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# Banking Globalization and Monetary Transmission

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**Abstract**

The globalization of banking in the United States is influencing the monetary transmission mechanism both domestically and in foreign markets. Using quarterly information from all U.S. banks filing call reports between 1980 and 2006, we show that globalized banks activate internal capital markets with their overseas affiliates to insulate themselves partially from changes in domestic liquidity conditions. The existence of these internal capital markets directly contributes to an international propagation of domestic liquidity shocks to lending by affiliated banks abroad. While these results imply a substantially more active lending channel than documented in Kashyap and Stein (2000), they also imply that the lending channel within the United States is declining in strength as banking becomes more globalized and monetary transmission abroad likewise increases in strength.

Key words: lending channel, bank, global, liquidity, transmission, internal capital markets

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## I. Introduction

How does banking globalization affect monetary policy? Reflecting a general trend toward increasingly globalized financial markets, the issue resonates since a rising share of total U.S. banking assets is accounted for by banks with significant operations in foreign countries (see Figure 1). In this paper we explore the implications for monetary policy of this first-order transformation of the U.S. banking industry. A key channel of monetary policy effectiveness passes through the impact on bank lending. How does this process of banking globalization affect the transmission mechanism? Has monetary policy become less effective as domestic banks have expanded their foreign operations?

It is not obvious that the process of banking globalization should affect monetary policy. An argument supporting this conjecture is that banks with international operations can respond to a domestic liquidity shock by reallocating funds between the head office and its foreign affiliates. This argument thus presumes that banking organizations actively operate *internal capital markets*, and that global banks can move liquid funds between domestic and foreign operations on the basis of relative needs. If this conjecture holds true, the domestic lending channel of monetary policy could become less effective. However, the effects of monetary policy would not disappear. If global banks respond to the liquidity shock through an internal reallocation of funds, their foreign lending may be affected. Hence, banks going global may increase the *international* propagation of domestic monetary policy.

A legitimate counter argument is that global banks may behave differently from other banks because they are large banks, as expansion into significant international activity presumably requires a pre-existing large scale of operation. Kashyap and Stein (1994, 1995, 2000) already have shown that large banks are expected to be insulated from monetary policy because of their potential unencumbered access to external capital markets. Indeed, Kashyap and Stein (2000) showed that U.S. banks in the top 5 percent of the asset distribution are virtually unaffected by U.S. monetary policy. The association between bank globalization and bank size is certainly pronounced. As the chart in Figure 2 shows, most global banks are in the top 5 percent of the asset distribution. Hence, by this argument, by the time a bank expands operations to include foreign countries,

monetary policy has already become inconsequential for its lending. In this case, banking globalization *per se* is unlikely to have an impact on monetary policy effectiveness.

Using quarterly data for all U.S. banks between 1980 and 2006, we find that bank globalization has an independent effect on monetary policy. We address the size versus global bank argument performing multiple, independent tests. First, expanding on Kashyap and Stein (2000), we likewise look at banks in the top 5 percent of the asset size distribution, but separate them in two clusters, based on whether they had or did not have global operations. We find that the group of large, global banks is indeed insulated from monetary policy, while the complementary group of large banks with domestic-only operations is instead found to be sensitive to changes in U.S. monetary policy. This can be interpreted as an indication that insulation derives from the global nature of banks, since otherwise large banks do not seem to be fully insulated via their access to *external* financial markets.

This first set of results may still not be sufficient to identify a separate effect of bank globalization. The U.S. banks' asset distribution is well-known to be highly skewed, so that even within the top 5 percent bracket there is a considerable size difference between banks in the top 1 percent and those between the 95$^{th}$ and the 99$^{th}$ percentile. Therefore, even within the top 5 percent, global banks may disproportionately populate the right tail of the distribution. Hence, to push further the size versus global issue, we repeat our tests focusing on banks between the 95$^{th}$ and the 99$^{th}$ percentile and find results consistent with our prior observations. However, a skeptic could still argue that even within this finer cluster of large banks, global institutions could still be larger on average. The charts in Figure 3 would seem to corroborate this point.[1] Consequently, we ran additional testing using weighted least squares estimation techniques, imposing on global banks the size distribution of non-global banks (in essence penalizing the contribution to the estimates of the largest of the global banks) and still found global banks to be fully insulated.

Limiting our analysis to this type of testing could still be considered as providing insufficient evidence for globalization as an independent factor affecting monetary policy

[1]The chart is drawn with 2005q4 data but it is representative of a similar pattern observable throughout the whole sample period.

effectiveness. For example, global banks may have a different type of clientele with loan demand that is less dependent on domestic economic and liquidity conditions. Corroboration of the evidence in favor of the globalization angle requires more direct testing. The global argument presupposes that global banks activate an internal capital market, moving resources between parent and foreign affiliated banks in response to domestic monetary policy changes. Our next set of tests looks for evidence that this is indeed what is occurring. For this analysis, we draw on data that stems from the requirement that U.S. banks report quarterly the value of the net liabilities (or claims) between the head office and the foreign offices. Outright internal borrowing or lending is a major component of these flows. These data provide an unusual opportunity for a direct test of the existence of an internal capital market: data on borrowing and lending *within* an organization, between its different components, is – to the best of our knowledge - hardly ever available. For this reason, evidence on the existence of internal capital markets is typically derived indirectly by looking at the *performance* of one side of an organization in response to a shock to the other side. Therefore, in our case we directly test whether internal flows of funds are systematically associated with changes in monetary policy. We find significant supportive evidence. In times of contractionary monetary policy in the United States, internal funds flow *from* foreign operations *to* the U.S. head office, and vice versa with liquidity expansions.[2]

A possible reservation is that in fact these internal flows are just picking up internal reallocations that chase better rates of returns of the global asset portfolio responding to changes in interest rates, both domestically and abroad, instead of reflecting internal funding needs. However, we show that the results are robust to introducing a benchmark rate of return on foreign investments as a control. Moreover, to hone in on the hypothesis that this internal flows respond to funding needs, we look at a differential response by banks with high or low capital to asset ratios. The idea is that banks with low capitalization ratios would be relatively more impaired in their ability to access external capital markets, hence they would be the ones more in need to mobilize funds internally. The evidence is consistent with this hypothesis, thus strengthening the

[2] This line of research is closely related to the earlier work by Houston, James and Marcus (1997) and Campello (2002). Important extensions are the contributions by Ashcraft (2006), Ashcraft (2008) and Ashcraft and Campello (2007).

conjecture that global banks exploit their global nature to respond to changes in monetary policy.

Finally, and more in the spirit of traditional approaches that investigate internal capital market channels, we examine indirect evidence jointly drawn from examining head office and foreign affiliate balance sheets. If internal capital markets are at work, the lending activity of the foreign offices should be directly affected by domestic monetary policy. Our tests confirm this prior. Consequently, while substantiating the main conjecture, we also identify a specific channel of *international* transmission of U.S. monetary policy.

Overall, banking globalization seems to exert an independent effect on monetary policy, above and beyond any impact coming from increasing bank size. Access to alternative sources of external financing is certainly key to monetary policy insulation. However, our results also indicate that banks with global operations make a significant use of internal borrowing and lending between their head offices and their foreign offices.

In addition to the main finding that globalization matters, the results of our study offer other interesting implications. First, we indicate a somewhat stronger domestic lending channel than implicit in the seminal study of Kashyap and Stein (2000), since the lending activity of the large but non-global banks continues to be exposed to changes in domestic monetary policy. In fact, in further testing following Campello (2002), we explore the insulation from monetary policy of the lending of *small* banks affiliated with large banks. We found that while small banks affiliated with large, global banks are indeed insulated, small banks but affiliated with large, non-global banks exhibited sensitivity to monetary policy changes. At the same time, a continuing process of increasing globalization suggests that the lending channel within the United States will be declining in strength.[3]

Second, our results also show that the total lending channel consequences of U.S. monetary policy are underestimated by a focus that is solely concentrated on U.S. markets. Hence, monetary policy through the lending channel may not be losing its effectiveness overall but, rather, it may be increasingly felt abroad and outside of the

[3] This work is closely related to others that have also suggested a reduced potency for monetary policy as a result of evolution of the banking industry, e.g., Morgan, Rime and Strahan (2004), Ashcraft (2006) and Loutskina and Strahan, (2009).

traditional purview of observation. In this sense, our work directly complements the Peek and Rosengren (1997, 2000) findings that banks are specifically involved in the international transmission of shocks. In our case, results based on bank-specific data demonstrate a direct mechanism that may generate the type of monetary policy transmission across countries documented in analyses of macroeconomic data, as in Kim (2001), Neumeyer and Perri (2005), and Canova (2005).[4]

Finally, it is worth noting that our findings introduce a new dimension to the debate on globalization effects on monetary policy and real activity in the United States. While contributors to this debate focus on issues like whether the Phillips Curve has flattened (for example, Yellen 2006, Bernanke 2006, Ihrig et al 2007, and Sbordone, 2007), globalization of banking has consequences for the transmission of monetary policy to the real U.S. economy and foreign markets through the lending channel.

## II. Identification strategy

Differences in the lending channel across large banks.

The main argument behind the lending channel of monetary policy, exposited in Bernanke and Blinder (1992), is that tight money should reduce the volume of reservable deposits held by depository institutions.[5] The lending channel for the transmission of monetary policy arises because a bank faces a significant wedge between the cost of acquiring insured, reservable deposits and the cost of acquiring other sources of funds such as large denomination CDs, money market funds, and securities. Hence, a contractionary monetary policy that drains reserves from the economy and reduces the amount of reservable deposits, translates into a reduction in bank lending activity when banks are unable to replace each dollar of deposits with other funds.

[4] Kim (2001) provides evidence on international transmission of U.S. monetary policy shocks in the context of a VAR framework. For transmission to emerging markets, Neumeyer and Perri (2005) emphasize the role of world interest rates in emerging market business cycles, and Canova (2005) focuses on transmission of US shocks to Latin American. Other studies highlight the role of exchange rate regime selection in such transmission, as in Di Giovanni and Shambaugh (2008), Frankel, Schmukler and Serven (2004), and Obstfeld, Shambaugh, and Taylor (2005).

[5] Other basic references on the lending channel see Bernanke and Blinder (1988), Bernanke and Gertler (1995), Kashyap and Stein (1994, 1995, 2000). See Stein (1998) for specific modeling of the informational frictions on banks' liability side.

Kashyap and Stein's (2000) seminal evidence was based on the argument that lending by any bank is sensitive to its balance-sheet health, with healthier banks able to lend a greater fraction of their assets, all else equal. Using the Call Report Data of individual U.S. banks,[6] Kashyap and Stein showed that loan sensitivity to monetary conditions was statistically important for smaller banks in the United States, but not for the larger banks that presumably have a greater ability to raise alternative sources of funds from external capital markets.

We begin by assessing the degree of sensitivity to monetary policy of global banks and that of similar banks whose business is however confined within domestic boundaries. Because global banks are mainly large banks, we restrict our analysis to banks that in every quarter were in the upper five percent of the asset distribution of all U.S. banks. These are the banks that in Kashyap and Stein (2000) were all combined into a single group of banks and found to be insulated from monetary policy. We follow closely the two-step empirical strategy adopted by Kashyap and Stein (2000) and then utilized and refined by Campello (2002). As in those studies, we estimate cross-sectional sensitivities of lending activity of banks to overall balance sheet liquidity at each date. In the first step of this empirical strategy, cross-sectional regressions for each quarter are run *separately* for banks indexed by *i* within each bank group. The bank groups that are the primary focus of our analysis are large global banks and the large, non-global, banks. The general stage 1 specification is:

$$(1) \quad \Delta \log(Y_{it}) = \sum_{j=1}^{4} a_{tj} \Delta \log(Y_{it-j}) + \beta_t X_{it-1} + \text{Controls} + \varepsilon_{it}$$

where $Y_{it}$ is either total loans or commercial and industrial (C&I) loans of bank *i* at time *t*. C&I lending, by focusing on business lending, is perhaps a better indicator of the possible impact on the real economy of liquidity conditions affecting the banking industry. At the same time, focusing on just C&I lending may be overly restrictive in terms of the actual impact of liquidity, since different banks may have a different orientations in their asset portfolios and investing strategies.

[6] Banks file quarterly financial data to the FFIEC (Federal Financial Institution Examination Council), with the reports of Condition and Income commonly referred to as Call Report Data.

On the right hand side, the main variable of interest is $X_{it-1}$, which in this first empirical exercise is a measure of overall balance sheet liquidity and is defined as the log of the ratio of a bank's liquid assets to its total assets. The estimated coefficient on $X_{it-1}$, denoted by $\beta_t$, reflects the degree of dependence of lending activity on balance sheet liquidity. Each regression is run at each quarter, thus generating a separate time series of estimated $\beta_t$ coefficients for each class of banks under consideration. A bank's capitalization ratio, its asset size, and the value of its nonperforming loans are included as bank-specific lagged controls. The vector of controls also includes indicator variables for the state where the bank's headquarters are located and whether or not the bank's headquarters are in a metropolitan statistical area (MSA). The inclusion of the state and MSA indicator variables allows for different macroeconomic conditions in each period for each geographical area and is intended to capture unobserved variability of loan demand.

In the second step of this empirical strategy, the $\beta_t$ series estimated in the first step are used as dependent variables to determine how lending sensitivity varies with monetary policy:

$$(2) \quad \beta_t = \eta + \sum_{j=1}^{8} \phi_j MP_{t-j} + \delta \text{Controls} + \mu_t$$

where $MP_{t-j}$ is an indicator of monetary policy. In our analysis we use three alternative indicators of monetary policy, each of which we describe at greater length in the data section: the Bernanke-Mihov indicator, the nominal Federal Funds rate, and the real Federal Funds rate. As a convention, these indicators of monetary policy are defined in our analysis so that they increase in times of liquidity tightening and decrease in times of looser liquidity conditions. If lending is affected by monetary policy, lending will be more dependent on balance sheet liquidity in times of monetary policy tightening and less dependent in times of monetary policy loosening. Hence, the sum of the coefficients of the monetary policy indicators in the second-step regression would be positive and significant if the lending channel is active. The regression analysis includes as additional controls a time trend, three quarterly indicator variables, and the growth rate in real GDP and its lags. Moreover, for global banks we also add in the second stage a control for

foreign monetary conditions in the economies in which U.S. banks have local affiliates. Presumably, if monetary conditions in countries where U.S. banks have local affiliates move in correspondence with U.S. monetary conditions, the incentive of U.S. parent banks to reallocate funds between parents and foreign affiliates might be mitigated. The second stage of our analysis presumes an all else equal scenario, which is that changes in monetary conditions in the United States influence domestic lending given foreign conditions.

As mentioned earlier, large, global banks are on average larger than large, non-global banks. Hence, we run an alternative test of specification (2) dropping observations in the top 1 percent of all banks in the full bank sample, so that large banks are redefined to be only those in the 95$^{th}$ to 99$^{th}$ percentile. Second, we utilize weighted least squares regression techniques, weighing the observations in the global bank sample to match the size distribution of banks in the sample of non-global banks.

Internal capital markets in global banks.

If global banks are insulated from domestic liquidity shifts *just because of their size*, we should not expect to observe any abnormal behavior in the functioning of internal capital markets between parent banks and their foreign affiliates around times of changes in monetary policy. Normally data on internal transactions within an organization are unavailable in any systematic format, but U.S. banks are required to report quarterly the aggregate value of internal transactions between head office and foreign offices ("Net Due To or From Own Related Offices in Other Countries").[7] A positive amount for $NetDue_{i,t}$ in a quarter implies that the domestic office of bank *i* has received a net inflow of funds from their foreign operations in period *t*. These net due data are distinct from other balance sheet entries, such as bank investments in foreign or local assets that could occur given liquidity and rate of return considerations in respective markets.

In order to test whether such an internal capital market is active for global banks, we use the following equation specification:

[7] Net Due To or From Own Related Offices in Other Countries is reported in schedule RC-H of Form 030 (Call Report).

$$(3) \quad \Delta Net\ Due_{i,t} = \alpha + \sum_{j=1}^{4} \varphi_j \Delta Net\ Due_{i,t-j} + \sum_{j=0}^{4} \phi_j \Delta MP_{t-j} + \sum_{j=0}^{4} \gamma_j \Delta GDP_{t-j} + \mu_t$$

where $\Delta Net\ Due_{i,t}$, the quarterly change in real Net Due funds for bank *i* at time *t*, is regressed on its own four lags, on the change in the indicator of monetary policy and its four lags, and the growth rate in real GDP and its four lags. Real Net Due is constructed by deflating nominal net due by the CPI, with 1980 as the CPI base year taking a value of 100. The regression includes the growth rates in real GDP to control for general economic conditions. If the internal capital market is in operation – and it is used as at least a partial offset of domestic monetary policy shocks - we should expect to find an increase in the inflow of funds (or a decline in outflows of funds) from foreign operations in times of domestic monetary policy tightening. This evidence of internal capital market response between the parent and foreign affiliates would be reflected in a positive and significant sum of coefficients $\phi_j$ on the monetary policy indicators.

Two types of robustness checks are run relative to this basic specification. As before, we add a control for changes in foreign monetary conditions. Again, if monetary conditions in countries where U.S. banks have local affiliates move in correspondence with U.S. monetary conditions, the incentive of U.S. parent banks to reallocate funds between parents and foreign affiliates might be mitigated. The second set of checks explores whether the sensitivity of net dues to liquidity varies according to the capital ratios of the individual bank. The logic is that banks with weaker capital positions might rely more, compared with their well capitalized counterparts, on internal capital markets in the event of a liquidity shock.

Our final set of key results investigates the possible effects of domestic monetary policy on the lending activity of the *foreign offices* of global banks. If global banks operate an active internal capital market between their domestic and their foreign operations, then the lending activity of the foreign offices of these banks should be affected by domestic liquidity shocks. If an active internal capital market is in operation, the lending activity of the foreign offices should depend on the overall level of available liquidity of the domestic head office. However, in times of monetary policy contraction foreign offices would have to rely *less* on the overall balance sheet strength of the

domestic head office, and vice versa. The thought experiment is again based on the two-step procedure described above. In this case, however, in the first step the dependent variable is a measure of the lending activity of the foreign offices of bank *i* at time *t*. The alternative lending measures used are the growth in C&I lending of the foreign offices and the growth in total lending of the foreign offices. The main regressor of interest is the overall liquidity measure of the reporting bank.

We present a fourth set of results as well, focused on the internal capital markets that exist within bank holding companies, between the parent banks and affiliated small domestic banks. The question considered is whether insulation differences observed across large domestic-only banks and globally-oriented U.S. banks extend to the small banks affiliated through common bank holding companies. Methodologically, the empirical steps are analogous to those for equations (1) and (2), with the main exceptions of additional controls applied for the size of the large banks in the BHC.

## III. The Data

The sample of banks. We examine data on banks and liquidity conditions for the period from 1980Q1 through 2006Q4. We purposefully exclude data for later quarters since any inference would be confounded by the concomitance with the financial crisis, officially started in 2007Q3.[8] The core of our analysis utilizes Call Report data available quarterly for every chartered U.S. bank.[9] Table 1 provides descriptive statistics on the banks used for our analysis. Four categories of banks are covered in the table: large domestic banks, large global banks, and for reference, small banks affiliated with a large global bank via common ownership under the same bank holding company (BHC) organization, and small bank in BHCs that contain large banks but no global banks. We use Call Report data on foreign assets and foreign liabilities of branches and subsidiaries to determine whether a bank is global or not. A large bank is defined as any bank that is in the 95th percentile or higher of banks sorted by asset size, with this categorization performed in

[8] These data deserves a separate study (currently underway).

[9] The specific details on the FFIEC 031 Consolidated Reports of Condition and Income for a Bank with Domestic and Foreign Offices and FFIEC 041 Consolidated Reports of Condition and Income for a Bank with Domestic Offices Only are available at http://www.ffiec.gov/forms031.htm and http://www.ffiec.gov/forms041.htm.

every quarter of the sample period. Following Campello (2002), a small bank is defined as any bank that is in the 90th percentile or lower. Leaving out the intermediate group of banks between the 90th and 95th percentile is justified to impose a cleaner separation between small and large banks.

The main balance sheet data of these types of banks are summarized in Table 1. The information presented covers the number of bank-quarter observations in the sample, median values for bank size, loan to asset ratios, C&I lending to assets, and bank liquidity, capitalization and nonperforming loan shares. For reporting within the Table, three reference dates are considered, 1985, 1995, and 2005, indicative of the respective decades covered by the full dataset.

The overall sample consists of more than 1.1 million bank-quarters of data. The large global and domestic banks have evolved to become larger on average and to represent more of the total assets of the banking sector. While large global banks are fewer in number, by 2005 they account for almost 70 percent of banking system assets. Large domestic banks are more numerous but characterized by a substantially smaller median bank size. Those small banks that are affiliated with large BHCs currently account for less than one percent of banking system assets.

The global banks tend to have less liquid assets, lower capitalization, and higher nonperforming loan shares. The portfolios of the global banks tend to be similar in terms of loan to asset ratios, but commercial and industrial loans play a larger role in the business base.[10] The observations about differences in portfolios across the large banks are consistent with lessons from Berger et al. (2005), wherein it is argued that bank size is correlated with the bank business model: larger banks tend to lend at a greater distance, interact more at arms-length with their borrowers, and have shorter and less exclusive relationships with these borrowers.

Two other forms of bank-specific data are central to our analysis, both particular to the global banks. The first data are loans of foreign offices[11] and the second type is net

[10] The patterns are the same when small banks affiliated with global BHCs are compared with small banks affiliated with domestic BHCs.

[11] These data are from schedule RC-C of the Call Report, item RCFN 2122 (total loans) and RCFN 1763+1764 (C&I loans).

due with foreign offices.[12] The lending of the foreign offices of U.S. global banks captures loans extended directly by offices in countries where they are physically located. These figures do not include possible lending activity of the domestic offices to clients residing abroad. The net due data reflects *direct* flows between a parent with its branches and subsidiaries abroad. Positive values represent flows from foreign operations to the parent bank located in the United States, and vice versa (see Data Appendix for more details).

Some features of the foreign loan and net due data are presented in Table 2, which primarily focuses on the means, medians and number of observations. The first point to note is the consistent difference between means and medians, which are substantially smaller. The implication is that the distribution of activity is highly skewed, with overall quantities dominated by a few large players. Second, the net due observations are split across net due to (flows to the parent) and net due from (flows from the parent to foreign affiliates). In recent years, the flows from affiliates to parents have substantially exceeded flows in the opposite direction. Note, however, that our conjecture and the related identification strategy does not rely on trends in the data, but focuses on quarterly changes in internal flows in response to changes in monetary policy. Third, while foreign lending has risen – both total and C&I lending – the median bank is not engaged in this activity recently. This activity is dominated by very large global banks. While total foreign lending has been rising, domestic lending is rising at a higher rate, so that foreign loans are declining as a share of total bank lending. The direction of flows from foreign affiliates to parents, reflected in Net Due To statistics, show that affiliated foreign banks have assets abroad that tend to be directed to U.S. markets.

Macroeconomic Liquidity. Three measures of market liquidity, proxied by measures of monetary policy, are used in our analysis: a nominal Federal Funds rate, a real Federal Funds rate (the nominal rate adjusted for CPI inflation), and the Bernanke and Mihov

[12] We construct these as the difference between schedule RC-H Net due *to* own foreign offices, Edge and Agreement subsidiaries, and IBFs and Net due *from* own foreign offices, Edge and Agreement subsidiaries, and IBFs (RC-H 2941-2163).

(1998) measure.[13] The quarterly effective Federal funds rate is calculated from monthly data from the Federal Reserve Board. The Bernanke-Mihov measure is constructed via a "semi-structural VAR" model of the market for bank reserves. We use an oppositely signed Bernanke-Mihov series compared to the published measure, so that its interpretation is similar to the Federal Funds series. In all cases, our empirical results enter these variables so that an increase in the monetary measure is interpreted as a tightening of liquidity conditions.

These three measures are depicted in Figure 4. In terms of the values of these series, positive values of our Bernanke-Mihov metric and of the real Federal Funds rates are considered periods of *tight* monetary policy. Upward movements in all three measures generally are considered indicative of *tighter* policy. Of course, the real Federal Funds rate can be tighter either due to an explicit rise in the nominal policy rate, or from a reduction in inflation while the nominal rate remains unchanged. The Bernanke-Mihov measure can reflect tighter liquidity conditions that are generated from policy instruments other than the Funds rate.[14]

Some specifications include a control variable for foreign monetary conditions, which enters in the regressions with the same lag structure as the domestic monetary policy variable. The foreign monetary condition variable is a weighted average of short-term money market or policy rates in the countries in which U.S. banks have local claims.[15]

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[13] Bernanke and Mihov (1998) applied a flexible VAR model which nested specific assumptions about central bank operating procedures, such as whether it is based on federal funds rate or non-borrowed reserves targeting. Ilian Mihov kindly updated and revised this measure in 12/06 using data through the end of 2005. The Kashyap and Stein (2000) study uses a narrative measure of monetary policy, the Boschen-Mills (1995) index, the Federal Funds rates, and the Bernanke and Mihov measure. Kashyap and Stein (2000) do not use a real Federal Funds rate.

[14] The differences in definition and construction across these measures generate positive but not necessarily tight correlations among them. The tightest correlations are among the nominal and real Federal Funds rate series at 0.71, which have a common policy base but differ in terms of correction for slower moving inflation. The real rate is consistently lower in value and trends downward by less through these decades as average inflation has declined. The trajectory of the Bernanke-Mihov measure is more tightly correlated with the nominal Federal Funds rate (0.41) than the real rate (0.14), perhaps not surprising since the nominal rate enters the VAR used in constructing the Bernanke-Mihov measure. Despite this pattern in correlations reflecting changing liquidity conditions, the B-M and real rates have more comparable direct signals regarding absolute liquidity conditions, namely, whether policy is monetary policy is loose or tight at any point in time.

[15] The short-term monetary rates are generally drawn from International Financial Statistics. Item 60B is typically a money market rate or a call money rate; where unavailable, item 60C Treasury Bill rates are utilized. Weights are based on the quarterly data on local claims by country of all U.S. banks reporting

Data screens. For our regression analysis we apply a number of screens to the data. These screens follow closely those of Kashyap and Stein (2000) and Campello (2002). We drop bank quarters in which mergers or changes in "high holder" within a BHC occur. We drop bank quarters where asset growth was above 100 percent and total loan growth was above +50 percent or below –50 percent. In regressions where we focus on C&I lending, we remove similar outliers in the C&I lending growth distribution. Finally, for regressions analyzing the lending of foreign offices we dropped outliers at the 1st and 99th percentile of either the series of growth in total and C&I lending of foreign offices.

## IV. Empirical Findings

The Lending Channel in Domestic versus Global Large Banks. As described above, the first empirical exercise tests how lending sensitivity to balance sheet liquidity varies with monetary policy for different categories of banks. We compare large banks with international operations, our global banks, and those banks that instead operate exclusively within domestic boundaries.

Table 3 presents the results from the second stage regressions run on these two subsets of banks. Each cell within the table presents the summed coefficient on monetary policy and is generated from a distinct regression. The table is divided into two panels, representing regressions over the distinct dependent variables for loans. The upper panel reports estimated summed coefficients where the first stage regressions used growth in total loans as the dependent variable, while the lower panel reports estimated coefficients using growth in C&I loans. Within each of the panels we report results of separate regression specifications run using one of the three alternative indicators of monetary policy, and which either exclude or include controls for GDP growth in the second stage regression. For the group of global banks we also show results from second stage regressions where we added the foreign interest rate variable. Results highlighted in bold

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foreign exposures. Adjustments are made to exclude periods when specific countries are in crisis, as summarized in Appendix Table 2, and quarters in which real interest rates exceed 25 percent or are below negative 25 percent. India, one of the twenty countries, is excluded from the weighting due to the volatility of data on short-term market rates. Real rates are constructed using quarterly CPI inflation data relative to one year previous levels.

are statistically significant at least at the 10 percent level and indicate an active lending channel for monetary policy.

As the results in the table clearly indicate, we do not observe the lending channel of monetary policy transmission at work for the group of global banks. The sums of coefficients for the regressions based on this category of banks are never significant at standard significance levels. Even controlling for foreign conditions does not change the results. Interestingly, large, but domestic-only banks seem less insulated than expected. In seven out of twelve of the regressions the sums of coefficients are statistically significant and positive, and marginally significant in one additional specification.

The size of the coefficients suggests that the economic magnitude of the effect of monetary policy on lending of the large, non-global banks may not be very large. However, this is expected: these are still institutions that, because of their size, to a substantial degree are indeed able to access external financial markets. The goal of our test is to provide support to the conjecture that globalness is an additional, independent factor contributing to insulation, and the results are consistent with this conjecture. In a later section we return to the economic magnitude theme in order to provide a quantitative appreciation of the role of globalness in response to monetary policy changes.

The findings reported in Table 3 are robust to further sub-clustering aimed at separating the bank size and globalness factors. For instance, aware of the fact that global banks heavily populate the top 1 percent of the size distribution, we ran an additional set of regressions curtailing the dataset to banks within the 95$^{th}$ and the 99$^{th}$ percentile. This refinement, with results in Table 4, still shows that large global banks (excluding the largest), are insulated from monetary policy, while large, non-global banks within the same sub cluster still display a certain degree of lending sensitivity. Only non-global banks in the top 1 percent are found to be wholly insulated (results not reported).[16]

Trying to push the envelope even further, we also ran regressions for the global banks using weighted least squares in the first stage, using as weights the size distribution of the large, non-global banks, in essence penalizing the largest of the global banks and

[16] The lack of statistical significance may be due to the relatively small sample size for this category of banks in the top 1 percent group.

over-emphasizing the contribution to the results of the smallest ones. The results, in the last column of Table 4, still confirm that global banks are insulated from monetary policy, and that size per se may not be the leading factor explaining such finding.

Internal capital markets of global banks. While the results in the previous section suggest that monetary policy insulation for global banks may be due to their global nature, confirming this conjecture requires more direct testing. As we have noted, global banks can operate an internal capital market that potentially allows them to reshuffle resources between domestic and foreign operations depending on the relative liquidity needs within the banking organization. To determine whether this channel is active and used to respond to changes in monetary policy, we use equation specification (3), on the "net due" from foreign operations to the parent, and report the results in Table 5. In all regressions the dependent variable is the change in net due flows between a bank domestic headquarter and its foreign offices, with the net due flows deflated to be expressed in constant 1980 dollars. Recall that, by construction, an *increase* in net due means that the domestic offices are receiving more funds from their foreign offices or sending fewer resources abroad.

The results reported in the first column of Table 5 show that the pattern of funds flow responds to changes in monetary policy, with this effect statistically significant. In particular, this evidence indicates that an active internal capital market between the domestic headquarter and its foreign offices exists. The next columns of results consider the size and statistical significance of the effect under periods of tighter versus under looser monetary conditions, testing for potential asymmetries. The transmission of U.S. liquidity conditions onto net-due flows is bi-directional. Funds flow into the parent bank at a faster pace when domestic monetary policy is tighter, and funds flow out to the affiliates, or into the parent from the affiliate at a slower pace, when domestic monetary policy is more expansionary. Tests performed for equality across the asymmetric coefficients show that none of the specifications yield a statistically significant difference between estimated size of net due response to tightening versus loosening of credit conditions. Consequently, the empirics reject the notion that an internal capital market

between U.S. banks and foreign affiliates is active only in one direction of monetary policy conditions.

An objection to this finding is that the movement of funds picked up by the regressions may not reflect internal funding needs, but may instead be the result of chasing higher relative return opportunities. So, for instance, a higher fed funds rate may just signify higher return opportunities in the United States, with the foreign operations reallocating their resources accordingly. However, if this were the case, foreign offices would simply increase their own positions in domestic assets on their balance sheet (e.g., through purchases of U.S. government securities or other). In other words, portfolio reallocations could be done directly without the affiliate engaging in internal transactions with the head office.

Nonetheless, we test the validity of this objection running alternative model specifications. First, we added to the basic specification of equation (3) the composite foreign interest rate with the same lag structure as the monetary policy variables. As reported in Table 6, the inclusion of this control does not substantially alter the basic result. Second, and perhaps even more telling, we look for a differential response in net due flows between banks based on whether they displayed high or low capitalization ratios: if the net due flows are just the result of portfolio considerations and not due to internal funding needs, we would expect to see no difference in response between banks with higher and lower capital to asset ratio. On the contrary, under the presumption that banks with lower capitalization may be the ones with more difficulties to access traditional external markets, we would expect to see a higher response exactly from this subgroup of banks. Each quarter, we construct a dummy variable equal to one if a global bank has a lower than median capital-to-asset ratio relative to other global banks. Interacting this dummy in the regression specifications leads to the results shown in the second and third data columns of Table 6. The significant results on the lower-capitalization dummy show that global banks with lower capitalization ratios tend to use the net dues channel more aggressively. This finding adds to the evidence already provided that global banks use their global nature to respond to domestic monetary policy changes.

Internal Capital Markets and Lending by Foreign Affiliates. Our observation that foreign affiliates help insulate global banks against domestic liquidity shocks does not mean that the total consequences of U.S. monetary policy are smaller than in the absence of globalization. While some insulation occurs in U.S. domestic markets, transmission of U.S. monetary shocks can be magnified on foreign markets. Indeed, the *economic* impact of the same amount of inflows and outflows can be markedly different from the domestic lending and foreign perspectives. Since the total foreign lending portfolios are typically much smaller than the total domestic loan portfolios (Table 2), the impact of a given outflow on the lending of foreign offices would be proportionately much larger than the impact of an equally sized inflow on domestic lending.

We explore the potential impact of changes in U.S. monetary policy for lending activity abroad by the affiliates of U.S. banks using the bank-specific data on foreign loans. Again, if global banks are insulated from domestic monetary policy shocks because of their ability to redirect liquid funds across borders, we expect the lending activity of the foreign offices of such banks to be directly affected by domestic shocks. Evidence supporting this conjecture would provide a direct channel through which domestic monetary policy is transmitted internationally, supporting the type of spillovers of policy established in VAR studies that exclusively rely on macroeconomic data.

The empirical strategy relies on the expectation that, with operable internal capital markets, foreign lending is likely to depend on the strength of the balance sheet of the domestic office. Consequently, we test whether such degree of dependence varies with the conditions of domestic monetary policy. The regression specifications cover growth in C&I lending of foreign offices, shown in the first set of columns of Table 7, and Total Foreign Lending, shown in the second set of columns of Table 7. As in Table 3, the reported results are the summed effects across quarters of a change in U.S. monetary variables, with the cells of the table drawn from regression specifications that are inclusive or exclusive of controls for real GDP growth.

The pattern of results reported in Table 7 is highly consistent across specifications and across the coverage of the foreign lending variable. The estimated sums of coefficients are always negative and are significant in nine out of the twelve regressions. The implication is that foreign lending activity of U.S. bank affiliates abroad can rely *less*

on the overall strength of the home office in times of tighter monetary conditions in the United States, and rely more on the U.S. parent in times of looser U.S. liquidity.

Lending by Domestic Affiliates. As a final set of regression exercises, we test whether the impact of globalization also extends to the lending activity of small size banks operating within the United States. Campello (2002) had argued that while it must be true that smaller banks are restricted in their ability to raise alternative sources of external finance – as found by Kashyap and Stein - it is also true that a number of small banks are linked to large ones via bank holding company affiliation. Campello successfully showed that these small banks remain insulated from monetary policy shocks because they can access internal funds that can be reallocated within the bank holding company organization. The Campello results made another dent to the effectiveness of the lending channel by excluding a whole other group of banks from potential effects. In light of our main results, we revisit this conclusion with the expectation that the degree of insulation may be different for small banks that are associated with large and global banks, compared with insulation afforded those associated with large but domestic-oriented banks.

The identification is achieved with the same two-step procedure described above through equations (1) and (2). However, following very closely Campello, in this case in the first stage we estimate the sensitivity of lending activity of the small banks to their own internally-generated income and then in the second stage measure how such sensitivity varies with monetary policy. The intuition is that small banks associated with banks that are insulated by liquidity shocks should not be in need, or should be less in need, of their own internally generated income to fund lending activity. If these small banks cannot rely on funds reallocation provided by the larger, better insulated affiliates, their lending activity will be more dependent on their own income and such dependence will be even higher in times of tighter monetary policy. As before, the first stage regressions include as bank-specific lagged controls a bank capitalization ratio, its size, and the value of its non-performing loans, together with state and MSA indicator variables. In addition, we include controls for the overall size of the large banks in the

BHCs to which each bank *i* belongs. These controls are the lagged values of the log of the sum of total assets of all large banks in the BHC, and its squared term.

Table 8 reports the results of second stage regressions for these two new groups of banks. The first set of columns refer to estimated coefficients from the regressions run on the subset of small banks affiliated with large, domestic banks, while the second set of columns refer to regressions run on the subset of small banks affiliated with large, global banks. The second set of columns shows that small banks affiliated with large, global banks appear to be insulated from liquidity shocks. In all cases, with any indicator of monetary policy, looking at total lending or just C&I lending, and including or excluding GDP controls, the estimated sums of coefficients are never positive and significant. In fact, they are actually negative and significant in three of the regressions with total loans as dependent variable. By contrast, the results for small banks affiliated with large, domestic banks are markedly different. In eleven of the twelve alternative specifications the sums of coefficients from the second stage regressions are positive and significant, indicating that these small banks need to rely more on their own internal funds in times of liquidity shortage. The implication is that the small banks affiliated with domestic-only BHCs appear to remain exposed to changes in U.S. liquidity conditions, an indication that the large banks in their organizations may not be sufficiently shielded to be able to activate a meaningful reallocation of resources to their small affiliates through the organization's internal capital market.

Economic effects of globalization**.** We now use the empirical results in order to gauge the economic significance of the effects of bank globalization. We start by quantifying the effect on lending on large, non-global banks. Following Kashyap and Stein (2000), we compute the impact on growth in lending occurring over a period of 8 quarters of a 100 basis points change in the nominal federal funds rate. Because the identification strategy relies on banks being liquidity constrained, we assume (again, as in Kashyap and Stein, 2000) that banks are liquidity constrained if they are below the $90^{th}$ percentile in the liquidity-to-asset ratio distribution for each separate group of banks that we analyzed. From each subset of banks below this threshold, we take the median value in the

liquidity-to-asset ratio and evaluate the economic impact of the monetary policy change at this point in the distribution.[17]

For the quantitative exercises, we use the estimated coefficients from the regressions with the added GDP growth controls and using the nominal Federal Funds rate. Consider C&I lending by large banks first. The estimated sum of coefficients on monetary policy from this specification is 0.0012, as reported in Table 3.[18] From examining the Call Report data, across large domestic banks the value of the liquidity-to-asset ratio at the 90$^{th}$ percentile is 0.40 and the median value for banks below the 90$^{th}$ percentile threshold is 0.19 (in logs equal to -1.64). Hence, a 100 basis point tightening of the nominal federal funds rate would result in a decline in C&I lending growth by 0.2 percentage points for the median bank (0.0012 × -1.64). Since the median quarterly C&I loan growth for this bank group over our sample period was 1.7 percent, the Federal Funds tightening would reduce the median growth rate to 1.5 percent, or by about 12 percent of the median value. The same exercise applied to total lending would instead find a 0.13 percentage points decline in the total lending growth rate (0.008 x 1.64). Since the median total loan growth rate was 1.9 percent, the monetary tightening would reduce median total loan growth to 1.77 percent, or about 7 percent of the median value. As anticipated earlier, this effect is relatively small in economic magnitude, but this is not surprising: these are still relatively very large banks with better than average access to external financial markets. The point of the testing is to show that despite access to external markets, insulation is not complete. This therefore suggests that global banks can complement this basic strategy of using external funding with the activation of a global internal funding market.

In order to gauge the quantitative importance of such internal funding market, consider now the change in net due flows in response to a 100 basis point increase in the nominal Federal Funds rate. From Table 5, the estimated sum of the coefficients on the nominal Federal Funds rate was equal to 189.07. Since the net due variable was

[17] Kashyap and Stein (2000) calculated the integral over the entire distribution of banks at the given point in time. Our exercise is simpler but it is still informative.

[18] These coefficients indicate the change in the sensitivity of lending growth to liquidity, the estimated β's from the first-stage regressions. The sizes of the coefficients in the various specifications are comparable to the means of the β's for each corresponding group of banks. For instance, a change in sensitivity by 0.0012 is large compared to the mean of the estimated β's for large domestic banks, which was equal to 0.0032. Similar magnitude comparisons apply for the other bank groups.

expressed in real 1980 dollars, we convert back into nominal terms using the CPI deflator. For instance, consider the effect at the most current data point, the fourth quarter of 2005, where the multiplication factor for the CPI deflator was 250.7. Then the total effect of a 100 basis point tightening on the quarterly change in net due flows is equals to $47.4 million (189.07 x 250.7), with net due variables in the empirical exercise expressed in thousands of dollars. This figure is within the range of typical fluctuations in net due flows across the global banks and their subsidiaries. For example, in the fourth quarter of 2005 the median size of a change in net dues, whether inflows or outflows, was $15 million, while the absolute size of net due for the median bank was $74 million. Hence, the evidence suggests that global banks mobilize substantial funds in their internal capital markets.

However, to establish that these funds matter for the liquidity needs of global banks we need a benchmark for what the monetary tightening would have done to these banks in the absence of the foreign-sourced funds. As a hypothetical exercise, we apply to the group of large global banks the quantified impact of monetary tightening that had been calculated for large, non-global banks. To obtain a direct comparison with the calculated response in net due flows, we look at the potential impact on total lending of the median, liquidity constrained, large and global bank in the fourth quarter of 2005. In this quarter, the median bank reported about $21 billion in total loans. Using the coefficient estimated for the group of large, domestic banks, the median, constrained global banks would experience a potential loss in total lending growth of about $63 million.[19] Hence, the estimated magnitude of the response of net due flows for the median global bank from our monetary policy experiment ($47.4 million) would deliver a substantial fraction of the funds needed to insulate the liability side of the bank balance sheet and mitigate the transmission to the asset side.

In terms of lending spillovers from large banks, we can assess the domestic consequences across affiliated foreign branches and subsidiaries. For the transmission of U.S. monetary policy to foreign loans through global banks we use Table 7 estimates and conclude that the economic significance of U.S. monetary policy on foreign lending is

[19] Computed as follows: The 90$^{th}$ pct in log(liquid asset ratio) for large global in 2005q4 = -2.00. Median of those banks below this threshold = - 4.01. Impact on total lending = 4.01 *0.0008 = 0.003. Total lending for median, constrained, large global bank = 21Bn. Loss = 21Bn*0.003 = 63Mn.

potentially large. The increase in the Federal Funds rate would reduce C&I lending of foreign offices by about 3 percentage points and reduce total lending of foreign offices by 2.2 percentage points. Over the entire sample period, the median values in both C&I and total lending growth for foreign offices were actually negative (-1.2 and -0.3 percent, respectively). Monetary tightening in the United States would thus slow lending abroad to an even greater extent. The effect would still be considerable even for a foreign office at the 75$^{th}$ percentile of either loan growth distribution (+ 5.9 and + 6.1 percent, respectively).

In sum, our study confirms that the ongoing process of globalization of the banking industry impacts the transmission mechanism of monetary policy. The aggregate impact is not trivial: total lending in the fourth quarter of 2005 was approximately $4.8 trillion. Of this total amount, $3.1 trillion were issued by large, global banks. Hence, about 65 percent of total lending is largely insulated, at least in terms of direct effects, from changes in monetary policy. On the other hand, we find that there is evidence of sensitivity to monetary policy among the remaining large domestic institutions. In 2005Q4 the overall lending of this bank category amounted to about $1 trillion. Hence, our "reclaiming" about 25 percent of large bank loans to the potential lending channel effects seems economically significant, even if the coefficient on the magnitude of this effect for these banks only changes loan growth by a modest amount.[20]

## V. Conclusions

There is evidence that globalization of banking is changing the transmission of monetary policy via the lending channel. Our conclusion is that globalization has a deep and pervasive impact on the transmission of monetary policy. Using bank-specific data over the period between 1980 and 2005 we have found evidence of differences in the lending channel across large banks. While large banks are typically considered to be insulated from monetary policy, once global banks are separated from this group of large banks, the remaining domestic-oriented banks show significant lending sensitivity to monetary policy. Our evidence supports the conjecture that insulation of large global

[20] The effect is even larger if we also consider the impact on the small banks affiliated with the large, non-global banks.

banks is aided by a functioning internal capital market between globalized parents in the United States and their foreign affiliates.

The consequences of these results are statistically and economically significant. On the one hand, documenting that large but non-global banks are less insulated than previously evaluated suggests a stronger impact of monetary policy via the lending channel. On the other hand, the mechanisms we identify imply that, under increasing globalization, the impact of monetary policy on domestic bank lending and on the U.S. economy as a whole will be attenuated, while at the same time the domestic shock is transmitted more broadly to foreign markets through affiliated banks.

Our results also indicate that access to external capital markets may not be frictionless if large, domestic-oriented banks display a significant degree of sensitivity to their own balance sheet liquidity, and if large, global banks make use of their international, internal channel in response to monetary policy. Understanding the dynamics of international, intra-bank funding adds important insights to our understanding of banks' response to liquidity shocks and it should therefore assist in the undertaking of effective policy making. As a case in point, the response of U.S. global banks in the aftermath of the liquidity crisis during the summer of 2007 indicates a significant use of internal funds even during such an event. Our calculation shows that internal borrowings of global banks from foreign operations jumped from pre-crisis averages and financed more than 20 percent of domestic asset growth during the second half of 2007 for these banks, a figure almost doubled from pre-crisis averages. Hence a banking system that grows increasingly global may have enhanced resilience and self-adjustment in times of liquidity crisis. However, it may not rule out broader international propagations of shocks and perhaps a more limited scope for isolated intervention by national policy authorities.

As a concluding remark, in principle the importance of the internal capital markets across globalized parents and their foreign affiliates may be predicated on the regulatory and macroeconomic regimes at home and abroad. For the channels we identify the role of the foreign policy regimes warrants further careful study. The potential for viewing foreign markets as a liquidity buffer against U.S.-generated liquidity shocks may rely on the presumption that the cost of capital in foreign markets does not move in step

with the U.S. federal funds rate. In this case, it may be that those branches and subsidiaries in countries in where currencies are not pegged to the dollar are the ones that play the dominant liquidity buffer role. Indeed, existing studies using macroeconomic data already identify differences in monetary regimes on monetary policy transmission across markets that are associated with exchange rate regime. The implication is that globalization consequences for the lending channel could differ depending on whether the constellation of partners in banking contains countries that directly tie their monetary policies to those of the United States.

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**Data Appendix.**

Net due to and Net due from items are **located on schedule RC-H--Selected Balance Sheet Items for Domestic Offices of the CALL report (FFIEC 031, page 24)**

**Item Number 2941:** *NET DUE TO OWN FOREIGN OFFICES, EDGE AND AGREEMENT SUBSIDIARIES, AND IBFS*

**Data Description:** The position of the domestic offices of the bank relative to all of the bank's Edge and Agreement subsidiaries, foreign branches, consolidated foreign subsidiaries, and branches in Puerto Rico and U.S. territories and possessions. All intra-bank transactions of the domestic offices with these other offices of the bank, including investments (both equity and debt) in consolidated subsidiaries (foreign and domestic), are reflected here, since all other items are reported on a fully consolidated basis and excludes all intra-bank transactions. A single net amount for all the intra-bank due to and due from positions of the domestic office is calculated and entered either in "Net Due from Own Foreign Offices, Edge and Agreement Subsidiaries, and IBFs (2163)" or this item, depending on whether the single net amount is a net due from or a net due to balance.

**Item Number 2163:** *NET DUE FROM OWN FOREIGN OFFICES, EDGE AND AGREEMENT SUBSIDIARIES, AND IBFS*

**Data Description:**
The position of the domestic offices of the bank relative to all of the bank's Edge and Agreement subsidiaries, foreign branches, consolidated foreign subsidiaries, and branches in Puerto Rico and U.S. territories and possessions. All intra-bank transactions of the domestic offices with these other offices of the bank, including investment (both equity and debt) in consolidated subsidiaries (foreign and domestic), are reflected here, since all other items are reported on a fully consolidated basis and exclude all intra-bank transactions. A single net amount for all the intra-bank due to and due from positions of the domestic offices is calculated and entered either in "Net Due to Own Foreign Offices, Edge and Agreement Subsidiaries, and IBFs (2941)" or this item, depending on whether the single net amount is a net due from or a net due to amount.

**Figure 1**
**Share of total U.S. bank assets in globally-oriented U.S. banks**

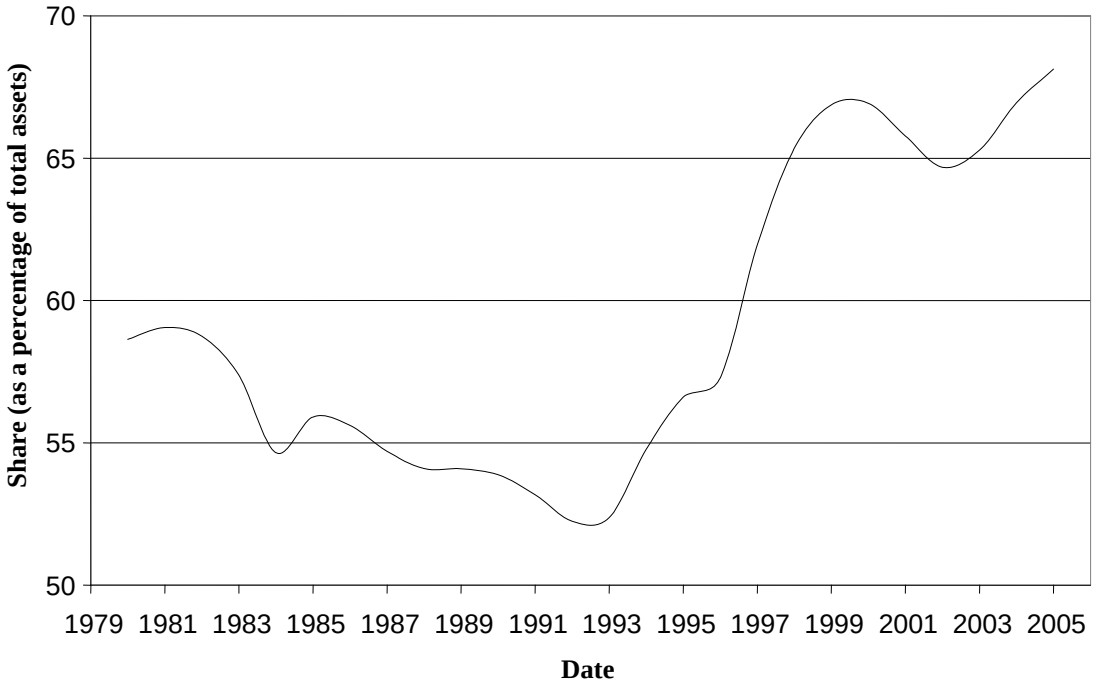


**Figure 2**
**Most global banks are large banks**

## Figure 3

**Asset distribution, 95th-99th percentile, 2005q4. Global vs. non-global banks**

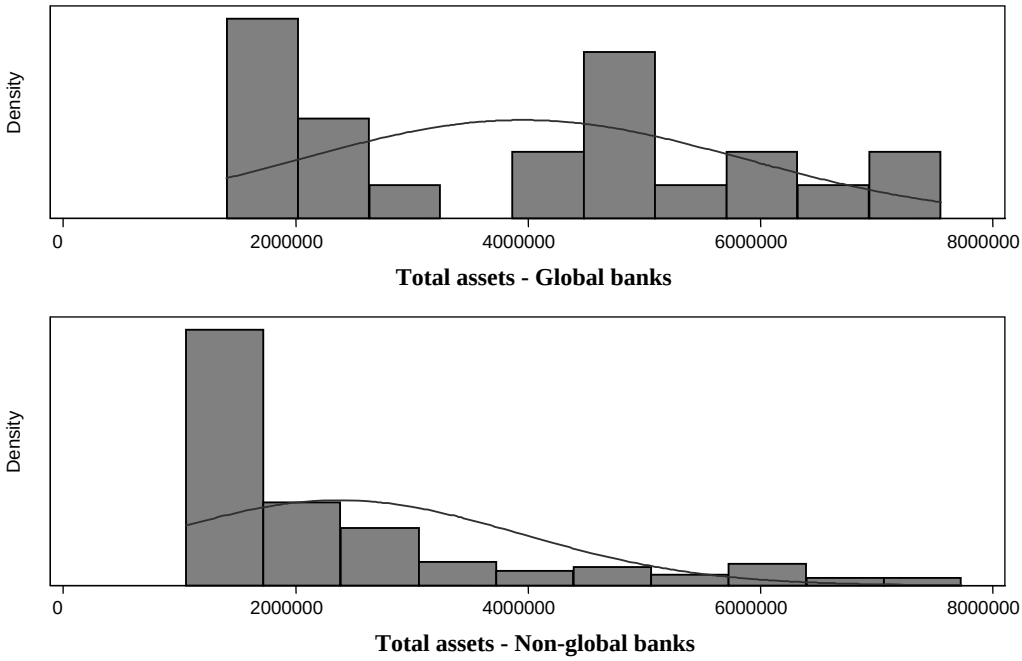
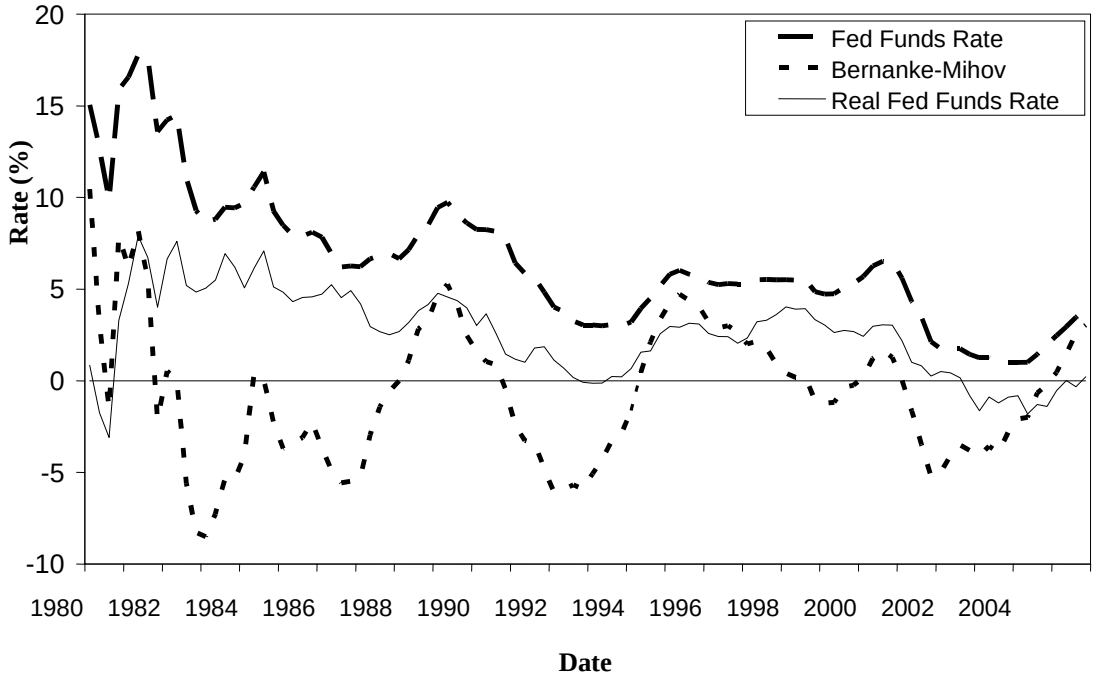


**Figure 4**
**Monetary Policy Variables**




The Bernanke-Mihov index has been modified from the original so that all three monetary policy indicators signal tightening when they increase.

**Table 1: Basic Balance Sheet Information for U.S. Banks**

| | All banks | Large domestic banks | Large global banks | Small banks in domestic BHCs | Small banks in global BHCs |
|---|---|---|---|---|---|
| Total number of bank observations (1980Q1-2005Q4) | 1,162,969 | 43,921 | 14,252 | 41,339 | 47,640 |
| Median values for bank asset size (thousands 2005USD) | | | | | |
| 1985 | 62,269 | 996,951 | 5,123,663 | 93,897 | 102,967 |
| 1995 | 73,906 | 1,775,889 | 10,358,585 | 142,711 | 134,766 |
| 2005 | 105,223 | 2,236,512 | 22,300,000 | 213,294 | 213,157 |
| Share of each bank group in total assets (%) | | | | | |
| 1985 | 100.0 | 16.6 | 56.0 | 1.4 | 2.2 |
| 1995 | 100.0 | 22.6 | 56.1 | 1.0 | 0.9 |
| 2005 | 100.0 | 17.9 | 67.9 | 0.4 | 0.3 |
| Median total loans / assets (%) | 55.6 | 61.1 | 60.4 | 57.1 | 55.5 |
| Median C&I loans / assets (%) | 17.3 | 22.8 | 35.4 | 18.4 | 21.0 |
| Median bank liquid assets / total assets (%) | 28.0 | 26.5 | 20.1 | 16.6 | 27.1 |
| Median capitalization ratio (%) | 8.7 | 7.2 | 6.4 | 8.0 | 7.6 |
| Value of nonperforming loans/ total loans (%) | 1.0 | 1.0 | 1.1 | 1.6 | 0.8 |

Data is from quarterly Call Report forms for all banks from 1980Q1 to 2006Q4. A bank is defined as global in a quarter if it reports positive foreign assets. A bank is defined as domestic if all its activity comes from offices located domestically. Large banks are those with total assets above the $95^{th}$ percentile of the total asset distribution in each quarter. Small banks are those with total assets below the $90^{th}$ percentile of the total asset distribution in each quarter. Small banks in domestic BHCs are small banks affiliated in BHCs with at least one large, domestic bank and no global banks. Small banks in global BHCs are small banks affiliated in BHCs with at least one large global bank.

**Table 2 Net due flows and Foreign Loans**
(Thousands 2005 USD)

| | | 1985q4 | 1995q4 | 2005q4 |
|---|---|---|---|---|
| Net due flows | | | | |
| Net due to | Median | 62,279 | 299,162 | 657,339 |
| | Mean | 304,304 | 955,710 | 3,856,075 |
| | Number of observations | 60 | 103 | 62 |
| Net due from | Median | 43,264 | 3,934 | 852 |
| | Mean | 458,316 | 332,548 | 983,989 |
| | Number of observations | 187 | 67 | 45 |
| (Net due to – Net due from) | | | | |
| | Median absolute value | 47,285 | 141,930 | 74,356 |
| | Mean absolute value | 420,904 | 710,111 | 2,648,189 |
| | Number of observations | 247 | 170 | 107 |
| Loans of Foreign Offices | | | | |
| Total loans | Median value across banks | 19,270 | 27 | 0 |
| | Mean value across banks | 1,599,723 | 1,977,955 | 3,129,760 |
| | Number of observations | 247 | 170 | 107 |
| | Share of total bank lending | 0.15 | 0.11 | 0.07 |
| C&I loans | Median value across banks | 4,839 | 0 | 0 |
| | Mean value across banks | 866,359 | 942,215 | 1,236,887 |
| | Number of observations | 247 | 170 | 107 |
| | Share of total C&I lending | 0.08 | 0.05 | 0.03 |
| Abs(Net due)/ total foreign loans | | | | |
| | Median value across banks | 0.70 | 1.01 | 0.98 |
| | Aggregate ratio | 0.26 | 0.35 | 0.84 |

Net due to/from indicate the position of the domestic offices of a bank relative to all of the bank's Edge and Agreement subsidiaries, foreign branches, consolidated foreign subsidiaries, and branches in Puerto Rico and U.S. territories and possessions (schedule RC-H from form FFIEC 031 – Call Report). A positive net due *to* indicates that the head office owes funds to its foreign offices. A positive net due *from* indicates that the head office is owed funds from its foreign offices. Foreign loans are the total loans booked by the foreign offices of U.S. global banks.

**Table 3 Lending Channel for Large Domestic and Large Globally-Oriented Banks**

Summed monetary variable effect on first-stage regression betas

[Prob > chi2 that summed coefficients=0]

**Total Bank Lending**

| | **Domestic Banks** | | **Global Banks** | | |
|---|---|---|---|---|---|
| | no gdp controls | with gdp controls | no gdp controls | with gdp controls | Gdp and foreign rate controls |
| Federal Funds Rate (nominal) | **0.0007** **[0.006]** | **0.0008** **[0.001]** | -0.0013 [0.161] | -0.0015 [0.154] | -0.0006 [0.591] |
| Federal Funds Rate (real) | 0.0006 [0.113] | **0.0012** **[0.006]** | 0.0003 [0.766] | -0.0004 [0.974] | 0.0002 [0.893] |
| Bernanke-Mihov index (negative*100) | **0.0003** **[0.044]** | 0.0003 [0.123] | 0.0001 [0.898] | 0.0003 [0.970] | 0.0005 [0.424] |

**Total C&I Lending**

| | **Domestic Banks** | | **Global Banks** | | |
|---|---|---|---|---|---|
| | no gdp controls | with gdp controls | no gdp controls | with gdp controls | Gdp and foreign rate controls |
| Federal Funds Rate (nominal) | **0.0012** **[0.017]** | **0.0012** **[0.032]** | -0.0009 [0.4586] | -0.0012 [0.278] | -0.0025 [0.174] |
| Federal Funds Rate (real) | 0.0008 [0.104] | **0.0012** **[0.039]** | -0.0002 [0.9036] | 0.0001 [0.945] | -0.0012 [0.459] |
| Bernanke-Mihov index (negative*100) | 0.0000 [0.944] | -0.0001 [0.763] | -0.0004 [0.7377] | -0.0007 [0.473] | -0.0009 [0.304] |

This table presents results from regressions where the dependent variable is the time series of estimated coefficients on the liquidity to asset ratio in quarterly cross-sectional regressions where the dependent variable was either growth in total bank loans or total C&I loans. The reported figures in the columns are from the sum of the estimated coefficients on the eight lags of each respective monetary policy variables. The Bernanke-Mihov index has been modified from the original so that all three monetary policy indicators signal tightening when they increase. Reported in brackets is the probability that the sum of the coefficients is significantly different from zero. The upper panel reports results from estimations where the dependent variable in the first-stage regressions was total lending growth. The lower panel reports results from estimations where the dependent variable in the first-stage regressions was total C&I lending growth. The first two columns reports results for the group of large domestic banks. The last three columns report results for the group of large, global banks. Columns 1 and 3 refer to second-stage specifications without GDP controls, while columns 2, 4 and 5 to specifications including GDP controls. Column 5 also includes foreign rate controls. Bold indicates statistical significance at least at the 10 percent level. Sample period: 1980:Q1-2006:Q4. Standard errors are computed with an 8-lags Newey-West correction for autocorrelation and heteroskedasticity.

**Table 4 Robustness checks on the Role of Large Bank Size in Monetary Effects on Lending**

Summed monetary variable effect on first-stage regression betas

[Prob > chi2 that summed coefficients=0]

**Total Bank Lending**

| | **Domestic Banks** | | **Global Banks** | | |
|---|---|---|---|---|---|
| | Excludes top 1 percentile | | Excludes top 1 percentile | | WLS 95-99 percentile |
| | no gdp controls | with gdp controls | no gdp controls | with gdp controls | with gdp controls |
| Federal Funds Rate (nominal) | **0.0011** **[0.002]** | **0.0012** **[0.0002]** | -0.0027 [0.475] | -0.0035 [0.378] | -0.0029 [0.424] |
| Federal Funds Rate (real) | **0.00075** **[0.086]** | **0.0013** **[0.004]** | 0.0010 [0.778] | -0.0008 [0.856] | 0.0012 [0.768] |
| Bernanke-Mihov index (negative*100) | **0.0003** **[0.048]** | 0.0003 [0.144] | -0.0016 [0.436] | -0.0016 [0.455] | -0.0013 [0.540] |

**Total C&I Lending**

| | **Domestic Banks** | | **Global Banks** | | |
|---|---|---|---|---|---|
| | Excludes top 1 percentile | | Excludes top 1 percentile | | WLS 95-99 percentile |
| | no gdp controls | with gdp controls | no gdp controls | with gdp controls | with gdp controls |
| Federal Funds Rate (nominal) | **0.0009** **[0.048]** | **0.0009** **[0.085]** | 0.0079 [0.216] | 0.0055 [0.383] | 0.0068 [0.274] |
| Federal Funds Rate (real) | 0.0007 [0.111] | 0.0008 [0.122] | 0.0107 [0.117] | 0.0069 [0.318] | 0.0098 [0.163] |
| Bernanke-Mihov index (negative*100) | 0.0000 [0.6586] | -0.0000 [0.981] | 0.0002 [0.944] | -0.0015 [0.528] | -0.0010 [0.631] |

This table presents results from robustness tests to the model specifications in Table 3. The dependent variable is the time series of estimated coefficients on the liquidity to asset ratio in quarterly cross-sectional regressions where the dependent variable was either growth in total bank loans or total C&I loans. The reported figures in the columns are from the sum of the estimated coefficients on the eight lags of each respective monetary policy variables. The Bernanke-Mihov index has been modified from the original so that all three monetary policy indicators signal tightening when they increase. Reported in brackets is the probability that the sum of the coefficients is significantly different from zero. The upper panel reports results from estimations where the dependent variable in the first-stage regressions was total lending growth. The lower panel reports results from estimations where the dependent variable in the first-stage regressions was total C&I lending growth. The first two columns reports results for the group of large domestic banks. The last three columns report results for the group of large, global banks. In the first four columns, the sample was curtailed at the 99$^{th}$ percentile of the asset size distribution. In the fifth column, the first stage regressions were run with weighted least squares, where the weights were represented by the asset distribution for large, non-global banks in the 95$^{th}$-99$^{th}$ percentile cluster. Bold indicates statistical significance at least at the 10 percent level. Sample period: 1980:Q1-2006:Q4. Standard errors are computed with an 8-lags Newey-West correction for autocorrelation and heteroskedasticity.

**Table 5 Monetary Effects on Real Net Due To Parent Banks from Foreign Affiliates**

| Monetary variable | baseline | Potential asymmetry of effects Coefficients when | |
|---|---|---|---|
| | | Tighter money | Looser money |
| Federal Funds Rate (nominal) | **189.1** **[0.024]** | **383.9** **[0.039]** | **206.5** **[0.013]** |
| Fed Funds Rate (real) | **229.9** **[0.022]** | **262.9** **[0.010]** | **325.6** **[0.073]** |
| Bernanke-Mihov index (negative*100) | **63.3** **[0.045]** | **118.7** **[0.064]** | 56.4 [0.225] |

This table presents results from regressions where the dependent variable is the quarterly real change in net due flows from foreign affiliates to the head office. The reported figures in the columns are from the sum of the estimated coefficients on the eight lags of each respective monetary policy variables. The Bernanke-Mihov index has been modified from the original so that all three monetary policy indicators signal tightening when they increase. Reported in brackets are the probabilities that the sum of the coefficients is significantly different from zero. Bold indicates statistical significance at least at the 10 percent level. Sample period: 1980:Q1-2006:Q4.

**Table 6 Robustness Tests of Monetary Effects on Real Net Due To Parent Banks**

| Monetary variable | Foreign rate controls | Average vs. lower capitalization banks | |
|---|---|---|---|
| | | Baseline effect | Dummy for Lower capitalization banks |
| Federal Funds Rate (nominal) | **198.6** **[0.020]** | **195.2** **[0.011]** | **229.3** **[0.038]** |
| Fed Funds Rate (real) | **325.5** **[0.004]** | 105.0 [0.233] | **295.5** **[0.006]** |
| Bernanke-Mihov index (negative*100) | **69.0** **[0.053]** | **91.14** **[0.004]** | 27.8 [0.600] |

This table presents results from robustness tests to the specification in Table 5. In all regressions the dependent variable is the quarterly real change in net due flows from foreign affiliates to the head office. The reported figures in the columns are from the sum of the estimated coefficients on the lags of each respective monetary policy variables. The Bernanke-Mihov index has been modified from the original so that all three monetary policy indicators signal tightening when they increase. The first column report results of the basic specification where foreign rate controls were also included. The last two columns report results of the specification where the effect of monetary policy is identified separately for banks with average and lower capitalization ratios. The total effect on lower capitalization banks is the sum of the baseline and dummy coefficients. Reported in brackets are the probabilities that the sum of the coefficients is significantly different from zero. Bold indicates statistical significance at least at the 10 percent level. Sample period: 1980:Q1-2006:Q4.

**Table 7 Monetary Policy and Foreign Lending**
Summed monetary variable effect on first stage betas
[Prob > chi2 that summed coefficients=0]

| Monetary variable | Total Foreign C&I Lending | | Total Foreign Lending | |
|---|---|---|---|---|
| | Without gdp controls | With gdp controls | Without gdp controls | With gdp controls |
| Federal Funds Rate (nominal) | **-0.0192** **[0.001]** | **-0.0176** **[0.004]** | **-0.0115** **[0.002]** | **-0.0124** **[0.001]** |
| Fed Funds Rate (real) | **-0.0146** **[0.012]** | **-0.0137** **[0.031]** | **-0.0115** **[0.042]** | **-0.1366** **[0.010]** |
| Bernanke-Mihov index (negative*100) | **-0.0057** [0.061] | -0.0043 [0.179] | -0.0033 [0.302] | -0.0034 [0.248] |

This table presents results from regressions where the dependent variable is the time series of estimated coefficients on the liquidity to asset ratio in quarterly cross-sectional regressions where the dependent variable was either growth in total bank loans or total C&I loans of the foreign offices of global banks. The reported figures in the columns are from the sum of the estimated coefficients on the eight lags of each respective monetary policy variables. The Bernanke-Mihov index has been modified from the original so that all three monetary policy indicators signal tightening when they increase. Reported in brackets are the probabilities that the sum of the coefficients is significantly different from zero. The first two columns report results from estimations where the dependent variable in the first-stage regressions was total lending growth of foreign offices. The last two columns report results from estimations where the dependent variable in the first-stage regressions was total C&I lending growth of foreign offices. Odd columns refer to second-stage specifications without GDP controls, while even columns to specifications including GDP controls. Bold indicates statistical significance at least at the 10 percent level. Sample period: 1980:Q1-2006:Q4. Standard errors are computed with an 8-lags Newey-West correction for autocorrelation and heteroskedasticity.

**Table 8 Results for Small Affiliated with Domestic or Globally-Oriented Banks**
Summed monetary variable effect on first-stage regression betas
[Prob > chi2 that summed coefficients=0]

| | Total Bank Lending | | | |
|---|---|---|---|---|
| | Small in Domestic Banks | | Small in Global Banks | |
| | no gdp controls | with gdp controls | no gdp controls | with gdp controls |
| Federal Funds Rate (nominal) | **0.2909** **[0.047]** | **0.5203** **[0.026]** | -0.1390 [0.764] | -0.0207 [0.970] |
| Fed Funds Rate (real) | **0.8440** **[0.000]** | **0.9411** **[0.001]** | -1.0854 [0.233] | -1.0579 [0.282] |
| Bernanke-Mihov index (negative*100) | 0.1278 [0.122] | **0.2495** **[0.016]** | -0.1084 [0.604] | -0.0145 [0.953] |

| | Total C&I Lending | | | |
|---|---|---|---|---|
| | Small in Domestic Banks | | Small in Global Banks | |
| | no gdp controls | with gdp controls | no gdp controls | with gdp controls |
| Federal Funds Rate (nominal) | **1.4342** **[0.029]** | **1.0752** **[0.087]** | -1.1977 [0.131] | -0.3404 [0.471] |
| Fed Funds Rate (real) | **2.5028** **[0.050]** | **2.6469** **[0.027]** | **-1.5803** **[0.057]** | -1.8704 [0.142] |
| Bernanke-Mihov index (negative*100) | **0.7712** **[0.035]** | **0.6619** **[0.057]** | **-0.6966** **[0.075]** | **-0.4937** **[0.042]** |

This table presents results from regressions where the dependent variable is the time series of estimated coefficients on the net income to loan ratio in quarterly cross-sectional regressions where the dependent variable was either growth in total bank loans or total C&I loans. The reported figures in the columns are from the sum of the estimated coefficients on the eight lags of each respective monetary policy variables. The Bernanke-Mihov index has been modified from the original so that all three monetary policy indicators signal tightening when they increase. Reported in brackets are the probabilities that the sum of the coefficients is significantly different from zero. The upper panel reports results from estimations where the dependent variable in the first-stage regressions was total lending growth. The lower panel reports results from estimations where the dependent variable in the first-stage regressions was total C&I lending growth. The first two columns reports results for the group of small banks members of BHCs where there is at least one large domestic bank and no global banks. The last two columns report results for the group of small banks members of BHCs where there is at least one large global bank. Odd columns refer to second-stage specifications without GDP controls, while even columns to specifications including GDP controls. Bold indicates statistical significance at least at the 10 percent level. Sample period: 1980:Q1-2006:Q4. Standard errors are computed with an 8-lags Newey-West correction for autocorrelation and heteroskedasticity.