

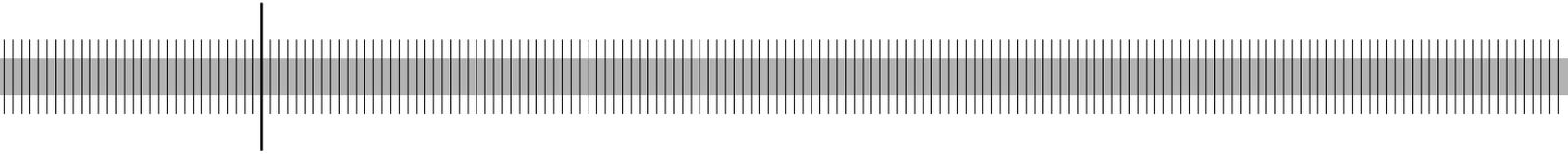
Banking globalization, monetary transmission and the lending channel

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Central Banks and Globalisation

10th Bundesbank Spring Conference
(in cooperation with the IMFS)

22-23 May 2008

Thursday, 22 May 2008

9.00 – 9.30

Introduction

Axel Weber (*Deutsche Bundesbank*)

Chair: Axel Weber (*Deutsche Bundesbank*)

9.30 - 10.30

Global business cycles: convergence or decoupling?

Speaker: Ayhan Kose (*IMF*)
Christopher Otrok (*IMF*)
Esward Prasad (*IMF*)

Discussant: Massimiliano Marcellino (*Bocconi University*)

10.30 – 10.45

Coffee break

10.45 – 11.45

Absorbing German immigration: wages and employment

Speaker: Gabriel Felbermayer (*University of Tübingen*)
Wido Geis (*ifo*)
Wilhelm Kohler (*University of Tübingen*)

Discussant: Michael Burda (*Humboldt University*)

- 11.45 – 13.15 **Lunch**
- Chair: Stefan Gerlach (*IMFS*)
- 13.15 – 14.15 **Financial exchange rates and international currency**
- Speaker: Philip Lane (*Trinity College Dublin*)
 Jay Shambrough (*Dartmouth College*)
- Discussant: Frank Warnock (*University of Virginia*)
- 14.15 – 14.30 **Coffee break**
- 14.30 – 15.30 **International Portfolios and Current Account Dynamics:
The Role of Capital Accumulation**
- Speaker: Robert Kollmann (*ECARES, Universite Libre de
Bruxelles, University Paris XII and CEPR*)
 Nicolas Coeurdacier (*London Business School*)
- Discussant: Mathias Hoffmann (*University Zurich*)
- 15.30 – 15.45 **Coffee break**
- 15.45 – 16.45 **Financial globalisation and monetary policy**
- Speaker: Michael Devereux (*University of British Columbia*)
 Alan Sutherland (*University of St Andrews*)
- Discussant: John Rogers (*Federal Reserve Board*)
- 16.45 – 17.00 **Coffee break**
- 17.00 – 18.00 **Globalization and inflation – evidence from factor augmented
Phillips curve regressions**
- Speaker: Sandra Eickmeier (*Deutsche Bundesbank*)
 Katharina Moll (*Frankfurt University*)
- Discussant: Matteo Ciccarelli (ECB)

19.30 **Dinner**

Speaker: Harold James (*Princeton University*)

Friday, 23 May 2008

Chair: Lars Jonung (*European Commission*)

10.00 – 11.00 **Globalisation of banking and the effectiveness of monetary policy**

Speaker: Linda Goldberg (*Federal Reserve Bank of New York*)
 Nicolla Cetorelli (*Federal Reserve Bank of New York*)

Discussant: Claudia Buch (*University of Tübingen*)

11.00 – 11.15 **Coffee break**

11.15 – 12.15 **Foreign capital and economic growth in the first era of globalisation**

Speaker: Michael Bordo (*Rutgers University*)
 Chris Meissner (*University of Cambridge*)

Discussant: Albrecht Ritschl (*London School of Economics*)

12.15 – 14.00 **Lunch**

Chair: Beatrice Weder di Mauro (*University Mainz*)

14.00 – 15.00 **Money, liquidity and financial stability**

Speaker: Franklin Allen (*University of Pennsylvania*)
 Elena Carletti (*Frankfurt University*)

Discussant: Wolf Wagner (*Tilburg University*)

15.00 – 15.15 **Coffee break**

15.15 – 16.15 **International linkages and financial fragility**

Speaker: Falko Fecht (*Deutsche Bundesbank*)
Hans Peter Grüner (*University of Mannheim*)
Phillip Hartmann (*ECB*)

Discussant: Roman Inderst (*Frankfurt University & IMFS*)

16.15 – 16.30 **Coffee break**

Chair Heinz Herrmann (*Deutsche Bundesbank*)

16.30 – 17.30 **Financial globalisation and regulation**

Speaker: Xavier Freixas (*Pompeu Fabra*)

Discussant: Arnoud Boot (*University of Amsterdam*)

Banking Globalization, Monetary Transmission, and the Lending Channel

Nicola Cetorelli

Federal Reserve Bank of New York

Linda S. Goldberg

Federal Reserve Bank of New York and NBER

June 4, 2008

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 2005, we find evidence for the lending channel for monetary policy in large banks, but only those banks that are domestically-oriented and without international operations. We show that the large globally-oriented banks rely on internal capital markets with their foreign affiliates to help smooth domestic liquidity shocks. We also show that the existence of such internal capital markets 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 the seminal work of Kashyap and Stein (2000), the lending channel within the United States is declining in strength as banking becomes more globalized.

Keywords: Lending channel, Bank, global, liquidity, transmission, internal capital markets

JEL Classification: E44, F36, G32

The views expressed in this paper are those of the individual authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System. We appreciate valuable discussions with Jeremy Stein, Phil Strahan and Adam Ashcraft. We also thank Sarita Subramanian, Nikki Candelore and Victoria Baranov for research assistance. Address correspondences to Nicola Cetorelli or Linda S. Goldberg, Federal Reserve Bank of NY, Research Department, 33 Liberty St, New York, N.Y. 10045. email: Nicola.Cetorelli@ny.frb.org, or Linda.Goldberg@ny.frb.org.

Non- technical summary

Monetary policy transmission through banks has long been noted as one of the key channels for policy effectiveness. (See Kashyap and Stein, 1994, 1995, 2000). This lending channel differs across players within the banking system. While lending of small banks appear to be highly responsive to monetary shocks, the same is not true for larger banks. In a country where the average size of banks has progressively increased, the implication of this is that the lending channel seemed destined to a more marginal role in the United States. We re-examine the evidence on the lending channel in light of the considerable changes in the size and structure of U.S. banking in recent decades. Of particular focus is the observation that bank balance sheets have evolved significantly, partly as a result of increased international activities.

Using data for all U.S. banks between 1980 and 2005, we show that this process of "globalization" of U.S. banking has had a deep and pervasive impact on the transmission mechanism of monetary policy. Large banks with a global presence are indeed insulated from domestic monetary shocks. At the same time, large banks with domestic-only activity exhibit sensitivity to monetary policy. Our results thus indicate a stronger domestic lending channel than implicit in former studies. Our results also suggest that the lending channel within the United States is declining in strength as banking becomes globalized. Furthermore we 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 since transmission to foreign markets and associated lending are enhanced. Finally, it is worth noting that our findings introduce a new dimension of the debate on globalization effects on monetary policy and real activity in the United States. While former contributors to this debate focus on issues like whether the Phillips Curve has flattened, we show that globalization of banking has consequences for the transmission of monetary policy to the real economy through the lending channel.

Nichttechnische Zusammenfassung

Die geldpolitische Transmission über den Bankensektor wird schon lange als einer der zentralen Kanäle betrachtet, der über die Effektivität der Geldpolitik entscheidet. (Siehe Kashyap und Stein, 1994, 1995, 2000). Dieser Kreditkanal ist von Bank zu Bank unterschiedlich. Die Kreditgewährung kleiner Banken reagiert stark auf geldpolitische Schocks, während dies für große Banken nicht gilt. Da die durchschnittliche Größe der Banken in den USA stetig zugenommen hat, schien der Kreditkanal zunehmend eine marginale Rolle zu spielen. Wir überprüfen deshalb die Existenz des Kreditkanal im Lichte der beträchtlichen Veränderungen hinsichtlich der Größe und der Struktur der U. S. Banken in den letzten Jahrzehnten. Insbesondere ist von Interesse, dass sich die Bankbilanzen im Zuge der verstärkten internationalen Aktivitäten verändert haben.

Wir verwenden Daten für alle amerikanischen Banken zwischen 1980 und 2005 und zeigen, dass dieser Prozess der "Globalisierung" von US Banken einen tiefen Einfluss auf den geldpolitischen Transmissionsprozess hatte. Große Banken mit weltweiter Präsenz sind in der Tat von geldpolitischen Schocks abgeschirmt. Andererseits reagieren große Banken, die nur auf das Inland konzentriert sind, sensitiv auf die Geldpolitik. Unsere Ergebnisse legen deshalb einen stärkeren heimischen Kreditkanal nahe als frühere Studien. Gleichzeitig implizieren sie, dass mit der fortschreitenden Globalisierung des Bankensystems der Kreditkanal schwächer wird. Weiterhin wird gezeigt, dass die gesamten Wirkungen der Geldpolitik über den Kreditkanal unterschätzt werden, wenn wir uns nur auf die amerikanischen Märkte konzentrieren. Schließlich erweitert unsere Studie die Debatte um die Globalisierung und ihre Effekte auf Geldpolitik und die Realwirtschaft in den USA. Während frühere Beiträge sich auf Themen wie die Auswirkungen auf die Phillips-Kurve konzentriert haben, zeigen wir, dass die Globalisierung der Banken Folgen für die Transmission der Geldpolitik durch den Kreditkanal auf den realen Sektor hat.

I. Introduction

Monetary policy transmission through banks has long been noted as one of the key channels for policy effectiveness. Seminal work by Kashyap and Stein (1994, 1995, 2000) shows that this lending channel differs across players within the banking system of the United States. While lending of small banks appear to be highly responsive to monetary policy shocks, the same is not true for larger banks. The main reason for the difference within the population – the authors argue - stems from the presumed greater ability of large banks to substitute reservable deposits with other external sources of funds, so that the shock to the liability side of their balance sheet from monetary policy is not transmitted to the asset side.

The Kashyap and Stein results provide a mixed picture of the lending channel. While they indicate that such a channel exists, the effectiveness is also shown to be limited to the lending of the smaller banks. In an industry where the average size of banks has progressively increased, the lending channel seemed destined to a more marginal role. We re-examine the evidence on the lending channel in light of the considerable changes in the size and structure of U.S. banking in recent decades. Of particular focus is the observation that bank balance sheets have evolved significantly as a result of increased international activities.

Figure 1 shows the share of total U.S. assets of banks that have global orientation, where we define a bank as having global orientation if it reports positive assets from foreign offices.¹ While global banks accounted for half of U.S. banking system assets through the early part of the 1990s, by 2005 they directly accounted for about seventy percent of U.S. banking system assets. The share of assets from foreign offices within the total assets of global banks is also of significant size. As Figure 2 shows, it has fluctuated between twenty and thirty percent of total assets over the recent decades.² We conjecture and show that this process of “globalization” of U.S. banking has had a deep and

¹ For reporting purposes, foreign offices are branches or consolidated subsidiaries in a foreign country, International Banking Facilities, majority-owned Edge or Agreement subsidiaries. Moreover, a branch or consolidated subsidiary in Puerto Rico or a U.S. territory or possession is also considered a “foreign” office for reporting purposes.

² The reasons for bank globalization are posited to include search for risk-adjusted returns, as in Garcia-Herrero and Medeiros (2007), and technological advances and institutional environments of home and host countries, as in Claessens and VanHoren (2008).

pervasive impact on the transmission mechanism of monetary policy. Barring truly global events, banks with activities in multiple countries can reallocate funds in the event of a liquidity shock occurring either domestically or abroad. Our argument thus presumes that banking organizations actively operate internal capital markets, in which the global banks move liquid funds between domestic and foreign operations on the basis of relative needs. Hence, according to this conjecture the shock to reservable deposits caused by a change in monetary policy would be absorbed through *internal* sources of funding rather than exclusively through an attempt to access external capital markets. This theme is of interest to macroeconomics for the insights generated on the monetary transmission mechanism, to international finance for implications on the propagation of shocks across borders, and to corporate finance and banking studies by providing evidence of existing capital market frictions even for very large institutions.

Using quarterly data for all U.S. banks between 1980 and 2005 we find evidence that large U.S. banks with a global presence are indeed insulated from domestic monetary policy shocks. We also find that it is exactly their global nature that allows insulation. Differently from any study on internal capital markets that we know of, in this particular case we are able to use data on actual internal flows of funds between a bank's own domestic and foreign offices. We find that globally-oriented U.S. banks reallocate funds internally – and in a sizeable manner - in response to domestic monetary policy shocks. At the same time, large U.S. banks, but those with domestic-only activity, exhibit sensitivity to monetary policy. For these banks there does not seem to be complete frictionless access to alternative sources of funds, whether internal or external. Hence, size *per se* is not a sufficient trait to explain insulation. Rather it is the global nature of the bank that effectively determines (or at the very least highly contributes to) insulation from monetary policy. Our results thus indicate a 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 remain exposed to changes in monetary policy. At the

same time, our results also suggest that the lending channel within the United States is declining in strength as banking becomes more globalized.³

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. We look at the response of lending of the *foreign offices* of U.S. global banks to a change in domestic monetary policy and find evidence consistent with the existence of an international mechanism of transmission of monetary policy. 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 traditional field 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 through the lending channel.

II. The Logic and Estimation of the Lending Channel

The main argument behind the lending channel of monetary policy, explicated in Bernanke and Blinder (1992), is that tight money should reduce the volume of reservable

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 Loutschina and Strahan, forthcoming).

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 (forthcoming), Frankel, Schmukler and Servén (2004), and Obstfeld, Shambaugh, and Taylor (2005).

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

Kashyap and Stein (2000) provide seminal evidence on the scale of the lending channel of monetary policy in the United States using data from the period from the late 1970s through 1993. They argued 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. The extent to which banks can convert their balance sheet liabilities into lending also depends on general liquidity conditions in financial markets. The key Kashyap and Stein insight is that monetary policy influences lending activity by altering the sensitivity of lending to balance sheet health. 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 sources in the event that the Federal Reserve restricts banking sector liquidity. One main conclusion was that evidence for the lending channel was concentrated in a part of the banking system that accounts for a relatively small slice of overall U.S. bank lending.

The role of sources of funds internal to banking networks was raised by Campello (2002), who demonstrated that even lending by small banks may be partially insulated from monetary policy shocks if they are part of banking networks. Using data on individual U.S. banks between 1981 and 1997, Campello showed that the funding of new

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.

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.

loans by small banks that are members of bank holding companies is less dependent on bank's own cash flow than is funding by independent or standalone small banks.⁷

Our empirical strategy follows from these insights on external and internal capital market access by different types of banks, and sets out to make three main points about the consequences of taking into account U.S. bank globalization. First, banks with a global outreach are in a better position to absorb liquidity shocks because of their unique ability to activate an internal capital market *between their domestic and foreign offices*. The implicit corollary is that otherwise similar banks without access to this potential internal source of funds may instead remain exposed to monetary policy changes. Second, the differences in the observed lending channel across domestic-only and global banks are not exclusively due to the differences in their size. We provide direct evidence of internal capital markets at work, with such flows compensating for the funding shortfalls. Third, the lending channel consequences of monetary policy are larger than the current conventional wisdom. This arises both because of the large domestic-only banks that are influenced by U.S. monetary policy, and also because we demonstrate that the transmission of shocks appears through the lending activity done in foreign markets by affiliates of U.S. banks. As a final point, we also show that the internal capital markets argument applies to small banks in the United States, since those small banks that are part of a banking network containing global banks achieve insulation not afforded to small banks in domestic-only banking networks.

Identification strategy

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

⁷ This line of research is closely related to the earlier work by Houston, James and Marcus (1997). Important extensions are the contributions by Ashcraft (2006), Ashcraft (forthcoming) and Ashcraft and Campello (2007).

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, but domestic only, banks. The general stage 1 specification is:

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

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.

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 β_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 β_t coefficients for each class of banks under consideration. A bank's capitalization ratio, its asset size, and the value of its non performing loans are included as bank-specific lagged controls. The vector of controls also includes indicator variables for the state where the bank headquarter is located and whether or not the headquarter is 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 β_t series estimated in the first step are used as dependent variables to determine how lending sensitivity varies with monetary policy. This second step, which follows Campello (2002), is summarized by the following specification:

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

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.

The next main element of our analysis focuses on whether differences among the large global and large domestic banks are attributable to operable internal capital markets of the global banks. This element is needed, since our first set of results could merely reflect a size differential, since even within the top five percent in the asset distribution the median domestic banks are substantially smaller than the median global banks. Consequently a finding of limited or absent sensitivity to monetary policy could just be, as in Kashyap and Stein (2000), the result of better access to alternative sources of external funding.

We are able to provide direct evidence that an internal capital market exists and that it is mobilized in response to domestic monetary policy changes. Normally data on internal transactions within an organization are unavailable in any systematic format, which is the reason why 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 (hopefully exogenous) shock to the other side. However, as part of their filing duties, U.S. banks are required to report quarterly the value of the net liabilities (or claims) between their domestic offices and their foreign offices. These balance sheet items record the aggregate value of all transactions between offices, including internal

loans and borrowings.⁸ 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 .

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

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

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 ϕ_j on the monetary policy indicators.

The third set of key results that are provided on bank globalization and monetary transmission investigate 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

⁸ Net Due To or From Own Related Offices in Other Countries is reported in schedule RC-H of Form 030 (Call Report).

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 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, through bank holding companies, between the parent banks and affiliated small banks within the United States. 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. These results are included to address the existing work on internal capital markets and small banks, as presented by Campello (2002).

III. The Data

The sample of banks. We examine data on banks and liquidity conditions for the period from 1980Q1 through 2005Q4. 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, 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. A large bank is defined as any bank that is in the 95th percentile or higher of banks sorted by asset size, with this

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>.

categorization performed in every quarter of the sample period. A small bank is defined as any bank that is in the 90th percentile or lower.

U.S. bank 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 95th and the 99th percentile. Our definition of small banks, as those in the 90th percentile or smaller of banks sorted by asset size, differs from Kashyap and Stein (2000), who use a 95th percentile cut-off.¹⁰ We follow Campello (2002) in our sample choice, and, by leaving out the intermediate group of banks between the 90th and 95th percentile, 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. The full sample of banks is described, as are the sub-samples containing the large domestic banks, the large global banks, the group of small banks affiliated with domestic bank holding companies, and the small banks affiliated with global bank holding companies. We use Call Report data on foreign assets and foreign liabilities of branches and subsidiaries to determine whether a bank is global or not. 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. Within the group of banks represented, 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

¹⁰ Kashyap and Stein (2000), for instance, reported separate results on the effects of monetary policy for banks below the 95th percentile (their “small” banks), banks between the 95th and the 99th and banks in the top 1 percent. Their main result was to find a significant effect of monetary policy on small banks only, and mainly insignificant coefficients, or significant but with opposite sign, for the two largest groups of banks. Hence, their results indicated overall insulation from monetary policy for banks in the top 5 percent of the size distribution. We do not split our sample between banks in the 95th to 99th and banks in the top 1 percentile. We already are performing a split between large domestic and large global, so that any further divisions would result in insufficient observations for a meaningful statistical comparison across groups.

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.¹¹ 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 offices¹² and the second type is net due with foreign offices.¹³ 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.

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. Third, while foreign lending has risen – both total and C&I lending – the median bank is not engaged in this activity recently. This is dominated

¹¹ The patterns are the same when small banks affiliated with global BHCs are compared with small banks affiliated with domestic BHCs.

¹² These data are from schedule RC-C of the Call Report, item RCFN 2122 (total loans) and RCFN 1763+1764 (C&I loans).

¹³ 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).

by very large global banks, as reflected in the means across the years. 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 (1998) measure.¹⁴ 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 3. 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.¹⁵

¹⁴ 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.

¹⁵ The differences in definition and construction across these measures generate positive but not necessarily tight correlations among them, as reported in Appendix Table 1. The tightest correlations are among the nominal and real Federal Funds rate series, 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

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. Our main comparison is between 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. In total, Table 3 summarizes results from twenty-four regressions: twelve for

measure is more tightly correlated with the nominal Federal Funds rate than the real rate, 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.

large, global banks and twelve for large, domestic banks. Results highlighted in bold are those where monetary policy consequences for lending are statistically significant at the 10 percent level and which indicate an active lending channel for monetary policy.

First, consider the results in the second set of columns of Table 3, which are based on regression analysis over the sample of large, global banks. The sums of coefficients are never significant at standard significance levels. In these banks we do not observe the lending channel of monetary policy transmission at work. The more surprising results are provided in the first set of columns, which reflect the effects of liquidity measures on bank balance sheets and lending by large, but domestic-only banks. Strikingly, in seven out of twelve of the regressions the sums of coefficients are statistically significant and positive, and marginally significant in one additional specification. This finding of a substantive effect of monetary policy on lending by large banks contrasts with the Kashyap and Stein (2000) results, which had pooled together the large domestic and large global banks. Our results show that when the large bank sample is split along domestic versus global lines, tighter monetary policy is significantly associated with more binding balance sheet constraints on large banks, but only on the domestically-oriented group of banks.

This set of results provides an important insight into the Kashyap and Stein (2000) result that large banks are shielded from monetary policy shocks because of their innate ability to freely access alternative sources of funds. This access to external capital markets is not completely frictionless for large banks: once we remove the banks with global operations from the cluster of large banks, size itself may not be a sufficient trait to provide insulation. Stated differently, this result can be evidence that in fact globalness is a trait that helps explain why the aggregated class of large banks seems to be insulated from monetary policy. Later in Section IV we turn to the economic significance of these findings and the strength of our documented internal capital markets within global banks in explaining the difference between the domestic and global large banks.

Flows Between Global Banks and Their Foreign Affiliates. If globalness is such a trait, one challenge is to identify the means through which global banks achieve this. As we have noted, one way global banks can do this is by maintaining an active 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, we use equation specification (3), on the “net due” from foreign operations to the parent and report the results in Table 4. 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 4 show that the pattern of funds flow responds to changes in monetary policy, and this effect is 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. The results show that 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.

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 would be the case without 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 should expect that 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 5, and Total Foreign Lending, shown in the second set of columns of Table 5. 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 5 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.

Internal Capital Markets and 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 argued 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 (2002), 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 6 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.

Overall potency of the lending channel. The analyses presented above using bank-specific data provide very clear *qualitative* lessons on the consequences of globalization of banks for the lending channel. In this section, we pull together those empirical results in order to gauge both their *quantitative* economic significance and the role of internal capital markets in global banks in explaining differences across the large banks. We undertake exercises similar to those in Kashyap and Stein (2000), computing 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 that banks are liquidity constrained if they are below the 90th 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.¹⁶

¹⁶ 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.

For all of the quantitative exercises, we use the estimated coefficient 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 3.¹⁷ From examining the Call Report data, across large domestic banks the value of the liquidity-to-asset ratio at the 90th percentile is 0.40 and the median value for banks below the 90th 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 (0.008×1.64). 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.

Recall the key result that the global banks were not significantly affected by monetary policy variables and the conjecture that the net dues adjustment, representing internal capital markets at work within the globalized banks, provides the offset on the liability side of the balance sheet so that asset side adjustments through loans do not occur. In the next paragraphs we compute the quantities of loan adjustment that would have occurred for the global banks if they did not have this net due offset and compare these quantities with the estimated net due changes.

Consider the magnitude of a change in net due flows in response to a 100 basis point increase in the nominal Federal Funds rate. The estimated sum of the coefficients on the monetary policy variable for that model specification was equal to 189.07. Since the net due variable was 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

¹⁷ 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.

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 (189.07×250.7), 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 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, but domestic-only 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.¹⁸ Hence, the estimated magnitude of the response of net due flows for the median global bank from our monetary policy experiment can deliver the additional funds needed to insulate the liability side of the bank balance sheet and mitigate the type of lending reduction occurring in domestic-only banks due to tighter domestic funding conditions.

In terms of lending spillovers from large banks, we can assess the domestic consequences across affiliated small banks and affiliated foreign branches and subsidiaries. For the economic impact on lending of small banks, we use the estimated coefficients from Table 6. An increase of 100 basis points produces a decline in C&I loan growth of 0.4 percentage points for the small domestic banks affiliated with a domestic-only BHC. Considering the median in C&I loan growth for the bank group was 0.7

¹⁸ Computed as follows: The 90th pct in $\log(\text{liquid asset ratio})$ 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 = $21\text{Bn} * 0.003 = 63\text{Mn}$.

percent, the monetary tightening effect corresponds to 57 percent of the median value of loan growth. For total lending, the change in loan growth was calculated to be equal to 0.28 percentage points, corresponding to 19 percent of the median value in loan growth. These contractionary lending effects from monetary tightening are not evident in the small banks that are part of a BHC with large global banks.

For the transmission of U.S. monetary policy to foreign loans through global banks we use Table 5 estimates and conclude that the economic significance of U.S. monetary policy on foreign lending is 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 75th 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.

Continuing with the domestic lending channel consequences, if we add to this large number the results from lending channel effects through the small banks affiliated with large domestic banks, the lending channel emerges even more potent than previously estimated. Going back to the aggregate evaluation, in the fourth quarter of 2005 the total lending of small banks affiliated with large banks was about \$31 Billion.

Of this grand total, \$21 Billion came from small banks affiliated with large, domestic-oriented ones. Consequently, about 66 percent more lending of small banks are potentially affected through the lending channel than previously suggested. While this lending figure is an order of magnitude smaller than the one calculated for large banks, its economic significance cannot be discounted both due to the size of the estimated median loan growth response for the banks and the observation that small banks serve principally small and medium size enterprises, which in turn have a central role in the overall engine of U.S. economic growth. These consequences are just the domestic ones, with the lending channel also transmitted abroad through affiliated banks.

As a final remark, while we are showing that globalization has a first-order impact on the conduct of monetary policy and that the lending channel is stronger than estimated without taking this process into account, our analysis highlights time variation in these effects. The potency of the lending channel evolves as the banking industry trends toward increasing globalization. In 1995, large global banks issued about 55 percent of total loans, as opposed to about 65 percent of total loans in 2005. Suppose the estimated parameters from our regression exercises were stable over time, and consider the counterfactual of an increase in the share of global banks by another 10 percentage points, to 75 percent of total domestic lending. For a lower bound on this impact, we assume that total lending issued by non-global banks, large or small, has the sensitivity to monetary policy estimated for the large banks, at 0.13 percent, as in the numerical exercise described after Table 3. Total lending by non-global banks was about \$1.8 trillion in the fourth quarter of 2005. Assuming a median loan growth rate of 1.9 percent, an increase in the Federal Funds rate of 100 basis points would reduce loan growth by about 7 percent, “shaving” loan growth by about \$2.3 billion over eight quarters. If the share of total lending issued by global banks were instead 75 percent of the current \$4.8 trillion, monetary tightening would have instead reduced lending by about \$1.56 billion. While this is still the same 7 percent reduction in loan growth, it amounts to a 33 percent reduction in the amount of new lending that is affected by monetary policy through the lending channel.

V. Conclusions

Our goal was to investigate whether 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 sensitivity to monetary policy in support of the lending channel.

Insulation of large global banks relative to large domestic-only banks arises due to a functioning internal capital market between globalized parents in the United States and their foreign affiliates. We demonstrate this point by showing that the net due flows between parents and affiliates respond to U.S. monetary policy. Globalness is part of the insulation of large banks from domestic liquidity shocks, with this form of insulation apparently unavailable to the domestic only banks. Some of these differences in the lending channel across banks also extend to small banks, depending on whether they are affiliated with large domestic banks or large global banks through bank holding companies.

The consequences of these results are statistically and economically significant. The mechanisms we identify imply that, under globalization, the impact of the liquidity shock 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. Using bank-specific data, we show that the lending of foreign offices of U.S. banks is affected by U.S. monetary policy, and these foreign offices can rely less on support from parent bank balance sheets in times of tighter liquidity conditions in the United States. While the *domestic* impact of monetary policy through the lending channel may have diminished over time as globalization progressed, our other observation that this channel influences foreign market activity suggests an expanded breadth of effects of domestic liquidity changes.

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

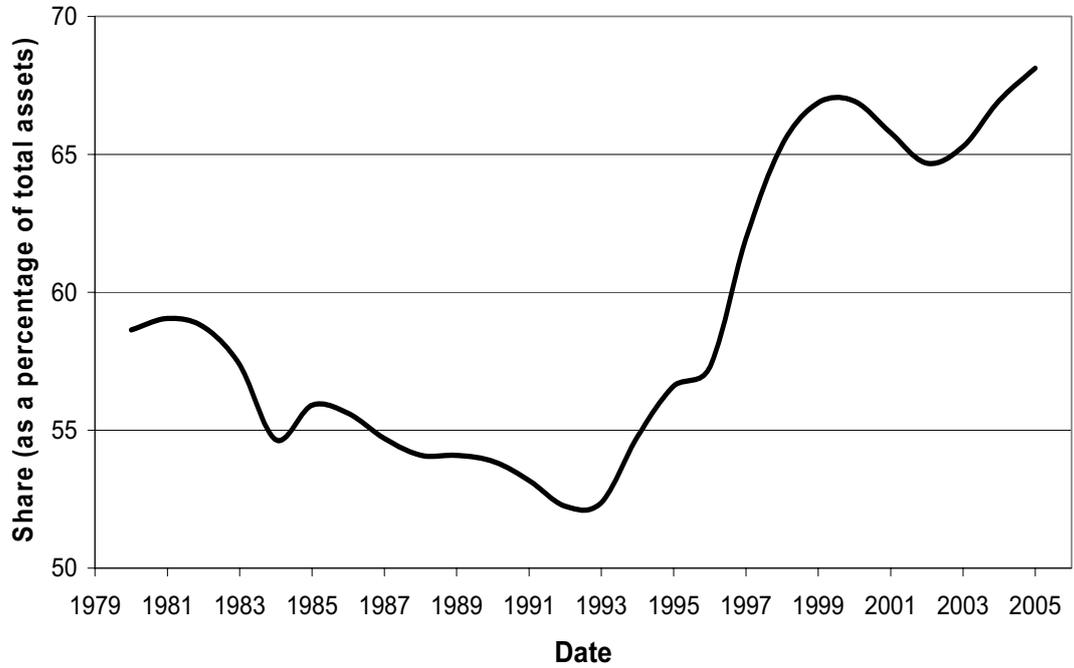


Figure 2
Share of foreign assets in total assets in globally-oriented U.S. banks

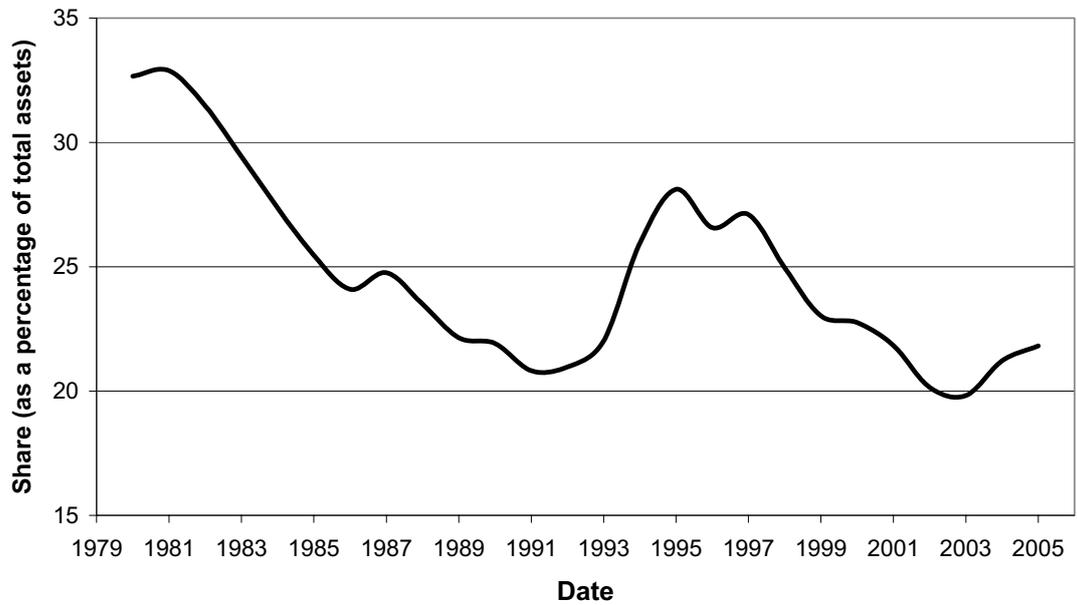
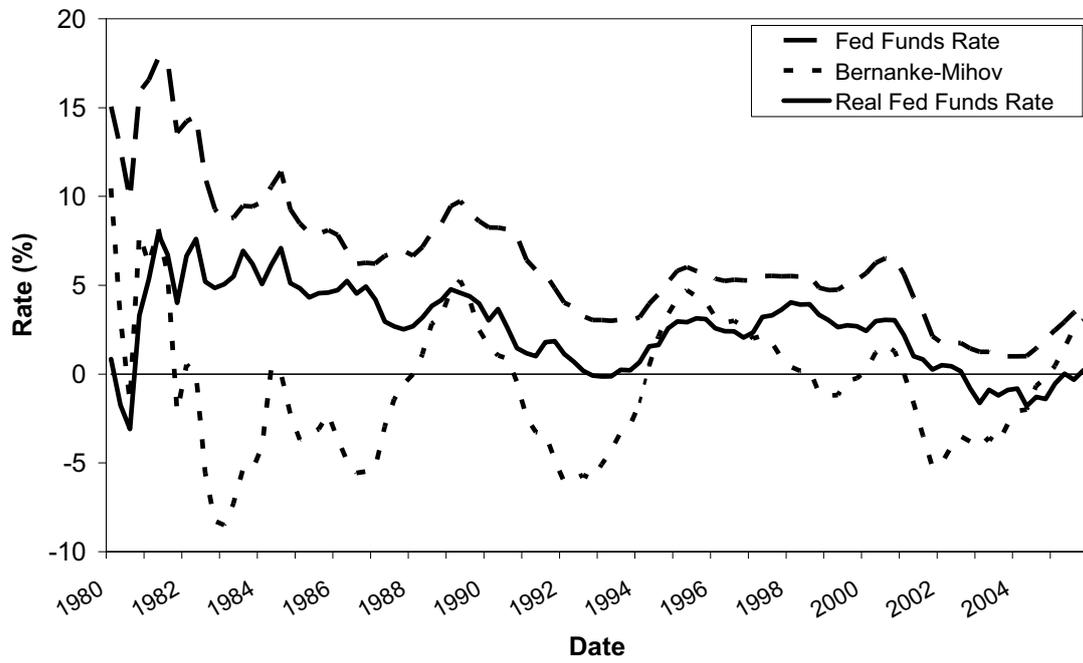


Figure 3
Monetary Policy Variables



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 2005Q4. 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 95th percentile of the total asset distribution in each quarter. Small banks are those with total assets below the 90th 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 |
| Federal Funds Rate (nominal) | 0.0007 [0.0059] | 0.0008 [0.0011] | -0.0013 [0.1609] | -0.0015 [0.1535] |
| Federal Funds Rate (real) | 0.0006 [0.1125] | 0.0012 [0.0060] | 0.0003 [0.7658] | -0.0004 [0.9741] |
| Bernanke-Mihov index (negative*100) | 0.0003 [0.0442] | 0.0003 [0.1229] | 0.0001 [0.8984] | 0.0003 [0.9696] |
| | Total C&I Lending | | | |
| | Domestic Banks | | Global Banks | |
| | no gdp controls | with gdp controls | no gdp controls | with gdp controls |
| Federal Funds Rate (nominal) | 0.0012 [0.0171] | 0.0012 [0.0315] | -0.0009 [0.4586] | -0.0012 [0.2776] |
| Federal Funds Rate (real) | 0.0008 [0.1041] | 0.0012 [0.0392] | -0.0002 [0.9036] | 0.0001 [0.9454] |
| Bernanke-Mihov index (negative*100) | 0.0000 [0.9436] | -0.0001 [0.7634] | -0.0004 [0.7377] | -0.0007 [0.4727] |

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 are 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 two columns report results for the group of large, global banks. 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:Q1-2005:Q4. Standard errors are computed with an 8-lags Newey-West correction for autocorrelation and heteroskedasticity.

Table 4 Monetary Policy and Net Due to Parent Banks from Foreign Affiliates

| Monetary variable | Real net inflows to parent (net due to less net due from) | | |
|--|--|--------------------------------|----------------------------|
| | baseline | Asymmetry Coefficients when | |
| | | Tighter money | Looser money |
| Federal Funds Rate (nominal) | 189.076 [0.0243] | 383.854 [0.0391] | 206.456 [0.0132] |
| Fed Funds Rate (real) | 229.856 [0.0216] | 262.875 [0.0102] | 325.586 [0.0725] |
| Bernanke-Mihov index (negative*100) | 63.218 [0.0446] | 118.725 [0.0636] | 56.400 [0.2249] |

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:Q1-2005:Q4. Standard errors are computed with an 8-lags Newey-West correction for autocorrelation and heteroskedasticity.

Table 5 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 [0.0006] | -0.0176 [0.0038] | -0.0115 [0.0018] | -0.0124 [0.0009] |
| Fed Funds Rate (real) | -0.0146 [0.0118] | -0.0137 [0.0311] | -0.0115 [0.0417] | -0.1366 [0.0098] |
| Bernanke-Mihov index (negative*100) | -0.0057 [0.0610] | -0.0043 [0.1792] | -0.0033 [0.3020] | -0.0034 [0.2479] |

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:Q1-2005:Q4. Standard errors are computed with an 8-lags Newey-West correction for autocorrelation and heteroskedasticity.

Table 6 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 [0.0471] | 0.5203 [0.0258] | -0.1390 [0.7638] | -0.0207 [0.9697] |
| Fed Funds Rate (real) | 0.8440 [0.0001] | 0.9411 [0.0009] | -1.0854 [0.2329] | -1.0579 [0.2823] |
| Bernanke-Mihov index (negative*100) | 0.1278 [0.1218] | 0.2495 [0.0155] | -0.1084 [0.6038] | -0.0145 [0.9528] |
| | 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 [0.0290] | 1.0752 [0.0874] | -1.1977 [0.1310] | -0.3404 [0.4713] |
| Fed Funds Rate (real) | 2.5028 [0.0499] | 2.6469 [0.0267] | -1.5803 [0.0571] | -1.8704 [0.1420] |
| Bernanke-Mihov index (negative*100) | 0.7712 [0.0351] | 0.6619 [0.0566] | -0.6966 [0.0745] | -0.4937 [0.0420] |

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:Q1-2005:Q4. Standard errors are computed with an 8-lags Newey-West correction for autocorrelation and heteroskedasticity.

Appendix Table 1: Correlations of Measures of Monetary Policy

| Correlation 1980Q1 to 2005Q4 | | | |
|------------------------------|-------------------------------|----------------------------|---------------------------|
| | Nominal Federal Funds Rate | Real Federal Funds Rate | Bernanke-Mihov Measure |
| Nominal Federal Funds Rate | 1 | | |
| Real Federal Funds Rate | 0.71 | 1 | |
| Bernanke-Mihov Measure | 0.41 | 0.14 | 1 |

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

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