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Safer Ratios, Riskier Portfolios: Banks' Response to Government Aid

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Safer Ratios, Riskier Portfolios:
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Abstract

We study the effect of government assistance on bank risk taking. Using hand-collected data on bank applications for government assistance under the Troubled Asset Relief Program (TARP), we investigate the effect of both application approvals and denials. To distinguish banks' risk taking behavior from changes in economic conditions, we control for the volume and quality of credit demand based on micro-level data on home mortgages and corporate loans. Our difference-in-difference analysis indicates that banks make riskier loans and shift investment portfolios toward riskier securities after being approved for government assistance. However, this shift in risk occurs mostly within the same asset class and, therefore, remains undetected by the closely-monitored capitalization levels, which indicate an improved capital position at approved banks. Consequently, these banks appear safer according to regulatory ratios, but show a significant increase in volatility and default risk.

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1. Introduction

The financial crisis of 2008-2009 resulted in an unprecedented liquidity shock to financial institutions in the U.S. (Gorton and Metrick, 2012) and abroad (Beltratti and Stulz, 2012). To stabilize the banking system, governments around the world initiated a wave of capital assistance to financial firms. Many economists and regulators argue that this wave altered the perception of government protection of banks (Kashyap, Rajan, and Stein, 2008) and created a precedent that will have a profound effect on the future behavior of financial institutions. At the forefront of this debate is the effect of the bailout on bank risk taking (Flannery 2010), since risk taking, coupled with inadequate regulation (Levine 2012), is often blamed for leading to the crisis in the first place. This debate has broad policy implications, since the relation between government intervention and bank risk taking is at the core of financial system design (Song and Thakor, 2011). This paper studies whether and how the recent bailout affected risk taking in credit origination and investment activities of U.S. financial institutions.

Our empirical analysis focuses on the financial crisis of 2008-2009, thus exploiting an economy-wide liquidity shock, which simultaneously affected an unusually large cross-section of firms and resulted in the largest bailout in corporate history. In particular, we study the effect of the Capital Purchase Program (CPP), which invested $205 billion in U.S. financial institutions, becoming the first and largest initiative of the Troubled Asset Relief Program (TARP). Using a hand-collected dataset on the status of bank applications for federal assistance, we are able to observe both banks' decisions to apply for bailout funds and regulators' decisions to grant assistance to specific institutions. This research setting allows us to control for the selection of bailed firms and to study the risk taking implications of both bailout approvals and bailout denials. Our risk analysis spans three channels of bank operations: (1) retail lending (mortgages), (2) corporate lending (large syndicated loans), and (3) investment activities (financial assets).

Our empirical analysis begins with the retail lending market. Our data allow us to observe bank lending decisions on nearly all mortgage applications submitted in the United States in 2006-2010 and to account for key loan characteristics, such as borrower income and demographics, loan amount, and property location. This empirical design enables us to address a critical identification issue – to distinguish the supply-side changes in bank credit origination from the demand-side changes in the volume and quality of potential borrowers.

In difference-in-difference tests, we do not find a significant change in the volume of credit origination by banks that were approved for federal assistance, as compared to banks with similar financial characteristics that were denied federal aid. We also do not detect a significant change in the distribution of borrowers between approved and denied banks. Our main finding is that after being approved for federal assistance, banks shifted their credit origination toward riskier mortgages. For example, relative to banks that were denied federal assistance, approved banks increased their origination rates on mortgage applications with above-median loan-to-income ratios by 4.9 percentage points. As a result, the fraction of higher-risk mortgages in the originated credit increased for approved banks, but declined for their unapproved counterparts.

Our findings are qualitatively similar for large corporate loans. Our tests focus on the variation in the share of credit originated by CPP participants at the level of each syndicated loan. In difference-in-difference analysis of banks granted and denied government assistance, we document a robust shift by banks approved for CPP toward originating higher-yield, riskier loans. After being approved for federal assistance, banks increase their share of credit issuance to riskier corporate borrowers, as measured by borrowers' cash flow volatility, interest coverage, and asset tangibility, and reduce their share of credit issuance to safer firms. Altogether, our findings for both retail and corporate loans suggest that the bailout was associated with a shift in credit rationing rather than an expansion in the volume of credit, leading to a marked increase in the riskiness of originated credit by banks approved for government support relative to unapproved banks. In particular, using interest yields as a measure of credit risk, we find that after the bailout, the average loan yield at approved banks increased by 23.1% relative to unapproved banks with similar characteristics.

We find a similar increase in risk taking by approved banks in their investment activities. After being approved for federal assistance, banks significantly increased their investments in risky securities such as non-agency mortgage-backed securities and reduced their allocations to low-risk securities such as Treasury bonds. For the average bank approved for federal assistance, the total weight of investment securities in bank assets increased by 8.7% after CPP relative to unapproved banks. Within these portfolio investments, approved banks increased their allocations to risky securities by 6.8%, while, at the same time, reducing their investments in lower-risk securities by 11.2% relative to unapproved banks. This shift in portfolio assets toward risky securities is reliably significant relative to unapproved banks and holds after controlling for bank fundamentals.

Overall, our analysis at the micro-level indicates a robust increase in risk taking in both lending and investment activities by banks approved for government assistance, as compared to fundamentally similar banks, which were denied federal assistance. After identifying the sources of the shift in risk taking at the micro-level, we present aggregate evidence on the perceived risk of approved and unapproved financial institutions. We find that federal capital infusions significantly improved capitalization levels of approved banks, with their average capital-to-assets ratio increasing by 13.6% relative to unapproved banks. However, the reduction in leverage was more than offset by an increase in the riskiness of the asset mix of approved banks. The net effect was a marked increase in the riskiness of banks approved for government assistance as compared to their unapproved counterparts with similar financial characteristics. This result holds robustly whether bank risk is measured by earnings volatility, stock volatility, market beta, or the distance to default (z-score). For example, after the bailout, approved banks show a 21.4% increase in default risk and an 11.9% increase in beta relative to unapproved banks.

One important consideration in interpreting our results is the selection of banks approved for CPP. Since the approval of banks is not random, it is possible that the Treasury approved those banks that were more likely to experience a significant future shock as a result of their crisis exposure or other factors. It is possible that the approved banks would have experienced an even greater increase in risk without government aid.

We address sample selection in several ways. First, we explicitly control for the proxies of the declared financial criteria used by banking regulators for evaluating financial institutions, such as capital adequacy, asset quality, profitability, and liquidity, as well as bank size, reliance on core deposits, exposure to regional economic shocks, and exposure to the financial crisis (foreclosures). Second, we estimate all our tests using an instrumental variable approach, with banks' location-based connections to politicians on the House finance committees as our instrument for bailout decisions. For completeness, we also show the main results without the instrumental variable. Finally, we estimate all our tests in matched samples of approved and unapproved institutions based on measures of financial condition and performance. Our conclusions are very similar across these specifications.

We review three non-mutually exclusive explanations that may account for the observed increase in risk at approved banks: (1) government intervention; (2) risk arbitrage; (3) moral hazard. The first hypothesis – *government intervention* – posits that that the increase in risk taking at approved banks is a consequence of government intervention in bank policies aimed at increasing the flow of funds into subprime mortgages and

mortgage-backed securities. However, to the extent that bailed banks were subject to government regulations, these regulations sought to reduce rather than increase risk taking, for example, by limiting executive pay "to prevent excessive risk taking" and by restricting share repurchases and dividends to prevent asset substitution.

To investigate this hypothesis, we collect data on banks that applied for CPP, were approved, but did not receive CPP funds for various institutional reasons discussed in Section 5.4. We then compare risk taking by this subset of non-recipients relative to the banks that *did* receive the money and were similar in size, financial condition, and performance at the time of CPP approval. We find a similar increase in risk taking across all banks approved for bailout funds, regardless of whether or not they received the money and were subject to the subsequent government regulation. As another test of the government intervention hypothesis, we examine changes in bank risk taking after the repayment of CPP capital. We find that the release from government oversight after the repayment of CPP funds has little effect on bank risk taking. Collectively, these results suggest that if government intervention played a role in banks' credit rationing and investment decisions, it appears unlikely to have been the primary driver of higher risk taking.

The second hypothesis – *risk arbitrage* – conjectures that some of the risky assets, such as subprime mortgages and investment securities, were significantly underpriced during the financial crisis, providing excess profit opportunities with relatively low risk. In this case, the additional CPP capital may have enabled approved banks to exploit these opportunities without an ex-post increase in risk. Our results do not support this interpretation. First, we find that a shift toward riskier asset classes at approved banks was associated with an increase in loan charge-offs and investment losses, suggesting that these higher-yield assets were riskier not only based on ex-ante characteristics, but also based on ex-post performance. Second, a shift in approved banks' credit rationing and investment strategies was associated with a significant increase in the market's perception of their risk, as measured by stock volatility, beta, and default risk. Overall, while the extra capital likely played a role in banks' investment and lending decisions, these decisions reflected a significant increase in risk tolerance rather than the allocation of capital to low-risk arbitrage opportunities.

A third explanation – *moral hazard* – posits that a firm's approval for CPP funds may provide a signal of implicit government protection of certain financial firms in case of distress. According to this hypothesis, there is some ex-ante probability that a given bank will be bailed out in case of distress. During a financial shock, the

bank either receives government protection or is denied it. If there is some consistency in the regulator's treatment of banks across time, a bank's approval for government assistance signals an increase in the probability that this bank will be protected again in case of future distress. Conversely, if a bank is denied government aid, the probability that this bank will be bailed out in the future goes down. This effect can be particularly significant in the short term, within the same crisis, since the government will prefer to avoid the near-term distress of banks it has publicly declared to endorse. For example, some bailed firms, such as AIG and Citigroup, received multiple rounds of government assistance. Under this interpretation, the bailout may encourage risk taking by protected banks by reducing investors' monitoring incentives and increasing moral hazard, as predicted in Acharya and Yorulmazer (2007), Kashyap, Rajan, and Stein (2008), and Flannery (2010), among others.

Our evidence appears consistent with a view that moral hazard likely contributed to the increase in risk taking at approved banks. In particular, the finding that higher risk taking is associated with the certification of government support, rather than with the capital injection itself, is consistent with this view. Further, our evidence indicates that the increase in risk taking was more pronounced at larger banks, which are more likely to receive continued government protection. Finally, we find that approved banks increased their risk primarily by investing in asset classes with a high exposure to the common macroeconomic risk. If government protection is more likely in case of a systematic rather than idiosyncratic shock to a firm, this evidence would be consistent with a strategic response of approved banks to a revised probability of future government support. This interpretation of empirical evidence is also supported by the evaluation of CPP by its chief auditor, the Special Inspector General of the Troubled Asset Relief Program (SIGTARP).[1] It is also consistent with the views about a shift in bailed banks' risk tolerance expressed by prominent regulators in a testimony to Congress.[2]

Our article has several implications. First, one of the most significant recent events was a negative revision of the outlook for the long-term U.S. debt by Standard and Poor's, followed by the downgrade in August 2011 for the first time since the beginning of ratings in 1860. Among the reasons for a revised outlook cited by

[1] For example, in evaluating the consequences of government assistance on the financial sector, the SIGTARP report to Congress concludes that "To the extent that institutions were previously incentivized to take reckless risks through a "heads, I win; tails, the Government will bail me out" mentality, the market is more convinced than ever that the Government will step in as necessary to save systemically significant institutions (SIGTARP, 2010, p. 6)."

[2] For example, in his testimony before the House Financial Services Committee on October 1, 2009, the former Fed Chairman, Paul Volker, stated: "What all this amounts to is an unintended and unanticipated extension of the official safety net…The obvious danger is that risk taking will be encouraged and efforts at prudential restraint will be resisted."

the rating agency were the increased riskiness of U.S. financial institutions and a higher estimated probability of future government assistance to financial firms.[3] Our paper identifies potential sources of the increased risk in the financial system and links them to the initial bailout policy and the predictions of academic theory.

Second, earlier studies underscore the importance of bank capital for credit origination (Thakor, 1996) and economic growth (Levine, 2005). Our findings suggest an asymmetric response of financial institutions to capital shocks. In particular, while previous research shows that a negative shock to bank (equity) capital forces a cut in lending (Berger and Bouwman, 2011), we find that a positive shock to capital need not result in credit expansion, but instead may lead to a shift in credit rationing and an increase in risky investments. Finally, although bank capital requirements are used as a key instrument in bank regulation (Bernanke and Lown, 1991), we show that the strategic response of financial institutions to this mechanism erodes and, in some cases, reverses its efficacy. In particular, government-supported banks significantly increased their risk within regulated asset classes, while, at the same time, improving their capital ratios.

The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 describes our data. Section 4 discusses the empirical design. Section 5 studies retail lending. Section 6 investigates corporate lending and portfolio investments. Section 7 examines aggregate bank risk. A brief conclusion follows.

2. Related Literature

2.1. Theoretical Motivation and Main Hypotheses

The government safety net has been long recognized as a cornerstone of the economic system. Its architecture includes social assistance programs, government insurance, and financial regulation. We adopt this broader perspective and begin with a review of key theoretical work on government guarantees in general economic settings. We then proceed with a more specific discussion of government guarantees in financial regulation and build on this work to motivate our main hypotheses.

The early theoretical work on government guarantees has focused on social insurance programs such as social security and unemployment insurance. The classical studies in this area have established some of the first predictions regarding the unintended effect of government guarantees on agents' incentives (Ehrenberg and

[3] Standard and Poor's Sovereign Credit Rating Report, "United States of America 'AAA/A-1+' Rating Affirmed; Outlook Revised To Negative", April 18, 2011, p. 4.

Oaxaca, 1976; Mortensen, 1977). In particular, government guarantees in the form of social insurance lead to moral hazard and perverse incentives for insured individuals and firms, imposing large welfare costs. From a firm's perspective, the moral hazard effect from government insurance manifests itself in riskier management of human capital and aggressive layoffs during crises (Feldstein, 1978; Topel, 1983; Burdett and Wright, 1989). From an individual's perspective, the implicit reliance on government insurance results in higher risk tolerance and reduced effort (Feldstein, 1989; Hansen and Imrohoroglu, 1992).[4]

In the context of the financial sector, the role of government guarantees was first studied from the perspective of deposit insurance. In early work, Merton (1977) used a contingent claim framework to show that government deposit insurance provides banks with a put option on the guarantor. Unless insurance premia perfectly adjust for risk, this put option induces banks to take on more risk. In subsequent work, Kanatas (1986) has shown that even if insurance premia are periodically adjusted for risk, banks receive an incentive to strategically vary their risk exposure by demonstrating lower risk during assessment periods and engaging in aggressive risk taking between examination dates.

A related set of theoretical work has reached broadly similar conclusions by studying another form of government insurance – loan guarantees. In particular, Chaney and Thakor (1985) show that the introduction of government loan guarantees creates incentives for firms to make riskier investments and increase leverage. These perverse incentives impose a significant cost on the government in the form of increased liabilities (e.g., Sosin, 1980; Selby, Franks, and Karki, 1988; Bulow and Rogoff, 1989; Hemming, 2006).

Perhaps one of the most extreme forms of government guarantees is a bailout of distressed firms. A central issue in the theoretical frameworks of government bailouts has been the effect of such a policy on firms' risk taking. A number of studies show analytically that the downside protection from the government encourages risk taking by inducing moral hazard, both by individual banks (Mailath and Mester, 1994) and at the aggregate level (Acharya and Yorulmazer, 2007). These risk taking incentives can have far-reaching destabilizing effects on the financial system and the entire economy by raising its sovereign credit risk and the cost of national debt (Acharya, Drechsler, and Schnabl, 2011). However, a contrasting theoretical view argues that bailouts may reduce

[4] A number of more recent contributions derive similar conclusions and demonstrate the pernicious welfare effects resulting from perverse incentives introduced by government guarantees. Please see Fredriksson and Holmlund (2006) for a review of this work.

risk taking at protected banks. In particular, a bailout raises the value of a bank charter by reducing the refinancing costs and increasing the bank's long-term probability of survival. In turn, the higher charter value, which a bank would lose in case of failure, acts as a deterrent to risk taking (Keeley, 1990). The disciplining effect of the charter value is predicted to be amplified under the conditions similar to those observed during the recent crisis. For example, when the bailout is discretionary and follows an adverse macroeconomic shock, the risk-reducing effect of the charter value may outweigh moral hazard, resulting in a lower equilibrium level of risk (Goodhart and Huang, 1999; Cordella and Yeyati, 2003).

The primary goal of our paper is to investigate the effect of a bailout on firms' risk taking behavior. Motivated by the debate in the theoretical literature, we formulate our central hypotheses as follows:

H1a*: A firm's bailout is followed by an increase in its risk taking*

H1b*: A firm's bailout is followed by a reduction in its risk taking*

2.2. Empirical Evidence

A recent wave of bailouts around the globe has enabled researchers to provide empirical evidence on various types of government aid. In particular, government assistance in the United States and Germany has received the most attention in the literature and will be the primary focus of our discussion.

In the United States, several studies have focused on the causes and consequences of government assistance programs during the financial crisis. Veronesi and Zingales (2010) calculate the costs and benefits of the bailout from the perspective of large banks' stakeholders and conclude that the government provided significant subsidies to bailed firms. Bayazitova and Shivdasani (2012) study banks' incentives to participate in CPP and show that the bailout raised investor expectations of future regulatory interventions. Li (2012) investigates the determinants of government assistance decisions and studies the dynamics of asset growth at bailed banks. Duchin and Sosyura (2012) document the role of banks' political connections in the distribution of CPP funds and show that government investments in politically-connected banks earned lower returns.

Perhaps the closest to our article is a recent study by Black and Hazelwood (2012), which provides survey evidence on credit origination at bailed banks. In a sample of 29 TARP banks and 28 non-TARP banks, the authors find that after the bailout, most TARP banks shifted credit origination toward riskier loans, as measured by the survey's internal risk rating. The authors show that the increase in risk is confined to large and medium

banks and attribute their results to moral hazard. This paper and ours provide complementary evidence from different economic channels – from commercial loans in their article to retail credit, syndicated loans, and portfolio investments in our paper. In addition, by combining the study of banks' asset risk with the analysis of their capital positions, we provide evidence on banks' aggregate risk. We find that the relative improvement in capital positions at bailed banks from federal infusions was more than offset by an increase in the risk of their assets, resulting in a higher aggregate risk and higher likelihood of default, as compared to unapproved banks.

Outside of the United States, research on government interventions in Germany has provided a valuable long-term perspective. Gropp, Grundl, and Guettler (2011) use a natural experiment to study the effect of government guarantees on bank risk taking. They find that the removal of government guarantees for German savings banks leads to lower risk taking and conclude that government guarantees are associated with moral hazard. Berger, Bouwman, Kick, and Schaeck (2012) study two types of regulatory interventions in Germany: disciplinary actions and mandatory capital support. The authors find that both types of interventions are generally associated with lower risk taking and liquidity creation at disciplined banks. Their evidence also yields two important conclusions: (1) the consequences of government interventions vary depending on the business cycle and have an effect mainly in non-crisis years; and (2) disciplinary actions against banks generate spillover effects on other banks, providing the latter with a competitive advantage.

The combination of prior evidence and our findings suggests a highly nuanced effect of government aid on bank risk taking. This effect appears to vary with the regulatory signal associated with capital infusions, the likelihood of regulatory forbearance, and the quality of program governance. We briefly discuss these factors.

The first important factor is the type of the information signal – positive versus negative – that accompanies government assistance. In the U.S., government capital injections were voluntary and targeted a large fraction of banks. In this setting, an approval of a bank's application for federal funds implied that the bank was viewed as sufficiently healthy and/or systemically important to receive a federal back-up (Paulson, 2008). In fact, weak financial institutions were denied government assistance (Bayazitova and Shivdasani, 2012). In contrast, in Germany, capital injections were mandatory and targeted the weakest 7% of banks. These injections sent a strong negative signal from the regulators that the bank is in distress and is put on close watch by the regulators. Consistent with this interpretation, the negative signals from the regulators – mandatory injections in

Germany and rejections of applications for federal funds in the U.S. – were kept confidential to avoid bank runs and were associated with a reduction in risk in both markets. In contrast, the positive signal of a federal back-up in the U.S. was associated with an increase in risk taking.

The second important factor is regulatory forbearance. Previous research shows that regulators are significantly less likely to close weak banks during crises, when the financial system is more fragile and the number of distressed banks is large (e.g., Acharya and Yorulmazer, 2007; Brown and Dinc, 2011). If these incentives reduce the perceived threat of closure for bailed banks, government assistance may be less effective in achieving its declared goals during financial crises. Consistent with this interpretation, Berger, Bouwman, Kick, and Schaeck (2012) find that government capital injections fail to restrict bank risk taking and have little effect on liquidity creation during financial crises, in contrast to non-crisis years. Similarly, we show that government assistance in the U.S. during the crisis had little effect on credit origination and was associated with an increase rather than a reduction in risk taking. An important caveat is that our study focuses on a relatively short period after federal assistance, and our findings may be specific to programs initiated during financial crises.

A third important factor is the role of political interests in government intervention. For example, Kane (1989, 1990) argues that regulators' short time horizons and political interests induce them to pursue a policy of forbearance, thus weakening regulatory enforcement in government programs. More recently, Calomiris and Wallison (2009) show evidence of politically-motivated regulatory forbearance during the U.S. mortgage default crisis. Mian, Sufi, and Trebbi (2010) document political motivations in the adoption of TARP, which was initiated shortly before the congressional and presidential elections. To the extent that such considerations played a role in CPP, our evidence suggests that the politicized nature of banking may distort risk taking incentives. Under this interpretation, our study adds to the literature on economic distortions from government intervention in the financial sector (Sapienza 2004; Khwaja and Mian, 2005) and in other economic settings (Faccio, Masulis, and McConnell, 2006; Cohen, Coval, and Malloy, 2011).

3. Data and Summary Statistics

3.1. Capital Purchase Program

On October 3, 2008, the Emergency Economic Stabilization Act (EESA) was signed into law. The act authorized the Troubled Asset Relief Program (TARP) – a system of federal initiatives aimed at stabilizing the financial system. On October 14, 2008, the government announced the Capital Purchase Program (CPP), which authorized the Treasury to invest up to $250 billion in financial institutions. Initiated in October 2008 and terminated in December 2009, CPP invested $204.9 billion in 707 firms, becoming the first and largest TARP initiative.

To apply for CPP funds, a qualifying financial institution (QFI) – a domestic bank, bank holding company, savings association, or savings and loan holding company – submitted a short two-page application (by the deadline of November 14, 2008) to its primary federal banking regulator – the Federal Reserve, the Federal Deposit Insurance Corporation (FDIC), the Office of the Comptroller of the Currency (OCC), or the Office of Thrift Supervision (OTS). Applications of bank holding companies were submitted both to the regulator overseeing the largest bank of the holding company and to the Federal Reserve. If the initial review by the banking regulator was successful, the application was forwarded to the Treasury, which made the final decision on the investment.

The review of CPP applicants was based on the standard assessment system used by banking regulators – the Camels rating system – which evaluates 6 dimensions of a financial institution: *C*apital adequacy, *A*sset quality, *M*anagement, *E*arnings, *L*iquidity, and *S*ensitivity to market risk. The ratings in each category, which range from 1 (best) to 5 (worst), were assigned based on financial ratios and onsite examinations. In Appendix A, we provide a description of our proxies for the assessment categories, along with the definitions of other variables used in our study.

In exchange for CPP capital, banks provided the Treasury with cumulative perpetual preferred stock, which pays quarterly dividends at an annual yield of 5% for the first five years and 9% thereafter. The amount of the investment in preferred shares was determined by the Treasury, subject to the minimum threshold of 1% of a firm's risk-weighted assets (RWA) and a maximum threshold of 3% of RWA or $25 billion, whichever was smaller. In addition to the preferred stock, the Treasury obtained warrants for the common stock of public firms.

The warrants, valid for ten years, were issued for such number of common shares that the aggregate market value of the covered common shares was equal to 15% of the investment in the preferred stock.

3.2. Sample Firms

To construct our sample of firms, we begin with a list of all public domestically-controlled financial institutions that were eligible for CPP participation and were active as of September 30, 2008, the quarter immediately preceding the administration of CPP. This initial list includes 600 public firms. We focus on public firms because the regulatory filings of public firms allow us to identify whether or not a particular firm applied for CPP funds. Public financial institutions account for the overwhelming majority (92.8%) of all capital invested under CPP. In particular, the 295 public recipients of CPP funds obtained $190.1 billion under this program, according to the data from the Treasury's Office of Financial Stability.

To identify CPP applicants and to determine the status of each application, we read quarterly filings, annual reports, and proxy statements of all CPP-eligible public financial institutions, starting at the beginning of the fourth quarter of 2008 and ending at the end of the fourth quarter of 2009. We also supplement these sources with a search of each firm's press releases for any mentioning of CPP or TARP and, in cases of missing data, we call the firm's investment relations department for verification. Using this procedure, we are able to ascertain the application status of 538 of the 600 public firms eligible for CPP (89.7% of all eligible public firms).

From the 538 firms with available data, we exclude the seventeen large QFIs in our sample that were subject to stress tests under the Capital Assessment Plan (CAP).[5] This sample filter is motivated by several reasons. First, there is some evidence that these firms were asked to participate in CPP by the regulators to provide a signal to the market at the early stages of the program in the fall of 2008.[6] Second, on February 10, 2009, the regulators announced that these firms will be required to participate in CAP. Under this plan, the said firms underwent formal assessment of capitalization levels, and nine of the seventeen excluded QFIs were forced

[5] The excluded firms include Citigroup, JP Morgan, Bank of America (including Merrill Lynch), Goldman Sachs, Morgan Stanley, State Street, Bank of New York Mellon, and Wells Fargo (including Wachovia), KeyCorp, Fifth Third Bancorp, Regions Corp., BB&T, Capital One, SunTrust, U.S. Bancorp, American Express, and PNC Financial Services. The two other firms subject to the Capital Assessment Plan, namely GMAC and MetLife were not part of our original sample of QFIs. In particular, GMAC, the financing arm of General Motors, received TARP funding through the Automotive Industry Financing Program (AIFP) rather than CPP. MetLife was excluded as an insurance firm with negligible (internet) banking operations.

[6] Solomon, Deborah and David Enrich, "Devil Is in Bailout's Details", *The Wall Street Journal*, October 15, 2008.

to raise $63.1 billion in equity capital.[7] Third, in contrast to CPP, the capital raised under CAP was in the form of common stock rather than preferred stock. Because of these distinctive features of the CAP firms, we follow a conservative approach and exclude them from our sample. However, our results are not sensitive to this sample restriction and remain similar if we retain these firms. These results are discussed in Section 5.5.

Of the 521 firms in our final sample, 416 firms (79.8%) submitted CPP applications, and the remaining 105 firms explicitly stated their decision not to apply for CPP funds. Among the 416 submitted applications, 329 applications (79.1%) were approved for funding. Finally, among the firms approved for funding, 278 (84.5%) accepted the investment, while 51 firms (15.5%) declined the funds. Figure 1 illustrates the partitioning of eligible firms into each of these subgroups.

Figure 2 illustrates the typical application timeline for the median CPP applicant in our sample. To reconstruct the key dates in the application process, we collect this information for our sample firms from their press releases, proxy filings, annual and quarterly reports, and records of shareholder meetings. In Appendix B, we provide examples of firms' disclosures regarding their CPP application process. The median firm in our sample received a decision on its CPP application in 19 calendar days after the CPP application deadline. For the median firm whose application was approved, it took an extra 12 calendar days to announce the firm's decision to accept or decline CPP funds. Finally, for the median firm that accepted CPP funds, it took an additional 4 days for the funds to be disbursed from the Treasury. Overall, the vast majority (85.7%) of the publicly traded QFIs in our sample received CPP funds by the end of January 2009. Figure 3 illustrates the cumulative disbursement of CPP funds for our sample firms in time.

The average (median) amount of CPP investment in our sample was $144 ($30.1) million, as shown in Panel A of Table I. The overwhelming majority of CPP applicants (82% of firms in our sample) received approximately the maximum amount stimulated by CPP, an investment equal to 3% of the firm's risk-weighted assets.[8] Figure 4 depicts the distribution of CPP investment amounts relative to the risk weighted assets of

[7] The list of the nine of the excluded QFIs that were required to raise capital is as follows: Bank of America ($33.90 billion), Citigroup ($5.50 billion), Wells Fargo ($13.70 billion), Morgan Stanley ($1.80 billion), PNC Financial Services ($0.60 billion), SunTrust Banks ($2.20 billion), Regions Corp. ($2.50), Fifth Third Bancorp ($1.10 billion), KeyCorp ($1.80 billion).

[8] The conditions of the program establish the minimum CPP investment amount to be 1% of risk-weighted assets (RWA) and the maximum amount to be 3% of RWA or $25 billion, whichever is smaller.

recipient firms. Since the investment amount was largely hard-wired to the firm's risk weighted assets, with little variation cross-sectional variation in relative terms, we do not focus on investment amounts.

Financial data on QFIs come from the quarterly Reports of Condition and Income, commonly known as call reports, which are filed by all active FDIC-insured institutions. Our sample period starts in the first quarter of 2006 and ends in the fourth quarter of 2010. Panel A of Table I provides sample-wide summary statistics for the Camels variables and other characteristics for the QFIs included in our sample.

The average (median) QFI has book assets of $327.4 million ($145.1 million). The Camels variable *Capital Adequacy*, which reflects a bank's Tier 1 risk-based capital ratio, shows that the vast majority of banks are well capitalized. For example, the 50th percentile of the Tier 1 ratio in our sample is 10.7%, nearly double the threshold of 6% stipulated by the FDIC's definition of a well-capitalized institution. The variable *Asset Quality* captures loan defaults and shows the negative of the ratio of nonperforming loans to total loans. To measure bank earnings, we use the return on equity (ROE), which measures a bank's net income relative to equity used to support both on- and off-balance sheet activities. The variable *Earnings* shows that the average (median) bank in our sample has a quarterly ROE of 3.2% (6.5%). To proxy for a firm's exposure to the financial crisis, we use the ratio of foreclosed assets to the total value of loans and leases. This ratio for the average (median) bank in our sample was 0.40% (0.15%). While *Asset Quality* is a forward-looking measure based on nonperforming loans, *Foreclosures* is a backward-looking measures based on assets that have already been foreclosed. Next, following Bayazitova and Shivdasani (2012), we also construct an index of a bank's exposure to regional economic shocks. For each bank, the index is calculated as a weighted average of the quarterly changes in the state-coincident macro indicators from the Federal Reserve Bank of Philadelphia.[9] The weights are computed for each bank as the ratio of this bank's deposits held at the branches in a particular state to all of the bank's deposits. These weights are revised annually based on the FDIC summary of deposits data. Finally, we also collect data on a bank's funding sources. In particular, we compute the percentage of a bank's funds obtained from core deposits. This variable helps control for the effect of the funding mix on banks' lending policies, as discussed in Song and

[9] The coincident indexes are designed to capture the economic conditions in a state by aggregating the data on four state-level indicators into one statistic: (1) nonfarm employment, (2) average hours worked in manufacturing, (3) the unemployment rate, and (4) wage and salary disbursements deflated by the consumer price index. For more detailed information on the construction of the state-coincident macro indicators, please see the web page of the Philadelphia Federal Reserve Bank: http://www.philadelphiafed.org/research-and-data/regional-economy/indexes/coincident

Thakor (2007). Panel A in Table I shows that the percentage of core deposit funding for the average (median) firm in our sample is 80.2% (81.0%).

3.3. Loan Data

We obtain loan application data from the Home Mortgage Disclosure Act (HMDA) Loan Application Registry. This dataset covers approximately 90% of mortgage lending in the U.S. (Dell'Ariccia, Igan, and Laeven, 2012), with the exception of mortgage applications submitted to the smallest banks (assets under $37 million) located in rural areas.[10] The unique feature of these data is its coverage of both approved and denied mortgages, which enables us to study bank lending decisions at the level of each application. This attribute is important for our empirical tests, since it will allow us to distinguish changes in credit origination driven by loan demand (the number of applications and their quality) from those driven by credit rationing of financial institutions.

At the level of each application, we are able to observe the characteristics of the borrower (e.g., income, gender, and race), the features of the loan (e.g., loan amount and loan type), and the decision of the bank on the loan application (e.g., loan originated, application denied, application withdrawn, etc.). The borrower and loan characteristics allow us to study changes in banks' credit rationing across riskier and safer loans. Finally, the HMDA data provide the location of the property underlying each mortgage application. This location is reported by the U.S. census tract (median population of 4,066 residents), an area "designed to be homogeneous with respect to population characteristics, economic status, and living conditions".[11] This level of data granularity allows us to focus on the differences in lending decisions by different banks within the same small region, while controlling for the conditions specific to the local housing market.

To construct our sample of mortgage applications, we aggregate financial institutions in HMDA at the level of the bank holding company and match them to our list of QFIs. Among the 521 QFIs in our sample, 498 institutions reported their mortgage activity under HMDA in 2006-2010. Next, we limit our analysis to applications that were either denied or approved, thus excluding observations with ambiguous statuses, such as

[10] According to the Home Mortgage Disclosure Act of 1975, most depository institutions must disclose data on applications for home mortgage loans, home improvement loans, and loan refinancing. A depository institution is required to report if it has any office or branch located in any metropolitan statistical area (MSAs) and meets the minimum threshold of asset size. For the year 2008, this reporting threshold was established at $37 million.

[11] Tract definition from the U.S. Census Bureau, Geographic Areas Reference Manual, p. 10-1. http://www.census.gov/geo/www/GARM/Ch10GARM.pdf

incomplete files and withdrawn applications. Since the focus of our analysis is on credit origination, we restrict our sample to new loans, thus excluding refinancing and purchases of existing loans. We also exclude loans that were sold in the same calendar year when they were originated because these loans have a comparatively smaller effect on the risk of the originating QFI. Finally, we drop observations with missing data.

Panel B of Table I provides summary statistics for our sample of mortgage applications. Approximately 64.3% of applications are approved, and the median amount of the loan is $123,000. The data show significant variation in the loan-to-income ratio, a measure commonly used in the mortgage industry as an indicator of loan risk.[12] This ratio in our sample ranges from 0.85 at the 25th percentile to 2.8 at the 75th percentile.

In addition to the analysis of retail lending, we also collect data on corporate credit facilities from DealScan. This dataset covers large corporate loans, the vast majority of which are syndicated (i.e., originated by several banks in a syndicate). DealScan reports loans at origination, allowing us to focus on the issuance of new corporate credit and to avoid contamination from the drawdowns of previously-made financial commitments. Each unit of observation is a newly-issued credit facility, which provides such information as the originating bank(s), date of origination, loan amount, interest rate, and the corporate borrower.

According to DealScan, between 2006 and 2010, 179 QFIs in our sample originated $1.7 trillion in corporate credit. As shown in Panel B of Table I, the average (median) corporate loan amount during our sample period is $604 ($300) million. In our subsequent tests, we break down the newly-issued credit between approved and unapproved banks at the loan level, which allows us to control for the changes in investment opportunities of industrial firms. As a result, this data feature enables us to identify the effect of CPP, if any, on industrial firms' access to credit, as proxied by the share of loans originated by CPP recipients in the firm's funding mix.

4. Empirical Methodology

The objective of our empirical design is to identify the treatment effect of CPP approvals on the risk taking behavior in the financial sector. To isolate this effect, we would like to control for several issues that may confound empirical inferences: (1) selection of CPP recipients; (2) changes in economic conditions; (3) changes in the distribution of credit demand between approved and denied banks.

[12] For example, the loan-to-income ratio is used by regulators in the assessment of mortgage risk in determining its eligibility for federal loan modification programs, such as the Federal Home Affordable Modification Program (HAMP).

4.1. Selection

Since CPP recipients are not selected at random, we would like to control for the possibility that approved banks were selected on attributes correlated with subsequent risk. For example, if government assistance was provided to better-capitalized or more profitable banks, which were more likely to survive the crisis, these banks may have been better positioned to increase their risk after receiving federal capital. Under such a scenario, the subsequent increase in risk taking by approved banks could be explained by the selection of CPP recipients rather than by government intervention.

Several features of our data enable us to account for selection of recipient firms. A typical issue in most studies on government regulation is that the researcher can identify only the firms approved for government intervention, thus making it difficult to distinguish those that were denied government assistance (negative treatment effect) from those that did not request it (outside the selection group). In contrast, our data allow us to identify both applicants and non-applicants for government funds, to observe the selection of approved and denied firms, and to document the subsequent effect of both positive and negative treatment. Second, the criteria used by the government in its various forms of financial intervention in the private sector are typically unknown to the researcher. In contrast, our research design focuses on a systematic and structured government program with a unified decision framework and a known set of declared selection criteria.

To account for selection of CPP recipients, we explicitly control for proxies of the Camels measures of financial condition and performance, bank size, reliance on core deposits, exposure to the crisis, and exposure to regional economic shocks. We note, however, that our Camels proxies are constrained by publicly available data and therefore constitute an imperfect measure of the true Camels ratings, which are never made public by the regulators. Furthermore, our measures cannot capture the onsite bank examination ratings.

To further address the selection issue, we use an instrumental variable approach. Specifically, as an instrument for CPP approvals, we propose a firm's geographic location in the election district of a House member serving on key finance committees involved in drafting and amending TARP. We consider a firm to be connected to a politician if it is headquartered in his or her election district. We consider a politician to be connected to TARP if he or she served on the House Financial Services Committee in the 110th Congress (2007-2008) and was a member of the Subcommittee on Financial Institutions or the Subcommittee on Capital Markets. These

subcommittees played a direct role in the development of the EESA and were charged with preparing voting recommendations for Congress on authorizing and expanding TARP. This role of the subcommittees fostered close interaction between committee members, banking regulators, and the Treasury. For example, Duchin and Sosyura (2012) provide examples of this interaction, where members of these subcommittees have been shown to arrange meetings between QFIs and the Treasury, write letters to banking regulators on behalf of particular firms, and even write provisions into the EESA aimed at helping particular firms in their home state.

To construct our instrument, we define an indicator variable, *House representation*, which takes on the value of one if a firm is headquartered in a district of a House member who served on at least one of the two key subcommittees in the 110th Congress and zero otherwise. This variable definition is motivated by simplicity and ease of interpretation, and our results are very similar if we use alternative specifications, such as an index of a firm's representation on each committee.

In our sample, 19.1% of CPP applicants have this type of political connection. The firms with a geography-based political connection in 2008 are also widely dispersed geographically, representing 31 states.[13] In Appendix C, we show that *House representation* satisfies the inclusion restriction. This appendix reports the results from an OLS regression explaining the decision of CPP approval using *House representation*, Camels proxies, foreclosures, percentage of core deposit funding, exposure to regional economic shocks, and size. In the first-stage regression, the *House representation* variable is found to have a positive and statistically significant effect on CPP approvals. Accordingly, the F-test in the first stage model is highly significant (F-statistic = 16.76 with a p-value less than 0.001), confirming the strength of the instrument. To complement the F-test, we also consider Shea's (1997) partial R-squared from the first-stage regressions. The R-squared exceeds the suggested (rule of thumb) hurdle of 10%, with a value of 14.2%. These statistics suggest that our instrument is relevant in explaining the variation of our model's potentially endogenous regressors.

Next, we consider whether the proposed instrument likely satisfies the exclusion restriction. We begin by providing a brief discussion of the appointment process of House members to committees and subcommittees. The first important factor in committee assignments is the fraction of House seats won by each party in the most recent elections, which affects the ratio of seats allocated to the party on each congressional committee. After

[13] States with two or more seats on the key subcommittees include AL, CA, CO, CT, DE, FL, GA, IL, IN, KS, KY, MA, MN, MO, NH, NJ, NY, NC, OH, PA, SC, TN, TX, and WV.

general elections are concluded, House leaders meet to determine party ratios on each committee via inter-party negotiations. For example, in the 110th Congress (2007-08), the Subcommittee on Capital Markets in the House Financial Services Committee consisted of 26 Democrats and 23 Republicans, but in the 111th Congress (2009-10), this subcommittee included 30 Democrats and 20 Republicans.

The second important factor in committee assignments is the pool of elected House members and their committee preferences. In particular, each House member can serve on no more than two standing committees and four subcommittees of those committees. Moreover, there are additional constraints on committees imposed by each party. For example, the Democratic Party, but not the Republican Party, considers the House Financial Services Committee to be an exclusive committee, and the Democratic members of this committee generally cannot serve on other committees. Ultimately, committee members are determined separately by each party in a process that considers the number of seats negotiated by the party, the constraints on committee memberships imposed by the House and by the party, and the preferences of individual members.

Since the distribution of House seats and the pool of House members are determined in nationwide elections, these factors are likely outside of control for a given financial firm. Further, since committee assignments are reevaluated every two years, there is significant turnover in committee representation for each election district. These factors, combined with the relatively sudden adoption of the bailout program, make it reasonable to conjecture that a firm's geography-based political connection is not directly related to a firm's risk taking and credit origination, except through the effect of house representation on CPP approvals.

To account for selection of CPP-approved banks, we estimate all our tests using the predicted likelihood of CPP approval from the first stage regression reported in Appendix C. For completeness, we also show the main results without the instrumental variable. Furthermore, to accommodate various functional forms of the relation between the Camels measures and the approval for government funds, we repeat all of our tests in subsamples matched on the Camels variables. Specifically, we construct a subsample of approved banks matched on their approval propensity to other CPP applicants that were not approved for government funds. Since our sample consists of 327 firms that were approved for CPP and 87 firms that were not approved, we start with the sample of 87 unapproved firms, and match each of them to the approved firm with the closest approval propensity score.

The propensity scores are estimated from a linear regression of the approval decision on a host of bank-level variables, which include proxies for the Camels measures of financial condition and performance, foreclosures, and size. This procedure results in a matched sample of 174 firms, whose summary statistics are shown in Panel C of Table I. The two groups of matched firms are generally statistically indistinguishable with respect to the Camels proxies, crisis exposure (foreclosures), and size.

In addition to the declared decision criteria, it is possible that the regulators used other, perhaps less tangible criteria in the selection of recipient firms. To control for these characteristics, our tests include bank fixed effects, which capture all time-invariant bank characteristics.

4.2. Economic Conditions

The financial crisis was characterized by rapid changes in economic conditions across various parts of the United States. In this environment, a change in a bank's risk may be induced by the worsening macroeconomic conditions in the regions to which this bank has significant exposure.

To account for the dynamics in the economy-wide conditions, we adopt the difference-in-difference methodology as our main specification, thus controlling for the shocks common to the entire financial sector. To capture the heterogeneity in economic conditions at the regional level, we construct specifications with regional fixed effects, where each region is defined at the level of one U.S. Census Tract. This analysis compares credit rationing by approved and unapproved CPP applicants on loan applications submitted within the same census tract, thus controlling for the differential effect of the crisis at a highly refined unit of geographic analysis. Finally, we also account for time-variant changes in economic conditions at the regional level by controlling for the state macro index of a bank's exposure to regional economic shocks.

4.3. Demand for Credit

It is possible that federal capital infusions were associated with changes in the distribution of credit demand and the quality of borrowers between approved and unapproved CPP applicants. For example, banks may have been approved for federal funds because of the expected increase in credit demand in their markets. Alternatively, federal capital infusions may have changed borrowers' perception of credit availability across banks, leading them to apply for credit at banks that received additional capital from the government.

As discussed earlier, our empirical tests distinguish the supply-side changes in bank credit origination from the demand-side changes in the volume and quality of potential borrowers. At the retail level, we observe the incoming mortgage applications and study banks' credit rationing across borrowers of various levels of risk. We also explicitly test for systematic differences in the volume of credit demand between approved and unapproved banks. At the corporate level, we focus on the within-firm variation in credit obtained from approved and unapproved banks at the level of each corporate borrower, thus controlling for each firm's credit demand.

5. Retail Lending

5.1. Baseline Regressions

In this section, we study the effect of CPP on credit rationing across borrowers with different risk characteristics. Our main empirical framework is a difference-in-difference model of credit origination, where the first difference is taken between the periods before and after CPP, and the second difference is taken between approved and denied CPP applicants.

To account for credit demand and capture the active credit rationing by financial institutions, we estimate a linear model of loan approvals, where each observation is a mortgage application, and the outcome variable is a bank's decision to approve or deny the loan. We use a linear model rather than a logit or probit framework because non-linear models tend to produce biased estimates in panel datasets with a short time series and many fixed effects. In particular, non-linear specifications give rise to an incidental parameters problem, which leads to inconsistent coefficient estimates.[14] Furthermore, logit and probit fixed effects models generate biased estimates for interaction terms, our main coefficients of interest (Ai and Norton, 2003). Therefore, we follow the recommendation of the econometrics literature (Wooldridge, 2002) and the research design of other recent studies with panel data on loan approvals (Puri, Rocholl, and Steffen, 2011) and estimate a linear model of loan approvals. Our empirical model is estimated on a sample period from 2006 to 2010 and is specified as follows:

[14] The incidental parameters problem, first noted in Neyman and Scott (1948) and discussed more recently in Lancaster (2000) and Greene (2004), arises because the number of fixed effects increases without bounds, but the amount of information available for their estimation is limited, particularly in large panel datasets with a short time series. As a result, both fixed effect estimates and coefficients on other variables tend to be biased in this setting.

$$Y_{i,b,c,t} = \beta_1 \cdot LoanToIncome_i + \beta_2 \cdot After\ CPP * Approved\ bank_b + \beta_3 \cdot After\ CPP * LoanToIncome_i + \beta_4 \cdot Approved\ bank_b * LoanToIncome_i + \beta_5 \cdot After\ CPP *\ Approved\ bank_b * LoanToIncome_i + \beta_6 \cdot RegulatoryInterventions_b + \beta_7 \cdot RegulatoryInterventions_b * LoanToIncome_i + A_b + B_c + C_t + \alpha \cdot X_{b,c,t} + \gamma \cdot Z_i + \varepsilon_{i,b,c,t}$$

The dependent variable $Y_{i,b,c,t}$ is an indicator that equals 1 if a loan application by customer *i* at bank *b* for census tract *c* in year *t* is approved and 0 otherwise. The main independent variables include *After CPP* (an indicator that equals 1 in 2009-2010 and 0 otherwise), *Approved bank* (an indicator that equals 1 for approved CPP applicants and 0 for denied applicants), and *LoanToIncome* (a continuous measure of loan risk).

There are several interaction terms of interest. The interaction term *After CPP x Approved bank* captures the difference-in-difference effect of CPP on the overall volume of credit origination by approved banks (relative to unapproved banks) from before to after CPP. The interaction term *After CPP x Approved bank x LoanToIncome* shows how the marginal effect of CPP on loan origination at approved banks (relative to unapproved banks) varies with the level of borrower risk, as proxied by the loan-to-income ratio. As discussed earlier, the loan-to-income ratio has been shown to be a good predictor of mortgage default (Campbell and Cocco, 2011).

To capture the effect of CPP, we would like to control for bank characteristics which are correlated with CPP investments and which may also influence a bank's credit origination. First, we include bank fixed effects, A_b, to control for time-invariant unobservable bank characteristics. Second, we include controls, $X_{b,c,t}$, for the following bank characteristics: size (the natural logarithm of book assets), proxies for the Camels measures of a bank's financial condition and performance, the percentage of funding from core deposits, and proxies for a bank's exposure to the crisis (foreclosures) and to regional economic shocks (state macro index).

We would also like to control for the effect of regulatory interventions – namely, the disciplinary actions imposed on banks by their regulators, such as cease-and-desist orders, restrictions on lending, and suspension of certain banking operations. Berger, Bouwman, Kick, and Schaeck (2012) find that regulatory interventions are associated with a decline in risk-taking and lending in Germany. To control for regulatory interventions, we collect data on all publicly disclosed disciplinary actions imposed on U.S. financial institutions during our sample period by one of the four banking regulations: the FDIC, Federal Reserve, OCC, and OTS. We obtain these data

from the web-based databases of disciplinary actions maintained by each of the four banking regulators.[15] The two most common types of disciplinary actions imposed on firms in our sample between 2006 and 2010 include a Cease and Desist Oder (208 cases) and a Supervisory Agreement (158 cases).

To account for these disciplinary actions, we define an indicator variable *Regulatory interventions*, which equals 1 if a disciplinary action was imposed on a bank in a given calendar year and 0 otherwise. This variable definition is motivated by the annual structure of our data on loan applications. In addition to controlling for the direct effect of regulatory interventions on credit origination (captured by the coefficient on *Regulatory interventions*), we also include the interaction term *Regulatory interventions x LoanToIncome*, which captures the effect of regulatory interventions on the risk of credit origination, as measured by loan approval rates across borrowers of different risk.

Since our focus is on bank lending decisions, we would also like to control for variation in the quality of mortgage applications received by each bank. First, we include housing market fixed effects, B_c, to compare lending decisions within the same census tract. Second, we include borrower-level characteristics that affect loan approval, such as the loan-to-income ratio and the fixed effects for borrower gender, race, and ethnicity (Z_i). For brevity, we do not report regression coefficients on these controls.

In Table II, we present the results for the full sample of approved and unapproved CPP applicants, as well as evidence from the matched samples of approved and unapproved CPP applicants, constructed as discussed in the previous section. The columns in Table II correspond to different empirical specifications. In Columns (1) and (4), we report the results from our baseline OLS model, in which *Approved bank* is the predicted value from the first-stage regression reported in Appendix C, that is, from regressing CPP approval on *House representation* and control variables. In Columns (2) and (5), we include in the regression all banks, including those that did not apply and those with unverified application status. In the first stage, we estimate the CPP approval regression for all banks, setting CPP approval to zero for non-applicants and banks with unverified application status. In the second stage, we define *Approved bank* as the predicted value from the first-stage regression for all these banks.

[15] For example, the FDIC voted to disclose disciplinary actions taken against the FDIC-regulated banks in May 1985, and the regulation went into effect on January 1, 1986. The FDIC database of enforcement decisions and orders (EDO) is available online at: https://www5.fdic.gov/EDO/DataPresentation.html . Other banking regulators have adopted similar disclosure rules and provide similarly-structured databases.

Finally, in Columns (3) and (6), we define *Approved bank* simply as an indicator that equals 1 if the bank applied and was approved for CPP and 0 if it applied and was not approved.

The empirical results, summarized in Table II, show a significant increase in loan origination rates for riskier borrowers at approved banks relative to unapproved banks. These results hold both in the full sample and in the matched sample and are statistically significant at conventional levels. In particular, the coefficient on the interaction term *After CPP x Approved bank x LoanToIncome* is positive and statistically significant at the 10% level or better in all cases. The economic magnitude is also nontrivial. Based on Column (3), relative to banks that were denied federal assistance, approved banks increased their loan origination rates by 4.9 percentage points for riskier mortgage applications, defined as applications with an above-median loan-to-income ratio of the borrower (median ratio = 1.78). Moreover, the relative shift toward riskier borrowers by approved banks (relative to unapproved banks) is observed only in the post-CPP period. In particular, credit origination rates for riskier borrowers were statistically indistinguishable between the two groups of banks before CPP, as indicated by the coefficient on the interaction term *Approved bank x LoanToIncome*.

We do not detect a significant effect of CPP on the overall volume of credit origination by approved banks relative to their unapproved peers, as evidenced by the coefficient on the interaction term *After CPP x Approved bank*. The coefficient on this interaction term is economically small, changes signs across specifications, and is never statistically significant across all columns. The results on other variables are consistent with the findings in the literature. In particular, the coefficient on the loan-to-income ratio is always negative and highly significant across all specifications, indicating that applications from higher-risk borrowers are less likely to be approved. Finally, the coefficient on the variable *Regulatory interventions* is negative and statistically significant in four of the six specifications. In addition to the overall credit-tightening effect of regulatory interventions, disciplined banks appear to further tighten approval rates for riskier borrowers, as indicated by the interaction term *Regulatory interventions x LoanToIncome*. The coefficient on this interaction term is always negative and statistically significant at the 10% level or better across all specifications. The evidence on regulatory interventions is consistent with the findings in Berger, Bouwman, Kick, and Schaeck (2012) that regulatory interventions are associated with a decline in risk taking and liquidity creation at disciplined banks.

Overall, our main finding is that after CPP, approved banks tilted their credit origination toward higher-risk loans by loosening credit standards for riskier borrowers. This pattern would be consistent with a strategy aimed at originating assets which produce higher yields but do not cause deterioration in regulatory ratios, since the main regulatory ratios do not distinguish between higher-risk and lower-risk mortgages.[16]

5.2. Cross-Sectional Evidence

In this section, we evaluate how our main findings on risk taking vary with bank characteristics, such as size, capitalization, organizational form, and exposure to the crisis. In particular, we reestimate the baseline regression of loan approvals in subsamples partitioned on these key characteristics.

We begin by investigating how our results vary across banks of different size. Prior research suggests that there are significant differences in credit policies of large and small banks. For example, Berger, Miller, Petersen, Rajan, and Stein (2005) show that large banks have different balance sheet compositions, borrower clienteles, and lending practices than small banks. Yet it is less clear how the differences between large and small banks are associated with risk. On the one hand, bank size may be positively related to risk taking since large banks have the potential to diversify their assets and absorb a greater level of risk (Saunders, Strock, and Travlos, 1990). Also, to the extent that bank size captures market power in the loan market, this market power can lead to riskier loan portfolios (Boyd and De Nicolo, 2005; Berger, Klapper, Turk-Ariss, 2009). On the other hand, greater market power of large banks increases their franchise value. In turn, a higher franchise value, which a bank stands to lose in case of insolvency, has been shown to deter risk taking (Marcus, 1984; Keeley, 1990; Demsetz, Saidenberg, and Strahan, 1996; Carletti and Hartmann, 2003). While even the general relation between bank size and risk taking remains an open question, we know even less about the differences in risk taking between large and small banks in response to government support. Our next tests provide evidence in this direction.

In Columns (1) and (2) of Table III, we split the banks in our sample at the median value of book assets ($145 million) and reestimate our main difference-in-difference model of loan approvals. The estimation results

[16] For example, consider a closely monitored capitalization ratio, Tier-1 risk-based capital, which is commonly used as a measure of bank capital adequacy. The ratio is computed by dividing bank's capital by the risk-weighted bank assets (all assets are divided into risk classes, with safer assets assigned lower weights). The intuition is that banks holding riskier assets require a greater amount of capital to remain well capitalized. According to regulatory requirements, all mortgages are assigned the same weight of 0.5. Under this methodology, a prime and a subprime mortgage of equal notional amounts would have the same effect on the ratio, despite the significant difference in the perceived risk of the borrower.

for the full sample and matched samples are presented in Panels A and B of Table III, respectively. The evidence in both panels is similar. First, our main finding of higher risk taking by approved banks (relative to unapproved banks) after CPP holds for both larger and smaller banks, as shown by the positive and significant coefficient on the triple interaction term *After CPP x Approved bank x LoanToIncome*. Second, the incremental increase in risk taking after CPP by approved banks (relative to unapproved banks) is significantly stronger, both statistically and economically, at larger banks. In economic terms, the increase in approval rates on riskier loans (above-median loan-to-income ratio) was approximately 5.5% greater at large approved banks than at small approved banks, relative to their unapproved counterparts. These estimates also provide economic insight into the drivers of the overall increase in the origination rate of riskier loans by approved banks reported in Table II.

Our findings on bank risk taking are consistent with the evidence in Black and Hazelwood (2012). Using survey data, the authors study changes in the banks' internal risk rating of originated loans at 29 TARP banks and 28 non-TARP banks. They find that all but the smallest TARP banks increased risk taking after federal capital infusions, and this increase in risk was the strongest at larger banks. The similarity of our evidence suggests two inferences. First, our measures of loan risk based on borrower characteristics result in similar conclusions to those obtained from the risk ratings supplied by originating banks. Second, the increase in risk taking at the majority of TARP banks appears to be a conscientious decision to the extent it was noted in their internal risk assessments.

Next, we study whether the effect of CPP approvals on bank risk taking varies with bank capitalization. The theoretical literature provides diverging predictions for the relation between capital and bank risk taking. On the one hand, higher capitalization levels may decrease risk taking because they reduce asset-substitution (Morrison and White, 2005) and strengthen monitoring incentives (Holmstrom and Tirole, 1997; Mehran and Thakor, 2011). On the other hand, higher capitalization levels may push banks to shift capital into riskier portfolios unless this risk-shifting is constrained by the regulators (Koehn and Santomero, 1980). Furthermore, if higher capitalization levels increase banks' likelihood of survival, banks may take on more risk because they estimate a lower probability of regulatory closure (Calem and Robb, 1999).

In Columns (3) and (4) of Table III, we partition the banks in the sample at the median equity capital ratio (10.1%) and test whether the effects of CPP approval differ between high-capitalization and low-capitalization banks. We find that our main conclusions hold in both subsamples. In particular, after CPP, both subsamples of

approved banks increased origination rates on riskier loans (relative to unapproved banks), as indicated by positive and significant coefficients on the triple interaction term *After CPP x Approved bank x LoanToIncome* in both Panel A (full sample) and Panel B (matched samples) of Table III. However, the shift in risk taking was significantly stronger for low-capitalization banks. For example, the point estimates on the said triple interaction term in the full sample are almost twice as large for low-capitalization banks as for high-capitalization banks (0.091 and 0.048, respectively). In economic terms, the increase in approval rates on riskier loans (above-median loan-to-income ratio) was approximately 4.8% larger at low-capitalization approved banks than at high-capitalization approved banks, relative to their unapproved counterparts.

Consistent with our main results, we find no significant increase in lending in both subsamples partitioned on bank capitalization, as indicated by the insignificant coefficients on the interaction term *After CPP x Approved bank* in both panels. These findings are related to a recent study by Li (2012), where the author investigates the effect of TARP on credit supply. He finds an increase of 6.4% in the loan supply within the subsample of poorly-capitalized TARP recipients. We believe that the difference in our results within this subsample is attributable to some of the following methodological distinctions. First, since changes in loan demand are unobservable in Li (2012), they may account for some of the identified increase in the book value of the loans. Second, the control group in Li (2012) includes all non-TARP banks, including banks that did not apply for TARP and banks that applied, but were rejected. Third, while we focus on publicly-traded banks to infer their application status from corporate disclosure, Li (2012) does not require this information and includes both public and private financial institutions. Under this last interpretation, it is possible that the stimulatory effect of TARP on credit supply was confined to small private banks with low capitalization.

Next, we examine whether our results differ between banks with high and low exposure to regional economic shocks. We conjecture that banks with significant exposure to the hardest-hit states, such as Nevada or Florida, may respond differently to government assistance, as compared to banks located in regions that were less affected by the crisis. Since virtually all of the banks in our sample operate in multiple states, we measure a bank's exposure to regional economic shocks using the state macro index. As discussed earlier, this index is a weighted average of the macroeconomic indicators across all states in which a given bank maintains active branches, and the weights represent the fraction of the bank's deposits held in the branches within each state.

Columns (5) and (6) of Table III show the results in the subsamples of banks with high and low exposure to the crisis, defined as banks with above- and below- median value of their state macro index. The results indicate that the increase in risk taking at approved bank after CPP, relative to their unapproved peers, was observed within both subsamples. However, the point estimates suggest that the increase in risk was more pronounced at banks with a high exposure to regional economic shocks. For example, in Panel B of Table III, the coefficient on the triple interaction term *After CPP x Approved bank x LoanToIncome* for low-exposure banks in Column (5) is 0.040, significant at the 5% level, while the coefficient on this term for high-exposure banks in Column (6) is 0.074, significant at the 1% level.

Our final set of cross-sectional tests studies whether the shift in bank risk in response to CPP approvals varies with the organizational structure of the financial institution. In particular, approximately 79.6% of CPP-approved financial institutions are bank holding companies, and the remaining 20.4% are standalone banks. On the one hand, bank holding companies have a more diversified revenue stream because they operate as financial conglomerates. Moreover, even those holding companies that operate solely in the banking sector typically derive some diversification benefits from managing multiple commercial banks in different geographic markets or different market segments. The theoretical literature predicts that a higher level of a firm's diversification is associated with a greater capacity to absorb risk (e.g., Lewellen, 1971). Under this argument, we should observe a larger increase in risk taking among bank holding companies in response to CPP approvals, relative to standalone banks. On the other hand, changes in government policies in other contexts have been shown to produce a quicker and stronger effect on the behavior of standalone banks (Campello, 2002).

In Columns (7) and (8), we show the results of our main difference-in-difference tests of loan approvals for the subsamples of standalone banks and bank holding companies. While the increase in risk taking is observed in both subsamples, the economic effect is significantly stronger for bank holding companies. This finding is consistent with the theoretical predictions that revenue diversification provides a firm with a greater capacity to take on risk and permits wider boundaries for the variation of risk exposure over time.

In summary, our main conclusions about the effect of CPP on risk taking and credit origination hold in a broad range of subsamples of financial institutions. From an economic perspective, the increase in bank risk taking in response to CPP approvals was stronger at larger and better-diversified financial institutions that have a

greater capacity to absorb risk. The increase in risk was also more pronounced at banks with lower capitalization levels and greater exposure to the crisis that were arguably closer to financial distress.

5.3 Possible Explanations

In this section, we evaluate three non-mutually exclusive explanations that may account for the increase in risk taking at approved CPP banks: (1) government intervention; (2) risk arbitrage; and (3) regulatory arbitrage.

The first hypothesis – *government intervention* – posits that that the increase in risk taking at approved banks is a consequence of government intervention in their policies aimed at increasing lending to riskier borrowers. As our first test of this hypothesis, we collect data on banks that applied for CPP, were approved, but did not receive CPP funds for various institutional reasons. To identify these banks, we search QFIs' press releases, proxy statements, financial reports (8K and 10Q), and news announcements in Factiva for any mentionings of CPP. We identify 51 such firms in our sample. We then read these press releases and news articles to understand the reasons for the bank's decision to decline CPP funds. Some examples of the reasons discussed by the banks include restrictions on the issuance of preferred stock in the firm's articles of incorporation, sufficient capitalization levels, and restrictions associated with CPP participation. For illustration, Appendix D provides sample disclosures of approved CPP banks that elaborate on some of these reasons.

While all approved banks received the certification of government support in case of distress, only the banks that received federal capital were subject to CPP program conditions and possible government intervention. If government intervention was the main driver of the shift in risk at approved banks, we should observe the increase in risk only within the group of approved banks that received the funds. In contrast, in Column (1) of Table IV, we find that the increase in risk was similar across all banks approved for bailout funds, regardless of whether or not they received the money and were subject to the subsequent government regulation. This can be seen from the coefficient on the triple interaction term *After CPP x Approved bank x LoanToIncome* (in this column, *Approved bank* is defined as an indicator that equals one for approved banks that accepted CPP funds and zero for approved banks that declined CPP funds), which shows that the change in risk was statistically and economically indistinguishable between these groups of approved banks.

Next, for the subset of approved banks that did not receive CPP funds, we construct a matched sample of approved banks that *did* receive the money and were similar in size, financial condition, and performance at the

time of CPP approval. In Appendix E, we provide details on the construction of these matched samples and show that these samples are statistically indistinguishable across a variety of measures of financial condition. Among the eight characteristics compared, only one – size – is significantly different. In particular, approved banks that accepted the funds had somewhat larger book assets than the banks that declined the funds. Column (2) of Table IV reports the results in the matched sample of approved banks that received the funds and approved banks that did not receive the funds. As in Column (1), we find that the increase in risk was similar across all banks approved for bailout funds, regardless of whether or not they received the funds and were subject to the subsequent government regulation.

As another test of the government intervention hypothesis, we examine changes in bank risk taking for firms that repaid their capital quickly. We obtain data on the timing and amount of CPP repayments from the Treasury's Office of Financial Stability. In Columns (3) and (4) of Table IV, we focus on the subset of banks that repaid their CPP capital in 2009 and were relieved of CPP constraints and possible government intervention. In Column (3), we compare approved banks that repaid CPP funds in 2009 and banks whose CPP applications were not approved. In Column (4), we construct a matched sample of these two groups of banks based on the one-to-one matching procedure according to the propensity score for CPP approval. We find that CPP approvals were followed by an increase in risk taking at these firms that was comparable to, albeit a bit smaller than, that observed in the main sample (point estimates on the triple interaction term of 0.056 and 0.051 relative to the point estimate of 0.080 in Column (1) of Table II). However, due to the smaller sample size, the statistical significance of the increase in risk in this subsample declines, as evidenced by an increase in p-values.

Collectively, the results of both tests of the government intervention hypothesis appear to provide similar conclusions. In particular, to the extent that government intervention played a role in banks' credit rationing and investment decisions, it appears unlikely to have been the primary driver of higher risk-taking.

The second hypothesis – *risk arbitrage* – conjectures that some of the risky assets, such as subprime mortgages and investment securities, were significantly underpriced during the financial crisis, providing excess profit opportunities with relatively little risk. In this case, the additional CPP capital may have enabled bailed banks to exploit these opportunities without an ex-post increase in risk.

To test this hypothesis, we first study the changes in net loan charge-offs at approved banks relative to their unapproved counterparts, using a difference-in-difference regression framework, where the dependent variable is the fraction of loan charge-offs relative to total loans. One limitation in this analysis is that we have a relatively short post-CPP time period. This is somewhat mitigated by the evidence that a significant fraction of mortgage defaults tends to be concentrated during the first two years of a loan's life, the time horizon of choice in many recent studies on loan performance (Keys, Mukherjee, Seru, and Vig, 2010; Demyanyk and Van Hemert, 2011; Rajan, Seru, and Vig, 2012). Another limitation is that our data do not allow us to track the specific loans approved after CPP. Consequently, the observed loan charge-offs are likely to reflect loan losses on loans approved both before and after CPP. However, to the extent that denied CPP applicants had a lower quality of loan portfolios (Bayazitova and Shivdasani, 2012), likely to materialize in future loan delinquencies, this effect would bias our tests towards finding an increase in loan charge-offs at *denied* banks relative to approved banks. In contrast, our findings indicate the opposite pattern. In particular, Columns (5) and (6) of Table IV show a significant increase in loan charge-offs at *approved* CPP banks relative to their denied peers in the full and matched samples, respectively. This is indicated by the positive and significant interaction term *After CPP x Approved bank*, which captures the incremental increase in loan delinquencies of approved banks relative to unapproved banks in the period after CPP. This effect is also economically significant. In particular, based on Column (5), the net charge-offs at approved banks after CPP increased by 6.2% more than at unapproved banks.

As a second test of the risk arbitrage hypothesis, we offer evidence from the market-based measures of bank risk. As we discuss in more detail in Section 7, a shift in approved banks' credit rationing was associated with a significant increase in these banks' beta, stock volatility, and risk of default. Collectively, the evidence from the ex-post loan performance and market-based measures of bank risk indicates that the shift in approved banks' credit origination toward higher-yield loans reflected a significant increase in banks' risk tolerance rather than the allocation of capital to low-risk arbitrage opportunities.

A third explanation – *moral hazard* – posits that a firm's approval for CPP funds provides a signal of implicit government protection of certain financial firms in case of distress. Because the government has incentives to prevent the failure of firms it has declared to support, the bailout may encourage risk taking by protected banks, as discussed in the introduction.

Several empirical results suggest that moral hazard likely contributed to the observed shift in bank risk. First, the finding that higher risk taking is associated with the certification of government support, rather than with the capital injection itself, is consistent with the effect of a revised probability of government protection derived in the theoretical literature (Mailath and Mester, 1994 and Acharya and Yorulmazer, 2007). Second, the cross-sectional evidence on risk shifting aligns well with the analytical predictions in the models of moral hazard. In particular, the increase in risk taking in response to a revision of bailout expectations was significantly stronger at larger banks, for which a bailout program is most likely to result in moral hazard. Moreover, the increase in risk taking in response to the bailout is stronger at banks that are closer to financial distress, as proxied by weak capitalization levels and greater exposure to crisis-hit regions. Proximity to financial distress increases the value of the put option from the implicit government protection and creates moral hazard by providing a manager with a greater incentive to increase risk, since such a firm has less to lose before it reaches the critical capitalization level that triggers continued government support. As an example of this continued government support in the context of CPP, dozens of CPP banks that found their capitalization levels depleted after federal capital infusions were allowed by the Treasury to skip their dividend payments on federal capital, and some received follow-up rounds of capital support. Third, the evidence suggests a strategic aspect in the risk taking behavior by approved banks, consistent with moral hazard. In particular, approved banks increased their risk primarily by investing in asset classes with a high exposure to the common macroeconomic risk and increased their risk exposure mostly within the regulated asset classes, thus reducing the effect on regulatory ratios. If government protection is more likely in case of a systematic rather than idiosyncratic shock to a firm, this evidence would be consistent with a strategic response of approved banks to a revised probability of future government support.

Overall, the increase in risk taking by government-approved banks was likely associated with a combination of factors, including an increase in available capital, possible government guidelines, and reaching for yield in credit origination. Though it is difficult to assess the relative impact of these incentives, our evidence suggests that moral hazard from a revised probability of government support was likely a contributing factor.

5.4 Robustness

In this section, we evaluate the robustness of our results to the variation in the sample period, alternative inclusion criteria for sample firms, and the dynamics of loan demand.

In Panels A and B of Table V, we test the robustness of our results to different sample periods, using the full sample and matched sample, respectively. So far, we have classified 2006–2008 as the period "Before CPP" and 2009-2010 as the period "After CPP". One concern is that the period of 2006-2007 might be less suitable as a benchmark because it coincides with the peak of the housing market. To address this issue, Column (1) in Panels A and B excludes loan applications processed in 2006-2007. Second, it is likely that bank risk taking in 2008 was affected by the financial crisis. Therefore, in Column (2) of Panels A and B, we reestimate our main specification after excluding loan applications processed in 2008. Third, we would like to evaluate the robustness of our results to excluding the year 2009, when bank risk taking was most likely affected by the crisis. In this case, a possible concern is that our tests might be picking up a crisis effect that hit CPP recipients harder. To test this prediction, in Column (3), we reestimate our main results after excluding loan applications processed in 2009. Finally, in Column (4), we exclude loan applications processed in 2010, since a number of institutions (42 of the 278 CPP recipients in our main sample) repaid their CPP funds by the beginning of 2010.

The results reported in Columns (1)-(4) of Panels A and B suggest that our findings are robust to alternative definitions of time periods. In particular, the main results on the increase in risk taking by CPP recipients are qualitatively similar across all columns in the full sample (Panel A) and in the matched sample (Panel B). The interaction term *After CPP x Approved bank x Loan-to-income* is positive and statistically significant at the 5% level or better in all columns but Column (2) of Panel A, where it is significant at 10%.

Next, we consider the robustness of our results to the changes in CPP conditions introduced by the American Recovery and Reinvestment Act (ARRA) of 2009, which was signed into law on February 17, 2009. In particular, the ARRA imposed a number of additional restrictions on TARP recipients, including claw-back provisions in executive compensation in case of earnings restatements, prohibitions of golden parachutes, and limits on luxury expenditures and incentive pay.[17] While the vast majority (89.6%) of CPP firms in our sample received their funds before the ARRA, we would like to verify the robustness of our findings to excluding firms that received CPP funds after the ARRA. This analysis is presented in Column (5) of Panels A and B in Table V. We would also like to account for the possible expectation of the ARRA before it was passed. Therefore, we also exclude firms that received CPP funds after December 31, 2008 and present our results in Column (6) of Panels A

[17] For details, please see the text of the American Recovery and Reinvestment Act of 2009, available online at: http://www.gpo.gov/fdsys/pkg/BILLS-111hr1enr/pdf/BILLS-111hr1enr.pdf

and B in Table V. Our main results are qualitatively similar, as indicated by the positive and statistically significant coefficient on the triple interaction term of interest in Columns (5) and (6) across both panels. This evidence suggests that our results are unlikely to be driven by the timing of the decision to accept or reject CPP funds or by the institutional restrictions that were subsequently introduced in the later stages of the program.

Next, we evaluate the robustness of our findings to alternative filters in sample construction related to sample firms, the treatment of mergers and acquisitions, and the treatment of loan demand. These results are presented in Panel C (full sample) and Panel D (matched sample) of Table V. In Column (1) of Panel C, we include in our sample the CPP recipients subject to the Capital Assessment Plan.[18] We find that all the main conclusions hold in this expanded sample. In particular, we find no significant changes in the volume of credit approvals between approved and denied banks after CPP, as shown by the insignificant coefficient on the interaction term *After CPP x Approved bank.* Also, our main finding – the increase in the origination rate of riskier loans by approved banks after CPP – holds in this expanded sample. In particular, the coefficient on the triple interaction term of interest, *After CPP x Approved bank x Loan-to-income* is positive and statistically significant (p-value of 0.031). According to the point estimate on this coefficient in Column (1), relative to banks that were denied federal assistance, approved banks increased their loan origination rates by 6.0 percentage points for riskier mortgage applications (as defined earlier). Moreover, as in our main tests, the relative shift toward riskier borrowers by approved banks (relative to unapproved banks) is observed only in the post-CPP period. In particular, origination rates for riskier loans were statistically indistinguishable between approved and denied banks before CPP, as indicated by the insignificant coefficient on the term *Approved bank x Loan-to-Income*.

Next, we examine the robustness of our findings to FDIC-facilitated acquisitions. One concern is that some CPP recipients were asked by the FDIC to acquire distressed banks, whose lending practices were riskier compared to the average bank. In this case, our findings that CPP recipients increased lending to riskier borrowers may reflect the acquisition of riskier lenders. To control for this, we collect data on the FDIC-facilitated acquisitions in 2006-2010 by our sample firms from the FDIC online directory, and exclude from our sample the

[18] In Column (1) of Panel D, we also present this analysis in the matched sample. However, the addition of the firms subject to stress tests does not change the matched sample analysis presented earlier, since none of these large firms are better matches for the firms that were unapproved for CPP funds (based on propensity scores). Therefore, the inclusion of these large firms does not affect the matched pairs constructed earlier. We present these results for completeness.

63 banks that took part in such transactions. Column (2) of Panels C and D reports the results of our tests in this subsample. Our findings hold, suggesting that the evidence cannot be explained by regulator-facilitated deals.

In our main analysis, we have included approved CPP participants that did not receive government funds as part of our treatment group. Though the results in the previous section suggest that the increase in risk taking is attributable to the certification of government support rather than the receipt of extra capital, we would like to evaluate the robustness of our findings to excluding approved CPP applicants that did not receive federal capital. In Column (3) of Panels C and D, we exclude approved CPP banks that declined government funds and obtain similar results. In particular, the coefficient on the triple interaction term is positive, significant at the 5% level, and has a comparable magnitude (e.g., 0.088 in the full sample) to that reported earlier (0.080 in the full sample in Column (1) of Table II). The coefficients on other variables are also similar to those observed earlier.

In our final set of robustness tests, we focus on the distribution of loan demand between approved and denied CPP banks. So far, we have controlled for loan demand by estimating our tests at the level of loan applications submitted in each geographic region. We proceed with formal tests of the effect of government assistance on loan demand in Columns (4)-(6) of Panel C (full sample) and Panel D (matched sample).

In Column (4) of Panels C and D, we use a difference-in-difference framework to study relative changes in the risk profile of mortgage applications received by banks that were approved for CPP, relative to banks that were denied CPP funds. The dependent variable (and the unit of analysis) is the loan-to-income ratio of mortgage applications received. The results indicate no significant differences in the loan-to-income ratios of applications received between approved and unapproved banks. The coefficient on the interaction term *After CPP x Approved bank* is economically small and statistically indistinguishable from zero (p-values of 0.868 and 0.558), suggesting that CPP approvals did not materially affect the distribution of riskier borrowers between the two groups of banks.

Column (5) of Panels C and D examines whether CPP approvals had an effect on the number of mortgage applications received by a bank. The dependent variable is the total number of applications received by a bank each year, normalized by the bank's book assets. The regression results indicate no significant differences in the number of mortgage applications received by approved and unapproved banks. The coefficient on the interaction term *After CPP x Approved bank* is not statistically significant, suggesting that CPP approvals did not significantly shift credit demand between approved and unapproved banks. This result is consistent with the view

that the Treasury did not publicly announce denials of CPP applications, and, as a result, it is unlikely that borrowers perceived different credit availability between approved and denied banks.

Column (6) of Panels C and D examines whether CPP had an effect on the amount of mortgage loans requested on borrower applications at approved and denied banks. The dependent variable is the total dollar amount of loan applications received by a bank each year, normalized by the bank's book assets. The regression results indicate no significant differences between approved and unapproved banks after CPP. The coefficient on the interaction term *After CPP x Approved bank* is not statistically significant, suggesting that CPP approvals did not have a material effect on the amount of credit demanded by borrowers at approved and unapproved banks.

In summary, CPP approvals do not appear to have had a material effect on the distribution of credit demand across banks. These findings suggest that the increase in approval rates for riskier borrowers, observed for approved banks compared to unapproved banks, is likely driven by credit rationing (or the supply of credit) rather than by credit demand. This shift in credit rationing at approved banks is robust to alternative definitions of time periods, holds in various subsamples, and cannot be explained by regulator-facilitated acquisitions.

6. Extensions

So far, we have focused on retail lending. In this section, we extend our analysis by studying the effect of CPP on two other channels of bank operations: (1) corporate lending and (2) portfolio investments. While we believe that the richness of data in the mortgage market provides the cleanest empirical setting, we offer these additional tests as complementary evidence. We also alert the reader to some of the limitations of this extended analysis.

6.1 Corporate Lending

We study the effect of CPP on corporate credit by investigating the origination of large, mostly syndicated loans by approved and denied CPP banks before and after the bailout. There are two important caveats in this analysis. First, in contrast to the mortgage market, we do not observe loan applications by corporate borrowers. Therefore, to control for credit demand by borrowing firms, we focus on within-borrower variation in credit supplied by approved and denied banks. This approach allows us to control for the changes in investment opportunities (credit demand) at the level of each borrowing firm. The second caveat is that while the amount of each syndicated loan issued to a corporate borrower is reported, the exact share supplied by each bank in a given credit facility is

missing in the majority of observations in DealScan. Therefore, our tests focus on the fraction of approved (vs. denied banks) at the level of each syndicated loan. An implicit assumption in this analysis is that banks with an equal status in the syndicate, on average, support an equal share of each credit facility.

In Panel A of Table VI, we report the results of our tests of originations of new corporate credit by approved and denied CPP applicants. The unit of observation in this analysis is a corporate loan facility, and the dependent variable is the fraction of approved banks within the loan facility. The key independent variables include the indicator *After CPP* and *Borrower risk*. We use three measures of borrower credit risk. The first measure is *Cash flow volatility*, calculated as the volatility of earnings, net of taxes and interest, scaled by total assets, over the previous ten years. The second measure of risk is *Intangible assets*, defined as the ratio of intangible assets to total book assets. The third measure of risk is *Interest coverage*, defined as the inverse of the interest coverage ratio, calculated as the interest expense divided by earnings before interest and taxes. These measures are motivated by the literature on corporate credit risk, which shows a strong relation between these variables and the likelihood of default. The main independent variable of interest is the interaction term *After CPP x Borrower risk*, which captures the marginal effect of CPP on the fraction of loans extended to riskier borrowers by approved banks relative to unapproved banks. All regressions include bank fixed effects.

In Panel A, odd columns provide evidence from the full sample of banks and even columns show evidence from the matched samples, as described earlier. We first focus on the evidence on *Cash flow volatility*. The interaction term *After CPP x Cash flow volatility* is positive and statistically significant at the 5% level or better in the full and matched samples. These findings indicate that the fraction of CPP-approved banks in loans to riskier borrowers (those with higher cash flow volatility) has increased after CPP. The results are qualitatively similar for intangible assets and the interest coverage ratio. Specifically, the interaction term *After CPP x Intangible Assets* is positive across both specifications and statistically significant at the 10% level or better. The effects are also economically significant. For instance, based on the full sample model, a one standard deviation increase in cash flow volatility (4.8%) corresponds to a 6.6% increase in the fraction of CPP-approved banks for the average loan. These results suggest that after CPP, approved banks shifted their credit origination toward riskier corporate borrowers. This conclusion holds across various measures of corporate credit risk and complements the earlier evidence from the retail lending market.

6.2 Loan Yields and Loan Commitments

As an additional test of the effect of CPP on the riskiness of originated credit in the retail and corporate markets, we provide evidence on the average yield of loan portfolios at approved and denied CPP banks. To the extent that approved banks shifted their credit origination toward higher-risk loans after CPP, this effect should be reflected in an increase in the average loan yield at approved banks relative to their denied peers with similar financial characteristics. We test this prediction by estimating a difference-in-difference regression, where the dependent variable is the average loan yield, as proxied by the ratio of interest income on loans and leases to the end-of-period book value of loans and leases. Each observation is the average loan yield at a given bank in a given quarter. The main independent variables include the interaction term *After CPP* x *Approved Bank*, bank-level controls, bank fixed effects, and year fixed effects.

The regression evidence on the dynamics of loan yields at approved and denied banks is presented in Columns (1) and (2) of Table VI, Panel B. The main variable of interest is the interaction term *After CPP x Approved Bank*, which captures the marginal changes in the average loan yield between approved and denied banks from before to after CPP. The coefficient on this term is positive and significant at the 10% level or better across both columns. Based on the point estimate in Column (1), CPP approvals were followed by a 1.2 percentage point increase in the average yield on loan portfolios at approved banks relative to their denied counterparts. These results corroborate the micro-level evidence in the retail and corporate credit markets reported earlier and provide an aggregate, market-based measure of an increase in credit risk at CPP banks.

We conclude our analysis of the effect of CPP on credit origination by providing evidence on loan commitments. This analysis seeks to complement our investigation of on-balance sheet activities with a study of the main source of off-balance sheet financing, which plays a significant role in liquidity creation (Kashyap, Rajan, and Stein, 2002; Berger and Bouwman, 2009). We use the same difference-in-difference regression framework as in the analysis of loan yields, except the dependent variable now is the amount of a bank's end-of-period loan commitments. The results of estimation in the full sample and matched samples are summarized in Columns (3) and (4), respectively. The coefficient on the main variable of interest, the interaction term *After CPP x Approved Bank* is statistically insignificant, economically small, and has opposite signs, thus indicating no significant changes in loan commitments between approved and denied banks from before to after CPP.

Overall, the results on loan commitments are consistent with the earlier evidence from on-balance sheet credit activities, which indicates that CPP did not have a strong effect on the aggregate credit supply. Rather, the micro-level evidence from the retail and corporate credit markets shows that approved banks shifted their credit origination toward riskier borrowers, relative to denied banks. At the aggregate level, this shift was associated with a significant tilt of loan portfolios at approved banks toward riskier, higher-yield loans.

6.3 Security Investments

The evidence so far suggests that banks increased the risk of their loan portfolios after being approved for CPP funds. If this strategy reflects a general increase in risk taking by CPP banks, we are likely to observe a similar tilt toward higher-risk assets in banks' portfolio investments. The advantage of analyzing portfolio investments is that the risk of financial assets is often more transparent and can be estimated based on market information.

In our analysis of portfolio investments, we study whether banks increased their allocations to risky securities relative to other assets after they were approved for CPP funds. We examine both the aggregate measures such as total investment in securities and average interest yield, as well as the breakdown of securities into safer and riskier classes. To provide a simple and transparent classification, we define 'lower-risk securities' to include Treasuries and securities issued by state and political subdivisions. Conversely, we define 'higher-risk securities' to include mutual funds and equity products, mortgage-backed securities (excluding government-sponsored agency obligations), and other domestic and foreign debt securities. For completeness, we standardize the measures of security investments both by a bank's total assets and total security holdings.

Table VII shows the results of difference-in-difference tests of investments in all securities, riskier securities, and lower-risk securities between approved and unapproved CPP applicants. We first consider the evidence in Panel A, which shows the results for the full sample. The results indicate that approved banks significantly increased their allocations to investment securities after being approved for CPP funds. For the average CPP bank, the total weight of investment securities in bank assets increased by 8.7% after CPP relative to unapproved banks. Within these portfolio investments, CPP banks increased their allocations to riskier securities by 6.8% relative to unapproved banks. In contrast, CPP banks reduced their investments in lower-risk securities by 11.2% relative to unapproved banks.

We also offer additional detail on the interest yields and maturities of banks' portfolio investments. The results suggest that approved banks shifted their portfolios toward higher-yield securities after CPP, as compared to unapproved banks. In particular, after CPP, the average interest yield on investment portfolios of approved banks increased by 10.0% relative to unapproved banks. Similar conclusions about the increased risk of CPP banks emerge from the analysis of the average maturity of assets, suggesting an increase in allocations to long-term securities. Panel B examines portfolio investments using the matched sample approach. The results in Panel B are similar with somewhat higher point estimates. For example, after CPP, the total weight of investment securities in bank assets increased by 12.2% at approved banks relative to unapproved banks, and this shift was associated with a relative tilt in approved banks' allocations toward riskier assets.

Overall, the analysis of investment portfolios suggests that approved banks actively increased their risk exposure after CPP. In particular, approved banks invested capital in riskier asset classes and tilted portfolios to higher-yield securities, compared to denied banks with similar financial characteristics.

7. Bank Risk

In this section, we study whether the observed changes in the bank loan origination and portfolio investments influenced the overall risk of financial institutions. Since in a broad sense the two primary sources of bank risk include leverage and asset composition, we first examine the effect of CPP on leverage and capitalization ratios and then provide evidence on aggregate bank risk.

7.1 Leverage and Capital Ratios

We begin with descriptive evidence on the dynamics of capital ratios around CPP investments for various subsets of CPP applicants: rejected firms, approved firms that received funding, and approved firms that declined funding. For each group of firms, Panel A of Table VII shows univariate evidence on the dynamics of three capitalization ratios around CPP: (1) tier 1 risk-based capital ratio, (2) total risk-based capital ratio, and (3) equity capital ratio. The definitions of capital ratios are provided in Appendix A.

The evidence in Panel A indicates that across all capitalization measures, approved firms that received funding experience an increase in capitalization ratios. The increase ranges from 0.28 percentage points (Equity capital to assets) to 0.96 percentage points (Total risk based capital ratio) and is highly statistically significant at

the 1% level in all cases. The point estimates also show that rejected firms, as well as approved firms that declined funding, experienced a decline in capitalization ratios around CPP infusions, but this decline is statistically indistinguishable from zero at conventional significance levels.

We continue with regression evidence on the changes in capitalization at approved and denied banks. In Columns (1)-(6) of Table VIII, Panel B, we report the results of difference-in-difference regressions where the dependent variable is one of the bank capital ratios, and the independent variables include the interaction term *After CPP* x *Approved Bank*, and bank and year fixed effects. Odd columns correspond to the full sample and even columns correspond to the matched sample. Panel B reports the coefficient on the interaction term *After CPP* x *Approved Bank* when the variable *Approved Bank* is defined both based on the IV approach described earlier (first row) and as an indicator that equals 1 when the applicant bank is approved for CPP (second row).

Regression results for capitalization ratios suggest that after CPP, approved banks improved their capitalization ratios relative to unapproved banks. These results hold regardless of the definition of the variable *Approved Banks*, and are highly statistically significant at the 1% level. The economic magnitudes are also significant. Based on Column (1), for example, the tier 1 risk-based capital ratio increased by 13.6% after CPP relative to unapproved banks. This result is consistent with a significant inflow of new capital from CPP, combined with a lack of increase in credit origination relative to denied banks.

7.2 Asset Composition

The evidence from credit origination activities and portfolio investments suggests that after CPP, approved banks increased the risk of their assets relative to unapproved banks with similar financial characteristics. For loan assets at approved banks, this conclusion is supported by an increase in the origination of riskier loans, associated with higher average loan yields and more loan delinquencies. For portfolio assets, this finding emerges from greater allocations to riskier securities associated with an increase in the average yield on investment portfolios.

As an additional test of asset risk that aggregates the effect of investment and lending activities, we examine the volatility of ROA. In Columns (1) and (2) of Table IX, we estimate the same difference-in-difference regressions, where the dependent variable is the volatility of earnings. Here, too, we estimate the regressions in the full sample (Column 1) and the matched sample (Column 2), for both definitions of the variable *Approved Banks* (first and second row). The results indicate a significant increase in ROA volatility at approved banks

relative to denied banks, consistent with a shift toward riskier assets. For the average approved bank, ROA volatility increased by 33.4% (36.8%) in the full sample (matched samples) after CPP, relative to a denied bank with similar fundamentals.

7.3 Overall Risk

In our final analysis, we examine the aggregate effect of the changes in banks' leverage and asset composition on the overall bank risk. First, we examine the composite z-score, a measure of a bank's distance to insolvency, which aggregates the effect of leverage and asset composition. The z-score is computed as the sum of ROA and the capital asset ratio scaled by the standard deviation of asset returns. Under the assumption of normally distributed bank profits, this measure approximates the inverse of the default probability, with higher z-scores corresponding to a lower probability of default.[19]

Second, we complement the accounting-based measures with market-based estimates of bank risk: stock volatility and market beta. The advantage of these proxies is that they are based on market data and reflect the combined effect of the changes in leverage and asset composition on bank risk. We compute stock return volatility by using daily returns over a one-year horizon. To compute betas, we assume the market model (with the CRSP value-weighted index used as the market proxy) and use daily returns over a one-year horizon. Our results are also similar if we use market betas from a two-factor model, which is often assumed to describe the return generating process for financial institutions.[20]

In Columns (3)-(8) of Table IX, we report the results of panel regressions of bank risk, where the dependent variables are the z-score, market beta, and stock volatility, respectively, in the full sample (odd columns) and the matched sample (even columns). The first row reports the results when the variable *Approved Banks* is defined based on the IV approach described earlier; in the second, *Approved Bank* is an indicator that equals 1 when the applicant bank is approved for CPP. The evidence across the columns and rows indicates a significant increase in each of the aggregate measures of risk. This suggests that the improvement in capital ratios

[19] The intuition for this result was first developed in Roy (1952). For a more recent discussion of the relation between z-score and bank default, see Laeven and Levine (2009).

[20] The two-factor model for financial institutions is based on the market risk and the interest rate risk, with the latter factor approximated by daily changes in the Treasury rate (e.g., Flannery and James 1984, Sweeney and Warga 1986, Saunders, Strock and Travlos, 1990; Bhattacharyya and Purnanandam, 2010).

at approved banks relative to denied banks was more than offset by an increase in the riskiness of the asset mix of approved banks. The net effect was a marked increase in total risk (stock volatility), market risk (beta), and the likelihood of default (inverse of z-score) at approved banks relative to their denied peers. The overall effect on bank risk is also economically significant. For example, after the bailout, approved banks show a 21.4% increase in default risk (measured by the z-score) and an 11.9% increase in beta relative to unapproved banks with similar characteristics. One explanation for the increase in aggregate risk combined with a relative decline in leverage could be a strategic response of QFIs to regulatory capital requirements, such as a strategy designed to increase the profitability of assets, while, improving capitalization levels monitored by the regulators.

In summary, we find that banks approved for CPP shifted their credit origination toward riskier borrowers and titled portfolio investments toward riskier securities. This strategy was associated with an increase in systematic risk and the probability of distress. This evidence suggests that at least some approved banks responded to the bailout by increasing their risk taking and that this effect appears to outweigh the disciplining role of government monitoring and the regulatory constraints on incentive compensation of CPP banks.

Conclusion

This paper has investigated the effect of government assistance on risk taking of financial institutions. While we do not find a significant effect of government assistance on the aggregate amount of originated credit, our results suggest its considerable impact on the risk of originated loans. After being approved for federal funds, CPP participants issue riskier loans and increase capital allocations to riskier, higher-yield financial securities, as compared to banks that were not approved for federal funds. A fraction of new capital inflows is also used to improve capital positions. Despite the improved capitalization ratios, the net effect is a significant increase in systematic risk and the probability of distress due to the higher risk of bank assets.

The evidence in our paper is broadly consistent with the theories that predict an increase in risk taking incentives in response to government protection. From a policy perspective, our findings show that any capital provisions should establish clear investment guidelines and provide tracking mechanisms for capital deployment.

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Appendix A: Variable Definitions

A.1. Bank-Level Variables

Camels Proxies

Capital adequacy = tier-1 risk-based capital ratio, measured by the ratio of tier-1 capital to risk-weighted assets.

Asset quality = negative of noncurrent loans and leases scaled by total loans and leases.

Earnings = return on equity (ROE), measured by the ratio of quarterly net income to total equity capital.

Liquidity = cash divided by deposits.

Sensitivity to market risk = sensitivity to interest rate risk, measured by the ratio of the absolute difference between short-term assets and short-term liabilities to earning assets.

Capital Ratios

Tier-1 risk-based capital ratio = tier-1 capital divided by risk-weighted assets.

Total risk-based capital ratio = total risk-based capital divided by risk-weighted assets.

Equity capital ratio = equity capital divided by total assets.

Bank Fundamentals

Size = natural logarithm of book assets.

Percentage of core deposit funding = core deposits divided by total deposits.

Exposure to regional economic shocks = weighted average of quarterly changes in the state-coincident macro indicators from the Federal Reserve Bank of Philadelphia across all states in which a given bank maintains active branches. The weights represent the fraction of the bank's deposits held in the branches in a given state.

Foreclosures = backward-looking measure of loan quality and exposure to the crisis, measured as the value of foreclosed assets divided by net loans and leases.

Loan charge-offs = ratio of net loan charge-offs to total loans.

Investment Portfolios

Lower-risk securities = U.S. Treasury securities and securities issued by states & political subdivisions.

Riskier securities = mortgage-backed securities (excluding government-sponsored agency obligations), other domestic and foreign debt securities, and investments in mutual funds and equity products.

Long-term debt securities = debt securities with the remaining maturity greater than five years.

Bank Risk

ROA volatility = standard deviation of quarterly ROA over the trailing year.

Z-score = ROA plus capital asset ratio divided by the standard deviation of ROA.

Beta = market beta computed from daily returns over a one-year horizon, with the CRSP value-weighted index used as the market proxy.

Stock return volatility = volatility of daily stock returns computed over a one-year horizon.

A.2. CPP and Financial Regulation

CPP application indicator = indicator that equals one if a firm applied for CPP funds.

CPP investment indicator = indicator that equals one if a firm received (conditional on being approved for) CPP funds.

After CPP = indicator that equals one in 2009-2010 and zero in 2006-2008.

Approved bank (specifications without instrumental variable) = indicator that equals one if a firm's CPP application was approved.

Approved bank (instrumental variable specifications)= predicted likelihood that a firm's CPP application is approved based on the regression of CPP approvals on a firm's geography-based House Representation, as defined below.

House representation = indicator that equals one if a firm is headquartered in a district of a House member, who served on the Capital Markets Subcommittee or the Financial Institutions Subcommittee of the House Financial Services Committee in 2008.

Regulatory interventions = indicator that equals one if, in a given year, a firm was subject to at least one disciplinary action from the four banking regulators (the FDIC, the Federal Reserve, the OCC, or the OTS).

A.3. Credit Origination and Credit Risk

Retail Lending

Application approval = indicator that equals one if a mortgage application was approved.

Loan-to-income ratio = loan amount requested in a mortgage application divided by the applicant's annual income.

Corporate Lending

Fraction of approved banks per loan = ratio of the number of CPP-approved banks in the loan facility to the total number of creditors in the loan facility.

Cash flow volatility = volatility of EBIT scaled by total assets, measured over a ten-year horizon.

Intangible assets = ratio of intangible assets to total book assets.

Interest coverage = inverse of the interest coverage ratio, measured as the ratio of interest expense to EBIT.

Overall Credit Activity

Yield on loan portfolios = interest and fee income from loans and leases divided by total loans and leases.

Loan commitments = total unused loan commitments scaled by total assets.

Appendix B: Sample Disclosures – CPP Timeline

Sample disclosures that were used for identifying CPP applicants and reconstructing the timeline of their application process

Example 1: Nara Bancorp

"On October 29, 2008, Nara Bancorp, Inc. (the "Company") filed an application with the U.S. Department of the Treasury ("Treasury") to participate in the voluntary Capital Purchase Program ("CPP"). The CPP offers all qualifying financial institutions that are approved by the Treasury the opportunity to issue and sell senior perpetual preferred stock, along with warrants to purchase common stock, to the Treasury. On November 10, 2008, the Company received preliminary approval from the Treasury to participate in the CPP, up to the program's maximum allowable amount of 3% of the Company's risk-weighted assets, or $67 million. A press release announcing the Treasury's preliminary approval of the Company's CPP application is attached hereto as Exhibit 99.1."

Source: Form 8-K (p. 2) of Nara Bancorp dated November 10, 2008.

"The board of directors of the Corporation (the "Board of Directors") or an applicable committee of the Board of Directors, in accordance with the certificate of incorporation and the bylaws of the Corporation and applicable law, adopted the following resolution on November 20, 2008 creating a series of 67,000 shares of Preferred Stock of the Corporation designated as "Fixed Rate Cumulative Perpetual Preferred Stock, Series A"."

Source: Certificate of designations of fixed cumulative preferred stock (exhibit 4.1, p. 1) of Nara Bancorp.

"On November 21, 2008, as part of the Capital Purchase Program (the "CPP") of the United States Department of the Treasury (the "UST"), Nara Bancorp, Inc. (the "Company") entered into a Letter Agreement, incorporating an attached Securities Purchase Agreement – Standard Terms (collectively, the "Securities Purchase Agreement") with the UST."

Source: Form 8-K (p. 2) of Nara Bancorp dated November 21, 2008.

Example 2: First California Financial Group

"WESTLAKE VILLAGE, Calif., December 2, 2008 – First California Financial Group, Inc., today announced that it has received preliminary approval to participate in the U.S. Treasury Department's Capital Purchase Program (TARP), with a preliminary commitment for $25 million in additional preferred equity. "

Source: Press release of First California Financial Group dated December 2, 2008.

"The board of directors of the Corporation (the "Board of Directors") or an applicable committee of the Board of Directors, in accordance with the certificate of incorporation and bylaws of the Corporation and applicable law, adopted the following resolution on December 17, 2008 creating a series of 25,000 shares of Preferred Stock of the Corporation designated as "Fixed Rate Cumulative Perpetual Preferred Stock, Series B"."

Source: Certificate of designations of fixed cumulative preferred stock (exhibit 3.1, p. 1) of First California Financial Group.

"On December 19, 2008 (the "Closing Date"), First California Financial Group, Inc. (the "Company") issued and sold, and the United States Department of the Treasury (the "U.S. Treasury") purchased 25,000 shares (the "Preferred Shares") of the Company's Fixed Rate Cumulative Perpetual Preferred Stock, Series B …"

Source: Form 8-K (p. 2) of First California Financial Group dated December 22, 2008.

Appendix C: First-stage Instrumental Variable Analysis

This table reports the first stage linear regression explaining CPP approvals with the instrumental variable *House representation*, while controlling for other bank-level variables. The dependent variable is an indicator that equals one if a firm's CPP application was approved and zero if it was denied. The instrumental variable, *House representation,* is an indicator that equals one if a firm is headquartered in a district of a House member, who served on the Capital Markets Subcommittee or the Financial Institutions Subcommittee of the House Financial Services Committee in 2008. All control variables are defined in Appendix A. The p-values (in brackets) are based on standard errors that are heteroskedasticity consistent and clustered at the bank level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

Dependent variable	CPP approval
House representation	0.124*** [0.005]
Capital adequacy	-0.003 [0.114]
Asset quality	-0.094 [0.172]
Earnings	0.046*** [0.003]
Liquidity	0.003 [0.920]
Sensitivity to market risk	0.004 [0.231]
Foreclosures	0.002 [0.511]
Percentage of core deposit funding	-0.011 [0.326]
Exposure to regional economic shocks	0.043 [0.174]
Size	0.025 [0.169]
Observations	416
R-Squared	0.213
F statistic	16.760
(p-value)	(<0.001)
Shea's (1997) partial R-squared	0.142

Appendix D: Sample Disclosures – Decision to Decline CPP

Sample disclosures explaining firms' decisions to decline CPP funds

Example 1: Chemical Financial Corporation
"Chemical Financial Corporation today announced that the Company has determined not to accept an $84 million capital investment recently approved as part of the U.S. Department of the Treasury's Capital Purchase Program (CPP). … Given the short timeframe between the release of the final CPP guidelines and agreements and the application deadline, the Company felt the prudent course of action was to submit its application to participate, and then take the opportunity to carefully consider all aspects of accepting funds awarded through the CPP. After such consideration, the Company's Board and management determined that the various restrictions and potential dilution to existing shareholders outweighed any potential benefits from the Company's participation in the CPP."

Source: press release of Chemical Financial Corporation dated December 18, 2008

Example 2: **United Bankshares**
"United is honored to have been approved for participation in the Treasury's CPP, which is only available to sound financial institutions. However, after careful consideration, we believe it is in the best interests of our shareholders not to participate. The program's restrictions on possible future dividend increases, the dilution to earnings, and the uncertainty surrounding future requirements of the program outweighed the benefits of United's participation in the program."

Source: press release of United Bankshares dated January 27, 2009

Appendix E: Matched Sample of Approved CPP Applicants that Received and Declined Funding

The matched sample is constructed as follows. For each bank that was approved for CPP and declined funding, we find the closest approved bank that received funding based on propensity scores estimated from an OLS regression that explains the decision of approved banks to reject CPP funding using the Camels proxies, foreclosures, and size. The Table below provides difference-in-means estimates for the two groups of firms.

Variable	Declined funding	Accepted funding	Difference	t-statistic
Tier 1 risk-based capital ratio (%)	12.050	11.622	-0.428	0.612
Noncurrent loans to total loans (%)	1.625	1.818	0.192	1.300
Return on equity (%)	3.467	2.520	-0.947	0.326
Cash holdings/assets (%)	3.836	3.847	0.010	0.027
Sensitivity to market risk (%)	14.571	12.964	-1.607	0.995
Foreclosures (%)	0.301	0.390	0.089	0.846
Size (log assets)	13.911	14.295	0.384	2.155
Exposure to regional econ. shocks	-1.284	-1.435	-0.152	1.260

Figure 1
Sample Firms and Their Investment Applications

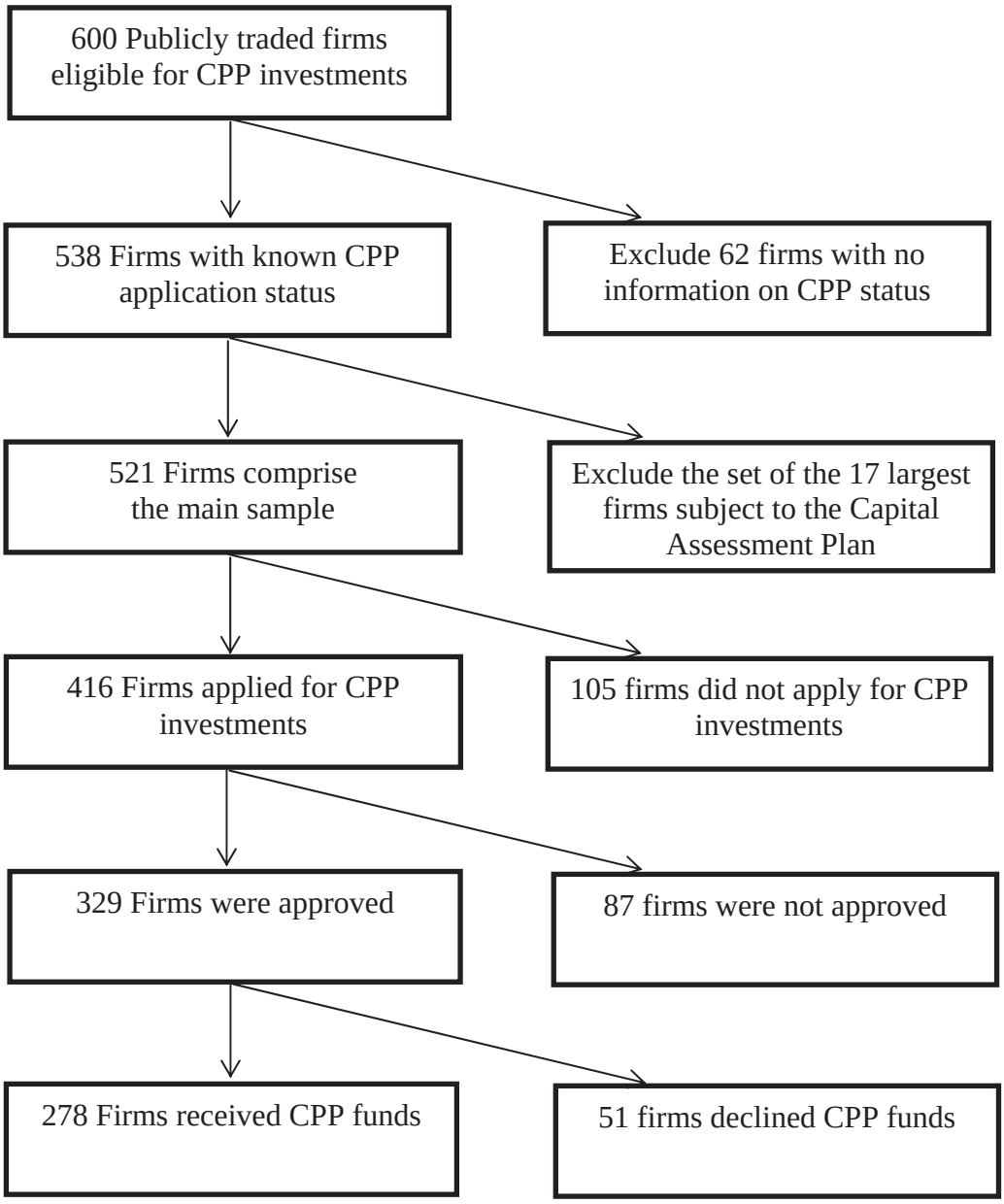

Figure 2
Timeline of the Median CPP Application

This figure shows the median length of time in each stage of the CPP application process for our sample firms with available data. Time intervals are shown in calendar days relative to day zero, the application submission date. For firms with a missing application submission date, the application is assumed to have been submitted on the day of the application deadline for public firms, November 14, 2008. Time spent on the decision to accept or decline CPP funds is computed for approved CPP applicants. Time spent on the disbursement of CPP funds is computed for approved applicants that accepted the funds.

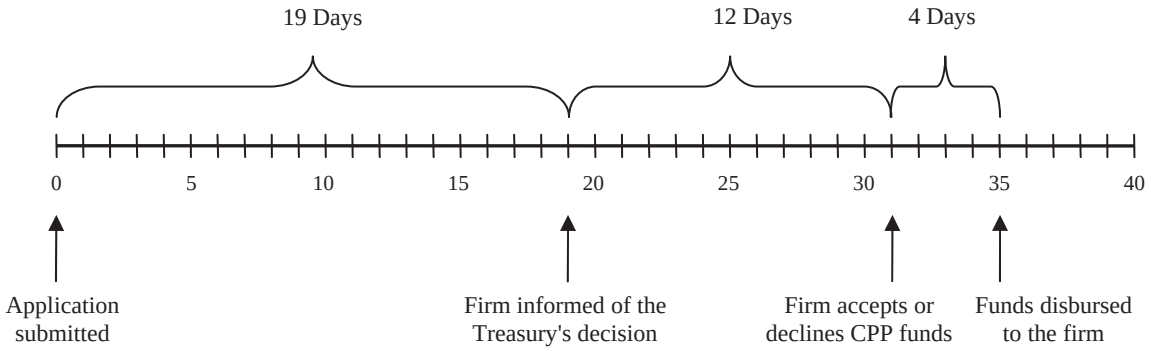

Figure 3
Cumulative Disbursement of CPP Funds

This figure shows the cumulative disbursement of CPP funds for 278 publicly-traded CPP recipients in our sample. The sample excludes the seventeen large CPP recipients that were subject to stress tests under the Capital Assessment Plan. Percent values are given based on the total amount of CPP funds received by our sample firms.

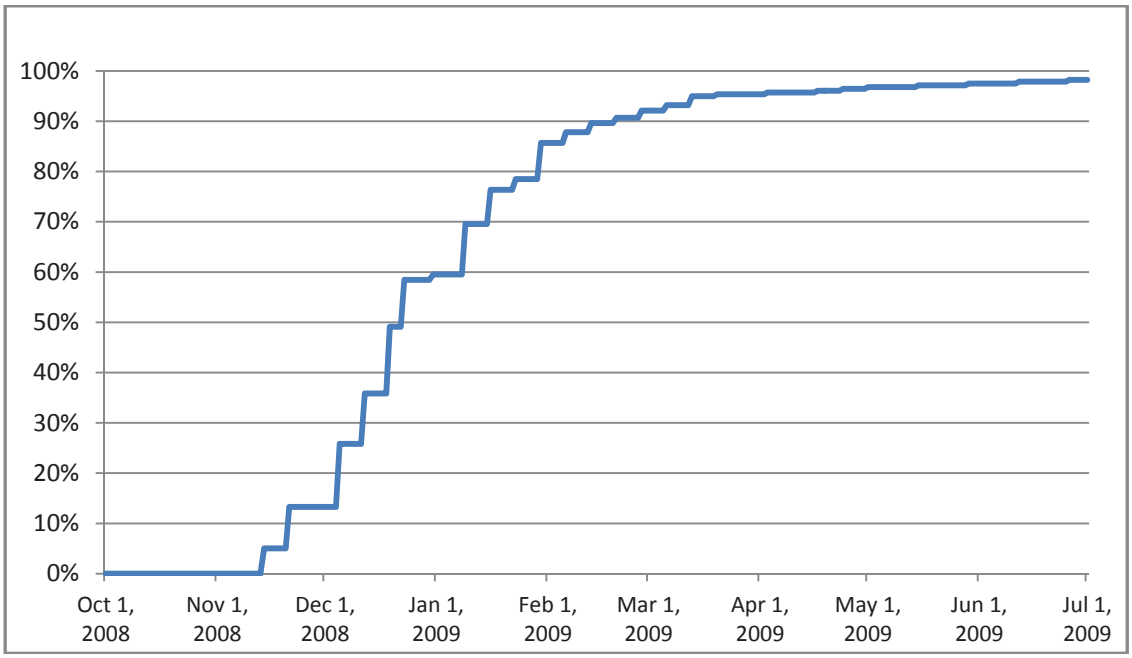

Figure 4
The Distribution of CPP Amounts

This Figure presents a histogram plot of the ratio of CPP investment amounts to risk-weighted assets of recipient firms. According to CPP guidelines, the minimum CPP investment amount is equal to 1% of risk-weighted assets (RWA), and the maximum amount is equal to 3% of RWA or $25 billion, whichever is smaller.

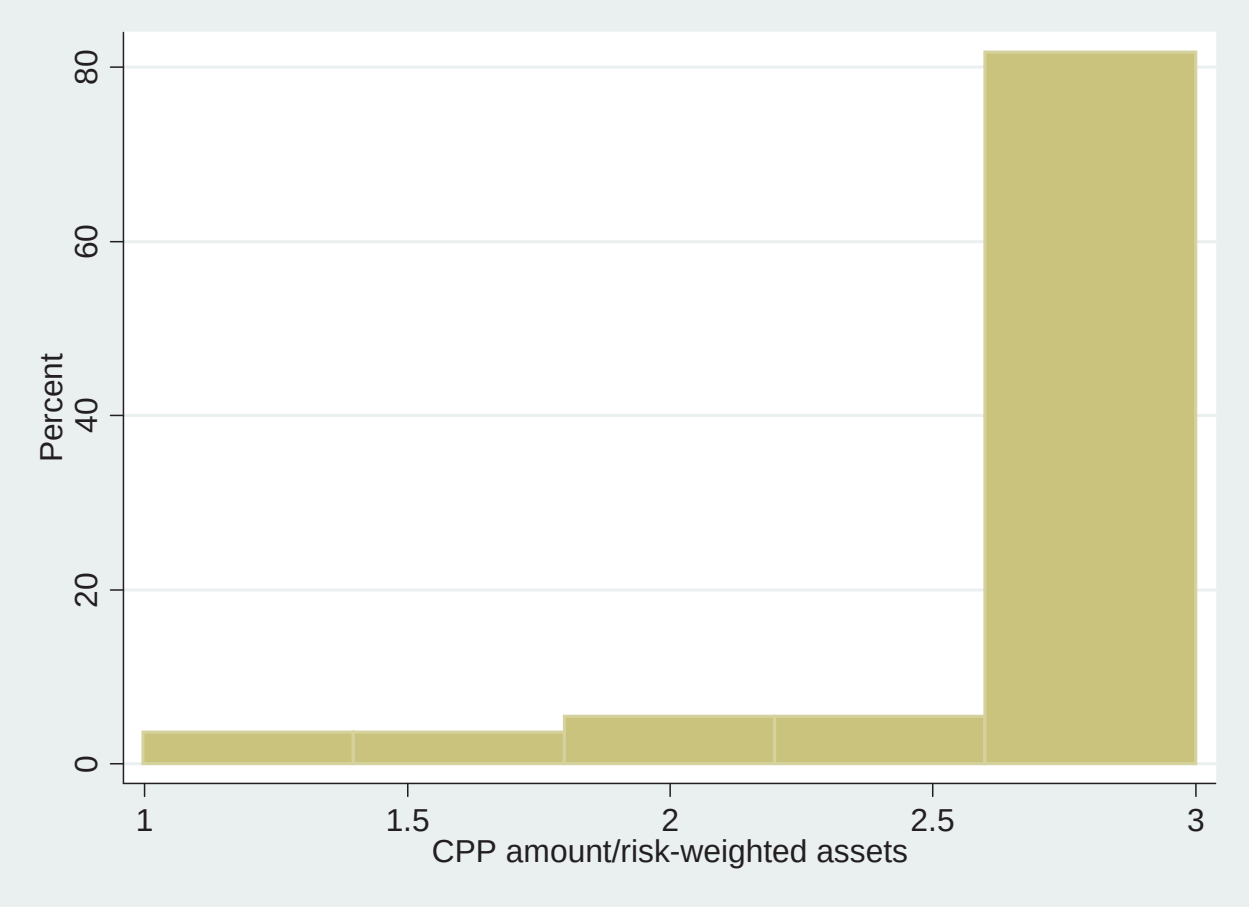

Table I
Summary Statistics

This table reports summary statistics for the data used in the analysis. The sample consists of all publicly-traded financial firms eligible for participation in the Capital Purchase Program (CPP) with available data on program application status, excluding the firms subject to stress tests under the Capital Assessment Plan (CAP). Panel A reports bank-level data. *CPP application indicator* is an indicator that equals one if a firm applied for CPP funds. *CPP approval indicator* is an indicator that equals one if a firm was approved for CPP funds (conditional on applying). *CPP investment indicator* is an indicator that equals one if a firm received CPP funds (conditional on being approved). The financial condition variables proxy for the Camels measures of banks' financial condition and performance used by banking regulators, augmented with exposure to the crisis (foreclosures), percentage of core deposit funding, and exposure to regional economic shocks. *Capital adequacy* is the tier-1 risk-based capital ratio, defined as tier-1 capital divided by risk-weighted assets. *Asset quality* is the negative of noncurrent loans and leases divided by total loans and leases. *Earnings* is the return on equity (ROE), measured by the ratio of quarterly net income to total equity capital. *Liquidity* is cash divided by deposits. *Sensitivity to market risk* is the sensitivity to interest rate risk, defined as the absolute difference between short-term assets and short-term liabilities divided by earning assets. *Foreclosures* is foreclosed assets divided by net loans and leases. *Percentage of core deposit funding* is core deposits divided by total deposits. *Exposure to regional economic shocks* is a weighted average of quarterly changes in the state-coincident macro indicators from the Federal Reserve Bank of Philadelphia across all states in which a bank maintains active branches; the index weights represent the fraction of the bank's deposits held in the branches in a given state. Panel B reports loan-level data. The mortgage application data are from the Home Mortgage Disclosure Act (HMDA) Loan Application Registry. *Application approval* is an indicator that equals one if the mortgage application was approved and zero if it was denied. *Loan to income ratio* is the loan amount divided by the applicant's annual income. The corporate loan data are from DealScan. Panel C compares between the propensity-score-matched samples of CPP applicants whose applications were approved and unapproved.

Panel A: Bank-level data

Variable	Mean	25th percentile	Median	75th percentile	Standard deviation
CPP					
CPP application indicator	0.798	1.000	1.000	1.000	0.402
CPP approval indicator (if applied)	0.791	1.000	1.000	1.000	0.407
CPP investment indicator (if approved)	0.845	1.000	1.000	1.000	0.362
CPP investment amount ($000)	144,000	14,700	30,100	817,000	406,000
Bank size					
Total assets ($000)	327,433	66,744	145,076	340,285	462,369
Assets in financial securities ($000)	58,874	9,049	23,728	61,355	88,426
Financial condition					
Capital adequacy (%)	12.876	9.692	10.658	12.748	9.256
Asset quality (%)	-1.889	-2.274	-0.927	-0.264	3.166
Earnings (%)	3.211	1.706	6.483	10.483	15.758
Liquidity (%)	3.993	2.231	3.028	4.207	4.217
Sensitivity to market risk (%)	14.681	5.382	11.029	19.865	12.534
Foreclosures (%)	0.397	0.033	0.148	0.411	1.086
Percentage of core deposit funding (%)	80.216	76.561	81.014	86.006	8.967
Exposure to regional economic shocks (%)	-0.032	-0.619	0.303	0.740	1.109

Panel B: Loan-level data

Variable	Mean	25th percentile	Median	75th percentile	Standard deviation
Mortgage application data					
Application approval indicator	0.643	0.000	1.000	1.000	0.479
Loan to income ratio	2.000	0.851	1.778	2.778	1.515
Loan amount ($000)	179.1	59.0	123.0	238.0	165.9
Applicant income ($000 per year)	104.3	44.0	73.0	128.0	88.0
Corporate loan data					
Loan amount ($000)	604,000	150,000	300,000	700,000	941,000

Panel C: Matched Samples

Variable	Unapproved	Approved	Difference	t-statistic
Capital adequacy (%)	11.548	12.013	0.464	0.754
Asset quality (%)	-0.052	-0.054	-0.003	0.131
Earnings (%)	-0.921	-0.822	0.099	0.247
Liquidity (%)	4.061	3.783	-0.279	0.446
Sensitivity to market risk (%)	11.508	9.969	-1.540	1.104
Foreclosures (%)	0.315	0.304	-0.012	0.364
Size (log assets)	13.922	13.402	-0.520	1.491

Table II
Mortgage Application Approval Rates and Loan Risk

This table reports regression estimates from a linear probability model explaining the relation between a bank's approval for CPP funds and a bank's mortgage origination decisions across borrowers of different risk. The dependent variable is an indicator that equals one if a loan was approved and zero if it was denied. *After CPP* is an indicator that equals one in 2009-2010 and zero in 2006-2008. *Approved bank* is instrumented as the predicted likelihood that a bank is approved for CPP funds, conditional on applying, from a regression of CPP approvals on a bank's geography-based representation on the House Financial Services Committee (please see Appendix C for details), except in Columns (3) and (6), where it is an indicator that equals one if a bank applied for CPP funds and was approved, and zero if it applied but was not approved. In all columns, except for Columns (2) and (4), the sample includes all publicly traded CPP applicants with a known application status, excluding the firms subject to stress tests. In Columns (2) and (4), the sample includes all publicly traded CPP-eligible firms, excluding the firms subject to stress tests. The variables *After CPP* and *Approved bank* drop out of the regression due to the inclusion of year and bank fixed effects, respectively. In the matched sample, for each bank that applied but was not approved for CPP, we match the closest approved bank based on propensity scores estimated from a regression that predicts the likelihood of CPP approval, using a bank's Camels proxies, foreclosures, and size. *Loan-to-income ratio* is the loan amount requested in a mortgage application divided by the applicant's annual income. *Regulatory interventions* is an indicator that equals one if, in a given year, a firm was subject to at least one disciplinary action from the four banking regulators. All variables are defined in Appendix A. The individual loan application data come from the Home Mortgage Disclosure Act (HMDA) Loan Application Registry and cover the period 2006-2010. All regressions include bank level controls, bank fixed effects, borrower fixed effects (gender, race, ethnicity), and tract fixed effects, which are not shown to conserve space. *Bank level controls* include the Camels proxies, foreclosures, fraction of core deposit funding, exposure to regional economic shocks, and size. The p-values (in brackets) are based on standard errors that are heteroskedasticity consistent and clustered at the bank level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

Sample	Full sample			Matched sample		
Model	Baseline	Including non-applicants	No instrument	Baseline	Including non-applicants	No instrument
Column	(1)	(2)	(3)	(4)	(5)	(6)
Loan to income	-0.030*** [0.000]	-0.029*** [0.000]	-0.029*** [0.000]	-0.030*** [0.000]	-0.037*** [0.000]	-0.034*** [0.000]
After CPP x Approved bank	-0.018 [0.655]	0.016 [0.351]	-0.052 [0.396]	-0.021 [0.649]	-0.022 [0.605]	-0.017 [0.407]
After CPP x Loan to income	-0.058 [0.181]	-0.006 [0.669]	0.002 [0.874]	-0.013 [0.265]	-0.025 [0.476]	-0.025 [0.306]
Approved bank x Loan to income	-0.014 [0.398]	-0.018 [0.312]	-0.014 [0.296]	-0.003 [0.749]	-0.017 [0.144]	-0.011 [0.494]
After CPP x Approved bank x Loan to income	0.080*** [0.007]	0.073* [0.062]	0.070*** [0.005]	0.063*** [0.003]	0.059* [0.088]	0.064*** [0.005]
Regulatory interventions	-0.012** [0.041]	-0.008** [0.032]	-0.004 [0.841]	-0.013** [0.039]	-0.044 [0.361]	-0.023* [0.055]
Regulatory interventions x Loan to income	-0.013** [0.038]	-0.014** [0.045]	-0.014** [0.027]	-0.005* [0.063]	-0.019* [0.057]	-0.018* [0.096]
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes
Borrower fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Tract fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	686,106	895,132	686,106	115,176	132,119	115,176
R-Squared	0.276	0.284	0.276	0.185	0.183	0.186

Table III
Cross Sectional Evidence

This table reports regression estimates from a linear probability model explaining the relation between a bank's approval for CPP funds and a bank's mortgage origination rates across borrowers of different risk. The dependent variable is an indicator that equals one if a loan was approved and zero if it was denied. *After CPP* is an indicator that equals one in 2009-2010 and zero in 2006-2008. *Approved bank* is instrumented as the predicted likelihood that a bank is approved for CPP funds, conditional on applying, from a regression of CPP approvals on a bank's geography-based representation on the House Financial Services Committee (please see Appendix C for details). The regressions are estimated in subsamples divided around firms' median size (book assets), equity capital ratio, and exposure to regional economic shocks, as well as between standalone banks and bank holding companies. The variables *After CPP* and *Approved bank* drop out of the regression due to the inclusion of year and bank fixed effects, respectively. In Panel B, for each bank that applied and was not approved for CPP, we match the closest approved bank based on propensity scores estimated from a regression that predicts the likelihood of CPP approval using the Camels proxies, foreclosures, and size. All variables are defined in Appendix A. The sample period is from 2006 to 2010. All regressions include bank level controls, bank fixed effects, borrower fixed effects (gender, race, ethnicity), and tract fixed effects, which are not shown to conserve space. *Bank level controls* include the Camels proxies, foreclosures, fraction of core deposit funding, exposure to regional economic shocks, and size. The p-values (in brackets) are based on standard errors that are heteroskedasticity consistent and clustered at the bank level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Full Sample

Sort criterion	Size		Equity capital ratio		Exposure to economic shocks		Organization form	
Subsample	Small	Large	Low	High	Weak	Strong	Standalone bank	Bank holding company
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Loan to income	-0.025*** [0.004]	-0.032*** [0.000]	-0.027*** [0.000]	-0.032*** [0.000]	-0.029*** [0.000]	-0.029*** [0.000]	-0.026*** [0.006]	-0.030*** [0.000]
After CPP x Approved bank	-0.020 [0.518]	-0.019 [0.498]	-0.029 [0.160]	-0.028 [0.243]	-0.030 [0.276]	-0.021 [0.229]	-0.019 [0.436]	-0.023 [0.395]
After CPP x Loan to income	-0.034 [0.323]	-0.048 [0.296]	-0.082 [0.119]	-0.073 [0.361]	-0.082 [0.274]	-0.019 [0.311]	-0.065 [0.299]	-0.076 [0.281]
Approved bank x Loan to income	-0.015 [0.558]	-0.016 [0.429]	-0.026 [0.226]	-0.011 [0.617]	-0.011 [0.223]	-0.027 [0.155]	-0.007 [0.347]	-0.035 [0.134]
After CPP x Approved bank x Loan to income	0.042** [0.031]	0.073*** [0.009]	0.091** [0.037]	0.048** [0.030]	0.040*** [0.005]	0.076*** [0.005]	0.036* [0.091]	0.075*** [0.006]
Regulatory interventions	-0.022* [0.075]	-0.032* [0.089]	-0.027* [0.070]	-0.022* [0.094]	-0.028* [0.088]	-0.031 [0.180]	-0.021* [0.082]	-0.021 [0.129]
Regulatory interventions x Loan to income	0.001 [0.925]	-0.024** [0.019]	-0.032 [0.106]	-0.019* [0.076]	-0.005 [0.564]	-0.023** [0.036]	-0.016 [0.123]	-0.017* [0.054]
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tract fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	192,315	493,791	337,564	348,542	341,912	344,194	181,475	504,631
R-Squared	0.178	0.264	0.290	0.201	0.204	0.270	0.281	0.264

Panel B: Matched Sample

Sort criterion	Size		Equity capital ratio		Exposure to economic shocks		Organization form	
Subsample	Small	Large	Low	High	Weak	Strong	Standalone bank	Bank holding company
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Loan to income	-0.022*** [0.000]	-0.043*** [0.000]	-0.045*** [0.000]	-0.022*** [0.002]	-0.037*** [0.000]	-0.036*** [0.000]	-0.026*** [0.000]	-0.035*** [0.000]
After CPP x Approved bank	-0.042 [0.186]	-0.036 [0.369]	-0.038 [0.490]	-0.031 [0.388]	-0.034 [0.406]	-0.035 [0.889]	-0.033 [0.347]	-0.033 [0.172]
After CPP x Loan to income	-0.071 [0.295]	-0.016 [0.682]	-0.040 [0.340]	-0.076 [0.227]	-0.038 [0.547]	-0.045 [0.544]	-0.042 [0.663]	-0.038 [0.429]
Approved bank x Loan to income	-0.018 [0.243]	-0.026 [0.219]	-0.026 [0.253]	-0.001 [0.937]	-0.011 [0.230]	-0.018 [0.242]	-0.002 [0.302]	-0.038 [0.127]
After CPP x Approved bank x Loan to income	0.035* [0.089]	0.064** [0.044]	0.074** [0.042]	0.039* [0.068]	0.040** [0.044]	0.074*** [0.007]	0.027* [0.095]	0.064*** [0.007]
Regulatory interventions	-0.008 [0.720]	-0.035*** [0.004]	-0.020* [0.090]	-0.023 [0.347]	-0.019* [0.076]	-0.024** [0.030]	-0.026** [0.033]	-0.029* [0.073]
Regulatory interventions x Loan to income	-0.011 [0.420]	-0.021** [0.038]	-0.026 [0.387]	-0.012 [0.558]	-0.022 [0.328]	-0.033** [0.048]	-0.006 [0.488]	-0.016* [0.079]
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tract fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	32,284	82,892	56,667	58,509	57,396	57,780	30,464	84,712
R-Squared	0.183	0.146	0.158	0.161	0.224	0.142	0.121	0.183

Table IV
Additional Evidence on Loan Originations and Loan Performance

This table presents additional evidence on loan originations and loan performance for various subsets of CPP applicants. Columns (1) and (2) compare mortgage origination and risk taking at CPP-approved banks that accepted the funds (the indicator variable *Approved bank* equals one) and CPP-approved banks that declined the funds (the indicator *Approved bank* equals zero). The dependent variable in these columns is an indicator that equals one if a loan was approved and zero if it was denied. The full sample in these columns comprises all CPP-approved banks, except for firms subject to stress tests under the Capital Assessment Plan. Columns (3) and (4) compare credit origination and risk taking at CPP-approved banks that repaid the funds in 2009 and banks that applied for CPP but were not approved. The dependent variable in these columns is an indicator that equals one if a loan was approved and zero if it was denied. The full sample in these columns comprises approved banks that repaid CPP funds in 2009 and banks whose CPP applications were not approved, excluding firms subject to stress tests under the Capital Assessment Plan. Columns (5) and (6) compare loan charge-offs between banks whose CPP applications were approved and banks whose CPP applications were denied. The dependent variable in Columns (5) and (6) is net loan charge-offs expressed as a fraction of total loans. In these columns, each observation is a bank-quarter, and the full sample comprises all publicly-traded CPP applicants with a known application status, excluding firms subject to stress tests under the Capital Assessment Plan. In these columns, *Approved bank* is instrumented as the predicted likelihood that a bank is approved for CPP funds, conditional on applying, from a regression of CPP approval on a bank's geography-based representation on the House Financial Services Committee. Across all columns, the variable *After CPP* is an indicator that equals one in 2009-2010 and zero in 2006-2008. Matched samples are constructed as follows. In Column (2), for each bank that was approved for CPP but declined funding, we find the closest approved bank that received funding based on propensity scores estimated from an OLS regression that explains the decision of approved banks to decline CPP funding using the Camels proxies, foreclosures, and size. In Columns (4) and (6), matched samples are constructed from the respective full sample based on the one-to-one matching procedure of the control and treatment groups according to the propensity score for CPP approval. The variables *After CPP* and *Approved bank* drop out of the regression due to the inclusion of year and bank fixed effects, respectively. All variables are defined in Appendix A. *Bank level controls* include the Camels proxies, foreclosures, percentage of core deposit funding, exposure to regional economic shocks, and size. Borrower fixed effects include gender, race, and ethnicity indicators. The p-values (in brackets) are based on standard errors that are heteroskedasticity consistent and clustered at the bank level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

Test	Approved CPP banks that accepted vs. declined funds		Banks that repaid CPP funds in 2009		Evidence on loan chargeoffs	
Sample	Full sample	Matched sample	Full sample	Matched sample	Full sample	Matched sample
Column	(1)	(2)	(3)	(4)	(5)	(6)
Loan to income	-0.028*** [0.001]	-0.023*** [0.000]	-0.034*** [0.002]	-0.065** [0.019]		
After CPP x Approved bank	-0.035 [0.628]	-0.028 [0.702]	-0.015 [0.758]	-0.007 [0.499]	0.664*** [0.003]	0.496* [0.088]
After CPP x Loan to income	-0.009 [0.362]	-0.004 [0.416]	-0.011 [0.291]	-0.010 [0.165]		
Approved bank x Loan to income	-0.028 [0.206]	-0.026* [0.071]	-0.012 [0.486]	-0.019 [0.374]		
After CPP x Approved bank x Loan to income	0.015 [0.299]	0.013 [0.326]	0.056* [0.073]	0.051* [0.093]		
Regulatory interventions	-0.024** [0.038]	-0.021** [0.046]	-0.006* [0.068]	-0.003 [0.512]		
Regulatory interventions x Loan to income	0.017 [0.537]	0.009 [0.302]	-0.021 [0.693]	-0.024** [0.037]		
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes
Borrower fixed effects?	Yes	Yes	Yes	Yes	N/A	N/A
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Tract fixed effects?	Yes	Yes	Yes	Yes	N/A	N/A
Observations	572,617	58,565	138,114	75,552	7,946	3,323
R-Squared	0.118	0.272	0.143	0.152	0.595	0.346

Table V
Robustness to Time Periods and Sample Composition

This table reports regression estimates from a linear probability model explaining the relation between a bank's approval for CPP and a bank's mortgage origination decisions across borrowers of different risk. In Panels A and B, the regressions are estimated in subsamples split according to the timing of mortgage applications and CPP funding. In Panels C and D, the regressions are estimated in different subsamples of firms and include specifications that investigate the demand for mortgages (Columns (4)-(6) of Panels C and D). The dependent variable is an indicator that equals one if a mortgage application was approved and zero if it was denied, except for Columns (4)-(6) of Panels C and D, where the dependent variable is one of the characteristics of mortgage applications received. *After CPP* is an indicator that equals one in 2009-2010 and zero in 2006-2008. *Approved bank* is instrumented as the predicted likelihood that a bank is approved for CPP funds, conditional on applying, from a regression of CPP approvals on a bank's geography-based representation on the House Financial Services Committee. The variables *After CPP* and *Approved bank* drop out of the regression due to the inclusion of year and bank fixed effects, respectively. In the matched sample, for each bank that applied for CPP funds but was not approved, we match the closest approved bank based on propensity scores estimated from a regression that predicts the likelihood of CPP approval using the Camels proxies, foreclosures, and size. All variables are defined in Appendix A. *Bank level controls* include the Camels proxies, foreclosures, percentage of core deposit funding, exposure to regional economic shocks, and size. *Borrower fixed effects* include gender, race, and ethnicity indicators. The p-values (in brackets) are based on standard errors that are heteroskedasticity consistent and clustered at the bank level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Robustness to Time Periods (Full Sample)

Subsample	Exclude loan applications reviewed in 2006-2007	Exclude loan applications reviewed in 2008	Exclude loan applications reviewed in 2009	Exclude loan applications reviewed in 2010	Exclude CPP investments made after the American Recovery and Reinvestment Act	Exclude CPP investments made after December 31, 2008
Column	(1)	(2)	(3)	(4)	(5)	(6)
Loan to income	-0.032***	-0.030***	-0.029***	-0.028***	-0.027***	-0.029***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
After CPP x Approved bank	-0.039	-0.015	-0.034	-0.029	-0.015	-0.016
	[0.846]	[0.717]	[0.401]	[0.748]	[0.546]	[0.963]
After CPP x Loan to income	-0.048	-0.062	-0.056	-0.063*	-0.078	-0.070
	[0.116]	[0.191]	[0.130]	[0.184]	[0.148]	[0.125]
Approved bank x Loan to income	-0.004	-0.013	-0.016	-0.016	-0.023	-0.008
	[0.553]	[0.451]	[0.372]	[0.355]	[0.205]	[0.353]
After CPP x Approved bank x Loan to income	0.069**	0.081*	0.080**	0.081***	0.078**	0.087**
	[0.029]	[0.092]	[0.038]	[0.008]	[0.038]	[0.048]
Regulatory interventions	-0.002	-0.008**	-0.013**	-0.014**	-0.018**	-0.012**
	[0.682]	[0.027]	[0.025]	[0.033]	[0.031]	[0.025]
Regulatory interventions x Loan to income	-0.009**	-0.011**	-0.014*	-0.014**	-0.017**	-0.005*
	[0.034]	[0.042]	[0.065]	[0.034]	[0.027]	[0.067]
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes
Borrower fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Tract fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	309,071	543,218	597,081	608,948	547,546	415,029
R-Squared	0.275	0.268	0.289	0.291	0.290	0.295

Panel B: Robustness to Time Periods (Matched Sample)

Subsample	Exclude loan applications reviewed in 2006-2007	Exclude loan applications reviewed in 2008	Exclude loan applications reviewed in 2009	Exclude loan applications reviewed in 2010	Exclude CPP investments made after the American Recovery and Reinvestment	Exclude CPP investments made after December 31, 2008
Column	(1)	(2)	(3)	(4)	(5)	(6)
Loan to income	-0.037*** [0.000]	-0.038*** [0.000]	-0.037*** [0.000]	-0.036*** [0.000]	-0.027** [0.010]	-0.034** [0.002]
After CPP x Approved bank	-0.018 [0.850]	-0.012 [0.620]	-0.021 [0.481]	-0.017 [0.698]	-0.016 [0.205]	-0.012 [0.174]
After CPP x Loan to income	-0.070 [0.517]	-0.052 [0.532]	-0.064 [0.191]	-0.061 [0.986]	-0.075 [0.566]	-0.065 [0.363]
Approved bank x Loan to income	-0.021 [0.901]	-0.019 [0.125]	-0.019 [0.133]	-0.018 [0.155]	-0.014 [0.583]	-0.016 [0.984]
After CPP x Approved bank x Loan to income	0.057** [0.049]	0.059** [0.038]	0.057** [0.036]	0.061** [0.034]	0.061** [0.034]	0.093* [0.071]
Regulatory interventions	-0.031** [0.042]	-0.019** [0.035]	-0.016* [0.091]	-0.014 [0.938]	-0.012* [0.052]	-0.011** [0.036]
Regulatory interventions x Loan to income	-0.003 [0.679]	-0.018* [0.077]	-0.019** [0.049]	-0.019** [0.042]	-0.028* [0.062]	-0.023** [0.029]
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes
Borrower fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Tract fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	50,015	90,891	100,766	103,856	91,916	30,604
R-Squared	0.188	0.162	0.170	0.169	0.141	0.133

Panel C: Robustness to Sample Firms and Credit Demand (Full Sample)

Subsample	Include firms subject to stress tests under the Capital Assessment Plan	Exclude FDIC-facilitated acquisitions	Exclude approved banks that declined CPP funds	Dependent variable: loan-to-income ratio of the application received	Dependent variable: annual number of applications received by each bank/assets	Dependent variable: annual application amount received by each bank/assets
Column	(1)	(2)	(3)	(4)	(5)	(6)
Loan to income	-0.031*** [0.000]	-0.027*** [0.000]	-0.030*** [0.000]			
After CPP x Approved bank	-0.015 [0.323]	0.014 [0.958]	-0.004 [0.544]	0.025 [0.868]	0.001 [0.700]	0.005 [0.755]
After CPP x Loan to income	-0.016 [0.636]	-0.014 [0.683]	-0.004 [0.385]			
Approved bank x Loan to income	-0.022 [0.455]	-0.018 [0.317]	-0.015 [0.410]			
After CPP x Approved bank x Loan to income	0.058** [0.031]	0.054** [0.029]	0.088** [0.042]			
Regulatory interventions	-0.006 [0.386]	-0.014** [0.037]	-0.011* [0.064]			
Regulatory interventions x Loan to income	-0.014 [0.177]	-0.012* [0.098]	-0.013** [0.038]			
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes
Borrower fixed effects?	Yes	Yes	Yes	Yes	N/A	N/A
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Tract fixed effects?	Yes	Yes	Yes	Yes	N/A	N/A
Observations	2,982,433	488,597	639,675	686,106	1,942	1,942
R-Squared	0.143	0.235	0.276	0.124	0.669	0.538

Panel D: Robustness to Sample Firms and Credit Demand (Matched Sample)

Subsample	Include firms subject to stress tests under the Capital Assessment Plan	Exclude FDIC-facilitated acquisitions	Exclude approved banks that declined CPP funds	Dependent variable: loan-to-income ratio of the application received	Dependent variable: annual number of applications received by each bank/assets	Dependent variable: annual application amount received by each bank/assets
Column	(1)	(2)	(3)	(4)	(5)	(6)
Loan to income	-0.030*** [0.000]	-0.026*** [0.000]	-0.026*** [0.000]			
After CPP x Approved bank	-0.021 [0.649]	-0.006 [0.728]	0.011 [0.486]	0.021 [0.558]	0.001 [0.485]	-0.004 [0.694]
After CPP x Loan to income	-0.013 [0.265]	0.006 [0.702]	-0.005 [0.314]			
Approved bank x Loan to income	-0.003 [0.749]	-0.012 [0.483]	-0.020 [0.466]			
After CPP x Approved bank x Loan to income	0.063*** [0.003]	0.061** [0.035]	0.083** [0.039]			
Regulatory interventions	-0.013** [0.039]	-0.010* [0.064]	-0.014* [0.057]			
Regulatory interventions x Loan to income	-0.005* [0.063]	-0.008 [0.259]	-0.016** [0.044]			
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes
Borrower fixed effects?	Yes	Yes	Yes	Yes	N/A	N/A
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Tract fixed effects?	Yes	Yes	Yes	Yes	N/A	N/A
Observations	115,176	102,884	111,362	115,176	827	827
R-Squared	0.185	0.192	0.161	0.779	0.743	0.743

Table VI
Corporate Loans, Loan Commitments, and Loan Yields

This table provides evidence on the relation between a bank's approval for CPP and its corporate lending, loan commitments, and loan yields. Panel A reports regression estimates from loan-level data explaining the relation between a bank's approval for CPP and corporate lending. In Panel A, the dependent variable is the ratio of the number of lenders that were approved for CPP to the total number of lenders per syndicated loan. Data on corporate loans are obtained from Dealscan and cover the period 2006-2010. In Panel A, we use three measures of borrowers' risk. *Cash flow volatility* is the volatility of earnings, net of taxes and interest and scaled by total assets, over the previous ten years. *Intangible assets* is the ratio of intangible assets to total book assets. *Interest coverage* is the inverse of the interest coverage ratio, calculated as interest expense divided by earnings before interest and taxes. Panel B reports regression estimates from panel regressions explaining bank loan commitments and yields on loan portfolios. In Columns (1) and (2) of Panel B, the dependent variable is *Yield on loan portfolios*, measured as interest and fee income from loans and leases divided by total loans and leases. In Columns (3) and (4) of Panel B, the dependent variable is loan commitments scaled by total assets. The quarterly data are from the Call Reports for 2006-2010. *Bank level controls* comprise the Camels variables, foreclosures, percentage of core deposit funding, exposure to regional economic shocks, regulatory interventions, and size. *Approved bank* is instrumented as the predicted likelihood that a bank is approved for CPP funds, conditional on applying, from a regression of CPP approvals on a bank's geography-based representation on the House Financial Services Committee. In the matched sample, each bank that applied for CPP but was not approved is matched to the closest approved bank based on propensity scores obtained from a regression that estimates the likelihood of CPP approval. *After CPP* is an indicator that equals one in 2009-2010 and zero in 2006-2008. The variables *After CPP* and *Approved bank* drop out of the regression due to the inclusion of year and bank fixed effects, respectively. All variables are defined in Appendix A. The p-values (in brackets) are based on standard errors that are heteroskedasticity consistent and clustered at the borrower level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Corporate Loans

Risk measure	Cash flow volatility		Intangible assets		Interest coverage	
Sample	Full sample	Matched sample	Full sample	Matched sample	Full sample	Matched sample
Model	(1)	(2)	(3)	(4)	(5)	(6)
Borrower risk	-0.085** [0.019]	-0.013 [0.833]	-0.015 [0.690]	-0.038 [0.607]	-0.001 [0.932]	-0.027 [0.142]
After CPP x Borrower risk	0.132** [0.033]	0.056** [0.029]	0.047** [0.049]	0.036* [0.068]	0.038** [0.048]	0.040 [0.594]
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,786	147	1,786	147	1,786	147
R-Squared	0.619	0.850	0.622	0.857	0.627	0.854

Panel B: Loan Commitments and Loan Yields

Dependent variable	Yield on loan portfolios		Loan commitments	
Sample	Full sample	Matched sample	Full sample	Matched sample
Model	(1)	(2)	(3)	(4)
After CPP x Approved bank	0.012* [0.078]	0.014** [0.037]	0.018 [0.502]	-0.023 [0.633]
Bank level controls?	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes
Observations	7,946	3,323	7,946	3,323
R-squared	0.106	0.095	0.816	0.615

Table VII
Banks' Investment Securities

This table reports regressions explaining banks' portfolio investments in various security classes scaled by total assets or by total securities. Quarterly data on bank security investments are obtained from Call Reports and cover the period 2006-2010. *After CPP* is an indicator that equals one in 2009-2010 and zero in 2006-2008. *Approved bank* is instrumented as the predicted likelihood that a bank is approved for CPP funds, conditional on applying, from a regression of CPP approvals on a bank's geography-based representation on the House Financial Services Committee. The variables *After CPP* and *Approved bank* drop out of the regression due to the inclusion of year and bank fixed effects, respectively. In Panel B, each bank that applied for CPP funds but was not approved is matched to the closest approved bank based on propensity scores obtained from a regression estimating the likelihood of CPP approval. All regressions include *Bank level controls*, which comprise the Camels proxies, foreclosures, percentage of core deposit funding, exposure to regional economic shocks, regulatory interventions, and size. All variables are defined in Appendix A. The p-values (in brackets) are based on standard errors that are heteroskedasticity consistent and clustered at the bank level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Full Sample

Dependent variable	Total securities/assets	Total interest income on securities/assets	Total interest income on securities/total securities	Lower-risk securities/assets	Lower-risk securities/total securities	Riskier securities/assets	Riskier securities/total securities	Long-term debt securities/assets	Long-term debt securities/total securities
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
After CPP x Approved bank	0.107**	0.083**	0.748***	-0.008***	-0.049***	0.046*	0.179**	0.001*	0.080**
	[0.044]	[0.016]	[0.006]	[0.008]	[0.000]	[0.088]	[0.011]	[0.096]	[0.030]
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,946	7,946	7,946	7,946	7,946	7,946	7,946	7,946	7,946
R-Squared	0.855	0.549	0.518	0.868	0.783	0.834	0.789	0.815	0.782

Panel B: Matched Sample

Dependent variable	Total securities/assets	Total interest income on securities/assets	Total interest income on securities/total securities	Lower-risk securities/assets	Lower-risk securities/total securities	Riskier securities/assets	Riskier securities/total securities	Long-term debt securities/assets	Long-term debt securities/total securities
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
After CPP x Approved bank	0.113**	0.095*	0.473*	-0.004**	-0.031*	0.039**	0.122*	0.001	0.091*
	[0.040]	[0.072]	[0.060]	[0.038]	[0.066]	[0.034]	[0.068]	[0.658]	[0.083]
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,323	3,323	3,323	3,323	3,323	3,323	3,323	3,323	3,323
R-Squared	0.85	0.622	0.542	0.802	0.738	0.833	0.739	0.768	0.767

Table VIII
Capitalization

This table provides evidence on the relation between CPP approvals and bank capital ratios. Panel A provides univariate evidence on the dynamics of bank capital ratios around CPP investments for various subsets of CPP applicants: rejected firms, approved firms that received capital funding, and approved firms that declined capital funding. For each subset of firms, the table reports the average of three capitalization ratios at the start of our sample period (Q1 2006), before CPP (Q3 2008), after most CPP investments (Q1 2009), and at the end of our sample period (Q4 2010). The three capitalization ratios include: (1) tier 1 risk-based capital ratio, (2) total risk-based capital ratio, and (3) equity capital ratio. Panel B reports difference-in-difference regressions explaining the three bank capitalization ratios. Quarterly data from Call Reports cover the period 2006-2010. *After CPP* is an indicator that equals one in 2009-2010 and zero in 2006-2008. The two rows in Panel B correspond to different definitions of the variable *Approved bank*. In the first row, *Approved bank* is instrumented as the predicted likelihood that a bank is approved for CPP, conditional on applying, from a regression of CPP approvals on a bank's geography-based representation on the House Financial Services Committee. In the second row, *Approved bank* is an indicator that equals one if the applicant bank was approved for CPP and zero if it was denied. The variables *After CPP* and *Approved bank* drop out of the regression due to the inclusion of year and bank fixed effects, respectively. In the matched sample, each bank that applied for CPP but was not approved is matched to the closest approved bank based on propensity scores obtained from a regression estimating the likelihood of CPP approval. All regressions include bank and year fixed effects. All variables are defined in Appendix A. The p-values (in brackets) are based on standard errors that are heteroskedasticity consistent and clustered at the bank level. ***, **, or * indicates that the point estimate is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Univariate Evidence

Capitalization measure	Tier 1 risk-based capital ratio					Total risk-based capital ratio					Equity capital ratio				
Period	Q1 2006	Q3 2008	Q1 2009	Q4 2010	Diff (3)-(2)	Q1 2006	Q3 2008	Q1 2009	Q4 2010	Diff (8)-(7)	Q1 2006	Q3 2008	Q1 2009	Q4 2010	Diff (13)-(12)
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Rejected firms	12.457	11.384	10.946	12.324	-0.439 (0.975)	13.532	12.643	12.266	13.650	-0.377 (0.885)	9.817	9.242	8.478	8.671	-0.765 (0.360)
Approved firms that received funding	11.423	10.736	11.619	12.450	0.883 (4.799)	12.662	12.058	13.013	13.888	0.955 (5.315)	9.803	10.009	10.288	10.047	0.279 (3.503)
Approved firms that declined funding	12.519	11.925	11.775	12.965	-0.150 (0.409)	13.556	12.933	12.841	14.134	-0.092 (0.252)	9.434	9.479	9.336	9.905	-0.143 (0.364)

Panel B: Regression Evidence

Dependent variable	Tier 1 risk-based capital ratio		Total risk-based capital ratio		Equity capital ratio	
Sample	Full	Matched	Full	Matched	Full	Matched
Model	(1)	(2)	(3)	(4)	(5)	(6)
After CPP x Approved bank (instrument)	3.945*** [0.001]	1.446*** [0.006]	3.967*** [0.001]	1.448*** [0.009]	4.793*** [0.000]	2.628*** [0.007]
After CPP x Approved bank (indicator)	1.579*** [0.000]	0.868*** [0.005]	1.523*** [0.000]	0.805*** [0.007]	1.457*** [0.000]	0.969*** [0.003]
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,946	3,323	7,946	3,323	7,946	3,323

Table IX
Overall Bank Risk

This table reports regression evidence on the relation between CPP approvals and bank risk. Bank quarterly data are obtained from Call Reports and cover the period 2006-2010. *After CPP* is an indicator that equals one in 2009-2010 and zero in 2006-2008. The two main rows in the table correspond to different definitions of the variable *Approved bank*. In the first row, *Approved bank* is instrumented as the predicted likelihood that a bank is approved for CPP funds, conditional on applying, from a regression of CPP approvals on a bank's geography-based representation on the House Financial Services Committee. In the second row, *Approved bank* is an indicator that equals one if the applicant bank was approved for CPP and zero if it was denied. The variables *After CPP* and *Approved bank* drop out of the regression due to the inclusion of year and bank fixed effects, respectively. In the matched sample, each bank that applied for CPP but was not approved is matched to the closest approved bank based on propensity scores obtained from a regression estimating the likelihood of CPP approval. *ROA volatility* is calculated as the quarterly standard deviation of ROA over the trailing four quarters. *Z-score* is the sum of the return on assets (ROA) and the equity capital ratio divided by the standard deviation of ROA. *Betas* are calculated based on the market model (with the CRSP value-weighted index as the market proxy), using daily returns over a one-year horizon. *Stock return volatility* is calculated from daily returns over a one-year horizon. All regressions include *Bank level controls*, which comprise the Camels variables, foreclosures, percentage of core deposit funding, exposure to regional economic shocks, regulatory interventions, and size. All variables are defined in Appendix A. The p-values (in brackets) are based on standard errors that are heteroskedasticity consistent and clustered at the bank level. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

Risk Measure	ROA volatility		Z-Score		Beta		Stock return volatility	
Sample	Full sample	Matched sample	Full sample	Matched sample	Full sample	Matched sample	Full sample	Matched sample
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After CPP x Approved bank (instrument)	0.007*** [0.002]	0.008*** [0.001]	-14.087*** [0.005]	-11.436*** [0.000]	0.119** [0.041]	0.048** [0.046]	0.024*** [0.000]	0.018*** [0.001]
After CPP x Approved bank (indicator)	0.005*** [0.009]	0.004** [0.023]	-10.392*** [0.002]	-8.596*** [0.006]	0.114** [0.038]	0.012** [0.039]	0.016** [0.032]	0.008* [0.089]
Bank level controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,946	3,323	7,946	3,323	7,946	3,323	7,946	3,323