage by Year



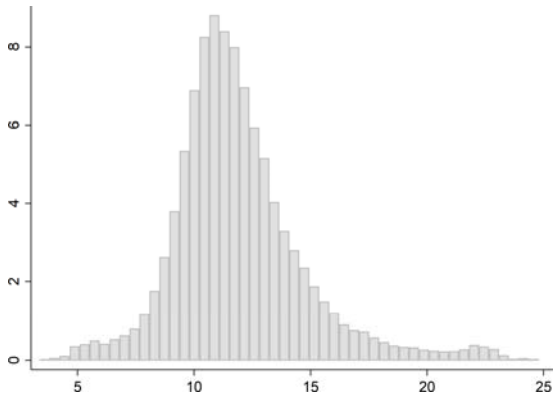
(b) Sample Size Distribution ($ billion)

Figure 2: Equity to Asset Ratio --- Shadow Banks versus Mortgage Banks

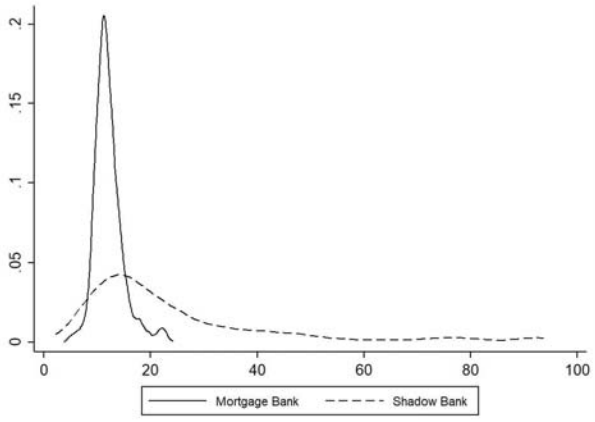
This figure shows the cross-section funding composition for shadow banks and mortgage banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 commercial banks. Mortgage banks are synthetically constructed by replacing all bank assets with residential mortgages. We restrict our attention to institutions that are required to file HMDA reports and originate mortgage loans. Panel (b) plots the equity to asset ratio for mortgage banks. Panel (c) compares the shadow banks' and mortgage banks' equity to assets ratios.



(a) Shadow Bank



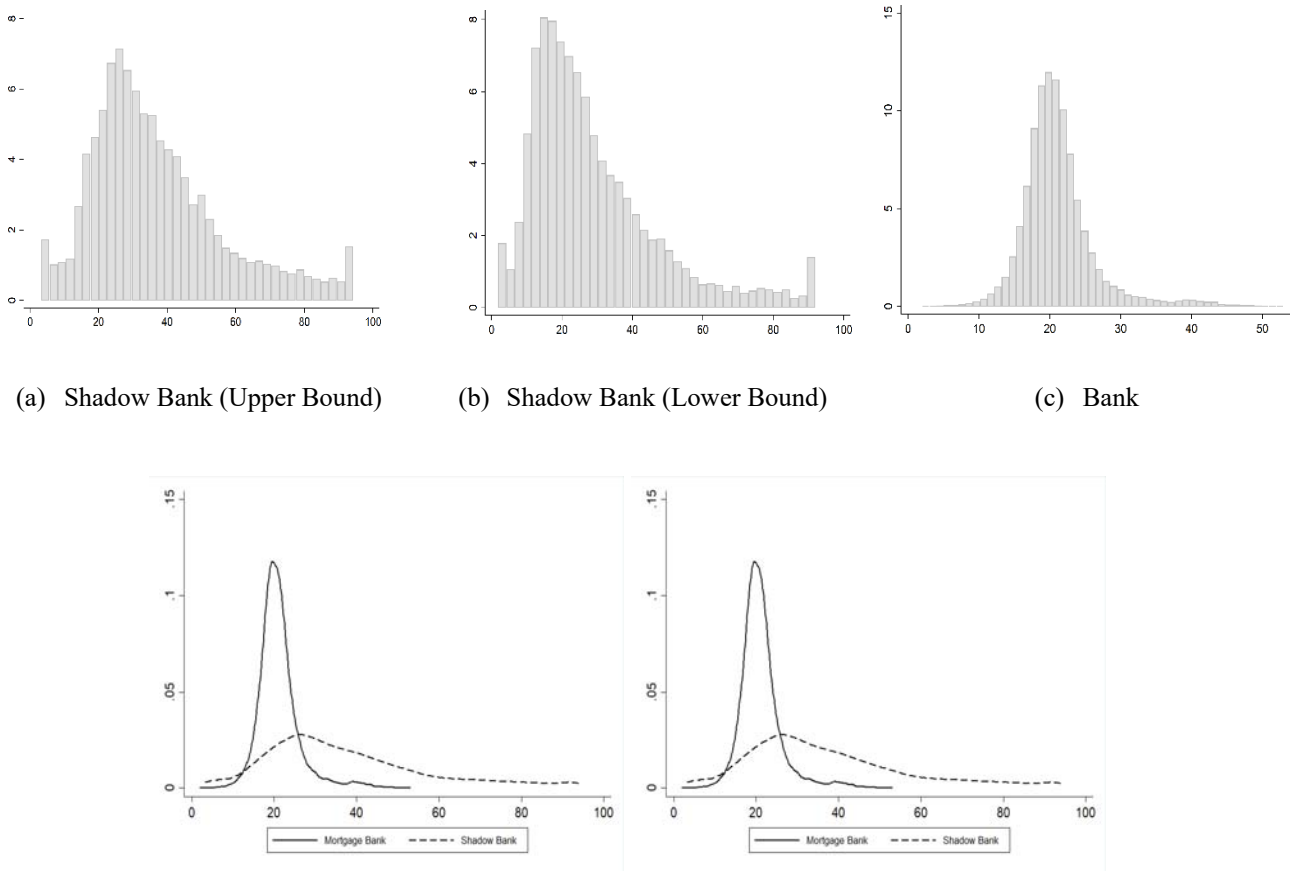
(b) Bank



(c) Bank vs Shadow Bank

Figure 3: Tier 1 Capital Ratio --- Shadow Banks versus Mortgage Banks

This figure shows the cross-section risk-based capital ratios for banks and shadow banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 mortgage banks. Mortgage banks are synthetically constructed by replacing all bank assets with residential mortgages. Since shadow banks do not report risk-based tier 1 capital ratios, we compute this ratio by applying the Basel III risk-based tier 1 capital ratio formula. Since we do not observe the detailed risk profiles for each type of assets held on the shadow banks' balance sheet, we calculate the upper bound and lower bound and plot the histograms of shadow banks' tier 1 capital ratios in Panel (a) and Panel (b), respectively. These bounds are computed as described in Section 2. Panel (c) plots the histogram of risk-based tier 1 capital ratios of mortgage banks. Panel (d) and (e) compare the mortgage banks' and shadow banks' tier 1 capital ratios.

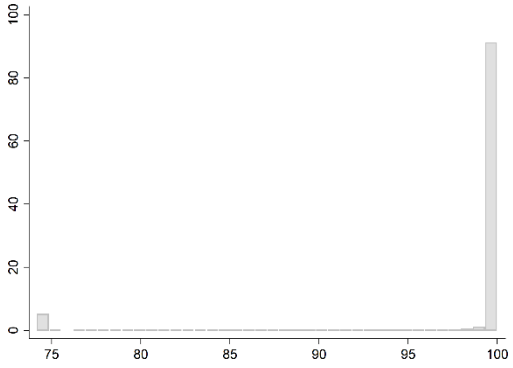


(a) Shadow Bank (Upper Bound) (b) Shadow Bank (Lower Bound) (c) Bank

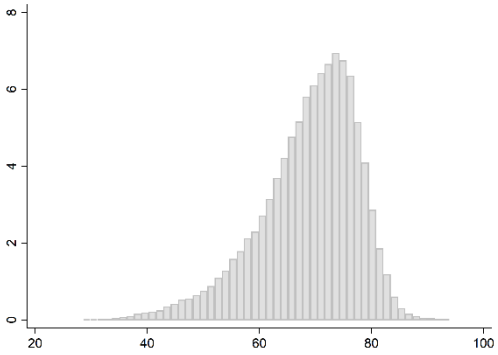
(d) Bank vs Shadow Bank (Upper Bound) (e) Bank vs Shadow Bank (Lower Bound)

Figure 4: Short-Term Debt to Total Debt --- Shadow Banks versus Mortgage Banks

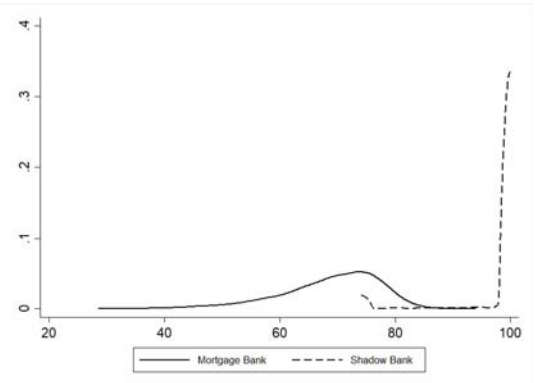
This figure shows the cross section short-term funding shares for shadow banks and mortgage banks and shadow banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 mortgage banks. Mortgage banks are synthetically constructed by replacing all bank assets with residential mortgages. Panel (a) plots the histogram of the short-term debt to total debt ratio of shadow banks. Panel (b) plots the histogram of the short-term debt to total debt ratio of mortgage banks. Panel (c) compares the shadow banks' and mortgage banks' short-term debt to total debt ratios.



(a) Shadow Bank



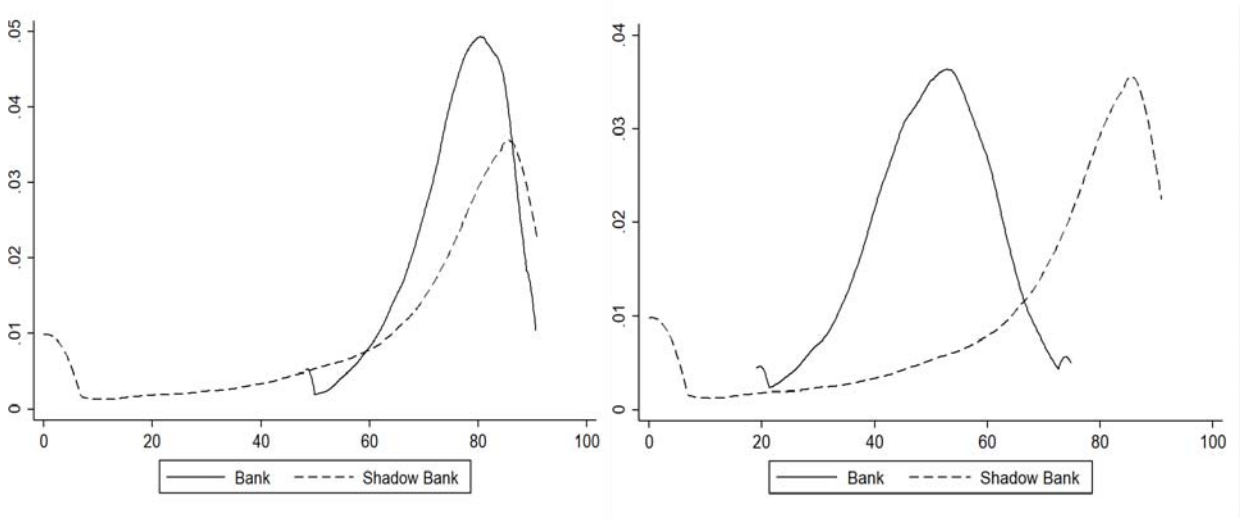
(b) Bank



(c) Bank vs Shadow Bank

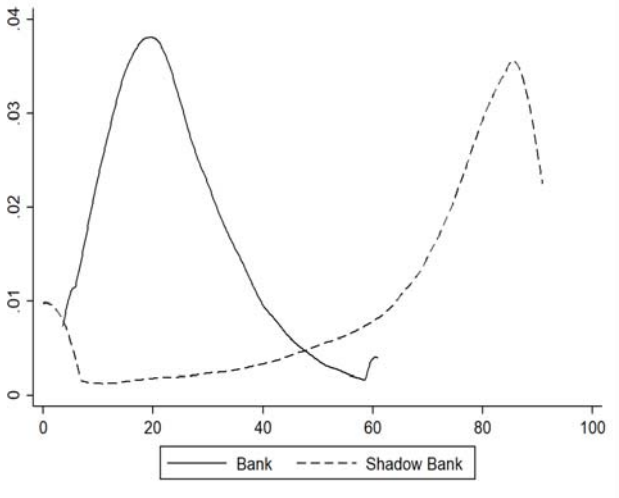
Figure 5: Short-Term Liabilities to Assets --- Shadow Banks versus Mortgage Banks

This figure shows the funding ratio distribution for mortgage banks and shadow banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 mortgage banks. Mortgage banks are synthetically constructed by replacing all bank assets with residential mortgages. Panel (a) compares shadow banks' and mortgage banks' distribution of short-term debt to debt and equity ratios. Short-term funding is defined as funding with less than 1-year time to maturity or repricing. When computing short-term debt for banks, we add short-term deposits (time deposits with more than 1-year maturity are excluded), repo, short-term borrowings and trading liabilities. Panel (b) compares the distribution of shadow banks' short-term funding to debt and equity ratios to the distribution of mortgage banks' short-term insured deposits to debt and equity ratios. Short-term insured deposits are computed by excluding insured time deposits with more than 1-year time to maturity from total insured deposits. Panel (c) compares the distribution of shadow banks' short-term funding to debt and equity ratios to the distribution of mortgage banks' short-term uninsured deposits to debt and equity ratios. Short-term uninsured deposits are computed by excluding uninsured time deposits with more than 1-year time to maturity from total uninsured deposits.



(a)
Bank vs Shadow Bank Short-Term Debt to Debt and Equity Ratios

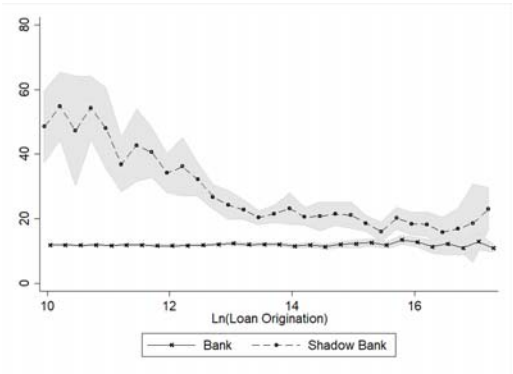
(b)
Bank Insured Deposits vs Shadow Bank Short-Term Debt to Debt and Equity Ratios



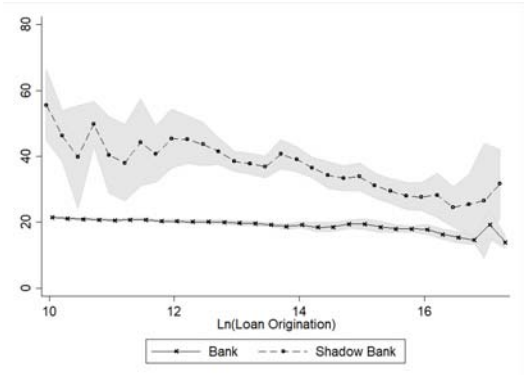
(c)
Bank Uninsured Deposits vs Shadow Bank Short-Term Debt to Debt and Equity Ratios

Figure 6: Funding Ratios by Loan Origination --- Shadow Banks vs Mortgage Banks

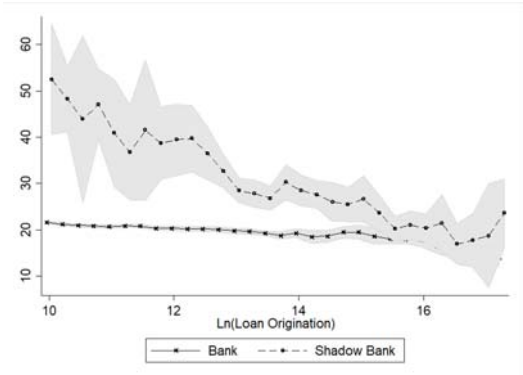
This figure plots funding ratios against log of loan origination volume. The sample consists of quarterly observations from 2011 to 2017 of 429 shadow banks and 4,822 synthetic mortgage banks, a total of 115,843 observations. Synthetic mortgage banks are constructed by replacing all bank assets with residential mortgages. Panel (a) plots equity to assets ratios. Panel (b) and (c) plots, respectively, upper and lower bound of risk-based tier 1 capital ratios for shadow banks along with risk-based tier 1 capital ratio for mortgage banks. Panel (d) plots short-term debt to debt and equity ratios. Panel (e) plots short-term debt to total debt ratios. The shaded area shows the 95% confidence interval. Standard errors are clustered by institutions.



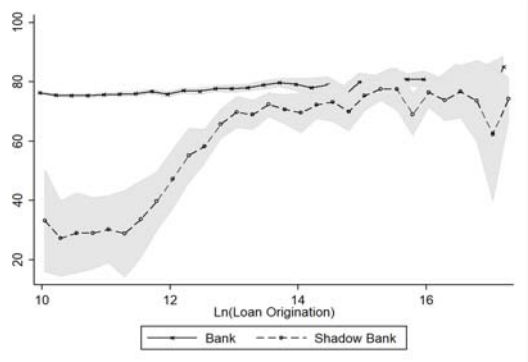
(a) Equity/Assets



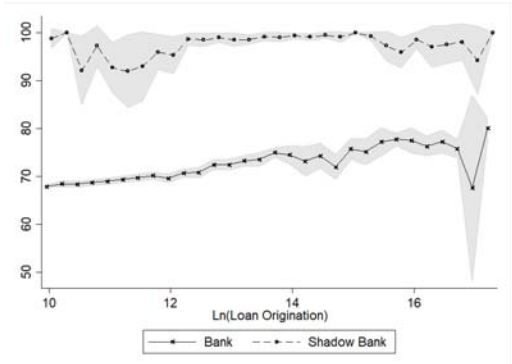
(b) Risk-based Tier 1 Ratio (Upper Bound)



(c) Risk-based Tier 1 Ratio (Lower Bound)



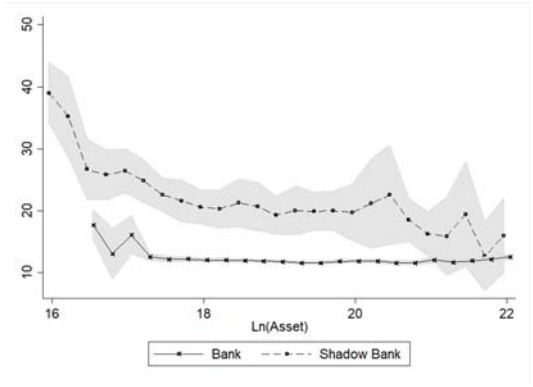
(d) Short-term Debt/(Debt+Equity)



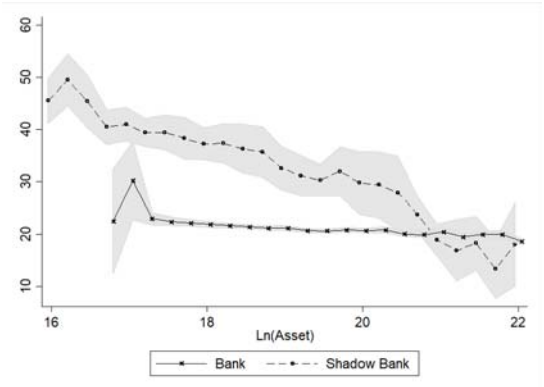
(e) Short-term Debt/Total Debt

Figure 7: Funding Ratios by Asset Size --- Shadow Banks vs Mortgage Banks

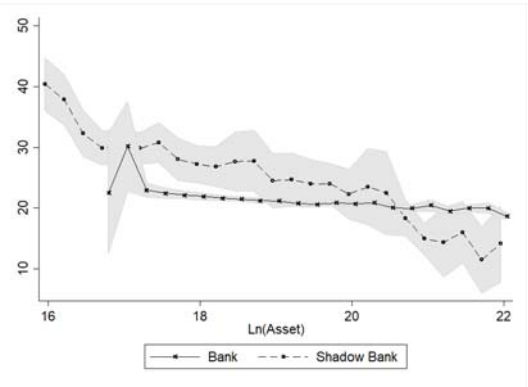
This figure plots funding ratios against log of total assets. The sample consists of quarterly observations from 2011 to 2017 of 429 shadow banks and 4,822 synthetic mortgage banks, a total of 115,843 observations. Synthetic mortgage banks are constructed by replacing all bank assets with residential mortgages. Panel (a) plots equity to assets ratios. Panel (b) and (c) plots, respectively, upper and lower bound of risk-based tier 1 capital ratios for shadow banks along with risk-based tier 1 capital ratio for mortgage banks. Panel (d) plots short-term debt to debt and equity ratios. Panel (e) plots short-term debt to total debt ratios. The shaded area shows the 95% confidence interval. Standard errors are clustered by institutions.



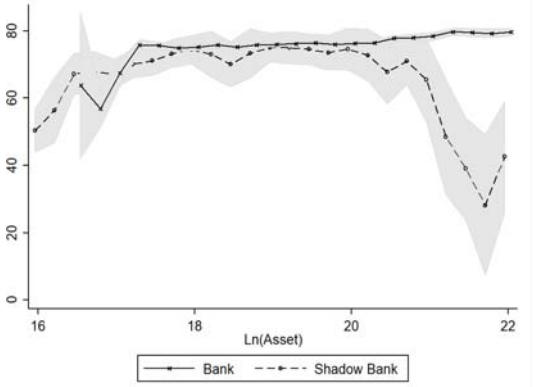
(a) Equity/Assets



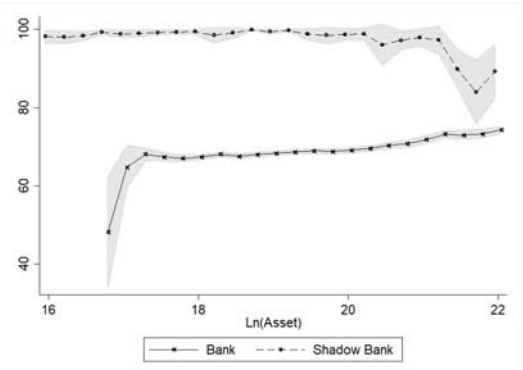
(b) Risk-based Tier 1 Ratio (Upper Bound)



(c) Risk-based Tier 1 Ratio (Lower Bound)



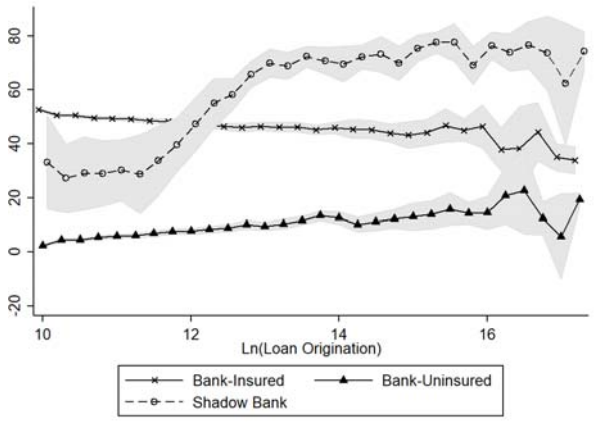
(d) Short-term Debt/(Debt+Equity)



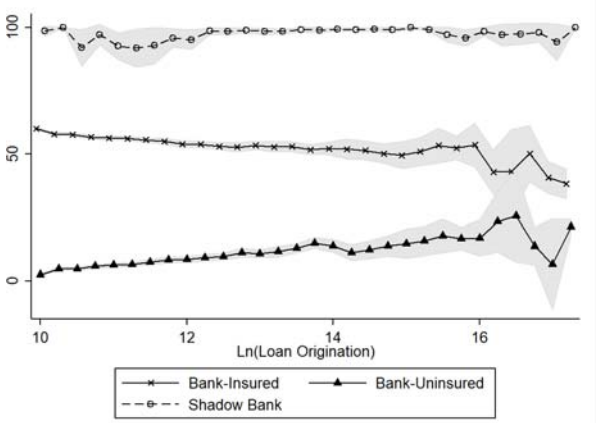
(e) Short-term Debt/Total Debt

Figure 8: Insured and Uninsured Short-term Debt and Size --- Shadow Banks vs All Banks

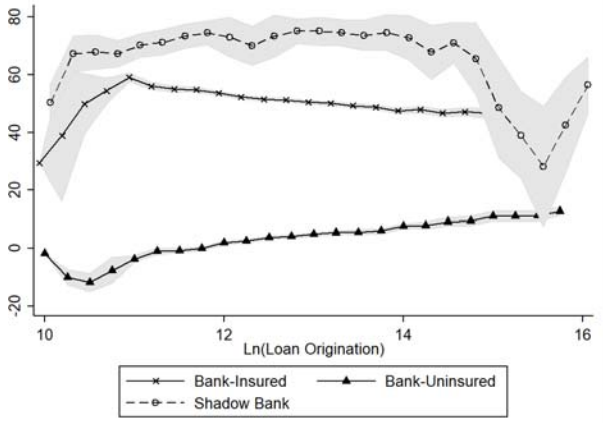
This figure compares insured and uninsured funding ratios. The sample consists of quarterly observations from 2011 to 2017 of 429 shadow banks and 4,822 synthetic mortgage banks, a total of 115,843 observations. Synthetic mortgage banks which are constructed by replacing all bank assets with residential mortgages. Panel (a) and (b) plot short-term insured funding and short-term uninsured funding against total loan origination volume. Panel (c) and (d) short-term insured funding and short-term uninsured funding against total assets. The shaded area shows the 95% confidence interval. Standard errors are clustered by institutions.



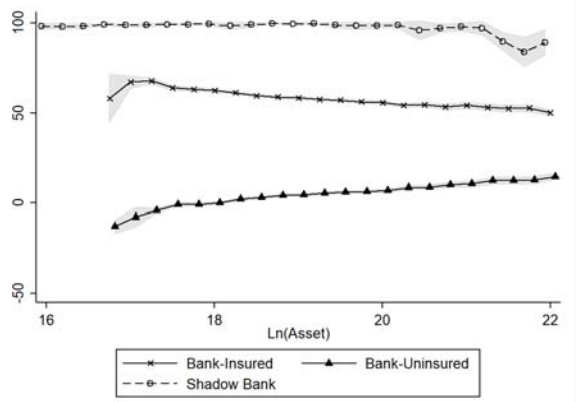
(a) Short-term Debt/(Debt+Equity)



(b) Short-term Debt/Debt



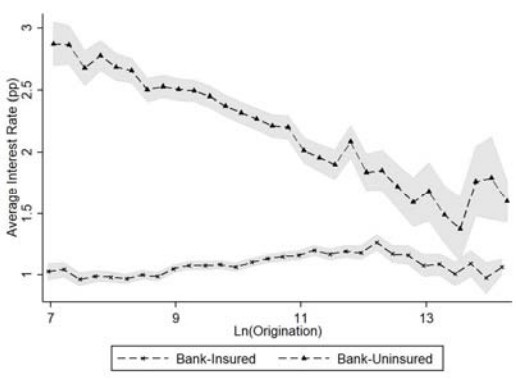
(c) Short-term Debt/(Debt+Equity)



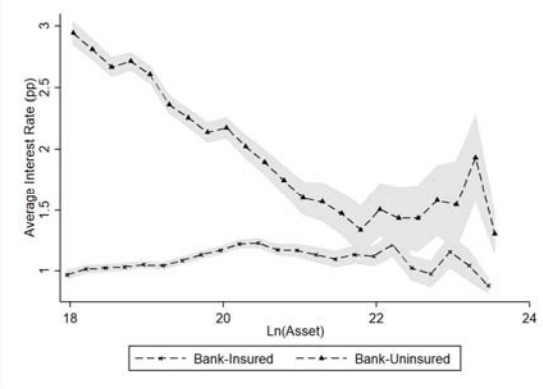
(d) Short-term Debt/Debt

Figure 9: Debt Funding Cost by Asset Size --- Shadow Banks vs Banks

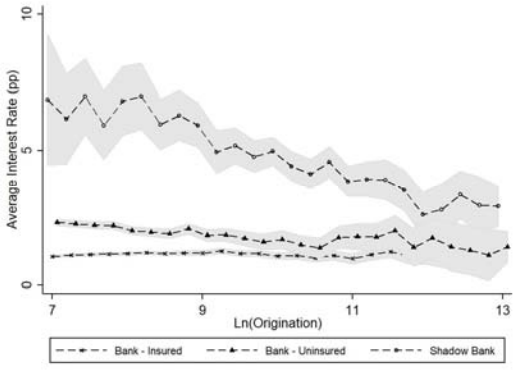
This figure shows average interest rate (in %) for short-term insured vs uninsured deposits by bank loan origination volume (Panel a) and asset size (Panel b). Panel (c) and (d) compares these rates to the average interest rate on short-term debt of shadow banks. The sample consists of quarterly observations from 2011 to 2017 of shadow banks and commercial banks.



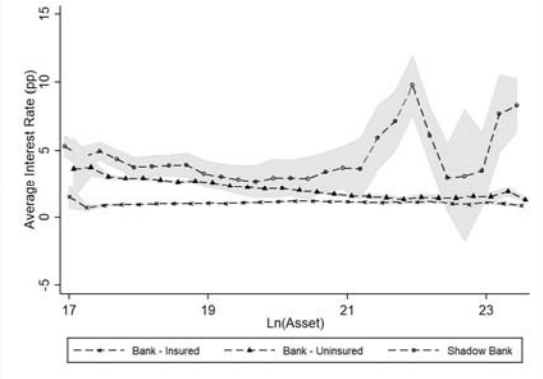
(a) Average Interest Rate by Loan Origination



(b) Average Interest Rate by Asset Size



(c) Average Interest Rate by Loan Origination



(d) Average Interest Rate by Asset Size

APPENDIX

Appendix: Tables

Table A1: Equity to Asset Ratio --- Shadow Banks versus All Banks

This table reports results of a pooled OLS regression of capital structure on shadow bank indicator, its interaction with size, which is measured by the logarithm of mortgage origination volume and the logarithm of asset size, and the institution controls. The sample consists of shadow banks all banks. Institution controls include loan origination growth, the share of refinanced mortgages out of total mortgage origination volume, the share of government-insured mortgages out of total mortgage origination volume, and the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i, as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Equity/Asset						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	10.917***	11.262***	55.476***	33.937***	58.038***	39.057***	62.521***
	(0.67)	(0.86)	(7.18)	(5.09)	(7.50)	(5.47)	(7.46)
Ln(Loan Volume)		0.036	0.008		0.160**	-0.200***	
		(0.08)	(0.02)		(0.08)	(0.07)	
Ln(Asset)		-0.217**		0.027	-0.157	0.241***	-0.008
		(0.10)		(0.03)	(0.10)	(0.07)	(0.05)
Shadow Bank× Ln(Loan Vol.)			-3.253***		-3.393***		-2.968***
			(0.51)		(0.53)		(0.60)
Shadow Bank ×Ln(Asset)				-1.274***		-1.461***	-0.496
				(0.27)		(0.29)	(0.32)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,175	109,419	115,175	115,175	109,419	109,419	109,419
R2	0.252	0.258	0.300	0.273	0.306	0.278	0.307

Table A2: Equity to Asset Ratio --- Shadow Banks versus Mortgage Banks (Alternative Comparison Group)

This table reports results of a pooled OLS regression of capital structure on shadow bank indicator, its interaction with size, which is measured by the logarithm of mortgage origination volume and the logarithm of asset size, and the institution controls. The sample consists of shadow banks and synthetic mortgage banks which are constructed by replacing all loans with residential mortgages while keeping the other assets fixed. Institution controls include loan origination growth, the share of refinanced mortgages out of total mortgage origination volume, the share of government-insured mortgages out of total mortgage origination volume, and the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i, as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Equity/Asset						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	9.994***	10.714***	54.276***	33.352***	57.309***	40.255***	62.919***
	(0.67)	(0.86)	(7.18)	(5.09)	(7.53)	(5.45)	(7.47)
Ln(Loan Volume)		-0.039	-0.020		0.085	-0.290***	
		(0.08)	(0.02)		(0.08)	(0.07)	
Ln(Asset)		-0.133		0.045	-0.074	0.353***	0.113**
		(0.10)		(0.03)	(0.11)	(0.07)	(0.05)
Shadow Bank×Ln(Loan Vol.)			-3.225***		-3.380***		-2.963***
			(0.51)		(0.53)		(0.60)
Shadow Bank×Ln(Asset)				-1.291***		-1.553***	-0.620*
				(0.27)		(0.29)	(0.32)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,175	109,419	115,175	115,175	109,419	109,419	109,419
R2	0.221	0.227	0.271	0.243	0.276	0.251	0.279

Table A3: Tier 1 Capital Ratio --- Shadow Banks versus All Banks

This table reports results of a pooled OLS regression of risk-based tier 1 capital ratio on shadow bank indicator, its interaction with size, which is measured by the logarithm of mortgage origination volume and the logarithm of asset size, and the institution controls. Panel (a) shows the results for the upper bound of tier 1 capital ratio, while Panel (b) shows the correspond results for the lower bound. The sample consists of shadow banks and all banks. Institution controls include loan origination growth, the share of refinanced mortgages out of total mortgage origination volume, the share of government-insured mortgages out of total mortgage origination volume, and the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i, as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Panel A: Tier 1 Capital Ratio (Upper Bound)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	20.936***	20.693***	60.306***	40.569***	58.884***	49.766***	66.482***
	(0.82)	(1.06)	(7.66)	(6.08)	(8.10)	(6.27)	(7.74)
Ln(Loan Volume)		-0.220*	-0.645***		-0.119	-0.467***	
		(0.11)	(0.05)		(0.11)	(0.10)	
Ln(Asset)		-0.955***		-0.905***	-0.906***	-0.476***	-0.654***
		(0.14)		(0.06)	(0.15)	(0.11)	(0.10)
Shadow Bank× Ln(Loan Vol.)			-2.696***		-2.770***		-2.439***
			(0.55)		(0.57)		(0.72)
Shadow Bank ×Ln(Asset)				-1.172***		-1.528***	-0.840**
				(0.33)		(0.34)	(0.43)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,175	109,419	115,175	115,175	109,419	109,419	109,419
R2	0.289	0.323	0.319	0.322	0.333	0.330	0.334
	Panel B: Tier 1 Capital Ratio (Lower Bound)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	11.091***	10.669***	50.841***	22.333***	46.052***	32.236***	49.777***
	(0.71)	(0.92)	(6.99)	(5.00)	(7.72)	(5.21)	(7.12)
Ln(Loan Volume)		-0.399***	-0.647***		-0.305***	-0.582***	
		(0.11)	(0.05)		(0.10)	(0.10)	
Ln(Asset)		-0.744***		-0.907***	-0.699***	-0.389***	-0.575***
		(0.13)		(0.06)	(0.13)	(0.11)	(0.10)
Shadow Bank× Ln(Loan Vol.)			-2.724***		-2.567***		-2.650***
			(0.50)		(0.54)		(0.67)
Shadow Bank ×Ln(Asset)				-0.707***		-1.133***	-0.412
				(0.27)		(0.27)	(0.36)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,175	109,419	115,175	115,175	109,419	109,419	109,419
R2	0.117	0.156	0.159	0.153	0.168	0.161	0.168

Table A4: Tier 1 Capital Ratio --- Shadow Banks versus Mortgage Banks (Alternative Comparison Group)

This table reports results of a pooled OLS regression of risk-based tier 1 capital ratio on shadow bank indicator, its interaction with size, which is measured by the logarithm of mortgage origination volume and the logarithm of asset size, and the institution controls. Panel (a) shows the results for the upper bound of tier 1 capital ratio, while Panel (b) shows the correspond results for the lower bound. The sample consists of shadow banks and synthetic mortgage banks which are constructed by replacing all loans with residential mortgages while keeping the other assets fixed. Institution controls include loan origination growth, the share of refinanced mortgages out of total mortgage origination volume, the share of government-insured mortgages out of total mortgage origination volume, and the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i, as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Tier 1 Capital Ratio (Upper Bound)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	13.355***	16.079***	50.624***	36.142***	52.931***	59.438***	69.713***
	(0.82)	(1.08)	(7.65)	(6.05)	(8.29)	(6.13)	(7.75)
Ln(Loan Volume)		-0.810***	-0.857***		-0.713***	-1.179***	
		(0.12)	(0.04)		(0.11)	(0.10)	
Ln(Asset)			-0.743***	-0.238	0.429***	0.321***	
			(0.06)	(0.15)	(0.11)	(0.09)	
Shadow Bank×Ln(Loan Vol.)		-2.484***		-2.676***		-1.328*	
		(0.55)		(0.58)		(0.73)	
Shadow Bank×Ln(Asset)			-1.336***		-2.283***	-1.861***	
			(0.33)		(0.33)	(0.43)	
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,175	109,419	115,175	115,175	109,419	109,419	109,419
R2	0.156	0.205	0.210	0.194	0.218	0.226	0.228
	Tier 1 Capital Ratio (Lower Bound)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	3.510***	6.055***	41.159***	17.906***	40.099***	41.908***	53.008***
	(0.71)	(0.93)	(6.99)	(4.97)	(7.81)	(5.05)	(7.11)
Ln(Loan Volume)		-0.989***	-0.858***		-0.898***	-1.293***	
		(0.11)	(0.04)		(0.11)	(0.10)	
Ln(Asset)		-0.073		-0.744***	-0.029	0.518***	0.400***
		(0.13)		(0.06)	(0.13)	(0.11)	(0.09)
Shadow Bank×Ln(Loan Vol.)			-2.513***		-2.470***		-2.602***
			(0.50)		(0.54)		(0.68)
Shadow Bank×Ln(Asset)				-0.867***		-1.884***	-1.428***
				(0.27)		(0.27)	(0.36)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,175	109,419	115,175	115,175	109,419	109,419	109,419
R2	0.017	0.079	0.089	0.055	0.093	0.097	0.101

Table A5: Short-Term Debt --- Shadow Banks vs All Banks

This table reports results of a pooled OLS regression of short-term liabilities to assets (panel a) and short-term debt to debt on shadow bank indicator, its interaction with size, which is measured by the logarithm of mortgage origination volume and the logarithm of asset size, and the institution controls. The sample consists of shadow banks and all banks. Institution controls include loan origination growth, the share of refinanced mortgages out of total mortgage origination volume, the share of government-insured mortgages out of total mortgage origination volume, and the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i, as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Short-term Debt to Debt and Equity						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	-7.098***	-4.892***	-85.467***	8.603	-84.708***	14.316	-51.286***
	(1.17)	(1.84)	(11.29)	(11.64)	(12.17)	(12.25)	(13.34)
Ln(Loan Volume)		-0.203	0.037		-0.414***	-0.366**	
		(0.19)	(0.07)		(0.16)	(0.16)	
Ln(Asset)		0.917***		0.812***	0.814***	1.233***	1.926***
		(0.26)		(0.09)	(0.23)	(0.18)	(0.15)
Shadow Bank×Ln(Loan Vol.)			5.707***		5.789***		7.366***
			(0.81)		(0.86)		(0.86)
Shadow Bank×Ln(Asset)				-0.796		-1.009	-3.704***
				(0.65)		(0.67)	(0.71)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,167	109,411	115,167	115,167	109,411	109,411	109,411
r2	0.031	0.046	0.067	0.041	0.079	0.048	0.103

	Short-term Debt to Debt						
	(1)	(2)	(3)	(4)	(5)	(6)	(8)
Shadow Bank	12.324***	16.996***	8.263**	39.843***	17.191***	59.028***	42.468***
	(0.32)	(0.80)	(4.08)	(3.18)	(5.33)	(3.96)	(4.60)
Ln(Loan Volume)		-0.653***	0.059		-0.653***	-0.985***	
		(0.11)	(0.07)		(0.11)	(0.11)	
Ln(Asset)		1.362***		0.955***	1.363***	2.007***	2.173***
		(0.14)		(0.09)	(0.14)	(0.15)	(0.15)
Shadow Bank× Ln(Loan Vol.)			0.279		-0.014		0.999***
			(0.29)		(0.37)		(0.34)
Shadow Bank ×Ln(Asset)				-1.438***		-2.214***	-2.920***
				(0.18)		(0.20)	(0.24)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	114,941	109,212	114,941	114,941	109,212	109,212	109,212
R2	0.105	0.126	0.105	0.121	0.126	0.138	0.141

Table A6: Short-Term Debt --- Shadow Banks versus Mortgage Banks (Alternative Comparison Group)

This table reports results of a pooled OLS regression of short-term liabilities to assets (panel a) and short-term debt to debt on shadow bank indicator, its interaction with size, which is measured by the logarithm of mortgage origination volume and the logarithm of asset size, and the institution controls. The sample consists of shadow banks and synthetic mortgage banks which are constructed by replacing all bank loans with residential mortgages while keeping the other assets fixed. Institution controls include loan origination growth, the share of refinanced mortgages out of total mortgage origination volume, the share of government-insured mortgages out of total mortgage origination volume, and the logarithm of the weighted average of income per capita in states of operation, and each state income per capital is weighted by the share of institution i's loan origination in this state out of total loan origination of institution i, as reported in HMDA. Time fixed effects are included in all specifications. Standard errors in the parentheses are clustered by institution. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

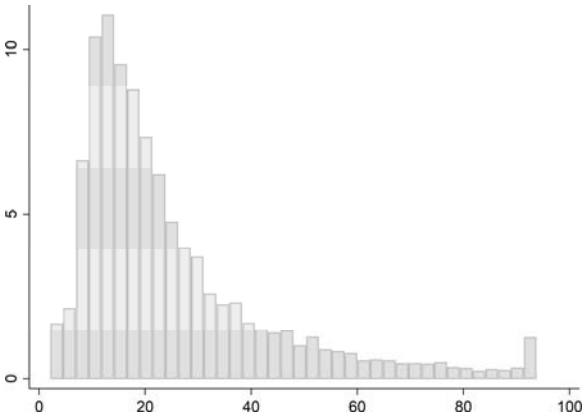
	Short-term Debt to Debt and Equity						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	0.232	-0.618	-76.235***	11.903	-79.542***	3.227	-55.831***
	(1.17)	(1.78)	(11.29)	(11.63)	(11.84)	(12.12)	(13.37)
Ln(Loan Volume)		0.391**	0.228***		0.183	0.358**	
		(0.18)	(0.06)		(0.15)	(0.15)	
Ln(Asset)		0.201		0.603***	0.099	0.264	0.888***
		(0.25)		(0.09)	(0.22)	(0.17)	(0.15)
Shadow Bank×Ln(Loan Vol.)			5.516***		5.724***		7.320***
			(0.81)		(0.84)		(0.86)
Shadow Bank×Ln(Asset)				-0.592		-0.202	-2.628***
				(0.65)		(0.66)	(0.71)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,166	109,411	115,166	115,166	109,411	109,411	109,411
R2	0.010	0.021	0.051	0.016	0.057	0.021	0.070

	Short-term Debt to Debt						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Shadow Bank	19.571***	21.138***	17.349***	42.921***	22.036***	47.900***	37.921***
	(0.32)	(0.74)	(4.07)	(3.14)	(4.82)	(3.81)	(4.58)
Ln(Loan Volume)		-0.051	0.243***		-0.049	-0.263**	
		(0.10)	(0.07)		(0.10)	(0.10)	
Ln(Asset)		0.623***		0.739***	0.625***	1.034***	1.134***
		(0.12)		(0.09)	(0.12)	(0.14)	(0.15)
Shadow Bank×Ln(Loan Vol.)			0.095		-0.065		0.933***
			(0.29)		(0.34)		(0.33)
Shadow Bank×Ln(Asset)				-1.227***		-1.410***	-1.835***
				(0.17)		(0.20)	(0.23)
Institution Controls	No	Yes	No	No	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	114,940	109,212	114,940	114,940	109,212	109,212	109,212
R2	0.228	0.232	0.229	0.237	0.232	0.237	0.238

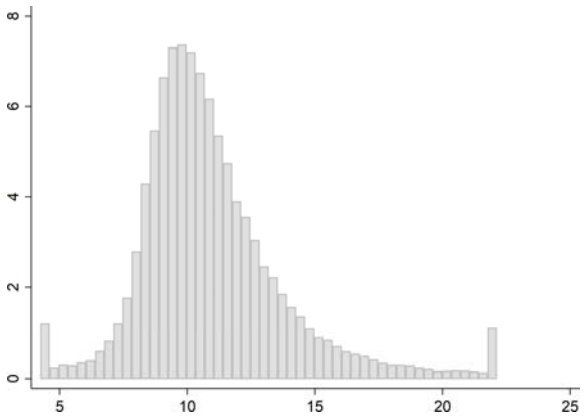
Appendix: Figures

Figure A1: Equity to Asset Ratio --- Shadow Banks versus All Banks

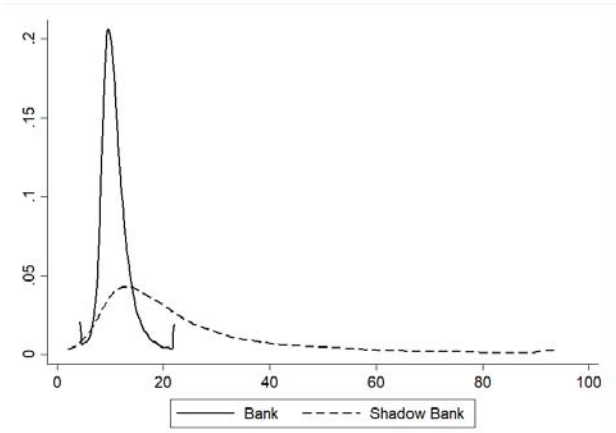
This figure shows the cross-section funding composition for shadow banks and banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 commercial banks. We restrict our attention to institutions that are required to file HMDA reports and originate mortgage loans. Panel (b) plots the equity to asset ratio for mortgage banks. Panel (c) compares the shadow banks' and banks' equity to assets ratios.



(a) Shadow Bank



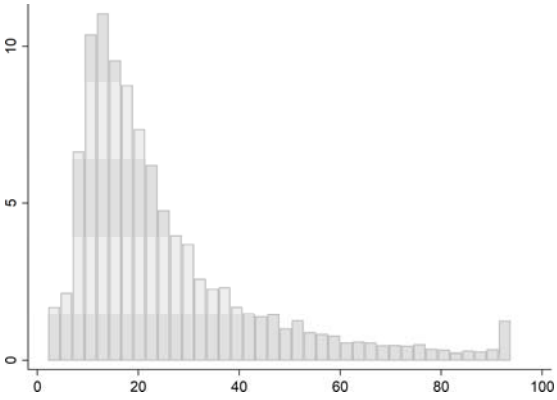
(b) Bank



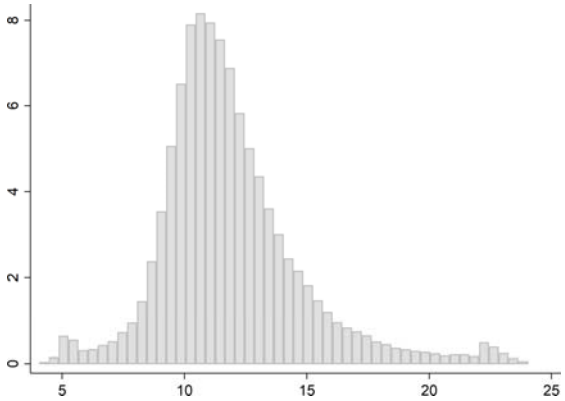
(c) Bank vs Shadow Bank

Figure A2: Equity to Asset Ratio --- Shadow Banks versus Mortgage Banks (Alternative Comparison Group)

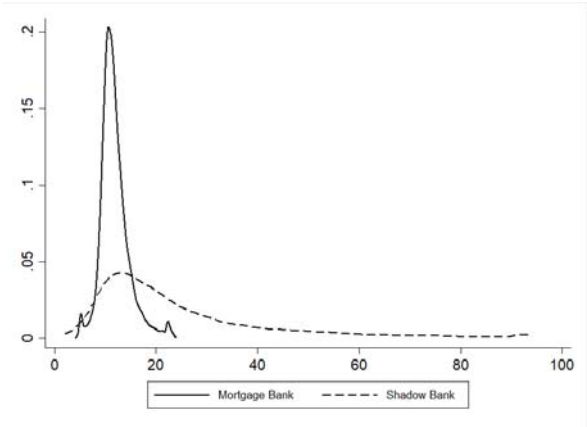
This figure shows the cross-section funding composition for shadow banks and mortgage banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 commercial banks. Mortgage banks are synthetically constructed by replacing all bank loans with residential mortgages while keeping the other assets fixed. We restrict our attention to institutions that are required to file HMDA reports and originate mortgage loans. Panel (b) plots the equity to asset ratio for mortgage banks. Panel (c) compares the shadow banks' and mortgage banks' equity to assets ratios.



(a) Shadow Bank



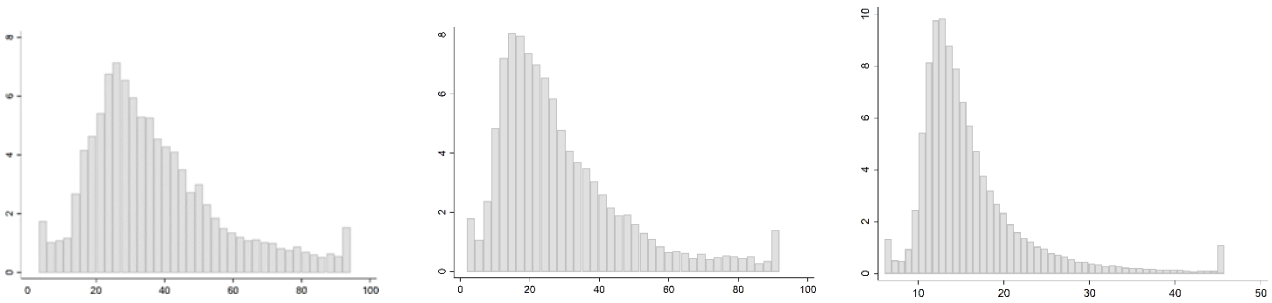
(b) Bank



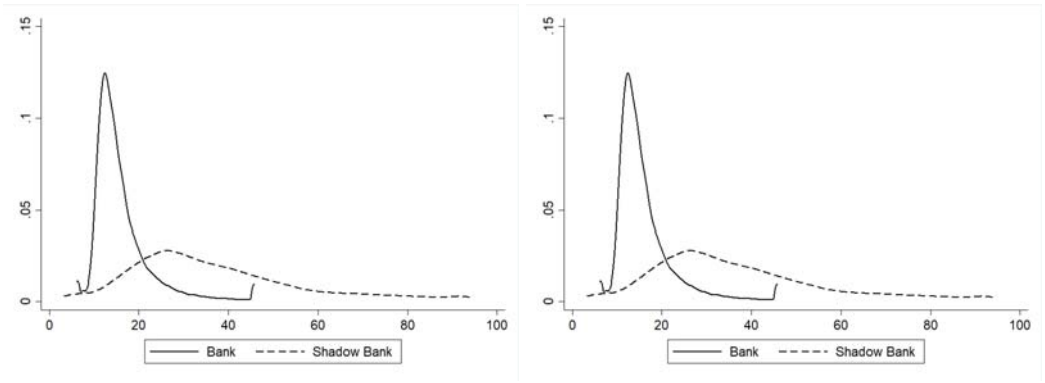
(c) Bank vs Shadow Bank

Figure A3: Tier 1 Capital Ratio --- Shadow Banks versus All Banks

This figure shows the cross-section risk-based capital ratios for banks and shadow banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 commercial banks. Since shadow banks do not report risk-based tier 1 capital ratios, we compute this ratio by applying the Basel III risk-based tier 1 capital ratio formula. Since we do not observe the detailed risk profiles for each type of assets held on the shadow banks' balance sheet, we calculate the upper bound and lower bound and plot the histograms of shadow banks' tier 1 capital ratios in Panel (a) and Panel (b), respectively. These bounds are computed as described in Section 2. Panel (c) plots the histogram of risk-based tier 1 capital ratios of banks. Panel (d) and (e) compare the banks' and shadow banks' tier 1 capital ratios.



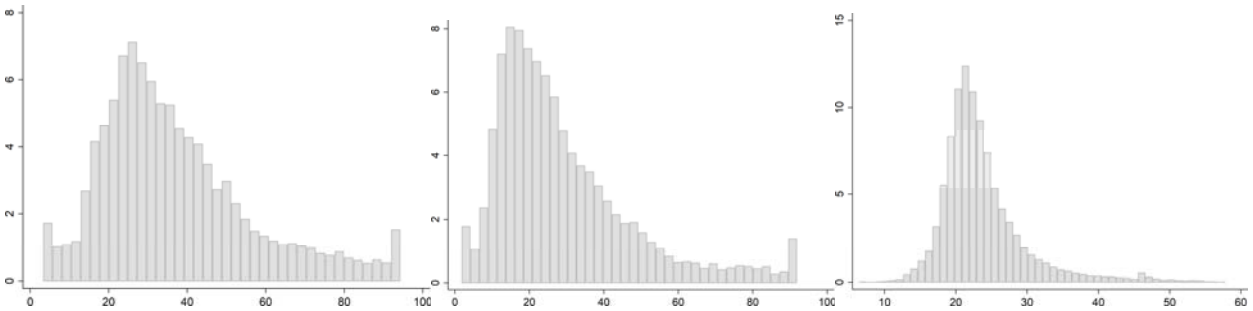
(a) Shadow Bank (Upper Bound) (b) Shadow Bank (Lower Bound) (c) Bank



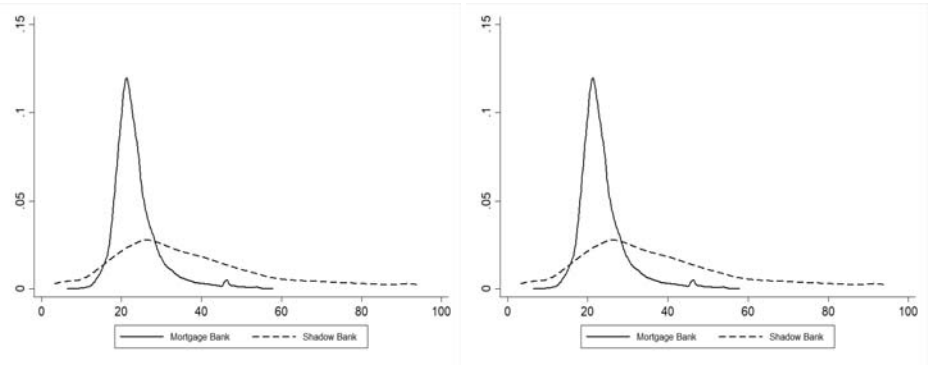
(d) Bank vs Shadow Bank (Upper Bound) (f) Bank vs Shadow Bank (Lower Bound)

Figure A4: Tier 1 Capital Ratio --- Shadow Banks versus Mortgage Banks (Alternative Comparison Group)

This figure shows the cross-section risk-based capital ratios for banks and shadow banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 mortgage banks. Mortgage banks are synthetically constructed by replacing all bank loans with residential mortgages while keeping the other assets fixed. Since shadow banks do not report risk-based tier 1 capital ratios, we compute this ratio by applying the Basel III risk-based tier 1 capital ratio formula. Since we do not observe the detailed risk profiles for each type of assets held on the shadow banks' balance sheet, we calculate the upper bound and lower bound and plot the histograms of shadow banks' tier 1 capital ratios in Panel (a) and Panel (b), respectively. These bounds are computed as described in Section 2. Panel (c) plots the histogram of risk-based tier 1 capital ratios of mortgage banks. Panel (d) and (e) compare the mortgage banks' and shadow banks' tier 1 capital ratios.



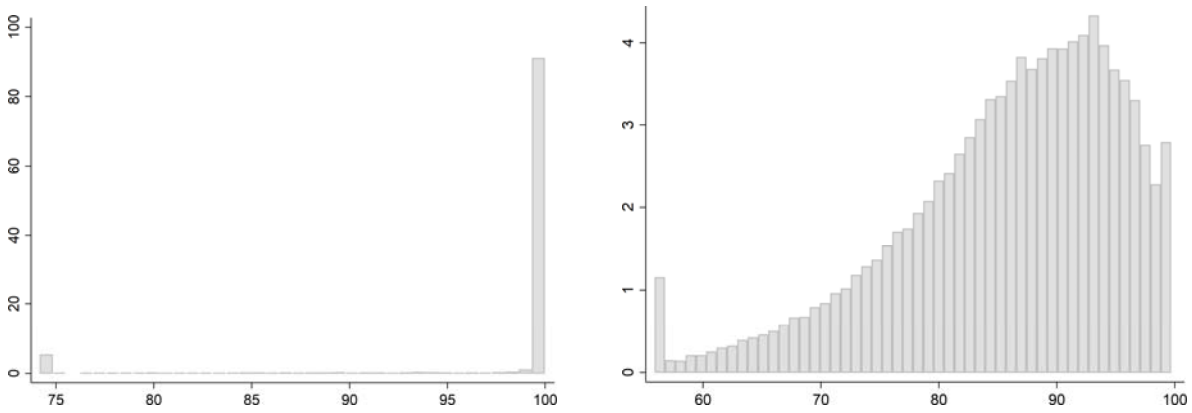
(a) Shadow Bank (Upper Bound) (b) Shadow Bank (Lower Bound) (c) Bank



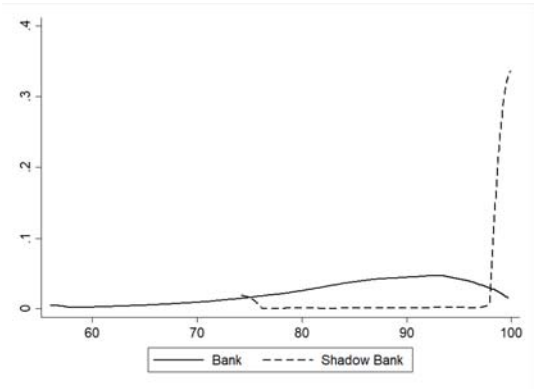
(d) Bank vs Shadow Bank (Upper Bound) (g) Bank vs Shadow Bank (Lower Bound)

Figure A5: Short-Term Debt to Total Debt --- Shadow Banks versus All Banks

This figure shows the cross section short-term funding shares for shadow banks and banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 banks. Panel (a) plots the histogram of the short-term debt to total debt ratio of shadow banks. Panel (b) plots the histogram of the short-term debt to total debt ratio of banks. Panel (c) compares the shadow banks' and banks' short-term debt to total debt ratios.



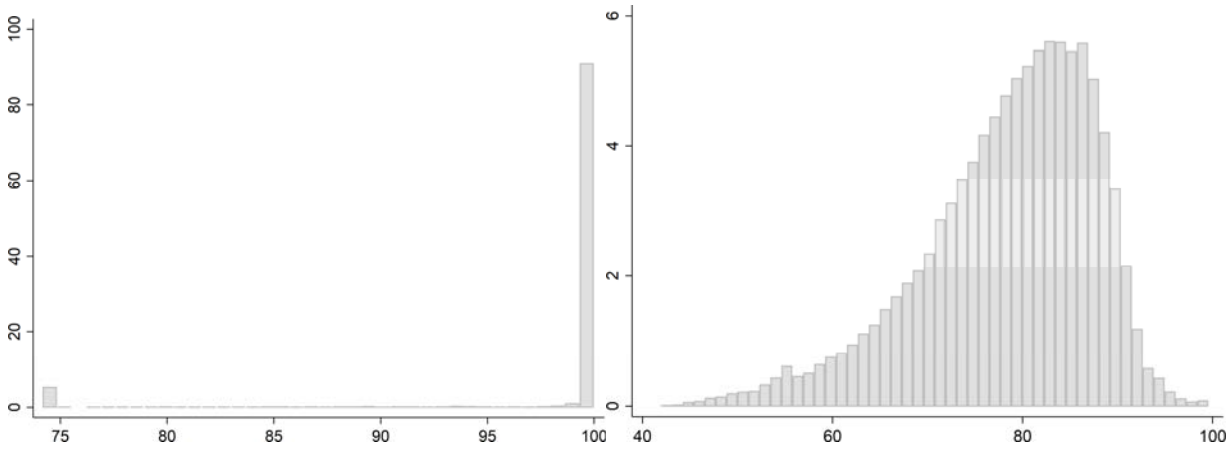
(a) Shadow Bank (b) Bank



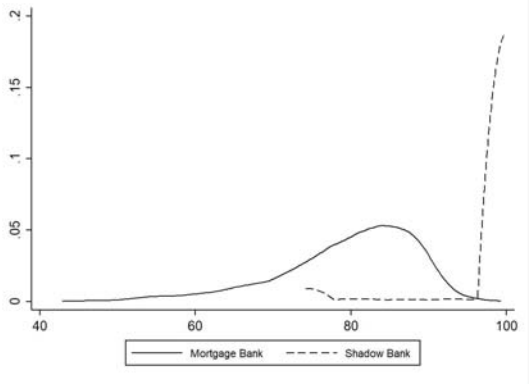
(c) Bank vs Shadow Bank

Figure A6: Short-Term Debt to Total Debt --- Shadow Banks versus Mortgage Banks (Alternative Comparison Group)

This figure shows the cross section short-term funding shares for shadow banks and mortgage banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 mortgage banks. Mortgage banks are synthetically constructed by replacing all bank loans with residential mortgages while keeping the other assets fixed. Panel (a) plots the histogram of the short-term debt to total debt ratio of shadow banks. Panel (b) plots the histogram of the short-term debt to total debt ratio of mortgage banks. Panel (c) compares the shadow banks' and mortgage banks' short-term debt to total debt ratios.



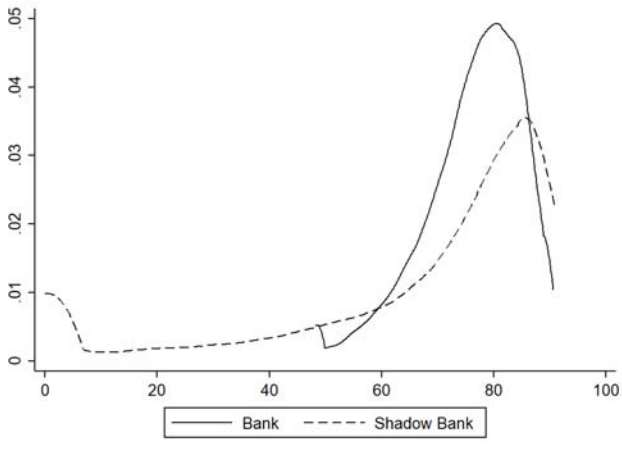
(a) Shadow Bank (b) Bank



(c) Bank vs Shadow Bank

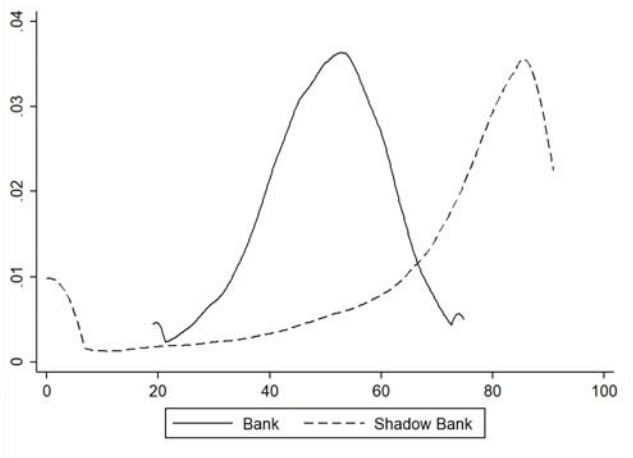
Figure A7: Short-Term Liabilities to Assets --- Shadow Banks versus All Banks

This figure shows the funding ratio distribution for banks and shadow banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 commercial banks. Panel (a) compares shadow banks' and banks' distribution of short-term debt to debt and equity ratios. Short-term funding is defined as funding with less than 1-year time to maturity or repricing. When computing short-term debt for banks, we add short-term deposits (time deposits with more than 1-year maturity are excluded), repo, short-term borrowings and trading liabilities. Panel (b) compares the distribution of shadow banks' short-term funding to debt and equity ratios to the distribution of banks' short-term insured deposits to assets ratios. Short-term insured deposits are computed by excluding insured time deposits with more than 1-year time to maturity from total insured deposits. Panel (c) compares the distribution of shadow banks' short-term funding to debt and equity ratios to the distribution of banks' short-term uninsured deposits to debt and equity ratios. Short-term uninsured deposits are computed by excluding uninsured time deposits with more than 1-year time to maturity from total uninsured deposits.



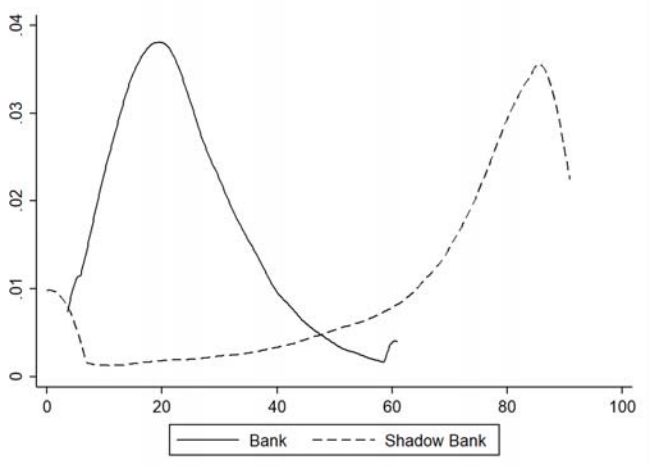
(a)

Bank vs Shadow Bank Short-Term Debt to Debt and Equity Ratios



(b)

Bank Insured Deposits vs Shadow Bank Short-Term Debt to Debt and Equity Ratios

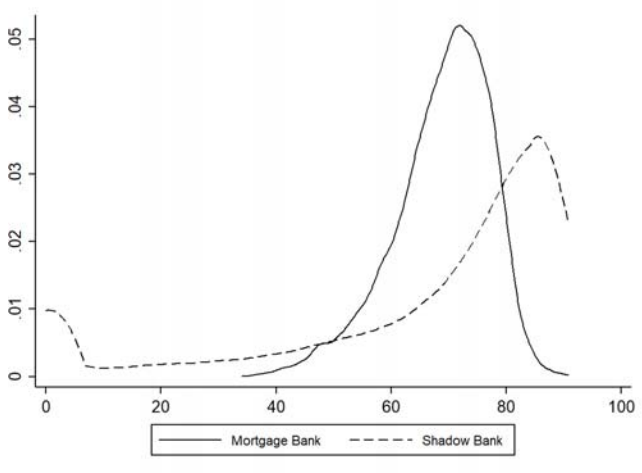


(c)

Bank Uninsured Deposits vs Shadow Bank Short-Term Debt to Debt and Equity Ratios

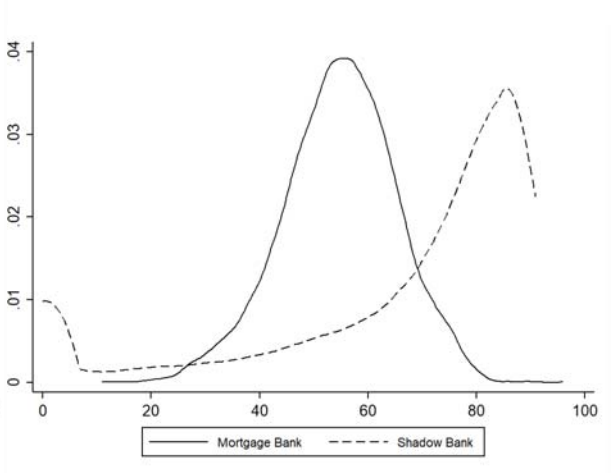
Figure A8: Short-Term Liabilities to Assets --- Shadow Banks versus Mortgage Banks (Alternative Comparison Group)

This figure shows the funding ratio distribution for mortgage banks and shadow banks from 2011 to 2017. We restrict attention to institutions that are required to file HMDA reports and originate mortgage loans. Removing institutions that do not have a match in HMDA database leaves us with 429 shadow banks and 4,822 mortgage banks. Mortgage banks are synthetically constructed by replacing all bank loans with residential mortgages. Panel (a) compares shadow banks' and mortgage banks' distribution of short-term debt to debt and equity ratios. Short-term funding is defined as funding with less than 1-year time to maturity or repricing. When computing short-term debt for banks, we add short-term deposits (time deposits with more than 1-year maturity are excluded), repo, short-term borrowings and trading liabilities. Panel (b) compares the distribution of shadow banks' short-term funding to debt and equity ratios to the distribution of mortgage banks' short-term insured deposits to debt and equity ratios. Short-term insured deposits are computed by excluding insured time deposits with more than 1-year time to maturity from total insured deposits. Panel (c) compares the distribution of shadow banks' short-term funding to debt and equity ratios to the distribution of mortgage banks' short-term uninsured deposits to debt and equity ratios. Short-term uninsured deposits are computed by excluding uninsured time deposits with more than 1-year time to maturity from total uninsured deposits.



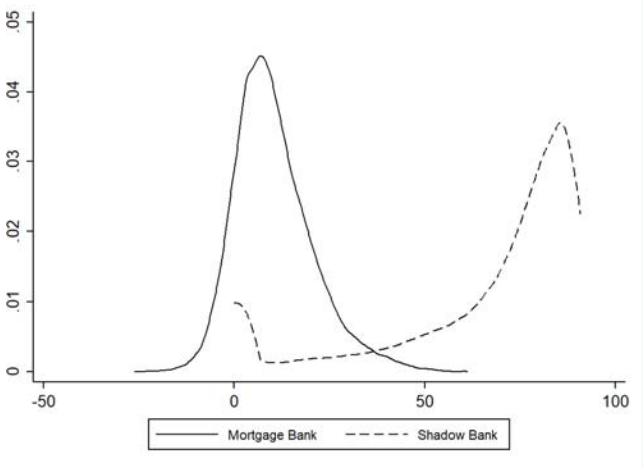
(a)

Bank vs Shadow Bank Short-Term Debt to Debt and Equity Ratios



(b)

Bank Insured Deposits vs Shadow Bank Short-Term Debt to Debt and Equity Ratios

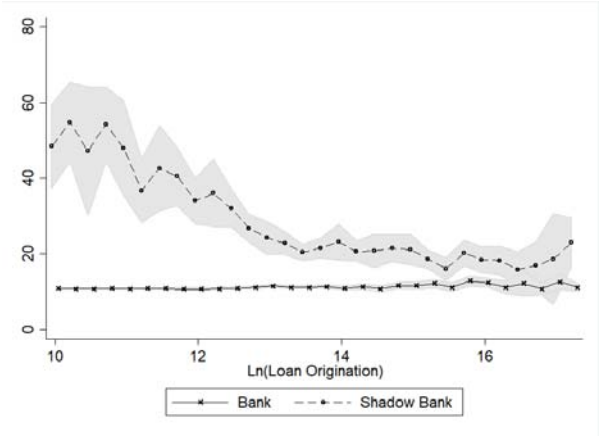


(c)

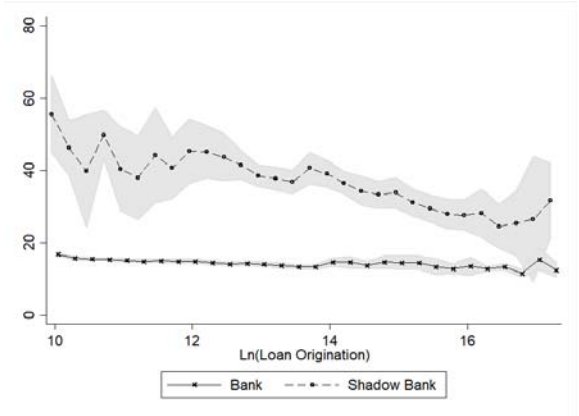
Bank Uninsured Deposits vs Shadow Bank Short-Term Debt to Debt and Equity Ratios

Figure A9: Funding Ratios by Loan Origination --- Shadow Banks versus All Banks

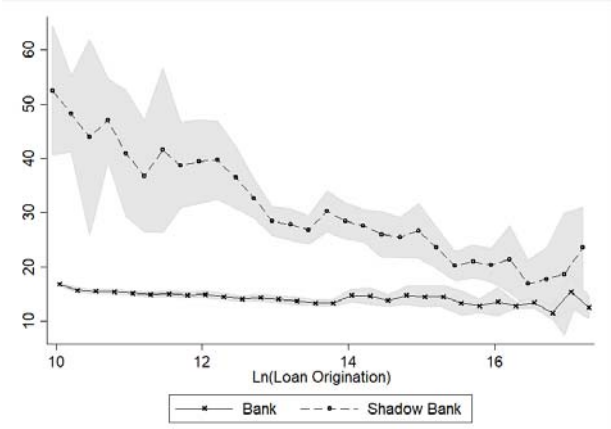
This figure plots funding ratios against log of loan origination volume. The sample consists of quarterly observations from 2011 to 2017 of 429 shadow banks and 4,822 banks, a total of 115,843 observations. Panel (a) plots equity to assets ratios. Panel (b) and (c) plots, respectively, upper and lower bound of risk-based tier 1 capital ratios for shadow banks along with risk-based tier 1 capital ratio for banks. Panel (d) plots short-term debt to debt and equity ratios. Panel (e) plots short-term debt to total debt ratios. The shaded area shows the 95% confidence interval. Standard errors are clustered by institutions.



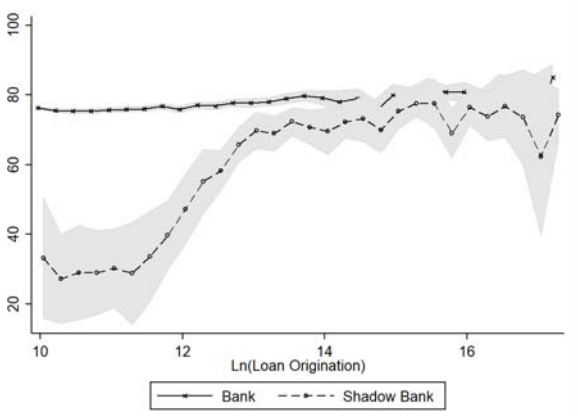
(a) Equity/Assets



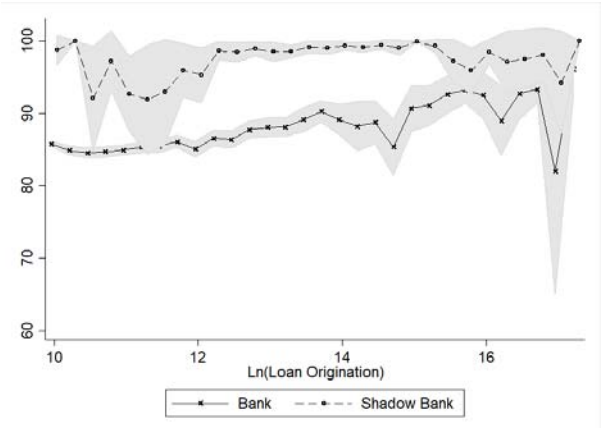
(b) Risk-based Tier 1 Ratio (Upper Bound)



(c) Risk-based Tier 1 Ratio (Lower Bound)



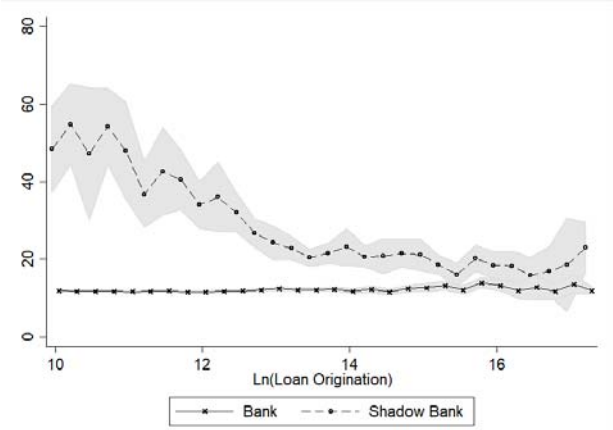
(d) Short-term Debt/(Debt+Equity)



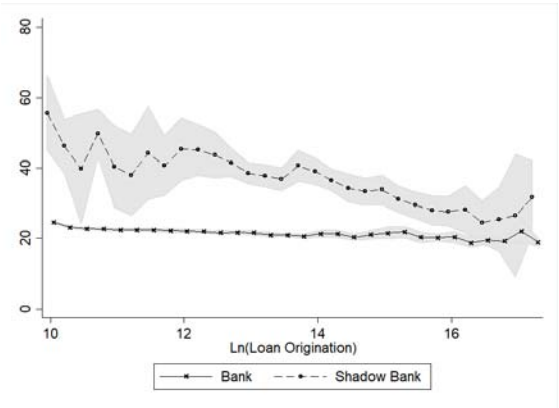
(e) Short-term Debt/Total Debt

Figure A10: Funding Ratios by Loan Origination -- Shadow Banks versus Mortgage Banks (Alternative Comparison Group)

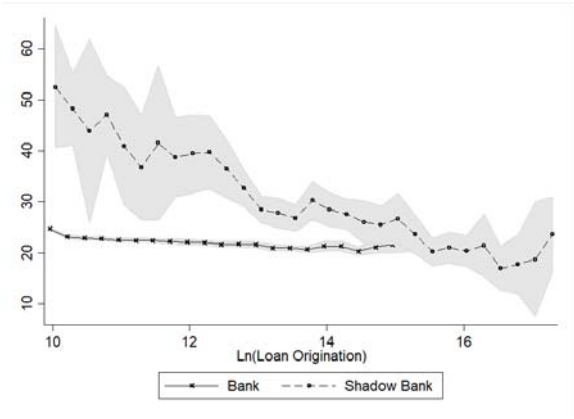
This figure plots funding ratios against log of loan origination volume. The sample consists of quarterly observations from 2011 to 2017 of 429 shadow banks and 4,822 mortgage banks, a total of 115,843 observations. Synthetic mortgage banks are constructed by replacing all bank loans with residential mortgages while keeping the other assets fixed. Panel (a) plots equity to assets ratios. Panel (b) and (c) plots, respectively, upper and lower bound of risk-based tier 1 capital ratios for shadow banks along with risk-based tier 1 capital ratio for mortgage banks. Panel (d) plots short-term debt to debt and equity ratios. Panel (e) plots short-term debt to total debt ratios. The shaded area shows the 95% confidence interval. Standard errors are clustered by institutions.



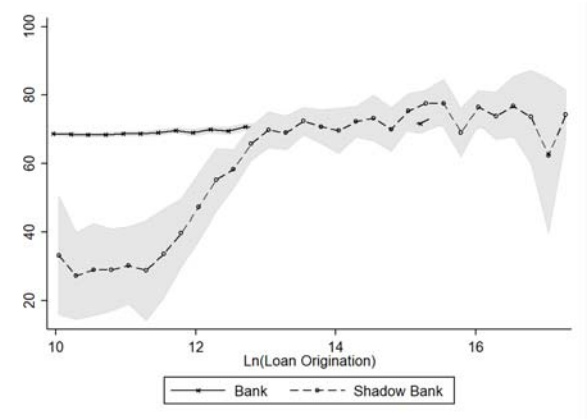
(a) Equity/Assets



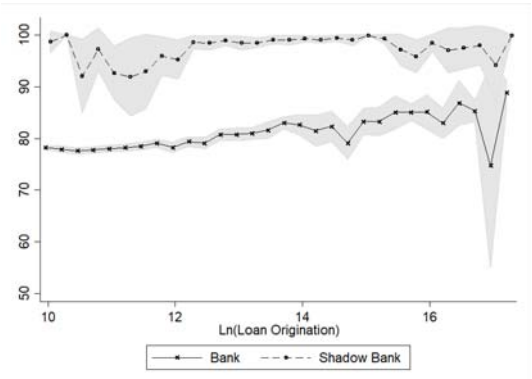
(b) Risk-based Tier 1 Ratio (Upper Bound)



(c) Risk-based Tier 1 Ratio (Lower)



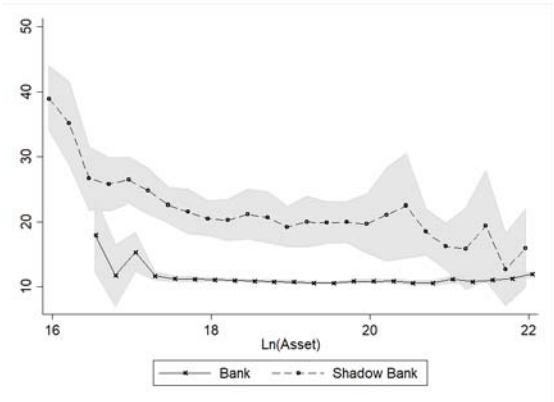
(d) Short-term Debt/(Debt+Equity)



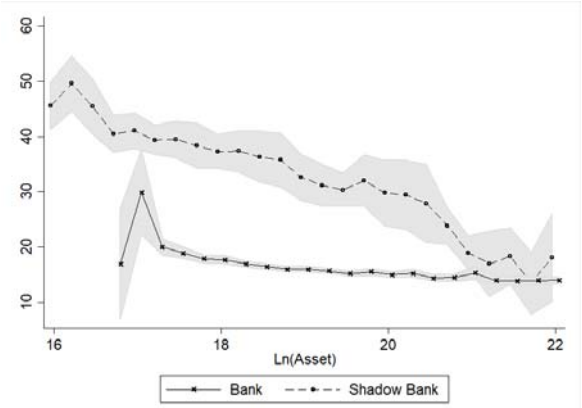
(e) Short-term Debt/Total Debt

Figure A11: Funding Ratios by Asset Size --- Shadow Banks vs All Banks

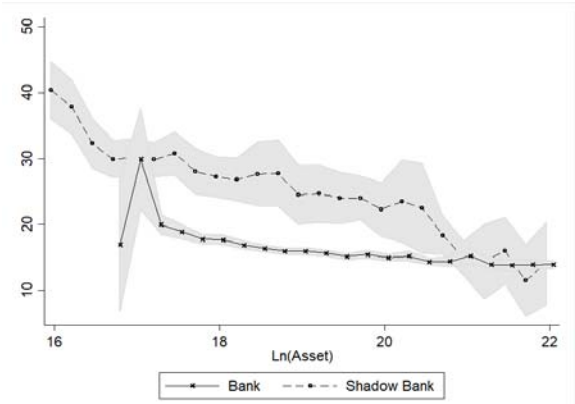
This figure plots funding ratios against log of total assets. The sample consists of quarterly observations from 2011 to 2017 of 429 shadow banks and 4,822 banks, a total of 115,843 observations. Panel (a) plots equity to assets ratios. Panel (b) and (c) plots, respectively, upper and lower bound of risk-based tier 1 capital ratios for shadow banks along with risk-based tier 1 capital ratio for banks. Panel (d) plots short-term debt to debt and equity ratios. Panel (e) plots short-term debt to total debt ratios. The shaded area shows the 95% confidence interval. Standard errors are clustered by institutions.



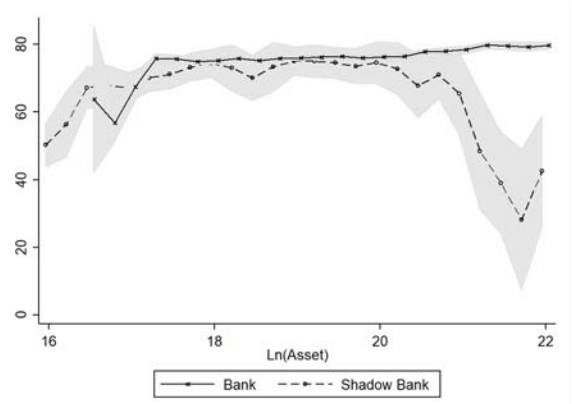
(a) Equity/Assets



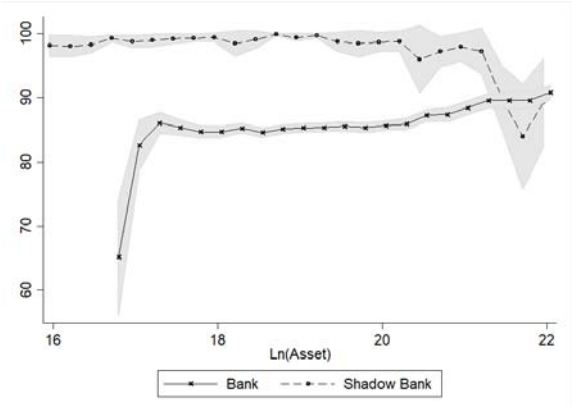
(b) Risk-based Tier 1 Ratio (Upper Bound)



(c) Risk-based Tier 1 Ratio (Lower Bound)



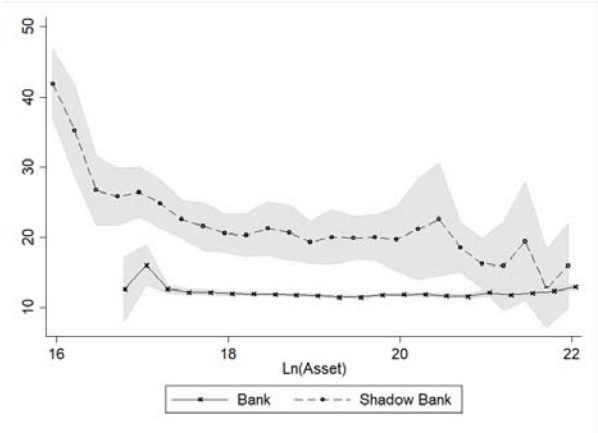
(d) Short-term Debt/(Debt+Equity)



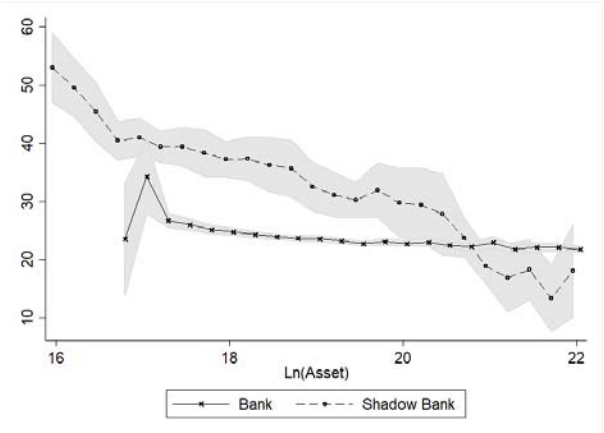
(e) Short-term Debt/Debt

Figure A12: Funding Ratios by Asset Size --- Shadow Banks vs Mortgage Banks (Alternative Comparison Group)

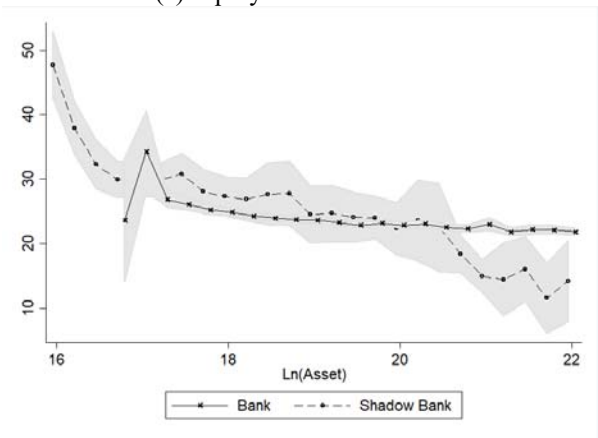
This figure plots funding ratios against log of total assets. The sample consists of quarterly observations from 2011 to 2017 of 429 shadow banks and 4,822 synthetic mortgage banks, a total of 115,843 observations. Synthetic mortgage banks are constructed by replacing all bank loans with residential mortgages while keeping the other assets fixed. Panel (a) plots equity to assets ratios. Panel (b) and (c) plots, respectively, upper and lower bound of risk-based tier 1 capital ratios for shadow banks along with risk-based tier 1 capital ratio for mortgage banks. Panel (d) plots short-term debt to debt and equity ratios. Panel (e) plots short-term debt to total debt ratios. The shaded area shows the 95% confidence interval. Standard errors are clustered by institutions.



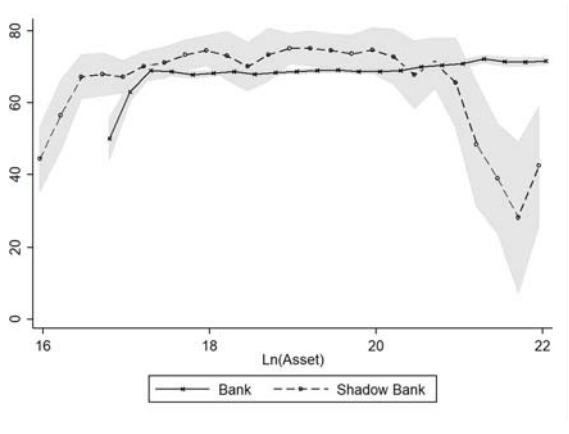
(a) Equity/Assets



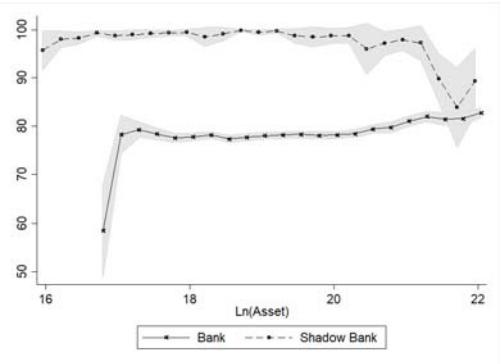
(b) Risk-based Tier 1 Ratio (Upper Bound)



(c) Risk-based Tier 1 Ratio (Lower Bound)



(d) Short-term Debt/(Debt+Equity)



(e) Short-term Debt/Total Debt