Liquidity Backstop, Corporate Borrowing, and Real Effects*

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We show the effects of the provision of public liquidity on corporate outcomes. Exploiting the Commercial Paper Funding Facility's (CPFF) eligibility criteria for nonfinancial CP issuers, we show that firms with access to the CPFF were able to mitigate financing disruptions caused by Lehman's bankruptcy. The CPFF significantly reduced the cost of debt financing while having little impact on the amount of CP borrowing. This, in turn, led to an increase in profitability and short-term earnings forecasts. However, we find little support for long-term real effects, such as investments or payout policies. We also find public liquidity has spillover effects from CPFF-eligible firms to their customers through the increased use of trade credits after the introduction of the CPFF.

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The failures of financial intermediaries that followed the collapse of Lehman Brothers in September 2008 raised concerns that a weakened financial sector would lead to a credit crunch for non-financial firms and destabilize the overall economy. In response, the Federal Reserve and other U.S. government agencies implemented a series of policy interventions designed to restore the financial sector.[1] While many studies investigate the effects of this crisis on various sectors of the economy, relatively few papers assess the impact of these policy interventions at the level of the end user. As noted by Spatt (2012), the recent series of government interventions provides good opportunities to measure the various roles of government in financial markets.

In this paper, we study the effect of the public provision of liquidity on non-financial firms through the implementation of the Commercial Paper Funding Facility (CPFF) and subsequent firm-level responses. While there are only a few commercial paper (CP) issuers in the economy, they are top quality firms and comprise a significant fraction of the economy.[2] The CPFF is a Fed-sponsored liquidity backstop designed to stabilize the contraction of the CP market by purchasing 90-day CP from highly rated U.S. issuers between October 27, 2008 and February 1, 2010. According to the Fed, the CPFF helped lower the surging CP spreads and mitigate the rollover risk caused by the bankruptcy of Lehman Brothers (Adrian, Kimbrough, and Marchioni, 2011).

Understanding the impact of the public provision of liquidity is important for two reasons. First, corporate liquidity is critical to firms' real decisions. Second, the public provision of liquidity, especially in the form of the lender of last resort, may lead to undesirable consequences, such as moral hazard by borrowers or lenders. Whether public provision boosts

[1] Other government policy interventions implemented during the recent financial crisis include the Primary Dealer Credit Facility (PDCF), the Term Securities Lending Facility (TSLF), the Temporary Liquidity Guarantee Program (TLGP), the Money Market Investor Funding Facility (MMIFF), and the Term Asset-Backed Securities Loan Facility (TALF).

[2] As of 2008:Q1, CP issuers constitute 57% of total assets and over 60% of total market cap in the manufacturing sector.

confidence in the lending market or exacerbates reckless defaults by borrowers is a matter that should be subject to careful empirical examination.

Empirically, assessing the impact of government policy is often challenging because the decision to adopt a particular policy is endogenous to entities (firms) that are subject to such policy. The CPFF provides a useful setting that permits us to examine the impact of the public provision of liquidity on the real economy. First, *borrowed reserves* (the Fed's source of funds for the CPFF program) are intended to be used for deposit-taking institutions, and this program was mainly intended to rescue financial CP issuers. Various policy choices (including eligibility criteria) were largely exogenous for the non-financial (e.g., manufacturing) firms studied here.[3] Second, the collapse of Lehman Brothers led to an unprecedented liquidity shock driven by a substantially weakened financial sector, which was the main source of private liquidity. Given the severely contracted private liquidity, the impact of government-sponsored public liquidity was expected to be substantive, which gives power to our identification of impact of public liquidity provision on the real economy. Finally, the CPFF was available only to a subset of CP issuers. Thus the eligibility criteria not only guard against the issues arisen due to firms' "self-selection" into policy intervention, but also allow us to exploit some cross-sectional features embodied in the policy intervention. That is, these cross-sectional (CPFF eligible and ineligible) and time-series (before and after the creation of the CPFF) variations allow us to identify the impact of the public provision of liquidity on firms under a quasi-experiment setting.

We focus on firms near the CPFF eligibility cutoff based on CP issuers' *long-term* ratings, which are more discriminating than short-term ratings (i.e., there is more than one long-

[3] Also, whereas financial CP issuers suffered from fundamentals (e.g., losses from non-performing loans), manufacturing sector firms faced difficulties arising mainly from the disruption in financing rather than their fundamentals. Hence, the CPFF for financial CP issuers may be viewed as "bail-outs," whereas the CPFF for nonfinancial CP issuers can be better viewed as the public provision of liquidity.

term rating associated with each short-term CP rating). Prior studies, such as Calomiris, Himmelberg, and Wachtel (1995), suggest that CP issuers as a whole are considered highest credit quality borrowers, with large asset size, high collateral value, extensive credit market experience, and high earning power. In other words, they are rather homogeneous on these dimensions. Comparisons of CP issuers based on their relative credit quality using finely-defined *long-term* ratings (*within* each short-term CP rating) further minimize unintended influence due to differences in credit quality (e.g., flight-to-quality) and permit us focus on the differential impact of the CPFF on firms with and without access to this program. In addition to the main test (lowest long-term rating of A-1 vs. highest long-term rating of A-2), we examine two placebo tests that compare firms from CPFF eligible and CPFF ineligible groups, where we find no significant differences. These insignificant placebo test results confirm that our results are not driven by differences in borrower credit quality such as flight-to-quality.

Using manually-collected firm-level quarterly CP borrowing data from the SEC 10-Q/10-K and Capital IQ for publicly traded U.S. manufacturing firms from 2007:Q1 to 2010:Q4, we find that the CPFF mainly affected CP issuers by lowering the cost of debt financing rather than through changes in total debt or CP borrowings. For example, after the introduction of the CPFF, the difference in interest expenses to debt ratio between A (lowest long-term rating of CPFF eligible A-1) and A- (highest long-term rating of CPFF ineligible A-2) rated firms decreased by 0.37% (32% of the pre-crisis sample mean). However, there was no significant change in differences between these firms in debt-to-assets or CP-to-assets ratios after the CPFF was introduced. Such a reduction in the cost of debt financing led to a substantial increase in the profitability and short-term earnings forecasts of CPFF eligible firms: the net income-to-assets ratio of CPFF eligible firms increased by 2.93% over CPFF ineligible firms after the CPFF was introduced. However, we do not find any significant changes in the differences between CPFF eligible and ineligible firms for long-term earnings forecasts and other real activities, such as investments and dividend payout policies.

We also explore the broader implications of this government liquidity backstop for firms that did not have direct access to this program. Notably, we find that net trade credits extended to CPFF eligible firms' customers (as measured by receivables minus account payables) increased after the CPFF was introduced. We find that customers of CPFF eligible A-1 rated CP issuers around the crisis period received more trade credit in the form of accounts payable relative to their peers (former clients of the same firms) after the introduction of the CPFF.

Findings from our study contribute to the extant literature by providing firm-level evidence on how the public supply of liquidity affected nonfinancial firms' financing and operational decisions. That is, we provide disaggregate evidence on the impact of the provision of public liquidity on the end users of short-term credit. Our study also sheds light on how the public provision of liquidity is redistributed to the rest of the economy through client networks, thereby having more widespread effects than just those on the originally targeted firms. With more government-initiated intervention programs expected to appear in the upcoming years, the findings of this paper are significant, as we provide empirical analysis of how one of the early policies, the CPFF, performed.

The rest of the paper develops as follows. Section I provides background on the recent financial crisis and the institutional features of CPFF. Section II includes a description of the data used for this study and provides summary statistics of the variables. Section III presents evidence of the impact of the CPFF on firms' financing decisions and real effects. Section IV examines the spillover effect of the CPFF from CPFF eligible firms to their clients. Section V concludes.

I. The Financial Crisis of 2008 and the CPFF

I.A. Background

The increase in subprime mortgage defaults in early 2007 triggered the 2007–2008 financial crisis. In March 2008, Bear Stearns was bailed out and acquired by J. P. Morgan Chase. As the mortgage delinquency rate rose further, Freddie Mac and Fannie Mae were placed into federal conservatorship. The most significant event that led the global financial markets into a full-fledged financial crisis was Lehman Brothers' bankruptcy filing on September 15, 2008. Lehman's default raised concerns about the health of financial firms, which may subsequently have led to a credit crunch for non-financial firms. The market responded negatively: the deterioration of American International Group intensified, investors lost confidence in the safety of U.S. money market mutual funds, and, notably, the CP market broke down immediately after Lehman Brothers announced its bankruptcy filings (Mollenkamp, Whitehouse, Hilsenrath, and Dugan, 2008). According to market observers and commentators, the collapse of Lehman Brothers was followed by a virtual closing of the CP market, and a number of firms drew excessively on their remaining lines of credit out of fear that weakened banks would reduce their loan commitments.[4] In his testimony before the Financial Services Subcommittee Hearing (June 9, 2009), U.S. Secretary of Treasury Timothy Geithner stated, "If you look back at that period of time [fall of 2008], lending absolutely stopped."

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[4] For example, when the commercial paper market dried up during the fall of 2008, hampering American Electric Power (AEP)'s ability to raise near-term cash, AEP drew $2 billion from the facility, banked cash, and gradually retired their commercial paper. Holly Koeppel, the Chief Financial Officer of AEP, said: "that was our bridge to get us through the end of the year so we could stay out of the long-term credit market when it was rolling…Our ability to move early in drawing on our lines of credit has benefited us, giving us the flexibility to wait out the current crisis to resume more normal refinancing." (Banham, 2009). Similarly, the financial chief of Sally Beauty, which has 3,700 stores and annual sales of $2.5 billion, said that his firm is not affected directly by Lehman, but he drew $74 million from a $400 million revolver for precautionary purposes (McCracken and Enrich, 2008). The Journal reports that, within a month after the collapse of Lehman Brothers, at least 17 companies, including Goodyear Tire & Rubber, drew on lines to create a rainy-day fund (Enrich and McCracken, 2008).

Outstanding CP severely declined in the third week of September 2008. This contraction lasted until the end of October, when the Federal Reserve implemented the Commercial Paper Funding Facility (CPFF). The CPFF uses a special purpose vehicle (SPV) that purchases CP from issuers using financing provided by the Federal Reserve Bank of New York (New York Fed), holds the CP until maturity, and uses the proceeds from maturing CP and other assets of the SPV to repay its loan from the New York Fed. Through this process, the CPFF provides a liquidity backstop to U.S. issuers of CP. The SPV was initially scheduled to terminate on April 30, 2009, but was extended to February 1, 2010. While the CPFF was more widely used by financial firms, the role of the CPFF was also significant for non-financial firms because the presence of a lender of last resort in the CP market greatly reduced CP investors' concerns about downside risk during the financial crisis. According to a Fed report, the CPFF greatly improved the liquidity of the CP market for both financial and non-financial firms (Adrian, Kibrough, and Marchinoni, 2011).

A notable feature of the CPFF is the variation in its availability to CP issuers. Since the Federal Reserve acted as the lender of last resort, there was a concern that issuers might take excessive risks funded by CP. To minimize the credit risk and to decentralize credit risk management, the CPFF's SPV only purchased U.S. dollar-denominated CP with an A-1/P-1/F-1 rating from a nationally recognized statistical rating organization (NRSRO). Also, to avoid excessive risk taking using government-backed CP, the maximum amount of CP the SPV was allowed to purchase was equal to the greatest amount of U.S. dollar-denominated CP the issuer had outstanding on any day between January 1 and August 31, 2008.

Using these eligibility criteria, we divide our sample firms in two groups: top-rated CP issuers that had CP outstanding between January 1 and August 31, 2008 (CPFF eligible firms) and those that do not satisfy these conditions (CPFF ineligible firms). Specifically, in the main tests, we focus on A-1 and A-2 rated CP issuers with CP outstanding during January to August of 2008. While Calomiris, Himmelberg, and Wachtel (1995) show that CP issuers as a whole are homogeneous in many observable characteristics, we supplement our main test (A-1 vs. A-2) with two placebo tests that compare firms within CPFF eligible and CPFF ineligible groups to confirm that our results are not driven by differences in borrower credit quality.

Finally, there were a number of other government interventions implemented around the time when the CPFF was introduced. Interventions that targeted all CP issuers or randomly benefitted some CP issuers may add noise to our test. These interventions may reduce the precision of our test but will not introduce any estimation bias. Some interventions that targeted financial institutions may have indirectly impacted nonfinancial firms, including manufacturing CP issuers. These interventions were designed to restore the strength of financial institutions, which, in turn, encourages financial institutions to ease lending to financially constrained (e.g., lower credit quality) nonfinancial borrowers. For example, intervention in financial institutions benefits lower credit quality borrowers by mitigating flight-to-quality. Since our test looks for divergence between A-1 and A-2 rated CP issuers after the introduction of the CPFF, such interventions in financial institutions (which seek to narrow the gap between high and low credit quality borrowers) work against our test. That is, in the presence of additional intervention in financial institutions, findings from our test can be considered a conservative estimate.[5] The most

[5] For example, the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) was designed to restore money market mutual funds (MMMF) (U.S. depository institutions, U.S. bank holdings, or U.S. branches and agencies of foreign banks) , which are major investors in the commercial paper market. As shown in page 29 of Adrian, Kimbrough, and Marchioni (2011), the collapse of MMMF (i.e., broke the buck) disproportionately impacted A-2 (CPFF ineligible) CP issuers, because MMMF are required to invest in safe assets. That is, MMMF investors pulled A-2 rated CP first before withdrawing A-1 rated CP. The revival of the MMMF had a more positive impact on A-2 rated issuers, and narrowed the difference between A-1 and A-2 CP issuers. Since our test looks for diverging trends between A-1 and A-2 rated CP issuers after the introduction of the CPFF,

serious concern is when government intervention targets manufacturing CP issuers. In such cases, eligibility criteria are likely to be endogenous with unobserved CP issuer characteristics, and the resulting impact of such interventions on firm outcomes will interfere with the effect of the CPFF, making it difficult to establish a causal relationship between the CPFF and firm outcomes. There are two government interventions that targeted manufacturing firms: the Troubled Asset Relief Program (TARP) and the Cash for Clunkers Program.[6] Among the $700 billion TARP fund, $604.5 billion was disbursed to 926 firms, including two nonfinancial/nonmortgage/noninsurance firms: General Motors and Chrysler. We exclude these firms from our sample. As documented by Mian and Sufi (2012), the Cash for Clunkers Program lasted for one month: July 24 to August 24, 2009. In the Appendix (Table AI), we show that our results are qualitatively similar when periods after the Cash for Clunkers Program are excluded.

I.B. Theoretical motivation

This paper is motivated by theories about government intervention in financial markets and public liquidity provision. Prior literature suggests that government intervention in the lending market can be beneficial when capital markets are imperfect or contracts are incomplete. Bolton and Rosenthal (2002) show that government-initiated debt relief can be beneficial when contracts are constrained to be state-independent. In this case, majority voting can "certify" economic conditions that merit debt relief. Bolton, Santos, and Scheinkman (2009, 2011) show that banks facing a liquidity shortfall may be compelled to trade their assets prematurely to avoid adverse selection in secondary markets at future dates. Banks that engage in these premature

any significant impact of the MMMF (i.e., convergence of A-1 and A-2) is likely to work against our findings, so our result is actually a conservative estimate.

[6] http://www.nytimes.com/packages/html/national/200904_CREDITCRISIS/recipients.html.

sales give up the opportunity to avoid fire sales entirely when liquidity needs turn out to be temporary. Injections of public liquidity deter the premature sale of assets upon liquidity shock by providing price supports for secondary markets. In the presence of aggregate uncertainty, the private sector is unable to fully insure liquidity shocks because each firm faces trouble exactly when the others do and cross-subsidization breaks down. Government intervention can mitigate illiquidity-driven inefficiencies by supplying public liquidity in the financial market (Holmstrom and Tirole, 1998).

The creation of the CPFF is consistent with these theoretical motivations. Following the bankruptcy of Lehman Brothers, a series of extraordinary policy interventions, including the CPFF, were passed by the congress (Mian, Trebbi, and Sufi (2010)). This is consistent with the view of "certification" though majority voting for economic conditions that merit debt relief, as proposed by Bolton and Rosenthal (2002). The correlated collapse of the financial sector in the recent financial crisis fits well with the theoretical situation in which pure aggregate uncertainty causes cross-subsidization to break down. As suggested by Holmstrom and Tirole (1998, 2011), a central bank can efficiently coordinate the allocation of excess liquidity in the economy and avoid systemic financial meltdown. This crisis provides a natural context in which to assess the impact of the Fed's liquidity intervention (i.e., the CPFF) on corporate liquidity.[7] Our paper shows that Fed intervention allowed financial markets to maintain their level of lending for creditworthy borrowers during the crisis.[8] Finally, Bebchuk and Goldstein (2011) show how provision of government capital or guarantees can encourage privately managed lending.

[7] An incomplete list of studies on corporate liquidity (cash and lines of credit) includes Boot, Thakor, and Udell (1987); Fazzari, Hubbard, and Petersen (1988); Blanchard, Lopez-de-Silanez, and Shleifer (1994); Kaplan and Zingales (1997); Martin and Santomero (1997); Kim, Mauer, and Sherman (1998); Opler, Pinkowitz, Stulz, and Williamson (1999); Kashyap, Rajan, and Stein (2002); Almeida, Campello, and Weisbach (2004); Faulkender and Wang (2006); DeMarzo and Fishman (2007); Dittmar and Mahrt-Smith (2007); Harford, Mansi, and Maxwell (2007); Sufi (2009); and Yun (2009).

[8] In contrast, credit card limits were reduced in the consumer credit market after the crisis in the absence of a similar liquidity injection (Andriotis, 2009).

Consistent with their prediction, our results show that the CPFF had spillover effects to clients of CP issuers, firms that were not subject to this policy, through the use of trade credits within business networks.

Given the severe contraction in the lending market following the bankruptcy of Lehman Brothers, we would expect most of the financial and operational characteristics of non-financial firms to decline in the short run (1–2 years) in the absence of government intervention. Hence, we expect CPFF eligible firms to have better access to financing in the lending market than ineligible firms. It remains to careful empirical investigation whether such mitigated disruption in financing lead to higher profits or better performance for CPFF eligible firms. We will explore some of these venues in the following sections.

I.C. Relation to the empirical literature

Our work relates to the literature on the provision of public liquidity. Notably, Sundaresan and Wang (2009) show that the provision of public liquidity in the form of millennium date change (Y2K) options reduced the liquidity concerns of bond dealers due to Y2K issues (e.g., disruption in the banking system because transaction dates in 2000 were interpreted by computers to be in 1900) and reduced the Y2K-related liquidity premium of Treasury securities. Christensen, Lopez, and Rudebusch (2009) provide evidence from the recent financial crisis: the central bank’s announcement of liquidity facilities led to a lower liquidity premium in term interbank rates. Duygan-Bump et al (2012) evaluate the impact of the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) on flows of money market funds and asset-backed commercial paper’s yields. Our study complements these works by providing firm-level evidence on how the public supply of liquidity affected individual firms' financing and other operational decisions. From an identification point of view, the cross-sectional variation in the public supply of liquidity (i.e., the CPFF was available only to current top-tier rated CP issuers) allow us to compare the impact of the CPFF against *ex ante* similar firms with differential access to public liquidity.

There is a growing literature on empirical examinations of the financial crisis; ours fits there and is closely related to studies on short-term lending and corporate liquidity. Afonso, Kovner, and Schoar (2011) examine the impact of counterparty risk in interbank lending following the Lehman Brothers bankruptcy. Chari, Christiano, and Kehoe (2008) and Ivashina and Scharfstein (2010) show changes in aggregate lending activities by banks during the recent financial crisis. Bebchuk and Goldstein (2011) discuss how government intervention can mitigate self-fulfilling market freezes. Duchin, Ozbas, and Sensoy (2010) and Almeida, Campello, Laranjeira, and Weisbenner (2012) examine the impact of pre-crisis liquidity positions on post-crisis corporate outcome. Campello, Giambona, Graham, and Harvey (2010) show how firms managed liquidity during the crisis. Campello, Graham, and Harvey (2010) provide a CFO survey on companies' ability to access external funds. Wermers (2012) provides high-frequency estimates of the run on money market mutual funds during the Lehman crisis. Kacperczyk and Schnabl (2011) and Covitz, Liang, and Suarez (2012) report contraction in the asset-backed commercial paper market during the recent financial crisis. Kacperczyk and Schnabl (2010) and Adrian, Kimbrough, and Marchioni (2011) consider the impact of the CPFF on aggregate market conditions and money market funds, respectively, whereas our study provides firm-level evidence on the impact of the CPFF on non-financial firms.

Works on prior financial crises include Lemmon and Roberts (2010), who examine leverage and the investment decisions of junk bond issuers after the collapse of Drexel Burnham

Lambert. Also, Chava and Purnanandam (2008) study correlations between banking relationships and valuations during the financial crisis in 1998. These works focus on the impact of a financial crisis on various aspects of firms' short-term lending and their real effects, whereas this paper focuses on the impact of governmental response to the crisis on firms' business decisions and subsequent real effects.

Finally, our paper relates to literature on trade credits, short-term borrowing, and liquidity. Kashyap, Stein, and Wilcox (1993) show that firms switch from bank loans to commercial paper following shifts toward tighter monetary policy. Gatev and Strahan (2006), Adrian, Colla, and Shin (2012), and Becker and Ivashina (2011) show similar switches between bank loans and public bonds. Petersen and Rajan (1997) show that trade credit supplements capital markets in that financially constrained firms often receive trade credits from their suppliers. We focus on end-users of short-term credits and show that the heterogeneous availability of public liquidity led to diverging financing decisions and real effects among firms. This finding is related to Gertler and Gilchrist (1994), who find that the financial propagation mechanism is asymmetric because of access to alternative sources of funds. Kahl, Shivdasani, and Wang (2008) suggest that commercial paper provides financial flexibility and substitutes for cash holdings. Our work complements this by showing how commercial paper issuers respond to a financial crisis and subsequent government rescue efforts in terms of debt borrowings (including commercial paper) and cash holdings.

II. Data

II.A. Sample construction

The primary data comprise firm-level commercial paper outstanding for manufacturing firms (SIC codes 2000–3999) in the United States at quarterly frequency from the first quarter of 2007 to the fourth quarter of 2010. Information on commercial paper and unused lines of credit are collected from Capital IQ and SEC 10-K/10-Q filings. Commercial paper is a corporate-issued promissory note with maturity up to 270 days. Corporations use commercial paper as a lower-cost alternative to bank loans to raise cash needed for current transactions. We focus on manufacturing firms because these firms constitute a large fraction of non-financial CP issuers and exhibit less seasonality, which can obscure quarter-to-quarter changes in business activities. Also, by focusing on manufacturing firms, we can mitigate the high cost of manually collecting commercial paper data while also being able to examine the majority of the commercial paper data among non-financial firms. To ensure that our findings are not driven by pseudo-financing activities, we exclude firms associated with shadow banking, which we determine using various data sources, including the Mergent database and news articles from Factiva. Also, information on default risk as measured by expected default frequency (EDF) is obtained from Moody's-KMV.

This panel of commercial paper data is then matched with Compustat Quarterly Files to obtain borrowers' financial characteristics. For an observation to be included in our sample, we require the total assets (Compustat data code: ATQ) and total debt (DLCQ+DLTTQ) to be positive and non-missing. The resulting final sample includes 1914 firm-quarter observations for 138 firms during the 2007:Q1–2010:Q4 period. Seventy-two of these firms had an A-1 or A-1+ rating as of August 2008; these firms are the main focus of the paper.

We also consider business partners or clients (e.g., customers and suppliers) of the CPFF eligible CP issuers. Information on clients is obtained from Capital IQ. We mainly focus on clients in the manufacturing industry and those firms that are not associated with shadow banking activities. The resulting sample includes 1,639 firm–quarter observations from 2008:Q1 to 2009:Q4 for 218 firms.

II.B. Description of the data

In this paper, we consider profitability, financing, and real effects of CP issuers around the introduction of the CPFF.

For capital structure, we use debt-to-assets, non-CP-debt-to-assets, and short-term-debt-to-total-debt ratios. We also consider interest expenses to total debt and liquidity demand. *Debt/assets* is short-term (DLCQ) and long-term debt (DLTTQ) divided by noncash assets (ATQ-CHEQ). *ST debt/debt* is short-term debt (DLCQ) divided by total debt (DLCQ+DLTTQ). *Interest/debt* is interest expenses (XINTQ) divided by total debt. Following Sufi (2009) and Yun (2009), we measure liquidity demand using the sum of cash and unused lines of credit: *(Cash+LC)/assets* is the sum of cash (CHEQ) and unused lines of credit divided by noncash assets.

For profitability, we use total revenue-to-assets, operating income-to-assets, and net income-to-assets ratios. *Revenue/assets* is total revenue (REVTQ) divided by noncash assets. *OI/assets* is operating income before depreciation (OIBDPQ) divided by noncash assets. *NI/assets* is net income (NIQ) divided by noncash assets.

We also consider the major components of income statements. *COGS/assets* (COGSQ) is cost of goods sold divided by noncash assets. *SG&A/assets* is selling, general, and administrative expenses (XSGAQ) divided by noncash assets. *Depreciation/assets* is total depreciation and amortization (DPQ) divided by noncash assets. *Tax/assets* (TXTQ) is total income tax divided by noncash assets.

For firm operations, we consider net trade credits, inventory, investments, and dividends. *NetTC/assets* is receivables net of account payables (RECTQ-APQ) divided by noncash assets. *Inventory/revenue* is total inventory (INVTQ) divided by revenue (REVTQ). Investment is measured by capital expenditures, where *CapEx/assets* is capital expenditures (CAPXY-one period lag of CAPXY) divided by noncash assets. *Dividends/assets* is total dividends (DVTQ) divided by noncash assets.

To measure earnings management, we consider discretionary accruals. *Accruals/assets* is discretionary accruals divided by noncash assets; discretionary accruals are computed following Hribar and Collins (2002) as the sum of accounts receivable (RECCH), inventory (INVCH), accounts payable and accrued liabilities (APALCH), accrued income taxes (TXACH), other assets and liabilities (AOLOCH), and depreciation and depletion (DEPC), all divided by noncash assets. To measure market responses, we consider analysts' forecasts of earnings per share from Thomson Reuters I/B/E/S. Analysts' earnings forecasts are measured at monthly frequency and are available for 1-quarter, 2-quarters, 3-quarters, 4-quarters, 2-year, and long-term forecast horizons. *EPS/price* is analysts' forecasts of earnings per share divided by stock price.

For clients of CPFF eligible CP issuers, we examine borrowings through trade credits. *Payable/assets* is accounts payable (APQ) divided by noncash assets. *(Receivable-payable)/assets* is total receivables minus accounts payable divided by noncash assets.

To account for the heterogeneity of borrowers' financial characteristics, we control for firm size, non-CP book leverage, and market-to-book ratio. Firm size is measured by the natural logarithm of total assets (ATQ). Non-CP book leverage, *(Debt-CP)/assets*, is measured by book debt (DLTTQ + DLCQ) minus CP outstanding divided by noncash assets. *Market-to-book ratio* is the book value of assets plus the market value of common equity minus the book value of common equity and deferred taxes divided by total assets. *Market value of equity* is the price (at close) times the number of common shares outstanding.

To illustrate the economy-wide default risk around the financial crisis, we consider the asset-value-weighted expected default frequency (EDF) of non-financial firms, obtained directly from Moody's-KMV. Building on the insights of the Black-Scholes-Merton contingent claim framework, Moody's-KMV developed the concept of EDF (see Crosbie and Bohn, 2003; Bharath and Shumway, 2008).[9] Compared to the traditional low-frequency measures of default risk, such as credit rating, leverage, and Z-score, among others, EDF is a market-based, timely, and forward-looking predictor of corporate defaults.

Since the EDF characterizes a borrower's default risk, we can compare EDFs associated with firms from different CP rating categories, and examine how each category is perceived by the market in terms of credit worthiness. Figure 1 shows a time-series plot of the average EDFs of each CP rating category for each month. As shown in the figure, the difference in mean EDFs among CP issuers is very small prior to 2008:Q3 (right after the collapse of Lehman Brothers) and only starts to diverge after 2008:Q4 (after the introduction of the CPFF). The pattern until 2008:Q3 confirms Calomiris, Himmelberg, and Wachtel (1995), who argue that CP rated firms as a whole are considered to be top quality firms with very low default risks. That is, CPFF eligible (A-1 rated firms with CP outstanding between January 2008 and August 2008) and ineligible firms had similar risk characteristics prior to the creation of the CPFF (2008:Q4). It is interesting that a noticeable divergence of EDF between CPFF eligible and ineligible firms starts

[9] A recent study by Correia, Richardson, and Tuna (2011) compares different predictors of default, and finds that EDF provided by Moody's-KMV outperforms other default predictors.

at 2008:Q4 when the CPFF was created. This is consistent with the view that investors began to assign higher default risks to CPFF ineligible firms (as opposed to CPFF eligible firms) because only CP issued by CPFF eligible firms was guaranteed by the CPFF.

II.C. Summary statistics

Table I shows medians, means, and standard deviations for the variables used in this paper. In Panel A, we show the firm-level financial characteristics of all CP issuers between 2007:Q1 and 2010:Q4 (Columns I–IV), of all CP issuers between 2008:Q1 and 2009:Q4 (Columns V–VIII), and top-rated (A-1 and A-1+) CP issuers between 2008:Q1 and 2009:Q4 (Columns IX–XII).

The mean (median) of total assets of all CP issuers is \$25 billion (\$12.6 billion); it is \$33 billion (\$16.7 billion) for top-rated CP issuers, which suggests that top-rated CP issuers are larger firms. The top-rated CP issuer sample has similar capital structure to the full CP issuer sample: the mean of market-to-book (2.38), debt-to-assets (0.28), short-term-debt-to-total-debt ratios (0.21), and interest expenses (0.01) of the top-rated CP issuers are very similar to those of all CP issuers. However, the mean of liquidity demand (cash and unused lines of credit divided by noncash assets) for top-rated CP issuers is higher (0.20) than that of the complete CP issuer sample (0.16). Also, the profitability of the top-rated CP issuer sample is similar to the full CP issuer sample except net income, which is slightly larger for the top-rated CP issuer sample (2.7% vs. 2.1%). All major components of the income statement are similar between the top-rated and the full CP issuer samples. For real activities, net trade credit (receivables minus accounts payable), investment (capital expenditures), payout policies (dividends), inventories, and accruals are similar between the top-rated and the full CP issuer samples.

In Panel B, we show pre-crisis (2008:Q1–Q2) summary statistics for top-rated (A-1 and A-1+) CP issuers with and without CP outstanding during January to August of 2008; only those with CP outstanding in that period are eligible for the CPFF. Overall, except for CP usage (*CP/debt*), comparison of the pre-CPFF means of CPFF eligible and ineligible CP issuers shows that various financial and operational characteristics were very similar between these two groups of firms before the CPFF was introduced. For example, the non-CP debt-to-assets ratio is 25% for CPFF eligible and 26% for the CPFF ineligible top-rated CP issuer sample. The pre-crisis mean of the net income-to-assets ratio is 2.8% for the CPFF eligible and 3.1% for the CPFF ineligible top-rated CP issuer sample. The differences in means in both cases are statistically insignificant. The most noticeable difference between the CPFF eligible and ineligible top-rated CP issuer samples is the liquidity demand (sum of cash and unused lines of credit divided by noncash assets): the mean of liquidity demand is significantly smaller for the CPFF ineligible sample in the pre-crisis period (13.6% vs. 19.6%). Panel B suggest that, except for CP usage and liquidity demand, CPFF eligible and ineligible firms were very similar in many observable characteristics in the pre-crisis period.

Panel C shows summary statistics for the clients of CPFF eligible CP issuers. The mean (median) of payables per assets is 0.3158 (0.0977). The mean (median) difference between receivables and payables (per assets) is -0.1357 (0.0616), which suggests that there are more receivables than payables. The mean (median) EDF of clients of CPFF eligible firms is 5.0465 (0.8300), which is much higher than that of the CPFF eligible firms themselves. The firm sizes of suppliers are substantially smaller than that of the CP issuers, with a mean (median) of $6.7 billion ($0.641 billion) in total assets. These firms have substantially higher leverage than CP issuers, with mean (median) leverage of 0.7369 (0.2606).

III. Direct impact on CPFF eligible firms

In this section, we examine the impact of the provision of public liquidity through the introduction of a liquidity backstop (i.e., the CPFF) on the CP market after the collapse of Lehman Brothers.

III.A. Empirical specification

One of the main challenges of establishing a causal link between the CPFF and firm performance is the endogenous nature of unobserved firm characteristics and performance. To account for this endogeneity, we exploit the heterogeneous access to the CPFF among CP issuers. While all CP issuers had similar credit risk profiles prior to the policy intervention, the Fed only allowed access to the CPFF to A-1 rated CP issuers with CP outstanding between January and August of 2008. Furthermore, these eligibility criteria were mainly driven by concerns about *financial* CP issuers, and hence can be viewed as exogenous to nonfinancial CP issuers.[10]

One possibility is to compare firms with CP outstanding between January and August of 2008 that differ in their CP rating, such as A-1 vs. A-2. However, during a financial crisis, firms with low default risks and good investment opportunities may disproportionately benefit from flight-to-quality in terms of access to financing (Bernanke, Gertler, and Gilchrist (1996)). In this

[10] One of the reasons for limiting access to the CPFF to the top-rated CP issuers with active CP usage before the Lehman crisis was to limit the credit risk exposure of financial CP issuers (Adrian, Kimbrough, and Marchioni (2011)). For example, non-top-tier-rated financial CP issuers during this period include Countrywide Financial Corporation and Washington Mutual Inc, who would have imposed large credit risks had the CPFF been accessible to them. Also, the CPFF limited coverage to the maximum amount outstanding between January to August of 2008 to avoid excessive use and abuse of this program.

case, it is difficult to distinguish the incremental impact of public liquidity provision (to high credit quality/A-1 rated firms) from other channels, including flight-to-quality.

To overcome such inference challenges, we exploit differences in S&P long-term rating (as of August 2008) within the A-1 and A-2 categories: S&P designates firms with long-term ratings of AAA to AA- as A-1+ in their short-term ratings, while firms with long-term ratings of A+ and A are given an A-1 short-term rating, and firms with long-term ratings of A- to BBB+ get an A-2 short-term rating.

Based on the S&P long-term ratings of CP issuers with CP outstanding between 2008:Q1 and Q2, we make three sets of comparisons, as shown in Figure 2: (i) A-1 rated CP issuers with the lowest long-term ratings (S&P long-term rating of A as of August 2008) and A-2 rated CP issuers with the highest long-term rating (S&P long-term rating of A- as of August 2008) (*Baseline difference-in-differences test or Baseline DD test*), (ii) A-1 and A-1+ rated CP issuers, all of whom have access to the CPFF (*Placebo test I*), and (iii) A- and BBB+ rated CP issuers, all of whom do not have access to the CPFF (*Placebo test II*). To focus on firms that are strongly impacted by the CPFF, we drop firms in the bottom tercile of CP-to-total-debt ratio, and keep firms that mostly use CP for their debt financing. Whereas the first comparison (*Baseline DD*) can be driven either by the impact of the CPFF or by flight-to-quality, the remaining two tests (*Placebo tests I and II*) can only be driven by flight-to-quality because there is no difference in the accessibility of the CPFF between the two groups used in each placebo test.

If flight-to-quality were significant among CP issuers around the time of the introduction of the CPFF, we would expect significant changes to occur in all three tests (*Baseline DD*, *Placebo I*, and *Placebo II*). That is, in the time of crisis after Lehman's default, investors prefer A-1+ to A-1 (*Placebo I*), A to A- (*Baseline DD*), and A- to BBB+ (*Placebo II*). However, if there is no significant change in *Placebo tests I and II*, and only the *Baseline DD test* reveals significant changes, then we can infer that there is a significant impact of the CPFF because flight-to-quality is not present between A-1+ and A-1 (*Placebo I*), and A- and BBB+ (*Placebo II*) and is unlikely to be present only between A and A- (*Baseline DD*).

In order to test the differential impact of the CPFF on CP issuers for the *Baseline DD test*, we use a difference-in-differences specification:

$$y_{it} = \alpha_i + \gamma_t + \beta_1 \times Post_{it} \times CPFF_i + \beta_2 \times Post_{it} + \beta_3 \times CPFF_i + \delta \times X_{it} + \varepsilon_{it.} \quad (1)$$

$CPFF_i$ is an indicator variable that is one if a firm is CPFF eligible and is zero otherwise. A CP-issuer is eligible for the Commercial Paper Funding Facility (CPFF) if it is A-1 rated as of August 2008 and has commercial paper outstanding between January and August of 2008.[11] $Post_{it}$ is an indicator variable that is one if an observation is taken from the post-CPFF (2008:Q4) period and is zero otherwise. For the *Baseline DD test*, A rated firms are CPFF eligible ($CPFF_i = 1$) and A- rated firms are CPFF ineligible ($CPFF_i = 0$). We control (X_{it}) for firm size (log of total assets), non-CP debt to total debt ratio, and market-to-book ratio. Firm fixed effects (α_i) and year fixed effects (γ_t) are included, and ε_{it} is an error term. Standard errors are clustered at the firm level. The key variable of interest is the parameter of the interaction between $CPFF_i$ and $Post_{it}$ (β_1), which captures the difference-in-differences effect of the CPFF program between eligible and ineligible A-1 rated CP issuers after the introduction of this program.

Due to multicollinearity between the CPFF indicator ($CPFF_i$) and firm fixed effects (α_i), Equation (1) is estimated using a first differences specification,

$$\Delta y_{it} = \gamma_t + \beta_1 \times \Delta(Post_{it} \times CPFF_i) + \delta \times \Delta X_{it} + \Delta\varepsilon_{it}, \quad (2)$$

[11] To avoid endogeneity concerns, the CPFF indicator is kept constant based on pre-crisis (August 2008) values.

following Wooldridge (2002, Equation 10.73). The first difference of fixed effects (α_i) and $CPFF_i$ is zero and that of $Post_{it}$ is absorbed in year fixed effects. Interpretation of β_1 in Equation (2) is identical to that of Equation (1): the change in difference between CPFF eligible and ineligible firms before and after the introduction of the CPFF. That is, the net impact of the CPFF program on CPFF eligible firms (relative to ineligible firms).

For *Placebo test I*, the CPFF indicator is replaced by an A-1+ rating indicator, which is one if a firm is A-1+ rated as of August 2008 and is zero otherwise. The interaction term ($Post_{it}$ $\times$*A-1+*$_i$) measures the changes in the gap between A-1+ and A-1 rated firms after the introduction of the CPFF. Similarly, for *Placebo test II*, the CPFF indicator is replaced by an A rating indicator, which is one if a firm is A rated as of August 2008 and is zero otherwise. The interaction term ($Post_{it} \times A_i$) measures the changes in the gap between A and A- rated firms after the introduction of the CPFF.

Using equation (2), we estimate the difference-in-differences effect of the CPFF program on the financing, profitability, and real outcomes of CP issuers.

III.B. Financing

Since the CPFF's objective was to stabilize short-term financing after Lehman's collapse, we first examine the impact of the CPFF on the financing activities of CP issuers from 2008:Q1 to 2009:Q4.

Table II shows the impact of the CPFF on firms' financing activities: overall usage of debt is measured by debt-to-assets ratio (Column I), maturity structure by short-term-debt-to-total-debt ratio (Column II), CP usage by CP outstanding divided by total debt (Column III), cost of debt financing by interest expenses divided by total debt (Column IV), and liquidity demand by the sum of cash and unused lines of credit divided by total assets (Column V). We compare changes in these five variables after the introduction of the CPFF across four different sets of firms that had CP outstanding during 2008:Q1-Q2, based on their pre-crisis ratings:

i. A-1 vs. A-2 (Panel A)

ii. Near CPFF eligibility cutoff boundary: A vs. A- (Panel B: *Baseline DD*)

iii. Within CPFF eligible firms: A-1+ vs. A-1 (Panel C: *Placebo test I*)

iv. Within CPFF ineligible firms: A- vs. BBB+ (Panel D: *Placebo test II*)

The CPFF program is most relevant for firms that rely on CP, and hence we focus on firms that show a high CP demand in 2008 prior to the crisis and drop firms in the bottom tercile of the CP/debt ratio as of 2008:Q2. Also, although intercept, firm and year fixed effects, and controls are included in all regressions, we only report parameter estimates of the interaction variables (i.e., Post*CPFF, Post*A-1+ indicator, Post*A indicator), which measure the changes in difference between two comparison groups after the introduction of the CPFF, to focus on the impact of the CPFF on these financing activities.

Since only top-rated firms have access to the CPFF, we expect differences in financing activities (e.g., more CP borrowing, lower financing cost) between top-rated (CPFF eligible) and other CP issuers (CPFF ineligible) to increase after the CPFF was introduced. That is, if the CPFF has a positive impact on CP issuers, then we expect the interaction (difference-in-differences) variable to be significantly positive.

In Panel A, we compare A-1 and A-2 rated CP issuers with CP outstanding in 2008:Q1 and Q2, of which only A-1 rated firms are eligible for the CPFF. We do not find noticeable changes in the differences between A rated and A- rated CP issuers in terms of the use of debt (Column I, leverage), debt maturity structure (Column II, short-term debt to total debt), or the use of CP (Column III): the parameter estimates on *Debt/assets* (Column I), *ST debt/assets* (Column II), and *CP/debt* (Column III) are all insignificant. However, in Column IV, we find a significant reduction in interest expenses for A-1 rated (CPFF eligible) firms relative to A-2 rated (CPFF ineligible) firms after the introduction of the CPFF: the difference-in-differences estimate of *Interest/debt* is -0.0028, which is 24% of the pre-crisis sample mean of CPFF eligible firms. When we combine this with the results from Columns I and III, our findings suggest that the main impact of the CPFF program is a reduction in financing costs (Column IV) for eligible CP issuers, rather than the avoidance of quantity rationing (Columns I and III). This is consistent with a study by Adrian, Colla, and Shin (2012), who find that the recent financial crisis affected firms more through higher risk premiums than through credit rationing. Our findings show that the CPFF mainly benefitted firms by ameliorating this increase in risk premiums.

In Panel B, we examine changes near the CPFF eligibility cutoff, where we expect the CPFF effect to be the strongest, by comparing A (lowest long-term rating among A-1 rated firms) and A- (highest long-term rating among A-2 rated firms) rated CP issuers with CP outstanding during 2008:Q1–Q2. Among these firms, only A rated firms are eligible for the CPFF. Overall, we confirm the findings from Panel A that indicate that the CPFF had little impact on the amount of debt, CP borrowings, and maturity structure. However, we do find a stronger impact of the CPFF (than Panel A) on the reduction in the cost of debt financing: the difference-in-differences estimate of *Interest/debt* (Column IV) is -0.0037, which is 32% of the pre-crisis sample mean of CPFF eligible CP issuers. Also, in Column V, we show liquidity demand, as measured by cash and unused lines of credit (divided by noncash assets): the difference-in-differences estimate of *(Cash+LC)/debt* is -0.0447, which is 33% of the pre-crisis sample mean of CPFF eligible CP issuers. The reduction in liquidity could be driven by less need for liquidity because of the government-sponsored liquidity backstop (i.e., the CPFF) or increased drawdowns of lines of credit to back up CP. However, we find little evidence of increased CP borrowings, and hence the reduction in liquidity demand is most likely driven by less need for liquidity.

In Panels C and D, we conduct placebo tests to compare CP issuers within CPFF eligible (Panel C: A-1+ vs. A-1) and ineligible (Panel D: A- vs. BBB+) groups. For these comparisons, the availability of the CPFF is homogeneous and only credit quality differs between the two comparison groups. Hence, any significant changes after the introduction of the CPFF can be attributed to differences in credit quality between control (A-1+ in Panel C or A- in Panel D) and treatment (A-1 in Panel C or BBB+ in Panel D) groups, and may possibly be caused by flight-to-quality. In contrast, if flight-to-quality is not significant among CP issuers, we expect to find insignificant difference-in-differences estimates in these placebo tests. Consistent with the latter, the difference-in-differences estimates in Panels C and D are mostly insignificant and we do not find many significant changes after the introduction of the CPFF for these comparisons. Hence, the findings from Panels A and B are mostly driven by the impact of CPFF.

To sum up, Table II shows that the CPFF mainly affected CP issuers by lowering the cost of debt financing while leaving debt borrowing amount and maturity unchanged.

III.C. Profitability

Findings from the previous section suggest that the CPFF lowered firms' cost of debt financing, which surged after Lehman Brothers collapsed. In this section, we examine how CP issuers’ profitability was impacted by the introduction of the CPFF from 2008:Q1 to 2009:Q4.

Table III shows changes in profitability and major components of income statements after the introduction of the CPFF. As in Table II, we compare four different groups, shown in Panels A to D. Also, we drop firms in the bottom tercile of *CP/debt* as of 2008:Q2 to focus on the firms that are most relevant for the CPFF program, and report only the interaction variables that measure the difference-in-differences effect of the CPFF, i.e., changes in differences between CPFF eligible and ineligible firms (Panels A and B), A-1+ and A-1 rated firms (Panel C), or A- and BBB+ rated firms (Panel D).

The first three columns of Table III show the profitability of CP issuers around the introduction of the CPFF from 2008:Q1 to 2009:Q4. Since Table II shows that eligible firms benefitted from the CPFF through decreased debt financing costs, we expect profits of CPFF eligible firms to increase relative to CPFF ineligible firms after the introduction to the CPFF. That is, we expect the parameter estimate of the interaction (difference-in-differences) variable to be positive.

As shown in Panels A (comparing A-1 vs. A-2) and B (comparing A vs. A-), the profitability of CPFF eligible firms increased in terms of revenue divided by noncash assets (Column I), operating income divided noncash assets (Column II), and net income divided by noncash assets (Column III). Notably, the increase in net income (of CPFF eligible firms relative to ineligible firms) is much larger than the increase in operating income: the increase in *NI/assets* of A rated (CPFF eligible) firms is 2.93% relative to A- rated (CPFF ineligible) firms, whereas the increase in *OI/assets* is only 1.18% .

In contrast, the two placebo tests, comparison within CPFF eligible (Panel C) and CPFF ineligible (Panel D) groups, show no significant changes in profitability. This suggests that the significant changes observed in Panels A and B are less likely to be driven by differences in credit rating via such mechanisms as flight-to-quality, and are mostly due to the positive impact of the CPFF.

To uncover the sources of the divergence in profitability in more detail, we decompose the profits of CP issuers into the major components of income statements: the cost of goods sold divided by noncash assets (Column IV), selling, general, and administrative expenses divided by noncash assets (Column V), depreciation and amortization divided by noncash assets (Column VI), interest expenses divided by noncash assets (Column VII), and income tax divided by noncash assets (Column VIII). Revenue minus COGS, SG&A, and depreciation and amortization gives an approximate estimate of operating income. Operating income minus interest expenses and income taxes gives an approximate estimate of net income.

As shown in Panels A and B, the difference-in-differences changes of the cost of goods sold per noncash assets (Column VI) between CPFF eligible and ineligible CP issuers is very large: for example, the difference-in-differences estimate of *COGS/assets* between A and A-rated firms (Panel B) is 4.45%. This is mainly due to increased sales (revenue) for CPFF eligible firms, which amounts to 5.32%. The increase in revenue net of COGS approximately amounts to increase in operating income, which is 1.18% (Panel B). The most notable finding is the large decrease in interest payments, which contributes to the large increase in net income relative to the moderate increase in operating income. In contrast to the significant changes between CPFF eligible and ineligible firms shown in Panels A and B, changes in profitability within CPFF eligible (Panel C) or ineligible (Panel D) CP issuers are insignificant or small in economic size.

When we combine the results shown in Table II and Table III, we see that the CPFF mainly affected firms by lowering the cost of debt financing (*Interest/assets*) and this reduction led to an increase in profitability around the introduction of the CPFF.

One possible cause for the diverging profitability between CPFF eligible and ineligible firms after the introduction of the CPFF is the difference in accounting manipulations between CPFF eligible and ineligible firms. Prior literature shows that discretionary accruals can be a measure of accounting manipulations (Hribar and Collins, 2002). The last column of Table III shows changes in discretionary accruals after the introduction of the CPFF. As shown in Column IX, we do not find any significant changes in the difference of discretionary accruals between CPFF eligible and ineligible firms. So, again, we conclude that the changes in the differences of profitability between CPFF eligible and ineligible firms after the introduction of the CPFF are mainly due to the stabilization of financing (reduction of cost of debt financing) of the CPFF.

III.D. Long-term real effects

In previous sections, we show how financing and profitability was impacted by the introduction of the CPFF. In this section, we examine whether the CPFF had any impact on real activities. In contrast to short-term financing such as CP borrowing, real activities such as investments and payout policies may change gradually. Hence, we consider changes in real activities over a broader period, 2007:Q1–2010:Q4. We make four comparisons: A-1 vs. A-2, *Baseline DD*, and *Placebo tests I and II*.

In Column I, we consider the trade credit activities of CP issuers. Comparison of CPFF eligible and ineligible firms shows that there is a significant increase in net trade credit extended (receivables minus account payables) by CPFF eligible firms: for example, Panel B shows that the *NetTC/assets* of A rated (CPFF eligible) firms increased 2.54% relative to A- rated (CPFF ineligible) firms after the CPFF was introduced. This corresponds to 28% of the pre-crisis mean of CPFF eligible firms. In contrast, we do not find any significant change in net trade credit within CPFF eligible (*Placebo test I* in Panel C) or ineligible (*Placebo test II* in Panel D) groups. This suggests that the significant change in net trade credit between A and A- rated firms is mainly driven by the difference in access to the CPFF rather than differences in credit quality.

In Column II, we consider changes in the difference in inventories among CP issuers around the introduction of the CPFF. While we find a decrease in inventories divided by revenue of CPFF eligible firms relative to ineligible firms, it appears to be mainly driven by the increase in revenue (as shown in Table III) rather than a decrease in inventories. We do not find any significant changes in the differences in investments (Column III) and dividend payout policies (Column IV) around the introduction of the CPFF.

Overall, the findings shown in Table IV suggest that the effect of the CPFF is modest for investments and payout policies.[12] CP issuers, with or without access to the CPFF, are large firms with very high credit qualities. So, these firms had access to external financing even during the recent financial crisis, although the cost of financing may have increased. As a result, it is difficult to find significant setbacks in long-term business strategies due to the disruption in access to external financing among CP issuers. However, trade credits significantly increased after the CPFF was introduced, which may have had a significant effect on the business partners of these CP issuers. We will further explore this issue in Section IV.

III.E. Comparison within top-rated CP issuers

Previous sections compared CP issuers with different access to the CPFF program based on credit quality. Although CP issuers have very high credit quality and share similar financial

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[12] Among other real consequences of the CPFF not reported in Table V, changes in the differences among CP issuers are noteworthy: the probability of downgrades of S&P long-term ratings from pre-crisis (2008:Q) to post-crisis (2009:Q4) period is significantly lower for A rated (CPFF eligible) firms than A- (CPFF ineligible) firms.

characteristics, as shown in Panel B of Table II, there may be a concern that our results have been driven by differences in CP issuers' credit quality. To address this concern, we first conducted the two already-described placebo tests, which compare CP issuers that have homogeneous access to the CPFF program but differ in credit quality. These show that there are no significant changes in the differences in financing and operations within CPFF eligible and ineligible CP issuers.

While these placebo tests are sufficient to confirm the robustness of our results against flight-to-quality concerns, it is nevertheless interesting to compare firms within the top short-term credit quality (A-1 or A-1+) that had different access to the CPFF based on CP usage. Note that the within A rated comparison is based on differences in CP usage that may be correlated with unobserved firm characteristics. Hence, we cannot conclude that the CPFF has a clear causal relationship to the differences between these A-1 rated firms the results in this section can only reflect correlation, not causation.[13]

Panel A of Table V compares relative changes in the financing and operations of A-1 bottom-rated CP issuers (A long-term rating) with CP outstanding from 2007:Q1 to 2008:Q2. Clearly, all firms in this sample had CP demands within the year and a half before Lehman's collapse. Since real activities may change slowly over time, we consider a long period of 2007:Q1–2010:Q4. We focus on A rated (A-1 rated firms with the lowest long-term rating) firms because the impact of the CPFF is likely to be the strongest for them. Among these A rated CP

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[13] One key difference between CPFF eligible and ineligible A-1 rated CP issuers is their reliance on CP for short-term financing. CPFF ineligible A-1 rated CP issuers did not use CP between January and August of 2008, and it is likely that these firms rely on other sources for their financing needs. To put it another way, another difference between CPFF eligible and ineligible A-1 rated CP issuers is their exposure to rollover risk (Acharya, Gale, and Yorulmazer (2011), Almeida, Campello, Laranjeira, and Weisbenner (2012), and He and Xiong (2012)). Firms that rely heavily on CP (e.g., CPFF eligible firms) may have shorter maturities than CPFF ineligible firms, and need to rollover their debt more frequently. The CPFF may have alleviated this rollover risk in addition to supplying liquidity. In addition to rollover risk, differences in debt maturity structures may also lead to differences in asset duration when firms match debt maturity with the duration of assets.

issuers, only those who had CP outstanding in 2008:Q1–Q2 are eligible for the CPFF. As shown in Panel A, CPFF eligible A rated firms issued more debt (Column I) and had shorter maturity (Column II), but did not issue more CP (Column III). It is notable that CPFF eligible A rated firms have a smaller cost of debt (Column IV) than ineligible firms after the CPFF was introduced. In addition to the significant impact of debt financing, the CPFF had a significant impact on trade credits (Column VI) and investments (Column VIII), but no significant impact on payout policy (Column IX).

As prior studies note, the run on money market mutual funds led to severe contraction in the CP market right after the bankruptcy of Lehman Brothers (Wermers (2012)). Hence, we expect the CPFF eligible A rated CP issuers (those who relied on CP) to suffer more from the collapse of Lehman Brothers than CPFF ineligible A rated CP issuers (those who did not rely on CP). However, these CPFF eligible firms had more debt and lower costs of financing after the CPFF was introduced. This is consistent with the idea that the CPFF had a beneficial impact on CPFF eligible firms and reversed the adverse trend that disproportionally hurt CPFF eligible firms with substantial exposure to the CP market after Lehman's collapse.

To focus more on the impact of the CPFF on those with CP demand, Panel B compares CPFF eligible A rated CP issuers based on CP slack, which is the ratio of CP outstanding (as of 2008:Q2) to maximum CP backed by the CPFF program (i.e., maximum CP outstanding from January to August, 2008). The key variable of interest is the interaction of *Post* and the *CPFF Slack* indicator, which is one if the CPFF slack is larger than sample median. This variable measures the relative change in the difference between firms with large and small CPFF slack values after the introduction of the CPFF. As in Panel A, we focus on the A-1 rated CP issuers with the lowest long-term rating (A-rated).

As shown in Panel B, after the introduction of the CPFF, CPFF eligible firms with high slack increased leverage (Column I) as well as CP amount (Column III), and experienced a reduction in the cost of debt financing (Column IV) relative to those firms with low CPFF slack. For example, we find that A rated (CPFF eligible) firms that did not fully use the maximum CP borrowings allowed by the CPFF (high CPFF slack firms) increased their *CP/debt* by 30% relative to those with low CPFF slack. These firms also enjoyed a 0.2% reduction in the costs of debt financing, which corresponds to 18% of the sample mean. Firms with a high CPFF slack also decreased liquidity reserves, as measured by cash and unused lines of credit. by 4.64%, and increased investments by 4%.

Overall, the findings shown in Table V suggest that CPFF eligible top-rated firms enjoyed lower costs of debt financing after the CPFF was introduced, even though they had greater exposure to the CP market, which collapsed after Lehman's default.

III.C. Market responses

Findings from previous sections show that the CPFF affected the costs of debt financing and short-term profitability, while having only a modest effect on long-term investments and dividend payouts. In this section, we examine how the market responded to the CPFF using analysts' forecasts of earnings and changes in the market-to-book ratio around the introduction of the CPFF, from 2007:Q1–2010:Q4.[14] Especially, we investigate whether the market responded differently to CPFF eligible and ineligible CP issuers. Since the primary effect of the CPFF was to mitigate disruption in financing in the short run without significant permanent shifts in long-term real activities and fundamentals, we may expect the CPFF to have little impact on stock

[14] A shorter period of 2008:Q1–2009:Q4 gives qualitatively similar results.

prices, which are the sum of all discounted future cash flows. However, investors may expect short-term cash flows to be higher for CPFF eligible firms than for ineligible firms.

Table VI shows changes in the differences in analyst 1-quarter (Column I), 2-quarters (Column II), 3-quarters (Column III), 4-quarters (Column VI), 2-year (Column V), and long-term (Column VI) forecasts of earnings per share divided by share price (*EPS/price*), as well as changes in the differences in market-to-book ratios between CPFF eligible and ineligible firms around the introduction of the CPFF. As in Tables II–IV, we exclude the bottom tercile of *CP/debt* (as of 2008:Q2) CP users, and compare CPFF eligible and ineligible firms (Panels A and B), as well as comparisons within CPFF eligible (A-1+ and A-1 rated) firms (Panel C) and CPFF ineligible (A- and BBB+ rated) firms (Panel D).

Panel A shows changes in differences in market responses between A-1 (CPFF eligible) and A-2 (CPFF ineligible) firms. The short-term analyst *EPS/price* forecasts of eligible CP issuers increased more than those of ineligible CP issuers after the CPFF was introduced, but differences in longer horizon forecasts are insignificant. For example, 1-quarter *EPS/price* forecasts for CPFF eligible firms are 0.57% higher than those of ineligible firms after the CPFF was introduced. This corresponds to 33% of the sample mean (0.0154 for 1-quarter *EPS/price* forecasts). However, the difference decreases over longer horizon estimates: 0.35% for 2-quarter, 0.27% for 3-quarter, 0.15% for 4-quarter forecasts.

As shown in Panel B, the difference in analyst forecasts is mostly concentrated near the CPFF eligibility boundary. The changes in *EPS/price* between A (lowest of A-1) and A- (highest of A-2) rated CP issuers is 0.8% for 1-quarter, 0.45% for 2-quarter, 0.3% for 3-quarter, and 0.16% for 4-quarter predictions. Among them, only 1-quarter is significant; the 2-quarter prediction is marginally insignificant. Longer horizon predictions are insignificant, as are market-to-book ratios, which account for all future discounted cash flows.

Placebo tests comparing CP issuers within CPFF eligible (Panel C) and ineligible (Panel D) groups are insignificant. This suggests that the observed difference in short horizon earnings predictions is mainly driven by the introduction of the CPFF rather than differences in credit quality.

To sum up, results from Table VI show that differences in the cost of financing and the profitability of CPFF eligible and ineligible firms led to differences in short horizon earnings predictions from the market. But, given that the effects on long-term real activities were modest, the market responded rationally, by predicting insignificant differences in long horizon earnings and placing insignificant differences on the values of CPFF eligible and ineligible firms.

IV. Transmission through trade credits

In the previous section, we find that trade credits extended by CPFF eligible firms increased after the introduction of the CPFF. Prior works, such as Petersen and Rajan (1997) or Fisman and Love (2003), note that trade credits are one of the key channels of financing business activities for firms facing difficulties borrowing from traditional financial institutions. In a related study, Love, Preve, and Sarria-Allende (2007) show that trade credit substitutes for more traditional means of financing during a financial crisis and redistributes credit from financially strong to financially weak firms across the economy. During the crisis triggered by the collapse of Lehman Brothers, the financial sector was substantially weakened, which, in turn, led to increased difficulties in raising funds for non-financial firms (Ivashina and Scharfstein (2010)). Given the weakened financial sector and the substantial uncertainty in credit risk during this crisis, one of the Fed's objectives when designing the CPFF was to decentralize credit risk management: delegate credit risk decisions to the firms that are better informed about the credit conditions of their business partners (e.g., suppliers and customers).[15]

To test whether the CPFF contributed to redistributing credit from financially strong to weaker firms via trade credit, we collect information on 218 business partners of CPFF eligible firms in the manufacturing sector, and test whether trade credit activity increased after the introduction of the CPFF, especially for firms that were customers of CPFF eligible firms during the recent financial crisis. We focus on business partners in the manufacturing sector because other sectors, such as retail, exhibit seasonality, which may influence trade credit activities.[16] We use a difference-in-differences specification with first difference estimation similar to Equation (2), except the CPFF indicator is replaced by an indicator for crisis-period customers ($\mathrm{CrisisCustomer}_i$) that is one if a firm was a customer during the crisis period, and is zero otherwise.[17]

Table VII compares the change in the difference between crisis-period current customers of CPFF eligible firms and former customers around the introduction of the CPFF. Columns I–III consider 2008:Q1–2009:Q4, whereas Columns IV–VI consider a shorter period right around the introduction of the CPFF, 2008:Q2–2009:Q2.

Column I shows trade credit received (accounts payable/assets), which is positive (14.70%): that is, the difference in trade credit received between CPFF eligible firms' customers during the crisis period and former clients increased after the introduction of the CPFF. While positive, the estimate is marginally insignificant. This may be due to the fact that trade credits are

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[15] We thank Zhenyu Wang for his discussion of this issue.

[16] Inclusion of retail sector clients give qualitatively similar results to those reported in Table VII.

[17] Using Capital IQ, we collect information on the suppliers and customers of CPFF eligible firms during 1999–2012 based on source date, which is the last time a relationship is reported. Among those, we classify firms reported to be customers during 2008–2011 as "crisis-period customers."

more likely to be offered to financially constrained clients. In Column IV, where a shorter period is considered, the effect is stronger: the difference-in-differences estimate is 18.26% and is statistically significant. Note that, unlike the evidence in Tables II to IV, crisis period and former clients are not ex-ante identical, and hence, this positive association is not necessarily causal.

In Column II, we examine net trade credit issuance (receivables minus accounts payable) scaled by total assets. A positive net trade credit issuance indicates trade credit extended; a negative number indicates trade credit borrowed. During the crisis, we expect firms to face increased difficulties in borrowing funds from traditional financial intermediaries and thus to rely more on trade credit (i.e., negative net trade credit issuance), especially when the CPFF allowed CPFF eligible firms to extend credit to their customers. Although marginally insignificant, the difference-in-differences estimate on net trade credit is negative. For a shorter period, in Column V, the difference-in-differences estimate (*Post*CrisisCustomer*) of net trade credit (receivables minus payables divided by total assets) is -18.98% and is statistically significant.

According to the Fed's idea of decentralized credit risk management, we expect CPFF eligible firms to sort out the credit quality of their clients and extend trade credit accordingly. In such a case, we expect the default risk to be small because only the appropriate amount of credit is extended to clients. To test this idea, Column III examines changes in EDF around the introduction of the CPFF. We find strong evidence that the difference in EDF between crisis-period customers and former clients became negative (-2.19%) after the introduction of the CPFF. The effect is stronger for a focused period (-2.63%). This result supports the role of the CPFF program in implementing decentralized credit risk management.

Overall, the findings shown in Table VII suggest that the liquidity injected by the government via the CPFF spilled over to the clients of CPFF eligible firms. Furthermore, the default risk of crisis-period clients, who were screened by CPFF eligible CP issuers when receiving trade credit, decreased substantially relative to former clients (who were not screened).

V. Conclusions

This paper provides the first piece of firm-level empirical evidence about the impact of the CPFF on corporate borrowing, profitability, and the real effects of the recent financial crisis on non-financial firms. In a difference-in-differences framework, we show that the CPFF mostly impacted firms' short-term financing by reducing the cost of debt financing. This, in turn, led to an increase in profitability in the short-run. However, long-term real effects such as investments and payout policies were not strongly impacted by the CPFF. We also show that the benefits to CPFF eligible firms spilled over to other firms in the manufacturing sector through the extension of trade credits to their customers.

This paper highlights the importance of liquidity provision by the public sector as the lender of last resort. By focusing on relative changes in the business activities of commercial paper issuers who have similar financial characteristics but are subject to different government support with regards to liquidity backstops, we are able to infer the impact of government-supported liquidity provisions on firms. The overall welfare implications of the CPFF program require careful examination extended well beyond the manufacturing sector. We leave this for future studies.

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Table I. Summary Statistics

This table shows summary statistics for the 2007–2010 sample. Panel A shows summary statistics for all CP issuers in the manufacturing industry (SIC 2000–3999) during the sample period; Panel B shows summary statistics for top-rated (A-1/A-1+) CP issuers in the manufacturing industry (SIC 2000–3999) during the pre-CPFF period (2008:Q1–Q2); Panel C shows summary statistics for manufacturing industry CPFF-eligible CP issuers' suppliers . CP issuers engaged in shadow banking are excluded from the sample. Supplier sample excludes CP issuers and firms engaged in shadow banking. A CP issuer is eligible for the Commercial Paper Funding Facility (CPFF) if it is A-1 rated as of August 2008 and has commercial paper outstanding between January and August of 2008. Information on the suppliers of CPFF eligible CP issuers is obtained from Capital IQ. All CP issuer samples include CP issuers with A-1+, A-1, A-2, and A-3 ratings. *Assets* is total assets (ATQ). *Market-to-book ratio* is the book value of assets plus the market value of common equity minus the book value of common equity and deferred taxes divided by total assets. *Market value of equity* is the price (at close) times the number of common shares outstanding. *Debt/assets* is short-term (DLCQ) and long-term debt (DLTTQ) divided by noncash assets (ATQ-CHEQ). *(Debt-CP)/assets* is short-term (DLCQ) and long-term debt (DLTTQ) minus CP outstanding all divided by noncash assets. *ST debt/debt* is short-term debt (DLCQ) divided by total debt (DLCQ+DLTTQ). *Interest/debt* is interest expenses (XINTQ) divided by total debt. *(Cash+LC)/assets* is the sum of cash (CHEQ) and unused lines of credit divided by noncash assets. *Revenue/assets* is total revenue (REVTQ) divided by noncash assets. *OI/assets* is operating income before depreciation (OIBDPQ) divided by noncash assets. *NI/assets* is net income (NIQ) divided by noncash assets. *COGS/assets* (COGSQ) is cost of goods sold divided by noncash assets. *SG&A/assets* is selling, general, and administrative expenses (XSGAQ) divided by noncash assets. *Depreciation/assets* is total depreciation and amortization (DPQ) divided by noncash assets. *Tax/assets* (TXTQ) is total income tax divided by noncash assets. *Receivables/assets* is total receivables (RECTQ) divided by noncash assets. *NetTC/assets* is net trade credit (RECTQ-APQ) divided by noncash assets. *Inventory/revenue* is total inventory (INVTQ) divided by revenue (REVTQ). *CapEx/assets* is capital expenditures (CAPXY-one period lag of CAPXY) divided by noncash assets. *Dividends/assets* is total dividends (DVTQ) divided by noncash assets. *Accruals/assets* is discretionary accruals divided by noncash assets; discretionary accruals are computed following Hribar and Collins (2002) as the sum of accounts receivable (RECCH), inventory (INVCH), accounts payable and accrued liabilities (APALCH), accrued income taxes (TXACH), other assets and liabilities (AOLOCH), and depreciation and depletion (DEPC), all divided by noncash assets. *EPS/price* is analysts long-term forecasts of earnings per share (EPS) divided by stock price. *Expected default frequency* (EDF) is the probability that a company will default within a given time horizon, typically one year. All financial information except CP outstanding, unused lines of credit, EPS, and EDF is obtained from the Compustat quarterly database. Information on commercial paper outstanding and unused lines of credit is obtained from SEC 10-K/10-Q filings and Capital IQ. Information on EPS is obtained from Thomson Reuters I/B/E/S. Information on EDF is obtained from Moody's KMV.

Panel A. Full CP issuer sample.

Sample	***All CP issuers (2007:Q1-2010:Q4)***				***All CP issuers (2008:Q1-2009:Q4)***				***A-1/A-1+ CP issuers (2008:Q1-2009:Q4)***			
	Obs.	***Mean***	***Std.Dev.***	***Median***	***Obs.***	***Mean***	***Std.Dev.***	***Median***	***Obs.***	***Mean***	***Std.Dev.***	***Median***
Assets	1914	24985	37034	12654	964	24590	35915	12591	541	33075	44750	16663
Market-to-book	1913	2.2495	1.0	1.9643	963	2.0967	0.9530	1.8235	540	2.3813	1.0	2.2228
Debt/assets	1914	0.2790	0.1380	0.2673	964	0.2874	0.1434	0.2762	541	0.2829	0.1474	0.2689
(Debt-CP)/assets	1914	0.2667	0.1365	0.2586	964	0.2740	0.1426	0.2675	541	0.2675	0.1452	0.2630
ST debt/debt	1891	0.1945	0.1923	0.1505	950	0.1922	0.1907	0.1504	533	0.2093	0.1864	0.1742
CP/debt	1891	0.0428	0.1087	0.0000	950	0.0466	0.1155	0.0000	533	0.0536	0.1191	0.0000
Interest/debt	1832	0.0130	0.0047	0.0131	913	0.0127	0.0041	0.0128	503	0.0112	0.0039	0.0114
(Cash+LC)/assets	1845	0.1731	0.1780	0.1220	926	0.1615	0.1663	0.1051	516	0.1958	0.1676	0.1425
Revenue/assets	1914	0.2656	0.1139	0.2522	964	0.2629	0.1133	0.2487	541	0.2728	0.1136	0.2508
OI/assets	1831	0.0481	0.0242	0.0436	915	0.0466	0.0242	0.0431	522	0.0541	0.0235	0.0503
NI/assets	1914	0.0235	0.0305	0.0216	964	0.0207	0.0359	0.0202	541	0.0271	0.0283	0.0250
COGS/assets	1908	0.1594	0.1080	0.1439	961	0.1587	0.1086	0.1425	539	0.1534	0.1099	0.1384
SG&A/assets	1874	0.0605	0.0437	0.0533	948	0.0596	0.0426	0.0534	533	0.0671	0.0475	0.0606
Depreciation/assets	1831	0.0102	0.0044	0.0095	915	0.0102	0.0045	0.0095	522	0.0110	0.0046	0.0102
Tax/assets	1914	0.0089	0.0107	0.0082	964	0.0081	0.0114	0.0079	541	0.0106	0.0102	0.0092
Receivables/assets	1914	0.1626	0.0902	0.1493	964	0.1604	0.0877	0.1462	541	0.1700	0.0972	0.1471
NetTC/assets	1914	0.0682	0.0892	0.0613	964	0.0687	0.0879	0.0614	541	0.0734	0.1003	0.0746
Inventory/revenue	1914	0.4890	0.2776	0.4482	964	0.4971	0.2700	0.4552	541	0.4726	0.2561	0.4391
CapEx/assets	1914	-0.0005	0.0244	0.0068	964	-0.0013	0.0255	0.0064	541	-0.0007	0.0270	0.0077
Dividends/assets	1914	0.0001	0.0224	0.0048	964	-0.0005	0.0233	0.0048	541	-0.0001	0.0235	0.0060
Accruals/assets	1877	0.2302	6.5319	0.0917	941	0.1153	6.0960	0.0766	521	0.1283	6.4513	0.0584
EPS/price	5500	0.2902	0.2339	0.2335	2755	0.3203	0.2678	0.2489	1574	0.2680	0.1882	0.2196

Table I. (continued)

Panel B. Pre-CPFF Top-rated (A-1/A-1+) CP issuer sample.

Sample	*Pre-crisis CPFF Eligible (A-1/A-1+)*				*Pre-crisis CPFF Ineligible (A-1/A-1+)*				*Difference-in-means*		
	Obs.	*Mean*	*Std.Dev.*	*Median*	*Obs.*	*Mean*	*Std.Dev.*	*Median*	*Diff.*	*t-stats*	*p-value*
Assets	42	27182	39878	15221	99	33947	48169	17713	-6766	-0.8008	0.4246
Market-to-book	42	2.4875	1.2806	1.9459	96	2.6790	1.0540	2.6010	-0.1915	-0.9239	0.3572
Debt/assets	42	0.2979	0.1232	0.2622	99	0.2634	0.1627	0.2615	0.0345	1.2314	0.2203
(Debt-CP)/assets	42	0.2547	0.1180	0.2204	99	0.2634	0.1627	0.2615	-0.0087	-0.3147	0.7534
ST debt/debt	42	0.2319	0.1663	0.2003	97	0.2483	0.1895	0.2386	-0.0164	-0.4850	0.6285
CP/debt	42	0.1500	0.1344	0.1616	97	0.0000	0.0000	0.0000	0.1500	11.0472	0.0000
Interest/debt	40	0.0117	0.0026	0.0118	91	0.0117	0.0032	0.0121	0.0000	0.0205	0.9837
(Cash+LC)/assets	42	0.1355	0.1339	0.0826	93	0.1961	0.1681	0.1248	-0.0607	-2.0606	0.0413
Revenue/assets	42	0.2630	0.0782	0.2591	99	0.2997	0.1326	0.2704	-0.0368	-1.6757	0.0961
OI/assets	41	0.0537	0.0205	0.0470	95	0.0601	0.0253	0.0566	-0.0064	-1.4406	0.1520
NI/assets	42	0.0282	0.0166	0.0214	99	0.0310	0.0254	0.0310	-0.0028	-0.6471	0.5186
COGS/assets	41	0.1486	0.0712	0.1419	99	0.1724	0.1370	0.1464	-0.0238	-1.0512	0.2950
SG&A/assets	40	0.0684	0.0541	0.0595	99	0.0677	0.0439	0.0649	0.0007	0.0775	0.9384
Depreciation/assets	41	0.0102	0.0031	0.0099	95	0.0108	0.0045	0.0100	-0.0006	-0.7673	0.4443
Tax/assets	42	0.0129	0.0086	0.0087	99	0.0124	0.0143	0.0110	0.0005	0.2040	0.8386
Receivables/assets	42	0.1864	0.1145	0.1611	99	0.1724	0.0926	0.1560	0.0140	0.7662	0.4449
NetTC/assets	42	0.0899	0.1017	0.0812	99	0.0582	0.1035	0.0740	0.0317	1.6707	0.0970
Inventory/revenue	42	0.4467	0.2466	0.4198	99	0.4757	0.2443	0.4627	-0.0290	-0.6426	0.5215
CapEx/assets	42	-0.0125	0.0283	-0.0022	99	-0.0049	0.0274	0.0078	-0.0077	-1.5096	0.1334
Dividends/assets	42	-0.0077	0.0205	0.0000	99	-0.0066	0.0324	0.0028	-0.0011	-0.2122	0.8323
Accruals/assets	42	2.6229	5.6826	0.3598	90	1.6978	5.0855	0.3404	0.9251	0.9374	0.3503
EPS/price	126	0.2515	0.0960	0.2358	286	0.2668	0.2353	0.2137	-0.0154	-0.7066	0.4802

Table I. (continued)

Panel C. Customers and Suppliers of CPFF eligible CP-issuers sample.

Variables	N	Mean	Std.Dev.	p10	Median	p90
Payable/assets	1639	0.3158	3.2723	0.0365	0.0977	0.2873
(Receivables-payable)/assets	1632	-0.1357	3.2894	-0.0787	0.0616	0.1802
EDF	1495	5.0465	9.1389	0.0567	0.8300	18.5100
Assets	1639	6710	23138	17	641	9933
Leverage	1599	0.7369	4.0270	0.0000	0.2606	0.8142

Table II. Impact of the CPFF: Financing

This table shows changes in financing activities around the introduction of the CPFF, from 2008:Q1 to 2009:Q4. Panel A considers all A-1 and A-2 rated CP issuers. Panel B considers A (lowest long-term rating among A-1 rated firms) and A- rated (highest long-term rating among A-2 rated firms) CP issuers. Panel C considers A-1 and A-1+ rated CP issuers. Panel D considers BBB+ and A- (A-2 rated) CP issuers. All firms considered have CP outstanding during 2008:Q1-Q2. To focus on firms with high CP demand, we exclude the bottom tercile of *CP/debt* firms. Observations are measured at quarterly frequency. This table uses a difference-in-differences specification, $y_{it} = \alpha_i + \gamma_t + \beta_1 \times Post_{it} \times CPFF_i + \beta_2 \times Post_{it} + \beta_3 \times CPFF_i + \delta \times X_{it} + \varepsilon_{it}$. The key variable of interest is the interaction term ($Post_{it} \times CPFF_i$ for Panels A and B, $Post_{it} \times "A-1+" - rated_i$ for Panel C, and $Post_{it} \times A - rated_i$ for Panel D), which measures the changes in the difference between CPFF eligible and ineligible CP issuers after the introduction of the CPFF. The dependent variables (y_{it}) are *Debt/assets* (Column I), *ST debt/assets* (Column II), *CP/debt* (Column III), *Interest/debt* (Column IV), and *(Cash+LC)/debt* (Column V). *Debt/assets* is short-term (DLCQ) and long-term debt (DLTTQ) divided by noncash assets (ATQ-CHEQ). *(Debt-CP)/assets* is short-term (DLCQ) and long-term debt (DLTTQ) minus CP outstanding all divided by noncash assets. *ST debt/debt* is short-term debt (DLCQ) divided by total debt (DLCQ+DLTTQ). *Interest/debt* is interest expense (XINTQ) divided by total debt. *(Cash+LC)/assets* is the sum of cash (CHEQ) and unused lines of credit divided by noncash assets. $Post_{it}$ is an indicator variable that is one if the observation is taken from the post-CPFF period (after 2008:Q4) and is zero otherwise. $CPFF_i$ is an indicator variable that is one if a firm is CPFF eligible. A CP issuer is eligible for the Commercial Paper Funding Facility (CPFF) if it is A-1 rated as of August 2008 and has commercial paper outstanding between January and August of 2008. We control (X_{it}) for *firm size* (log of total assets), *non-CP debt/debt* (DLCQ+DLTTQ-CP outstanding all divided by noncash assets), and *Market-to-book* ratio (book value of assets plus market value of common equity minus book value of common equity and deferred taxes divided by total assets). α_i is firm fixed effects, γ_t is year fixed effects, and ε_{it} is an error term. Due to multicollinearity between the CPFF indicator ($CPFF_i$) and firm fixed effects (α_i), this difference-in-differences equation is estimated using a first differences specification, $\Delta y_{it} = \gamma_t + \beta_1 \times \Delta(Post_{it} \times CPFF_i) + \delta \times \Delta X_{it} + \Delta\varepsilon_{it}$, following Wooldridge (2002, Equation 10.73). The first difference of $CPFF_i$ is zero and that of $Post_{it}$ is absorbed in year fixed effects. Controls (X_{it}), intercepts, and firm (α_i) and year (γ_t) fixed effects are included but not shown in the table. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

Dependent variables	*Debt/assets* (I)	*ST debt/debt* (II)	*CP/debt* (III)	*Interest/debt* (IV)	*(Cash+LC)/assets* (V)
Panel A. A-1 and A-2 rated CP issuers					
*Post*CPFF eligible*	-0.0066	0.0240	-0.0245	-0.0028 ***	-0.0396
	[0.0128]	[0.0275]	[0.0280]	[0.0008]	[0.0552]
Obs.	119	119	119	115	117
R-squared	0.349	0.149	0.634	0.405	0.231
Panel B. A-1 and A-2 boundary (A vs. A-)					
*Post*CPFF eligible*	-0.0168	0.0252	-0.0185	-0.0037 ***	-0.0447 **
	[0.0156]	[0.0271]	[0.0261]	[0.0007]	[0.0171]
Obs.	77	77	77	73	76
R-squared	0.436	0.151	0.622	0.377	0.458
Panel C. Placebo test I: Within CPFF eligible CP issuers (A-1 vs. A-1+)					
*Post*A-1+ rated*	0.0013	-0.0002	0.0177	0.0004	0.0015
	[0.0292]	[0.0338]	[0.0479]	[0.0009]	[0.0350]
Obs.	94	94	94	90	92
R-squared	0.359	0.169	0.537	0.169	0.485
Panel D. Placebo test II: Within CPFF ineligible A-2 rated CP issuers (A- vs. BBB+)					
*Post*A- rated*	0.0076	0.0175	0.0182	0.0014 *	0.0919
	[0.0156]	[0.0499]	[0.0493]	[0.0005]	[0.0564]
Obs.	42	42	42	42	42
R-squared	0.327	0.323	0.690	0.706	0.299

Table III. Impact of the CPFF: Profitability

This table shows changes in profitability around the introduction of the CPFF, from 2008:Q1 to 2009:Q4. Panel A considers all A-1 and A-2 rated CP issuers. Panel B considers A (lowest long-term rating among A-1 rated firms) and A- rated (highest long-term rating among A-2 rated firms) CP issuers. Panel C considers A-1 and A-1+ rated CP issuers. Panel D considers BBB+ and A- (A-2 rated) CP issuers. All firms considered have CP outstanding during 2008:Q1-Q2. To focus on firms with high CP demand, we exclude the bottom tercile of *CP/debt* firms. Observations are measured at quarterly frequency. This table uses a difference-in-differences specification, $y_{it} = \alpha_i + \gamma_t + \beta_1 \times Post_{it} \times CPFF_i + \beta_2 \times Post_{it} + \beta_3 \times CPFF_i + \delta \times X_{it} + \varepsilon_{it}$. The key variable of interest is the interaction term ($Post_{it} \times CPFF_i$ for Panels A and B, $Post_{it} \times "A-1+" - rated_i$ for Panel C, and $Post_{it} \times A - rated_i$ for Panel D), which measures the changes in the difference between CPFF eligible and ineligible CP issuers after the introduction of the CPFF. The dependent variables (y_{it}) are *Revenue/assets* (Column I), *OI/assets* (Column II), *NI/assets* (Column III), *COGS/assets* (Column IV), *SG&A/assets* (Column V), *Depreciation/assets* (Column VI), *Interest/assets* (Column VII), *Tax/assets* (Column VIII), and *Accrual/assets* (Column IX). *Revenue/assets* is total revenue (REVTQ) divided by noncash assets. *OI/assets* is operating income before depreciation (OIBDPQ) divided by noncash assets. *NI/assets* is net income (NIQ) divided by noncash assets. *COGS/assets* (COGSQ) is cost of goods sold divided by noncash assets. *SG&A/assets* is selling, general, and administrative expenses (XSGAQ) divided by noncash assets. *Depreciation/assets* is total depreciation and amortization (DPQ) divided by noncash assets. *Interest/debt* is interest expense (XINTQ) divided by total debt. *Tax/assets* (TXTQ) is total income tax divided by noncash assets. *Accruals/assets* is discretionary accruals divided by noncash assets; discretionary accruals are computed following Hribar and Collins (2002) as the sum of accounts receivable (RECCH), inventory (INVCH), accounts payable and accrued liabilities (APALCH), accrued income taxed (TXACH), other assets and liabilities (AOLOCH), and depreciation and depletion (DEPC), all divided by noncash assets. $Post_{it}$ is an indicator variable that is one if the observation is taken from the post-CPFF period (after 2008:Q4) and is zero otherwise. $CPFF_i$ is an indicator variable that is one if a firm is CPFF eligible. A CP issuer is eligible for the Commercial Paper Funding Facility (CPFF) if it is A-1 rated as of August 2008 and has commercial paper outstanding between January and August of 2008. We control (X_{it}) for *firm size* (log of total assets), *non-CP debt/debt* (DLCQ+DLTTQ-CP outstanding all divided by noncash assets), and *Market-to-book* ratio (book value of assets plus market value of common equity minus book value of common equity and deferred taxes divided by total assets). α_i is firm fixed effects, γ_t is year fixed effects, and ε_{it} is an error term. Due to multicollinearity between the CPFF indicator ($CPFF_i$) and firm fixed effects (α_i), this difference-in-differences equation is estimated using a first differences specification, $\Delta y_{it} = \gamma_t + \beta_1 \times \Delta(Post_{it} \times CPFF_i) + \delta \times \Delta X_{it} + \Delta\varepsilon_{it}$, following Wooldridge (2002, Equation 10.73). The first difference of $CPFF_i$ is zero and that of $Post_{it}$ is absorbed in year fixed effects. Controls (X_{it}), intercepts, and firm (α_i) and year (γ_t) fixed effects are included but not shown in the table. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

	Profits			Major components of income statement					Accruals
Dependent variables	***Revenue/assets (I)***	***OI/assets (II)***	***NI/assets (III)***	***COGS/assets (IV)***	***SG&A/assets (V)***	***Deprec./assets (VI)***	***Interest/assets (VII)***	***Tax/assets (VIII)***	***Accruals/assets (IX)***
Panel A. A-1 and A-2 rated CP issuers									
*Post*CPFF eligible*	0.0355 **	0.0152	0.0154 **	0.0198 *	0.0006	-0.0004	-0.0009 ***	0.0069	-0.0957
	[0.0165]	[0.0095]	[0.0063]	[0.0104]	[0.0023]	[0.0003]	[0.0002]	[0.0049]	[0.3123]
Obs.	119	113	119	117	119	113	115	119	119
R-squared	0.386	0.202	0.261	0.230	0.164	0.225	0.449	0.232	0.353
Panel B. A-1 and A-2 boundary (A vs. A-)									
*Post*CPFF eligible*	0.0532 ***	0.0118 ***	0.0293 ***	0.0445 ***	-0.0041	-0.0010 *	-0.0011 **	0.0031	0.5144
	[0.0044]	[0.0022]	[0.0090]	[0.0027]	[0.0037]	[0.0004]	[0.0003]	[0.0029]	[0.5300]
Obs.	77	73	77	77	77	73	73	77	77
R-squared	0.480	0.409	0.464	0.533	0.227	0.375	0.544	0.276	0.370
Panel C. Placebo test I: Within CPFF eligible CP issuers (A-1 vs. A-1+)									
*Post*A-1+ rated*	-0.0064	-0.0012	-0.0007	0.0004	-0.0048	0.0004	0.0001	-0.0001	0.1323
	[0.0088]	[0.0056]	[0.0044]	[0.0052]	[0.0044]	[0.0003]	[0.0003]	[0.0033]	[0.4959]
Obs.	94	89	94	93	94	89	90	94	94
R-squared	0.358	0.177	0.367	0.168	0.168	0.157	0.277	0.145	0.352
Panel D. Placebo test II: Within CPFF ineligible A-2 rated CP issuers (A- vs. BBB+)									
*Post*A- rated*	-0.0418	0.0007	-0.0211	-0.0493 **	0.0039	0.0006	0.0005	0.0040	-0.3122
	[0.0269]	[0.0199]	[0.0132]	[0.0166]	[0.0037]	[0.0006]	[0.0003]	[0.0093]	[0.2850]
Obs.	42	40	42	40	42	40	42	42	42
R-squared	0.463	0.253	0.339	0.284	0.300	0.322	0.765	0.393	0.516

Table IV. Impact of the CPFF: Long-term Real Effects

This table shows changes in long-term real activities (trade credit, inventory, investments, and payout policy) around the introduction of the CPFF, from 2007:Q1 to 2010:Q4. Panel A considers all A-1 and A-2 rated CP issuers. Panel B considers A (lowest long-term rating among A-1 rated firms) and A- rated (highest long-term rating among A-2 rated firms) CP issuers. Panel C considers A-1 and A-1+ rated CP issuers. Panel D considers BBB+ and A- (A-2 rated) CP issuers. All firms considered have CP outstanding during 2008:Q1-Q2. To focus on firms with high CP demand, we exclude the bottom tercile of *CP/debt* firms. Observations are measured at quarterly frequency. This table uses a difference-in-differences specification, $y_{it} = \alpha_i + \gamma_t + \beta_1 \times Post_{it} \times CPFF_i + \beta_2 \times Post_{it} + \beta_3 \times CPFF_i + \delta \times X_{it} + \varepsilon_{it}$. The key variable of interest is the interaction term ($Post_{it} \times CPFF_i$ for Panels A and B, $Post_{it} \times "A-1+" - rated_i$ for Panel C, and $Post_{it} \times A - rated_i$ for Panel D), which measures the changes in the difference between CPFF eligible and ineligible CP issuers after the introduction of the CPFF. The dependent variables (y_{it}) are *NetTC/assets* (Column I), *Inventory/revenue* (Column II), *CapEx/assets* (Column III), and *Dividends/assets* (Column IV). *NetTC/assets* is net trade credit (RECTQ-APQ) divided by noncash assets. *Inventory/revenue* is total inventory (INVTQ) divided by revenue (REVTQ). *CapEx/assets* is capital expenditures (CAPXY minus one period lag of CAPXY) divided by noncash assets. *Dividends/assets* is total dividends (DVTQ) divided by noncash assets. $Post_{it}$ is an indicator variable that is one if the observation is taken from the post-CPFF period (after 2008:Q4) and is zero otherwise. $CPFF_i$ is an indicator variable that is one if a firm is CPFF eligible. A CP issuer is eligible for the Commercial Paper Funding Facility (CPFF) if it is A-1 rated as of August 2008 and has commercial paper outstanding between January and August of 2008. We control (X_{it}) for *firm size* (log of total assets), *non-CP debt/debt* (DLCQ+DLTTQ-CP outstanding all divided by noncash assets), and *Market-to-book* ratio (book value of assets plus market value of common equity minus book value of common equity and deferred taxes divided by total assets). α_i is firm fixed effects, γ_t is year fixed effects, and ε_{it} is an error term. Due to multicollinearity between the CPFF indicator ($CPFF_i$) and firm fixed effects (α_i), this difference-in-differences equation is estimated using a first differences specification, $\Delta y_{it} = \gamma_t + \beta_1 \times \Delta(Post_{it} \times CPFF_i) + \delta \times \Delta X_{it} + \Delta\varepsilon_{it}$, following Wooldridge (2002, Equation 10.73). The first difference of $CPFF_i$ is zero and that of $Post_{it}$ is absorbed in year fixed effects. Controls (X_{it}), intercepts, and firm (α_i) and year (γ_t) fixed effects are included but not shown in the table. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

Dependent variables	***NetTC/assets***	***Inventory/revenue***	***CapEx/assets***	***Dividends/assets***
	(I)	***(II)***	***(III)***	***(IV)***
Panel A. A-1 and A-2 rated CP issuers				
*Post*CPFF eligible*	-0.0052	-0.0646 **	0.0011	0.0012
	[0.0165]	[0.0270]	[0.0030]	[0.0017]
Obs.	247	247	247	247
R-squared	0.066	0.246	0.736	0.761
Panel B. A-1 and A-2 boundary (A vs. A-)				
*Post*CPFF eligible*	0.0254 ***	-0.1043 ***	0.0029	0.0009
	[0.0028]	[0.0308]	[0.0026]	[0.0024]
Obs.	161	161	161	161
R-squared	0.294	0.327	0.799	0.823
Panel C. Placebo test I: Within CPFF eligible CP issuers (A-1 vs. A-1+)				
*Post*A-1+ rated*	0.0028	0.0185	-0.0008	0.0007
	[0.0038]	[0.0331]	[0.0042]	[0.0015]
Obs.	198	198	198	198
R-squared	0.156	0.308	0.775	0.702
Panel D. Placebo test II: Within CPFF ineligible A-2 rated CP issuers (A- vs. BBB+)				
*Post*A- rated*	-0.0506	0.0581	-0.0026	0.0003
	[0.0262]	[0.0418]	[0.0024]	[0.0023]
Obs.	90	90	90	90
R-squared	0.169	0.283	0.747	0.832

Table V. Comparison within A-1 Rated CP Issuers.

This table shows relative changes in financing (Columns I to V) and operations (Columns VI to IX) around the introduction of the CPFF, from 2007:Q1 to 2010:Q4, within A-1 bottom-rated CP issuers. A-1 bottom-rated CP issuers are those who have A-1 S&P short-term debt ratings and A S&P long-term debt ratings. Panel A considers A-1 bottom-rated CP issuers with CP outstanding during 2007:Q1 to 2008:Q2; only firms with CP outstanding during 2008:Q1–Q2 are CPFF eligible. Panel B considers A-1 bottom-rated CP issuers with CP outstanding during 2008:Q1-Q2. Panel A uses a difference-in-differences specification, $y_{it} = \alpha_i + \gamma_t + \beta_1 \times Post_{it} \times CPFF_i + \beta_2 \times Post_{it} + \beta_3 \times CPFF_i + \delta \times X_{it} + \varepsilon_{it}$, where observations are measured at quarterly frequency. Panel B uses a *CPFFSlack* indicator instead of a CPFF indicator. The *CPFFSlack* indicator is one if CP outstanding as of 2008:Q2 divided by maximum CP backed by the CPFF program (i.e., maximum CP outstanding during January to August, 2008) is less than 0.9. The key variable of interest is the interaction term ($Post_{it} \times CPFF_i$ for Panel A, and $Post_{it} \times CPFFSlack_i$ for Panel B), which measures the changes in the difference between CPFF eligible and ineligible CP issuers (Panel A) or CPFF eligible firms with large and small CPFF slack (Panel B) after the introduction of the CPFF. Dependent variables (y_{it}) are *Debt/assets* (Column I), *ST debt/debt* (Column II), *CP/debt* (Column III), *Interest/debt* (Column IV), *(Cash+LC)/assets* (Column V), *NetTC/assets* (Column VI), *Inventory/revenue* (Column VII), *CapEx/assets* (Column VIII), and *Dividends/assets* (Column IX). *Debt/assets* is short-term (DLCQ) and long-term debt (DLTTQ) divided by noncash assets (ATQ-CHEQ). *(Debt-CP)/assets* is short-term (DLCQ) and long-term debt (DLTTQ) minus CP outstanding all divided by noncash assets. *ST debt/debt* is short-term debt (DLCQ) divided by total debt (DLCQ+DLTTQ). *Interest/debt* is interest expense (XINTQ) divided by total debt. *(Cash+LC)/assets* is the sum of cash (CHEQ) and unused lines of credit divided by noncash assets. *NetTC/assets* is net trade credit (RECTQ-APQ) divided by noncash assets. *Inventory/revenue* is total inventory (INVTQ) divided by revenue (REVTQ). *CapEx/assets* is capital expenditures (CAPXY minus one period lag of CAPXY) divided by noncash assets. *Dividends/assets* is total dividends (DVTQ) divided by noncash assets. $Post_{it}$ is an indicator variable that is one if the observation is taken from the post-CPFF period (after 2008:Q4) and is zero otherwise. $CPFF_i$ is an indicator variable that is one if a firm is CPFF eligible. A CP issuer is eligible for the Commercial Paper Funding Facility (CPFF) if it is A-1 rated as of August 2008 and has commercial paper outstanding between January and August of 2008. We control (X_{it}) for *firm size* (log of total assets), *non-CP debt/debt* (DLCQ+DLTTQ-CP outstanding all divided by noncash assets), and *Market-to-book* ratio (book value of assets plus market value of common equity minus book value of common equity and deferred taxes divided by total assets). α_i is firm fixed effects, γ_t is year fixed effects, and ε_{it} is an error term. Due to multicollinearity between the CPFF indicator ($CPFF_i$) and firm fixed effects (α_i), this difference-in-differences equation is estimated using a first differences specification, $\Delta y_{it} = \gamma_t + \beta_1 \times \Delta(Post_{it} \times CPFF_i) + \delta \times \Delta X_{it} + \Delta\varepsilon_{it}$, following Wooldridge (2002, Equation 10.73). The first difference of $CPFF_i$ is zero and that of $Post_{it}$ is absorbed in year fixed effects. Controls (X_{it}), intercepts, and firm (α_i) and year (γ_t) fixed effects are included but not shown in the table. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

Dependent variables	***Debt/assets***	***ST debt/debt***	***CP/debt***	***Interest/debt***	***(Cash+LC)/assets***	***NetTC/assets***	***Inventory/revenue***	***CapEx/assets***	***Dividends/assets***
	(I)	***(II)***	***(III)***	***(IV)***	***(V)***	***(VI)***	***(VII)***	***(VIII)***	***(IX)***
Panel A. Top rated CP issuers with recent CP demand (A-rated and CP outstanding during 2007:Q1-2008:Q2)									
*Post*CPFF eligible*	0.0184 *	0.082 *	-0.0308	-0.0019 *	-0.0730	0.0399 **	-0.0120	0.0094 **	0.0027
	[0.0104]	[0.0396]	[0.0308]	[0.0009]	[0.0997]	[0.0181]	[0.0807]	[0.0043]	[0.0018]
Observations	236	236	236	230	235	236	236	236	236
R-squared	0.134	0.163	0.611	0.311	0.228	0.034	0.423	0.743	0.834
Panel B. CPFF eligible (A-rated and CP outstanding during 2008:Q1-Q2)									
*Post*CPFF Slack*	0.1482 ***	0.0631	0.3047 ***	-0.0021 ***	-0.0464 *	0.0022	0.0746 ***	0.0401 ***	-0.0015
	[0.0318]	[0.0367]	[0.0207]	[0.0004]	[0.0252]	[0.0115]	[0.0235]	[0.0082]	[0.0048]
Observations	176	176	176	170	175	176	176	176	176
R-squared	0.355	0.191	0.635	0.203	0.337	0.067	0.408	0.750	0.812

Table VI. Impact of the CPFF: Firm Value (Analyst EPS Forecasts and Market-to-Book)

This table shows changes in market response of firm values around the introduction of the CPFF, from 2007 to 2010. Panel A considers all A-1 and A-2 rated CP issuers. Panel B considers A (lowest long-term rating among A-1 rated firms) and A- rated (highest long-term rating among A-2 rated firms) CP issuers. Panel C considers A-1 and A-1+ rated CP issuers. Panel D considers BBB+ and A- (A-2 rated) CP issuers. All firms considered have CP outstanding during 2008:Q1-Q2. To focus on firms with high CP demand, we exclude the bottom tercile of *CP/debt* firms. Observations are measured at monthly frequency. This table uses a difference-in-differences specification, $y_{it} = \alpha_i + \gamma_t + \beta_1 \times Post_{it} \times CPFF_i + \beta_2 \times Post_{it} + \beta_3 \times CPFF_i + \delta \times X_{it} + \varepsilon_{it}$. The key variable of interest is the interaction term ($Post_{it} \times CPFF_i$ for Panels A and B, $Post_{it} \times "A-1+" - rated_i$ for Panel C, and $Post_{it} \times A - rated_i$ for Panel D), which measures the changes in the difference between CPFF eligible and ineligible CP issuers after the introduction of the CPFF. The dependent variables (y_{it}) are analysts forecasts of earnings per share divided by price (*EPS/price*) and market-to-book ratio. *EPS/price* is obtained from the IBES and we consider six forecast horizons: 1-quarter, 2-quarters, 3-quarters, 4-quarters, 2-years, and long-term. *Market-to-book* ratio is book value of assets plus market value of common equity minus book value of common equity and deferred taxes divided by total assets. $Post_{it}$ is an indicator variable that is one if the observation is taken from the post-CPFF period (after 2008:Q4) and is zero otherwise. $CPFF_i$ is an indicator variable that is one if a firm is CPFF eligible. A CP issuer is eligible for the Commercial Paper Funding Facility (CPFF) if it is A-1 rated as of August 2008 and has commercial paper outstanding between January and August of 2008. We control (X_{it}) for *firm size* (log of total assets), *non-CP debt/debt* (DLCQ+DLTTQ-CP outstanding all divided by noncash assets), and *Market-to-book* ratio (book value of assets plus market value of common equity minus book value of common equity and deferred taxes divided by total assets). In Column VII, we exclude *Market-to-book* ratio from controls to avoid multicollinearity. α_i is firm fixed effects, γ_t is year fixed effects, and ε_{it} is an error term. Controls (X_{it}), intercepts, and firm (α_i) and year (γ_t) fixed effects are included but not shown in the table. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

Dependent variables	***Earning Per Share/stock price***						***Market-to-Book***
Prediction horizon	***1 Quarter (I)***	***2 Quarters (II)***	***3 Quarters (III)***	***4 Quarters (IV)***	***2 Years (V)***	***Long-Term (VI)***	***(VII)***
Panel A. A-1 and A-2 rated CP issuers							
*Post*CPFF eligible*	0.0057	0.0035	0.0027	0.0015	0.0017	-0.1729	0.3785
	[0.0036]	[0.0030]	[0.0027]	[0.0025]	[0.0074]	[0.1570]	[0.7892]
Obs.	984	983	964	937	984	945	984
R-squared	0.350	0.331	0.413	0.445	0.572	0.579	0.847
Panel B. A-1 and A-2 boundary (A vs. A-)							
*Post*CPFF eligible*	0.0080 **	0.0045	0.0030	0.0016	0.0001	-0.2655	0.8245
	[0.0036]	[0.0027]	[0.0030]	[0.0036]	[0.0088]	[0.2509]	[1.3108]
Obs.	660	660	652	639	660	633	660
R-squared	0.447	0.444	0.504	0.468	0.579	0.578	0.805
Panel C. Placebo test I: Within CPFF eligible CP issuers (A-1 vs. A-1+)							
*Post*A-1+ rated*	-0.0010	-0.0007	-0.0017	-0.0012	-0.0042	-0.0353	0.2902
	[0.0018]	[0.0016]	[0.0017]	[0.0017]	[0.0063]	[0.0476]	[0.4591]
Obs.	684	684	680	675	684	673	684
R-squared	0.488	0.559	0.586	0.591	0.702	0.662	0.864
Panel D. Placebo test II: Within CPFF ineligible A-2 rated CP issuers (A- vs. BBB+)							
*Post*A- rated*	-0.0057	-0.0033	-0.0020	-0.0016	-0.0045	0.1220	-1.0746
	[0.0071]	[0.0059]	[0.0051]	[0.0048]	[0.0116]	[0.3427]	[1.2469]
Obs.	432	431	414	390	432	404	432
R-squared	0.349	0.292	0.362	0.397	0.564	0.611	0.892

Table VII. Spillover Effects

This table shows changes in trade credits (receivables (RECTQ) and accounts payable (APQ)) and EDF around the introduction of the CPFF from 2008:Q1 to 2009:Q4. Observations are measured at quarterly frequency. Panel A uses a difference-in-differences specification, $y_{it} = \alpha_i + \gamma_t + \beta_1 \times Post_{it} \times CrisisCustomer_i + \beta_2 \times Post_{it} + \beta_3 \times CrisisCustomer_i + \delta \times X_{it} + \varepsilon_{it}$. The key variable of interest is the interaction term ($Post_{it} \times CrisisCustomer_i$), which measures the changes in the difference between CPFF customers during the crisis period and the non-crisis period after the introduction of the CPFF. The dependent variables (y_{it}) are accounts payable divided by assets (Columns I and IV), receivables minus accounts payable all divided by assets (Columns II and V), and EDF (Columns III and VI). $Post_{it}$ is an indicator variable that is one if the observation is taken from the post-CPFF period (after 2008:Q4) and is zero otherwise. $CrisisCustomer_i$ is an indicator variable that is one if a firm is a customer around the crisis period (2008–2011). We control (X_{it}) for firm size (log of total assets) and book leverage. Firm fixed effects (α_i) and year fixed effects (γ_t) are included, and ε_{it} is an error term. Due to multicollinearity between the crisis customer indicator ($CrisisCustomer_i$) and firm fixed effects (α_i), this difference-in-differences equation is estimated using a first differences specification, $\Delta y_{it} = \gamma_t + \beta_1 \times \Delta(Post_{it} \times CrisisCustomer_i) + \delta \times \Delta X_{it} + \Delta\varepsilon_{it}$, following Wooldridge (2002, Equation 10.73). The first difference of $CrisisCustomer_i$ is zero and that of $Post_{it}$ is absorbed in year fixed effects. Columns (I)–(III) consider all quarters from 2008 to 2009. Columns (IV)–(VI) consider the four quarters around the introduction of the CPFF (2008:Q2–2009:Q2). We exclude firms engaging in shadow banking. Controls (X_{it}) include *firm size* (log of total assets), *non-CP debt/debt* (DLCQ+DLTTQ-CP outstanding all divided by noncash assets), and *Market-to-book* ratio (book value of assets plus market value of common equity minus book value of common equity and deferred taxes divided by total assets). Controls, intercepts, and firm and year fixed effects are included but not shown. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

Sample period	***2008:Q1-2009:Q4***			***2008:Q2-2009:Q2***		
Dependent variables	***Payable/assets (I)***	***(Rec-Pay)/assets (II)***	***EDF (III)***	***Payable/assets (IV)***	***(Rec-Pay)/assets (V)***	***EDF (VI)***
*Post*CrisisCustomer*	0.1470	-0.1544	-2.1922 ***	0.1826 *	-0.1898 *	-2.6289 ***
	[0.109]	[0.112]	[0.829]	[0.107]	[0.110]	[1.211]
Observations	1373	1366	1257	996	991	921
R-squared	0.891	0.891	0.207	0.845	0.845	0.242

Table AI. Impact of the CPFF: Excluding the Cash for Clunkers Period

This table shows changes in financing activities and profitability around the introduction of the CPFF, from 2008:Q1 to 2009:Q2, which excludes the period when the *Cash for Clunkers* program was implemented. Panel A considers all A-1 and A-2 rated CP issuers. Panel B considers A (lowest long-term rating among A-1 rated firms) and A- rated (highest long-term rating among A-2 rated firms) CP issuers. Panel C considers A-1 and A-1+ rated CP issuers. Panel D considers BBB+ and A- (A-2 rated) CP issuers. All firms considered have CP outstanding during 2008:Q1-Q2. To focus on firms with high CP demand, we exclude the bottom tercile of *CP/debt* firms. Observations are measured at quarterly frequency. This table uses a difference-in-differences specification, $y_{it} = \alpha_i + \gamma_t + \beta_1 \times Post_{it} \times CPFF_i + \beta_2 \times Post_{it} + \beta_3 \times CPFF_i + \delta \times X_{it} + \varepsilon_{it}$. The key variable of interest is the interaction term ($Post_{it} \times CPFF_i$ for Panels A and B, $Post_{it} \times "A-1+" - rated_i$ for Panel C, and $Post_{it} \times A - rated_i$ for Panel D), which measures the changes in difference between CPFF eligible and ineligible CP issuers after the introduction of the CPFF. The dependent variables (y_{it}) are *Debt/assets* (Column I), *ST debt/assets* (Column II), *CP/debt* (Column III), *Interest/debt* (Column IV), *(Cash+LC)/debt* (Column V), *Revenue/assets* (Column VI), *OI/assets* (Column VII), and *NI/assets* (Column VIII). *Debt/assets* is short-term (DLCQ) and long-term debt (DLTTQ) divided by noncash assets (ATQ-CHEQ). *(Debt-CP)/assets* is short-term (DLCQ) and long-term debt (DLTTQ) minus CP outstanding all divided by noncash assets. *ST debt/debt* is short-term debt (DLCQ) divided by total debt (DLCQ+DLTTQ). *Interest/debt* is interest expense (XINTQ) divided by total debt. *(Cash+LC)/assets* is the sum of cash (CHEQ) and unused lines of credit divided by noncash assets. *Revenue/assets* is total revenue (REVTQ) divided by noncash assets. *OI/assets* is operating income before depreciation (OIBDPQ) divided by noncash assets. *NI/assets* is net income (NIQ) divided by noncash assets. $Post_{it}$ is an indicator variable that is one if the observation is taken from the post-CPFF period (after 2008:Q4) and is zero otherwise. $CPFF_i$ is an indicator variable that is one if a firm is CPFF eligible. A CP issuer is eligible for the Commercial Paper Funding Facility (CPFF) if it is A-1 rated as of August 2008 and has commercial paper outstanding between January and August of 2008. We control (X_{it}) for *firm size* (log of total assets), *non-CP debt/debt* (DLCQ+DLTTQ-CP outstanding all divided by noncash assets), and *Market-to-book* ratio (book value of assets plus market value of common equity minus book value of common equity and deferred taxes divided by total assets). α_i is firm fixed effects, γ_t is year fixed effects, and ε_{it} is an error term. Due to multicollinearity between the CPFF indicator ($CPFF_i$) and firm fixed effects (α_i), this difference-in-differences equation is estimated using a first differences specification, $\Delta y_{it} = \gamma_t + \beta_1 \times \Delta(Post_{it} \times CPFF_i) + \delta \times \Delta X_{it} + \Delta\varepsilon_{it}$, following Wooldridge (2002, Equation 10.73). The first difference of $CPFF_i$ is zero and that of $Post_{it}$ is absorbed in year fixed effects. Controls (X_{it}), intercepts, and firm (α_i) and year (γ_t) fixed effects are included but not shown in the table. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

Dependent variables	*Debt/assets* (I)	*ST debt/debt* (II)	*CP/debt* (III)	*Interest/debt* (IV)	*(Cash+LC)/assets* (V)	*Revenue/assets* (VI)	*OI/assets* (VII)	*NI/assets* (VIII)	*Accruals/assets* (IX)
Panel A. A-1 and A-2 rated CP issuers with CP outstanding during 2008:Q1-Q2									
*Post*CPFF eligible*	-0.0066	0.0240	-0.0245	-0.0028 ***	-0.0396	0.0355 **	0.0152	0.0154 **	-0.0957
	[0.0128]	[0.0275]	[0.0280]	[0.0008]	[0.0552]	[0.0165]	[0.0095]	[0.0063]	[0.3123]
Obs.	119	119	119	115	117	119	113	119	119
R-squared	0.349	0.149	0.634	0.405	0.231	0.386	0.202	0.261	0.353
Panel B. A-1 and A-2 boundary (A vs. A-)									
*Post*CPFF eligible*	-0.0092	0.0253	-0.0191	-0.0037 ***	-0.0398 *	0.0597 ***	0.0127 ***	0.0299 ***	0.3980
	[0.0154]	[0.0289]	[0.0299]	[0.0007]	[0.0211]	[0.0066]	[0.0031]	[0.0084]	[0.7584]
Obs.	55	55	55	53	55	55	53	55	55
R-squared	0.356	0.306	0.560	0.426	0.382	0.689	0.485	0.487	0.383
Panel C. Placebo test I: Within CPFF eligible CP issuers (A-1 vs. A-1+)									
*Post*A-1+ rated*	0.0025	-0.0009	0.0172	0.0003	0.0073	-0.0069	-0.0012	-0.0005	0.2059
	[0.0209]	[0.0334]	[0.0486]	[0.0009]	[0.0378]	[0.0101]	[0.0058]	[0.0048]	[0.6205]
Obs.	68	68	68	66	67	68	65	68	68
R-squared	0.225	0.209	0.511	0.196	0.439	0.522	0.185	0.312	0.350
Panel D. Placebo test II: Within CPFF ineligible A-2 rated CP issuers (A- vs. BBB+)									
*Post*A- rated*	0.0084	0.0211	0.0217	0.0013 *	0.0930	-0.0424	0.0011	-0.0211	-0.3063
	[0.0155]	[0.0521]	[0.0507]	[0.0006]	[0.0562]	[0.0270]	[0.0189]	[0.0136]	[0.2823]
Obs.	30	30	30	30	30	30	28	30	30
R-squared	0.326	0.332	0.689	0.735	0.363	0.524	0.318	0.369	0.498

Table AII. Impact of the CPFF: Discretionary Accruals

This table shows changes in discretionary accruals around the introduction of the CPFF, from 2008:Q1 to 2009:Q4. Panel A considers all A-1 and A-2 rated CP issuers. Panel B considers A (lowest long-term rating among A-1 rated firms) and A- rated (highest long-term rating among A-2 rated firms) CP issuers. Panel C considers A-1 and A-1+ rated CP issuers. Panel D considers BBB+ and A- (A-2 rated) CP issuers. All firms considered have CP outstanding during 2008:Q1-Q2. To focus on firms with high CP demand, we exclude the bottom tercile of *CP/debt* firms. Observations are measured at quarterly frequency. This table uses a difference-in-differences specification, $y_{it} = \alpha_i + \gamma_t + \beta_1 \times Post_{it} \times CPFF_i + \beta_2 \times Post_{it} + \beta_3 \times CPFF_i + \delta \times X_{it} + \varepsilon_{it}$. The key variable of interest is the interaction term ($Post_{it} \times CPFF_i$ for Panels A and B, $Post_{it} \times "A-1+" - rated_i$ for Panel C, and $Post_{it} \times A - rated_i$ for Panel D), which measures the changes in the difference between CPFF eligible and ineligible CP issuers after the introduction of the CPFF. The dependent variables (y_{it}) are different models of accruals based on Hribar and Collins (2002). *Accrual 1* is balance-sheet-based total accrual, given by changes in current assets minus changes in current liabilities minus changes in cash holdings plus changes in short term debt minus depreciation and amortization expenses. *Accrual 2* is cash-flow-statement-based total accrual, given by income before extraordinary items (IBC) minus net cash flow from operating activities (OACNF) plus extraordinary items and discontinued operations (XIDOC) divided by lagged total assets. *Accrual 3* is cash-flow-based discretionary accrual, given by accounts receivable (RECCH), inventory (INVCH), accounts payable and accrued liabilities (APALCH), accrued income taxes (TXACH), other assets and liabilities (AOLOCH), and depreciation and depletion (DEPC), all divided by noncash assets. Accrual 4 is the sum of *Accrual 3*. $Post_{it}$ is an indicator variable that is one if the observation is taken from the post-CPFF period (after 2008:Q4) and is zero otherwise. $CPFF_i$ is an indicator variable that is one if a firm is CPFF eligible. A CP issuer is eligible for the Commercial Paper Funding Facility (CPFF) if it is A-1 rated as of August 2008 and has commercial paper outstanding between January and August of 2008. We control (X_{it}) for *firm size* (log of total assets), *non-CP debt/debt* (DLCQ+DLTTQ-CP outstanding all divided by noncash assets), and *Market-to-book* ratio (book value of assets plus market value of common equity minus book value of common equity and deferred taxes divided by total assets). α_i is firm fixed effects, γ_t is year fixed effects, and ε_{it} is an error term. Due to multicollinearity between the CPFF indicator ($CPFF_i$) and firm fixed effects (α_i), this difference-in-differences equation is estimated using a first differences specification, $\Delta y_{it} = \gamma_t + \beta_1 \times \Delta(Post_{it} \times CPFF_i) + \delta \times \Delta X_{it} + \Delta\varepsilon_{it}$, following Wooldridge (2002, Equation 10.73). The first difference of $CPFF_i$ is zero and that of $Post_{it}$ is absorbed in year fixed effects. Controls (X_{it}), intercepts, and firm (α_i) and year (γ_t) fixed effects are included but not shown in the table. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

Dependent variables	*Accrual 1* (I)	*Accrual 2* (II)	*Accrual 3* (IV)
Panel A. A-1 and A-2 rated CP issuers with CP outstanding during 2008:Q1-Q2			
*Post*CPFF eligible*	-0.3630	-0.4431	-0.0957
	[0.4105]	[0.5253]	[0.3123]
Obs.	119	119	119
R-squared	0.108	0.336	0.353
Panel B. A-1 and A-2 boundary (A vs. A-)			
*Post*CPFF eligible*	-0.1302	-0.0882	0.5144
	[0.7189]	[0.8059]	[0.5300]
Obs.	77	77	77
R-squared	0.161	0.365	0.370
Panel C. Placebo test I: Within CPFF eligible CP issuers (A-1 vs. A-1+)			
*Post*A-1+ rated*	0.3844	0.5930	0.1323
	[0.5051]	[0.5973]	[0.4959]
Obs.	94	94	94
R-squared	0.199	0.338	0.352
Panel D. Placebo test II: Within CPFF ineligible A-2 rated CP issuers (A- vs. BBB+			
*Post*A- rated*	-0.1398	-0.1068	-0.3122
	[0.2222]	[0.3718]	[0.2850]
Obs.	42	42	42
R-squared	0.024	0.644	0.516

Figure 1. Expected Default Frequency around Lehman Brothers' Bankruptcy

This table shows the expected default frequency (EDF) for manufacturing (SIC codes 2000–3999) firms from January, 2008 through June, 2008. The expected default frequency (EDF) data for each firm is provided by Moody's KMV. Each marker indicates monthly average EDF value as of the last day of each month, starting January 2008. The vertical line indicates the announcement date of Lehman Brothers' bankruptcy (September 15, 2008). The CPFF was announced on October 7. Detailed eligibility criteria were announced October 14. Registration began on October 20. Finally, the CPFF became operational on October 27, 2008.

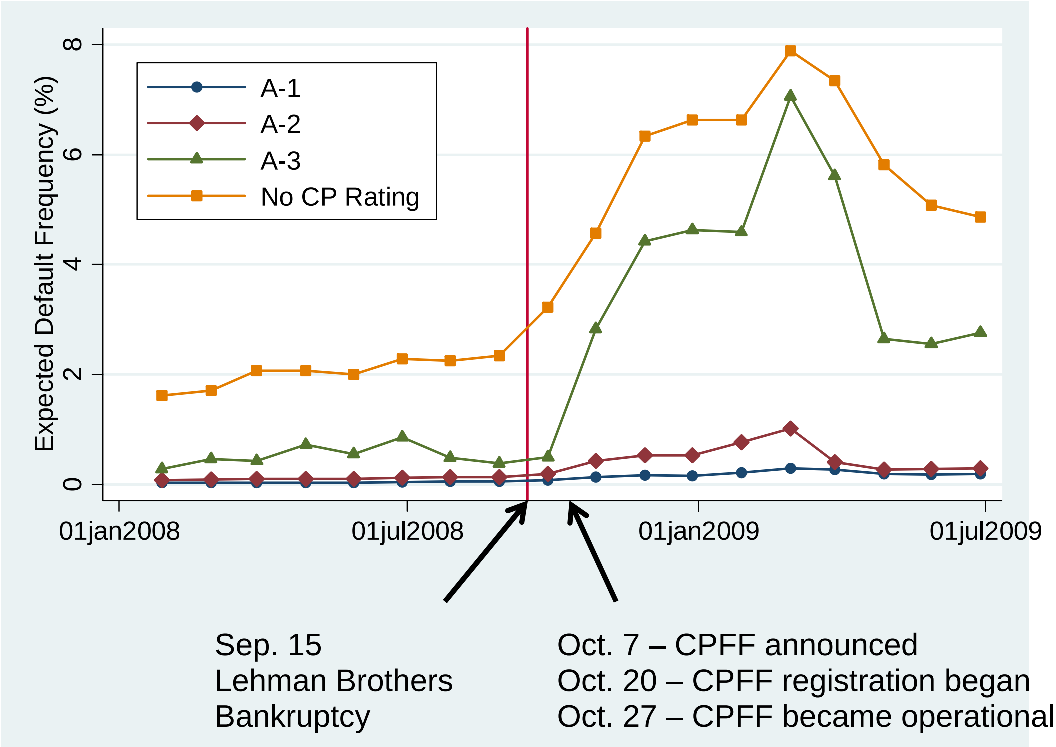

Figure 2. Description of Comparison Groups.

This figure shows control (CPFF ineligible CP issuers) and treatment (CPFF eligible) groups. Based on the CPFF eligibility criteria, a CP issuer is eligible when it is top-rated and has CP outstanding between January and August of 2008. The CP issuers can be further subdivided based on their S&P long-term rating. For example, A-1 rated firms are divided into A and A+ long-term ratings. A-2 rated firms are divided into BBB+ and A- long-term ratings. In the baseline empirical specification, we consider firms with CP outstanding between January and August of 2008. Among these firms only A-1 and A-1+ rated firms are eligible for the CPFF. We expect the CPFF effect to be the strongest when we compare firms at the CPFF eligibility boundary (A and A- long-term ratings). We perform several placebo tests against flight-to-quality concerns. Placebo test I compares CPFF eligible firms (A-1 vs. A-1+). Placebo test II compares CPFF ineligible firms (BBB+ vs. A-). In these two placebo tests, CPFF eligibility is homogeneous (i.e., the CPFF is available for all firms in placebo test I, and is not available for all firms in placebo test II) and only the flight-to-quality effect is present.