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Abstract

This study shows that financial market imperfections do matter for a firm's access to external finance. Prior studies of the importance of liquidity constraints faced by nonfinancial firms have suffered from a glaring weakness. They have been based on a sample of publicly traded firms, omitting precisely those small firms most likely to be liquidity constrained. We overcome this limitation by focusing on the banking sector. Unlike the nonfinancial sector, the banking sector has balance sheet and income data available for all firms, whether or not they are publicly traded. This allows the use of a superior measure of the degree of information asymmetry across firms by distinguishing between publicly traded and non-publicly traded firms. Furthermore, we focus on changes in monetary policy that represent exogenous (to the banks) changes in the financing constraints faced by banks. We find that publicly traded banks, which exhibit a lower degree of information asymmetry, are better able to overcome financial market frictions, compared to the relatively opaque non-publicly traded banks, when monetary policy is tightened. Lending by the more transparent publicly traded banks is less affected by a monetary policy tightening in large part due to their ability to issue uninsured large time deposits. These results are obtained controlling for firm (bank) size, a dimension commonly used in the literature as the measure of the degree of firm access to external finance.

Key words: Asymmetric information, liquidity constraints, banks, external finance, monetary policy

JEL Classifications: G21, G32, E51, E52

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Asymmetric Information and Liquidity Constraints: A More Complete Test

A growing literature investigates the extent to which easier access to external finance makes firms less financially constrained and how that affects their behavior. To obtain meaningful inferences about this important issue, it is crucial to identify firms with differing degrees of access to external finance, and it is essential to include the set of firms most likely to be "liquidity constrained" in any empirical test. Previous empirical studies have focused primarily on nonfinancial firms, using size, age and other firm characteristics as measures of the degree of firm access to external finance in order to identify those firms that can be deemed to be liquidity constrained. Due to a lack of comprehensive firm-level data for non-publicly traded nonfinancial firms, these studies have been based on a sample that includes only publicly traded firms, all of which, a priori, have a relatively high degree of access to external finance. Thus, precisely those firms most likely to be liquidity constrained, non-publicly traded firms, are not included among the firms upon which the empirical tests are conducted.

Relying on inadequate proxies for the degree of access to external finance in combination with omitting from the analysis precisely those firms likely to be most affected by limited access to external finance (non-publicly traded firms), raises serious questions about the precision and relevance of existing empirical results. This study addresses these weaknesses in the existing literature by focusing on the banking industry. Unlike data availability for nonfinancial firms, detailed individual bank-level data are available for the entire range of banks, whether or not the bank is publicly traded. Thus, banking industry data provide a unique opportunity to extend the existing literature by basing the distinction of whether a firm is liquidity constrained on its status as being, or not being, publicly traded, an important dimension not considered in the previous empirical literature.

This study exploits two important insights. First, by making a distinction between publicly traded and non-publicly traded banking organizations, we introduce a more satisfactory way to distinguish between less financially constrained and more financially constrained firms. Banking organizations whose equities are publicly traded are assumed to be less financially constrained than otherwise similar non-publicly traded banking organizations. Second, we focus on the *difference* in the effects of a change in monetary policy on the behavior of these two groups of banks because it is precisely those periods when liquidity is being drained from, or introduced into, the banking system that differences in the behavior of constrained and unconstrained banks are likely to be most apparent.

Due to the nature of the banking industry and banks' role in the monetary policy transmission mechanism, the monetary authority can exogenously change the financing constraints faced by banks. When monetary policy tightens, the banking industry experiences a decline in reserves and thus must reduce reservable deposits, insofar as banks do not hold excess reserves. This exogenous (to the banking sector) shock constrains bank behavior, forcing them to either replace reservable deposits with nonreservable liabilities, shrink their balance sheets, or both. Part of any shrinkage in assets can be accomplished by reducing securities holdings. However, much of any reduction in bank assets is likely to be in the form of reduced lending, analogous to the reduced investment by nonfinancial firms when they become liquidity constrained. Banks with better access to nonreservable, external sources of funds should be able to substitute nonreservable liabilities for "lost" reservable deposits to a greater degree and, hence, at least partially insulate their lending from the effect of monetary policy tightening.

Since banks primarily use *uninsured* nonreservable liabilities, such as large time deposits, as the marginal source of funds during periods of monetary policy tightening, the degree of

information asymmetry between a bank and a potential lender to a bank determines the degree of bank access to those liabilities. As a result, comparing the responses of banks with differing degrees of information asymmetry to changes in monetary policy provides a unique opportunity to test the importance of information-related financial market frictions for the behavior of firms.

A further advantage of banking data is that they provide an opportunity to investigate the behavior of smaller firms (banks). It has become a common practice in the literature to assume that small firms are necessarily more financially constrained. This study takes an additional (and important) step by differentiating between more and less financially constrained small firms. Fortunately, there are many small banks whose equities are publicly traded (indirectly) through their parent holding company. Thus, one can use banking data to fill a gap in the literature by exploring the extent to which it is possible for even smaller banks to overcome financial market frictions through their easier access to external funds as a consequence of the increased transparency that comes from being affiliated with a publicly traded parent holding company.

We find that when monetary policy is tightened, publicly traded banks are better able to raise uninsured large time deposits compared to otherwise similar non-publicly traded banks, and thus are better able to insulate their lending from monetary policy shocks. These results support the hypothesis that publicly traded banks are better able to overcome information-related financial market frictions. Furthermore, these results are obtained controlling for bank asset size. In fact, small and mid-sized publicly traded banks are shown to be better able to overcome financial market frictions than otherwise similar non-publicly traded banks. We focus primarily on those banks that are affiliated with a multibank holding company. This distinction ensures that the results are driven by a bank being publicly traded, and not simply as a consequence of any advantages of bank subsidiaries over stand-alone banks emanating from the operation of

internal capital markets for those banks affiliated with a parent holding company. These findings suggest that frictions associated with asymmetric information problems do matter for bank access to external finance, with more transparent banks being less financially constrained during periods of monetary policy tightening.

The next section provides some background in order to place the current study in the context of the existing literature. Section II contains a discussion of the hypotheses, as well as empirical specifications and a description of the variables used in the hypothesis tests. Section III describes how publicly traded banks are identified, as well as highlighting some differences between sets of publicly traded and non-publicly traded banks. Section IV contains the empirical results, and Section V concludes.

I. Background

Theoretical research has focused on the role of financial market frictions in explaining the imperfect access of firms to external finance. Stiglitz and Weiss (1981), Myers and Majluf (1984) and Greenwald, Stiglitz and Weiss (1984), among others, show that information asymmetry between a firm and a lender drives a wedge between the cost of external and internal sources of funds. Increases in this wedge, the external finance premium, may result in firms being financially constrained. As firms are subjected to various shocks over the business cycle, firm behavior will be impacted to the extent that the external finance constraint becomes binding. Naturally, the extent to which the behavior of more financially constrained firms differs from that of less financially constrained firms has become an important topic in the empirical finance and macroeconomics literature.

The challenge for the empirical literature is to identify financially constrained firms. A common strategy in firm-level panel data studies is to group firms on the basis of characteristics that should be correlated with the degree of asymmetric information, and thus the premium associated with raising funds externally that must be paid by borrowers in order to obtain credit. For example, studies of manufacturing firms have distinguished between more constrained and less constrained firms on the basis of such characteristics as dividend payouts (e.g., Fazzari, Hubbard and Peterson 1988), the presence of a bond rating (e.g., Kashyap, Lamont and Stein 1994; Gilchrist and Himmelberg 1995), age (e.g., Schaller 1993) and size (e.g., Oliner and Rudebusch 1992; Gertler and Gilchrist 1994).

Beginning with Fazzari, Hubbard and Peterson (1988), most studies of the importance of liquidity constraints for the behavior of nonfinancial firms have focused on the firm's investment sensitivity to its internally generated funds. The main hypothesis in these studies is that investment by financially constrained firms should be highly correlated with their internally generated funds, because external funds are not easily available to these firms. Kaplan and Zingales (1997), however, show that the sensitivity of investment to a firm's cash flow may actually be higher for unconstrained firms. This finding casts doubts on the validity either of the measures used to partition the set of firms into more and less constrained firms or of using investment-cash flow sensitivity as an indicator of the importance of financial constraints for firm behavior, or both.

Part of the problem may be that most of these studies concentrate only on publicly traded firms, which a priori have a relatively small wedge between the cost of internal and external finance, compared to that for non-publicly traded firms, due to their integration into capital markets.[1] A natural extension of previous studies is to use banking industry data rather than

nonfinancial firm data, since all FDIC-insured banks file quarterly balance sheet and income reports with bank regulators. In fact, several studies have attempted to group banks on the basis of their access to nonreservable liabilities and investigated the behavior of those groups during periods of monetary policy tightening as the central bank drains liquidity from the banking system. Kashyap and Stein (1995) used the size of a bank's assets as a proxy for the degree of information asymmetry and, hence, bank access to nonreservable liabilities. They find that the lending of large banks is less sensitive to monetary policy shocks compared to the lending of small banks. Kashyap and Stein (2000) take one step further and show that the lending of small banks during periods of monetary policy tightening is more dependent on their holdings of liquid assets compared to the lending of large banks. In both of these studies, the presumption is that large banks have a lower degree of information asymmetry and, therefore, have better access to external funds. However, the results of Kashyap and Stein (1995, 2000) could be due to heterogeneous loan demand across bank size categories, rather than reflecting the effect of capital market frictions on bank loan supply. In particular, larger banks may just have larger, less cyclically sensitive loan customers. Thus, observed differences between large and small banks in the response of lending to changes in monetary policy may be due to differences in loan demand rather than loan supply.

Kishan and Opiela (2000) propose using a bank's capital-to-assets ratio as a proxy for a bank's ability to raise large time deposits, liabilities that are both nonreservable and uninsured. They show that the lending of well-capitalized banks is less sensitive to a monetary policy tightening than the lending of poorly capitalized banks in the same size category. There is, however, an alternative explanation for their results. Poorly capitalized banks typically must reduce their loan growth in order to meet capital-to-asset ratio requirements. To the extent that

the capital ratio constraint becomes binding during a period of monetary policy tightening, the reduction in lending may reflect the response of banks to a binding capital ratio requirement constraint rather than a response to a binding reserve constraint, and thus may be unrelated to the ability of the bank to raise nonreservable sources of funds (Peek and Rosengren 1995b).

Another measure of bank access to nonreservable liabilities is the affiliation of a bank with a multibank holding company. Houston, James and Marcus (1997) show that loan growth at subsidiary banks is more sensitive to the bank holding company's cash flow than to the bank's own cash flow. Campello (2002) finds that the lending of small banks that are affiliated with large multibank holding companies is less sensitive to monetary policy tightening than the lending of small stand-alone banks with similar characteristics. Although these studies provide evidence consistent with the ability of bank holding companies to channel funds to their subsidiaries, they do not necessarily show the importance of bank access to funds external to the entire banking organization. Campello (2002) tries to address this issue by distinguishing among bank holding companies based on their capital-to-asset ratios. However, as was discussed above, the capital-to-asset ratio may better reflect the capital requirement constraint, rather than the reserve requirement constraint, faced by the banking organization.

In an attempt to overcome weaknesses in earlier studies, the key distinction exploited in this study is that banking organizations whose equities are publicly traded are assumed to be less financially constrained than otherwise similar non-publicly traded banking organizations. Publicly traded banking organizations, as well as nonfinancial firms, should be less financially constrained for a number of reasons. First, publicly traded banking organizations must satisfy the disclosure requirements of the Securities and Exchange Commission (SEC), which makes their financial information more available to the public compared to the information on non-

publicly traded banking organizations. Second, financial analysts, underwriters, investors and rating agencies research publicly traded banking organizations, rate their equities and provide evaluations of their financial status to the public.[2] This distinction is especially relevant for banks, given the relative opacity of banking firms compared to nonfinancial firms (Morgan 2002). Thus, financial information disclosure is particularly important for banking firms in overcoming the asymmetric information problem. Consequently, being more transparent and less informationally problematic, publicly traded banking organizations should have better access to external funds compared to otherwise similar banking organizations whose equities are not publicly traded.

Using the entire range of bank sizes and making a distinction between publicly traded and non-publicly traded banks have several advantages over previous studies that relied on size alone. First, for the reasons mentioned above, whether a firm is publicly traded or not is a more direct measure of information asymmetry between a firm and a lender to that firm than measures of firm size. For example, a smaller publicly traded firm, whose information is publicly available and under the scrutiny of financial market participants, will obviously be less informationally problematic than a more opaque, larger non-publicly traded firm. Second, we are able to differentiate between more and less financially constrained *small* firms, allowing one to overcome the concern associated with banking industry studies that differences between large and small banks might be attributable to loan demand heterogeneity. Fortunately, there are many small and mid-sized banks whose equities are publicly traded through their parent holding companies.

Our tests are associated with banks' central role in the monetary policy transmission mechanism, whereby the monetary authority can exogenously change the financing constraints

faced by banks. In particular, when monetary policy tightens, the banking industry experiences a decline in reserves and thus must reduce reservable deposits. This exogenous (to the banking sector) shock constrains bank behavior, typically causing banks to slow loan growth. However, not all banks are expected to reduce their lending in the same way or to the same extent. Banks with better access to nonreservable sources of funds should be able to more easily substitute nonreservable liabilities for "lost" reservable deposits and, hence, better insulate their lending from the effect of monetary policy tightening.

Since banks primarily use *uninsured* nonreservable liabilities, such as large time deposits, as the marginal source of funds during periods of monetary policy tightening, the degree of information asymmetry between a bank and a potential lender to that bank determines the degree of bank access to those liabilities during periods of monetary policy tightening. As a result, comparing the behavior of banks with differing degrees of information asymmetry during periods of monetary policy tightening provides a unique opportunity to investigate the importance of information-related financial market frictions for the behavior of financial firms.

Our results are based on a comparison of the behavior of publicly traded and non-publicly traded banks.[3] In particular, it is shown that publicly traded banks raise more nonreservable sources of funds during periods of monetary policy tightening than do otherwise similar non-publicly traded banks. Furthermore, it is shown that being able to better offset the outflow of reservable deposits, publicly traded banks have their lending less affected by a monetary policy tightening. These results support the hypothesis that publicly traded banks are better able to overcome information-related financial market frictions. Furthermore, it is shown that not all small banks are similarly financially constrained, as is usually assumed in the literature. Small

publicly traded banks are shown to be better able to overcome financial market frictions than otherwise similar small non-publicly traded banks.

II. Hypotheses, specification and data

The central idea in this study is that publicly traded banks face a lower degree of information asymmetry between the bank and potential lenders to the bank compared to similar non-publicly traded banks. As a result, publicly traded banks are better able to overcome financial market imperfections and, therefore, have better access to external funds compared to non-publicly traded banks. This advantage should become especially important during periods of monetary policy tightening, when banks are in need of external sources of funds to replace reservable deposits.

Thus, as a tightening of monetary policy drains reserves from the banking system, publicly traded banks are expected to attract nonreservable sources of funds to a greater extent than do otherwise similar non-publicly traded banks. Technically, since 1990, all sources of funds other than transaction deposits have been exempt from reserve requirements. Publicly traded banks, however, are expected to have an advantage over non-publicly traded banks only in raising *uninsured* nonreservable funds, such as large time deposits, federal funds and other borrowed funds, because the degree of information asymmetry is a key factor in the cost of raising these sources of funds.

Unfortunately, most of the banks in the sample do not borrow in the federal funds market and have no other borrowings. This makes it difficult to test any differences in the behavior of these components of nonreservable (and uninsured) funds between the relevant bank groups. The vast majority of the banks, however, do issue large time deposits, which constitute

approximately 10 percent of bank assets. Being nonreservable, uninsured and widely used by all sizes of banks, this source of external funds is a good candidate for the dependent variable in the regression analysis. As a result, the first testable hypothesis is as follows:

Hypothesis 1*: During periods of monetary policy tightening, the growth of large time deposits should increase more for publicly traded banks compared to otherwise similar non-publicly traded banks.*

If banks do not substitute nonreservable sources of funds sufficiently to completely replace lost reservable deposits during periods of monetary policy tightening, they will have to adjust the asset side of their balance sheets. One of the ways to do this is to reduce loans. For publicly traded banks, however, the effect of a monetary policy tightening on lending should not be as strong, since they are better able to make the necessary substitutions on the liability side of their balance sheets required to insulate their loan portfolios from the effects of monetary policy. Therefore, the second testable hypothesis is as follows:

Hypothesis 2: *During periods of monetary policy tightening, loan growth should decrease less for publicly traded banks compared to otherwise similar non-publicly traded banks.*

Note that to obtain the entire picture of the effect of a monetary policy tightening on bank behavior, one should also consider the reaction of reservable deposits and security holdings to a monetary policy tightening, since monetary policy acts on banks through reservable deposits and an important part of the reaction by banks is through security holdings, often referred to as "secondary reserves." It is expected that the growth of reservable deposits should slow as a result of a monetary policy tightening for both publicly traded and non-publicly traded banks. However, we have no specific hypothesis about the difference between publicly traded and non-publicly traded banks in the response of transaction deposits. Still, it is important to investigate

these reactions, since differences in the outflows of transaction deposits between the two groups may account for differences in the need for banks to raise additional large time deposits and in the pressures on banks to shrink loans that may not be related to the differential ability of the banks to raise uninsured liabilities.

Security holdings are expected to decline as a result of a monetary policy tightening, since banks can sell securities as an alternative to reducing loans or raising nonreservable liabilities. Given the same outflow of reservable deposits, the decline in securities holdings for publicly traded banks is expected to be smaller compared to that for non-publicly traded banks, insofar as publicly traded banks, having better access to nonreservable liabilities, will be able to more easily substitute large time deposits for the decline in transaction deposits.

We estimate the following baseline equation for each of the four alternative dependent variables:

$$\Delta Y_{it} / RAssets_{it-1} = \mu_i + \alpha_1 Capital_{it-1} + \alpha_2 NPL_{it-1} + \alpha_3 LRAssets_{it-1} + \alpha_4 MBHC_{it} + \sum_{j=1}^{4} \alpha_{5j} GSEmpl_{it-j} + \sum_{j=1}^{4} \alpha_{6j} GRGDP_{t-j} + \sum_{k=1}^{3} \alpha_{7k} Quarter_k + \alpha_8 Time_t + \alpha_9 NotPub_{it} + \sum_{j=1}^{4} \alpha_{10j} Pub_{it} * \Delta FFR_{t-j} + \sum_{j=1}^{4} \alpha_{11j} NotPub_{it} * \Delta FFR_{t-j} + \varepsilon_{it} \quad (1)$$

The dependent variables are the change in transaction deposits (as the measure of reservable deposits), the change in large time deposits (as the measure of external funds), the change in securities holdings, and the change in total loans, each measured in real terms (using the consumer price index as the deflator) as a percentage of beginning-of-period real total bank assets. We choose to scale all four variables by total assets rather than computing them as percentage growth rates so that we can easily interpret the relative magnitudes of the estimated responses to a change in monetary policy across the four alternative dependent variables.[4] The individual bank-level data are taken from the Consolidated Report of Condition and Income

database (Call Reports), which contains detailed balance sheet and income data on all FDIC-insured banks.

It is worth noting that the change in real total loans is a rather imperfect measure of the net flow of new bank lending (loan originations). As Peek and Rosengen (1995a) suggest, the change in loans held in a bank's portfolio is affected by loan charge-offs and recoveries, transfers of foreclosed real estate loans to the OREO (other real estate owned) category and net loan sales, as well as loan originations. Unfortunately, due to the changes in reporting requirements for banks, the data necessary to make adjustments to the change in loans for these factors are not available after 1993.

The set of explanatory variables includes the lagged value of the capital-to-assets ratio (Capital), measured as a percent, and the lagged value of nonperforming loans (NPL), measured as a percent of total loans, to control for a bank's financial health. We control for bank size with the lagged value of the logarithm of real total assets of the bank (LRAssets) in order to ensure that any observed differences in the behavior of publicly traded and non-publicly traded banks are not driven by bank size differences. Because the majority of publicly traded banks are affiliated with multibank holding companies, it is important to control for a bank being affiliated with a bank holding company. Otherwise, it is possible that comparing publicly traded with non-publicly traded banks may merely capture the behavioral differences between banks affiliated with multibank holding companies and stand-alone banks. Thus, we include a (0,1) dummy variable (MBHC) in our baseline regression specifications that takes a value of one if the bank is affiliated with a multibank holding company, and zero otherwise.

Given that bank balance sheet composition may be affected by local economic conditions as well as nationwide economic activity, we include four lagged values of both the state

employment growth rate (GSEmpl) and the growth rate of real gross domestic product (GRGDP), each measured as percentages, in our baseline specifications. The employment data are from the Bureau of Labor Statistics and the GDP data are from the FRED database of the Federal Reserve Bank of St. Louis. We also include a time trend (Time), as well as a set of three quarter dummy variables to control for any seasonal fluctuations. We allow for bank fixed effects (μ_i) in our regressions to control for other bank-specific characteristics, such as the composition of loan demand in the bank's local market, bank management style, etc., not captured by the other explanatory variables.

The target federal funds rate from the Board of Governors of the Federal Reserve System is used as the measure of the stance of monetary policy. Thus, the change in the target federal funds rate (ΔFFR) represents the measure of a monetary policy *shock*. In order to allow for the typical delay in the response of the economy to a change in the stance of monetary policy, we include four lagged values of the change in the target federal funds rate. Previous studies (Laurent 1988; Bernanke and Blinder 1992; Goodfriend 1993) showed that federal funds rate targeting describes the monetary policy reaction function in the U.S. reasonably well for the time period under consideration here, and Judd and Rudebusch (1998) show that the Taylor rule is particularly appropriate during the Greenspan period. Because the main focus in this study is the differential response to a monetary policy shock of publicly traded banks compared to non-publicly traded banks, we interact our monetary policy variables with (0,1) dummy variables to allow the responses of publicly traded banks (Pub) to differ from those of non-publicly traded banks (NotPub). We also include NotPub as a separate explanatory variable.

The two main hypotheses can now be interpreted in terms of the estimated coefficients in equation (1) for large time deposits and loans. For large time deposits, $\sum_{j=1}^{4}\alpha_{10j}$ - $\sum_{j=1}^{4}\alpha_{11j}$ is

expected to be positive; that is, during periods of monetary policy tightening, publicly traded banks increase large time deposits by more, compared to non-publicly traded banks. For loans, $\sum_{j=1}^{4}\alpha_{10j}$ - $\sum_{j=1}^{4}\alpha_{11j}$ is expected to be positive; that is, during periods of monetary policy tightening, publicly traded banks reduce their lending by less, compared to non-publicly traded banks. It is important to focus on the differential effects, insofar as the other explanatory variables may not perfectly control for loan demand effects over the business cycle.

The initial sample includes all FDIC-insured commercial banks for the period 1986:Q2 through 2003:Q1. We eliminate from our sample credit card banks, including those identified in the Call Reports as credit card banks as well as any remaining banks with a value of credit card loans to total loans exceeding 50 percent, and banks that are not active in the loan market, defined as banks with a maximum loans-to-assets ratio less than 5 percent. In addition, we eliminate *de novo* bank observations by omitting the first eight quarters of a bank's life. We also omit foreign branches, as well as banks located outside the continental United States. To avoid discrete jumps in the values of our dependent variables associated with bank mergers, we remove from our sample the bank-quarter observations in which a merger occurs, as well as the observation for the subsequent quarter of adjustment to the merger. We also eliminate observations with extreme values (outliers), defined as those observations with values for one of the four dependent variables, the capital-to-asset ratio or the nonperforming loan ratio that deviate by more than four standard deviations from the variable's mean value. After applying these filters, the dataset includes a total of 615,323 observations.

III. Distinguishing between publicly traded and non-publicly traded banks

It is crucial for this study to carefully distinguish between publicly traded and non-publicly traded banking organizations. The first step is to recognize that there are generally two possibilities for a particular individual bank to be considered publicly traded. One case is when a bank is a stand-alone institution (not in a holding company) and its equity is publicly traded. Another case is when a bank is a subsidiary of a bank (or, more recently, a financial services) holding company (BHC) and the equity of that BHC is publicly traded. In that instance, the bank is indirectly publicly traded *through* its parent BHC, whether it is a one-bank holding company or a multibank holding company (MBHC). To the extent that MBHCs can freely shift resources among their subsidiaries (for example, Houston, James and Marcus 1997; Campello 2002), each subsidiary bank of a publicly traded MBHC will have the same access to external funds as the parent BHC. Furthermore, due to the increased transparency arising from the banking organization being publicly traded, the individual bank subsidiaries should have easier *direct* access to external funds.

In order to distinguish between publicly traded and non-publicly traded banking organizations, we rely on individual bank-level data from the Call Reports, bank holding company level data from the FR-Y9 forms (Financial Statements for the Bank Holding Companies), and information on the structure of banking organizations from the National Information Center (NIC) website.[5] The banks were first separated into two categories in each quarter: stand-alone banks and banks in BHCs. In order to do this, the ID number of the highest holder was checked for each bank in each quarter. Those banks that had a highest holder ID equal to zero in any particular quarter were considered stand-alone banks in that quarter. Otherwise, the banks were considered to be operating under the BHC listed, and the IDs of the

highest holders were matched with the BHC database to identify the name, location and other characteristics of the BHC.[6]

The next step is to identify whether a particular stand-alone bank or BHC is publicly traded. Since the Call Reports do not contain a variable that clearly indicates whether a bank or a BHC is publicly traded in any particular quarter, the lists of the banking organizations had to be merged with other databases. First, the quarterly lists of all banking organizations (BHCs and stand-alone banks) were matched with The SNL Quarterly Bank Digest (SNL) data, which contain quarterly information on the set of publicly traded banks and bank holding companies. The matching was done using the name of an institution and the geographical location of its headquarters. The BHCs (and hence the individual banks operating as subsidiaries of those BHCs) and stand-alone banks that were found in SNL in a particular quarter were considered publicly traded in that quarter. All BHCs and stand-alone banks that were not identified as publicly traded by the SNL, but were present in the Call Reports, were then matched with the CRSP database, which presumably contains the most comprehensive set of publicly traded firms in the United States. If a bank or a BHC was found in CRSP in a particular quarter, that bank or BHC was considered publicly traded in that particular quarter.

The banking organizations that were contained in neither SNL nor CRSP data sets in any particular quarter were assumed to be non-publicly traded in that quarter. Note, however, that neither SNL nor CRSP contains the information on so called "pink sheet" stocks. These stocks are not very actively traded and are not listed on any of the national stock exchanges. Unfortunately, it is impossible to track the issuers of the "pink sheet" stocks historically. Because this class of publicly traded banking organizations cannot be separately identified, and,

in any case, likely have characteristics more similar to non-publicly traded banks than to publicly traded banks, they are grouped with non-publicly traded banking organizations.

Table 1 shows the total number of observations for publicly traded and non-publicly traded banks, as well as their distribution across asset size classes, for our commercial bank sample. In addition, the table also shows the size distribution separately for banks in multibank holding companies and for stand-alone banks, with the latter category defined to include banks in one-bank holding companies. Because average bank size changes over time, the size distributions are computed for each individual time period (quarter). For example, the first step in identifying the observations in the bottom quartile for the full sample is to identify the set of observations that are in the bottom quartile for each individual time period. The union of those sets of observations then form the bottom quartile for the entire sample.

As one would expect, the share of publicly traded banks in a size class grows with bank size. It is important to note, however, that above the bottom quartile, publicly traded banks account for a meaningful share of the observations, even though most banks above the bottom quartile are still quite small in absolute terms; for example, the 90th percentile threshold for bank assets in the first quarter of 2003 is only $423 million. Thus, other than at the extremes of the size distribution, bank size generally is not a good indicator of whether a bank is publicly traded. Thus, in the empirical analysis below, we should be able to isolate the effect of a bank being publicly traded from a bank simply being larger.

The table also reveals another interesting pattern: the fraction of publicly traded banks in the smallest size classes is substantially larger for banks affiliated with multibank holding companies than for stand-alone banks. Publicly traded stand-alone banks represent a meaningful share of the observations only for the size classes above the 90th percentile. For banks affiliated

with multibank holding companies, about 60 percent are in the 25th to 90th percentile range, with even the largest banks in this size class still being relatively small. The reason for such a difference is that it is possible for a small bank to be controlled by a much larger publicly traded multibank holding company and, hence, be classified as being publicly traded.

Table 2 presents selected balance sheet statistics separately for publicly traded and non-publicly traded banks for each size class. The table shows noticeable differences between publicly traded and non-publicly traded banks, even within a given size class. First, publicly traded banks have lower securities-to-assets ratios and larger loans-to-assets ratios on the asset side of their balance sheets compared to non-publicly traded banks, given the size class of the banks. This is what one would expect: Having relatively better access to external funds, publicly traded banks are able to hold a smaller buffer stock of liquidity and provide more relatively illiquid loans compared to non-publicly traded banks in the same size class.

On the liability side, publicly traded banks rely less on deposits and have lower capital-to-assets ratios. However, they use borrowed funds more intensively compared to non-publicly traded banks. In particular, measured relative to bank assets, federal funds borrowed are higher, while other borrowed money tends to be the same or higher, for publicly traded banks. All these patterns are consistent with publicly traded banks having better access to external funds.

It is also worth noting that publicly traded banks have a higher unused loan commitments-to-assets ratio, indicating that publicly traded banks tend to be more active in the market for loan commitments.[7] Combined with the fact that publicly traded banks hold less liquidity on their balance sheets, this observation provides two insights. First, publicly traded banks, having better access to external funds, are able to hold less on-balance-sheet liquidity and still be more exposed to liquidity demand shocks on the asset side of their balance sheet from

meeting loan commitment takedowns. Second, it is access to external funds, not simply on-balance-sheet liquidity, that matters for a bank's ability to be a provider of liquidity on demand.

To summarize, publicly traded banks show characteristics that are consistent with having better access to external funds compared to non-publicly traded banks. In the next section, we investigate whether publicly traded banks react differently to changes in the stance of monetary policy that alter the financing constraints faced by banks.

IV. Empirical results

Table 3 shows the detailed results from estimating the baseline specifications for the four alternative dependent variables. Because the focus of this study is the response of banks to a change in monetary policy and, more importantly, the differences in the responses between publicly traded and non-publicly traded banks, we do not discuss in detail the estimated coefficients on the control variables, other than to comment that the estimated coefficient patterns are unsurprising. Rather, we focus the discussion on the estimated coefficients of interest that are shown more compactly in Table 4, with each panel corresponding to a particular dependent variable. Within each panel, a comparison (column 3) is made between the estimated responses of publicly traded (column 1) and non-publicly traded (column 2) banks to a change in monetary policy.

As one can see from Panel A of Table 4, a tightening of monetary policy, as expected, significantly reduces the change in transaction deposits for both publicly traded and non-publicly traded banks. However, the two point estimates differ only by 0.01 and the difference is not statistically significant. Experiencing outflows in transaction deposits, both groups of banks raise nonreservable, uninsured large time deposits (Panel B). However, the response by publicly

traded banks is nearly twice as large, and the difference is statistically significant. Given that both groups experience similar outflows of transaction deposits, one might expect non-publicly traded banks to be equally aggressive in raising large time deposits, were it the case that they had the same degree of access to external funds as do publicly traded banks. However, publicly traded banks raise large time deposits more intensively when monetary policy is tightened, consistent with publicly traded banks having better access to external funds due to their being relatively more transparent than are (otherwise similar) non-publicly traded banks (Hypothesis 1).

Panel C of Table 4 contains the results for the change in bank securities holdings. For both groups of banks, security holdings decline in response to a monetary policy tightening, with non-publicly traded banks reducing securities more than do publicly traded banks, with the difference being statistically significant. Again, this is consistent with non-publicly traded banks having relatively poorer access to external funds and, therefore, running down their stock of liquid assets ("secondary reserves") to a greater degree in order to partially insulate their lending from the effects of a monetary policy tightening.

Finally, Panel D contains the results for the change in total loans. As expected, a monetary policy tightening reduces lending, with the response being much larger for non-publicly traded banks. The response is significant only for non-publicly traded banks, and the difference in the responses is statistically significant. These results support Hypothesis 2. Having better access to external funds, publicly traded banks are better able to insulate their lending from a monetary policy tightening.

While these results strongly support both of our hypotheses, one might still have concerns. Although the specifications include control variables for a bank being in a MBHC and

for bank asset size, one still might be concerned that the results are sensitive to the distribution of banks along two dimensions: (1) whether or not a bank is a member of a multibank holding company, and (2) across bank size classes. As was shown in Table 1, the vast majority of our publicly traded bank observations (85 percent) are affiliated with multibank holding companies, while the corresponding proportion for the non-publicly traded bank observations is less than 20 percent. As a result, the estimated differences in the behavior between publicly traded and non-publicly traded banks may primarily reflect differences between banks affiliated with multibank holding companies relative to stand-alone banks, which might be due, in large part, to the operation of *internal* capital markets rather than to differences in the degree of access to *external* funds.

Similarly, the distributions of both publicly traded and non-publicly traded bank observations are uneven across bank size classes. For example, relatively few publicly traded banks are among the smallest banks, and virtually all of the very largest banks are publicly traded. Consequently, given the correlation of being publicly traded with bank size at the extremes of the size distribution, our results may reflect, at least in part, differences in the bank size composition of the two groups as much as differences in the behavior of publicly traded compared to non-publicly traded banks arising from differing degrees of access to external funds.

To address these concerns, we re-estimate all our equations for the subsample of banks affiliated with multibank holding companies. Furthermore, we eliminate banks at the bottom and the top of the bank size distribution by restricting our sample to only those banks with assets between the 25th and 95th percentiles.[8] As one can see from Table 1, this range provides a good overlap of observations for publicly traded and non-publicly traded banks and, at the same time, still contains relatively small banks, which allows us to investigate whether small banks are

necessarily financially constrained – a common assumption in the literature. Since all banks in this subsample are members of MBHCs, we replace the (0,1) MBHC dummy variable with a measure of the logarithm of MBHC real assets, measured as the sum of the real assets of all bank subsidiaries of the holding company. Thus, the specification now controls for holding company size as well as for the size of the individual banks.

The results for the sum of the estimated coefficients on the change in the target federal funds rate for the sets of publicly traded and non-publicly traded banks are shown in Table 5. The results are qualitatively the same as those shown in Table 4. Thus, even within the group of relatively small banks affiliated with multibank holding companies, publicly traded banks use large time deposits more aggressively, while non-publicly traded banks rely relatively more on drawing down security holdings. Furthermore, the point estimate for the shrinkage of loans by non-publicly traded banks is still more than four times as large as that for publicly traded banks, and only that for non-publicly traded banks is statistically significant. Again, the key result is that the *differences* in the responses of publicly traded and non-publicly traded banks are statistically significant for the changes in large time deposits, securities and loans.

Tightening vs. loosening of monetary policy

While it is common to interpret the estimated coefficients as reflecting the response to a tightening of monetary policy, in reality the estimates measure the average response to a change, tighter or looser, of monetary policy. A priori, one might reasonably expect that the effect is coming primarily from a tightening of policy, since a tightening of monetary policy, by draining reserves from the banking system, represents a tightening of a binding constraint. To the extent that banks do not hold excess reserves, they *must* react immediately to reduce their reservable deposits, as well as make the additional balance sheet adjustments to nonreservable liabilities and

various asset categories necessary to offset the reduction in reservable deposits. In contrast, the impact on bank behavior of an easing of monetary policy might be expected to be weaker, since relaxing the constraint by increasing reserves in the banking system *eases* a constraint that banks may or may not fully exploit immediately, consistent with the often used analogy of monetary policy easing with "pushing on a string." Thus, it is worthwhile to investigate the extent to which our results are, in fact, coming from episodes of monetary policy tightening rather than loosening, and to see whether or not the prediction that tightening should produce stronger results than does loosening is supported by the data.

To distinguish between the effects of monetary policy tightening and loosening on bank behavior, we interact a pair of dummy variables with the change in the target federal funds rate. The value of Tighten in period t takes a value of one when the change in the target federal funds rate between periods t-1 and t is positive, and zero otherwise. Loosen takes on a value of minus one when the change in the target federal funds rate is negative, and zero otherwise.[9] To construct the lagged values of the monetary policy variables, we first interact Tighten and Loosen with the change in the target federal funds rate and then use lagged values of the interacted variables. Essentially, this specification is simply allowing the change in the federal funds rate to have an estimated coefficient for the set of changes that are positive that can differ from that for the set of changes in the target federal funds rate that are negative.

Table 6 contains the results for this specification using the same bank sample as Table 5. Interestingly, the point estimates for the tightening of monetary policy more closely mimic those in Table 5 than do the estimates for the easing of monetary policy. While the point estimates for the difference between publicly traded and non-publicly traded banks for transaction deposits are essentially identical for tightening and loosening, only that for monetary policy loosening is

statistically significant. More importantly, the differences between the estimated effects for publicly traded and non-publicly traded banks for the changes in large time deposits, securities and loans, the primary focus here, are statistically significant only for the tightening of monetary policy. Thus, the evidence is consistent with our hypotheses for a tightening of monetary policy and the effects are stronger, as anticipated, for a tightening of monetary policy than for an easing of the policy stance.

While our results have established the statistical significance of the differences in the behavior of publicly traded and non-publicly traded banks, it is worthwhile to obtain a feel for the economic significance of the differences. To better understand the economic significance of the results for large time deposits and loans, consider two banks, one of which is publicly traded, while the other is not. The comparison is done using the coefficient estimates from Table 6. Four quarters after a 100 basis point rise in the target federal funds rate, the growth of large time deposits relative to assets would be 0.21 percent higher and the growth of loans relative to assets would be 0.42 percent higher for the publicly traded bank compared to that for the non-publicly traded bank. Given that the average quarterly growth rate of large time deposits relative to assets for the entire sample period is 0.04 percent and that of loans is 0.51 percent, the discrepancies of 0.21 and 0.42 percent of assets over four quarters between publicly traded and non-publicly traded banks generated by a 100 basis point increase in the target federal funds rate is an economically meaningful amount. Assuming that both banks have assets of $196 million in current dollars, which corresponds to the mean assets for the banks in the regression sample in the first quarter of 2003, this would translate into a differential between the two banks of $411,600 in large time deposits and $823,200 in loans.

Capital-to-asset ratios and bank asset size

Earlier studies have argued that one might distinguish between more and less liquidity constrained banks by either capital ratios or asset size. While our specifications have included measures of each as control variables, one might still be concerned that simply including such measures is not an adequate control. Thus, we present two additional sets of results to address the relevance of such concerns.

A key concern mentioned earlier is that in addition to reserve requirements, banks may face binding capital ratio constraints that impact their lending activity. To ensure that our results are not driven by capital constrained banks, we re-estimate our key specifications omitting the set of capital-impaired banks, defined as those with a capital-to-asset ratio below 6 percent. The 6 percent threshold is chosen because it is consistent with the requirements included in many formal regulatory enforcement actions that require unhealthy banks to increase their capital ratios to that level (Peek and Rosengren 1995a). The results, shown in Table 7, are quite similar to those in Table 6. Thus, our original results, which include the bank capital ratio as a control variable, are not due to spurious correlation or distortions induced by the reactions of banks that are constrained by their capital ratios as they attempt to respond to a tightening of monetary policy.

Finally, we investigate the role of bank size in determining the response of banks to a tightening of monetary policy. Earlier literature has assumed that bank asset size is correlated with access to external funds. While our specifications do include the logarithm of real bank assets as an explanatory variable, this controls only for the average effects of bank size on the dependent variables, not the effect of bank size on the *response* of banks to a monetary policy tightening. Thus, our final specification includes measures of bank real assets interacted with the

monetary policy variables. The estimated coefficients on these variables will indicate the extent to which bank size affects the response by banks to a monetary policy tightening.

The central idea in this study is that if a bank is publicly traded, it is much more transparent than a non-publicly traded bank and, therefore, will exhibit a lower degree of information asymmetry between the bank and a potential lender to the bank. Because bank size is correlated with being publicly traded, it is possible that specifications that ignore the publicly traded distinction will be misspecified and inappropriately attribute to bank size the effects emanating from being, or not being, publicly traded. To the extent that the distinction of being publicly traded captures any essential difference in the degree of access to external funds of a bank, bank size should provide little, if any, additional explanatory power.

Table 8 presents the results for the specifications that include the additional proxy intended to capture the effect of bank size on the responses of banks to a tightening of monetary policy. The first column contains the results when no distinction is made between publicly traded and non-publicly traded banks. The second and third columns contain the results for the specification that does make such a distinction. The estimated coefficients of interest are shown in bold.

The specifications of particular interest are those for the change in large time deposits and the change in loans. In both instances, we obtain the result that bank size has a significant effect on the response of banks to a monetary policy tightening when no distinction is made between publicly traded and non-publicly traded banks (column 1). However, once we control for a bank being publicly traded, we obtain the striking result that the estimated effect is only about one-third as large and is no longer statistically significant (column 2). However, for the change in loans, the effect of the interaction term for non-publicly traded banks is almost as large as the

estimate in column 1 and is statistically significant. This is consistent with our hypothesis that once a bank is publicly traded, its size ceases to indicate its degree of access to external funds. In contrast, bank size still matters for non-publicly traded banks, presumably because larger banks are better known and thus more transparent. In fact, based on the differences in the point estimates, which do not differ significantly from each other, the difference between publicly traded and non-publicly traded banks in the total response of the change in loans to a monetary policy tightening is greatest for the smallest (and presumably least transparent) banks. However, the estimated effects of bank size on the response to a monetary policy tightening for the change in large time deposits do not appear to differ for publicly traded and non-publicly traded banks.

To summarize, the results for the differences in the behavior of publicly traded and non-publicly traded banks are not driven by individual bank size differences. It is apparent that being publicly traded has a distinct, independent effect on bank responses to a tightening of monetary policy. Thus, it is whether or not a bank is publicly traded, rather than its size, that determines a bank's ability to raise large time deposits and insulate its lending from a monetary policy tightening. The size of a bank does not affect the ability of publicly traded banks to "cope" with a monetary policy tightening. However, for the relatively less transparent non-publicly traded banks, bank size may still serve as a measure of the degree of transparency, and thus of a bank's degree of access to external funds.

V. Conclusion

Using a more direct measure of the degree of information asymmetry, this study provides evidence on the importance of financial market frictions for the behavior of banks during periods of monetary policy tightening. Whether a bank is publicly traded or not is used as the measure

of the degree of information asymmetry between a bank and a potential lender to that bank. It is shown that having a lower degree of information asymmetry, publicly traded banks are better able to raise nonreservable, uninsured large time deposits during periods of monetary policy tightening compared to otherwise similar non-publicly traded banks. It is also shown that exploiting their advantage in raising large time deposits, lending by publicly traded banks is less affected by a monetary policy tightening compared to non-publicly traded banks. These results are obtained controlling both for bank asset size and for bank health (the capital-to-asset ratio), measures that have been advocated as indicators of bank access to external funds in earlier studies.

The main contribution of this study is that it provides a sharper test for the role of financial market imperfections in firm access to external financing. We provide several improvements over previous studies. First, it is shown that the distinction between publicly traded and non-publicly traded banks is a superior indicator of the degree of access to external funds compared to bank size. In fact, even relatively small banks, which are usually considered highly financially constrained, may overcome financial market frictions through their affiliation with a parent holding company. Thus, each bank subsidiary of a publicly traded BHC will more easily be able to raise external funds (such as large time deposits) directly due to the increased transparency of the publicly traded BHC with which it is affiliated. Second, the differences in the behavior of publicly traded and non-publicly traded banks are hard to attribute to differences in loan demand between the two groups, since the results are obtained controlling in various ways for bank asset size. Finally, it is shown that once one controls for a bank being publicly traded, no role remains for bank size in explaining the response of banks to a tightening of monetary policy.

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Table 1. Distribution of bank observations across bank asset size classes by bank category, 1986:II to 2003:I

	Total	Below 25th percentile	Between 25th and 90th percentiles	Between 90th and 95th percentiles	Between 95th and 98th percentiles	Above 98th percentile
Asset range in 2003:I ($ millions)		Below 49	49 - 423	423 - 782	423 – 2,094	Above 2,094
	All banks					
Publicly traded banks	98,234	2,914	55,577	14,867	13,151	11,726
Non-publicly traded banks	517,089	150,894	344,375	15,899	5,308	612
Total	615,323	153,808	399,952	30,766	18,459	12,338
	Banks affiliated with multibank holding companies					
Publicly traded banks	83,547	2,814	50,015	11,256	9,519	9,944
Non-publicly traded banks	97,794	26,615	65,432	4,159	1,444	143
Total	181,341	29,429	115,447	15,415	10,963	10,087
	Stand-alone banks					
Publicly traded banks	14,687	100	5,562	3,611	3,632	1,782
Non-publicly traded banks	419,295	124,279	278,943	11,740	3,864	469
Total	433,982	124,379	284,505	15,351	7,496	2,251

Table 2. Selected balance sheet statistics of publicly traded (PT) and non-publicly traded (NPT) banks
Mean values for the 1986:II to 2003:I period

	Below 25th percentile		Between 25th and 90th percentile		Between 90th and 95th percentile		Between 95th and 98th percentile		Above 98th percentile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PT	NPT	PT	NPT	PT	NPT	PT	NPT	PT	NPT
Number of observations	2,914	150,894	55,577	344,375	14,867	15,899	13,151	5,308	11,726	612
Securities (% of total assets)	27.2	30.9	25.3	30.5	23.2	28.2	22.6	28.3	20.0	34.2
Total Loans (% of total assets)	54.4	52.9	60.7	56.2	63.8	59.7	64.5	58.7	63.5	53.0
Real Estate Loans (% of total loans)	46.4	33.7	52.7	48.1	53.8	56.0	51.7	53.3	42.9	51.2
C&I Loans (% of total loans)	18.8	15.2	18.9	18.1	21.4	21.2	22.1	23.8	28.0	24.5
Agricultural Loans (% of total loans)	11.0	31.3	6.6	15.0	2.2	4.1	1.8	2.9	1.1	1.4
Loans to Indiv. (% of total loans)	21.5	18.1	18.7	16.7	18.5	15.1	18.9	15.2	17.9	17.1
Unused Loan Com. (% of total assets)	4.9	3.8	8.2	5.9	12.1	10.1	14.6	12.7	25.4	16.1
Total Deposits (% of total assets)	87.8	88.1	87.5	87.7	85.0	86.1	82.2	83.6	72.4	78.3
Trans. Dep. (% of total dep.)	29.8	29.2	27.9	28.0	27.6	26.7	26.7	26.0	29.1	25.4
Large Time Dep. (% of total dep.)	11.2	9.7	11.2	11.8	11.9	12.6	12.5	14.4	13.7	14.6
Brokered Dep. (% of total dep.)	0.3	0.3	0.3	0.3	0.8	0.5	0.9	0.6	2.3	0.9
Federal Funds Borr. (% of total assets)	0.9	0.4	2.0	0.9	3.8	2.4	5.6	4.5	9.6	9.5
Other Borr. Money (% of total assets)	0.6	0.5	0.9	0.9	1.6	1.6	2.3	1.8	3.6	2.0
Equity (% of total assets)	9.5	10.1	8.4	9.4	7.9	8.6	7.7	8.3	7.3	8.3

Table 3. Detailed estimation results, all commercial banks, 1986:II to 2003:I
Estimation method: fixed (bank) effects

	$\Delta RTransDep_{it}$/ $RAssets_{it-1}$	$\Delta RLargeTimeDep_{it}$/ $RAssets_{it-1}$	$\Delta RSecurities_{it}$/ $RAssets_{it-1}$	$\Delta RLoans_{it}$/ $RAssets_{it-1}$
	(1)	(2)	(3)	(4)
$Pub_{it}*\Delta FFR_{t-1}$	-0.47**	0.14**	-0.18**	-0.14**
	(0.00)	(0.00)	(0.00)	(0.00)
$Pub_{it}*\Delta FFR_{t-2}$	-0.04**	0.11**	-0.22**	0.14**
	(0.01)	(0.00)	(0.00)	(0.00)
$Pub_{it}*\Delta FFR_{t-3}$	-0.11**	0.07**	-0.14**	0.11**
	(0.00)	(0.00)	(0.00)	(0.00)
$Pub_{it}*\Delta FFR_{t-4}$	-0.08**	0.08**	0.04*	-0.12**
	(0.00)	(0.00)	(0.02)	(0.00)
$NotPub_{it}*\Delta FFR_{t-1}$	-0.44**	0.06**	-0.19**	-0.05**
	(0.00)	(0.00)	(0.00)	(0.00)
$NotPub_{it}*\Delta FFR_{t-2}$	-0.10**	0.02**	-0.35**	-0.02
	(0.00)	(0.00)	(0.00)	(0.07)
$NotPub_{it}*\Delta FFR_{t-3}$	-0.04**	0.08**	-0.13**	-0.09**
	(0.00)	(0.00)	(0.00)	(0.00)
$NotPub_{it}*\Delta FFR_{t-4}$	-0.11**	0.07**	0.02**	-0.04**
	(0.00)	(0.00)	(0.01)	(0.00)
$Capital_{it-1}$	0.09**	0.05**	-0.01**	0.05**
	(0.00)	(0.00)	(0.00)	(0.00)
$LRAssets_{it-1}$	-0.40**	-0.05**	-0.03	-0.04**
	(0.00)	(0.00)	(0.11)	(0.01)
NPL_{it-1}	-0.01**	-0.05**	0.04**	-0.28**
	(0.00)	(0.00)	(0.00)	(0.00)
$MBHC_{it}$	-0.09**	-0.03**	-0.16**	0.04*
	(0.00)	(0.00)	(0.00)	(0.02)
$GSEmpl_{it-1}$	0.10**	0.05**	-0.01	0.09**
	(0.00)	(0.00)	(0.29)	(0.00)
$GSEmpl_{it-2}$	0.00	0.00	0.10**	0.03**
	(0.66)	(0.54)	(0.00)	(0.00)
$GSEmpl_{it-3}$	-0.01	0.02**	-0.02	0.12**
	(0.41)	(0.01)	(0.10)	(0.00)
$GSEmpl_{it-4}$	-0.05**	0.07**	-0.13**	0.25**
	(0.00)	(0.00)	(0.00)	(0.00)
$GRGDP_{t-1}$	0.17**	0.02**	0.20**	0.17**
	(0.00)	(0.00)	(0.00)	(0.00)
$GRGDP_{t-2}$	0.10**	0.03**	-0.04**	0.12**
	(0.00)	(0.00)	(0.00)	(0.00)
$GRGDP_{t-3}$	-0.12**	-0.02**	-0.06**	0.03**
	(0.00)	(0.00)	(0.00)	(0.00)
$GRGDP_{t-4}$	0.20**	0.05**	0.02**	0.14**
	(0.00)	(0.00)	(0.01)	(0.00)
Adj. R^2	0.1291	0.0396	0.0251	0.1649
N	615,323	615,323	615,323	615,323

Notes: The specifications also include a time trend and a set of three quarter dummy variables to control for seasonal effects. p – values, shown in parentheses, are based on Huber/White heteroskedasticity-adjusted standard errors.
* indicates significance at the 5 percent level
** indicates significance at the 1 percent level

Table 4. Four-quarter sum of the effect of monetary policy, all commercial banks, 1986:II to 2003:I

Panel A: Dependent variable – $\Delta RTransDep_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. ΔFFR	-0.70**	-0.69**	-0.01
(p-value)	(0.00)	(0.00)	(0.69)
Adj. R^2	0.1291		
N	615,323		
Panel B: Dependent variable – $\Delta RLargeTimeDep_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. ΔFFR	0.40**	0.23**	0.17**
(p-value)	(0.00)	(0.00)	(0.00)
Adj. R^2	0.0396		
N	615,323		
Panel C: Dependent variable – $\Delta RSecurities_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. ΔFFR	-0.50**	-0.65**	0.15**
(p-value)	(0.00)	(0.00)	(0.00)
Adj. R^2	0.0251		
N	615,323		
Panel D: Dependent variable – $\Delta RLoans_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. ΔFFR	-0.01	-0.20**	0.19**
(p-value)	(0.62)	(0.00)	(0.00)
Adj. R^2	0.1649		
N	615,323		

Notes: See Table 3.

Table 5. Four-quarter sum of the effect of monetary policy, 1986:II to 2003:I
Banks in the 25th to 95th percentile size range that are affiliated with a MBHC

Panel A: Dependent variable – $\Delta RTransDep_{it}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. ΔFFR	-0.68**	-0.66**	-0.02
(p-value)	(0.00)	(0.00)	(0.61)
Adj. R^2	0.1354		
N	130,862		
Panel B: Dependent variable – $\Delta RLargeTimeDep_{it}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. ΔFFR	0.34**	0.23**	0.11**
(p-value)	(0.00)	(0.00)	(0.00)
Adj. R^2	0.0464		
N	130,862		
Panel C: Dependent variable – $\Delta RSecurities_{it}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. ΔFFR	-0.40 **	-0.52**	0.12**
(p-value)	(0.00)	(0.00)	(0.01)
Adj. R^2	0.0302		
N	130,862		
Panel D: Dependent variable – $\Delta RLoans_{it}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. ΔFFR	-0.05	-0.22**	0.17**
(p-value)	(0.17)	(0.00)	(0.00)
Adj. R^2	0.1809		
N	130,862		

Notes: See Table 3.

Table 6. Tightening versus loosening: four-quarter sum of the effect of monetary policy, 1986:II to 2003:I Banks in the 25th to 95th percentile size range that are affiliated with a MBHC

Panel A: Dependent variable – $\Delta RTransDep_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. Tightening	-0.51**	-0.67**	0.16
(p-value)	(0.00)	(0.00)	(0.06)
Sum. Loosening	0.81**	0.66**	0.15**
(p-value)	(0.00)	(0.00)	(0.03)
Adj. R^2	0.1360		
N	130,862		
Panel B: Dependent variable – $\Delta RLargeTimeDep_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. Tightening	0.48**	0.27**	0.21**
(p-value)	(0.00)	(0.00)	(0.00)
Sum. Loosening	-0.20**	-0.21**	-0.01
(p-value)	(0.00)	(0.00)	(0.86)
Adj. R^2	0.0465		
N	130,862		
Panel C: Dependent variable – $\Delta RSecurities_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. Tightening	-0.39**	-0.75**	0.36**
(p-value)	(0.00)	(0.00)	(0.00)
Sum. Loosening	0.31**	0.27**	0.04
(p-value)	(0.00)	(0.00)	(0.67)
Adj. R^2	0.0308		
N	130,862		
Panel D: Dependent variable – $\Delta RLoans_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. Tightening	-0.04	-0.46**	0.42**
(p-value)	(0.59)	(0.00)	(0.00)
Sum. Loosening	0.11	0.08	0.03
(p-value)	(0.09)	(0.19)	(0.61)
Adj. R^2	0.1817		
N	130,862		

Notes: See Table 3.

Table 7. Four-quarter sum of the effect of monetary policy, 1986:II to 2003:I
Banks in the 25th to 95th percentile size range that are affiliated with a MBHC and have K/A > 6 percent

Panel A: Dependent variable – $\Delta RTransDep_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. Tightening	-0.50**	-0.67**	0.17*
(p-value)	(0.00)	(0.00)	(0.04)
Sum. Loosening	0.73**	0.60**	0.13
(p-value)	(0.00)	(0.00)	(0.06)
Adj. R^2	0.1344		
N	*N* = 121,935		
Panel B: Dependent variable – $\Delta RLargeTimeDep_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. Tightening	0.55**	0.30**	0.25**
(p-value)	(0.00)	(0.00)	(0.00)
Sum. Loosening	-0.21**	-0.23**	0.02
(p-value)	(0.00)	(0.00)	(0.58)
Adj. R^2	0.0391		
N	*N* = 121,935		
Panel C: Dependent variable – $\Delta RSecurities_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. Tightening	-0.45**	-0.74**	0.29**
(p-value)	(0.00)	(0.00)	(0.00)
Sum. Loosening	0.31**	0.29**	0.02
(p-value)	(0.00)	(0.00)	(0.83)
Adj. R^2	0.0300		
N	*N* = 121,935		
Panel D: Dependent variable – $\Delta RLoans_{it}/RAssets_{it-1}$			
	(1)	(2)	(3)
	PT	NPT	Difference: (PT – NPT)
Sum. Tightening	-0.02	-0.40**	0.38**
(p-value)	(0.73)	(0.00)	(0.00)
Sum. Loosening	0.10	0.05	0.05
(p-value)	(0.13)	(0.47)	(0.41)
Adj. R^2	0.1688		
N	*N* = 121,935		

Notes: See Table 3.

Table 8. Four-quarter sum of the effect of monetary policy, interacted with bank asset size, 1986:II to 2003:I
Banks in the 25th to 95th percentile size range that are affiliated with a MBHC

Panel A: Dependent variable – ΔRTransDep$_{it}$/RAssets$_{it-1}$			
	(1)	(2)	(3)
	All banks	PT	NPT
Sum. Tightening	-0.92	0.07	-0.96
(p-value)	(0.16)	(0.95)	(0.31)
Sum. Tightening*RBankAssets$_{it-1}$	**0.03**	**-0.05**	**0.03**
(p-value)	**(0.62)**	**(0.58)**	**(0.74)**
Sum. Loosening	1.57**	1.87*	2.25**
(p-value)	(0.00)	(0.04)	(0.00)
Sum. Loosening*RBankAssets$_{it-1}$	-0.07	-0.09	-0.15*
(p-value)	(0.13)	(0.23)	(0.03)
Adj. R^2	0.1364	0.1367	
N	130,862	130,862	
Panel B: Dependent variable – ΔRLargeTimeDep$_{it}$/RAssets$_{it-1}$			
	(1)	(2)	(3)
	All banks	PT	NPT
Sum. Tightening	-0.57	0.15	-0.11
(p-value)	(0.21)	(0.84)	(0.87)
Sum. Tightening*RBankAssets$_{it-1}$	**0.09***	**0.03**	**0.03**
(p-value)	**(0.04)**	**(0.65)**	**(0.56)**
Sum. Loosening	0.23	0.93	-0.06
(p-value)	(0.52)	(0.13)	(0.90)
Sum. Loosening*RBankAssets$_{it-1}$	-0.04	-0.10	-0.01
(p-value)	(0.22)	(0.07)	(0.74)
Adj. R^2	0.0465	0.0467	
N	130,862	130,862	
Panel C: Dependent variable – ΔRSecurities$_{it}$/RAssets$_{it-1}$			
	(1)	(2)	(3)
	All banks	PT	NPT
Sum. Tightening	-1.22	-0.34	0.34
(p-value)	(0.11)	(0.77)	(0.76)
Sum. Tightening*RBankAssets$_{it-1}$	**0.06**	**0.00**	**-0.10**
(p-value)	**(0.40)**	**(0.98)**	**(0.32)**
Sum. Loosening	1.61**	3.52**	0.76
(p-value)	(0.01)	(0.00)	(0.38)
Sum. Loosening*RBankAssets$_{it-1}$	-0.12*	-0.28**	-0.04
(p-value)	(0.04)	(0.00)	(0.57)
Adj. R^2	0.0308	0.0310	
N	130,862	130,862	
Panel B: Dependent variable – ΔRLoans$_{it}$/RAssets$_{it-1}$			
	(1)	(2)	(3)
	All banks	PT	NPT
Sum. Tightening	-2.70**	-0.91	-2.59**
(p-value)	(0.00)	(0.44)	(0.01)
Sum. Tightening*RBankAssets$_{it-1}$	**0.22****	**0.08**	**0.20***
(p-value)	**(0.00)**	**(0.46)**	**(0.04)**
Sum. Loosening	-0.95	-1.77	-0.25
(p-value)	(0.11)	(0.08)	(0.76)
Sum. Loosening*RBankAssets$_{it-1}$	0.10	0.16	0.03
(p-value)	(0.07)	(0.06)	(0.68)
Adj. R^2	0.1811	0.1818	
N	130,862	130,862	

Notes: See Table 3.

Endnotes

[1] An exception is the study by Gertler and Gilchrist (1994). They considered Quarterly Financial Report for Manufacturing Corporations (QFR) data that, unlike COMPUSTAT, include non-publicly traded firms. The authors distinguish only between large and small firms, which, as discussed below, is an imperfect way to distinguish between less and more financially constrained firms. Furthermore, because of the sampling technique used in the QFR, it does not provide a full panel firm-level dataset, since any given firm is in the sample for only a brief period.

[2] Several studies, surveyed by Healy and Palepu (2001), find evidence supporting the hypothesis that greater financial information disclosure is associated with public security issuance.

[3] All the regressions in this paper are performed using data at the individual bank level. An individual bank is considered to be publicly traded in two cases: 1) a bank is a stand-alone bank and its equities are publicly traded or 2) a bank is a subsidiary of a publicly traded bank holding company. Section III provides more details on how the distinction between publicly traded and non-publicly traded banks is made.

[4] Given that the shares of loans and transaction deposits relative to bank assets are much larger than that of large time deposits, measuring the dependent variables as growth rates complicates the interpretation. Even a large increase in the growth rate of large time deposits may be insufficient to offset a small reduction in the growth rate of transaction deposits and, therefore, insufficient to insulate loan growth from a monetary policy tightening. Scaling by assets allows one to see more clearly the relative importance of the responses of the various balance sheet elements to changes in monetary policy.

[5] Both Call Reports and Bank Holding Company databases are located on the web site of the Chicago Fed: http://www.chicagofed.org/economicresearchanddata/data/bhcdatabase/index.cfm. The National Information Center's website is http://www.ffiec.gov/nic/.

[6] In multilayered banking organizations, it is possible that a bank is directly owned by a BHC, which, in turn, is owned by another BHC, etc. In this case, a bank is treated as being owned by its ultimate, highest holder, not by its direct holder.

[7] Unfortunately, the Call Reports do not contain separate data on the loans that are made under commitment.

[8] We also estimated the equations using the alternative ranges of the 25th to 90th percentiles and the 25th to 98th percentiles. The results are not sensitive to these differences in the bank sample.

[9] We use a value of minus one instead of positive one for Loosen in order to more easily interpret the estimated coefficients in the tables.