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Cyclicality of credit supply: Firm level evidence ☆

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ABSTRACT

We quantify fluctuations in bank-loan supply in the time-series by studying firms' substitution between loans and bonds using firm-level data. Any firm that raises new debt must have a positive demand for external funds. Conditional on the issuance of new debt, we interpret firms' switching from loans to bonds as a contraction in bank-credit supply. We find strong evidence of this substitution at times that are characterized by tight lending standards, depressed aggregate lending, poor bank performance, and tight monetary policy. We show that this substitution behavior has strong predictive power for bank borrowing and investments by small firms.

1. Introduction

Credit is highly pro-cyclical: not much new credit is issued in recessions. A large theoretical literature—including Bernanke and Gertler (1989), Holmström and Tirole (1997), Kiyotaki and Moore (1997), and Diamond and Rajan (2005)—suggests that credit supply is important in explaining the evolution of the business cycle. However, it is challenging to establish this empirically: credit could be pro-cyclical because banks are not willing to lend (a supply shift), because firms do not desire to borrow (a demand shift), or both. The central challenge that this paper takes on is to isolate movements in loan supply in *a time-series context.* It is crucial to tell the loan supply apart from other cyclical frictions on an ongoing basis. Shifts in credit supply and demand differ in terms of welfare costs of financial frictions and the channel through which monetary policy operates. Also, policies that aim to stimulate lending by directly providing financial support to the banks (e.g., the Troubled Asset Relief Program implemented in 2008) are grounded in the idea that loan supply is low in recessions and this is harmful to the economy.

To isolate movement in the loan-supply, we examine the substitution between bank credit and public debt at the firm level, *conditional* on firms" raising new debt financing. By revealed preferences, if a firm gets debt financing, then the firm must have a positive demand for debt. Thus, by limiting the sample to new debt issuances, we can be certain that firms in our sample have a non-zero demand for credit. In contrast, if we studied a firm that did not receive new financing, we could not be sure if this was because the firm did not need new financing or because it was not able to raise new financing. The substitution from bank debt to public debt is interpreted as evidence of a shift in bank-credit supply. Put differently, if there is a contraction in bank-credit supply, ceteris paribus, some firms who would otherwise receive a loan instead have to issue

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bonds. (Some alternative explanations must be ruled out, in particular those related to the relative demand for bonds and loans, and we will do so in the results section.)

The advantage of examining substitution between bank credit and public debt *at the firm level*—in addition to the empirical design that enables us to rule out lack of demand for debt—is that it addresses the concern about compositional changes in the set of firms raising debt. Ramey (1992) and Kashyap et al. (1993) used changes in the composition of external finance over the business cycle to identify shifts in bank-loan supply. Given the heterogeneity across firms, these aggregate findings could be attributed to the compositional shift in demand and not necessary the conditions of bank-credit supply. Indeed, based on disaggregated data, Oliner and Rudebusch (1996) show that Kashyap et al. (1993) result is driven by large firms who issue most of the commercial paper.[1]

The intuition of our empirical design can be seen from the following examples: of firms receiving a bank loan but not issuing a bond in 1993, in 1994, 16% received a loan but did not issue bonds, 3% issued bonds but did not get a loan, and 4% did both (77% did neither). This pattern is similar in most years of the study. Of firms receiving a loan but not issuing a bond in 2003, in 2004, 27% only received a loan, 6% only issued bonds, and 5% did both (52% did neither). This reveals that firms getting a bank loan are likely to stay with that form of debt in the near future. This pattern changes when banks are in distress. Of firms receiving a bank loan in 2007, in 2008, only 6% received a loan but did not issue bonds, whereas 17% issued bonds but did not get a loan, and 2% did both (75% did neither). This illustrates that the incidence of bank loans, as compared to bonds, is very cyclical, and that this holds for individual firms (i.e., it does not reflect compositional shifts in who is raising new debt.)

Our main findings can be divided into two parts. The first set of results models a firm's *choice* between bank and public debt as a function of availability of bank credit. Given that any single measure of availability of bank credit is imperfect, we use six different variables to proxy for it: (i) tightening in lending standards based on the Federal Reserve Senior Loan Officer Opinion Survey, (ii) aggregate corporate lending based on the Flow of Funds Accounts, (iii) weighted average of banks' non-performing loans as a fraction of total loans, (iv) weighted average of banks' loan allowances as a fraction of total loans, (v) a market-adjusted stock price index for banks, and (vi) a measure of monetary policy shocks based on the federal funds rate deviation from the Taylor-rule. All five time-series variables indicate a strong pro-cyclical pattern in the debt financing mix for the firms in our sample. While these variables are correlated with aggregate lending volumes, this may reflect time series variation in either demand or supply for bank credit. By only including firms either issuing bonds or receiving a bank loan in our sample, we isolate the effect of bank-credit supply.

Our second set of results concerns implementation of the loan-to-bond substitution measure. The substitution between bank loans and public bonds can only be measured for firms with access to both markets. By design, our analysis relies on the least financially constrained firms, whose investment may be the least sensitive to the supply of bank credit. But it is the firms that cannot substitute that are most likely to be affected by a contraction in bank credit. However, because substitution between loans and bonds for the less constrained firms is affected by variation in the loan supply, changes in debt-issuance behavior of substituting firms inform us about conditions of aggregate bank-credit supply. It is a direct prediction, therefore, that our measure has forecasting power for the behavior of firms that are not in our sample. Indeed, we show that the fraction of rated firms receiving a loan (as opposed to issuing a bond) in a given quarter is a strong predictor of a likelihood of raising bank debt for firms which have never issued a bond—i.e., firms that are *out-of-sample*. It also predicts investments for the set of unrated firms that are most dependent on bank lending (firms with high leverage and low market valuation).[2]

The contribution of our paper is advancing the measurement of bank-credit supply in a business-cycle context. The role of bank-credit supply in the economy is an old and important question and different empirical approaches had been used to tackle it. Several papers had focused on exogenous shocks to the bank-credit supply in order to establish causal connection between availability of bank credit and firms' activity. Notably, Peek and Rosengren (2000) look at the contraction in the U.S. credit supply caused by Japanese banks in the context of the Japanese crisis in the early 1990s. More recently, Leary (2009) examines expansion in bank credit in the first half of 1960s following the introduction of the certificates of deposits and fall in credit during the 1966 Credit Crunch. Chava and Purnanandam (2011) examine the effects of exogenous disruptions in the credit supply in the context of the Russian crisis in the fall of 1998. The evidence in these papers is consistent with the importance of bank-credit supply on firms' activity. However, these clear but isolated examples of variation in bank-credit supply have limited implications about variation in loan supply over the business cycle.[3]

An alternative approach in the existing literature uses cross-bank variation in access to funding to identify the effect of loan supply on lending volume (e.g., Kashyap and Stein, 2000; Ivashina and Scharfstein, 2010). These studies take a stand on what causes cross-sectional variation in loan contraction and such factors are likely to change over time. They also have a caveat given that the key identifying assumption in these studies is that clients' demand for credit is uncorrelated with

[1] Although in reply to this criticism Kashyap et al. (1996) show that their aggregate results also hold for the overall debt mix of a set of largest firms constructed from the Quarterly Financial Report for Manufacturing, Mining and Trade Corporations. We are extending this logic further, by looking at a large cross-section of individual firms.

[2] Note that credit to firms without access to the bond market might differ from the types of credit that rated firms get; e.g., loans to large firms are likely to be syndicated, whereas loans to small firms are not. However, the necessary condition for the generalization of our measure is that the different types of bank credit are correlated. We elaborate further on the out-of-sample implications of our measure in the final section of the paper.

[3] Other examples include Ashcraft (2005) who uses the closure of healthy branches of impaired bank holding companies, and Becker (2007) who uses a demographics-based instrument. These studies are cross-sectional in nature.