

# Why Don't All Banks Practice Regulatory Arbitrage? Evidence from Usage of Trust Preferred Securities

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Nicole M. Boyson  
Northeastern University

Rüdiger Fahlenbrach  
Ecole Polytechnique Fédérale de Lausanne

René M. Stulz  
Ohio State University, NBER and ECGI

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## Abstract

We investigate why only some banks use regulatory arbitrage. We predict that banks wanting to be riskier than allowed by capital regulations (constrained banks) use regulatory arbitrage while others do not. We find support for this hypothesis using trust preferred securities (TPS) issuance, a form of regulatory arbitrage available to almost all U.S. banks from 1996 to Dodd-Frank. We also find support for predictions that constrained banks are riskier, perform worse during the crisis, and use multiple forms of regulatory arbitrage. We show that neither too-big-to-fail incentives nor misaligned managerial incentives are first-order determinants of this type of regulatory arbitrage.

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Nicole M. Boyson

Associate Professor of Finance  
Northeastern University, D'Amore-McKim School of Business  
360 Huntington Avenue  
Boston, Massachusetts 02115-5000, United States  
phone: +1 (617) 373-4775  
e-mail: n.boyson@neu.edu

Rüdiger Fahlenbrach

Associate Professor of Finance  
Ecole Polytechnique Fédérale de Lausanne  
Swiss Finance Institute @ EPFL  
Quartier UNIL-Dorigny, Extranef 211  
CH - 1015 Lausanne, Switzerland  
phone: +41 (0)21 693 0098 , fax: +41 (0)21 693 0110  
e-mail: ruediger.fahlenbrach@epfl.ch

René M. Stulz\*

Everett D. Reese Chair of Banking and Monetary Economics  
Ohio State University, Fisher College of Business  
2100 Neil Avenue  
Columbus, OH 43210, United States  
phone: +1 (614) 292-1970, fax: +1 (614) 292-2359  
e-mail: stulz@cob.ohio-state.edu

\*Corresponding Author

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Nicole M. Boyson, Rüdiger Fahlenbrach, and René M. Stulz\*

December 14, 2015

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\*Boyson is from Northeastern University. Fahlenbrach is from Ecole Polytechnique Fédérale de Lausanne and is affiliated with the Swiss Finance Institute. Stulz is Everett D. Reese Chair of Banking and Monetary Economics, Fisher College of Business, Ohio State University, and is affiliated with NBER, ECGI and Wharton Financial Institutions Center. We thank Norah Barger, Andrea Beltratti, Fabio Braggion, Wolfgang Bühler, Engelbert Dockner, Paul Irvine, Jan Krahn, Christian Leuz, Yan Liu, Aksel Mjøs, Steven Ongena, Phil Strahan, Sascha Steffen, Elu von Thadden, Josef Zechner, and seminar and conference participants at Bank for International Settlements, Bentley University, Bristol University, European School of Management and Technology, the Federal Reserve Board, the Frankfurt School of Finance and Management, Goethe Universität Frankfurt, HEC Paris, NHH Bergen, Oxford, Universität Mannheim, Universität St. Gallen, the University of Massachusetts at Amherst, Wirtschaftsuniversität Wien, Bocconi Carefin Conference, the American Economic Association, the European Finance Association, and the Napa Conference on Financial Markets Research for helpful comments and suggestions. Fahlenbrach thanks the Swiss Finance Institute for generous financial support. Brian Baugh and Andrei Gonçalves provided valuable research assistance. René Stulz serves on the board of a bank that is affected by capital requirements and consults and provides expert testimony for financial institutions.

## 1. Introduction

Acharya and Richardson (2009) argue that the use of regulatory arbitrage by banks to “get[ting] around the capital requirements imposed by regulators” is what made the subprime crisis a financial crisis. Since the crisis, both economists and regulators have paid considerable attention to regulatory arbitrage. Concerns about regulatory arbitrage have played a central role in the design of Basel III, since regulators believe that the new Basel III leverage ratio is much more resistant to regulatory arbitrage than capital requirements using risk weights. While the literature has shown that certain banks used regulatory arbitrage to increase risk – for instance, by putting assets off-balance sheet (Acharya, Schnabl, and Suarez (2013)) – it has not addressed why some banks engage in regulatory arbitrage and others do not. Addressing this issue is important in understanding bank behavior as well as its relationship to the crisis. Without knowing why some banks choose to engage in regulatory arbitrage, it is difficult to predict which banks will use regulatory arbitrage to take on more risk and when they will do so. In this paper, we develop hypotheses regarding the determinants of the use of regulatory arbitrage and test these hypotheses using banks’ issuance of trust preferred securities (TPS), a hybrid security used as a regulatory arbitrage vehicle available to almost all bank holding companies in the United States from 1996 to 2010.

There is a general belief that a major determinant of regulatory arbitrage is the incentives of large banks to exploit too-big-to-fail (TBTF) subsidies (e.g., Acharya and Richardson (2009), Carbó-Valverde, Kane, and Rodriguez-Fernandez (2013)). The relation between TBTF status and regulatory arbitrage cannot be investigated with forms of regulatory arbitrage such as asset backed commercial paper (ABCP) conduits that are only available to TBTF banks. By contrast, we can investigate whether regulatory arbitrage is driven by TBTF status, since TPS was available to almost all bank holding companies. We find strong evidence that TBTF status is not the main driver of regulatory arbitrage with TPS. The determinants of TPS usage are unchanged if we exclude banks with more than \$50 billion of assets (potential TBTF banks) from our sample. Similarly, some argue that regulatory arbitrage is driven by misaligned managerial incentives that lead banks to take on excessive risk (Bebchuck and Spamann (2010), Acharya and Richardson (2009)). The widespread availability of TPS enables us to investigate the

excess risk-taking hypothesis in a sample with significant variation in managerial ownership. We find that the use of TPS increases with managerial ownership. Our finding is not consistent with arguments that regulatory arbitrage results from excessive risk taking by managers with misaligned incentives, as we would expect banks with higher managerial ownership to have better aligned incentives than banks with lower managerial ownership.

Our hypothesis to explain the variation in usage of regulatory arbitrage is that banks have optimally different levels of risk. The optimal risk level is tied to the bank's franchise value or business model. Some banks have business models that are more transactional and have low franchise value. These banks seek a higher level of risk to maximize shareholder wealth, but are constrained in doing so by capital requirements (constrained banks). Regulatory arbitrage enables constrained banks to take more risk. By contrast, banks with high franchise value (unconstrained banks) want to preserve that value and do not benefit from regulatory arbitrage and hence are not expected to use the regulatory arbitrage opportunities available to them. We find strong support for this hypothesis.

Banks across the globe widely used various types of hybrid capital for the purpose of regulatory arbitrage before the crisis. In the U.S., TPS were the main form of hybrid capital that banks could use. In October 1996, the Federal Reserve Board authorized bank holding companies to include trust preferred securities (TPS) as Tier 1 regulatory capital up to a threshold level. As shown in Figure 1, from 1996 to 2007, U.S. bank holding companies in the aggregate repurchased common stock and issued TPS. TPS are cumulative non-perpetual preferred securities issued by subsidiaries of bank holding companies whose sole asset is junior subordinated debt issued by the bank holding company. As with other debt, interest on TPS is tax-deductible to the bank holding company. Interest paid to the trust on the debt is used to pay quarterly dividends to TPS investors. Interest payments are deferrable for up to 20 quarters without triggering default. Post-crisis regulatory changes eliminated this regulatory arbitrage opportunity.

An unconstrained bank has no reason to issue TPS. If it wants to become riskier through an increase in leverage, it can do so without using TPS. The tax advantage of TPS relative to equity is not valuable to such a bank because it could replace equity by debt to gain the same advantage. A constrained bank is a

bank that would prefer to be riskier than capital requirements allow. Because TPS are part debt and part equity, substituting TPS for equity amounts to increasing the bank's leverage without changing its Tier 1 capital ratio. Hence, a bank that is otherwise constrained by capital requirements can effectively increase its leverage using TPS. We therefore predict that constrained banks will issue TPS because it allows them to be riskier while still satisfying capital requirements.

To test our hypotheses, we must determine whether a bank is constrained by capital requirements. We use two proxies for whether a bank is constrained. The first proxy is a bank's franchise value. An important finding in the banking literature is that banks with higher franchise value hold more capital because these banks have more to lose if they fail (see, for instance, Marcus (1983), Marcus (1984), Keeley (1990), and Demsetz, Saldenberg, and Strahan (1996)). High franchise value could arise from a number of factors, such as valuable relationships, a profitable deposit base, and so on. We expect banks with high franchise values to be less constrained by capital requirements and to hold little or no TPS. We find strong support for this prediction. Our second proxy is a measure of how close a bank is to its regulatory capital threshold. In a world where raising capital quickly is costly, banks will hold a buffer stock of capital to cope with adverse shocks and to avoid the cost of having to raise capital unexpectedly. We consider a bank as constrained by regulation if its buffer stock of capital is low.<sup>1</sup> Using the second proxy, we also find evidence consistent with our hypotheses. Banks are more likely to use TPS if they are more constrained, i.e., if their excess regulatory capital levels are low.

Alternative reasons can be advanced for the issuance of TPS by banks that are unrelated to regulatory arbitrage. In particular, as a hybrid capital instrument, TPS could allow the issuing bank holding company to avoid inefficient liquidations or help resolve debt-equity conflicts. Further, TPS interest is tax-deductible. However, bank holding companies could have obtained the same benefits by directly issuing deeply subordinated debt prior to and after 1996. Such subordinated debt issues would have been nearly

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<sup>1</sup> We recognize that this approach is somewhat imprecise for two reasons. First, there are multiple capital requirements, so that a bank's buffer stock might differ substantially across measures. For instance, U.S. banks must meet a regulatory leverage ratio test where the denominator of the capital requirement formula is total assets rather than risk-weighted assets. A bank can have a large buffer with respect to the ratio that uses risk-weighted assets but a low buffer with respect to the leverage ratio. Second, a bank could choose to have a lower buffer stock simply because it has low risk. We control for systematic and idiosyncratic risk in our empirical analyses.

economically equivalent to the TPS structure of issuing deeply subordinated debt to a subsidiary trust which then issues TPS. Yet we find that over 85% of bank holding companies in our sample never issue subordinated debt unless it is related to TPS issuance, which we view as evidence in favor of the regulatory arbitrage motive.

A constrained bank can use TPS to increase the numerator of its Tier 1 capital ratio.<sup>2</sup> However, it can also take actions that affect the denominator of the ratio, i.e., the risk-weighted assets. Under our hypotheses, we would expect constrained banks to do both. Since the denominator of the capital ratio involves risk weights, banks cannot simply increase asset risk. Rather, we expect constrained banks to arbitrage these risk weights. Acharya, Schnabl, and Suarez (2013) examine such an arbitrage. They study how banks use asset-backed commercial paper (ABCP) conduits to reduce risk-weighted assets on their balance sheets and note that these conduits transfer the assets, but not the underlying risk, from bank balance sheets. Because this type of regulatory arbitrage entailed high fixed costs, it was available only to the very largest bank holding companies, and almost all of them used it. While TPS was available to many more banks than ABCP, those banks that used ABCP also used TPS, confirming our hypothesis.

With our hypotheses, banks that meet capital requirements with TPS rather than equity should be riskier and hence more vulnerable to adverse shocks because these banks choose to take on more risk than other banks. We investigate our predictions and show that they hold. First, we find that banks with more TPS in Tier 1 capital have a lower distance to default during our sample period. Second, we find that banks with more TPS in Tier 1 capital are significantly more likely to receive funds from the Capital Purchase Program, the part of the Troubled Asset Relief Program through which the Treasury purchased newly issued preferred stock of banks, and were also more likely to borrow from other Fed facilities. Third, banks with more TPS have significantly lower return on assets and return on equity during the crisis. Fourth, during the crisis, the equity of banks with more TPS performed substantially worse than the

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<sup>2</sup> Tier 1 capital for the period we study in this paper includes total shareholders' equity minus goodwill and other intangibles (except for mortgage-servicing rights) plus qualifying hybrid securities and non-controlling interests. Perpetual preferred stock and trust preferred securities were permitted up to a regulatory limit (approximately 15% of a BHC's core capital for large banks and 25% a BHC's core capital for small banks). See appendix A for a detailed description of Tier 1 capital.

equity of other banks, and the result is even stronger for banks that had both a significant amount of TPS and a significant amount of risky mortgage lending going into the crisis. Finally, for the subset of bank holding companies with traded CDS contracts, banks with more TPS in their regulatory capital have higher CDS spreads during the financial crisis period.

We contribute to three strands of the literature. First, we contribute to the literature on the determinants of bank capital. Second, we add to the literature on the impact of capital requirements on banks and on the determinants of regulatory arbitrage. Third, we contribute to the literature on TPS and other hybrid securities. A large body of research examines the determinants of bank capital (see Berlin (2011) and Thakor (2014) for reviews). A common finding in the empirical literature is that banks tend to hold significantly more capital than necessary to meet regulatory requirements. For example, Flannery and Rangan (2008) find that banks had capital levels that were 75% over the regulatory minima in the early 2000s. Berger et al. (2008) note that banks actively manage their capital ratios, set target levels above well-capitalized regulatory minima, and make rapid adjustments toward their targets. Our paper adds to this literature by showing that banks manage not only the level but also the composition of their regulatory capital when capital requirements are binding.

Other literature focuses on the relationship between bank capital and performance. Berger (1995) finds that banks with higher capital had better earnings in the 1980's. More recently, Mehran and Thakor (2011) also provide evidence that better capitalized banks perform better. Demircuc-Kunt, Detragiache, and Merrouche (2013) find that before the crisis bank capital was not related to performance, but that during the crisis, higher capital was positively related to stock performance. Beltratti and Stulz (2012) and Fahlenbrach, Prilmeier, and Stulz (2012) document a positive relationship between bank performance and Tier 1 capital during the recent crisis. Berger and Bouwman (2013) show a positive relationship between capital and market share during crises. All these papers focus either on Tier 1 capital or the ratio of book equity to assets, but none of them examine the influence of TPS. Our paper contributes to this literature by showing that, holding the amount of capital constant, banks with more TPS in their regulatory capital

perform worse and are more likely to need government assistance during the crisis. Acharya et al. (2012) show that the quality of bank capital deteriorated prior to the crisis for large international banks.

There is also a literature documenting that banks engage in regulatory arbitrage. In fact, the first working paper of the Basel Committee on Banking Supervision concluded: “banks have learnt how to exploit the broad brush nature of the requirements [...]. For some banks, this has probably started to undermine the meaningfulness of the requirements.” (Jackson (1999)). However, most literature on regulatory arbitrage has focused on showing the prevalence and types of regulatory arbitrage rather than understanding which banks engage in arbitrage. In contrast, with TPS, hundreds of bank holding companies in our sample of 857 banks never issued TPS. Because so many banks did not issue TPS, its usage is ideally suited to study why some banks use regulatory arbitrage and others do not. Finally, while there is a small literature on TPS, it only partially addresses the issues we focus on in this paper.<sup>3</sup>

The remainder of the paper is structured as follows. Section 2 gives some background on TPS. Section 3 explains the data sources and offers summary statistics. Section 4 contains our main empirical analysis, and Section 5 concludes.

## **2. Background on Trust Preferred Securities**

Trust preferred securities (TPS) are cumulative non-perpetual preferred securities issued by subsidiaries (special purpose entities, or SPEs) of bank holding companies (BHCs) whose sole asset is junior subordinated debt issued by the BHC. The bank holding company typically purchases 100% of the common equity of the SPE (which typically represents about 3% of the total assets of the trust). The SPE then issues preferred securities to investors. The SPE loans the offering proceeds of both the common and

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<sup>3</sup> Benston et al. (2003) examine 67 TPS issuances during 1996 and 1997. They find that the market responds favorably to TPS filings, and that issuers of TPS are larger and more sophisticated and have lower economic capital than non-issuers. Harvey, Collins and Wansley (2003) find that the issuance of TPS from 1996-2000 had a positive impact on bank stock prices, especially for firms that used TPS to retire common or preferred stock. Krishnan and Laux (2005) study trust preferred securities issued by both banks and other corporations, and find that the initial stock price reaction to the issuance of TPS is positive when issuers state a specific reason for issuance. Balasubramanian and Cyree (2010) argue that banks issue TPS to change their capital structure or improve capital ratios, but not for tax benefits. Finally, Kim and Stock (2012) show that the value of existing trust preferred securities increased when banks accepted TARP funding.

preferred securities to the bank holding company. In turn, the bank holding company issues deeply subordinated deferrable interest debentures to the SPE. The SPE is structured as a statutory business trust and is taxed as a partnership. Quarterly interest paid to the trust is used to pay dividends to holders of TPS. BHCs may defer this interest for up to 20 quarters without triggering default. If the BHC exceeds this deferral period, the note is considered in default and becomes immediately due and payable. Interest paid on the notes issued to the trust is tax-deductible for the BHC. Most TPS are callable after 5 or 10 years, and all TPS are mandatorily redeemable after 30 or 40 years.

This type of security has been used by non-bank corporations since 1993, and is also known as monthly-income preferred stock (MIPS) or quarterly-income preferred stock (QUIPS) (see, e.g., Engel, Erickson, and Maydew (1999)). The first TPS issue by a BHC did not occur until after October 21, 1996, when the Board of Governors of the Federal Reserve System (FRB) announced that bank holding companies may include trust preferred securities up to 25% of core capital in Tier 1 regulatory capital. Core capital is a grossed up version of Tier 1 capital that does not reflect deductions for disallowed intangible assets, goodwill, and disallowed deferred tax assets. Importantly, these securities would not qualify as Tier 1 capital if the BHC were to directly issue cumulative non-perpetual preferred stock. Therefore, the TPS structure facilitates regulatory arbitrage.

From our discussion with regulators, the Federal Reserve granted Tier 1 status to TPS in 1996 for several reasons. First, the fact that Basel I allowed for Tier 1 status of minority interests made it possible for TPS to qualify as Tier 1 capital as they were classified as minority interest in the equity accounts of consolidated subsidiaries under the then valid accounting rules. Second, the Fed was concerned that banks would issue REIT Trust Preferred and saw TPS as a better alternative. Finally, from a competitive standpoint, insurance companies were permitted to count TPS as capital, and international banks were already using hybrid capital as Tier 1 capital. While the Federal Reserve allowed BHCs to include TPS in regulatory capital, their subsidiary depository institutions were not allowed to do so, since the Federal Deposit Insurance Corporation (FDIC) contended that TPS do not provide sufficient capital support. Therefore, all TPS issuance was at the BHC level.

French et al. (2010) provide a detailed description of the history of TPS. Appendix B of our paper shows a timeline of important changes to the TPS market through time, from initial approval of Tier 1 status to the Dodd-Frank Act that disallowed Tier 1 recognition.

### **3. Data**

Our data come from several sources. The core sample is an unbalanced panel of all publicly traded U.S. BHCs that report on form FR Y-9C, which is filed quarterly on a consolidated basis by all domestic BHCs with over \$150 million in assets (\$500 million after 2006). These data are from the Federal Reserve Bank of Chicago. Our dataset covers the period from 1996 to 2012, and includes 857 BHCs. Data on individual trust preferred securities are from SNL Financial, a private data provider that uses information from a variety of sources to create a proprietary database. We supplement the TPS data from SNL Financial using hand-collected data from forms 10-K, 10-Q, 8-K, and TPS prospectuses (for publicly traded TPS) found at the SEC's website. Some data on publicly traded TPS is from Quantum Online, a website that collects information about publicly traded preferred securities. Detailed data on mergers and acquisitions come from SNL Financial. Stock price data come from CRSP. Data on Credit Default Swap (CDS) spreads are obtained from MarkIt.

#### **A. TPS Summary Statistics**

We have data on 1,467 separate TPS issuances. Figure 2 shows the total amount of TPS, the total Tier 1 qualified TPS outstanding by quarter, and the proportion of BHCs that have issued TPS. The total amount of TPS outstanding (Tier 1 qualified TPS) for publicly-traded BHCs was just under \$20 (\$20) billion at the end of 1996 and rose to a peak of about \$140 (\$120) billion in early 2010. It is evident from the figure that banks did not initially issue more TPS than would count towards Tier 1 capital. Total TPS exceeded Tier 1 qualified TPS during the financial crisis not because BHCs issued more TPS, but because net losses during this period caused BHCs to reach the Fed-imposed TPS core capital threshold. The proportion of BHCs with TPS increased significantly over the sample period, rising from less than 10% to

about 80% by the end of 2005, where it remained steady until 2010. The increase is particularly pronounced for the years 2000-2002. In 2000, Salomon Smith Barney issued the first TPS collateralized debt obligation, allowing small BHCs to issue TPS through a pooled structure. Small BHCs with less than \$1 billion of assets quickly seized the opportunity to issue additional Tier 1 capital between 2000 and 2002. The increase is also partially caused by increased merger activity, which reduced the number of BHCs in the sample over time. The BHCs that leave the sample are less likely to have TPS, since across the entire sample of 857 BHCs, about 40% never issue TPS. After Dodd-Frank was enacted in the third quarter of 2010, qualified TPS dropped from \$120 billion to just under \$100 billion by the first quarter of 2012. The more significant event was a Notice of Proposed Rulemaking (NOPR) on June 7, 2012, which reiterated the Dodd-Frank requirement that BHCs with over \$15 billion in assets phase out their TPS in Tier 1 capital over a three year period beginning January 2013, and that banks between \$500 million and \$15 billion in assets phase out TPS over a 10 year period.<sup>4</sup> Many BHCs treated the NOPR as a “qualifying event” that allowed them to redeem TPS prior to its call date. Most TPS include a provision allowing immediate call in the case of a qualifying “tax or regulatory event.” A tax or regulatory event would be deemed to occur if, for example, TPS lost its tax-deductibility status or no longer qualified as Tier 1 capital. During the last three quarters of 2012, total qualified TPS dropped another \$40 billion, ending at just under \$60 billion at the end of 2012.

Figure 3 shows a histogram of the outstanding TPS as a fraction of Tier 1 capital for our sample of bank holding companies (BHCs) between 1996 and 2007, conditional on a bank having TPS outstanding in the respective year.<sup>5</sup> Figure 3 demonstrates that there is a wide cross-sectional distribution of TPS / Tier 1 ratios; while TPS usage is substantial, bank holding companies do not typically issue the maximum possible amount. The histogram suggests that banks choose an amount of TPS / Tier 1 that is optimal for

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<sup>4</sup> On July 2, 2013, the Fed’s Final Rules allowed banks with assets below \$15 billion to permanently treat TPS as Additional Tier 1 Capital, contradicting the 10 year phase out requirement of the June 7, 2012 NOPR. Our data ends in 2012, before this Final Rule was announced.

<sup>5</sup> The data underlying the histogram excludes 106 BHC-firm years for internationally active banks because a different regulatory upper limit for TPS / Tier 1 applies to them. Since there are so few observations, including them in the histogram will not significantly change the distribution. We only show the histogram from 1996 to 2007, because banks did not issue TPS during the crisis and started redeeming them after regulatory changes in 2010.

them, which is consistent with our hypotheses. Note that while there is some clustering of TPS / Tier 1 at the 25% threshold, there are many BHC-year observations with more than 25% TPS in Tier 1 capital. French et al. (2010) point out that this is not inconsistent with regulatory limits. The maximum amount of TPS allowable is based on TPS / core capital, not TPS / Tier 1 capital. Since core capital does not reflect deductions for disallowed intangible assets, goodwill, disallowed deferred tax assets and other deductions, TPS legally may comprise more than 25 percent of actual Tier 1 capital.<sup>6</sup>

Panel A of Table 1 provides detailed data at the TPS issuance level. The largest number of securities (209) was issued in 2003, with the highest dollar amount issued in 2007 (about \$36 billion). Panel A also details the method of issue, divided into four categories. First, banks can register their securities with the SEC to be sold to the public. Second, they can issue TPS in a traditional private placement.<sup>7</sup> Third, banks can privately place their TPS under Rule 144A.<sup>8</sup> Finally, banks can issue TPS through a TPS-CDO structure (pooled). The last column provides details on dividend deferrals as a result of BHCs deferring interest payments to the trusts. Most deferrals occur in 2009, with 43 banks deferring 146 TPS issues. A BHC may not defer interest to trusts holding TPS unless it also defers dividends on common and other preferred stock.

Panel B provides data on bank-stated reasons for TPS issuance. We hand-collect these data from SEC filings and news releases for all TPS issuances. Consistent with our hypotheses, banks rarely issue TPS to pay down debt (5%), which would lower their probability of default. Rather, they use it to fund acquisitions or growth (23%), thereby reducing the amount of common stock they must issue to meet capital requirements following an increase in their assets. In addition, they state they use TPS to improve regulatory capital 16% of the time. Panel C presents the average underwriting costs of common stock,

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<sup>6</sup> Note that it is not possible to calculate core capital for the whole sample due to data availability, which explains why we focus on Tier 1 instead.

<sup>7</sup> In a traditional private placement, BHCs issue these securities to an unlimited number of accredited investors. The placement is generally conducted on a best-efforts basis, and the securities are restricted from resale for at least a year (see Arena (2011) for details).

<sup>8</sup> The SEC introduced Rule 144A private placements in 1990. Unlike traditional private placements, Rule 144A placements may be traded among Qualified Institutional Buyers without a minimum holding period. Qualified Institutional Buyers include banks, savings and loans, and BHCs with audited net worth of at least \$25 million, insurance companies or pension plans with at least \$100 million in investible assets, brokers and dealers registered under the Exchange Act, and entities whose equity holders are all Qualified Institutional Buyers.

preferred stock, long-term debt with different seniorities, and TPS. Cost data are available from 2000 forward. The underwriting cost is the difference between the price paid to the issuer and the price at which the securities are sold, as a percent of the price at which the securities are sold. Averages are taken by year, and then across years. Underwriting costs are significantly higher for common stock than for TPS, but lower for long-term debt, indicating that in addition to being tax-deductible Tier 1 capital, TPS are also less expensive to issue than common stock.

## **B. Bank Holding Company Data**

Table 2 presents summary statistics of annual data at the bank holding company level. There are 857 unique banks. Means and medians are calculated first by bank and then across banks, and are presented in two categories: banks that issued TPS at any time during the sample period (518 banks) and banks that did not (339 banks). Banks that acquired but never issued TPS (6 banks) are included in the “did not issue” category. Results do not change if we change the categorization of these banks.

Following Demsetz, Saidenberg, and Strahan (1996), we calculate franchise value as the sum of the market value of equity and the book value of liabilities, scaled by book value of assets minus goodwill. Consistent with our hypothesis that TPS issuers are constrained by capital requirements, both franchise value and the Tier 1 ratio are significantly lower for TPS issuers than for non-issuers. If we calculate the Tier 1 ratio by removing TPS from the numerator, the difference increases by 1.6 percentage points. Further, TPS issuers are larger, have higher risk-weighted assets, worse ROA, worse stock performance, higher betas, lower deposits, less cash, more loans, and higher derivative usage. They are also more likely to repurchase stock, and have higher internal and external growth than non-issuing banks. Non-issuers are located in states with on average higher state tax rates, which is contrary to what one would expect if taxes were an important motive for TPS issuance. The results are consistent across means and medians.

#### **4. Empirical Analysis**

We first present findings that make a prima facie case for the regulatory arbitrage motive of TPS. We then investigate whether our hypotheses are supported by the data. The first hypothesis is that banks that issue TPS are constrained by regulatory capital requirements. To test it, we relate the ratio of TPS to Tier 1 capital to our proxies for whether a bank is constrained. The second hypothesis is that constrained banks will also use other types of regulatory arbitrage, so we investigate whether banks that choose TPS and were sufficiently large to qualify also use ABCP. The third hypothesis is that constrained banks that use TPS are choosing to be riskier and therefore, will have a shorter distance to default, which we test by examining the relationship between lagged TPS usage and a bank's z score. Finally, we expect that banks that use TPS to be more affected by an adverse shock such as the credit crisis because they are riskier because of their use of regulatory arbitrage and hence because of their greater risk taking. We investigate this hypothesis by examining banks' likelihood of requiring TARP and other government funding and by evaluating their operating and stock performance in the crisis.

##### **A. Prima Facie Case for the Regulatory Arbitrage Motive of TPS Issuance**

Trust-preferred securities potentially offer additional advantages beyond providing regulatory capital. A well-studied property of senior or secured debt is that senior or secured claimants have incentives to force inefficient liquidations; i.e. liquidations in which a firm's assets are sold for less than the firm's value as a going concern (e.g., Bolton and Scharfstein (1996) or Rajan (1992)). Because the bank holding company issues deeply subordinated debt with low priority and an interest deferral option into the trust, TPS could help reduce these inefficient liquidations. Second, issuing TPS instead of more senior debt could help reduce conflicts of interest between shareholders and debt holders such as debt overhang or risk shifting (e.g., Myers (1977) and Jensen and Meckling (1976)). Finally, the TPS structure allows banks to issue a preferred security whose dividends receive a favorable tax treatment.

The economic transaction underlying the trust-preferred securities is the issuance of deeply subordinated debt at the bank holding company level. Deeply subordinated debt issuances share the

advantages of TPS described above, except for recognition as regulatory Tier 1 capital. An indirect test of the regulatory arbitrage motive is therefore to examine TPS issuance relative to the issuance of subordinated debt. The results are stark – for about 85% of sample BHCs, the fraction of TPS / total subordinated debt is equal to one, i.e. they only issue subordinated debt to fund trust-preferred securities.<sup>9</sup> We believe that this result suggests a regulatory arbitrage motive for TPS issuance.

Non-financial corporations have been active users of this hybrid security since 1993 (under the name of MIPS or QUIPS), when the Internal Revenue Service (IRS) granted favorable tax treatment to the preferred dividend payments. Benston et al. (2003) estimate that about 300 corporations issued over \$65 billion between 1993 and 1999. Banks could have also issued TPS since 1993 to alleviate inefficient liquidations, receive tax benefits, or reduce debt-equity conflicts. Yet, Benston et al. (2003) as well as our Figure 2 show that bank holding companies did not issue trust-preferred securities prior to their regulatory approval in October 1996. This fact also suggests a regulatory arbitrage motive for TPS issuance.

All trust preferred securities contain an early redemption clause that underscores the regulatory arbitrage motive. The clause specifies that the issuer may immediately redeem the debentures at par if there is a change in the capital adequacy guidelines adopted by the Board of Governors of the Federal Reserve Board resulting in trust preferred securities not being counted as Tier 1 regulatory capital.

Finally, not only did banks not issue TPS before they could include them in Tier 1 capital, they also reduced issuance in a period of uncertainty during which Tier 1 recognition was unclear. Specifically, the Financial Accounting Standards Board (FASB) changed the accounting treatment of the special purpose entity (SPE) underlying TPS in 2003 with a final ruling in December 2003 that threatened Tier 1 recognition of TPS (see Appendix B for details). Between December 2003 and a final ruling of the Federal Reserve Board that allowed TPS to maintain their Tier 1 status in April 2005, new TPS issuance activity decreased by approximately 20%. Finally, not a single bank holding company with assets over

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<sup>9</sup> The finding is consistent with the earlier literature on subordinated debt issuance by banks (e.g., Avery et al. (1988), Flannery and Sorescu (1996), and Goyal (2005)) that shows that only the largest U.S. bank holding companies issue subordinated debt in meaningful quantities.

\$500 million issued TPS after September 12, 2010, the date after which newly issued TPS could no longer be counted towards regulatory capital.

## **B. TPS / Tier 1 and TPS / Subordinated Debt Ratio**

We now examine the determinants of the TPS / Tier 1 and the TPS / total subordinated debt ratios. The TPS / Tier 1 ratio can vary because of growth in retained earnings and new common equity issuances that affect the denominator, or because of new TPS issuances or TPS redemptions that affect the numerator and denominator. The TPS / total subordinated debt ratio can vary because a bank issues TPS or subordinated debt. The TPS / total subordinated debt ratio has the advantage of being leverage neutral, but it suffers from limited variation – for most sample bank-years, the ratio is either zero or one.<sup>10</sup>

Our two key explanatory variables are the two proxies for regulatory capital constraints, franchise value and the regulatory Tier 1 ratio. In addition to these two variables, we include the log of total bank assets to control for size. Large banks may face different transaction costs, may embrace the new instruments earlier, may have different business models requiring different capital levels, and may have a different safety net protection. We also use in some specifications an indicator variable equal to one if the bank is internationally active, and zero otherwise. Large internationally active bank holding companies were initially encouraged and, after 2004, were restricted by regulators, to have a lower maximum TPS / core capital ratio than other banks (15% instead of 25%). The indicator variable is equal to one if a BHC has total assets larger than \$250 billion or if the Federal Reserve Statistical Release “Large Commercial Banks” shows that the main subsidiary bank of the BHC has more than \$10 billion in foreign assets.<sup>11</sup>

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<sup>10</sup> We set the TPS / total subordinated debt ratio to zero if both TPS and subordinated debt are equal to zero.

<sup>11</sup> Internationally active BHCs are defined as those with over \$250 billion in assets or \$10 billion in foreign exposure. There is, to the best of our knowledge, no publicly available list of these banks, because the Federal Financial Institutions Examination Council’s (FFIEC) country exposure report on foreign assets is not in the public domain. The Federal Reserve maintains a web page where it lists the largest US commercial banks and the fraction of domestic assets they hold, by quarter. These data are however for the depository bank subsidiaries and not for the bank holding companies. Hence, our procedure misses those BHC with less than \$250 billion in total assets in which the main subsidiary bank does not hold \$10 billion in foreign assets but the BHC does on a consolidated basis. Because there are only 10 or so internationally active banks each year, these missing internationally active BHC are unlikely to make a difference in the regressions.

In some specifications we control for additional bank characteristics that could influence the TPS / Tier 1 ratio. We include the deposits / assets ratio because banks with a stable funding structure could potentially depend less on TPS. We include the cash / assets ratio because banks with larger cash reserves should have a lower need to raise capital to fund new investments. Past profitability may also affect the decision to issue trust-preferred securities and potentially also impacts franchise value and regulatory capital. We therefore control for both return on assets and stock returns in some regression specifications.

One potential concern for our regression specification is that the TPS / Tier 1 ratio and our proxies for regulatory capital constraints are both driven by risk. We therefore include four additional variables that measure risk. We use a BHC's market beta to capture differences in systematic risk and we also control for the bank stock's idiosyncratic volatility. Beta is the regression coefficient from a regression of excess daily returns on a constant and the value-weighted CRSP index, and idiosyncratic volatility is the residual from this regression (aggregated to a monthly level). We also include the fraction of loans / assets and the loan concentration index of Berger and Bouwman (2013), which is a Herfindahl-like index measuring the concentration of the loan portfolio, to capture the riskiness of a bank's loan portfolio. We do not include a measure of regulatory risk assessment such as the risk-weighted assets, because one of our main variables of interest, the Tier 1 ratio, already includes risk-weighted assets in the denominator. However, if we do include risk-weighted assets as an independent variable, the results are unchanged.

The above variables control for some measurable risks, but the risk taking incentives of management, potentially unobservable, could affect both the decision to issue the new hybrid instrument as well as the regulatory capital a BHC holds. We control for the risk-taking incentives of bank managers by including director and officer aggregate stock ownership in the regressions. There is a widely held view in corporate finance that higher managerial ownership is valuable for shareholders because it aligns the interests of managers better with those of shareholders. Managerial incentives to take excessive risks should therefore be negatively related to the management team's ownership in their banks.

The tax deductibility of the interest paid on the subordinated debt underlying TPS is an attractive feature to banks, and the benefit increases in the amount of taxes paid. We therefore include a bank

holding company's state tax rate to examine whether taxes affect the TPS / Tier 1 ratio. A bank could issue TPS because it is reducing its Tier 1 capital through repurchases of equity. We include a repurchase indicator variable equal to one if the bank holding company repurchased stock in the same year it issued TPS, and zero otherwise. We also include the organic asset growth (excluding mergers) and the number of mergers in the current year as regression variables. As a bank grows, it requires a larger dollar amount of regulatory capital, which leads to issuance of common stock or TPS. Mergers that generate goodwill naturally deplete Tier 1 capital because goodwill is subtracted from the numerator when calculating Tier 1. Hence, issuing TPS provides a direct way to replenish Tier 1 capital that is lost to goodwill without having to issue new common equity. All variables are defined in the caption of Table 2.

We have two sets of results. Table 3 shows results from panel regressions, in which identification comes from both the cross-section and time-series. Table 4 shows results from bank-fixed effects regressions.

Panel A of Table 3, specifications (1) through (6) use TPS / Tier 1 as a dependent variable. Specifications (7) and (8) standardize TPS by total subordinated debt. Because there are a number of bank-firm-years with no TPS, all specifications estimate Tobit regressions with left-censoring at zero. In addition to left-censoring at zero, specifications (7) and (8) also right-censor the TPS / total subordinated debt variable at 1 since the ratio is bounded by 1. All regressions contain year-fixed effects and standard errors clustered by BHC. In addition, specifications (1) to (6) also cluster standard errors by year. Specification (4) includes as one of the main explanatory variables the Tier 1 ratio that excludes TPS in the numerator to reduce concerns about a mechanical relationship between the TPS / Tier 1 ratio and the lagged Tier 1 ratio.

As predicted by our hypotheses, Panel A of Table 3 shows that bank holding companies with more franchise value and higher Tier 1 capital hold less TPS, no matter whether we standardize by Tier 1 or by total subordinated debt. The parsimonious specifications (1) and (7), which only control for bank size, show statistically and economically meaningful effects. A one standard deviation increase in franchise value (0.073) is associated with a 2.6% decrease in the TPS / Tier 1 ratio and a 6.9% decrease in the TPS /

total subordinated debt ratio. A one standard deviation increase in the Tier 1 ratio (4.13%) is associated with a 5.8% decrease in the TPS / Tier 1 ratio and a 15.3% decrease in the TPS / total subordinated debt ratio. The economic and statistical magnitudes of the coefficients of franchise value and the Tier 1 ratio are stable across the different specifications. The more constrained a bank holding company is by regulatory capital, the more TPS it holds.

Regarding the control variables, the indicator variable for being a large international bank is significantly negative and economically large. Internationally active banks have about 11.5% less TPS / Tier 1 than other banks, which is consistent with the lower limit of 15% relative to 25% of total core capital for these banks. Larger banks have more TPS. Past stock returns have a positive association with both TPS ratios. Low accounting returns that decrease Tier 1 capital are positively associated with the TPS ratios. BHCs with more insider ownership have significantly more TPS. The tax rate is not a strong predictor of the TPS ratios. Concurrent organic asset growth and growth via mergers are strongly positively associated with the level of TPS (specification (3)).

Specifications (4) to (6) of Table 3, Panel A show additional results. In Column (4), we use the Tier 1 ratio that excludes TPS in the numerator instead of the regulatory Tier 1 ratio as the key independent variable to address the concern that the Tier 1 capital in year  $t$  is in the denominator of the dependent variable and, lagged by one year, in the numerator of the key independent variable. The results in Column (4) actually become stronger – the Tier 1 ratio less TPS is negatively and strongly significantly related to the TPS / Tier 1 ratio.

A well-established view is that TBTF incentives play a critical role in regulatory arbitrage. With this view, a TBTF bank does not bear all the costs of an increase in its risk and therefore has incentives to take on more risk, for instance, through TPS. This view implies that TBTF banks have higher incentives to issue TPS than other banks. Hence, it could be that our results are driven by TBTF banks. In Column (5), we repeat our analysis excluding all sample banks with more than \$50 billion in assets to address the concern that TBTF status could drive our results. The results of Column (5) are qualitatively and quantitatively similar to the results that include all sample banks, which is inconsistent with a unique role

of TBTF as a driver of regulatory arbitrage – at least for regulatory arbitrage implemented through TPS issuance. These results imply that all constrained banks have similar incentives to undertake regulatory arbitrage irrespective of their TBTF status.

In Column (6), we investigate the alternative hypothesis that managerial incentives to take excessive risk drive a bank's decision to use TPS. As discussed in the Introduction, one view is that banks take excessive risks because bank insiders have misaligned incentives. We would expect that bank insiders with less insider ownership would have greater incentives to take excessive risks because their interests are not well-aligned with shareholders' interests, and because the adverse consequences on their wealth of greater risk are smaller. Table 3 shows that managerial ownership is positively associated with the TPS / Tier 1 ratio. If managerial ownership is a good proxy for low managerial incentives to take risks, the result appears inconsistent with an argument that risk-taking incentives can explain TPS issuance. To further address this point, we also interact insider ownership with franchise value and the Tier 1 ratio in Column (6) of Table 3, Panel A. If managerial incentives played a large role in explaining both TPS issuance and low capital ratios, we would expect the coefficient of the interaction term of managerial ownership and franchise value / Tier 1 capital to be negative: in firms with low managerial ownership, the effect of a low Tier 1 ratio on TPS usage should be stronger. Column (6) shows that the coefficients on both interaction terms are statistically indistinguishable from zero.

In Panel B of Table 3, we re-estimate specifications (1), (2), (7), and (8) of Panel A, but substitute lagged franchise value and the lagged Tier 1 ratio with franchise value and a Tier 1 ratio that are lagged by five years. We do so to reduce concerns that TPS / Tier 1 and our proxies for constrained banks may be jointly determined by some unobserved time-varying characteristics. Five-year lagged franchise value and the five-year lagged Tier 1 ratio continue to have negative and statistically and economically significant coefficients. The results help alleviate concerns that the TPS / Tier 1 ratio, Tier 1 ratio, and franchise value are jointly driven by time-varying unobserved characteristics, because these characteristics would now have to simultaneously explain franchise value and Tier 1 capital five years ago as well as current TPS usage.

In unreported regressions, we also estimate a Cox proportional hazard model examining the determinants of a bank's initial TPS issuance. The results of these hazard regressions are quantitatively and qualitatively similar to the results reported in Table 3. It is reassuring that the two models yield similar results, although one models the level of TPS and the other models the time to first issuance and ignores further issuances.

We next turn to the question of whether time-invariant unobserved bank characteristics can explain our results. Table 4 reports results from BHC-fixed effects regressions. In these regressions, we do not include the internationally active indicator variable, because there is virtually no time-series variation for this variable. We also do not include the performance variables. With bank fixed effects, the change in franchise value is mainly driven by changes in market value of equity. Including both stock returns and franchise value in the regressions makes the interpretation of the coefficients more complicated. The same caveat holds for accounting returns which could drive, in the time-series, much of the change in Tier 1 capital via retained earnings. In the regressions in Table 4, we can gauge the economic magnitude of the estimated coefficients by multiplying them by the time-series standard deviation of franchise value (0.047) or the Tier 1 ratio (2%). For example, in the most parsimonious specification, Column (1), which includes both franchise value and the Tier 1 ratio, a one (within) standard deviation increase in franchise value (Tier 1 ratio) is associated with a decrease of  $0.047 \times 0.088 = 0.41\%$  ( $2 \times 0.003 = 0.6\%$ ) in the TPS / Tier 1 ratio. Relative to the median TPS / Tier 1 ratio of 0.074, this is a 5.6% (8.1%) decrease. The coefficients on franchise value and the Tier 1 ratio are qualitatively and quantitatively similar or even stronger in all regressions that include different sets of control variables. Column (3) shows results in which we replace the Tier 1 ratio by the common equity Tier 1 ratio. The result becomes stronger and shows that banks with less common equity have higher levels of TPS in their Tier 1 capital.

In the firm-fixed effects regressions, several bank characteristics have strong predictive power for the TPS / Tier 1 ratio. If a bank becomes larger, its TPS / Tier 1 ratio significantly increases. If the deposit base of banks shrinks, their TPS / Tier 1 ratio significantly increases. When banks have rapid internal growth or external growth via mergers, which makes them more likely to be constrained by capital

requirements, they increase their TPS / Tier 1 ratios. If idiosyncratic volatility increases, so does the TPS / Tier 1 ratio. These results corroborate our hypothesis that banks with riskier business models that are more likely to be constrained by capital requirements will use TPS more heavily.

### **C. Distinction between Pecking Order and Regulatory Constraints**

An important additional question is whether we can distinguish our hypothesis – that banks constrained by capital requirements issue TPS – from the prediction of a simple pecking order theory. Under the pecking order, management would, conditional on the need to raise Tier 1 capital, always issue the least information-sensitive form of Tier 1 capital, which is TPS. Fama and French (2005) examine firms that issue or retire equity and show that equity issuance decisions often violate the pecking order because equity issuers are not typically under duress, have moderate leverage, and have financing surpluses. Frank and Goyal (2003) argue that more opaque firms are more likely to have asymmetric information problems and should as a consequence be more likely to follow the pecking order. We follow the insights of these two papers and examine the characteristics of firms that issue equity vs. TPS, conditional on the decision to issue either.

In unreported regressions, we do not find evidence that bank holding companies that are more difficult to understand by analysts (and thus are more opaque) issue TPS more frequently, which is inconsistent with the pecking order. We also find strong and consistent evidence that banks are more likely to issue equity instead of TPS if they have higher Tier 1 ratios. The finding is similar to Fama and French (2005) and shows that BHCs with more capital choose to issue equity. Therefore, equity is not issued as a last resort, violating the pecking order. Our finding shows that banks already constrained by capital requirements issue a hybrid security instead of equity to lever up and be riskier, which could be consistent with a risk-shifting explanation after debt issuance as in Jensen and Meckling (1976).

#### **D. Regulatory Arbitrage and Asset Backed Commercial Paper**

Our second hypothesis predicts that a constrained bank will use all available opportunities to optimize its level of risk. We thus relate TPS-based regulatory arbitrage to another type of regulatory arbitrage. Acharya, Schnabl, and Suarez (2013) show that banks used asset backed commercial paper (ABCP) conduits as a form of regulatory arbitrage during the 2000s. These conduits allowed banks to move assets off their balance sheets, which improved their Tier 1 ratios by reducing risk-weighted assets (the denominator of the Tier 1 ratio). However, banks generally retained the risk associated with these assets by providing liquidity or credit guarantees should the underlying assets fail to roll over and/or default. Similar to our results for trust preferred securities, they find that banks constrained by capital requirements had more conduit exposure than other banks.

One key difference between ABCP usage and TPS usage is that ABCP usage was available to only a small fraction of the largest banks since regulatory arbitrage via ABCP entailed high fixed costs. By contrast, TPS issuance was available to far more banks, and after the invention of TPS CDOs to virtually all banks. Actual ABCP and TPS usage rates help illustrate this difference: in our sample, 25 of 857 banks used ABCP (about 3%) while 518 of 857 banks used TPS (over 60%). Thus, the following analysis focuses on whether banks that use ABCP also use TPS rather than the reverse comparison, due to the low participation rates in ABCP.

We examine whether the same banks that used ABCP for regulatory arbitrage were also significant users of TPS, as predicted by our second hypothesis. With that hypothesis, constrained banks are expected to use all tools at their disposal that enable them to become riskier. While most banks using TPS were typically not large enough to justify the costs of implementing an ABCP program, the banks that had such programs had no obstacle to using TPS. In Appendix C, we list the names of banks with conduit exposure at any point during the sample period, based on four items reported on Form FR Y-9C since 2001.<sup>12</sup> Appendix C also provides details on whether banks have TPS outstanding during the period, and the

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<sup>12</sup> Item BHCKB806 reports the maximum contractual credit exposure remaining for conduits sponsored by the bank or bank affiliate, and BHCKB807 reports the same information for conduits sponsored by other institutions. BHCKB808 reports the unused facilities for liquidity protection for conduits sponsored by the bank or affiliate, and BHCKB809 reports unused liquidity facilities for conduits sponsored by other institutions.

average size of the bank's assets and ABCP exposure, sorted in order of total sponsored ABCP exposure.<sup>13</sup> As expected, banks that have sponsored ABCP also have TPS.

Our results provide strong evidence that the same banks that use ABCP to decrease the denominator of their Tier 1 ratio also use TPS to increase the numerator of their Tier 1 ratio. Both activities are a form of regulatory arbitrage that allow constrained banks to move closer to their desired level of risk without a reduction in Tier 1 capital.

### **E. Distance to Default and TPS Usage**

We now analyze our third hypothesis, which posits that banks with TPS are riskier. We examine whether TPS usage is correlated with a common proxy for bank risk from 1996 to 2011. Our measure of risk is the bank's z-score, a distance-to-default measure. We follow Boyd, Graham, and Hewitt (1993) and Laeven and Levine (2009) and calculate the z-score as the ratio of the return on assets plus the capital-asset ratio divided by the standard deviation of the return on assets, where capital is the market value of equity. The standard deviation of ROA is calculated using six years of quarterly data. A higher z-score indicates that the bank is further away from default. The mean and median z-scores ( $\log(z\text{-score})$ ) of our sample banks are 17.84 and 18.35 (2.75 and 2.93), which are comparable to the means reported in Laeven and Levine (2009) for the U.S. Table 5, Columns (1) to (5) reports regressions of the log of z-score on our measures of TPS exposure. Columns (1) and (3) use as the key explanatory variable the TPS / Tier 1 ratio, Columns (2) and (4) use TPS / total subordinated debt, and Column (5) lags the TPS / Tier 1 variable 5 years to alleviate endogeneity concerns. We do not report regressions in which we lag the TPS / subordinated debt ratio by five years, because there is little time-series variation in this variable. The table shows that banks with more TPS / Tier 1 had a significantly lower distance to default. A one standard deviation increase in TPS / Tier 1 (0.117) in Column (3) is associated with a decrease in the log

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<sup>13</sup> These data differ from Acharya, Schnabl, and Suarez (2013) for two reasons. First, form FR Y-9C data provide detail on the guarantees on both sponsored and other conduits for our sample but not theirs as theirs is not limited to U.S. banks. Second, we list all banks with conduit exposure, not just those with assets greater than \$50 billion at the end of 2006.

z-score of 0.042. The result in Column (5), where we lag the TPS / Tier 1 variable by five years, is economically and statistically of similar magnitude as in Column (3).

The TPS / total subordinated debt measure is statistically significant in Column (2), but just misses statistical significance in Column (4). As for the other explanatory variables, we find that better capitalized banks, banks with better returns in the prior year, banks with lower idiosyncratic volatility, banks with lower book-to-market ratios, banks with a less correlated loan portfolio, and banks with lower asset growth have a larger distant to default.

One concern about the above results with respect to the TPS / Tier 1 ratio is that the z-score goes down when TPS are issued to retire equity. While this means that banks became riskier, it establishes a somewhat mechanical relationship between z-score and TPS / Tier 1. In Column (6), we test whether there continues to exist a negative relation between TPS / Tier 1 once we add back the value of TPS-financed repurchased equity. We create a modified z-score as follows. In each year in which a firm repurchased shares and issued TPS, we add back the value of the repurchased shares to the capital ratio in the numerator of the z-score and calculate a modified z-score as  $(ROA + (\text{market value of equity} + \text{market value of TPS used to repurchase shares}) / \text{assets}) / \text{sigma}(ROA)$ . Column (6) shows that the TPS / Tier 1 ratio is still economically and statistically negative and significant in the modified z-score regressions.

## **F. TPS and Bank Risk during the Recent Crisis**

Our fourth hypothesis is that banks with a higher ratio of TPS / Tier 1 or TPS / subordinated debt are riskier, so that we would expect them to have been affected more strongly by the financial crisis.

We start the section by providing visual evidence that banks with more TPS are riskier during the crisis. Figure 4 shows the evolution of credit default swap (CDS) spreads, buy-and-hold stock returns, and accounting return on equity and accounting return on assets for two groups of banks. The first group has an above median TPS / Tier 1 ratio (blue dotted line in all subplots), and the second group has a below median TPS / Tier 1 ratio (solid red line in all subplots). The CDS subplot uses data on all available names from our sample (20 observations), the other three plots use the full sample. The evidence from all

four subplots confirms our hypothesis. CDS spreads are low for both groups of banks during 2006 and 2007, but start to widen during the financial crisis. During the height of the crisis, the blue dotted line is always above the red solid line. CDS spreads of BHCs with more TPS are larger than the spreads of BHCs with little TPS exposure, i.e. BHCs with more TPS are viewed as riskier by the market. The top right subplot shows cumulative buy-and-hold returns for the two portfolios of BHCs. Again, there is little difference in the performance of the high TPS and low TPS portfolios in 2006 and 2007. In 2008, the differences between the two portfolios become apparent, and the high TPS portfolio starts to significantly underperform. The bottom left subplot shows that the high TPS portfolio has a worse return on equity than the low TPS portfolio during the financial crisis, but not before or after (we plot the average return on equity). The bottom right figure shows the return on assets for the high TPS and low TPS portfolio. The return on assets for the high TPS BHCs is lower than return on assets for the low TPS BHCs throughout the sample period.<sup>14</sup>

Overall, Figure 4 demonstrates that banks with more TPS were riskier and performed worse during the financial crisis compared to their low-TPS counterparts. We now turn to a more formal analysis that allows us to control for other variables that may affect the relationship.

### **F.1 TARP, Fed Facilities, and TPS Usage**

One measure of the impact of the crisis on a bank is whether it received financial assistance from the U.S. government during the crisis. Government assistance came in several different forms. The best known program is funding from the Troubled Asset Relief Program (TARP). The TARP was authorized by the U.S. Congress on October 3, 2008 to strengthen the financial sector. Our focus is on the Capital

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<sup>14</sup> The ROA and ROE evidence from Figure 4 holds in a more formal regression analysis that we omit for brevity. A regression of ROA on bank characteristics, TPS / Tier 1, and TPS / Tier 1 interacted with a crisis indicator variable between 1996 and 2008 suggests that the ROA is lower for banks with more TPS, but that there is no incremental effect during the financial crisis. A regression of ROE on bank characteristics, TPS / Tier 1, and TPS / Tier 1 interacted with a crisis indicator variable between 1996 and 2008 shows that the ROE of banks with more TPS/Tier 1 is not different from the ROE of banks with little TPS/Tier 1 during normal times, but that the ROE of banks with more TPS is strongly and economically significantly lower during the crisis period. The fact that the normal-time ROEs are the same for both categories of firms is consistent with an industry equilibrium in compensation tied to ROE.

Purchase Program (CPP), the direct government purchase of newly issued preferred stock of BHCs. Eligible institutions were permitted to sell equity to the Treasury in amounts of 1 percent to 3 percent of the risk-weighted assets. The Treasury spent about \$205 billion on the CPP from the start of their plan in October 2008 to the final distribution in December 2009. Most financial institutions participating in the CPP paid a five percent dividend on preferred shares for the first five years and a nine percent rate thereafter. In addition, Treasury received warrants to purchase common shares or other securities from the banks at the time of the CPP investment. We also add banks that received government support via the Term Auction Facility Program (TAF), the Primary Dealer Credit Facility (PDCF) Program, or the Term Securities Lending Facility (TSLF).<sup>15</sup> In an additional test, we also add banks that borrowed from the Federal Home Loan Bank System (FHLB). The FHLB provides funds via secured loans and mortgage purchase programs.

Of the 383 banks in our sample at the start of the crisis in July 2007, 191 received funding from at least one of the four government programs and facilities. The majority of our sample banks (323 out of 383) borrowed from the FHLB post-crisis. We drop six of these banks that were among the initial recipients of CPP since these banks were strongly encouraged to participate in the program by Secretary of the Treasury Paulson.<sup>16</sup> Results do not change if we include these banks. Since our hypotheses predict that banks with higher levels of TPS / Tier 1 are more likely to suffer during a financial crisis, we predict that these banks will be more likely to use the government programs. Columns 1 through 5 of Table 6 presents results of a probit regression in which the dependent variable is set to 1 if the bank receives CPP, TAF, PDCF, or TSLF funding between October 2008 and December 2009, and zero otherwise. Columns

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<sup>15</sup> See <http://www.treasury.gov/initiatives/financial-stability/TARP-Programs/bank-investment-programs/cap/Pages/overview.aspx> for more details on TARP, <http://www.federalreserve.gov/monetarypolicy/taf.htm> for details on TAF, [http://www.federalreserve.gov/newsevents/reform\\_pdcf.htm](http://www.federalreserve.gov/newsevents/reform_pdcf.htm) for details on PDCF, and <http://www.federalreserve.gov/monetarypolicy/tslf.htm> for details on the TSLF.

<sup>16</sup> These banks include Bank of America, Bank of New York, Citibank, JP Morgan, State Street, and Wells Fargo. On October 13, 2008, U.S. Treasury secretary Paulson requested these banks accept TARP money, stating in a memo to the banks, “We don't believe it is tenable to opt out because doing so would leave you vulnerable and exposed. If a capital infusion is not appealing, you should be aware your regulator will require it in any circumstance.” Three investment banks – Goldman Sachs, Merrill Lynch, and Morgan Stanley – also received this initial request, but are not in the sample as of 2007 since they were not bank holding companies at the time. For more detail, see <http://uk.reuters.com/article/2009/05/14/us-financial-banks-meeting-idUKTRE54DONH20090514>.

(6) and (7) of Table 6 present results in which the dependent variable is equal to one if the bank received CPP, TAF, PDCF, or TSLF funding or if it borrowed via the FHLB. The independent variables are measured pre-crisis, as of June 2007. The main variables of interest are TPS / Tier 1 and TPS / total subordinated debt. Column (5) includes a specification where we lag TPS / Tier 1 by 5 years to alleviate endogeneity concerns. The regressions also include a set of control variables used in prior literature (see, for example, Duchin and Sosyura (2012)). These variables include either the Tier 1 ratio or the regulatory leverage ratio, which is Tier 1 / total assets. Since these variables have a correlation coefficient of 0.75, they are included in separate regressions. Regressions also include the log of total assets to control for size, idiosyncratic volatility, beta, and the loan concentration index to control for risk, a bank's book to market ratio, prior year stock performance and ROA, and the prior three-year mean of asset growth.<sup>17</sup>

The results presented in Table 6 provide strong evidence that the banks that use more TPS are more likely to use the CPP program. The effects are economically large and statistically significant. In Column (2), a one standard deviation increase in TPS / Tier 1 (0.117) is associated with a 7.6% ( $0.117 \times 0.650 = 0.076$ ) higher probability of receiving funds from government programs. Banks that used more TPS were more likely to need government assistance during the financial crisis, consistent with our hypothesis that these banks are riskier. The Tier 1 capital ratio is strongly negatively related to government assistance, and the regulatory leverage ratio is weakly negatively related to government assistance, implying that better-capitalized banks are less likely to participate in these programs. There is some evidence that banks with lower systematic risk were more likely to participate in one of the programs. The other control variables are mostly insignificant. In column (4), we standardize TPS by total subordinated debt instead of the Tier 1 ratio. We find an economically important, but statistically weaker effect. A one standard deviation increase in TPS / total subordinated debt (0.466) is associated with a 5.5% higher probability of getting government assistance ( $0.119 \times 0.466 = 0.055$ ).

In column (5), we seek to reduce endogeneity concerns. We lag the TPS / Tier 1 ratio by five years so that we measure it in 2002. We continue to find an economically and statistically important relationship

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<sup>17</sup> Results are robust to the inclusion of an indicator variable set to one if the bank is internationally active to control for different TPS requirements for those banks.

between TPS and crisis federal assistance. BHCs with more TPS in 2002 have a much higher probability of receiving government assistance during the recent crisis.

Finally, in columns (6) and (7), we are more inclusive in the definition of government assistance and also include bank holding companies that borrowed from one of the government sponsored partner institutions of the Federal Home Bank Lending System. Our results continue to hold. Both the TPS / Tier 1 ratio and the TPS / total subordinated debt ratio strongly and positively predict government assistance. The increase in the probability of receiving assistance for a one standard deviation increase in the ratios is 4.3% and 3.4%, respectively.

In untabulated regressions, we only use the receipt of TARP funds as well as the actual dollar amount of CPP funding as a fraction of Tier 1 capital instead of the more inclusive indicator variable. The results are statistically significant and economically large. For example, in a regression that mimics Column (2) of Table 6, we find that a one standard deviation increase in TPS / Tier 1 increases the probability of receiving CPP funding by 9.8% and the ratio of CPP funding / Tier 1 by 2.6%, or 19% relative to the mean CPP funding / Tier 1 ratio of 0.135.

## **F.2. Crisis Performance and TPS Usage**

Next, we evaluate the relation between bank performance during the financial crisis and TPS usage. Our hypothesis predicts that banks with high levels of TPS should perform worse during the crisis. We evaluate both stock price performance in Table 7 and operating performance in Table 8 (return on assets and return on equity before income taxes). We consider the performance of BHCs from July 1, 2007 to December 31, 2008 to correspond to the returns during the crisis. These results are robust to alternative crisis ending dates of March 31, June 30, or September 30, 2009. As in Table 6, all explanatory variables are measured prior to the crisis as of June 30, 2007.

Table 7 shows results for stock market performance for the period from July 2007 to December 2008. In Column (1), which includes just the TPS / Tier 1 ratio, the coefficient on TPS / Tier 1 is negative and strongly statistically significant. Column (2) includes TPS / Total subordinated debt. The coefficient is

negative, but just misses significance levels, with a p-value of 0.13. Returning to the regressions that use TPS / Tier 1 as the key independent variable, its coefficient loses significance in Column (3) when we include the Tier 1 ratio and a number of other controls. However, in Column (4), which includes regulatory leverage as a control variable, the coefficient on TPS / Tier 1 is negative and strongly statistically significant. In terms of economic magnitude, a one standard deviation increase in the TPS / Tier 1 ratio (0.106) decreases annualized crisis returns by 2.9%. Relative to the sample BHC's annualized crisis return of -25.2%, this corresponds to an 11.4% lower return.

Columns (5) and (6) include a variable for past due real estate loans held by banks scaled by total loans before the crisis, as well as an interaction of this variable with the TPS / Tier 1 ratio. We wish to understand whether TPS usage alone or perhaps a combination of TPS usage and choosing a riskier lending portfolio is associated with worse stock performance during the crisis. To construct this variable, we collect data on past due real estate loans.<sup>18</sup> The variable has a mean of 0.014 and a median of 0.009, and ranges from 0 to 0.232. Not surprisingly given our predictions, banks with high TPS usage (above median TPS / Tier 1) have more past due loans both as of June 2007 and throughout our sample period (the difference is large and significant for the sample period, but not significant for June 2007). Columns (5) and (6) indicate that banks with risky real estate assets and high levels of TPS / Tier 1 perform significantly worse than their counterparts, suggesting that banks with TPS do not simply have lower returns because they have more leverage but that they also made a riskier pre-crisis asset choice. The economic magnitude of this effect is also significant; a one standard deviation change in the interaction

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<sup>18</sup> The specific data series from the bank holding company reports include real estate loans that are past due, which fall into three classifications: 30-89 days past due and still accruing interest, over 90 days past due and still accruing interest, and past due but no longer accruing interest. Included are the following categories of real estate: Loans secured by real estate (in domestic offices): construction and land development, and other land, Loans secured by real estate (in domestic offices): secured by farmland, Loans secured by real estate (in domestic offices): secured by multifamily (5 or more) residential properties, Loans secured by real estate (in domestic offices): secured by nonfarm nonresidential properties, Loans secured by 1-4 family residential properties: revolving, open-end loans secured by 1-4 family residential properties and extended under lines of credit, Closed-end loans secured by 1-4 family residential properties: secured by first liens, Closed-end loans secured by 1-4 family residential properties: secured by junior liens, Closed-end loans secured by 1-4 family residential properties: secured by first liens, 1-4 family residential construction loans, Other construction loans and all land development and other land loans. We sum these variables and scale by total loans for a variable called *Past due real estate loans/total loans*. This variable is winsorized at the 1% and 99% tails. Results do not change if we instead scale by total assets.

variable leads to a 5.1% (4.2%) decrease in stock return in Column 5 (6). Relative to the sample BHC's annualized crisis return of -25.2%, this corresponds to a 20.2% (16.4%) lower return.

Finally, in Column (7) we report regression results that attempt to alleviate endogeneity concerns by lagging the TPS / Tier 1 ratio by five years. The coefficient on the five year lagged TPS / Tier 1 is negative and statistically significant.

The control variables in the stock return regressions have the expected signs and are consistent with recent findings. Small banks and banks with high Tier 1 ratios performed better during the crisis. Banks with high idiosyncratic volatility, high book to market ratios, more concentrated loan portfolios, and high growth over the past three years did worse during the crisis. Finally, there is some evidence that bank holding companies with higher betas did better during the crisis.<sup>19</sup>

Table 8 shows regression results for the return on assets and return equity for the period from July 2007 to December 2008. For the ROA regressions in Columns (1) to (5), the coefficient on TPS / Tier 1 is negative and statistically significant regardless of the control variables used and regardless of whether we use the June 2007 or the 5-year lagged TPS / Tier 1 ratio. As with the stock performance regressions, the economic magnitude is meaningful. The average BHC has an annualized ROA of 0.86%. A one standard deviation increase in TPS / Tier 1 decreases ROA by 0.29% ( $0.106 \times (-0.028)$ ) in Column (3) (with the Tier 1 ratio as a control variable) and 0.33% in Column (4) (which includes the leverage ratio as a control variable). Relative to the sample mean, these correspond to 34% and 39% lower returns, respectively. Note that we used the return on assets before taxes in the regressions of Columns (1) to (5) so that there should not be a mechanical relation between increases in TPS and the return on assets (due to leverage, via a tax shield of debt). The regression in Column (2) uses as the key independent variable TPS / Total subordinated debt, which has a negative and significant coefficient, consistent with the results for TPS / Tier 1. Columns (6) through (10) show the results for ROE. We again consistently find that the return on equity is lower for bank holding companies with more TPS / Tier 1. The economic magnitude is large. A one standard deviation increase in the TPS / Tier 1 ratio (0.106) decreases the return on equity by 6.9%

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<sup>19</sup> This finding is consistent with Fahlenbrach, Prilmeier, and Stulz (2012). See their paper for a potential explanation of this somewhat surprising finding.

( $0.106 \times (-0.652)$ ). The average BHC has an annualized ROE of 27.8%. Relative to the sample mean, the decrease corresponds to a 25% lower return. The results are robust, no matter whether we include the Tier 1 ratio or the total leverage ratio as a control variable. Finally, the regression in Column (7) uses as the key independent variable TPS / Total subordinated debt, which has a negative and significant coefficient, consistent with the results for TPS / Tier 1. A one standard deviation increase in TPS / subordinated debt (0.40) decreases the return on equity by 7.7% ( $0.40 \times (-0.193)$ ).

Turning to the control variables for both the ROA and ROE regressions, we find that bank holding companies that are larger, have higher book-to-market ratios, higher growth over the past three years, and more concentrated loan portfolios had worse performance during the crisis.

## 5. Conclusion

Our paper provides an answer for why some banks engage in regulatory arbitrage and others do not. Our conjecture is that banks have different optimal levels of risk depending on their franchise values. Banks with high franchise values find it optimal to have low levels of risk and high levels of capital. These banks are unconstrained by capital requirements. In contrast, banks with low franchise values find it optimal to have high levels of risk and low levels of capital. Such banks are constrained by capital requirements. Constrained banks take actions to relax these constraints when possible. Therefore, we predict that constrained banks will use regulatory arbitrage, such as issuing TPS. TPS allows constrained banks to satisfy capital requirements with more risk than banks that do not issue TPS. Effectively, a bank with TPS in its regulatory capital is more levered than a bank that has the same amount of regulatory capital comprised solely of common equity. Since TPS are a combination of equity and debt, replacing equity with TPS amounts to an increase in the bank's debt.

We show that banks that use trust preferred securities have lower franchise values and Tier 1 capital ratios. Consistent with our hypotheses, we also show that banks that use TPS are more likely to engage in other forms of regulatory arbitrage such as using ABCP conduits. We expect banks that issue more TPS to be riskier than other banks, and we find that banks with more TPS have a smaller distance-to-default

during our sample period. We also expect riskier banks to have been more fragile during the financial crisis and show that, everything else equal, a bank that had more TPS in its capital structure was more likely to receive TARP funding and assistance from other government emergency programs, and had worse stock and operating performance during the 2007 crisis.

Because our study focuses on the use of TPS by banks, it considers a form of regulatory arbitrage that is available to almost all banks in contrast to other forms of regulatory arbitrage considered in the literature that are typically mostly available to the very largest banks. Consequently, we can investigate the importance of TBTF as a determinant of regulatory arbitrage. We find that the determinants of TPS use by banks that would not be expected to benefit from TBTF are the same as those of the very largest banks. We view this evidence as supportive of our explanation for the use of regulatory arbitrage. Similarly, we find that banks where interests of managers are poorly aligned with those of shareholders and where managers have little skin in the game actually hold less TPS. This evidence suggests that misaligned incentives are not the main driver of regulatory arbitrage.

Given our evidence, the best defense against regulatory arbitrage would seem to be franchise values that lead banks to choose risk levels such that they are not constrained by regulatory capital requirements. Our evidence suggests that the existence of a less regulated shadow banking sector that competes with banks reduces their franchise value and hence leads to even more regulatory arbitrage.

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## Appendix A: Description of Tier 1 Capital

The following description of Tier 1 capital is based on the Bank Holding Company Act, Section 6000 FDIC Law.<sup>20</sup>

Tier 1 capital is defined as the sum of core capital elements less any amounts of goodwill, other intangible assets (except for certain mortgage servicing rights), credit-enhancing interest-only strips receivables, deferred tax assets, and nonfinancial equity investments. Core capital elements include common stockholders' equity, qualifying noncumulative perpetual preferred stock, senior perpetual preferred stock issued under TARP (for 2008 forward), minority interest related to qualifying common or noncumulative perpetual preferred stock directly issued by a consolidated U.S. depository institution or foreign bank subsidiary (Class A minority interest), and restricted core capital elements. Restricted core capital elements include qualifying cumulative perpetual preferred stock, minority interest related to qualifying cumulative perpetual preferred stock directly issued by a consolidated U.S. depository institution or foreign bank subsidiary (Class B minority interest) (effective March 31, 2011), minority interest related to qualifying common stockholders' equity or perpetual preferred stock issued by a consolidated subsidiary that is neither a U.S. depository institution nor a foreign bank (Class C minority interest) (effective March 31, 2011) and qualifying trust preferred securities.<sup>21</sup>

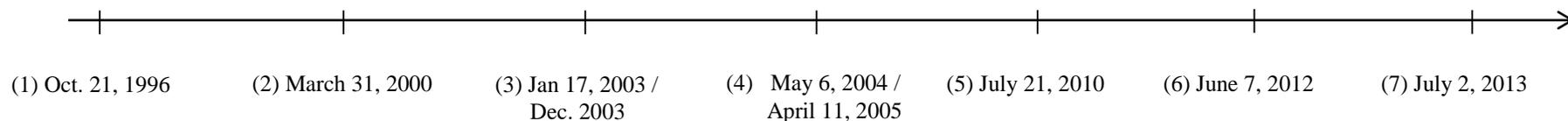
Effective March 31, 2011, the aggregate amount of restricted core capital elements that may be included in the Tier 1 capital of a banking organization must not exceed 25% (15% for internationally active bank holding companies) of the sum of all core capital elements, including restricted core capital elements, net of goodwill less any associated deferred tax liability. Prior to March 31, 2011, the aggregate amount of qualifying cumulative perpetual preferred stock (including related surplus) and qualifying trust preferred securities that a banking organization may include in Tier 1 capital is limited to 25% (15% for internationally active bank holding companies) of the sum of the following core capital elements: qualifying common stockholders' equity, qualifying noncumulative and cumulative perpetual preferred stock (including related surplus), qualifying minority interest in the equity accounts of consolidated subsidiaries, and qualifying trust preferred securities.

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<sup>20</sup> <http://www.fdic.gov/regulations/laws/rules/6000-1900.html>.

<sup>21</sup> Prior to the passage of FASB 46 in 2003, minority interest was not categorized into Classes A, B, and C, and TPS were classified as minority interest. There was also no specific limit on how much of a bank's Tier 1 capital could be comprised of minority interest, with the exception of TPS, which were limited to 25% of core capital. The definition of core capital was also slightly different prior to FASB 46, and included common stockholders' equity, qualifying noncumulative perpetual preferred stock including related surplus, qualifying cumulative perpetual preferred stock including related surplus (up to a 25% of core capital limit), and minority interest in the equity accounts of consolidated subsidiaries. The concept of "restricted securities" was introduced after FASB 46.

## Appendix B: Changes to the TPS Market through Time

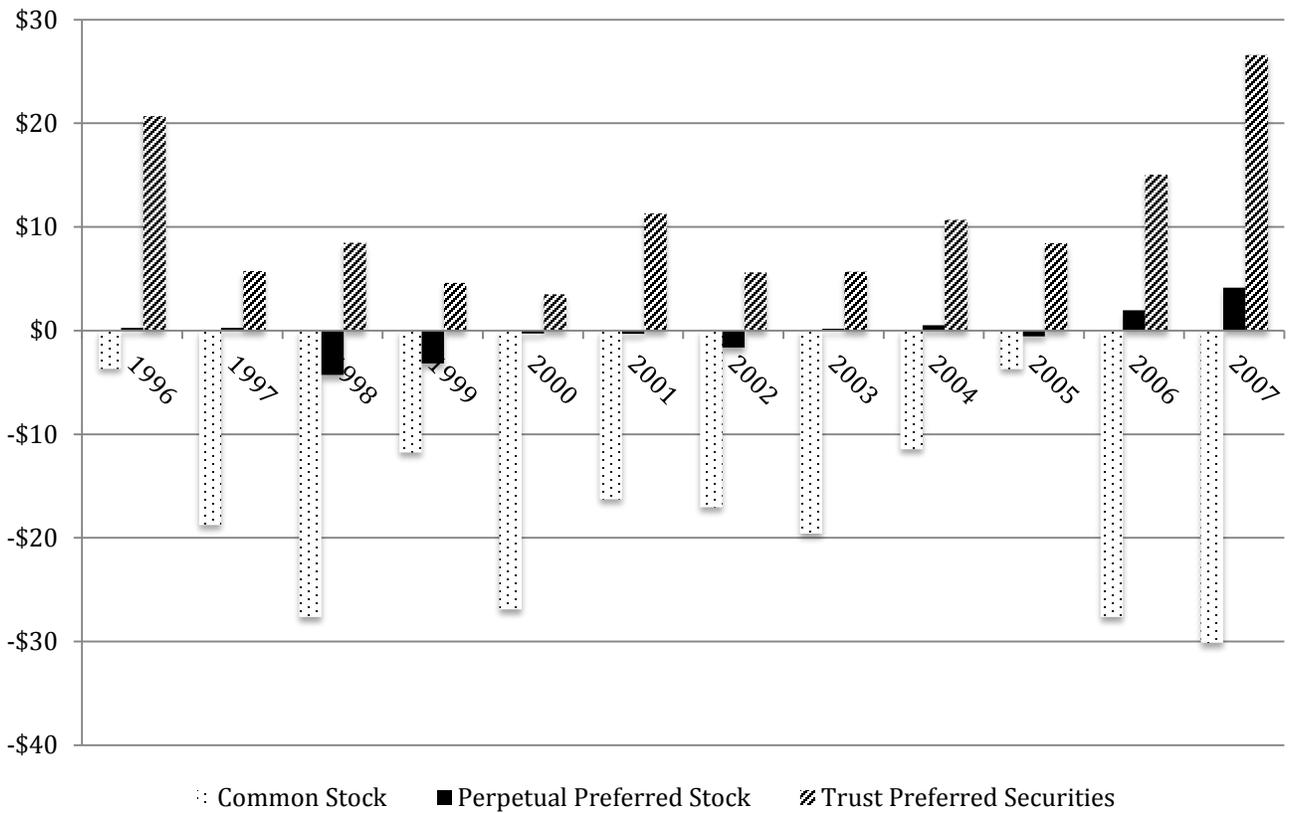


- (1) Board of Governors of the Federal Reserve System (FRB) announces that bank holding companies may include trust preferred securities up to 25% of core capital in Tier 1 regulatory capital.
- (2) Salomon Smith Barney issues the first TPS collateralized debt obligation, allowing small BHCs to issue TPS through a pooled structure (see Cordell, Hopkins, and Huang (2011) for more information).
- (3) FASB changes the accounting treatment of the special purpose entity (SPE) underlying TPS in 2003 (initial ruling on Jan 17, final ruling in December). Until 2003, the SPE has been consolidated at the BHC level and the trust preferred securities issued by the SPE have been classified as a minority interest in the equity accounts of consolidated subsidiaries. Under the new rules, the SPEs must be deconsolidated from their BHC sponsors' financial statements. Because the initial Tier 1 treatment of TPS hinged on the securities being classified as minority interest, the new FASB rule caused uncertainty as to how the FRB would treat these instruments for regulatory capital purposes.
- (4) The FRB resolves the uncertainty by proposing new regulations allowing TPS to maintain their Tier 1 status (initial Notice of Proposed Rulemaking (NOPR) / final ruling).
- (5) The Dodd-Frank Act is signed into law. The Collins amendment to Dodd-Frank states that TPS issued after May 19, 2010 (September 12, 2010 for BHCs with below \$15 billion in assets), are not eligible as Tier 1 capital. In addition, BHCs with over \$15 billion in assets must phase out TPS from Tier 1 over a three-year period beginning in January 2013.
- (6) The FRB reverses the Collins Amendment's exemption for banks with below \$15 billion of assets by issuing a NOPR requiring BHCs with assets between \$500 million and \$15 billion to phase out TPS from Tier 1 capital starting in January 2013, albeit over a longer 10-year period.
- (7) The FRB issues the final ruling which partially reverses the June 7, 2012 NOPR, and allows bank holding companies with total consolidated assets of less than \$15 billion on December 31, 2009, to permanently grandfather as a component of Tier 1 capital trust preferred securities that were issued prior to May 19, 2010. The FRB cites the limited access of these banking organizations to the capital markets as the reason for including this grandfathering provision.

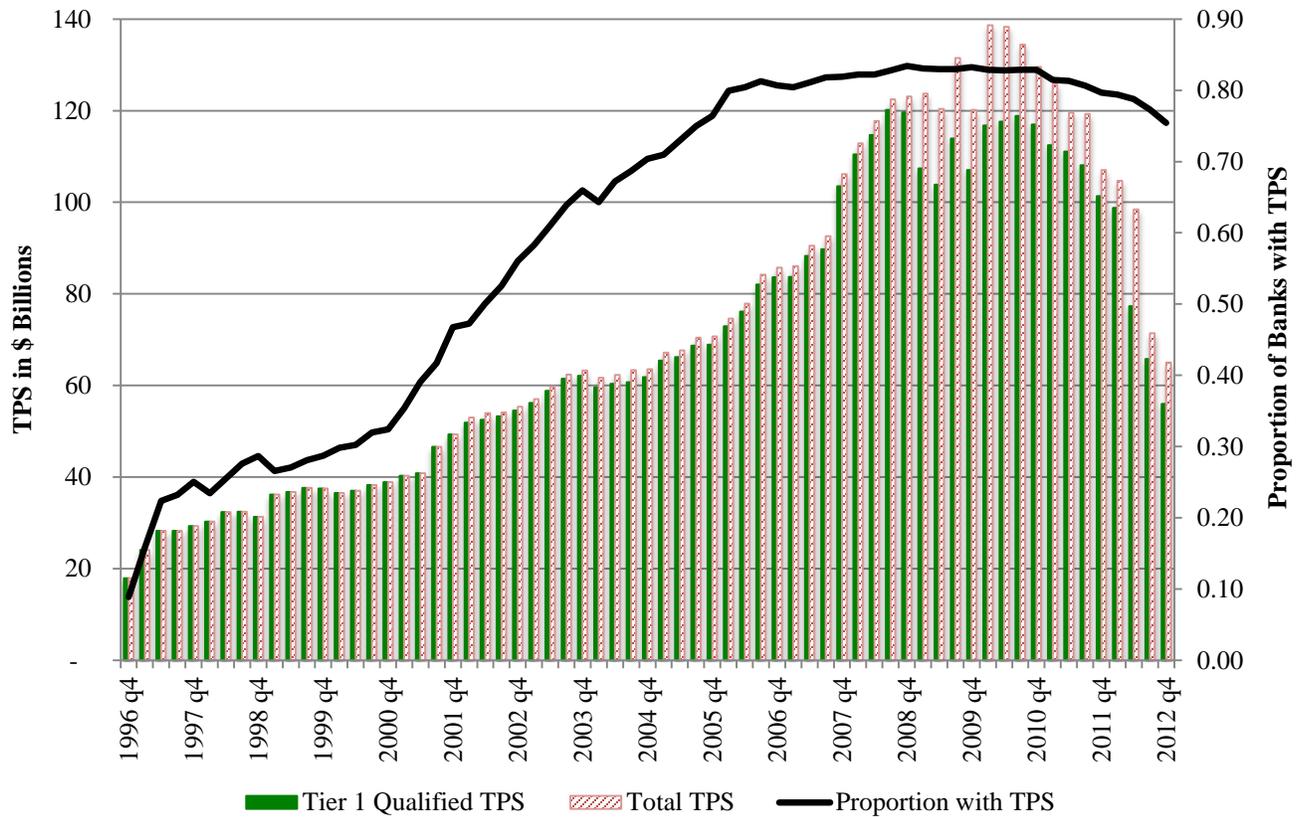
**Appendix C:  
List of Banks with Conduit Exposure**

The table below lists all sample BHCs that had exposure to asset-backed commercial paper sometimes during the period 2001-2012. The data are derived from four items reported on Form FR Y-9C. Item BHCKB806 reports the maximum contractual credit exposure remaining for conduits sponsored by the bank or bank affiliate, and BHCKB807 reports the same information for conduits sponsored by other institutions. BHCKB808 reports the unused facilities for liquidity protection for conduits sponsored by the bank or affiliate, and BHCKB809 reports unused liquidity facilities for conduits sponsored by other institutions. The reported numbers are time-series averages by BHC.

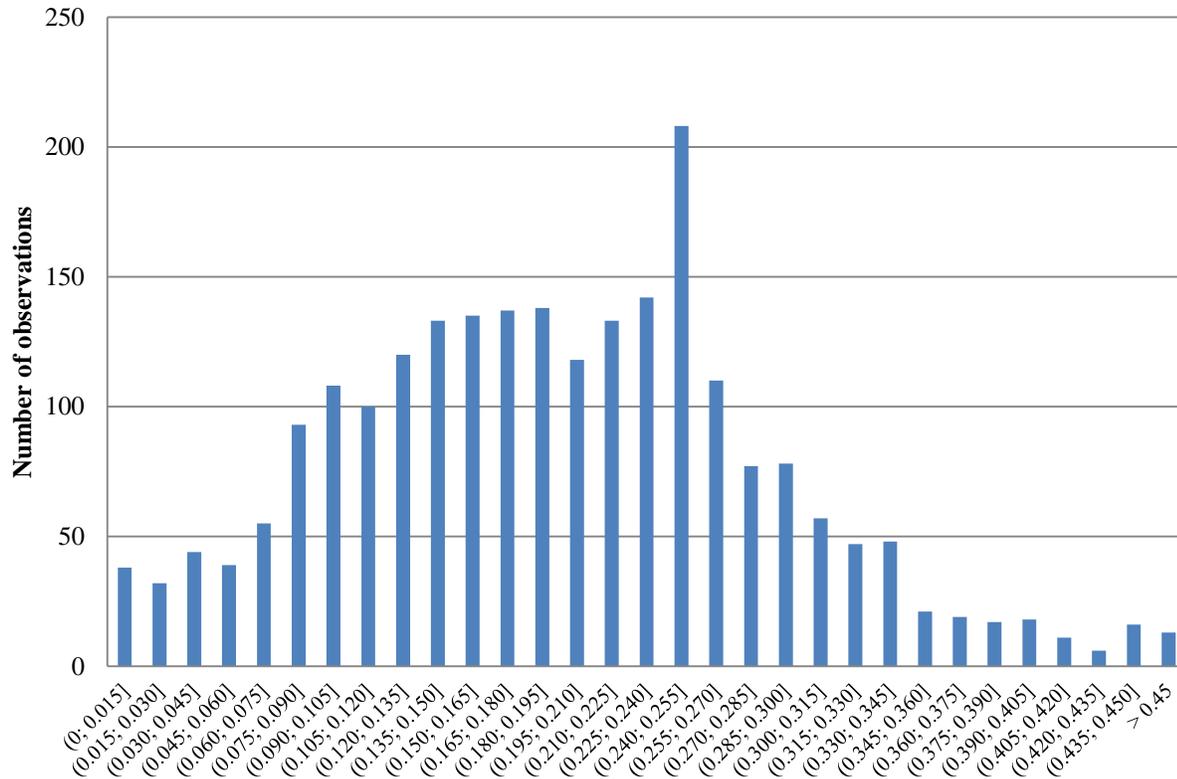
Name	Has TPS?	Assets (\$MM)	Sponsored ABCP			Other Bank ABCP		
			Liq. (\$MM)	Credit (\$MM)	Total (\$MM)	Liq. (\$MM)	Credit (\$MM)	Total (\$MM)
J.P. Morgan Chase & Co	Yes	1,462,148	48,912	4,781	53,693	6,539	47	6,586
Citigroup, Inc.	Yes	1,641,036	50,456	2,071	52,527	1,681	5	1,686
Bank One Corporation	Yes	290,967	41,144	1,264	42,408	3,733	0	3,733
Bank of America Corp.	Yes	1,460,707	37,814	3,672	41,486	92	0	92
Wachovia Corporation	Yes	511,060	17,307	4,143	21,450	3,121	2,356	5,477
State Street Corporation	Yes	117,755	19,522	1,589	21,111	0	0	0
Wells Fargo & Company	Yes	1,289,051	9,358	18	9,376	230	641	871
U.S. Bancorp	Yes	200,303	6,623	1,530	8,153	0	0	0
Zions Bancorporation	Yes	38,615	5,738	134	5,872	0	61	61
Suntrust Banks Inc.	Yes	160,078	5,319	509	5,828	132	0	132
FleetBoston Financial Corp.	Yes	198,194	4,072	1,692	5,764	0	0	0
PNC Financial Services Group	Yes	155,780	5,397	322	5,719	208	0	208
Compass Bancshares	Yes	27,914	2,000	0	2,000	85	83	168
Fifth Third	Yes	101,409	475	1,414	1,889	109	174	283
Mellon Financial Corp.	Yes	37,300	1,633	255	1,888	632	0	632
Countrywide Financial Corp.	Yes	167,842	0	1,163	1,163	0	429	429
National City Corporation	Yes	134,973	909	0	909	463	0	463
Bank of New York Mellon Co.	Yes	244,156	881	18	899	429	0	429
Keycorp	Yes	91,263	371	52	423	235	1	236
Bank of New York	Yes	91,872	0	229	229	889	0	889
First Tennessee National Corp.	Yes	22,222	0	224	224	0	0	0
Cit Group	No	60,511	0	46	46	0	0	0
Capital One Financial Corp.	Yes	110,695	0	35	35	0	678	678
Marshall and Ilsley	Yes	31,450	0	2	2	0	0	0
Independent Bank Corp.	Yes	4,833	0	1	1	0	0	0
Amsouth Bancorporation	No	45,454	0	0	0	1,990	115	2,105
Colonial Bancgroup	Yes	23,400	0	0	0	735	68	803
First Community Bancshares	Yes	2,273	0	0	0	0	14	14
Goldman Sachs Group	Yes	917,524	0	0	0	25	0	25
Hibernia Corporation	No	17,524	0	0	0	0	35	35
M&T Bank Corporation	Yes	61,188	0	0	0	0	24	24
Morgan Stanley	Yes	776,179	0	0	0	2,170	0	2,170
People's Mutual Holdings	No	11,999	0	0	0	98	0	98
Regions Financial Corporation	Yes	142,207	0	0	0	237	46	283
Susquehanna Bancshares, Inc.	No	5,749	0	0	0	0	31	31



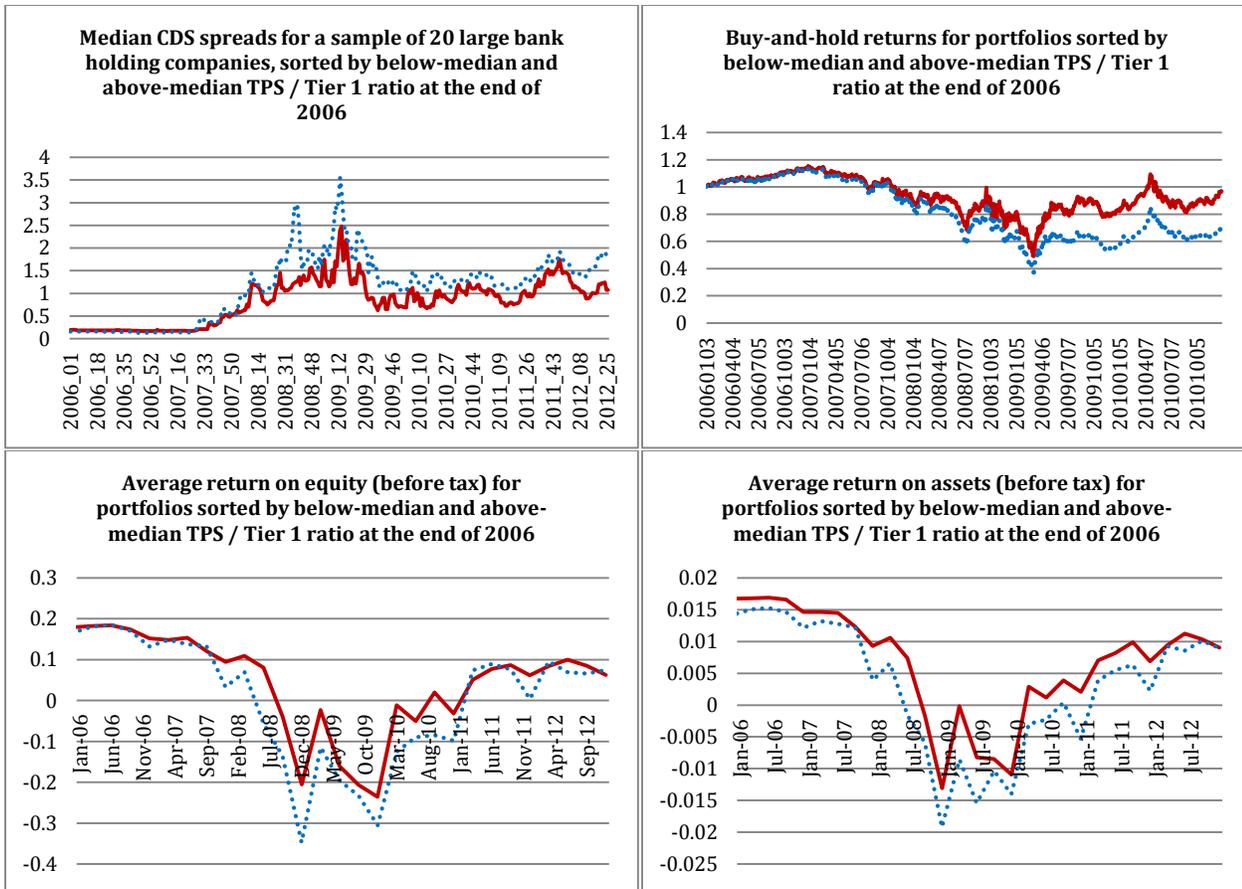
**Figure 1:** The figure shows the net issuance of common stock, perpetual preferred stock, and trust preferred securities by sample banks between 1996 and 2007. The y-axis shows the net issuance amounts in billions of U.S. dollars. The figure is constructed from data provided by SnL Financial.



**Figure 2:** The figure shows the total amount of outstanding trust preferred securities (TPS) by quarter during our sample period. The solid bars show the total amount of outstanding Tier 1 qualified TPS and the shaded bars show the total amount of outstanding TPS in billions of dollars (left-hand y-axis). The black line shows the fraction of sample banks that have issued TPS (right-hand y-axis).



**Figure 3:** The figure shows a histogram of the outstanding trust preferred securities (TPS) as a fraction of Tier 1 capital for our sample of bank holding companies (BHCs) between 1996 and 2007, conditional on a bank having TPS issued and outstanding in the respective year. Excluded from the figure are 106 BHC-year observations with total assets in excess of \$250 billion, because a different regulatory TPS / Tier 1 limit applies to them.



**Figure 4:** The four subplots show the evolution of credit default swap spreads (top left), buy-and-hold stock returns (top right), return on equity (bottom left), and return on assets (bottom right) from 2006 onward. To create each subplot, all available data were split by the median TPS / Tier 1 ratio at the end of 2006. Within each subplot, the solid red line shows the evolution for a portfolio of banks with below-median TPS usage, and the dotted blue line shows the evolution for a portfolio of banks with above-median TPS usage. The top left subplot uses data on CDS premia on the 5-year, no restructuring contract from MarkIt for the 20 sample bank holding companies with available data. The three other subplots are based on the data described in detail in Section 3 of the paper.

**Table 1: Summary Statistics at the Trust Preferred Security Level**

The table reports summary statistics for trust preferred securities (TPS) issued by U.S. publicly listed bank holding companies from 1996 to 2012. There are 1,467 unique securities. In Panel A, *Number pooled issuances* is the number of TPS that were issued as pooled TPS (also known as TPS CDOs). *Number that start deferral (bank)* is the number of TPS that started deferring dividends in the given year, and the number in parentheses is the number of issuing banks. Panel B reports banks' stated reasons for issuing TPS, by frequency and across all years. Panel C reports the underwriting spread of TPS issuance and other types of securities issued by sample banks. Reported is the average underwriting discount, i.e. the difference between the price paid to the issuer and the price at which the securities are sold, as a percent of the price at which the securities are sold. Values marked with <sup>a</sup> are higher than for TPS, and values marked with <sup>b</sup> are lower than for TPS, statistically significant at the 1% level based on t-tests assuming unequal variances.

**Panel A: Issuance Frequency, Method of Issue, and Deferral Frequency**

Year	Num. issued	Total value issued (in \$ millions)	Number SEC registered	Number traditional private placements	Number 144A private placements	Number pooled issuances	Number that start deferral (bank)
1996	63	18,933	13	0	50	0	0
1997	118	17,049	34	0	84	0	0
1998	56	5,982	30	0	26	0	0
1999	34	3,656	19	1	14	0	0
2000	64	2,803	13	27	7	17	1 (1)
2001	121	12,299	36	36	2	47	0
2002	170	8,400	32	44	2	92	1 (1)
2003	209	10,190	21	64	5	119	0
2004	149	6,423	6	64	11	68	0
2005	120	7,876	9	58	5	48	0
2006	153	24,225	20	63	11	59	0
2007	152	36,148	20	56	18	58	0
2008	40	13,242	19	19	1	1	50 (8)
2009	13	12,416	5	3	5	0	146 (43)
2010	5	6,142	4	0	1	0	58 (27)
2011	0	0	0	0	0	0	26 (12)
2012	0	0	0	0	0	0	12 (4)
Totals	1,467	185,783	281	435	242	509	294 (97)

**Table 1: Summary Statistics at the Trust Preferred Security Level, Continued**

**Panel B: Stated Reasons for TPS Issuance**

Reason	Frequency
To improve capital position	240
General corporate purposes	236
To fund a specific acquisition	198
To fund the redemption of existing TPS	163
To fund future growth	139
To pay down debt	78
To fund stock repurchases	73
Other (includes funding loan growth, redeeming preferred stock, and specific goals)	49
No reason stated	291
<b>Total</b>	<b>1,467</b>

**Panel C: Underwriting Spread for Issuing Securities**

	Common stock	Preferred stock	Senior debt	Senior subordinated debt	Subordinated debt	TPS
Mean	5.02 <sup>a</sup>	3.09	1.55 <sup>b</sup>	2.15 <sup>b</sup>	1.70 <sup>b</sup>	2.48

**Table 2: Summary Statistics for Bank Holding Companies**

The table presents means and medians for key characteristics of a sample of bank holding companies (BHC) from 1996 to 2012. Summary statistics are calculated by bank and then across banks, and are winsorized at the 1% and 99% tails. Summary statistics are calculated separately for banks that never issued trust preferred securities (TPS) during the sample period and those that issued TPS. There are 857 banks in the dataset, of which 518 issued TPS and 339 did not. *Franchise value* is the sum of the market value of equity and the book value of liabilities, scaled by the difference between the book value of assets and goodwill. *Tier 1 ratio (%)* is the ratio of Tier 1 capital to risk-weighted assets. *Tier 1 ratio less TPS (%)* is the ratio of (Tier 1 capital minus dollar amount of issued TPS) divided by risk-weighted assets. *Regulatory Leverage Ratio* is Tier 1 capital scaled by total assets. *Insider ownership* is the fraction of a BHC's common stock held by named executive officers and directors. *ROA before taxes (%)* is net income plus income tax expense divided by total assets. *Stock return* is the annual stock return in excess of the risk free rate. *Beta* is the regression coefficient from a market model of excess daily returns on the value-weighted CRSP index for the two-year period prior to the reporting date, and *idiosyncratic volatility (%)* is the residual from this regression (aggregated to a monthly level). *Loan concentration index* is a Herfindahl-like index measuring the concentration of the loan portfolio as in Berger and Bouwman (2013). *Asset growth excluding mergers* is total assets in year  $t$  of the BHC, less the sum of the total assets of all institutions or branches acquired in the same year, divided by total assets in year  $t-1$ , minus 1. The column *Difference* shows the differences between the group of TPS issuers and non-issuers. Statistically significant differences at the 10%, 5%, and 1% level are indicated with \*, \*\*, and \*\*\* respectively.

	Means			Medians		
	TPS issuers	Non-issuers	Difference	TPS issuers	Non-issuers	Difference
<b>Proxies for regulatory capital constraints</b>						
Franchise value	1.058	1.069	-0.011***	1.051	1.067	-0.016***
Tier 1 ratio (%)	11.9	14.6	-2.7***	11.6	13.3	-1.7***
Tier 1 ratio less TPS (%)	10.3	14.6	-4.3***	10.1	13.3	-3.2***
<b>Bank characteristics</b>						
Total assets (\$ billions)	1,951	771	1,180***	1,258	616	642***
Regulatory leverage ratio	0.085	0.094	-0.009***	0.083	0.090	-0.006***
Insider ownership	0.171	0.180	-0.009	0.142	0.155	-0.013
ROA before taxes (%)	1.5	1.9	-0.4***	1.8	2.2	-0.4**
Stock return	0.072	0.204	-0.132***	0.076	0.178	-0.102***
Beta	0.571	0.332	0.239***	0.488	0.242	0.246***
Idiosyncratic volatility (%)	2.5	2.4	0.1*	2.3	2.2	0.1**
Loan concentration index	0.594	0.624	-0.030***	0.592	0.606	-0.014
Deposits / assets	0.751	0.780	-0.029***	0.772	0.804	-0.032***
Cash / assets	0.041	0.046	-0.005***	0.036	0.040	-0.004**
Loans / assets	0.664	0.637	0.027***	0.684	0.651	0.033***
State tax rate	0.069	0.073	-0.004**	0.070	0.077	-0.007***
<b>Repurchases and growth</b>						
Repurchase indicator variable	0.524	0.468	0.056***	0.545	0.500	0.045
Asset growth excluding mergers	0.074	0.058	0.016***	0.066	0.051	0.014***
Number of mergers in a year	0.388	0.221	0.167***	0.188	0.000	0.188***

**Table 3: Tobit Regressions: TPS Level and Bank Characteristics**

The table presents results from Tobit regressions of TPS levels on bank characteristics. The sample consists of 6,512 bank-holding company-years (BHC-years). Independent variables, except for those measuring concurrent repurchases and growth, are lagged one period, and described in detail in Section 3. Regressions in Panel A include year-fixed effects and take into account that the dependent variable is left-censored at zero. Columns (1)-(6) use TPS / Tier1 capital as the dependent variable. Column (5) excludes bank holding companies with greater than \$50 billion in assets. Columns (7) and (8) use TPS / Total subordinated debt as the dependent variable, where TPS / Total subordinated debt is set to zero if total subordinated debt is equal to 0. Columns (7) and (8) also right-censor the dependent variable at 1, because many bank holding companies only issue subordinated debt for the purpose of issuing TPS. Panel B re-estimates the regressions of columns (1), (2), (7), and (8), but uses franchise value and the Tier 1 ratio lagged by 5 years as explanatory variables. Standard errors are clustered by BHC and year. Coefficients with statistical significance at the 10%, 5%, and 1% level are indicated with \*, \*\*, and \*\*\* respectively.

**Panel A**

	Dep. Var = TPS / Tier 1						Dep. Var = TPS / Sub debt	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Proxies for capital constraints</b>								
Franchise value <sub>t-1</sub>	-0.355***	-0.331***	-0.377***	-0.294***	-0.435***	-0.236*	-2.534***	-3.020***
Tier 1 ratio <sub>t-1</sub> (%)	-0.014***	-0.015***	-0.015***		-0.015***	-0.014***	-0.105***	-0.115***
Tier 1 ratio excluding TPS <sub>t-1</sub> (%)				-0.032***				
<b>Bank characteristics</b>								
Internationally active indicator <sub>t-1</sub>		-0.114***	-0.117***	-0.115***		-0.112***		-1.104***
Log total assets <sub>t-1</sub>	0.016***	0.017***	0.015***	-0.003	0.023***	0.016***	0.019	0.034
Insider ownership <sub>t-1</sub>		0.132***	0.119***	0.087**	0.129***	0.818		1.485***
ROA before taxes <sub>t-1</sub> (%)		-0.008***	-0.009***	0.001	-0.008***	-0.008***		-0.049**
Stock return <sub>t-1</sub>		0.057***	0.046***	0.043***	0.066***	0.058***		0.702***
Beta <sub>t-1</sub>		0.014	0.015**	0.022***	0.010	0.014**		0.243***
Idiosyncratic volatility <sub>t-1</sub> (%)		0.004	0.005*	-0.003	0.005	0.004		0.020
Loan concentration index <sub>t-1</sub>		-0.066**	-0.066**	-0.025	-0.068**	-0.065**		-0.603***
Deposits / assets <sub>t-1</sub>		-0.081	-0.094	-0.154***	-0.106	-0.081		-0.531
Cash / assets <sub>t-1</sub>		-0.297*	-0.251	-0.097	-0.452***	-0.304*		-3.957***
Loans / assets <sub>t-1</sub>		-0.084	-0.100	-0.233***	-0.098	-0.084		-0.747***
State tax rate <sub>t-1</sub>		0.295	0.371*	0.079	0.285	0.286		2.122**
<b>Interaction variables</b>								
Franchise value <sub>t-1</sub> x Ins. Own <sub>t-1</sub>						-0.627		
Tier 1 ratio <sub>t-1</sub> x Ins. Own <sub>t-1</sub>						-0.002		
<b>Repurchases and growth</b>								
Repurchase dummy variable <sub>t</sub>			-0.007					
Asset growth excluding mergers <sub>t</sub>			0.122**					
Number of mergers <sub>t</sub>			0.019***					
N	6,512	6,512	6,512	6,512	6,171	6,512	6,512	6,512
Censor at 0	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Censor at 1	No	No	No	No	No	No	Yes	Yes
Excludes very large banks?	No	No	No	No	Yes	No	No	No
Includes year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Table 3: Tobit Regressions: TPS Level and Bank Characteristics, continued**

**Panel B**

	Dep. Var = TPS / Tier 1		Dep. Var = TPS / Sub debt	
	(1)	(2)	(3)	(4)
<b>Proxies for capital constraints</b>				
Franchise value <sub>t-5</sub>	-0.245***	-0.162**	-0.968***	-0.812***
Tier 1 ratio <sub>t-5</sub> (%)	-0.012***	-0.012***	-0.023***	-0.020***
<b>Bank characteristics</b>				
Internationally active indicator <sub>t-1</sub>		-0.034		-0.057
Log total assets <sub>t-1</sub>	0.002	0.002	-0.006	-0.019
Insider ownership <sub>t-1</sub>		0.107**		0.412**
ROA before taxes <sub>t-1</sub> (%)		-0.010***		-0.025***
Stock return <sub>t-1</sub>		0.009		0.127***
Beta <sub>t-1</sub>		0.010		0.116***
Idiosyncratic volatility <sub>t-1</sub> (%)		0.003*		-0.002
Loan concentration index <sub>t-1</sub>		-0.032		-0.149
Deposits / assets <sub>t-1</sub>		-0.112		-0.192
Cash / assets <sub>t-1</sub>		-0.394***		-1.657**
Loans / assets <sub>t-1</sub>		0.022		0.140
State tax rate <sub>t-1</sub>		0.080		0.206
N	3,592	3,592	3,592	3,592
Censor at 0	Yes	Yes	Yes	Yes
Censor at 1	No	No	Yes	Yes
Includes year-fixed effects	Yes	Yes	Yes	Yes

**Table 4: Bank Fixed Effects Regressions: TPS Level and Bank Characteristics**

The table presents results from BHC-fixed effects regressions of TPS levels on bank characteristics. The sample consists of 6,512 bank-holding company-years (BHC-years). Independent variables, except for those measuring concurrent repurchases and growth, are lagged one period, and described in detail in Section 3. Regressions include year-fixed effects and BHC-fixed effects. Column (5) excludes banks with greater than \$50 billion in assets. Standard errors are clustered by BHC and year. Coefficients with statistical significance at the 10%, 5%, and 1% level are indicated with \*, \*\*, and \*\*\* respectively.

	(1)	(2)	(3)	(4)	(5)
<b>Proxies for capital constraints</b>					
Franchise value <sub>t-1</sub>	-0.088**	-0.077*	-0.080**	-0.096**	-0.127***
Tier 1 ratio <sub>t-1</sub> (%)	-0.003***	-0.003***		-0.003***	-0.003***
Tier 1 ratio excluding TPS <sub>t-1</sub> (%)			-0.009***		
<b>Bank characteristics</b>					
Log total assets <sub>t-1</sub>	0.027***	0.023***	0.011	0.028***	0.030***
Insider ownership <sub>t-1</sub>		0.050	0.021	0.046	0.055
Beta <sub>t-1</sub>		0.000	0.003	0.000	-0.001
Idiosyncratic volatility <sub>t-1</sub> (%)		0.004**	0.001	0.005**	0.005***
Loan concentration index <sub>t-1</sub>		0.045	0.051*	0.046	0.041
Deposits / assets <sub>t-1</sub>		-0.128***	-0.145***	-0.125***	-0.116***
Cash / assets <sub>t-1</sub>		-0.055	-0.076	-0.052	-0.090
Loans / assets <sub>t-1</sub>		-0.015	-0.074***	-0.019	-0.034
State tax rate <sub>t-1</sub>		0.199	0.143	0.230	0.128
<b>Repurchases and growth</b>					
Repurchase dummy variable <sub>t</sub>				-0.007**	-0.006*
Asset growth excluding mergers <sub>t</sub>				0.028*	0.038**
Number of mergers <sub>t</sub>				0.005***	0.007***
N	6,512	6,512	6,512	6,512	6,171
Excludes very large banks?	No	No	No	No	Yes
Includes bank fixed effects	Yes	Yes	Yes	Yes	Yes
Includes year-fixed effects	Yes	Yes	Yes	Yes	Yes

**Table 5: Distance to Default and TPS Usage**

The table presents results from pooled time-series cross-sectional OLS regressions of the log of z-score on TPS usage and other bank characteristics. The z-score is calculated as  $[(ROA + \text{capital ratio}) / \sigma(\text{ROA})]$ . ROA is calculated as the sum of quarterly net income over one year divided by end-of-year total assets. The capital ratio (market value of equity / total assets) in the numerator is calculated as end-of-year. Sigma ROA is calculated using quarterly data from the six years prior to the year of interest. Independent variables are lagged one period, and described in detail in Section 3. In Columns (1) to (5), the dependent variable is the log of the z-score. Column (6) uses the log of a modified z-score which is defined as follows:  $[(ROA + (\text{market value of equity} + \text{market value of TPS used to repurchase shares}) / \text{assets}) / \sigma(\text{ROA})]$ . All z-scores are winsorized at the 1% and 99% tails. Regressions include year-fixed effects. Standard errors are clustered by bank and by year. Coefficients with statistical significance at the 10%, 5%, and 1% level are indicated with \*, \*\*, and \*\*\* respectively, and p-values are reported below the coefficients in parentheses.

	Log Continuous z-score					Log Modified z-score
	(1)	(2)	(3)	(4)	(5)	(6)
TPS / Tier 1 <sub>t-1</sub>	-0.668*** (0.01)		-0.352*** (0.00)			-0.339*** (0.00)
TPS / subordinated debt		-0.099** (0.05)		-0.039 (0.15)		
TPS / Tier 1 <sub>t-5</sub>					-0.349** (0.02)	
Tier 1 ratio <sub>t-1</sub>			0.013*** (0.01)	0.014*** (0.01)	0.014** (0.02)	0.011** (0.05)
Stock return <sub>t-1</sub>			0.309*** (0.00)	0.306*** (0.00)	0.434*** (0.00)	0.312*** (0.00)
Log (market value) <sub>t-1</sub>			-0.008 (0.63)	-0.009 (0.63)	-0.032** (0.05)	-0.004 (0.84)
Beta <sub>t-1</sub>			-0.023 (0.66)	-0.026 (0.66)	0.045 (0.41)	-0.023 (0.67)
Idiosyncratic volatility <sub>t-1</sub>			-0.126*** (0.00)	-0.127*** (0.00)	-0.194*** (0.00)	-0.129*** (0.00)
Book / market <sub>t-1</sub>			-0.462*** (0.00)	-0.469*** (0.00)	-0.401*** (0.00)	-0.464*** (0.00)
Loan concentration index <sub>t-1</sub>			-0.348*** (0.00)	-0.341*** (0.00)	-0.465*** (0.00)	-0.334*** (0.00)
Mean asset growth, past 3 years			0.373*** (0.00)	0.349*** (0.00)	0.432*** (0.00)	0.377*** (0.00)
N	5,876	5,876	5,140	5,140	3,223	5,140
Includes year-fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.33	0.32	0.55	0.55	0.53	0.57

**Table 6: Special Federal Programs and TPS Usage**

The table shows results from probit regressions in which the dependent variable is set to 1 if the firm ever received funds from the Capital Purchase Program (CPP) of the Troubled Asset Relief Program (TARP), the Term Auction Facility (TAF), the Primary Dealer Credit Facility (PDCF), or the Term Securities Lending Facility (TSLF) and 0 otherwise (Columns (1) through (5)). The dependent variable in Columns (6) and (7) is equal to one if the firm ever received funds from one of the four programs above or if it borrowed from the Federal Home Loan Bank System. The independent variables are measured pre-crisis in June 2007 and are described in Section 3. The table reports marginal effects. Coefficients with statistical significance at the 10%, 5%, and 1% level are indicated with \*, \*\*, and \*\*\* respectively, and p-values from heteroskedasticity-adjusted standard errors are reported below the coefficients in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TPS / Tier 1	0.712*** (0.00)	0.650** (0.02)	0.786*** (0.00)			0.353*** (0.00)	
TPS / subordinated debt				0.119* (0.09)			0.073*** (0.01)
TPS/Tier 1 <sub>t-5</sub>					0.593** (0.03)		
Tier 1 ratio		-3.825** (0.03)			-4.540** (0.03)		
Leverage ratio			-3.586* (0.07)	-3.967** (0.05)		0.274 (0.75)	0.333 (0.72)
Return on assets before taxes 7/2006 to 6/2007		0.499 (0.78)	-0.091 (0.95)	-0.399 (0.78)	1.056 (0.56)	-0.629* (0.07)	-0.693 (0.08)
Stock return 7/2006 to 6/2007		-0.202 (0.36)	-0.291 (0.19)	-0.289 (0.19)	-0.257 (0.25)	0.036 (0.72)	0.031 (0.75)
Log (total assets)		0.118*** (0.00)	0.122*** (0.00)	0.125*** (0.00)	0.125*** (0.00)	-0.008 (0.50)	-0.003 (0.82)
Beta		-0.134*** (0.01)	-0.139*** (0.00)	-0.132*** (0.01)	-0.148*** (0.00)	0.019 (0.26)	0.017 (0.34)
Idiosyncratic volatility		3.901 (0.63)	4.036 (0.61)	2.463 (0.76)	3.396 (0.70)	-3.482 (0.25)	-4.121 (0.19)
Book / market		-0.080 (0.62)	-0.179 (0.23)	-0.159 (0.28)	-0.039 (0.70)	0.086 (0.22)	0.097 (0.19)
Loan concentration index		-0.109 (0.61)	-0.142 (0.51)	-0.170 (0.43)	-0.172 (0.44)	0.108 (0.23)	0.112 (0.23)
Mean asset growth ratio, past 3 years		-0.054 (0.82)	0.094 (0.69)	0.175 (0.43)	-0.118 (0.63)	-0.219*** (0.01)	-0.212*** (0.01)
Observations	377	365	365	365	350	365	365
Pseudo R <sup>2</sup>	0.02	0.12	0.10	0.09	0.13	0.15	0.14

**Table 7: Crisis Stock Returns and TPS Usage**

The table shows results from cross-sectional regressions of crisis returns on bank characteristics, measured in June 2007. The dependent variable is the buy-and-hold stock return of bank holding companies. Returns are calculated from July 2007 through December 2008. The independent variables are described in Sections 3 and 4. Coefficients with statistical significance at the 10%, 5%, and 1% level are indicated with \*, \*\*, and \*\*\* respectively, and p-values from heteroskedasticity-adjusted standard errors are reported below the coefficients in parentheses.

	Stock market return						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TPS / Tier 1	-0.320*** (0.01)		-0.163 (0.17)	-0.272** (0.02)	-0.004 (0.98)	-0.158 (0.27)	
TPS / Sub Debt		-0.046 (0.13)					
TPS / Tier 1 <sub>t-5</sub>							-0.164* (0.07)
Tier 1 ratio			1.587*** (0.00)		1.560*** (0.00)		1.409*** (0.01)
Regulatory leverage ratio				-0.741 (0.29)		-0.707 (0.29)	
Stock return 7/2006 to 6/2007			-0.029 (0.77)	0.056 (0.56)	-0.067 (0.51)	0.009 (0.92)	0.003 (0.98)
Log (market value)			-0.039*** (0.00)	-0.046*** (0.00)	-0.035*** (0.00)	-0.043*** (0.00)	-0.046*** (0.00)
Beta			0.086*** (0.00)	0.092*** (0.00)	0.092*** (0.00)	0.099*** (0.00)	0.090*** (0.00)
Idiosyncratic volatility			-11.281*** (0.00)	-11.080*** (0.00)	-9.984*** (0.01)	-9.779*** (0.01)	-13.080*** (0.00)
Book/market			-0.153*** (0.01)	-0.135** (0.03)	-0.079 (0.25)	-0.051 (0.47)	-0.210*** (0.00)
Loan concentration index			-0.358*** (0.00)	-0.296*** (0.00)	-0.299*** (0.00)	-0.236*** (0.01)	-0.399*** (0.00)
Mean asset growth, past 3 years			-0.317*** (0.00)	-0.374*** (0.00)	-0.358*** (0.00)	-0.411*** (0.00)	-0.340*** (0.01)
Past due real estate loans/total loans					-0.977 (0.40)	-1.505 (0.15)	
TPS / Tier 1 x Past due real estate loans/total loans					-16.284** (0.02)	-13.260** (0.04)	
Constant	-0.203*** (0.00)	-0.220*** (0.00)	0.543*** (0.01)	0.858*** (0.00)	0.419** (0.04)	0.727*** (0.00)	-0.732*** (0.00)
Observations	382	382	370	370	370	370	298
R <sup>2</sup>	0.02	0.01	0.23	0.20	0.26	0.24	0.23

**Table 8: Accounting Returns and TPS Usage**

The table shows results from cross-sectional regressions of crisis accounting returns on bank characteristics, measured in June 2007. In Columns (1)-(5), the dependent variable is the return on assets before income tax. In Columns (6) through (10), the dependent variable is the return on equity before income tax. Returns are calculated from July 2007 through December 2008. The independent variables are described in Sections 3 and 4. Coefficients with statistical significance at the 10%, 5%, and 1% level are indicated with \*, \*\*, and \*\*\* respectively, and p-values from heteroskedasticity-adjusted standard errors are reported below the coefficients in parentheses.

	Return on assets before income tax					Return on equity before income tax				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
TPS / Tier 1	-0.065*** (0.00)		-0.028** (0.05)	-0.031** (0.03)		-1.192*** (0.00)		-0.652*** (0.00)	-0.795*** (0.00)	
TPS/ Subordinated debt		-0.010*** (0.01)					-0.193*** (0.00)			
TPS / Tier 1 <sub>t-5</sub>					-0.030** (0.05)					-0.649** (0.02)
Tier 1 ratio			0.028 (0.67)		0.045 (0.55)			0.797 (0.36)		1.530 (0.16)
Regulatory leverage ratio				-0.178 (0.11)					-4.304*** (0.00)	
Return on assets before taxes 7/2006 to 6/2007			0.152 (0.11)	0.219** (0.04)	0.121 (0.13)					
Return on equity before taxes 7/2006 to 6/2007								0.814*** (0.00)	0.843*** (0.00)	0.939*** (0.00)
Log (total assets)			-0.002* (0.10)	-0.003*** (0.01)	-0.002* (0.10)			-0.053*** (0.00)	-0.078*** (0.00)	-0.050** (0.03)
Beta			-0.001 (0.58)	-0.001 (0.65)	-0.001 (0.60)			0.003 (0.94)	0.013 (0.73)	-0.019 (0.67)
Idiosyncratic volatility			-0.021 (0.95)	-0.023 (0.95)	-0.143 (0.72)			-4.477 (0.47)	-4.900 (0.41)	-4.482 (0.56)
Book/market			-0.048*** (0.00)	-0.046*** (0.00)	-0.043*** (0.00)			-0.553*** (0.00)	-0.537*** (0.00)	-0.520*** (0.01)
Loan concentration index			-0.030*** (0.00)	-0.028*** (0.00)	-0.300*** (0.00)			-0.690*** (0.00)	-0.650*** (0.00)	-0.780*** (0.00)
Mean asset growth, past 3 years			-0.049*** (0.00)	-0.050*** (0.00)	-0.063*** (0.00)			-0.804*** (0.00)	-0.827*** (0.00)	-1.130*** (0.00)
Constant	0.019*** (0.00)	0.019*** (0.00)	0.092*** (0.00)	0.122*** (0.00)	0.094*** (0.00)	0.019*** (0.00)	0.019*** (0.00)	1.685*** (0.00)	2.495*** (0.00)	1.564*** (0.00)
Observations	377	377	365	365	295	376	376	364	364	295
R <sup>2</sup>	0.05	0.02	0.29	0.30	0.27	0.05	0.02	0.33	0.34	0.27

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