Bank response to higher capital requirements under anticipated adverse selection

Sonny Biswas, Kostas Koufopoulos, and Songshan Li[1]

Abstract

Why do banks respond to an increase in capital requirements despite possessing sufficient buffers? We show that the extent to which banks expect to acquire private information regarding their assets is a key determinant of their response to higher capital requirements. Following an increase in capital requirements induced by the FAS 166/167 reforms, the average treated bank reduces risk-weighted assets. Our novel finding is that the opaque banks drive the average effect. We explain the findings in a model where opaque banks face an adverse selection discount when selling assets.

Keywords: Securitization, Off-balance sheet activities, Variable Interest Entity, Capital requirements.

JEL Classifications: G21, G28

---

[1] Biswas is in the University of Bristol Business School, Koufopoulos is in the University of Sussex Business School, and Li is in the Shanxi University of Finance and Economics. E-mail addresses: s.biswas@bristol.ac.uk, k.koufopoulos@sussex.ac.uk, and songshan.li.1996@gmail.com.

1. Introduction

Capital requirements are the most prominent macro-prudential instrument in the arsenal of bank regulators. Since the global financial crisis of 2007-2009, requirements have become more stringent under Basel III to curb excessive risk-taking. An important question which arises here is how banks respond to changes in capital requirements. Several existing empirical papers have considered this question (e.g., Gropp et al. 2019) but they do not capture how two important bank features affect banks' response to the change in capital requirements. These features, which have been discussed widely in the last three decades, are: First, banks often keep large capital buffers in excess of the minimum capital requirements (e.g., Berger et al. 1995). Second, it has been argued that banks gain private information about the true value of (some of) their assets over time (e.g., Parlour and Plantin, 2008 and Dang et al., 2017). In this context, the contribution of this paper is to argue theoretically and present supporting empirical evidence that information asymmetry associated with bank assets is a key determinant of banks' response to a change in capital requirements.

Model preview. We present a model which predicts that banks' response to higher capital requirements depends critically on the transparency of their assets. Suppose that there are two types of banks: one type owns informationally opaque assets and the other type owns more transparent assets. Would the two types of banks respond differently to an increase in capital requirements?

In the model, when the increase in capital requirements on banks is imposed, they do not have superior information about the quality of their assets; they only know the expected quality, which is also known to outside investors. Following the increase in capital requirements, banks learn the true quality of their assets over time. Opaque banks observe privately if their assets are of good or poor quality, while the quality of transparent banks' assets is publicly observed. Additionally, at a future date, there may be a negative shock to banks' untraded assets with some positive probability; the realization of the shock is privately observed by each bank. We assume that banks hold sufficient excess capital buffer such that the increase in capital requirements does not immediately lead to the violation of the requirements. However, if the negative shock to untraded assets realizes at the future date, a bank falls short of the regulatory

capital requirements and needs to sell risky assets. Banks can sell risky assets either before or after they learn the quality of their tradeable assets.

If opaque banks sell their assets after they privately observe their quality, the proportion of bad assets will be higher than if they sell them before quality is observed. Because this negative shock is privately observed by banks, even banks which are not hit by the idiosyncratic negative shock will sell their bad assets to benefit from the pooling price. Hence, the market applies an adverse selection discount if opaque banks sell their assets after they have observed the quality. Because of this adverse selection discount, opaque banks may breach the regulatory requirements if the negative shock hits and they sell their assets after they have gained private information about their true value. If they sell before they learn the true value of their assets, opaque banks will avoid the adverse selection discount and will meet the higher capital requirements even if the negative shock hits. Thus, opaque banks will sell the assets on which they expect to gain private information immediately after capital requirements are increased. In contrast, banks with transparent assets do not face the adverse selection discount since their asset quality is publicly observed; so, in response to the increase in capital requirements they need not sell risky assets, unless the negative shock to their untraded assets realizes. Beatty and Liao (2011) argue that it is difficult for banks to replenish regulatory capital in crisis periods (see also Beatty and Liao, 2014); our theory suggests that it is relatively more difficult to do so for banks which have mostly opaque assets.

Our model bears similarities with models in banking and corporate finance in which new information arrives and the information is private to some agents (e.g., Parlour and Plantin, 2008, Greenwood et al., 2015, Dang et al., 2017). In these models, informed and uninformed agents are allowed to trade only after the arrival of private information, and inefficiencies (from the ex-ante perspective) arise due to this private information. In contrast to existing models, we allow for trade to occur both prior to and after the arrival of the private information, and do not exogenously fix the timing of the trade. In equilibrium, parties can engage in trade prior to the arrival of the private information to avoid the adverse selection discount. This observation allows us to derive a new empirical prediction which is that banks with informationally opaque assets reduce risk-weighted assets more aggressively when there is an increase in capital

requirements compared to banks which own more transparent assets.

Empirical setting. The ideal scenario to assess the impact of capital requirements would be if the regulators impose higher capital requirements on some randomly chosen banks, and not on others. By randomly chosen banks, we mean that the regulator does not consider bank size or systemic importance in choosing which banks are subjected to the higher capital requirements. In Basel II, changes in capital requirements are uniform across all banks in a jurisdiction and implemented at the same time for all banks, which means that there is no comparable group of banks against who the effects can be benchmarked. The various buffers introduced in Basel III give rise to some heterogeneity which may potentially be exploited for benchmarking. However, the buffers are imposed systematically, e.g., the largest banks are subject to higher requirements. The systematic nature of the regulation renders the benchmarking imperfect. In some cases (e.g., in the UK), the regulator imposes bank-specific requirements, but these correlate with potentially unobserved bank-specific characteristics.

Gropp et al. (2019) address some of these identification challenges by exploiting the institutional set-up of the 2011 capital exercise, conducted by the European Banking Authority (EBA) (see also Bostandzic et al., 2021). The exercise targeted the largest banks in each EU member country. Since the largest banks in some EU member countries are smaller than some of the smaller banks in some other EU member countries, there is a size overlap between the banks chosen to be in the capital exercise and those that are left out. However, their set-up still suffers from the issue that the largest banks in any country are systemically more important from the perspective of that country, which makes them systematically different from the similar-sized banks from the other countries which are left out of the capital exercise. In support of this argument, Gropp et al. (2024) show that the individual governments of the EU member countries protected their largest banks from the new capital charges.

Our identification relies on the implementation of the FAS 166/167 in 2010. Under the previous relevant standard, FIN 46 (R), banks kept Variable Interest Entities (VIEs) mostly off the balance sheet. Following the implementation of the FAS 166/167, banks were required to consolidate the VIEs onto their balance sheets. Consolidation of the VIEs led to a mechanical fall in the level of the risk-weighted capital ratio, since the VIEs were included in the

calculation of the risk-weighted assets. Important for our identification, the consolidation itself did not directly affect bank risk, since the banks were already exposed to most of the risk coming from these assets even before consolidation. As with Gropp et al. (2019), there is a considerable overlap between the size distributions of the treated and control banks. Additionally, since all our banks belong to the same jurisdiction, the United States, size is a reasonable proxy for the bank's systemic importance. Thus, our identification is not subject to the shortcoming in Gropp et al. (2019) that treated banks are likely to be more systemically important than the control banks.

Our setting has another advantage which is that capital requirements vary at the bank-level. Imbierowicz et al. (2018), Eckley et al. (2019), Fraisse et al. (2019) and De Jonghe et al. (2020), also consider settings in which capital requirements vary at the bank-level. In these settings the regulator exercises discretion in imposing the bank-level requirements, and hence, the requirements may be correlated with potentially unobserved bank-level factors. In our setting the requirements are correlated with observed bank-level factors and can be controlled for in the regressions.

Our sample consists of annual bank-level data for US Bank Holding Companies for the time-period between 2005 and 2015. To be included in our sample, we require that a bank has non-zero securitized assets in at least one year during the sample. This gives us an initial sample of 171 banks, of which 36 form the treated group since they consolidate VIE assets. Figure 1 shows the size distribution (in terms of the average total assets over the sample period) of the treated and control groups. Although the treated banks are larger on average, there is a considerable overlap in the size distributions of the treated and the control groups: the largest control bank in the sample is larger than 33 treated banks, and there are 62 control banks which are larger than the smallest treated bank. These 62 banks make up the control group in the final sample.

Empirical results. In response to an increase in capital requirements induced by the FAS 166/167 regulation, treated banks rely on reducing risk-weighted assets (the denominator) to reduce leverage, rather than increasing their Tier 1 capital (the numerator). The implementation of the FAS 166/167 reforms leads to a 3.28 percentage points fall in risk-weighted assets,

equivalent to 4.5% of the average treated bank, and the effect is statistically significant at the 1% level. The result is striking since the mechanical impact of the reforms would be to increase the treated banks' risk-weighted assets if banks did not respond. That the treated banks' risk-weighted assets are lower relative to the control banks', suggests that the treated banks' response to the reforms was strong enough not only to neutralize but also to overturn the mechanical impact of the reforms. Overall, the treated banks increase their risk-weighted capital ratio following the reforms, relative to the control banks by around 1.1 percentage point (equivalent to, roughly, 10% of the sample mean for this variable). We show that our findings are not driven by the differential impact of the global financial crisis on the treated banks vis-à-vis the control banks.

Our model predicts that the impact of reforms differs across transparent and opaque banks. To measure transparency, we use the Adjusted R-squared measure developed by Chen et al. (2022) which reflects the ability of banks' disclosures on performance to predict future realizations of loan defaults. A higher Adjusted R-squared implies that disclosure contains more information about the bank's asset quality. Consistent with the prediction of our model, we find that the average effect that there is an increase in the risk-weighted capital ratio is driven by the opaque banks (i.e., banks with a lower Adjusted R-squared). To achieve a higher risk-weighted capital ratio, these opaque banks rely mostly on adjusting the denominator, i.e., reducing risk-weighted assets. For a treated opaque bank, the implementation of the FAS 166/167 reforms leads to a 3.94 percentage point fall in risk-weighted assets and the effect is statistically significant at the 1% level, while for transparent banks, the effect becomes statistically insignificant.

Regulators often increase capital requirements even when the higher requirements do not appear to bind given existing buffers. E.g., in January 2022, the German bank regulators, BaFin, raised capital requirements, but they said in a statement,

"Banks will be able to meet this requirement almost entirely from existing excess capital".

In existing papers, banks build up excess buffers to avoid accidentally breaching regulatory requirements due to negative shocks (Berger et al. 1995, Lindquist, 2004, Jokipii and Milne, 2008, and Stolz and Wedow, 2011); thus, raising capital requirements can be effective, even if

6

the increased requirements are not binding, because banks may wish to protect a certain level of buffer. It is suggested that liquidity cost or fire sale discounts deter banks from selling risky assets to increase their risk-weighted capital ratio when they are arbitrarily close to breaching requirements, thereby necessitating buffer protection. However, it is not clear where the liquidity cost or fire sale discounts may come from. In this paper, we provide micro-foundations for these discounts by explicitly considering information acquisition by banks over time. In our model, even if the increased requirements are currently slack, opaque banks anticipate that at a future date they may have to sell their assets at an adverse selection discount which may lead to a breach of the regulatory requirements. As a result, they sell assets immediately to avoid this adverse selection discount. Aside from providing theoretical grounding to the existing arguments, our analysis delivers a new empirical prediction which we test and find supporting evidence for.

Additional related literature. Our paper contributes to the literature which studies the impact of bank capital requirements (e.g., Laeven and Levine, 2009, Behr et al. 2010, Berger and Udell, 1994). In contrast to these studies, we exploit the across-bank heterogeneity in changes in capital requirements, which allows us to make more reliable inferences. In this regard, our paper is closest to Gropp et al. (2019), who we have discussed in detail above. To summarize our novel contribution, we show that there are differences in how transparent and opaque banks deleverage; the latter are more reliant on reducing risk-weighted assets in increasing the risk-weighted capital ratio.

Our paper also adds to a small set of papers which studies the impact of the FAS 166/167 reforms (e.g., Dou et al., 2018, Tian and Zhang, 2016, Dou, 2021, and Tang, 2019). These papers focus on the credit supply impacts of the FAS 166/167 reforms, with the general finding that the affected banks cut their credit supply. In contrast, we investigate how affected banks respond to these reforms in terms of their liability structure.

2. Model

We present a stylized model of banking which predicts that banks' response to higher capital requirements differs depending on the transparency of their assets. The model has four

dates, $t = \{0, 1, 2, 3\}$. There are two types of banks: opaque banks and transparent banks.[2] At $t = 0$, both types of banks have tradeable legacy assets and some non-tradeable assets. Opaque banks own relationship loans while transparent banks own arm's length assets. Only opaque banks expect to acquire private information regarding their tradeable legacy assets over time. A secondary market for assets operates at $t = 0$ and $t = 2$. All agents are risk-neutral and protected by limited liability. The risk-free rate is normalized to 0, so there is no discounting.

It has been argued that bank equity capital is costlier than deposits, which leads to the unregulated bank leverage to be higher than the socially optimal level (see e.g., Allen et al., 2015, and Biswas and Koufopoulos, 2022). The regulator imposes risk-based capital requirements, i.e., Tier 1 equity capital divided by risk-weighted assets. In addition, breaching the regulatory minimum is assumed to be costly. The cost of breaching the regulatory requirements may be interpreted as higher compliance costs (e.g., an increase in capital charge or restrictions on payout). This implies that a bank will hold a buffer in excess of the capital requirements at $t = 0$. With capital requirement, $k\%$, a bank brings forward a buffer, $b\%$, to $t = 0$, so the risk-weighted capital ratio at this date is $(k + b)$. Banks can sell risky assets which reduces risk-weights and leads to an increase in the risk-weighted capital ratio (similar to Greenwood et al., 2015, Corona et al., 2015 and Dávila and Hébert, 2020; see Adrian and Shin, 2010 and Shleifer and Vishny, 2011, for supporting empirical evidence).

For an opaque bank, the entrepreneur's project has a positive NPV at the time of the loan issuance; the gross interest rate, R, is set such that the bank makes non-negative expected profits, and it is paid at $t = 3$ only if the entrepreneur succeeds, which happens with probability, $p \in (0,1)$. With the complementary probability, $(1 - p)$, the entrepreneur's project fails, and the loan is not repaid. At $t = 1$ opaque banks privately learn with certainty whether the loan will be repaid or not. For a transparent bank, its tradeable assets will repay R at $t = 3$ with

---

[2] In our stylized model, we assume that some banks are transparent, and others are opaque. This assumption may be micro-founded in the framework of Biswas and Koufopoulos (2022), as follows. There are skilled and unskilled banks, and both can divert resources which puts an upper bound on bank leverage. The skilled banks will manage complex (opaque) projects such as relationship loans since they add value to these projects. The unskilled banks manage simpler (transparent) projects. If we assume that more can be diverted from opaque projects then the diversion constraint is more binding for the skilled bankers, and the equilibrium outcome is that opaque banks will be smaller and less levered compared to transparent banks. The details are available upon request.

probability p and 0 with probability $(1 - p)$; the difference with opaque banks is that transparent banks do not learn anything about their assets at $t = 1$.

At $t = 2$ both types of banks face a purely idiosyncratic shock with probability $\lambda \in (0,1)$; there is no aggregate uncertainty and λ is assumed to be distributed independently of p.[3] The shock reduces the value of the non-tradeable assets of the bank which impairs a fraction, $\alpha \in (0,1)$ of the banks' risk-weighted capital ratio, i.e., if a shock hits a bank, its risk-weighted capital ratio falls from $(k + b)$ to $(1 - \alpha)(k + b)$. The realization of the shock is privately observed by both types of banks. We summarize the timeline of model below:

t=0: Banks own legacy assets with expected value, pR. The bank capital ratio is $k + b$.

t=1: Opaque banks privately learn if the legacy loans will be repaid, whereas transparent banks do not gain any private information.

t=2: Banks face a negative shock to untraded assets with probability, λ. If the shock hits a bank, it impairs a fraction, α, of its risk-weighted capital ratio.

t=3: All returns are realized.

We look for the subgame perfect Nash equilibrium of the game and solve it using backward induction. Suppose that at $t = 0$ the risk-weighted capital requirements go up by $\Delta\%$. The increase in requirements is such that the requirements do not bind due to existing excess buffers, i.e., $b > \Delta$. However, if the negative shock hits a bank's untraded assets at $t = 2$, the bank will need to sell risky assets in order not to breach the regulatory requirements. Banks can sell risky assets at $t = 0$ or $t = 2$. Given the increase in risk-weighted capital requirements, if the negative shock hits a bank, the bank will increase risk-weighted capital worth:

$$(k + \Delta) - (1 - \alpha)(k + b) = \Delta + \alpha(k + b) - b \tag{1}$$

By increasing the amount of capital described in Equation (1) the bank will ensure that it will not breach the regulatory minimum. How would opaque and transparent banks respond to an increase in risk-based capital requirements at $t = 0$? Consider an opaque bank's problem at

---

[3] To simplify the analysis, we assume that the idiosyncratic shock hits the banks' untraded assets (this being the only purpose of the untraded assets in our model). However, it should be noted that if the shock hit the traded assets (e.g., lowering the success probability of the legacy assets), the main results go through qualitatively.

$t = 2$. When an opaque bank sells its loans, it is either due to the negative shock to the untraded assets or because it learns at $t = 1$ that the entrepreneur has failed and will not make the loan repayments. The potential buyers of opaque banks' loans do not know the loan quality, although the banks themselves know the loan quality. Therefore, opaque banks sell their bad loans even if they do not experience the negative shock, which leads to an increase in probability of selling loans by opaque banks from λ (the symmetric information prior) to $\lambda + (1 - \lambda)(1 - p)$. Asymmetric information leads to a higher probability that the loans being sold by an opaque bank are bad, compared to the symmetric information prior. If an opaque bank attempts to sell, the fair price of the loan at $t = 2$ will be:

$$\Pi = \frac{\lambda\, pR}{\lambda + (1-\lambda)(1-p)} < pR \tag{2}$$

In contrast, at $t = 0$ the price of opaque banks' loans is given by pR, which is the fair price of the loan given that the bank does not have superior information about the quality of the loan relative to the outside investors. Note that $pR > \Pi$ for any $\lambda < 1$. This implies that for any feasible parameters, an opaque bank faces an adverse selection discount in selling its loans at $t = 2$, relative to the price at $t = 0$. Lemma 1 summarizes the above discussion.

Lemma 1: *Opaque banks receive a higher price if selling the loan at $t = 0$ than if selling at $t = 2$. Specifically, the adverse selection discount is $\frac{(1-\lambda)(1-p)}{\lambda + (1-\lambda)(1-p)} pR$.*

Suppose that the shock hits at $t = 2$. Consider the following set of parameters:

$$pR > \Delta + \alpha(k + b) - b > \Pi > \alpha(k + b) - b \tag{3}$$

For these parameters, an opaque bank avoids breaching higher capital requirements if it sells its loans at $t = 0$ (first inequality), but not if it sells its loans at $t = 2$ (second inequality). The third inequality ensures that if there is no increase in capital requirements at $t = 0$, opaque bank can meet the regulatory requirements by selling the assets at $t = 2$ implying that if there is no increase in capital requirements the bank can meet any capital shortfall by selling the assets at $t = 2$. If the magnitude of the shock to the untraded assets, α, is more severe (the first inequality flips), selling loans never avoids breaching the regulatory requirements. If the magnitude of the negative shock is less severe (the second inequality flips), the bank avoids

breaching regulatory requirements by selling its loans $t = 2$.

Supposing that α is in the intermediate range (all inequalities in Equation (3) are satisfied), an opaque bank always sells its loans at $t = 0$. Waiting to sell till $t = 2$ is never an optimal strategy for the opaque bank since with a positive probability there will be a negative shock leading to a breach of the regulatory capital requirements, which is to be avoided in all states given the cost it entails. To ensure that the opaque bank does not fall short of the regulatory requirements in all future states, it responds to an increase in capital requirements by selling its loans, even though the requirements do not bind at $t = 0$.

Lemma 2: *For intermediate values of α (given by Equation (3)), opaque banks sell assets at $t = 0$ in response to an increase in capital requirements at $t = 0$, even if the increase in requirements is not immediately binding.*

Next, consider a transparent bank's problem. It does not face the adverse selection problem like opaque banks do. If it sells its assets at $t = 2$, it is clearly because of the shock, and not because it is attempting to hide the sale of bad assets behind the shock. Therefore, its assets are sold at the same price at $t = 2$ as at $t = 0$.

Lemma 3: *Transparent banks are indifferent between selling their assets at $t = 0$ or $t = 2$, in response to an increase in capital requirements at $t = 0$.*

To summarize, the key friction in the model is that opaque banks privately learn at the intermediate date whether the loan will be repaid, but the transparent bank do not gain any private information about their assets. In the presence of this friction, opaque banks reduce risk-weighted assets in response to an increase in capital requirements, even if the requirements are not immediately binding; transparent banks are indifferent between selling assets immediately or later. The reason is that in the event of a potential crisis, an opaque bank will face an adverse selection discount in selling its assets such that the proceeds from the sale may not be sufficient to cover the shortfall in equity capital. In contrast, a transparent bank can sell its assets at a fair price at any given point in time. In reality, both types of banks are likely to face some discounts in selling their assets during crisis times (e.g., due to a temporary lower demand for riskier securities during the crisis, as in Shleifer and Vishny, 1992, Allen and

11

Carletti, 2008, and Shleifer and Vishny, 2011); the model's predictions are qualitatively unchanged as long as the discount for opaque assets is larger than the discount for transparent assets. The main predictions from the model are stated below:

Empirical Prediction 1: *On average, banks respond to an increase in capital requirements even if the increased requirements are not immediately binding.*

Although, an increase in capital requirements may not lead to a breach in the regulatory requirements due to the presence of excess capital buffers, still it increases the probability that the capital requirements will become binding when a negative shock hits in the future. Because opaque banks acquire private information about their asset quality over time, selling risky assets sooner rather than later reduces the adverse selection cost. For this reason, opaque banks may respond immediately to an increase in capital requirement, even if at this point in time the requirements are not binding. Existing papers suggest that banks build up excess capital buffers to insure against negative shocks leading to a breach of the regulatory requirements (Berger et al. 1995, Lindquist, 2004, Jokipii and Milne, 2008, and Stolz and Wedow, 2011). But these papers cannot explain why banks would want to sell risky assets immediately following the increase in capital requirements rather than later, after the negative shock realizes. Our model provides micro-foundations for why selling risky assets following negative shocks can be costly for banks which is that it imposes an adverse selection cost on the bank due to the arrival of private information over time. Thus, banks may sell risky assets following an increase in capital requirements, even though the higher requirements are not immediately binding. The key distinguishing feature of our paper is that it shows whether a bank responds immediately or not to an increase in capital requirements depending on its asset transparency. This allows us to derive a novel empirical prediction, which is the following:

Empirical Prediction 2: *Following an increase in capital requirements, opaque banks reduce leverage more aggressively, relative to transparent banks.*

Opaque banks acquire private information over time which imposes an adverse selection cost on them when they sell risky assets in the event that a negative shock hits the bank. Thus, opaque banks sell risky assets immediately following an increase in capital requirements rather than after the realization of the negative shock. In contrast, transparent banks do not suffer from

12

the adverse selection cost if selling after the negative shock realizes, which makes them indifferent between selling before or after the arrival of information regarding the asset quality since this information is not private.

It is important to note that the predictions rely on an *anticipated* negative shock, which implies that it is not necessary to observe a shock in the data to test the prediction. As long as there is a positive probability of a future shock, transparent and opaque banks respond differentially to an increase in capital requirements. Therefore, to test the predictions, we need an exogenous shock to banks' capital requirements; the FAS 166/167 reforms precisely offer this empirical setting.

3. Data and Methodology

3.1 Institutional background

Our identification comes from the FAS 166/167 reforms, effective from 2010. Prior to the reforms, banks kept most of the Variable Interest Entities (the VIEs) off their balance sheets, even if retaining exposure to potential losses coming from these assets. Due to being off the balance sheet, the VIEs did not carry a capital charge. The previous standards which governed accounting for securitization, FAS 140 and FIN 46(R), were quantitative in nature, allowing banks to meet the necessary requirements for them to just avoid consolidation (and pay the associated capital charge). Following the FAS 166/167 reforms, banks are required to consolidate all VIEs over which they have significant control, and they retain an obligation to absorb their losses. The new requirements, being qualitative, are less prone to being abused by accounting manipulations.

Starting in 2011, banks disclose the data on the size of assets in consolidated VIEs on Schedule HC-V of the FR Y-9C reports (in 2010 disclosure of this information was not required). We identify 36 banks which reported the consolidation of at least one VIE asset under the FAS 166/167 between 2011-2015; these 36 banks make up the treatment group. The consolidation of VIE assets leads to an increase in the affected banks' capital charge, which we interpret as a de facto increase in capital requirements.

3.2 Data

We use annual bank balance sheet data collected from the FR Y-9C reports of US bank holding companies in the SNL Financial database. Our sample covers 2005–2015, with the implementation of the FAS 166/167 reforms at the beginning of 2010, which falls roughly in the middle of the sample period. To construct the sample, we begin with all 3920 US bank holding companies. We only keep the banks that have non-zero off-balance sheet securitized assets in at least one year during our sample to ensure comparability between the banks affected by the FAS 166/167 and those which were not (see e.g., Casu et al., 2013, who show that securitizing banks differ from non-securitizing banks across several dimensions). We end up with a total of 171 banks in our sample, including the 36 treated banks identified using the VIE consolidation data. Of the 135 control banks, we identify a sub-sample of 62 banks (see Figure 1), the smallest of which is larger than the smallest treated bank. We use this set of banks as the final control group. Thus, in the final sample we have 36 treated banks, 62 control banks, and 862 bank-year observations. Including control variables in the regressions reduces the number of observations. To retain the largest sample size possible, we report regressions both with and without including the control variables. We define the main variables in our analysis below, and the summary statistics are in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles to avoid the effects of outliers in the regressions.

Under Basel capital adequacy standards, riskier asset categories entail higher risk-weights, implying a higher associated capital charge for them. Therefore, banks may de-leverage by reducing risk-weighted assets (*RWA*) by tilting the asset portfolio away from the riskier assets to the safer ones (e.g., reduce lending and hold cash) and/or by issuing Tier 1 capital (*CET1*), which is composed of core capital including common equity and retained earnings. Unrealized gains and losses on available-for-sale (AFS) securities and loan loss reserves are excluded from Tier 1 capital. We examine how banks deleverage following the implementation of the FAS 166/167 reforms. We hypothesize that banks deleverage primarily through reducing risk-weights, due to costs associated with issuing capital. Therefore, our main dependent variable is *RWA*, scaled by total assets. One concern with this variable is that if consolidated assets have a lower risk-weighting than 100% (e.g., credit card receivables which make up a large portion of consolidated VIEs receive a risk-weighting of 50%), it affects the risk-weighted assets differently from the unweighted total assets. To remove this effect, we remove the consolidated

VIEs from both risk-weighted assets and the unweighted total assets to construct *RWA_Adj*. We also test to what extent deleveraging occurs through the numerator, i.e., *CET1*, scaled by total assets. Finally, what is the overall impact of the FAS 166/167 on the risk-weighted capital ratio, *CET1/RWA*.

We control for various bank characteristics in our regressions. Bank size is proxied using the natural logarithm of the total assets, *Size*. *GrowthTA* is the growth rate in *Size*. The return on assets, *ROA*, reflects bank profitability. The average bank in the sample has a *ROA* of 0.871%. *Loan* and *Cash*, which are the ratio of gross loans to the total assets and the ratio of total cash to total assets, reflect the bank's business model and liquidity, respectively. The average bank's loan portfolio makes up 63.52% of its total assets, and it holds 1.98% of the total assets in cash. *Deposit* is the total deposits scaled by the total assets, and *Equity* is the total equity divided by the total assets; together, they reflect the bank's funding structure. The ratio of overheads to the total assets, *Overheads,* captures the bank's operating costs. Finally, we control for the size of the off-balance sheet activities, *OFBS*, by using the total assets securitized divided by the total assets. Off-balance sheet activities make up 4.535% of the bank's total assets.

Bank asset transparency. A key prediction of our model is that the impact of reforms should differ by bank asset transparency. Theoretically, if banks are transparent and do not have private information about their assets, it is easier for them to sell the assets in the event of a negative shock because they will not face an adverse selection discount. Transparent banks are likely to have an arm's-length loan portfolio, resulting in less private information about these loans compared to opaque banks whose loan portfolio is likely to mainly consists of relationship loans, giving them access to more private information.

To measure transparency, we use the Adjusted R-squared measure developed by Chen et al. (2022) which reflects the ability of banks' disclosures on performance to predict future realizations of loan defaults. Specifically, the measure is the adjusted R-squared from a regression of bank loan write-offs on the past components of the disclosed earnings and other relevant controls. A higher Adjusted R-squared implies that disclosure contains more information about the bank's asset quality. Using the sample of publicly traded banks, Chen et

al. (2022) find that stock returns are more sensitive to earnings news in banks with high Adjusted R-squared, which validates the assertion that the measure contains an informational feature. We call banks above the 75th percentile of the Adjusted R-squared measure *Transparent*, while those below the 75th percentile are identified as *Opaque*. On average, banks in our sample have an Adjusted R-squared of 0.426. Banks in the treatment group have a score with the mean being 0.528 (i.e., they are more likely to be more transparent), but importantly for our identification, there is substantial variation in this variable within the sample of treated banks.

3.3 Methodology

We identify the impact of the higher capital requirements on bank deleveraging using a difference-in-differences research design. We estimate the following regression:

$$Y_{i,t} = \beta_1 Post_t * Consolidation_i + \alpha X_{i,t-1} + \gamma_i + \gamma_t + \varepsilon_{i,t} \qquad (4)$$

where Y_{it} is the outcome variable (e.g., *RWA*) for bank i in year t. *Consolidation* is an indicator variable that equals one if a bank consolidated VIEs under the FAS166/167 and zero otherwise. *Post* is an indicator variable, which equals one if the year is 2010 or later and zero otherwise. We include the bank fixed effects, γ_i, to control for time-invariant bank characteristics and the year fixed effects, γ_t, to control for time-varying shocks. We cannot estimate the coefficients on *Post* and *Consolidation* because these are subsumed by the included fixed effects. The variable of interest is the interaction term, *Post*Consolidation*, which captures the banks in the treated group in the post-reform period. The vector, X_{it-1}, is the set of bank characteristics (e.g., *Size, OFBS,* and others discussed in Section 3.2); the controls are lagged by one period to mitigate endogeneity concerns. We estimate Equation (4) using OLS, and the standard errors are clustered at the bank level.

4. Results

4.1 Parallel Trends

The validity of our difference-in-differences set-up requires that the parallel trend assumption is not violated, i.e., the change in the treated and control banks' outcome variables would have followed a similar trend in the absence of the FAS 166/167 implementation

(Angrist and Krueger, 1991). In Table 2, we look at the evolution of changes in the primary outcome variables, *RWA* and *CET1,* prior to the reforms. Panel (a) reports the results for *RWA*. The difference between the treated and control banks in the change in *RWA* is not statistically different from zero for two of the most recent pre-reform horizons, although the difference becomes positive statistically significant at the 10% level for the longest horizon. This observation suggests that although prior to the global financial crisis, *RWA* evolved differently for our treated and control banks, the trends became parallel over the crisis years, 2007 - 2009, leading up to the FAS 166/167 reforms. In Panel (b), we consider *CET1*; for this variable, the difference is statistically significant in the most recent horizon. These observations suggest that the parallel trends assumption is likely to be satisfied for *RWA,* although not necessarily for *CET1*. We present further tests of the parallel trends assumption below.

4.2 Baseline Results

We examine how banks deleverage following the de facto increase in capital requirements induced by the reforms. Regulatory capital requirements under Basel II are in terms of Tier 1 capital over risk-weighted assets. Higher capital requirements may be met either through increasing Tier 1 capital on the liability side (the numerator) or reducing risk-weights of assets (the denominator).

We begin by visually inspecting how each element of bank leverage evolves around the reforms in Figure 2. We plot the means of the primary outcome variables, *RWA* and *CET1*, separately for the treated and control banks. Panel (a) shows that prior to the reforms, i.e., over the crisis years, the mean *RWA* is similar for the two groups. There is an immediate differential impact following the FAS 166/167 reforms, with a much sharper fall for the treated banks compared to the control banks. The visuals in panel (a) are striking: the mechanical impact (i.e., if the treated banks did not respond to the reforms), of consolidating the VIEs on the balance sheet would be higher risk-weighted assets for the treated banks. That we observe the opposite in the data is indicative of a strong response by the treated banks. In panel (b), we plot the mean *CET1* around the reforms for the treated and control groups. In the most recent pre-reform year, the *CET1* variable climbs for both groups, but sharper for the treated banks. Post-reform, there

17

is no discernible differential impact detected in the *CET1* variable. The raw data plots suggest that bank deleverage primarily by reducing the risk-weighted assets following the reforms.

In Table 3, we present the regression results. In columns 1 and 2, the dependent variable is *RWA*, and the regressions are without and with controls included, respectively. β_1, which is the coefficient on the interaction term, *Post*Consolidation*, is negative and statistically significant at the 1% level in both columns. In terms of the economic magnitude of the effect, the implementation of the FAS 166/167 reforms leads to a 3.28 percentage points fall in risk-weighted assets, on average (after including bank-level controls in the regression), equivalent to a 4.5% fall relative to the sample mean for this variable. This result suggests that in response to the higher requirements, banks re-balance their portfolio towards assets which have lower risk-weights attached to them. The response is sufficiently strong to overturn the mechanical impact of the reforms which is to increase the amount of risk-weighted assets. The finding is consistent with Dou et al. (2018) who find that the banks affected by the FAS 166/167 reforms reduce mortgage origination and increase the sale of existing mortgages. In columns 3 and 4, the dependent variable is *RWA_Adj*, and the results are qualitatively the same. In columns 5 and 6, the dependent variable is *CET1*, and the regressions are without and with controls included, respectively. The coefficient on the interaction term is statistically insignificant at the conventional levels in both columns, consistent with the raw data plots.

In Figure 3, we trace out the dynamic effects of bank de-leveraging by plotting the coefficients obtained from estimating a version of Equation (4), replacing the interaction term, *Post*Consolidation*, with interactions of *Consolidation* with each year, and the year before the reforms, 2009, serves as the excluded category. In panel (a), we plot *RWA*. The pre-reform coefficients are insignificant, confirming that there are no significant pre-trends, and the post-reform coefficients are negative and statistically significant for several of the years. Note that non-action by treated banks would lead to positive coefficients. Thus, negative but insignificant coefficients (as in the first two treated years) do not suggest that treated banks did not respond; the correct interpretation would be that treated banks responded by reducing *RWA*, but the response only neutralized the mechanical impact of the reforms in these years, it did not overturn it. In contrast, for *CET1* which is plotted in panel (b), the plotted coefficients suggest

18

that in 2009 there is a positive adjustment, but the post-reform coefficients are statistically insignificant. Overall, these results indicate that the average bank meets the increased requirements through adjusting the denominator rather than numerator. Our results are consistent with the findings of Gropp et al. (2019) who also find evidence for bad deleveraging being the predominant response of the average bank to an increase in capital requirements, using a different empirical setting (the EBA capital exercise).

In columns 7 and 8, we estimate Equation (4) using *CET1/RWA* as the dependent variable, and the regressions are without and with controls included, respectively. The coefficient on the interaction term, *Post*Consolidation*, is positive and statistically significant in both columns. The magnitude of the effect is economically important. The treated banks increase their risk-weighted capital ratio by 1.1 percentage point (in the specification which includes the controls), which is roughly 10% of the sample average. This result confirms that the treated banks deleverage in response to the higher capital requirements.

4.3 Robustness

Since the post-reform period begins in 2010, one possibility is that global financial crisis of 2007-2009 drives our results. Alternatively, it may be the case that banks anticipate the reforms (see e.g., Hendricks et al., 2022). Additionally, motivated by the crisis, this period also experienced other major reforms, such as the Dodd-Frank Act and the Basel III (although, the implementation of Basel III did not start till much after the FAS 166/167 reforms and is still not completed in 2022). Our choice of control banks mitigates these concerns to some extent since they are also securitizing banks and comparable in size. We perform two additional tests to further address these concerns and report the results in Tables 4 and 5.

In Table 4, we use the year before the crisis, 2006, as the placebo treatment year (with the sample from 2003-2009)[4]: if the crisis is driving our original findings, then the placebo effect should be significant in the treated banks. We do not find this to be the case for any of our dependent variables, which suggests that the crisis is not driving our findings.

---

[4] Since there is no VIE consolidation during the placebo years, the *RWA_Adj* variable is the same as the *RWA* variable, and hence, excluded from the table.

Each of the nine globally systemically important banks, G-SIBs, in the sample is a treated bank. Given that the crisis and the ensuing regulations affected G-SIBs asymmetrically compared to the non-G-SIBs, it is possible that the treatment effect is a G-SIB effect, rather than coming from the FAS 166/167 reforms. To investigate this possibility, we re-do the original regressions, but drop the G-SIBs from the sample (in Table 5). The coefficients of interest are identical in sign to the full-sample regressions and remain statistically significant for *RWA*, while insignificant for *CET1*, suggesting that the G-SIBs do not drive our findings.

4.4 Cross-sectional heterogeneity

Our model generates a new prediction that the effects of an increase in capital requirements should be stronger for opaque banks. To test the hypothesis, we split the sample of treated banks into *Opaque* and *Transparent*, and re-estimate Equation (4) for each sub-sample. We present the results in Table 6.

In columns 1 and 2, the dependent variable is *RWA*. In Column 1 (the *Opaque* bank sub-sample regression), β_1, which is the coefficient on the interaction term, *Post*Consolidation*, is negative and statistically significant at the 1% level. In terms of the economic magnitude of the effect, the implementation of the FAS 166/167 reforms leads to a 3.94 percentage points fall in risk-weighted assets, on average, equivalent to a 5.4% fall relative to the sample mean for this variable. However, in column 2 (the *Transparent* bank sub-sample regression), β_1 is still negative, but smaller in magnitude and statistically insignificant. This suggests that the *Opaque* banks, but not the *Transparent* banks, reduce risk-weighted assets sufficiently to overturn the mechanical impact of the reforms. In columns 3 and 4, we obtain similar results when we use the variant, *RWA_Adj*. The findings are consistent with opaque banks selling riskier assets in order to avoid the adverse selection costs in the event of a crisis. In columns 5 and 6, the dependent variable is *CET1* for the *Opaque* bank sub-sample and the *Transparent* bank sub-sample, respectively. In both cases, β_1 is positive but statistically insignificant. In columns 7 and 8, the dependent variable is the risk-weighted capital ratio, *CET1/RWA*. In the *Opaque* banks sub-sample regression (Column 7), β_1 is positive and statistically significant at the 5% level. For the *Transparent* bank sub-sample regression (Column 8), the effect becomes statistically insignificant and the sign flips.

Overall, the evidence in Table 6 suggests that the average effect that there is an increase in the risk-weighted capital ratio in response to the reforms by the treated banks is driven by the *Opaque* banks. To achieve a higher risk-weighted capital ratio, these opaque banks rely mostly on adjusting the denominator, i.e., reducing risk-weighted assets, and less so on adjusting the numerator, i.e., increasing the Tier 1 capital (the effect on the numerator is statistically insignificant). The findings are consistent with Empirical Prediction 2 which states that opaque banks respond more aggressively to a change in capital requirements in anticipation of information acquisition over time.

5. Conclusion

We examine how banks deleverage in response to higher capital requirements. After the implementation of the FAS 166/167 in 2010, banks were required to consolidate the securitized VIEs onto their balance sheets. The consolidation itself did not directly affect the banks' risk exposures. Since the consolidated assets were included in the risk-weighted assets, the treated banks experience a (de facto) increase in capital requirements. We identify 36 banks which consolidated at least one VIE asset during 2011-15, which make up the treated group, and 62 securitizing banks which are comparable in size to the treated banks make up the control group.

We find that, on average, banks de-lever by reducing risk-weights. The average effect is driven by the more opaque banks. To explain our findings, we present a model in which banks with opaque assets may suffer adverse selection discounts in selling their assets in the potential event of a crisis -- by selling risky assets before they acquire private information about them, opaque banks avoid the adverse selection discount. Our findings provide a rationale for why (some) banks respond to an increase in capital requirements, even when the requirements do not immediately bind.

References

Adrian, T. and Shin, H. (2010). Liquidity and leverage. *Journal of Financial Intermediation*, 19(3): 418-437.

Allen, F. and Carletti, E. (2008). Mark-to-Market accounting and liquidity pricing. *Journal of Accounting and Economics*, 45(2-3): 358-378.

Allen, F., Carletti, E., and Marquez, R. (2015). Deposits and Bank Capital Structure. *Journal of Financial Economics*, 118(3): 601-619.

Angrist, J. D. and Krueger, A. B. (1991). Does compulsory school attendance affect schooling and earnings? *The Quarterly Journal of Economics*, 106(4): 979–1014.

Beatty, A. and Liao, S. (2011). Do delays in expected loss recognition affect banks' willingness to lend? *Journal of Accounting and Economics*, 52(1): 1-20.

Beatty, A. and Liao, S. (2014). Financial accounting in the banking industry: A review of the empirical literature. *Journal of Accounting and Economics*, 58(2-3): 339-383.

Behr, P., Schmidt, R., and Xie, R. (2010). Market structure, capital regulation and bank risk taking. *Journal of Financial Services Research*, 37(2): 131-158.

Berger, A. N., Herring, R. J., and Szegö, G.P. (1995). The role of capital in financial institutions. *Journal of Banking and Finance*, 19(3-4): 393-430.

Berger, A. and Udell, G. F. (1994). Did risk-based capital allocate bank credit and cause a 'credit crunch' in the United States? *Journal of Money, Credit and Banking*, 26(3): 585–628.

Biswas, S. and Koufopoulos, K. (2022). Bank capital structure and regulation: Overcoming and embracing adverse selection. *Journal of Financial Economics*, 143(3): 973-992.

Bostandzic, D., Irresberger, F., Juelsrud, R., and Weiβ, G. (2021). Do capital requirements make banks safer? Evidence from a quasi-natural experiment. *Journal of Financial and Quantitative Analysis*, 57(5): 1805-1833.

Casu, B., Clare, A., Sarkisyan, A., and Thomas, S. (2013). Securitization and bank performance. *Journal of Money, Credit and Banking*, 45(8): 1617-1658.

Chen, Q., Goldstein, I., Huang, Z., and Vashishtha, R. (2022). Bank transparency and deposit flows. *Journal of Financial Economics*, 146(2): 475-501.

Corona, C., Nan, L., and Zhang, G. (2015). Accounting information quality, interbank competition, and bank risk-taking. *The Accounting Review*, 90(3): 967-985.

Dang, T.V., Gorton, G., Holmström, B., and Ordonez, G. (2017). Banks as secret keepers. *American Economic Review*, 107(4): 1005-1029.

Dávila, E. and Hébert, B. (2020). Optimal corporate taxation under financial frictions. *The Review of Economic Studies*, 90(4): 1893-1933.

De Jonghe, O., Dewachter, H., and Ongena, S. (2020). Bank capital (requirements) and credit supply: Evidence from pillar 2 decisions. *Journal of Corporate Finance*, 60.

Dou, Y. (2021). The spillover effect of consolidating securitization entities on small business lending. *The Accounting Review*, 96(5): 207-229.

Dou, Y., Ryan, S. G., and Xie, B. (2018). The real effects of FAS 166/167 on banks' mortgage approval and sale decisions. *Journal of Accounting Research*, 56(3): 843-882.

Eckley, P., Francis, W., and Mathur, A. (2019). In the dangerzone! Regulatory uncertainty and voluntary bank capital surpluses. *Working Paper*.

Fraisse, H., Lé, M., and Thesmar, D. (2019). The real effects of bank capital requirements. *Management Science*, 66(1): 5-23.

Greenwood, R., Landier, A., and Thesmar, D. (2015). Vulnerable banks. *Journal of Financial Economics*, 115(3): 471-485.

Gropp, R., Mosk, T., Ongena, S., Simac, I., and Wix, C. (2024). Supranational rules, national discretion: Increasing versus inflating regulatory bank capital? *Journal of Financial and Quantitative Analysis*, 59(2): 830-862.

Gropp, R., Mosk, T., Ongena, S., and Wix, C. (2019). Banks response to higher capital requirements: Evidence from a quasi-natural experiment. *The Review of Financial Studies*, 32(1): 266-299.

Hendricks, B. E., Neilson, J. J., Shakespeare, C., and Williams, C. D. (2022). Anticipatory Effects around Proposed Regulation: Evidence from Basel III. *The Accounting Review*, 98(1): 285-315.

Imbierowicz, B., Kragh, J., and Rangvid, J. (2018). Time-varying capital requirements and disclosure rules: Effects on capitalization and lending decisions. *Journal of Money, Credit and Banking*, 50(4): 573-602.

Jokipii, T. and Milne, A. (2008). The Cyclical Behaviour of European Bank Capital Buffers. *Journal of Banking and Finance*, 32(8): 1440-1451.

Laeven L. and Levine R. (2009). Bank governance, regulation and risk taking. *Journal of Financial Economics*, 93(2): 259-275.

Lindquist, K. (2004). Banks' Buffer Capital: How Important Is Risk. *Journal of International Money and Finance*, 23(3): 493-513.

Parlour, C. and Plantin, G. (2008). Loan sales and relationship banking. *Journal of Finance*, 63(3): 1291-1314.

Shleifer, A. and Vishny, R. (2011). Fire sales in finance and macroeconomics. *Journal of Economic Perspectives*, 25(1): 29-48.

Shleifer, A. and Vishny, R. W. (1992). Liquidation values and debt capacity: A market equilibrium approach. *Journal of Finance*, 47(4): 1343-1366.

Stolz, S. and Michael, W. (2011). Banks' Regulatory Capital Buffer and the Business Cycle: Evidence for Germany. *Journal of Financial Stability*, 7(2): 98-110.

Tang, H. (2019). Peer-to-peer lenders versus banks: Substitutes or complements? *The Review of Financial Studies*, 32(5): 1900-1938.

Tian, X. and Zhang, H. (2016). Impact of FAS 166/167 on credit card securitization. *Working Paper*.

Figure 1: Bank size distribution.

This graph shows the size distribution of the control and treated groups. The Y-axis is the log of size. The value, 0, on the X-axis denotes the controls banks, while the value, 1, denotes the treated banks.
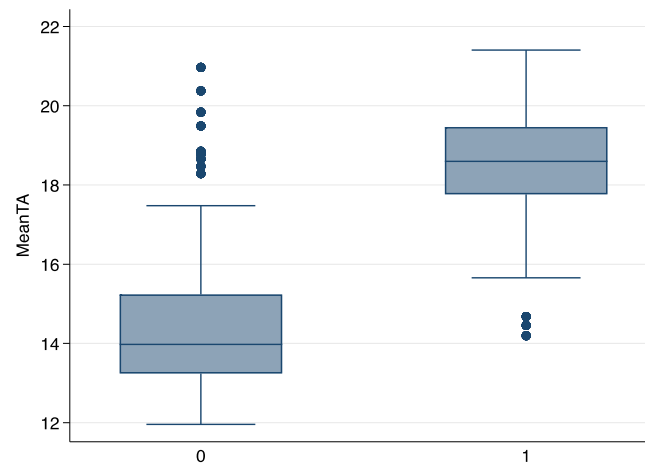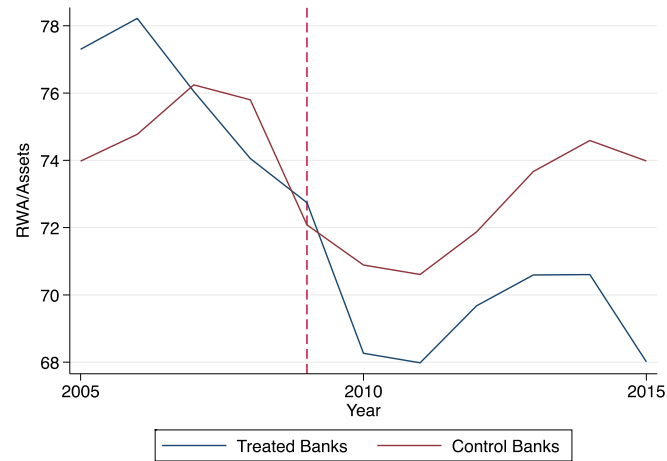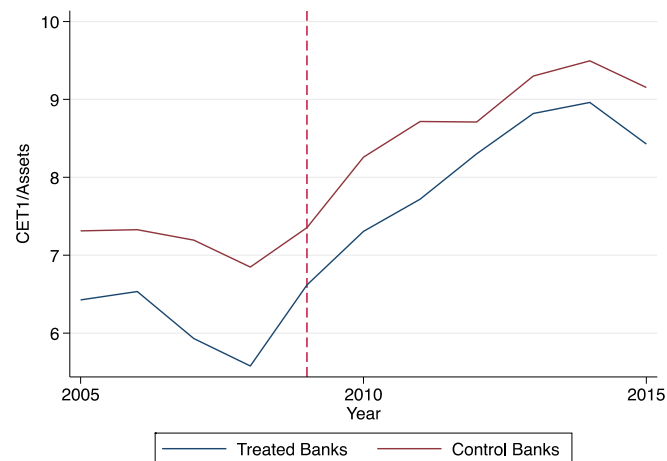
Figure 2: Unconditional average effects.

This figure plots the means of the outcome variables, *RWA/Assets* and *CET1/Assets*, separately for the treated and control groups over the sample period. The treatment date is the start of 2010.

Panel (a): RWA/Assets

Panel (b): CET1/Assets

Figure 3: Dynamic effects of bank de-leveraging.

This figure plots the dynamic effects of bank de-leveraging. In particular, this figure plots the coefficient estimates of an augmented version of Equation (4), replacing the interaction term, *Post*Consolidation*, with the interactions of *Consolidation* with a set of year dummy variables. We exclude the year before the reforms, 2009, thus estimating the dynamic effect of the reforms relative to that year. Vertical bars indicate 95% confidence intervals based on standard errors clustered at the bank level.
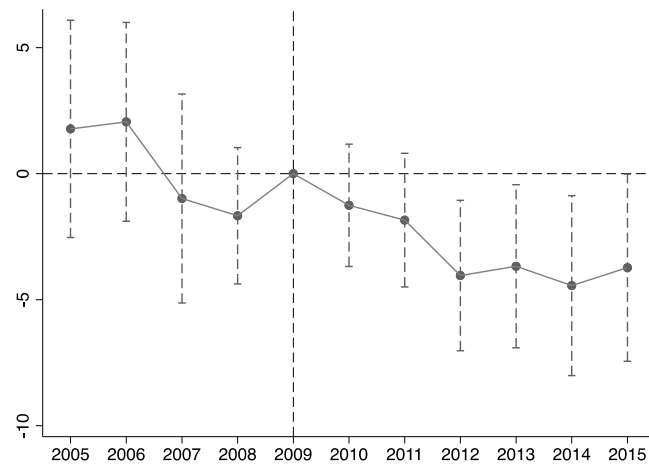
Panel (a): RWA/Assets
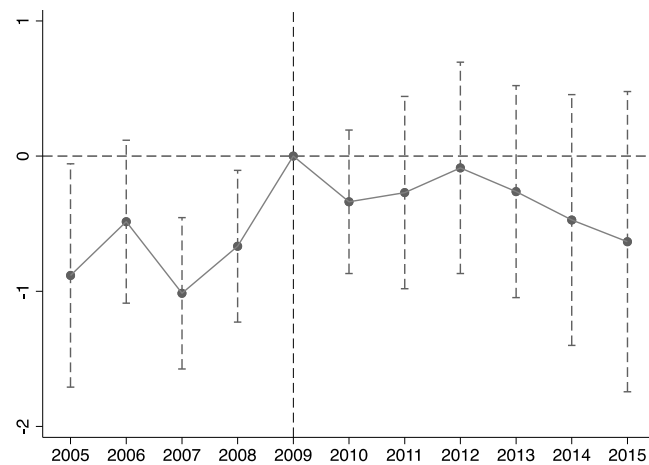
Panel (b): CET1/Assets

Table 1: Descriptive statistics.

The table shows the summary statistics of the key variables used in the analysis (see Section 3.2). All variables are winsorized at the 1st and 99th percentiles to minimize the effects of outliers.

Variable	N.	Mean	SD	p10	p25	P50	p75	p90
RWA/Assets	862	72.876	14.164	53.332	66.180	74.931	82.022	88.014
RWA_Adj	862	72.688	14.208	53.182	66.180	74.683	81.578	88.011
CET1/Assets	853	7.898	4.560	4.258	5.616	7.468	8.950	10.534
CET1/RWA	860	11.106	5.516	6.165	7.980	10.495	12.535	15.480
Size	897	16.499	1.817	14.410	14.825	16.074	18.301	19.429
GrowthTA	876	6.969	14.279	-3.843	0	4.241	9.885	18.867
ROA	880	0.871	0.861	0.005	0.600	0.950	1.225	1.550
Loan	886	63.521	15.620	37.330	59.140	67.255	73.840	78.730
Cash	886	1.982	1.083	0.870	1.260	1.775	2.450	3.370
Deposits	887	69.854	14.317	44.070	64.720	74.210	80.000	83.770
Equity	885	10.510	3.369	6.990	8.440	10.070	12.070	14.400
Overheads	880	3.339	1.294	2.250	2.660	3.040	3.585	4.740
OFBS	887	4.535	21.834	0	0	0	3.078	10.842
Adjusted R-Squared	687	0.426	0.390	-0.095	0.159	0.477	0.753	0.900

Table 2: The evolution of changes in the outcome variables for the pre-treatment years.

The table reports the changes in *RWA/Assets* and *CET1/Assets* for different horizons prior to the reforms. Columns 1 and 2 show the evolution of changes in the treated and control groups, respectively. Column 3 reports the differences in the changes between the two groups, and the t-statistic testing the equality of means is reported in column 4.

	(1)	(2)	(3)	(4)
	Treated	Control	Differences	T-Statistic
Panel a. RWA/Assets				
2009-2008	-2.130	-3.765	-1.635	-1.111
2009-2007	-4.123	-3.821	0.303	0.141
2009-2006	-6.295	-2.349	3.946*	1.724
Panel b. CET1/Assets				
2009-2008	0.817	0.268	-0.549**	-2.328
2009-2007	0.464	-0.002	-0.466	-1.410
2009-2006	-0.139	-0.122	0.017	0.046

Table 3: Unconditional response to higher capital requirements.

In columns 1 and 2, the dependent variable is *RWA/Assets*, in columns 3 and 4 it is *RWA_Adj*, in columns 5 and 6, it is *CET1/Assets*, and in columns 7 and 8, it is *CET1/RWA*. *Consolidation* is an indicator variable that equals one if banks consolidated VIEs under the FAS 166/167. *Post* is an indicator variable that equals one after the implementation of the FAS 166/167. Control variables are lagged by one year. Bank fixed effects and year fixed effects are included in all regressions. The standard errors are clustered at the bank level. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	RWA/Assets		*RWA_Adj*		*CET1/Assets*		*CET1/RWA*	
Post*Consolidation	-5.138***	-3.277***	-5.886***	-3.924***	-0.072	0.270	0.947*	1.123**
	(-3.20)	(-2.77)	(-3.67)	(-3.35)	(-0.18)	(0.89)	(1.76)	(2.33)
Size		1.377		1.551		-1.818***		-2.554***
		(0.89)		(1.00)		(-4.34)		(-3.34)
GrowthTA		-0.039***		-0.041***		-0.006		-0.002
		(-2.96)		(-3.08)		(-1.56)		(-0.30)
ROA		-0.039		-0.026		0.344***		0.521**
		(-0.08)		(-0.05)		(2.72)		(2.59)
Loan		0.599***		0.590***		0.020		-0.058
		(13.00)		(12.69)		(1.08)		(-1.59)
Cash		0.336		0.275		-0.024		-0.154
		(1.15)		(0.95)		(-0.21)		(-0.71)
Deposit		-0.053		-0.040		0.012		0.019
		(-1.01)		(-0.76)		(0.52)		(0.42)
Equity		-0.104		-0.087				
		(-0.53)		(-0.45)				
Overheads		0.112		0.188		0.183*		0.159
		(0.43)		(0.69)		(1.80)		(1.04)
OFBS		0.124		0.143*		0.050***		0.031
		(1.64)		(1.83)		(3.20)		(1.42)
Observations	862	834	862	834	853	826	860	831
R²	0.202	0.480	0.221	0.490	0.309	0.433	0.349	0.439
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Table 4: Robustness tests by using the placebo treatment year, 2006.

In this table, we report the results of placebo tests using the sample period during 2003-2009. In column 1 the dependent variable is *RWA/Assets*, in column 2 it is *CET1/Assets*, and in column 3 it is *CET1/RWA*. *Consolidation* is an indicator variable that equals one if banks consolidated VIEs under the FAS 166/167. *Post* is an indicator variable that equals one after 2006 (i.e. the year preceding the crisis). Control variables are lagged by one year. Bank fixed effects and year fixed effects are included in all regressions. The standard errors are clustered at the bank level. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)
	RWA/Assets	*CET1/Assets*	*CET1/RWA*
*Post*Consolidation*	-1.053	0.190	0.602
	(-0.96)	(0.59)	(1.50)
Controls	Yes	Yes	Yes
Observations	506	503	503
R^2	0.335	0.127	0.153
Bank FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Table 5: Robustness tests after dropping the G-SIBs.

In this table, we report the results without the nine G-SIBs. In column 1 the dependent variable is *RWA/Assets*, in column 2 it is *RWA_Adj*, in column 3 it is *CET1/Assets*, and in column 4 it is *CET1/RWA*. *Consolidation* is an indicator variable that equals one if banks consolidated VIEs under the FAS 166/167. *Post* is an indicator variable that equals one after the implementation of the FAS 166/167. Control variables are lagged by one year. Bank fixed effects and year fixed effects are included in all regressions. The standard errors are clustered at the bank level. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
	RWA/Assets	*RWA_Adj*	*CET1/Assets*	*CET1/RWA*
*Post*Consolidation*	-2.733***	-3.175***	0.364	1.117**
	(-2.76)	(-3.20)	(1.03)	(2.01)
Controls	Yes	Yes	Yes	Yes
Observations	753	753	745	745
R^2	0.465	0.470	0.428	0.429
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 6: Transparency and response to higher capital requirements.

In columns 1 and 2 the dependent variable is *RWA/Assets*, in columns 3 and 4 it is *RWA_Adj*, in columns 5 and 6 it is *CET1/Assets*, and in columns 7 and 8 it is *CET1/RWA*. *Consolidation* is an indicator variable that equals one if banks consolidated VIEs under the FAS 166/167. *Post* is an indicator variable that equals one after the implementation of the FAS 166/167. Control variables are lagged by one year. Bank fixed effects and year fixed effects are included in all regressions. The standard errors are clustered at the bank level. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

| | (1) *Opaque* | (2) *Transparent* | (3) *Opaque* | (4) *Transparent* | (5) *Opaque* | (6) *Transparent* | (7) *Opaque* | (8) *Transparent* |
	RWA/Asset		*RWA_Adj*		*CET1/Assets*		*CET1/RWA*	
Post*Consolidation	-3.937***	-1.121	-4.658***	-1.669	0.211	0.199	1.196**	-0.025
	(-2.79)	(-1.27)	(-3.38)	(-1.67)	(0.64)	(0.58)	(2.22)	(-0.05)
Size	1.239	2.752	1.362	2.855	-1.841***	-1.737***	-2.669***	-2.708***
	(0.77)	(1.49)	(0.84)	(1.53)	(-4.30)	(-2.95)	(-3.35)	(-2.70)
GrowthTA	-0.036**	-0.045***	-0.038***	-0.045***	-0.005	-0.008*	0.002	-0.002
	(-2.61)	(-2.67)	(-2.70)	(-2.69)	(-1.22)	(-1.69)	(0.25)	(-0.22)
ROA	-0.154	-0.099	-0.150	-0.100	0.362***	0.486***	0.570***	0.761***
	(-0.29)	(-0.16)	(-0.28)	(-0.16)	(2.75)	(3.44)	(2.73)	(3.39)
Loan	0.618***	0.597***	0.610***	0.592***	0.022	0.028	-0.061	-0.061
	(13.24)	(10.59)	(13.03)	(10.31)	(1.08)	(1.19)	(-1.56)	(-1.39)
Cash	0.361	-0.038	0.299	-0.051	-0.041	0.029	-0.170	0.070
	(1.24)	(-0.15)	(1.05)	(-0.20)	(-0.36)	(0.20)	(-0.78)	(0.49)
Deposit	-0.062	-0.001	-0.052	0.002	0.020	0.013	0.034	0.006
	(-1.11)	(-0.01)	(-0.93)	(0.03)	(0.84)	(0.41)	(0.72)	(0.11)
Equity	-0.128	-0.128	-0.109	-0.129				
	(-0.61)	(-0.44)	(-0.52)	(-0.44)				
Overheads	0.042	0.064	0.102	0.095	0.204*	0.148	0.207	0.197
	(0.15)	(0.17)	(0.36)	(0.24)	(1.99)	(1.27)	(1.32)	(1.05)
OFBS	0.101	0.123	0.113	0.162	0.049**	0.036	0.029	0.039

	(1.09)	(0.82)	(1.22)	(0.97)	(2.55)	(1.28)	(1.22)	(0.71)
Observations	779	593	779	593	771	585	776	585
R^2	0.488	0.453	0.498	0.453	0.426	0.434	0.429	0.404
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes