

Liquidity Backstop, Corporate Borrowings, and Real Effects^{*}

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We use firm-level commercial paper (CP) data to examine the impact of government-sponsored liquidity provision on non-financial firms. In response to the collapse of the CP market following the bankruptcy of Lehman Brothers in 2008, Federal Reserve created the Commercial Paper Funding Facility (CPFF) to provide a liquidity backstop for the CP market. In the pre-crisis period, all CP issuers had similar borrower characteristics. However, we find that the corporate borrowing activities of CPFF eligible (top-tier rated) and ineligible (below top-tier) CP issuers diverged after the introduction of the CPFF: the differences in new debt issuance amounts, loan spreads, and bond yields increased between these firms. Also, profitability, business activities (e.g., asset growth, acquisitions), cash holdings, and payout policies diverged when only top-tier (A1/P1/F1) rated CP issuers gained access to the CPFF. These findings highlight the role of public provision of liquidity in maintaining stability in the lending market as well as in insulating the business activities of non-financial firms against liquidity shocks.

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1. Introduction

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. In response, the Federal Reserve and other U.S. government agencies implemented a series of policy interventions 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.

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. The CPFF is a Fed-sponsored liquidity backstop designed to stabilize the contraction of commercial paper (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 key 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 helps by providing confidence in the lending market or exacerbates reckless defaults by borrowers is a matter that can be subject to empirical test.

The CPFF provides a setting in which to examine the impact of the public provision of liquidity; the collapse of Lehman Brothers led to an unprecedented liquidity shock driven by a

¹ Other government policy interventions implemented during 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).

substantially weakened financial sector, which is the main source of private liquidity. Given the severely contracted private liquidity, the impact of government-sponsored public liquidity can be expected to be substantive. In addition, the CPFF was available only to a subset of CP issuers. Prior studies such as Calomiris, Himmelberg, and Wachtel (1995), suggest that CP issuers as a whole are considered high credit quality borrowers with large size, high collateral levels, extensive credit market experience, and high earnings levels. In other words, they are rather homogeneous on these dimensions. However, the CPFF was available only for top-tier (A1/P1/F1 rated) CP issuers. These cross-sectional (top-tier vs. below top-tier CP issuers) and time-series (before and after the creation of the CPFF) variations allow us to identify the causal impact of the public provision of liquidity on firms. That is, by comparing the relative difference between top-tier and non-top-tier CP issuers before and after the creation of the CPFF, we can measure the net impact of the CPFF on firms' financing and other business activities.

Using firm-level manually-collected CP borrowing data from the SEC 10-Q/10-K for publicly traded U.S. manufacturing firms from 2005:Q1 to 2010:Q4, we find that the CPFF facilitated CP borrowings during the recent financial crisis: the difference in CP outstanding (scaled by total assets, excluding cash) between CPFF eligible and ineligible firms increased by 2.7% (which corresponds to 66% of the sample mean) after the CPFF was created. CPFF eligible firms gained better access to other debt markets after the creation of the CPFF.

Using loan origination data from Dealscan and bond issuance data from Mergent FISD and controlling for various firm and loan characteristics, we find no difference in new debt issuance amount and cost of borrowing between CPFF eligible and ineligible firms *before* the creation of the CPFF (2005:Q1–2008:Q3). In contrast, the difference in new debt issuance and cost of borrowing between CPFF eligible and ineligible firms increased *after* the creation of the

CPFF; for example, the difference in loan spread between CPFF ineligible and eligible firms increased by 125 basis points after the creation of the CPFF.

Finally, we find that these widening differences in the lending market between CPFF eligible and ineligible firms also affected other business activities. Differences between CPFF eligible and ineligible firms in profitability, asset growth, acquisitions, cash holdings, and dividend payouts increased after the CPFF was created. For example, the difference in net income divided by assets between CPFF eligible and ineligible firms increased by 4.7% after the creation of the CPFF.

We also carry out a set of placebo tests and robustness checks to substantiate the assumptions behind our identification strategy. For example, in order to address concerns that default risk of A1 rated and A2/A3 rated firms diverge during recessions regardless of the creation of the CPFF, we show that significant divergence in expected default frequency occurs only during the current crisis (post-CPFF period) and not during the 2000-2001 dot-com bubble burst.

Our work relates to the literature on the public provision of 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. 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 identification point of view, the cross-sectional variations 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 without ex-post access to such public liquidity.

There is a growing literature on empirical evidences on financial crisis; ours fits there and is closely related to studies on short-term lending and corporate liquidity. Chari, Christiano, and Kehoe (2008), and Ivashina and Scharfstein (2010) show changes in aggregate lending activities by banks during the recent financial crisis. Duchin, Ozbas, and Sensoy (2010), and Almeida, Campello, Laranjeira, and Weisbenner (2010) examine the impact of pre-crisis liquidity position on post-crisis corporate outcome. Campello, Graham, and Harvey (2010) provide CFO survey on company's ability to access external funds. Kacperczyk and Schnabl (2011) and Covitz, Liang, and Suarez (2009) report contraction in the asset-backed commercial paper market during the recent financial crisis. Adrian, Kimbrough, and Marchioni (2011) and Kacperczyk and Schnabl (2010) consider the impact of the CPFF on aggregate market conditions, 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 (2008), who examine leverage and 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 subsequent real effects, whereas this paper focuses on the impact of governmental response to the crisis on firms' business decisions and real effect. 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 in the recent financial crisis.

Finally, our paper relates to literature on short-term borrowing and liquidity. Kashyap, Stein, and Wilcox (1993) show that firms switch from bank loans to commercial paper following shifts toward tight monetary policy. Gatev and Strahan (2006), and Becker and Ivashina (2011) show similar switches between bank loans and public bonds. We focus on end users of short-term credits and show that 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 CP confers firms financial flexibility and substitutes for cash holdings. Our work complements this by showing how CP issuers respond to financial crisis and subsequent government rescue efforts in terms of debt borrowings (including CP) and cash holdings.

The rest of the paper develops as follows. Section 2 provides background on the current financial crisis and the CPFF. Section 3 includes a description of the data used for this study and provides summary statistics of the variables. Section 4 presents evidence of the impact of the CPFF on firms' financing decisions and real effects. Section 5 concludes.

2. The Financial Crisis of 2008 and the CPFF

2.1. Background

The increase in subprime mortgage defaults in early 2007 triggered the current 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 the

federal conservatorship. The most significant event that led the global financial markets into a full-fledged financial crisis was the filing of bankruptcy by Lehman Brothers on September 15, 2008. Lehman's default raised concerns regarding 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.² 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."

The 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

² 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).

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 the lender of last resort in the CP market greatly reduced CP investors' concerns about downside risk during the financial crisis. According to 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 availability among CP issuers. Since the Fed 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, the CPFF's SPV only purchased U.S. dollar-denominated CP with an A1/P1/F1 rating by a nationally recognized statistical rating organization (NRSRO).³ Also, to avoid excessive risk taking from government-backed CP, the maximum amount of CP the SPV was allowed to purchase was limited 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: CP issuers which had CP outstanding during January 1 and August 31, 2008 with a rating of A1/P1/F1 (CPFF eligible firms) and those who do not satisfy these conditions (CPFF ineligible firms).

2.2. Theoretical motivation and hypothesis development

This paper is motivated by theories on government intervention in financial markets and public liquidity. Prior literature suggests that government intervention in the lending market can be beneficial when capital markets are imperfect or contracts are incomplete. Bolton and

³ Discussions with Fed officials and economists suggest that eligibility of the CPFF was mainly determined by financial CP issuers. 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.

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 sales give up opportunities 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). Bebchuk and Goldstein (2011) consider a situation where success of a firm depends on the success of other operating firms in the economy. Under such circumstance, coordination failure among banks can lead to inefficient self-fulfilling credit freeze which can be mitigated by direct government intervention in the form of public liquidity provision to nonfinancial firms.

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, received bipartisan support. 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.⁴ Our paper shows that Fed intervention allowed financial markets to maintain their level of lending for creditworthy borrowers during the crisis.⁵

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. In addition, disruption in financing may force firms to pass up profitable investment opportunities. Hence, we expect CPFF eligible firms to be more profitable and have more active business operations than ineligible firms in the period when the CPFF was available only to the former group of firms.

3. Data

3.1. Sample construction

The paper uses several sources of data. The primary data comprise firm-level commercial paper outstanding for non-financial firms in the United States at quarterly frequency from the first quarter of 2005 to the fourth quarter of 2010. Commercial paper is a promissory note with maturities up to 270 days issued by corporations. Corporations use commercial paper as a lower-cost alternative to bank loans to raise cash needed for current transactions. To accommodate the

⁴ 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-Silanes, 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).

⁵ In contrast, credit card limit was reduced in the consumer credit market after the crisis in the absence of similar liquidity injection (Andriotis, 2009).

high cost of manually collecting commercial paper data while also being able to examine the use of lines of credit for non-financial firms, we focus on the U.S. domestic manufacturing industry (SIC codes 2000–3999), which issue a majority of the commercial paper among non-financial firms.

This panel of commercial paper data is then matched with Compustat Quarterly Files to obtain borrowers' financial characteristics. For an observation to be valid, we require the total asset (Compustat data code: ATQ) to be positive and non-missing. We also collect acquisition amounts from the SDC Platinum Global Issuance database. The resulting final sample includes 1397 firm year observations for 67 firms during the 2005:Q1–2010:Q4 period.

In addition to the commercial paper data, we also consider debt issuances either in the form of bank loans or corporate bonds for these 67 firms. We obtain the terms of bank loan contracts from Dealscan, and those of bond issuances from Mergent FISD. From Dealscan, we collect information on loan amounts, maturity, types of loans, purposes of loans, covenants, and spreads. From Mergent FISD, we collect information on offering amounts, maturity, covenants, and bond yields at the time of issuance. We merge loan and bond issuance data with Compustat quarterly data to link debt issuance characteristics with other firm-specific financial characteristics. The final loan sample from the Dealscan-Compustat intersection includes 888 contracts, and the bond sample from the Mergent FISD-Compustat intersection includes 470 contracts.

3.2. Description of the data

The main variable of interest for this study is commercial paper (CP) outstanding, which is normalized by total debt.

We also consider the real activities of firms by examining profitability, lending conditions, business activities, cash holdings, and payout policies. For profitability, we use net income (NIQ) divided by sales and S&P core earnings (SPCEQ) divided by sales (SALEQ). Firm-level borrowing activities are measured by the growth of total debt as well as cost of borrowing (i.e., interest expense (XINTQ) divided by total debt). Business activities are measured by growth of total assets (ATQ), growth of noncash assets (ATQ-CHEQ), growth of inventories (INVTQ), receivables (RECTQ) to sales ratio, and acquisition amount to noncash assets. For cash holdings, we use cash and short-term investments (CHEQ). For payout policy, we use cash dividends (DVTY- DVTY(lag)-DVPQ). Cash and dividends are divided by total non-cash assets (total assets minus cash and short-term investments, ATQ - CHEQ), following Sufi (2009).

In order to examine contract level characteristics, we use the natural logarithm of contract amount of loans and bonds (measured in millions of dollars), the natural logarithm of maturity (measured in months), loans' all-in-drawn spreads (measured in basis points), and bond yields. In order to examine loan choices, we use an indicator variable for revolvers that is one if a contract is a revolver and zero if a loan is a 364-day facility. Note that the majority of loans fall into these two categories: among 888 loan contracts, 523 are revolvers (59%) and 223 are 364-day facilities (25.11%). The remaining loans include bridge loans and term loans. Also, in order to examine the loans issued to back up commercial paper, we consider an indicator variable that is one if the loan purpose is CP backup and zero otherwise.

To account for the heterogeneity of borrowers' financial characteristics that may influence firms' use of commercial paper, we control for the following variables: firm size, book leverage, and market-to-book asset ratio. Firm size is measured by the natural logarithm of total

assets (ATQ). Book leverage is measured by book debt (DLTTQ + DLCQ) divided by assets. The market-to-book asset ratio $[(ATQ + PRCCQ) \text{ times } (CSHOQ - CEQQ)]$ divided by assets captures firms' growth prospects.

To illustrate the economy-wide default risk around the financial crisis, we consider the value-weighted expected default frequency (EDF) of non-financial firms, obtained directly from Moody's KMV. Built on the insights of the Black-Scholes-Merton model's contingent claim framework, Moody's KMV developed the concept of EDF (Crosbie and Bohn, 2003; Bharath and Shumway, 2008). Compared to the traditional and much debated low-frequency credit rating based measures, EDF is a timely and forward-looking predictor of corporate defaults. The resulting time-series is shown in Figure 1. Interestingly, the time-series plot of aggregate EDF provides a motivation for our choice of pre- and post-crisis periods. While the aggregate EDF began to rise in early 2007 when the excessive defaults on subprime mortgages became widely recognized, the most significant change occurred in September 2008 when the bankruptcy of Lehman Brothers was announced – the EDF of the manufacturing industry suddenly jumped more than four times.

Since the EDF characterizes a borrower's default risk, we can compare EDFs across CPFF eligible and ineligible firms to see how both groups of firms are perceived by the market in terms of credit worthiness as credit ratings are sticky, and may delay incorporation of credit-related information. Figure 2 shows the time series plot of the average EDFs for CPFF eligible (solid line) and ineligible (dash-dot line) firms for each month. As shown in the figure, the difference in mean EDFs is very small prior to 2008:Q3 and only starts to diverge after 2008:Q4. The pattern until 2008:Q3 is consistent with the view by Calomiris, Himmelberg, and Wachtel (1995) that CP-rated firms as a whole are considered to be top quality firms with a very low

default risk. That is, CPFF eligible and ineligible firms had similar risk characteristics prior to the creation of the CPFF (2008:Q4). It is interesting to observe that noticeable divergence of EDF between CPFF eligible and ineligible firms starts 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 were guaranteed by the CPFF.

3.3 Summary statistics

Table 1 shows medians, means, and standard deviations for the variables used in this paper. In Panel A, we show the firm-level financial characteristics of our sample. The mean (median) of commercial paper outstanding divided by noncash assets is 4.09% (2.51%) with a standard deviation of 4.78%. This suggests that firms in our sample hold a substantial amount of commercial paper during our sample period, and there is a large variation across firms on commercial paper holdings, to be explained by empirical tests. The mean of loan and bond issuance amount (scaled by noncash assets) is modest in value, 6.76%, with a median of zero. This reflects the slow lending activity around the crisis period. There is, however, substantial variation in issuance amount, as suggested by the large standard deviation of 25.76%.

Overall, firms with a commercial paper rating are large: the mean (median) of total assets is \$37.7 billion (\$17.5 billion), which is substantially larger than that of the mean of all manufacturing firms in Compustat in the corresponding period. They also have higher leverage, higher profitability, and lower cash holdings.⁶ Many of these characteristics are consistent with the empirical regularities identified by Calomiris, Himmelberg, and Wachtel (1994). They find

⁶ The means of all manufacturing firms in Compustat during 2005:Q1–2010:Q4 are \$1.94 billion for total assets, 0.152 for book leverage, 0.762 for M-B ratio, and 0.192 for cash divided by assets.

that commercial paper rated (CP-rated) firms are higher quality borrowers than those without a commercial paper rating (non CP-rated).

Panel B shows summary statistics for loan contracts initiated during the 2005:Q1–2010:Q4 period, and Panel C shows summary statistics for bond issuances during the same period. The mean borrowing amount is larger for loans (\$2.4 billion) than bonds (\$711 million). The mean of maturity for bonds is 113.2 months which is substantially longer than that of loan contracts (40.3 months).

4. Results

4.1. Impact of the CPFF on commercial paper market and corporate borrowings

4.1.1. Commercial paper borrowings

In this section, we examine the impact of the CPFF on borrowings of CP issuers. We show our preliminary evidence graphically by comparing the mean of the CP borrowings of CPFF eligible and ineligible firms in each year. Figure 3 depicts the difference in the means of CP divided by noncash assets between CPFF eligible and ineligible firms around the crisis. As shown, the difference in means jumps in 2009, shortly after the CPFF was created. This figure illustrates that the CP borrowing gap between CPFF eligible and ineligible firms widened after the creation of the CPFF.

In order to formally test the impact of the CPFF on commercial paper borrowings, we consider a quasi-experimental setting that exploits the differential treatment in CPFF eligibility among CP issuers. Namely, only active A1/F1/P1 rated CP issuers were eligible for the CPFF. We use this feature in a difference-in-differences framework as follows:

$$y_{it} = \alpha_i + \beta_t + \gamma \times CPFF_i \times Post_t + \delta_1 \times CPFF_i + \delta_2 \times Post_t + \delta_3 \times X_{it} + \varepsilon_{it} \quad (1)$$

where y_{it} is the dependent variable (commercial paper divided by noncash assets), α_i is firm fixed effects, β_t is year fixed effects, $CPFF_i$ is the CPFF eligibility indicator (one if CPFF eligible and zero otherwise), $Post_t$ is the post-CPFF indicator (one if in the post-CPFF period, i.e. after 2008:Q4, and zero otherwise), X_{it} contains other controls, and ε_{it} is the error term. In order to account for borrowers' heterogeneity, we control (X_{it}) for firm size, leverage, and market-to-book asset ratio. Standard errors are clustered at the firm level to account for the serial correlation within each firm. The key variable of interest is the interaction between the CPFF eligibility indicator ($CPFF_i$) and the post-CPFF indicator ($Post_t$). The parameter estimate of this interaction variable (γ) measures the difference-in-differences effect of the CPFF on commercial paper borrowings (y_{it}). That is, it measures the incremental change in commercial paper borrowings after the creation of the CPFF between CPFF eligible and non-eligible firms, after accounting for time-invariant firm-specific and time-specific effects.

Table 2 shows results for the difference-in-differences regressions for Equation (1). We repeat this regression for two different timeframes: Columns (I) and (II) consider the full sample period (2005:Q1–2010:Q4), and Columns (III) and (IV) consider a subperiod from 2008:Q1–2009:Q4.

As shown in Column (I), the parameter estimate of the differences-in-differences variable ($CPFF_i \times Post_t$) is significantly positive (2.36%) for the sample period of 2005:Q1 to 2010:Q4. This implies that the average differences in commercial paper borrowing between CPFF eligible and ineligible firms increased by 2.36% in the post CPFF period (ending in 2010:Q4) relative to 2008:Q1. This corresponds to 76.3% of the sample mean.⁷ Also, note that the parameter estimate

⁷ One may argue that A2/A3 borrowers rely less on CP, and voluntarily dropped out of the CP market. This is inconsistent with results in Table 5, which indicate that larger incremental damages in real effects from the financial crisis accrue to A2/A3 firms than A1 firms. If they were less dependent on CP, we would expect A2/A3 firms to be less affected by the disruption in the CP market.

on the CPFF indicator is insignificant. This suggests that there are no differences in CP borrowings between CPFF eligible and ineligible firms before 2008:Q4, when the CPFF was created. Column (II) shows the results when year and firm fixed effects are included. These results are qualitatively similar to those from Column (I), which has no fixed effects.

To focus on the changes right around the financial crisis and the creation of the CPFF, Columns (III) and (IV) consider a shorter sample period from 2008:Q1 to 2009:Q4. Again, the parameter estimates on the difference-in-differences variable are significantly positive with (Column III) or without (Column IV) the fixed effects. Also, the parameter estimates on the difference-in-differences variable are slightly larger for the short sample period (e.g., 2.36% without fixed effects) than the full sample period (e.g., 3.31% without fixed effects). This suggests that the main changes leading to the widening difference in CP borrowings between CPFF eligible and ineligible firms occurred near the time when the CPFF was created.

Overall, the findings from Table 2 suggest that after the creation of the CPFF, CPFF eligible firms increased their CP borrowings more than CPFF ineligible firms. That is, the CPFF had a positive impact on the CP market in terms of increased borrowings.

4.1.2. Corporate debt issuances

In the previous subsection, we focused on the impact of the CPFF on commercial paper outstanding. In this section, we examine whether the CPFF had a positive impact on other corporate lending activities. We focus on two activities: the origination of new bank loans and corporate bond issuances.

Table 3 shows summary statistics for debt issuance activities by CP issuers in the manufacturing industry.

In Panel A, we examine the lending conditions before and after the creation of the CPFF. We consider two conditions: the fraction of loans and bonds with covenants and the number of loans issued from 2005:Q1 to 2010:Q4. In the period before the creation of the CPFF, 61.3% of the loans issued by CPFF ineligible firms had covenants. This contrasts with 29.3% for the CPFF eligible firms. So, in the pre-CPFF period, the CPFF eligible firms had far fewer covenants than CPFF ineligible firms. However, after the collapse of Lehman Brothers, lending conditions tightened and covenant levels increased to 66.22% for CPFF ineligible and 47.9% for CPFF eligible firms. While covenant rates for both types of firms increased, the relative increase was much smaller for CPFF ineligible firms because their covenant rates were already high. However, the fraction of loans and bonds with covenants is still much smaller for CPFF eligible firms than CPFF ineligible firms, even after the creation of the CPFF. Instead of increasing the level of covenants for CPFF ineligible firms, banks and bond investors appear to have rationed additional lending in the post-crisis period: the number of loans and bonds decreased from 261 to 74 (28.4% of the pre-CPFF period). In contrast, the reduction in loans and bonds was more moderate for CPFF eligible firms (from 386 loans to 167 loans, 43.3% of the pre-CPFF period). Findings from Panel A suggest that CPFF eligible firms were less harshly treated by the lending market: while covenant levels increased in the wake of Lehman's default, these firms were less rationed in accessing bank loans and the bond market.

In Panel B, we focus only on bank loans and examine the number of new loans issued for CP backup. The proportion of loans for CP backup was larger for CPFF eligible (43.8%) than ineligible (29.9%) firms in the pre-CPFF adoption period. However, the difference increased in the CPFF period: the proportion of loans for CP backup is 36.53% for CPFF eligible and 18.9% for CPFF ineligible firms. That is, while CPFF eligible firms were able to maintain their fraction

of CP backup loans, CPFF ineligible firms experienced significant decline in the fraction of loans issued for CP backup purposes. There were only 14 loans issued by CPFF ineligible firms for CP backup during 2008:Q4–2010:Q4. During 2008, after Lehman’s default, only 2 loans issued by CPFF ineligible firms were for CP backup.

In Panel C, we examine the composition of loans versus bond issuances. Since the default of Lehman Brothers led to financial distress in the banking sector, bank lending became harder and firms sought alternative sources of financing, one of which was the bond market. Our sample consists of commercial paper issuers who rely on the bond market for short-term financing. Therefore, we expect our sample firms to have shifted towards bond financing after Lehman’s collapse. Consistent with this prediction, the fraction of new debt borrowing from the bond market increased from 25.9% to 30.5% for CPFF ineligible firms and 20.9% to 39.3% for CPFF eligible firms. Note that the shift toward the bond market is larger for CPFF eligible firms than ineligible firms. The main reason for this pattern is the increased commercial paper issuances of CPFF eligible firms.

In Panel D, we focus on short term bank loans and consider firms’ choices between 364-day facilities and revolvers, which together comprise 84% (223 loans are 364-day facilities and 523 loans are revolvers, out of total 888 loans) of the bank loans issued by the sample firms during the 2005:Q1–2010:Q4 period. Interestingly, the tendency to shift toward shorter maturity loans was stronger for CPFF eligible firms, whereas the fraction of revolvers increased from 75.9% to 84.3% for CPFF ineligible firms, it *decreased* from 77.12% to 37.31% for CPFF eligible firms. However, the reduction in total loan issuances was much larger for CPFF ineligible than eligible firms: while the number of revolvers and 364-day facilities decreased from 207 to 51 (24.5% of the pre-CPFF period) for CPFF ineligible firms, it decreased modestly

from 354 to 134 (37.9% of the pre-CPFF period) for eligible firms. In a striking similarity to findings in Panel A, firms' 364-day facility versus revolver choices suggest that loan terms tightened for CPFF eligible firms in terms of shorter maturity types (364-day facilities) after Lehman's collapse, but their access to new loan issuances was less rationed than for CPFF ineligible firms.

In Table 4, we investigate several key loan features in a more formal difference-in-differences framework as given by Equation (1) by replacing the dependent variable (y_{it}) with corresponding loan terms of interest. Specifically, we focus on the amounts of loan and bonds issued, loan spread (all-in-drawn spread), bond yields, and maturity of new debt issuances during the 2006:Q1–2010:Q4 period. For each variable of interest, we estimate a regression with no interaction term for the pre-CPFF period (2005:Q1–2008:Q3) as given by

$$y_{it} = \alpha_i + \beta_t + \delta_1 \times CPFF_i + \delta_2 \times X_{it} + \varepsilon_{it} \quad (2)$$

and a difference-in-differences regression given by Equation (1) for the full sample period (2005:Q1–2010:Q4).

The key variable of interest in Equation (2) is the CPFF eligibility indicator ($CPFF_i$) which measures the difference between CPFF eligible and ineligible firms before the CPFF was adopted. In the second specification using Equation (1), the key variable is the interaction between the CPFF eligibility indicator and the post-CPFF indicator ($CPFF_i \times Post_t$) which measures the difference-in-differences effect, as described in the previous subsection.

Columns (I) and (II) show the impact of the CPFF on loan and bond issuance. The dependent variable is the natural logarithm of the loan or bond issuance amount for each contract. In Column (I), the parameter estimate of the CPFF eligibility indicator ($CPFF_i$) is insignificant. This implies that there were no significant differences in loan and bond issuance

amounts in the pre-CPFF period. In contrast, the parameter estimate of the interaction variable ($CPFF_i \times Post_t$) in Column (II) is significantly positive (0.4399). That is, the differences in debt issuance amounts between CPFF eligible and ineligible firms increased after the creation of the CPFF.⁸

In Columns (III) and (IV), we consider the impact of the CPFF on loan spreads. The dependent variable is all-in-drawn spreads of loan contracts. In Column (III), the parameter estimate of the CPFF indicator ($CPFF_i$) for the estimation of Equation (2) is insignificant. That is, there were no significant differences in loan spreads between CPFF eligible and ineligible firms in the pre-CPFF period. However, as shown in Column (IV), the parameter estimate on the difference-in-differences variable ($CPFF_i \times Post_t$) is significantly negative (-125.53), which suggest that the difference in loan spreads between CPFF eligible and ineligible firms widened (CPFF eligible firms received lower loan spreads than CPFF ineligible firms) after the introduction of the CPFF. Such a substantial difference in the cost of borrowing between CPFF eligible and ineligible firms following the creation of the CPFF is consistent with a recent aggregate-level study by Adrian, Kimbrough, and Marchioni (2011). They show that after the introduction of the CPFF, the one month AA-rated financials spread declined from 188 basis points (October 2008) to 38 basis points (December 2009), whereas those of A2/P2 commercial paper increased from 483 basis points to 503 basis points. Findings from Column (V) suggest that the widening spreads between CPFF eligible and ineligible firms were not limited to commercial paper and occurred with bank loans as well.

We find similar evidence in the bond yield data, as shown in Columns (V) and (VI). The CPFF eligibility indicator is insignificant in the pre-CPFF regression of Equation (2) (Column

⁸ An alternative specification using firm-level debt issuance data (divided by noncash assets) with a Heckman two-step regression for selection bias gives qualitatively similar results.

(V)) and the estimate of the difference-in-differences variable for Equation (1) is significantly negative (Column (VI)). So, there were no significant differences in bond yields in the pre-CPFF period, but after the introduction of the CPFF, CPFF eligible firms received much lower bond yields than CPFF ineligible firms.

Finally, in Columns (VII) and (VIII), we investigate changes in debt maturities after the adoption of the CPFF. While we find that the maturities of CPFF eligible firms were longer than for CPFF ineligible firms in the pre-CPFF period (the parameter estimate on CPFF eligibility indicator is positively significant: 2.0193, in Column (VII)), we don't find any evidence that the CPFF caused changes in these maturity differences between CPFF eligible and ineligible firms: the parameter estimate on the interaction variable is statistically insignificant in Column (VIII).

Historically, firms with any CP rating are usually considered the highest credit quality borrowers. Calomiris, Himmelberg, and Wachtel (1995) suggest that the flight to quality among lenders during a crisis may have given these borrowers access to financing alternatives like lines of credit (Bernanke, Gertler, and Gilchrist 1996). Findings from Columns (I), (III), and (V) of Table 4 suggest that prior to the crisis, the CPFF eligible and ineligible firms had been treated in similar ways by the lending market. However, findings from Tables 2 to 4 suggest that the CPFF disproportionately benefited CPFF eligible firms in terms of commercial paper borrowing amounts, other debt issuance amounts and their costs of borrowing. Sufi (2009) finds certification effects, in that obtaining a third-party bank loan rating impacts a firm's financial and investment policy. The spillover of different treatment in the CP market to other lending markets is consistent with this and other prior studies on certification effects: the government's endorsement of CPFF eligible firms acted as a certification of credit quality for other lending markets.

4.2. Real effects of the CPFF

The previous section shows how the CPFF affected corporate borrowing. In this section, we investigate the real effects of the CPFF.

We examine heterogeneous changes in profitability (net income, S&P core earnings), cost of debt financing (interest expense), business activity (assets growth, noncash assets growth, inventory growth, receivables, acquisition amounts), cash holdings (cash and short-term investments), and payout policies (cash dividends) for CPFF eligible and ineligible firms after the creation of the CPFF, using Equation (1). Following prior work, receivables, cash and short-term investments, and dividends are divided by non-cash assets instead of total assets to avoid spurious mechanical correlations. Standard errors are clustered at the firm level to account for serial correlation within each firm. The key variable of interest is the interaction between the CPFF eligibility indicator ($CPFF_i$) and the post-CPFF indicator ($Post_t$). The parameter estimate of this interaction variable (γ) measures the difference-in-differences effect of the CPFF, i.e., changes in the difference between CPFF eligible and ineligible firms.

Table 5 shows the results from difference-in-differences tests using Equation (1). Columns (I) and (II) show changes in profitability after the adoption of the CPFF. The parameter estimates of the difference-in-differences variable ($CPFF_i \times Post_t$) are significantly positive for net income per sales and for earnings per sales regressions. That is, the difference in profitability between CPFF eligible and ineligible firms was greater after the adoption of the CPFF.

One source of the increased profitability of CPFF eligible firms can be found in the lower cost of financing after the creation of the CPFF. In Columns (III) and (IV), we investigate changes in debt financing and costs for CPFF eligible and ineligible firms after the adoption of

the CPFF. As shown in Column (III), we find a significantly positive difference-in-differences effect for debt growth. The parameter estimate in the interaction between the CPFF indicator and the post-CPFF indicator is significantly positive (0.0727): this difference-in-differences change corresponds to 1.5 times the sample mean (0.049). Also, as shown in Column (IV), the cost of financing (interest expense divided by total debt) became relatively lower for CPFF eligible versus ineligible firms after the introduction of the CPFF; the parameter estimate on the difference-in-differences variable is significantly negative (-0.22%), which is 16.5% of the sample mean. Findings from Columns (III) and (IV) suggest that CPFF eligible firms increased their debt at lower costs than CPFF ineligible firms, which contributed to their higher profitability, as shown in Columns (I) and (II).

In Columns (V) to (VIII), we explore heterogeneous changes in business activities between CPFF eligible and ineligible firms after the creation of the CPFF. Based on a prior study, we use asset growth to measure a firm's investment activities (Fama and French, 2006). Prior studies on inventories suggest that credit constrained firms cut back on inventories to reduce the cost of carrying them (Kashyap, Lamont, and Stein, 1994). Love, Preve, and Sarria-Allende (2007) examine the use of trade credit (measured by accounts receivables) during the 1997 Asian crisis, as a measure of business activities. Hence, we look at inventory growth and receivables for alternative measures of business activities. We find that CPFF eligible firms had higher asset growth, both in total assets (Column V) and in noncash assets (Column VI), than CPFF ineligible firms after the adoption of the CPFF. For example, noncash assets grew 4.63% (i.e., twice the sample mean) more for CPFF eligible firms than ineligible firms in the post-CPFF period. Also, inventories, as shown in Column (VII), grew 3.11% (i.e., 1.5 times the sample mean) more for CPFF eligible firms than ineligible firms after the adoption of the CPFF. The

CPFF also positively affected receivables for CPFF eligible firms: the difference in receivables (divided by noncash assets) between CPFF eligible and ineligible firms increased by 11.81% (which corresponds to 16% of the sample mean) after the creation of the CPFF. Column (IX) shows a difference-in-differences test for acquisition amounts (divided by noncash assets). The parameter estimate on the difference-in-differences variable is significantly positive (0.0126, which is 3 times the sample mean of 0.0041), which indicates that the difference in acquisition amounts between CPFF eligible and ineligible firms increased after the adoption of the CPFF. Note that acquisition activities decreased after the bankruptcy of Lehman Brothers for all firms; in our sample period (2005:Q1–2010:Q4), there were 97 acquisitions completed by CPFF eligible and 30 by CPFF ineligible firms, of which 47 of the CPFF eligible and 10 of the CPFF ineligible firms' acquisitions were made after the bankruptcy of Lehman Brothers (2008:Q3). So while acquisition activities by CPFF firms remained close to pre-crisis levels, those by CPFF ineligible firms were substantially decreased. Evidence from asset growth, acquisitions, and level of receivables suggests that the CPFF positively affected business activities.

Finally, Columns (X) and (XI) show changes in cash and payout policies for CPFF eligible and ineligible firms after the creation of the CPFF. A recent article suggests that, after Lehman's collapse and the subsequent liquidity crisis, firms have been wary of their liquidity reserves and accumulated cash by issuing debt (Wirz, 2011). Also, Alfonso, Kovner, and Schoar (2011) report similar cash hoarding behavior by banks. Consistent with this, we find that CPFF eligible firms which had better access to the debt market increased their cash holdings more than CPFF ineligible firms in the post-CPFF period. As shown in Column (X), the parameter estimate of the difference-in-differences variable is significantly positive (1.81%) and corresponds to

19.6% of the sample mean. Interestingly, as shown in Column (XI), CPFF eligible firms also paid more dividends than CPFF ineligible firms after the CPFF was created.

Overall, findings from Table 5 suggest that the CPFF had positive real effects allowing firms to have higher profitability, lower costs of financing, higher growth in business activities, and more payouts to shareholders.

4.3. Robustness

To check the robustness of our findings through a series of “placebo tests”, we examine whether an event date other than 2008:Q4, when the CPFF was created, would coincidentally yield positive difference-in-differences effects like those we report in earlier sections. A number of studies indicate that the financial crisis began in the middle of 2007 with increases in the default rates of mortgage loans (e.g., Ivashina and Scharfstein (2011)). Hence, we consider a placebo difference-in-differences test (Equation (1)) with the second quarter of 2007 as the event date (i.e., $Post_t$ is one for dates after 2007:Q2 and zero otherwise) and a sample period of one year before and after this date (2006:Q1–2008:Q2).

As shown in Table 6, parameter estimates of the difference-in-differences variable ($CPFF_i \times Post_t$) are statistically insignificant for all regressions considering real effects as well as commercial paper borrowings. That is, there are no significant differences in real effects or commercial paper borrowings between CPFF eligible and ineligible firms after an alternative event date (2007:Q2). We obtain similar (insignificant difference-in-differences) results when considering other event dates between 2007:Q1 and 2008:Q2. These findings suggest that the significant difference-in-differences effect obtained in the previous section is unlikely to be a

coincidental outcome but rather an outcome that truly indicates changes attributable to the creation of the CPFF.

Finally, there may be a concern that default risks of A1 rated and A2/A3 rated firms diverge during recessions, which leads to differences in CP borrowings and real effects regardless of the creation of the CPFF. To explore this alternative hypothesis, we examine differences in expected default frequency between A1 rated and A2/A3 rated firms around the two most recent recessions: the dot-com bubble burst (March 2001–November 2001) and the current financial crisis (December 2007–June 2009). For each regression, the sample period begins one year prior to the corresponding NBER recession and runs until the end of the corresponding NBER recession. We run a difference-in-differences test using the start date of the 2001 recession (March 2001) and the creation of the CPFF (October 2008) as event dates (i.e., $Post_t$ variable is one after this event date). As shown in Table 7, only the second regression for the recent financial crisis leads to a significant parameter estimate for the difference-in-differences variable ($A1\ Indicator_i \times Post_t$). This indicates that the EDF between A1 and A2/A3 rated firms did not change in the prior recession (March 2001–November 2001). In contrast, the EDF of A2/A3 rated firms increased much more than that of A1 firms after the creation of the CPFF. Hence, the alternative hypothesis, that the default risk (as measured by EDF) difference between A1 and A2/A3 firms increases during recession regardless of whether the CPFF is in place or not, is not supported.

5. Conclusions

This paper provides empirical evidence on the impact of the CPFF on corporate borrowings, and the real effects of the recent financial crisis on non-financial firms.

In a difference-in-differences framework, we show that the difference in commercial paper and other corporate borrowings between CPFF eligible and ineligible firms increased after the creation of CPFF: the loan spreads and bond yields of CPFF eligible firms became substantially lower than those of CPFF ineligible firms. Also, amounts of loans and bonds newly issued by CPFF eligible firms largely surpassed those of the CPFF ineligible firms. Furthermore, we find that the CPFF had positive real effects: CPFF eligible firms had higher profitability, more active business operations (e.g., higher asset growth, more acquisitions) than CPFF ineligible firms.

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 real effects of government-supported liquidity provisions on firms. While we show positive impact of the public provision of liquidity, it is beyond the scope of this paper to show overall welfare effect of this policy. For example, Mishkin notes that Fed's action to stabilize the financial system may increase moral hazard (Mishkin, 2010). Whether Fed's backstop caused substantial moral hazard for future discipline is an important issue. We leave them for future studies.

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Table 1. Summary Statistics

Sample from the SEC–Dealscan–Mergent FISD–Compustat intersection (2005:Q1–2010:Q4) for CP-issuing manufacturing firms (SIC codes 2000–3999). Information on outstanding commercial paper amounts are obtained from 10-K and 10-Q filings. Information on loan contracts is obtained from Dealscan. Information on bond issuances is obtained from Mergent FISD. Total assets (ATQ), cash and short-term investments (CHEQ), non-cash assets (ATQ-CHEQ), book leverage (DLTTQ + DLCQ divided by ATQ), market-to-book assets (ATQ + PRCCQ times CSHOQ – CEQQ divided by ATQ), S&P core earnings (SPCEQ), net incomes (NIQ), interest expenses (XINTQ), inventory (INVTQ), receivables (RECTQ), and dividends (DVQY-DVQY(lag)-DVPQ) are obtained from the Compustat quarterly database. Acquisition amounts are obtained from the SDC Platinum database. Commercial paper, the sum of loan and bond amounts, acquisition amounts, cash, and dividends are divided by noncash assets.

Panel A. Financial characteristics

Variables	Number Obs	Mean	Std Dev.	p10	Median	p90
<i>Commercial Paper / assets</i>	921	0.0409	0.0478	0.0000	0.0251	0.1046
<i>(Loan+Bond) / assets</i>	1397	0.0675	0.2576	0.0000	0.0000	0.1392
<i>Total assets (\$million)</i>	1397	37729	50429	3935	17490	105016
<i>Book leverage</i>	1397	0.2599	0.1179	0.1212	0.2414	0.4400
<i>M-B ratio</i>	1397	1.9727	0.9021	1.1664	1.7157	3.0778
<i>Net income / assets</i>	1368	0.0932	0.1267	0.0229	0.0795	0.1875
<i>S&P core earnings / sales</i>	1223	0.0888	0.0691	0.0247	0.0774	0.1776
<i>Total debt growth</i>	1370	0.0490	0.3055	-0.1040	-0.0003	0.1909
<i>Interest expense / debt</i>	1288	0.0133	0.0054	0.0076	0.0131	0.0183
<i>Total assets growth</i>	1331	0.0213	0.1046	-0.0409	0.0139	0.0690
<i>Noncash assets growth</i>	1331	0.0234	0.1479	-0.0412	0.0113	0.0624
<i>Inventory growth</i>	1334	0.0205	0.1519	-0.0837	0.0116	0.1181
<i>Receivables / sales</i>	1367	0.7416	0.4672	0.3878	0.6400	1.0971
<i>Cash / assets</i>	1331	0.0922	0.1065	0.0159	0.0595	0.1965
<i>Dividends / assets</i>	1328	0.0003	0.0187	-0.0222	0.0045	0.0157
<i>Acquisition (\$million)</i>	127	2221	6159	34	243	5030

Panel B. Loan characteristics

<i>Loan amount (\$million)</i>	888	2397	3771	250	1375	5000
<i>Maturity (months)</i>	888	40.3	23.0	12.0	59.5	60.0

Panel C. Bond characteristics

<i>Issue amount (\$million)</i>	468	711	3770	5	338	1150
<i>Maturity (months)</i>	468	113.2	90.9	49.0	84.0	241.0

Table 2. Impact of the CPFF on the commercial paper market (difference-in-differences)

Sample from the SEC–Dealscan–Mergent FISD–Compustat intersection (2008:Q1–2010:Q4) for CP-issuing manufacturing firms (SIC codes 2000–3999). CPFF is one if a firm was an active CP issuer with an A1 rating in 2008 and is zero otherwise. Post is one if the observation is after 2008:Q4 and zero otherwise. Intercept and firm and year fixed effects are included as controls but not shown in the table. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

<i>Dependent variable</i>	<i>Commercial paper / noncash assets</i>			
	<i>2005:Q1-2010:Q4</i>		<i>2008:Q1-2009:Q4</i>	
	(I)	(II)	(III)	(IV)
<i>CPFF*Post</i>	0.0236 ** [0.009]	0.0270 *** [0.009]	0.0331 *** [0.011]	0.0291 *** [0.010]
<i>CPFF indicator</i>	-0.0020 [0.010]	-0.0263 [0.025]	-0.0132 [0.015]	-0.0088 [0.065]
<i>Post</i>	-0.0376 *** [0.008]	-0.0341 *** [0.011]	-0.0445 *** [0.009]	-0.0553 *** [0.010]
<i>Log of assets</i>	-0.0081 ** [0.003]	0.0113 [0.010]	-0.0095 * [0.005]	-0.0088 [0.029]
<i>Book leverage</i>	0.1357 *** [0.032]	0.3031 *** [0.055]	0.0810 ** [0.035]	0.2632 *** [0.094]
<i>M-B ratio</i>	0.0014 [0.004]	0.0060 [0.006]	-0.0017 [0.004]	-0.0068 [0.006]
<i>Year controls</i>	No	Yes	No	Yes
<i>Firm fixed effects</i>	No	Yes	No	Yes
<i>Observations</i>	921	921	329	329
<i>R-squared</i>	0.231	0.672	0.194	0.767

Table 3. Impact of the CPFF on debt issuance: summary statistics

Sample from the SEC–Dealscan–Mergent FISD–Compustat intersection (2005:Q1–2010:Q4) for CP-issuing manufacturing firms (SIC codes 2000–3999). Log of assets, book leverage, M-B ratio and intercepts are included but not shown in the table. Panel A shows the fraction of loans with covenants and the number of loans issued around the adoption of the CPFF for CPFF eligible and ineligible CP-issuing firms. A firm is CPFF eligible if it had issued CP in 2008 and had an A1 rating before 2008:Q3. Panel B shows the number of loans issued for CP backup and other purposes. Panel C shows the number of bond and loan contracts. Panel D shows the number of loan contracts for revolvers and 364-day facilities. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

Panel A. Fraction of loans with covenants and number of loans and bonds					
	<i>CPFF ineligible</i>		<i>CPFF eligible</i>		
	<i>Fraction</i>	<i>Loans</i>	<i>Fraction</i>	<i>Loans</i>	
<i>Before CPFF</i>	0.6130	261	0.2927	386	
<i>After CPFF</i>	0.6622	74	0.4790	167	

Panel B. Loan purpose: CP backup?					
	<i>CPFF ineligible</i>		<i>CPFF eligible</i>		
	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	
<i>Before CPFF</i>	183	78	217	169	
<i>After CPFF</i>	60	14	106	61	

Panel C. Bond or loan?					
	<i>CPFF ineligible</i>		<i>CPFF eligible</i>		
	<i>Loan</i>	<i>Bond</i>	<i>Loan</i>	<i>Bond</i>	
<i>Before CPFF</i>	261	91	386	102	
<i>After CPFF</i>	74	169	167	108	

Panel D. Revolver or 364 day facility?					
	<i>CPFF ineligible</i>		<i>CPFF eligible</i>		
	<i>364 day</i>	<i>Revolver</i>	<i>364 day</i>	<i>Revolver</i>	
<i>Before CPFF</i>	50	157	81	273	
<i>After CPFF</i>	8	43	84	50	

Table 4. Impact of the CPFF on debt issuance: difference-in-differences

Sample from SEC–Dealscan–Mergent FISD–Compustat intersection (2005:Q1–2010:Q4) for CP-issuing manufacturing firms (SIC codes 2000–3999). CPFF is one if a firm was an active CP issuer with an A-1 rating in 2008 and is zero otherwise. Post is one if the observation is after 2008:Q4 and zero otherwise. Log of issue amount is the natural logarithm of loan and bond amounts. Loan amounts are obtained from Dealscan and bond amounts are obtained from Mergent FISD. Columns (I)–(VIII) are OLS regressions with contract-level data. All-in-drawn spreads are measured in basis points, and maturity is measured in months. Intercept and firm and year fixed effects are included but not shown in the table. Standard errors are clustered at firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

<i>Dependent variables</i>	<i>Log of issue amount</i>		<i>All-in-drawn spread</i>		<i>Bond yield</i>		<i>Log of maturity</i>	
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
<i>CPFF*Post</i>		0.4399 ** [0.219]		-125.5310 *** [46.527]		-1.4471 *** [0.337]		-0.1440 [0.143]
<i>CPFF indicator</i>	0.6662 [1.006]	4.6159 *** [0.995]	-6.3850 [14.413]	-33.3697 * [18.821]	-1.2944 [3.643]	1.3977 [1.480]	2.0193 * [1.075]	1.2600 ** [0.560]
<i>Post</i>		-0.4136 [0.373]		102.7664 *** [17.166]		1.3209 ** [0.527]		-0.2272 [0.216]
<i>Log of assets</i>	-0.1973 [0.599]	-0.1412 [0.381]	32.0053 [38.166]	-74.9273 ** [34.132]	0.1269 [1.784]	0.3871 [1.036]	-0.8840 [0.662]	0.0297 [0.268]
<i>Book leverage</i>	-0.1199 [2.103]	-1.2543 [1.467]	-167.3854 ** [72.249]	100.2095 [121.760]	-3.2871 [3.871]	2.3881 [2.466]	-3.4098 *** [1.150]	-1.6587 ** [0.713]
<i>M-B ratio</i>	0.0000 [0.074]	-0.1992 [0.154]	-15.8381 ** [6.857]	10.3496 [8.349]	-0.4956 [0.420]	-0.4755 [0.346]	0.0558 [0.086]	0.0079 [0.101]
<i>Log of debt amount</i>			2.6816 [1.780]	6.0325 [4.851]	-0.3765 [0.310]	-0.0729 [0.072]	-0.1753 *** [0.056]	-0.1949 *** [0.027]
<i>Log of maturity</i>	-0.0033 *** [0.001]	-0.0038 ** [0.001]	-0.0105 [0.066]	-0.3504 [0.213]	0.0031 *** [0.001]	0.0062 *** [0.001]		
<i>Sample</i>	Loans+bonds	Loans+bonds	Loans	Loans	Bonds	Bonds	Loans+bonds	Loans+bonds
<i>Year controls</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Firm fixed effects</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Observations</i>	780	1,358	582	760	135	430	780	1,358
<i>R-squared</i>	0.702	0.706	0.801	0.861	0.842	0.781	0.361	0.356

Table 5. Real effects of the CPFF (difference-in-differences)

Sample Sample from the SEC–Dealscan–Mergent FISD–Compustat intersection (2005:Q1–2010:Q4) for CP-issuing manufacturing firms (SIC codes 2000–3999). CPFF is one if a firm was an active CP issuer with an A1 rating in 2008 and is zero otherwise. Post is one if the observation is after 2008:Q4 and zero otherwise. Net income (NI), S&P core earnings (Earnings), interest expenses (Interest), noncash assets (NCA; total assets less cash), inventories (Invt), receivables (Receiv), cash and short-term investments (Cash), and dividends (Div) are obtained from the Compustat quarterly database. Acquisition amounts (Acq) are obtained from the SDC Platinum database. Intercept and firm and year 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.

	<i>Dependent variables</i>										
	<i>NI / sales</i>	<i>Earnings / sales</i>	<i>Debt growth</i>	<i>Interest / debt</i>	<i>Assets growth</i>	<i>NCA growth</i>	<i>Invt. growth</i>	<i>Receiv. / sales</i>	<i>Acq/ assets</i>	<i>Cash / assets</i>	<i>Div. / assets</i>
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)
<i>CPFF*Post</i>	0.0468 ** [0.019]	0.0183 ** [0.009]	0.0727 * [0.042]	-0.0022 *** [0.001]	0.032 ** [0.016]	0.0463 ** [0.021]	0.0311 * [0.017]	0.1181 ** [0.050]	0.0131 * [0.007]	0.0181 * [0.010]	0.0019 ** [0.001]
<i>CPFF</i>	-0.063 [0.065]	-0.0014 [0.045]	0.0125 [0.017]	-0.001 [0.001]	-0.3489 *** [0.093]	-0.485 *** [0.127]	0.366 *** [0.103]	0.3593 *** [0.027]	-0.1587 ** [0.073]	0.0087 [0.051]	0.0021 [0.003]
<i>Post</i>	-0.0191 [0.020]	0.0109 [0.011]	-0.1788 ** [0.075]	0.0022 ** [0.001]	-0.0553 * [0.032]	-0.0715 [0.043]	-0.0635 [0.043]	0.0000 * [0.062]	0.0035 [0.019]	-0.011 [0.011]	-0.0048 * [0.003]
<i>Log of assets</i>	0.0177 [0.035]	-0.0055 [0.031]	0.2761 *** [0.070]	-0.0016 [0.001]	0.1951 *** [0.047]	0.2703 *** [0.066]	0.2382 *** [0.076]	0.0389 [0.117]	0.0835 ** [0.037]	-0.017 [0.025]	0.0005 [0.002]
<i>Book leverage</i>	-0.2735 *** [0.076]	-0.099 * [0.051]	1.3792 *** [0.263]	-0.0111 ** [0.004]	0.0794 [0.100]	0.038 [0.116]	-0.0894 [0.165]	0.4521 * [0.267]	-0.0397 [0.072]	-0.0057 [0.068]	-0.0009 [0.007]
<i>M-B ratio</i>	0.0009 [0.018]	0.0199 [0.018]	0.1075 * [0.054]	-0.0003 [0.000]	0.0104 [0.008]	0.013 [0.014]	0.0222 [0.015]	0.0485 * [0.029]	-0.0001 [0.005]	0.0017 [0.012]	0.0001 [0.001]
<i>Year controls</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Firm fixed effects</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Observations</i>	1,368	1,223	1,370	1,288	1,331	1,331	1,334	1,367	1,331	1,331	1,328
<i>R-squared</i>	0.292	0.704	0.121	0.535	0.21	0.162	0.158	0.908	0.120	0.748	0.562

Table 6. Robustness: Placebo test

Sample from the SEC–Dealscan–Mergent FISD–Compustat intersection (2006:Q1–2008:Q2) for CP-issuing manufacturing firms (SIC codes 2000–3999). CPFF is one if a firm was an active CP issuer with an A1 rating in 2008 and is zero otherwise. Post is one if the observation is after 2007:Q2 and zero otherwise. Information on outstanding commercial paper amounts is obtained from 10-K and 10-Q filings. Net income (NI), S&P core earnings (Earnings), interest expenses (Interest), noncash assets (NCA; total assets less cash), inventories (Invt), receivables (Receiv), cash and short-term investments (Cash), and dividends (Div) are obtained from the Compustat quarterly database. Acquisition amounts (Acq) are obtained from the SDC Platinum Global Issuance database. Intercept and firm and year 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.

	<i>Dependent variables</i>											
	<i>CP / assets</i>	<i>NI / sales</i>	<i>Earnings / sales</i>	<i>Debt growth</i>	<i>Interest / debt</i>	<i>Assets growth</i>	<i>NCA growth</i>	<i>Invt. growth</i>	<i>Receiv. / sales</i>	<i>Acq / assets</i>	<i>Cash / assets</i>	<i>Div. / assets</i>
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
<i>CPFF*Post</i>	0.0112 [0.012]	-0.0426 [0.028]	0.0042 [0.005]	-0.0401 [0.054]	-0.0009 [0.001]	-0.0150 [0.016]	-0.0198 [0.021]	-0.0204 [0.014]	0.0403 [0.024]	-0.0035 [0.004]	-0.0085 [0.013]	0.0020 [0.002]
<i>CPFF</i>	-0.0158 [0.089]	-0.6786 ** [0.319]	-0.1703 *** [0.052]	-1.2365 * [0.674]	-0.0074 [0.005]	0.7081 *** [0.126]	1.0269 *** [0.359]	-0.5273 ** [0.256]	0.0271 [0.133]	0.1394 [0.128]	0.1147 [0.080]	0.0002 [0.012]
<i>Post</i>	-0.0032 [0.015]	-0.0168 [0.026]	-0.0155 ** [0.006]	-0.0813 [0.110]	0.0002 [0.001]	-0.0330 * [0.019]	-0.0662 ** [0.032]	-0.0631 *** [0.023]	-0.0228 [0.025]	-0.0093 [0.007]	-0.0118 [0.012]	0.0313 *** [0.003]
<i>Log of assets</i>	0.0081 [0.035]	0.2374 ** [0.111]	0.0651 *** [0.020]	0.6046 ** [0.266]	0.0010 [0.002]	0.3372 *** [0.068]	0.5353 *** [0.200]	0.2164 ** [0.100]	0.2128 *** [0.078]	0.0687 [0.067]	0.0918 * [0.049]	0.0001 [0.004]
<i>Book leverage</i>	0.3723 *** [0.083]	-0.9047 ** [0.384]	-0.1830 *** [0.050]	3.1590 *** [0.560]	-0.0213 *** [0.004]	0.3836 *** [0.124]	0.3284 [0.208]	0.1500 [0.132]	0.3279 ** [0.125]	0.0419 [0.066]	-0.2658 * [0.147]	0.0019 [0.015]
<i>M-B ratio</i>	-0.0019 [0.007]	-0.0387 [0.045]	0.0306 ** [0.015]	0.0263 [0.066]	-0.0008 [0.001]	-0.0059 [0.014]	-0.0034 [0.026]	0.0245 * [0.014]	0.0141 [0.010]	-0.0034 [0.005]	-0.0366 ** [0.016]	0.0021 [0.002]
<i>Year controls</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Firm fixed effect:</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Observations</i>	355	564	510	566	538	551	551	552	563	551	551	549
<i>R-squared</i>	0.785	0.274	0.797	0.273	0.685	0.362	0.279	0.263	0.973	0.171	0.804	0.586

Table 7. Difference in expected default frequency around recessions: A1 vs. A2/A3 rated firms

Monthly expected default frequency (EDF) data are provided by Moody's KMV. NBER recession periods are March 2001 to November 2001 (regression (I)), and December 2007 to June 2009 (regression (II)). For each regression, the sample period begins one year prior to the corresponding NBER recession and ends with the end of the corresponding NBER recession. Post variable is one for observations after March 2001 (regression (I)), and October 2008 (regression (II)) and zero otherwise. Standard errors are clustered at the firm level and are significant at the 1% (***), 5% (**), and 10% (*) levels.

<i>Dependent variable</i>	<i>Expected Default Frequency</i>	
	<i>2000.3- 2001.11</i>	<i>2006.12- 2009.6</i>
<i>Sample period</i>	(I)	(II)
<i>A1*Post</i>	0.0856 [0.055]	-1.2277 ** [0.488]
<i>A1 indicator</i>	-1.0351 * [0.547]	0.6222 ** [0.310]
<i>Post</i>	-0.0267 [0.070]	1.2752 *** [0.400]
<i>Event date</i>	2001.3	2008.10
<i>Year controls</i>	Yes	Yes
<i>Firm fixed effects</i>	Yes	Yes
<i>Observations</i>	3899	3968
<i>R-squared</i>	0.615	0.347

Figure 1. Average expected default frequency (EDF)

Monthly expected default frequency (EDF) for manufacturing firms (SIC codes 2000–3999) during 2004–2010. The expected default frequency (EDF) data is provided by Moody’s KMV.

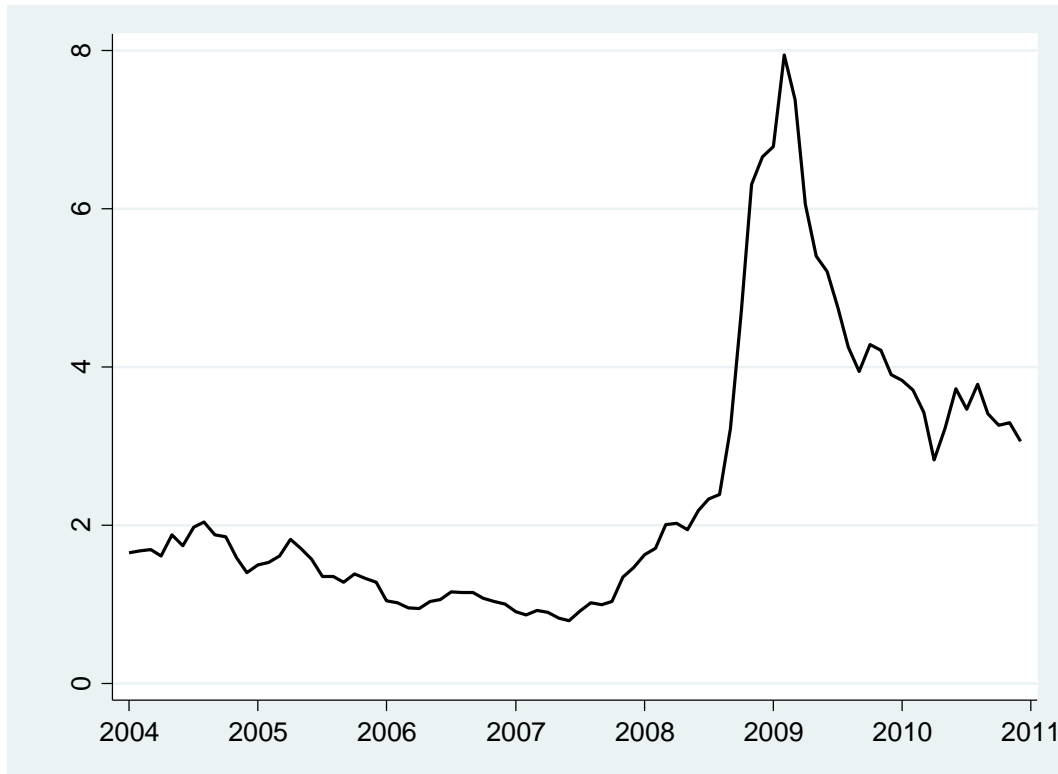


Figure 2. Average expected default frequency: CPFF eligible vs. ineligible

Manufacturing firms (SIC codes 2000–3999) during 2004–2010. A firm is CPFF eligible if it was an active CP issuer with an A1/P1/F1 rating in 2008 and is ineligible otherwise. The expected default frequency (EDF) data is provided by Moody’s KMV. The plot shows average EDF for CPFF eligible (solid line) and ineligible (dash-dot line) firms for each period. The dashed vertical line indicates when the CPFF was created.

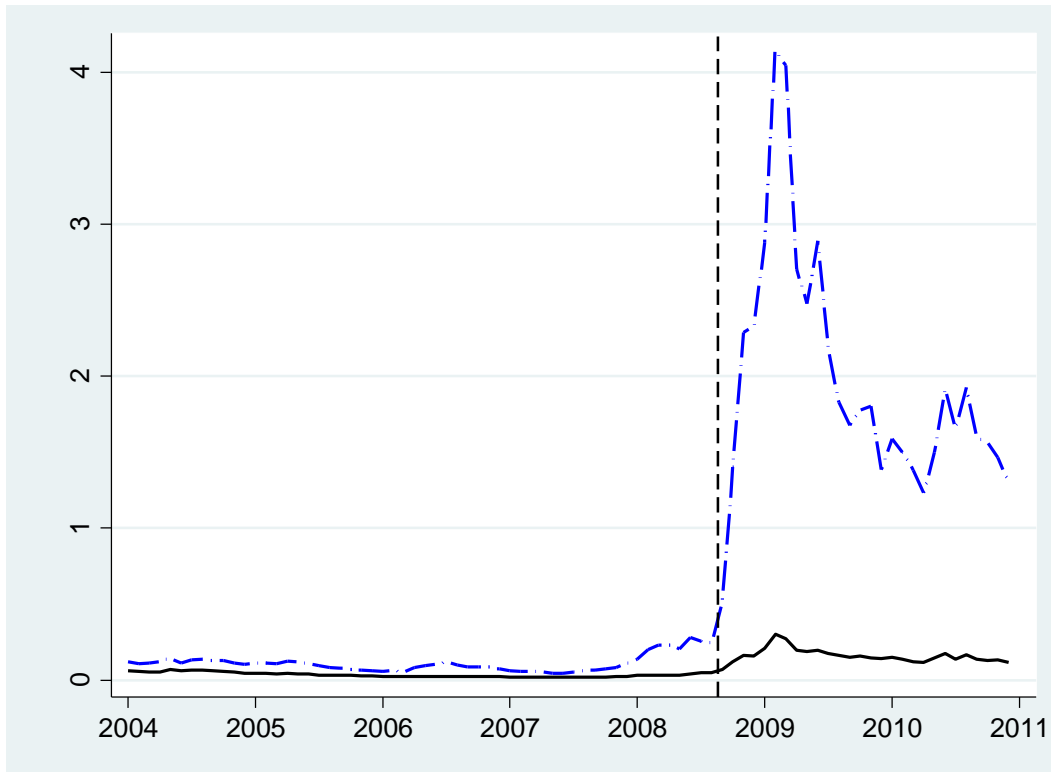


Figure 3. Difference-in-means of CP/noncash assets: CPFF eligible vs. ineligible

Manufacturing firms (SIC codes 2000–3999) during 2006–2010. A firm is CPFF eligible if it was an active CP issuer with an A1/P1/F1 rating in 2008 and is ineligible otherwise. The amount of commercial paper outstanding for each firm is obtained from SEC 10-Q and 10-K filings. The plot shows difference-in-means of CP divided by noncash assets between CPFF eligible and ineligible firms for each period.

