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Three Essays On

The Bank Lending Channel

Der Wirtschaftswissenschaftlichen Fakultät

der Universität Passau eingereichte

DISSERTATION

zur Erlangung des Grades eines

doctor rerum politicarum (Dr. rer. pol.)

vorgelegt von

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Passau, März 2008

ZUSAMMENFASSUNG

Wie werden monetäre Impulse der Zentralbank auf die Realwirtschaft übertragen? Diese immer noch nicht abgeschlossene Debatte um die Funktionsweise der Zentralbankpolitik beschäftigt Ökonomen seit über zweihundert Jahren. Die gegenwärtige Antwort der Forschung hierzu ist eine Reihe von Transmissionskanälen. So haben neben dem traditionellen Zinskanal der Vermögens-, der Wechselkurs, der Erwartungs- und der Kreditkanal Eingang in die Lehrbücher gefunden. Beim Kreditkanal wird üblicherweise zwischen dem Bilanzkanal und dem Bankkreditkanal bzw. Bank Lending Channel (BLC) unterschieden. Letzterer steht im Fokus dieser Arbeit und ist 1988 von Bernanke und Blinder entwickelt worden. Dabei wird postuliert, dass sich monetäre Impulse nicht nur über relative Preise wie Zinssätze oder Vermögenspreise auf die Realwirtschaft übertragen. Stattdessen wird ein zusätzlicher Effekt auf die gesamtwirtschaftliche Nachfrage über das Kreditvolumen propagiert. Da die Zentralbank über das Bankkreditangebot ebenfalls die Kreditmenge steuern kann, habe sie eine weitere Einwirkungsmöglichkeit auf das Ausgabeverhalten der Wirtschaftssubjekte. Daher untersuchen auch Bernanke und Blinder (1988) auf der Grundlage ihres Modells, inwieweit sich quantitative Größen wie Kredit- und Geldmenge als Steuerungsziel und auch als Zwischenziel für die praktische Zentralbankpolitik eignen.

Diese Ansicht von Vertretern des BLC, dass also die Zentralbank die Kreditmenge und damit unabhängig von relativen Preisen die gesamtwirtschaftliche Nachfrage beeinflussen kann, wird in dieser Arbeit in theoretischer und empirischer Hinsicht kritisch hinterfragt. Diese Auffassung spricht nicht nur dem Kreditvolumen sondern auch der Geldmenge einen zusätzlichen Transmissionseffekt zu. Dem vielfach vermuteten Einfluss der Geldmenge auf die Vermögenspreise und die Inflation liegen dem BLC vergleichbare Argumentationsmuster zu Grunde. Dieses ist zwar nicht Gegenstand dieser Arbeit, steht aber gegenwärtig ebenfalls auf dem Prüfstand. Als Beispiel kann da die umstrittene Diskussion um die Rolle der Geldmenge bei der Erklärung der Höhe der Vermögenspreise oder die kontroverse Debatte um die zweite, monetäre Säule der Europäischen Zentralbank dienen.

Die vorliegende Arbeit konzentriert sich aber auf den BLC und die Kreditmenge und besteht aus drei Aufsätzen, obwohl jeder Essay als separate Einheit versanden werden kann. Da jedoch der Fokus dieser Essays auf den gleichen Unterssuchungsgegenstand ausgerichtet ist, werden die

Aufsätze in Kapitel umbenannt und in dieser vorliegenden Abhandlung, die mit einer kurzen historischen Würdigung des BLC eröffnet (Kapitel I), zusammengefasst. Zunächst aber erfolgt eine Zusammenfassung der Aufsätze (Kapitel II-IV), die dem Leser einen Ausblick auf die Ergebnisse dieser Arbeit gewähren soll.

Aufsatz 1 (Kapitel II): Auf theoretischer Ebene werden Kritikpunkte gegen den BLC und gegen die erste und richtungweisende Modellierung von Bernanke und Blinder (1988) präsentiert. Zentrale Modellfunktionen wie die der Kreditnachfrage, des Geldangebots und der Geldnachfrage sind unplausibel konstruiert. Dabei vermag die Logik des BLC für einzelne Investoren, die vom verminderten Bankkreditangebot betroffen sind, gelten. Bei gegebenem Zinsniveau gilt dieses Argument aber nicht für den ganzen wirtschaftlichen Sektor, da die Reduktion von Bankkrediten nicht die Nachfrage nach Investitionsgütern sondern nur die Geldhaltung mindert.

Aufsatz 2 (Kapitel III): Seit 1988 haben Forscher das Modell von Bernanke und Blinder benutzt, um die Frage nach der quantitativen Relevanz des BLC empirisch zu klären. Cecchetti (1995) und Hubbard (1995) erfassen die Entwicklung der Empirie bis dato, die überwiegend in den USA mit US Zahlenmaterial stattfand. Hier wird ein Überblick über die Literatur seit Mitte der 90-er präsentiert, der die Entwicklung in Europa einfängt. Vorherrschend ist dabei, dass europäische Zentralbankforscher Ansätze von Kashyap und Stein (1995, 2000) und von Kishan und Opiela (2000) zum US-Transmissionsmechanismus. Zentrales Merkmal dieser Ansätze ist, dass sie als erste nicht-aggregiertes Zahlenmaterial aus Bankbilanzen verwenden. Dennoch sind die Resultate der empirischen Untersuchungen nicht konsistent. Dies wird umso offensichtlicher, wenn man bedenkt, dass die Mehrzahl der Untersuchungen unzureichend um die Transmissionskanäle, die auf relativen Preisen basieren, kontrollieren.

Aufsatz 3 (Kapitel IV): Die Debatte um die Funktionsweise der Zentralbankpolitik hat noch kein Ende gefunden: Dem BLC, der die Bedeutung der potentiellen Variation des Bankkreditangebots durch die Zentralbankpolitik und die Auswirkung auf die gesamtwirtschaftliche Nachfrage betont, mangelt es trotz seiner kürzlich erlangten Prominenz an abschließender empirischer Evidenz. Ich versuche einen Beitrag zur dieser Diskussion zu leisten, indem ich eine

Querschnitts- und eine Panelanalyse mit dem Zahlenmaterial von entwickelten und zu entwickelnden Ländern durchführe und als abhängige Variable die Verfügbarkeit von Bankkrediten wähle. Die Wahl der abhängigen Variable umgeht das Identifikationsproblem, das entsteht, wenn man die Entwicklung der aggregierten Bankkredite im Anschluss an die Operation der Zentralbank analysiert. Diese empirische Untersuchung findet keine Unterstützung für die These, dass der BLC ein über den Zinskanal hinaus zusätzlicher Transmissionsmechanismus monetärer Impulse auf die Realwirtschaft ist.

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I Introduction

On 10 March 2008, the Federal Reserve once again offered a 28-day credit to depository institutions ('banks') under the term auction facility (TAF) for a fixed amount and with the rate determined by the auction process. In the midst of the turmoil in the real estate and financial markets and with the onset of a recession in the United States, the Federal Reserve provided liquidity to the financial system via the TAF. In his testimony before the Committee on the Budget 17 January 2008, the chairman of the Federal Reserve, Benjamin S. Bernanke (2008: 3), stated that the "goal of the TAF is to reduce the incentive for banks to hoard cash and increase their willingness to provide credit to households and firms." Hence, even without changing interest rates the Federal Reserve aimed at influencing banks' lending. Will these repeatedly implemented actions succeed? Will banks reconsider their calculus on lending in times of deteriorating balance sheets of borrowers and less creditworthiness because the central bank provides more liquidity? Is it a coincidence that banks accumulate cash in these times? Why should more liquidity help make bank lending profitable again? Will the real economy be stimulated by liquidity injections of the Federal Reserve?

This is a good example of how economic theory influences everyday monetary policy. Which concept lies behind this policy? The implemented action is based upon the theory called the bank lending channel (BLC) developed by Bernanke and Blinder (1988) and theoretically and empirically contested in this thesis.

Ever since, it has been state-of-the-art to survey the main types of monetary transmission mechanisms as Mishkin (1995) or the European Central Bank (ECB) (2004) present them: the interest rate channel, the asset channel, the expectations channel, the exchange rate channel, the balance sheet channel and the BLC. All these mechanisms explain how the central bank's impulses are transmitted to the real economy. This thesis is on the BLC and is a contribution to the central topic of debate in macroeconomics.

Distinguishing the monetary transmission mechanisms is useful for a variety of reasons. First, understanding which financial aggregates are affected by monetary policy would improve our understanding of the link between the financial and the real sectors of the economy. Second, a better understanding of the transmission mechanisms would help monetary authorities and analysts interpret movements in financial aggregates. Finally, more information about the transmission mechanisms might lead to a better choice of intermediate targets.

This thesis consists of three separate essays on the recently developed transmission mechanism, the BLC, which are linked here to a new whole and renamed in chapters. The BLC has found entrance into macroeconomic textbooks – but it does not exist. In order to display the critique on this channel, I focus on the seminal paper by Bernanke and Blinder (1988) who formalized the BLC (Chapter II). Besides presenting critical remarks on theoretical grounds, I show in a literature survey that after almost two decades of empirical research, the existence of the BLC is still a conundrum (Chapter III). In Chapter IV, I provide empirical evidence from a cross-section of countries and a panel data analysis. This thesis – as other investigations – does not find support for the empirical evidence of the BLC.

The essence of the BLC is the existence of an alleged additional channel of monetary transmission mechanism which spotlights loans on the asset side of banks. Enriching the traditional IS/LM-two-asset model by introducing bank loans, proponents of the BLC claim the central bank to have a further impact on the real economy through the possibility of shifting bank loans directly. That is, the central bank alters banks' reserves in the context of open market operations, and banks respond by adjusting loans on their asset side since nonbank deposits (bank liabilities) change, too. This additional channel ought work, notwithstanding the traditional interest rate channel in the IS/LM framework. According to the interest rate channel, monetary impulses are transmitted via the bond rate which in turn affects interest-sensitive spending. Advocates of the BLC claim this volume effect stemming from reduced loans provides an additional reason for decreased investments, and they state that the central bank affects the real economy by altering this loan volume. Therefore, proponents of the BLC imply that central banks influence the real economy via relative prices such as interest rates **and** the loan volume,

Cecchetti (1995, 86). I will show that there is no theoretical plausibility and empirical evidence for this coexistence. Therefore, I do not find support for the BLC as an additional channel for conducting monetary policy.

Wicksell picked up on early contributions of Thornton and Bagehot, posing that monetary transmission affects the real economy only via relative prices, that is interest rates and asset prices (Bindseil 2004: 20). This viewpoint has long been contested and a more direct transmission has been proposed: the quantities of money and credit were suggested as being linked to commodity demand even where relative prices remained unchanged. Various reasons have been suggested for this type of transmission, among them the quantity equation and Patinkin's (1965) real balance effect. A more recent contribution in this series is the BLC, which has found its place in standard economic textbooks.

Central bankers have recognized the existence of differing theories of monetary transmission by adopting an eclectic approach (ECB, 2004; Kuttner and Mosser, 2002). Given that many transmission channels may be relevant, the quantity of money and credit, and not only relative prices, are given importance in monetary policy. The BLC is repeatedly recognized as justifying the relevance of quantities (money and credit). Based on their theoretical findings Bernanke and Blinder (1988: 437) discuss following questions: "What does our model say about the suitability of money or credit as indicators? What about the target question, that is, about the choice between stabilizing money vs. stabilizing credit?" This is still a hotly debated issue for central bankers. The recent discussion within the ECB and among experts in the media has been about the importance of money growth for central banks' operations.

Is there a causality between money and credit and aggregate demand and prices? Does money growth affect aggregate demand? An example might give a good lead to answer these questions. Expansive monetary policy brings about reduced interest rates which affect decisions of economic agents and stimulate credit growth and aggregate demand. Lower interest rates also increase money demand of economic entities. Yet, money and credit growth do not impact on the aggregate demand since they are a by-product of monetary policy. Likewise, in the phase of

economic upswing, creditworthiness of debtors improves and credit growth will be the result of increased credit demand. Again, there is no causality from money and credit to aggregate demand since the growth of quantities is only the consequence of monetary policy in the first example, or economic upswing in the second. In this spirit, I criticize the BLC because its proponents postulate a causality and state that the central bank can stimulate or curb credit volume and herewith output beyond changes of relative prices.

Before I present in detail the model developed by Bernanke and Blinder, the theoretical critique, the review of the empirical research, and my own investigation, it may be helpful to outline a very brief retrospection of past theoretical concepts to which the BLC is linked.

In the monetary economics of the last 200 years, the prominence of the banking sector and bank lending has varied significantly in the relationship between the financial sphere and the real economy. Thornton (1802) and MacLeod (1855) made early contributions in this context and shed some light on banks that create money by taking deposits on the one hand and by lending to borrowers on the other. Both authors accentuated the role of banks and developed a theory of credit. Thornton particularly stressed that a change in the money supply is not directly transmitted into a different price level, but has an initial effect on the interest rate which affects spending and, eventually, prices. This is one of the first concepts of the transmission in which the transmission variable is the interest rate.

Wicksell (1898) started to develop a new theory by dropping the prevailing assumption that the interest rate is the price on the capital market driven by real factors. In the short run he assumed the interest rate is determined by monetary factors. Wicksell developed a cashless economic system which is based on credit in order to improve the dominating “creditless” quantity theory and give rise to financial intermediation. His ideas relate to earlier works by Thornton and MacLeod when he stresses the active role of banks in the determination of interest rates and creation of money. According to Wicksell, a disrupted monetary equilibrium is a gap between the loan rate and the rate to real investment, or the capital rate of interest. In case of the relative lower loan rate, firms invest and demand loans because they are encouraged to do so. Banks provide

financial means and “create” money, leading to an increase in money supply. It is the gap in interest rates that causes excess demand on the goods market and an upward pressure on the price level. Thus, Wicksell stressed the cost-of-capital-argument also known from the later interest rate channel. Banks are central in Wicksell’s theory since they adjust the supply of loans to higher demand and restore the monetary equilibrium. The bottom line of his theory is that it serves as a building block for monetary transmission mechanisms developed in the next 100 or more years because the dichotomy in terms of short-run neutrality was broken.

The BLC also stresses the role of banks in the transmission of monetary policy and particularly the role of bank loans. Yet, the history of economic theory took another route and bank credit seemed to be dismissed during the following 50 or 60 years. These early contributions dropped bank lending in their concepts and the interest rate channel dominated the understanding of how monetary impulses are transmitted to the real economy. Hicks’s (1937) IS/LM interpretation of Keynes’ ideas is the essence of the interest rate channel which assumes the capital market to be perfect and distinguishes between two financial assets, money and bonds. The latter asset aimed to be the representative of the capital market. The third asset, loans, and a bank loan market were not included in the IS/LM as Bernanke and Blinder (1988) try to accomplish in the BLC. Modigliani and Miller (1958) show that under strong assumptions financial structures do not influence spending decisions of borrowers and lenders. Thus, bonds and other assets such as bank loans are perfect substitutes. The magnitude of the interest rate change depends on how money is substituted by other assets, represented by bonds.

The role of the financial intermediation revives again with Gurley and Shaw (1955, 1960). The effects of monetary policy on investor portfolios are closely analyzed by Brainard and Tobin (1963), Brainard (1964) and Tobin (1969). In this spirit but from different a dogmatic background, Brunner and Meltzer (1972) pay special attention to the credit market by developing a “monetarist model” with many other assets.

Bernanke and Blinder (1988) can be interpreted as a special case of these multi-asset models. They focus on the three-asset-world (money, bonds and bank loans) and assume in agreement

with Akerlof (1970) and many others that information is asymmetric on (credit) markets. Again, the role of banks attracts the spotlight: particularly financial intermediaries such as banks are capable of reducing informational frictions because they act as "delegated monitors," Diamond (1984). A non-monitored finance in public markets suffers from a free-rider problem. As a consequence of this research, some borrowers become dependent on bank loans since the costs of switching lenders are significant. In the BLC the Modigliani-Miller theorem is therefore under attack because bank loans and bonds are assumed to be imperfect substitutes. Against this background, proponents of the BLC claim to have developed an additional transmission mechanism which I present and scrutinize in the following chapter.

What are the results of this analysis? In a nutshell I briefly summarize the outcome of the theoretical and empirical essays.

Chapter II: This essay is written on the basis of the paper by Bajec and Lambsdorff (2006). Monetary policy is commonly assumed to affect commodity demand via relative prices. The BLC proposes an additional effect via the quantity of loans. This has found its way into economic textbooks, although it remains empirically controversial. I present various theoretical criticisms of the BLC and its building block, the formal model by Bernanke and Blinder (1988). This model operates with lopsided loan demand, money demand and money supply functions. The logic of the BLC is valid for individual investors who are affected by a cut in bank loans. For a whole sector with a given level of interest rates, a reduction of loans does not dry up investment, only the holding of money.

Chapter III: Since 1988 academics have been using model by Bernanke and Blinder as a work horse to empirically address the question of the quantitative relevance of the BLC. Cecchetti (1995) und Hubbard (1995) summarize the overall evolution of the controversial debate up to then. The data used for the research is mainly from the United States. In this literature review, I mainly focus on the next and more recent cohort of empirical investigations on the BLC in Europe that follow papers by Kashyap and Stein (1995, 2000) and Kishan and Opiela (2000) on U.S. transmission mechanisms. It is crucial that these authors are the first to address the question

using individual bank balance sheet data for the U.S. Until now, empirical research has produced largely inconsistent results. This is more revealing as many of these investigations have deficiencies in controlling for other transmission channels that relate to relative prices.

Chapter IV: The debate on how monetary policy works has not ended: the BLC, which stresses the importance of potential changes in the supply of loans as a result of monetary policy, and its subsequent impact on aggregate demand, became prominent recently, but the concluding empirical evidence is absent. I attempt to contribute to this debate by conducting a cross-section and panel data analysis of developed and developing countries and by choosing the availability of bank loans as a dependent variable. The latter circumvents identification problems that appear when analyzing the response of aggregated bank loans to monetary policy changes. This evidence finds no support for the prediction of the BLC that there is an additional channel of monetary transmission mechanism.

II Is There A Bank Lending Channel? Some Theoretical Criticism

II.1 Introduction

The BLC was developed by Bernanke and Blinder in 1988.[1] It stresses the importance of potential changes in the supply of loans as a result of monetary policy and a subsequent impact on aggregate demand for goods and services, in particular business and residential investments as well as consumer durables, (Mishkin 2006: 621). That is, a tightening monetary policy such as an open market sale reduces nonbanks' deposits at banks and banks' reserves at the central bank. Therefore, banks have fewer funds available to supply loans and cut back lending. With borrowers depending on bank loans, investment spending is reduced.

Empirical research has up to now produced largely inconsistent results, (Kashyap and Stein 1995, Hernando and Martinez-Pagés 2001 and de Bondt 1988). This is all the more revealing as many of these investigations have deficiencies in controlling for other transmission channels that relate to relative prices, (Cecchetti 1995, Oliner and Rudebusch 1996).

This paper provides another challenge to the BLC, rejecting its existence on theoretical grounds.

This chapter is organized as follows: In Section 2 I reproduce the BLC as developed by Bernanke and Blinder (1988), which is still the building block of contemporary research. In Section 3 I formulate the critique of the BLC and aim to highlight six theoretical facets that I find implausible. Section 4 concludes.

II.2 Bernanke and Blinder's Bank Lending Channel

The model consists of three assets: money (deposits), loans and bonds. Banks contribute to the creation of money by issuing deposits and by buying bonds from the private sector (the

[1] Together with the balance sheet channel, the BLC forms what is regarded as the credit channel. The balance sheet channel relates to asset prices impacting on companies' balance sheet and net worth. A deterioration of these indicators would increase the external finance premium and thus lower investment. Essentially, this can be regarded as a transmission via relative prices, whose existence we are not contesting here.

nonbanks) or issuing loans. The private sector holds money as assets and its liabilities consist of bank loans and corporate bonds.[2] Table 1 displays balance sheets of all modelled parties: the private sector, banks and the central bank.

The loan demand is $L^d = L(\underset{-}{\rho}, \underset{+}{i}, \underset{+}{y})$, where ρ is the interest rate on loans, i is the interest rate on bonds and y denotes GDP. All sheets ignore net worth. According to the central bank's balance sheet, the monetary base, *R*, consists of banks' reserve requirements, $\tau \mathrm{D}$, and *E*, the excess reserves at the central bank. B^b stands for the bank's holding of bonds and L^s for loans. On the liabilities side of the banks' balance sheet *D* denotes deposits, which is held by nonbanks as assets. The central bank's and commercial banks' aggregated balance sheet is $R + B^b + L^s = D$.

[2] Bernanke and Blinder do not to specify whether the bonds are corporate or publicly issued. In the spirit of the BLC, we assume that the private sector manages its liabilities by demanding bank loans or issuing bonds. Loans and bonds are consequently alternatives for the private sector. In the case of publicly issued bonds, nonbanks would hold government bonds as assets and acquire financial means by selling them. But then, the concept of substituting financial sources on the liabilities side is less straightforward and not in the logic of the BLC. Ultimately, this difference is not essential to the debate because financing by issuing corporate bonds is similar to selling government bonds.

PRIVATE SECTOR		BANKS		CENTRAL BANK	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D^d = D(\underset{-}{i}, \underset{+}{y})$	R	τD	D^d	R	τD
		$E = \varepsilon(\underset{-}{i})D(1-\tau)$			E
	$B^s = D(\underset{-}{i}, \underset{+}{y}) - L(\underset{-}{\rho}, \underset{+}{i}, \underset{+}{y}) - R$	$B^b = b(\underset{-}{\rho}, \underset{+}{i})D(1-\tau)$			
	$L^d = L(\underset{-}{\rho}, \underset{+}{i}, \underset{+}{y})$	$L^s = \lambda(\underset{+}{\rho}, \underset{-}{i})D(1-\tau)$			

Table 1: Balance Sheets of All Parties

The model disregards currency and central bank loans to commercial banks. The only way a central bank conducts monetary policy is by buying or selling corporate bonds, which is denoted by an alteration of R.[3] Banks' adding up constraint can be rewritten as: $B^b + L^s + E = D(1-\tau)$. The loan supply is $L^s = \lambda(\underset{+}{\rho}, \underset{-}{i})D(1-\tau)$, assuming that structural changes of the banks' desired portfolio are driven by variations in interest rates of assets. The equilibrium on the loan market is

(1) $L^d = L(\underset{-}{\rho}, \underset{+}{i}, \underset{+}{y}) = L^s = \lambda(\underset{+}{\rho}, \underset{-}{i})D(1-\tau)$.

The model states that banks hold bonds according to $B^b = b(\underset{-}{\rho}, \underset{+}{i})D(1-\tau)$. There is no impact of ρ on E and banks hold excess reserves according to: $E = \varepsilon(\underset{-}{i})D(1-\tau)$. There is no explicit

[3] Bernanke and Blinder are not clear in stating whether central banks may also buy government bonds. Our conclusions remain valid with this modification when assuming that nonbanks hold government bonds instead of issuing corporate bonds.

function for bond supply, but due to the nonbank's budget constraint, this must equal, $B^s = D(\underset{-}{i}, \underset{+}{y}) - L(\underset{-}{\rho}, \underset{+}{i}, \underset{+}{y}) - R$.

As can be easily derived, the supply of deposits (money) is equal to bank reserves times the money multiplier: $D^s = m(\underset{+}{i})R$.[4] The demand for deposits is equal to the demand for money in a cashless economy. It is defined as $D^d = D(\underset{-}{i}, \underset{+}{y})$. Equating the demand for money and the money supply gives

(2) $D(\underset{-}{i}, \underset{+}{y}) = m(\underset{+}{i})R$.

The equilibrium on the money market in Equation (2) is graphically represented by the conventional LM curve. Bernanke and Blinder insert (2) into (1) to obtain an for the loan market equilibrium

(3) $L^d = L(\underset{-}{\rho}, \underset{+}{i}, \underset{+}{y}) = L^s = \lambda(\underset{+}{\rho}, \underset{-}{i})m(\underset{+}{i})R(1-\tau)$.

In words, the equilibrium on the money market in (2) is used to rewrite the loan supply L^s and, hence, the equilibrium on the loan market in (3). Bernanke and Blinder make use of (3) to construct a substitute for the conventional IS curve that includes the loan market equilibrium. On the market for goods, it appears plausible that investment is negatively affected by both interest rates, that for loans and that for bonds, suggesting to rewrite the IS curve for output, *y*:

(4) $y = Y(\underset{-}{i}, \underset{-}{\rho})$[5].

Assuming that d*m*/d*i* is not too large, (3) can be solved for ρ as an implicit function of i, y, and R

(5) $\rho = \phi(\underset{+}{i}, \underset{+}{y}, \underset{-}{R})$.

Substituting (5) into (4), one obtains

(6) $y = Y(i, \phi(i, y, R))$,

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[4] From $R=\tau D+\varepsilon D$, we obtain $D=R/(\varepsilon+\tau)$. However, *Bernanke and Blinder* claim the money supplier to be $[\varepsilon(1-\tau)+\tau]^{-1}$. We assume *Bernanke and Blinder* made a simple error that is immaterial to the core hypothesis of the paper.

[5] In (3) Bernanke and Blinder refer to real interest rates but assume expected inflation to be zero.

which Bernanke and Blinder label the CC (commodities and credit) curve. Apparently, the CC curve is negatively sloped like the IS curve (see Figure 1).

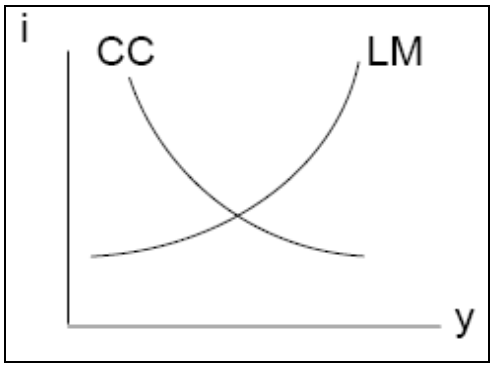

Figure 1: The BLC

The important point is that monetary policy shifts R in (2) and, hence, not only the LM curve but also the CC curve represented in (6). As a consequence of the policy induced shift of the CC curve, expansionary monetary policy affects y twice because the curves shift in the same direction, i.e. outward. The effect on the interest rate is not easy to depict. Hence, Bernanke and Blinder (1988: 437) state that the BLC "makes monetary policy more expansionary than in IS/LM (…)". Figure 2 illustrates this aspect. A tight monetary policy operation shifts the CC_0 curve to CC_1 and the LM_0 curve to LM_1. The resulting equilibrium brings about y_{CC}. In the textbook IS/LM model, contractionary monetary policy shifts only the LM curve inward and the IS curve remains unchanged, bringing about y_{IS}. If CC_0 is shaped similarly to the IS curve y_{CC} indicates a stronger reduction of output compared to y_{IS}.

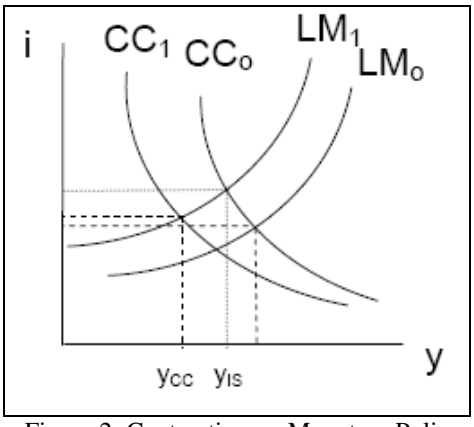

Figure 2: Contractionary Monetary Policy

In a less formal approach proponents of the BLC seek to establish a direct link between the availability of bank loans and investment and consumption, (Hubbard 1995: 65). Some firms are dependent on bank loans because issuing corporate bonds involves large fixed costs for informing investors. This becomes relevant particularly for small and mid-sized enterprises (SMEs). Banks are capable of reducing the fixed costs of monitoring and are therefore in a better position to provide external financial means particularly to SMEs, (Diamond 1984: 393). Hence, any change in banks' willingness to lend will influence debtors directly. The bigger the pool of bank-dependent borrowers the more severe is the reduction of spending, e.g. investment spending, and income.

Proponents of the BLC also describe circumstances where the suggested transmission mechanism is less effective, see for example Kashyap and Stein (1993: 14) and Freixas and Rochet (1997: 165). If a central bank conducts an open market sale, nonbanks will pay for the additional bonds with their deposits. This affects banks because they are financed with demand deposits as a reservable form of finance. Other intermediaries financed by non-reservable forms, e.g. certificates of deposits, commercial papers and long-term debt, cannot be affected by the central banks' operation although they provide services comparable to those of banks. Therefore, the BLC is significantly weakened if the share of loans provided by banks is small relative to the portion of credit supplied by nonbank intermediaries. I disagree with this argument, but I shall formulate the critique below.

Mishkin (2006: 621) sums up the BLC in a nutshell: "Expansionary monetary policy, which increases bank reserves and bank deposits, increases the quantity of bank loans available. Because many borrowers are dependent on bank loans to finance their activities, this increase in loans will cause investment (and possibly consumer) spending to rise."

II.3 Critique of the Bank Lending Channel

II.3.1 The CC Curve is Not an Adequate Substitution of the IS Curve

In the presented model of Bernanke and Blinder, Equation (3) is the starting point of my critique. When Bernanke and Blinder replace *D* for $m(i)R$, they insert elements from the money market equilibrium into the loan market equilibrium. This results in a curve of the demand for goods, commonly described as the IS curve and called the CC (credit and commodities) curve by Bernanke and Blinder. The CC curve thus does not solely refer to the loan market and its impact on the demand for goods, but also embraces the market for money. Departing from Bernanke and Blinder, an alternative approach would be to assume that the quantity of money does not vary on the IS curve. Thus, a simpler version for constructing the IS curve would arise by keeping *D* constant in (1). Similarly to (5) I can solve (1) for ρ as an implicit function of i, y, yielding,

(5') $\rho = \phi'(\underset{+}{i}, \underset{+}{y})$, with $\frac{\mathrm{d}\phi'}{di} > \frac{d\phi}{di}$.

The positive impact of the interest rate via $m(i)R$ on the right hand side of (3) is missing in (1), suggesting that the implicit impact of *i* on ρ is larger than that in Equation (5).[6] Inserting (5') into (4) I obtain

(6') $y = Y(i, \phi'(\mathrm{i}, \mathrm{y}))$.

This curve, for which I employ the standard IS-notation, is flatter than the CC curve due to $d\phi'/\mathrm{di} > \mathrm{d}\phi/\mathrm{di}$. Evidently, central bank policy has no direct impact on this curve. Changes of bank reserves, *R*, leave the curve unaffected.

[6] For example, if the bond interest rate decreases, the loan supply increases in (3) and (1). Due to m(i)R in (3) but not in (1), the loan supply stays lower and therefore the loan interest rate has to rise less to restore equilibrium. As result, the impact of *i* on ρ is larger.

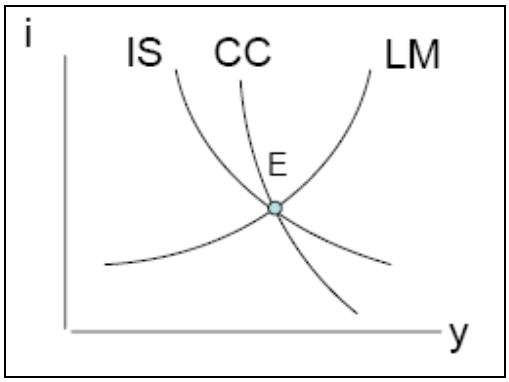

Figure 3: The Problematic CC Curve

Therefore, contractionary monetary policy changes R and shifts only the LM curve inwards as depicted by Equation (2). The outcome is the well-known result. There is no additional shift of the IS curve; monetary policy is not more contractionary than in IS/LM. It becomes clear that minor modifications of the model change the outcome significantly. This raises first doubts about the robustness of the BLC.

II.3.2 Testing an Alternative Form of the Loan Demand Function

Bernanke and Blinder (1988) operate with the bank loan demand function $L^d = L(\underset{-}{\rho}, \underset{+}{i}, \underset{+}{y})$. What is problematic about this specification? Due to the nonbank's budget constraint, money demand and loan demand implicitly determine the bond supply, $B^s = D(\underset{-}{i}, \underset{+}{y}) - L(\underset{-}{\rho}, \underset{+}{i}, \underset{+}{y}) - R$. Contractionary monetary policy reduces R because the central bank sells corporate bonds. Nonbanks in turn substitute restricted financial means by selling bonds to banks, B^s increases.

But another equally plausible reaction by nonbanks would be to increase loans. When the central bank absorbs a share of the nonbanks' financial means these turn to the banks and ask for more loans. Assume for simplicity's sake the extreme variant that the increase in B^s is solely financed by loans. This can be captured by modelling bond supply according to

(7) $\quad B^s = B(\underset{+}{\rho}, \underset{-}{i}, \underset{+}{y}),$

and determine loan supply from the nonbank's balance sheet:

(8) $L^d = D(\underset{-}{i}, \underset{+}{y}) - B(\underset{+}{\rho}, \underset{-}{i}, \underset{+}{y}) - R.$

Introducing (8) into (3), one obtains

(3') $L^d = D(\underset{-}{i}, \underset{+}{y}) - B(\underset{+}{\rho}, \underset{-}{i}, \underset{+}{y}) - R = L^s = \lambda(\underset{+}{\rho}, \underset{-}{i}) m(\underset{+}{i}) R(1-\tau).$

An open market sale (R decreases) leads to an increase in loan demand and forces an increase in ρ according to (3'). This repeats the finding of (5), where an inverse impact of R on ρ has been found. However this impact does not only arise due to a reduction in the loan supply (the right hand side). This impact also arises due to an increase in loan demand via a reduction of R. Whether in equilibrium loans will increase or not becomes a complex question. Loan supply rises due to an increase in ρ but sinks due to decreasing the R. A potential increase of the interest rate on bonds, i, may reduce loan supply and loan demand. Overall the equilibrium reaction of loans is ambiguous. Interestingly, the early work by Brunner and Meltzer came to the same conclusion, (Brunner and Meltzer 1966: 163; Brunner 1974 and Brunner and Meltzer 1968). The standard wisdom of their contribution is that the equilibrium level of loans increases only if money demand is insensitive to the increasing interest rate.

Once this modification is introduced into the standard model, the negative impact of R on ρ in Equation (5) becomes stronger. The reason is that a decrease in R additionally increases loan demand (and also decreases the loan supply) and thus forces a more pronounced rise of ρ, the interest rate on loans. In reaction to a decreasing R the downward drop of the CC curve in an (i/Y)-diagram is therefore more pronounced. This argument seems to strengthen the point made by Bernanke and Blinder, but it is in contrast to the description of the BLC. Bernanke and Blinder (1988: 437) state, in contrast to Brunner and Meltzer, that the inclusion of the credit market makes monetary policy more powerful because a central bank affects the real economy by changing the bond interest rate and the loan volume. However, the increased power of monetary policy does not relate to a reduction in the loan volume but an increase in the interest rate on

loans. Bernanke and Blinder's shift of the CC curve is not well related to their argument of changes in R.[7]

II.3.3 Money Demand and Money Supply are Lopsided

Let us turn to the money demand function employed, $D^d = D(\underset{-}{i}, \underset{+}{y})$. The standard argument for an influence of the interest rate relates to the opportunity costs of holding money and to portfolio considerations. But these arguments would relate not only to the interest rate on bonds, i, but equally to the interest rate on loans, ρ. As the nonbank's balance sheet shows, costs of holding money increase with dearer bank loans. Thus, ρ reduces money demand financed by credit. An adequate modification would thus include the influence of ρ: $D^d = D(\underset{-}{i}, \underset{-}{\rho}, \underset{+}{y})$. The same argument relates to the money multiplier. Banks have reason to reduce their reserves when loans are profitable.[8] Thus, money supply is positively related to the interest rate on loans, ρ: $D^s = m(\underset{+}{i}, \underset{+}{\rho})R$. The money market equilibrium is represented by:

(2') $D(\underset{-}{i}, \underset{-}{\rho}, \underset{+}{y}) = m(\underset{+}{i}, \underset{+}{\rho})R$.

Apparently, a reduction of R may not only be balanced by an increase in i but also by a higher ρ. In an (i/Y)-diagram a higher ρ would shift the LM curve downward after the initial reduction of R shifted the LM curve upwards.[9]

With the many additional shifts of curves as a result of the modifications it becomes arduous to draw straightforward conclusions from the model. A core reason is the choice of the graphical presentation with the interest rate on bonds, i, on the ordinate. The IS curve in its conventional logic represents the goods market's reaction to overall finance conditions as determined by the money market. These conditions embrace both interest rates, i and ρ. Bernanke and Blinder

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[7] We note in passing that similar notation and results follow when assuming that the central bank purchases government bonds and not corporate bonds.

[8] Therefore, excess reserves should be given by: $E = \varepsilon(\underset{-}{i}, \underset{-}{\rho})D(1-\tau)$.

[9] An open market sale reduces R and increases i to balance the money market. The LM curve shifts upwards. But the increased bond rate diminishes the loan supply and raises ρ. The money market is restored when i sinks. Thus, the LM curve shifts again, downwards. Overall, the position of the LM curve would be unclear.

deviate from this standard argument. They include ρ and the loan market separately in the analysis of IS, but they disregard ρ when they model the money market.

Assuming for simplicity's sake that loans and bonds are equally important for the goods market, Equation (4) could be written as $y = Y((i + \rho)/2)$. This would allow the portrayal of the model in a $((i+\rho)/2, Y)$-diagram. Suggesting also that interest rates for loans and bonds are equally important for the money market, I can simplify the money market equilibrium:

(2'') $D((i + \rho)/2, y) = m((i + \rho)/2)R$.

The LM curve obtains the standard positive slope with only *R* having an impact on its position. In essence, we end up with a simple IS/LM-model in a $((i+\rho)/2, Y)$-diagram. Equilibrium on the loan and bond market are automatically obtained once IS and LM intersect.[10] Therefore, once the IS/LM-equilibirium has been achieved with an equilibrium value for $(i + \rho)/2$, the individual values for *i* and ρ are determined so as to balance the loan and the bond market.

This argument reveals that the inclusion of a market for loans by Bernanke and Blinder does not add much to the standard logic of IS/LM. In this standard logic loans and bonds had been aggregated into a composite market for financial means. Splitting up this market into two reveals how loans and bonds are substituting one another, but it does not add a mechanism of monetary transmission.

II.3.4 The Logic of the IS Curve has been Missed

Contractionary monetary policy raises i and ρ so that capital costs increase and investments are less attractive. This interest rate effect goes along with a reduction of money (deposits) and loans issued by banks. Advocates of the BLC claim that this volume effect provides an additional reason for decreased investments, and they state that the central bank impacts on the real economy by altering this loan volume.

[10] This result also holds when open market sales are carried out with publicly issued bonds.

But an impact of the loan volume on investment is not convincing. First, an exogenous decrease in the loan supply exerts no clear effect on investments, because banks can only achieve this if other assets are increased. Recall banks' balance sheets: With excess reserve (E) given[11], they would have to increase their holdings of corporate bonds. But this would provide nonbanks (as investors) with an alternative source of finance, providing no clear direction to the aggregate impact of such a policy.

Loans are not what is needed for investment but rather savings. Apparently, there is no reason why reduced loans may lower savings, the driving forces of which we know to be macroeconomic income and interest rates.

It would even be misleading to assume that savings constrain investments because such a reasoning misunderstands the logic of the IS curve. Any investment automatically creates the savings that are necessary for its execution. Any additional investment leads to increased private income. This might be saved. If it is consumed, a multiplier effect leads to increased income elsewhere until all of the initial increase in investment is saved elsewhere. This logic remains intact even if part of the income leads to increased taxation, because in this case public savings increase. Even in open economy the logic of the IS curve remains intact. Increased income may raise imports; these in turn increase capital imports, which are foreign savings. The idea that loans constrain investments appears convincing for an individual investor. But the macroeconomic logic of the IS curve suggests that such a constraint is not binding.

II.3.5 Stock-Flow-Problems

Bernanke and Gertler (1995: 40) explain: "Bernanke and Blinder's (1988) model of the bank lending channel suggested that open market sales by the Fed, which drain reserves and hence deposits from the banking system, would limit the supply of bank loans by reducing banks' access to loanable funds. (…) (A) reduction in the supply of bank credit (…) is likely (…) to reduce real activity. "

[11] An increase in excess reserves provides the classical example of a reduction of money supply that is not carried out by the central bank. But this increase generates a transmission process via relative prices. An additional effect via the volume of loans does not arise.

Deposits and loans are a stock variable: Reducing deposits by conducting tight monetary policy means reducing a stock, a variable expressed at a certain moment in time. In contrast, a flow variable is defined in units of time. Investment, savings and loanable funds are flow variables. In this context representatives of the BLC are not clear about how stocks are supposed to impact on flows. One potential link might arise by considering the stock of physical capital as another asset in the nonbank's balance sheet. But this provides no clue for the proclaimed effect via volumes. Increased loans and corporate bonds are modelled so as to reflect increased deposits. The equilibrium has been determined such that the changes in these aggregates balance out. There is no reason why adjustments should thus spill over to the demand for physical capital. The only plausible impact on the stock of physical capital would, again, have to run via relative prices.

Particularly in the liquidity trap proponents of the BLC accentuate the impact on the real economy by taking stock adjustments into consideration: an impact is claimed to arise only via a changing loan supply because the interest rate channel is ineffective. But the low interest rates render the holding of money attractive. The nonbank's balance sheet reveals that nonbanks demand loans to hold deposits and not to bind borrowed money for an increase in the physical capital. Real activity remains unaffected.

Therefore, once the real economy is stuck in a liquidity trap, my critique implies that even if the central banks are able to influence banks' loan supply beyond an impact via relative prices, monetary policy is impotent in affecting the investment demand.

II.3.6 Open Market Sale also Affects Nonbank Intermediaries

If a central bank conducts an open market sale, banks are affected because they are financed with the deteriorating demand deposits. Kashyap and Stein (1993: 14) argue that the BLC is significantly weakened if nonbank intermediaries come into play. These are not financed by demand deposits and may counteract the diminishing loans supplied by banks. Instead of demand deposits they are financed by non-reservable forms such as certificates of deposits or commercial

papers.[12] In a similar spirit, Bernanke and Gertler (1995: 41) explain that the BLC is weaker if banks find alternative sources of funding and this is seen to explain the alleged weakening of the BLC since the early 1980s.

I disagree with this argument. Crucial is that all sorts of assets, including certificates of deposit, can be brought into play to reimburse the central bank for open market sales. That is, nonbanks are able to sell not only demand deposits but also certificates of deposits or commercial papers in exchange for the bonds from the open market sale. Therefore, nonbank intermediaries financed by commercial papers or certificates of deposits can also be affected by a tight monetary policy operation. The open market operations of a central bank influence all sources of finance of banks and nonbank intermediaries.

II.4 Conclusion

The discussion about how monetary impulses by the central bank are transmitted to the real economy has not come to an end. This paper contributes to the ongoing debate by questioning the existence of one of the monetary transmission mechanisms, i.e. the bank lending channel, and by formulating a critique highlighting six aspects.

First, Bernanke and Blinder (1988: 437) state that "(…) the credit channel makes monetary policy more expansionary than in IS/LM (…)". This conclusion is essentially based on the constructed substitute for the IS curve, the CC curve. I posit that the tricky construction of the CC curve obfuscates more than it reveals. Second, the BLC as presented by Bernanke and Blinder (1988) is based on a special form of the loan demand function. Once an alternative version is employed, the impact of an open market sale on loans is ambiguous, in line with the traditional work of Brunner and Meltzer in the late sixties. Third, I show that a plausible inclusion of the loan rate in the functions of money demand and supply brings about the textbook IS/LM results. Fourth, the

[12] Certificates of deposits are not subject to the reserve requirement. Puzzling, in a cashless world, as assumed by Bernanke and Blinder (1988: 436), funding without reserve requirements could lead to an unlimited increase of money because the multiplier increases to infinity. Therefore, the central bank loses control of the money stock. But the consequences of such a money supply for the BLC remain unclear.

BLC dismisses the logic of the IS curve by claiming that loans constrain investments. While this argument appears convincing for an individual investor, the macroeconomic logic of the IS curve suggests that such a constraint is not binding. Fifth, I see some stock-flow problems with deposits, loans and investment. While I concede that central banks may be able to adversely affect bank's loan supply, this may have no impact on investments. Sixth, Bernanke and Gertler (1995) explain that the BLC is weaker if banks find alternative sources of funding. From the macroeconomic perspective, I find this argument implausible because banks and nonbank intermediaries are all affected by a reduction in liabilities, be they deposits or certificates of deposits.

III Review of the Empirical Research on the Bank Lending Channel

III.1 Introduction

This chapter aims at displaying the development of the empirical research concerning the existence of the BLC. Bernanke and Blinder (1988) model and describe this channel for the first time, but the approach operates with lopsided loan demand, money demand and money supply functions as discussed in Chapter II. This invalidates the core idea of the BLC that potential changes in the supply of loans may affect aggregate demand for goods and services. A reduction of loans may restrict an individual investor, but the macroeconomic logic of the IS curve suggests such a constraint is not binding.

Since 1988 academics have been using this model as a work horse to empirically address the question of the quantitative relevance of the BLC. Cecchetti (1995) and Hubbard (1995) summarize the overall evolution of the controversial debate since then. The data used for the research is mainly from the United States. The first generation of papers follows approaches by Bernanke and Blinder (1992) and Kashyap, Stein and Wilcox (1993) from the United States. Based on the estimation of vector autoregression (VAR) models using aggregate macroeconomic time-series, numerous contributions have looked for the possible existence of a BLC in several European countries. In a VAR model, a number of variables are explained in terms of their own lags and those of other variables. Early contributions are made by Tsatsaronis (1995), Barran et al. (1996) and Stöß (1996), but identification problems arise. The findings of these papers are also consistent with monetary transmission mechanisms other than the BLC. These interpretations stress the impact of the bank loan demand instead of the loan supply, which is essential to the identification of the BLC. Shortcomings of aggregate time-series inspired academics to come up with a new approach using microeconomic datasets.

In the review I focus on the more recent cohort of empirical investigations that, again, follow seminal papers by Kashyap and Stein (1995, 2000) and Kishan and Opiela (2000) on U.S. transmission mechanisms. It is crucial that these authors are the first to address the question using

individual bank balance sheet data for the U.S. Their approach is inspired by Gertler and Hubbard (1988) or Kashyap, Lamont and Stein (1994) who apply disaggregated data on non-financial firms to test the cross-sectional implications of monetary policy actions.

Apart from studies with microeconomic data, it is worth mentioning that empirical research on bank lending is still carried out with aggregate data, applying the estimation method of vector error correction model (VECM). A VECM is a VAR model which integrates long-term restrictions based on co-integration relations in the form of error-correction terms. This technique is developed by Johansen (1988, 1995) and first applied in Europe by de Bondt (1999) to the question of the BLC. Due to the aforementioned drawback of using aggregate data, the second strand of this recent literature is analyzed here only briefly by depicting an illustrative investigation.

Economists from the rest of the world started to make use of data other than that from the U.S. Likewise, many central banks set in motion studies that examine how the monetary transmission mechanism works in their country or currency area. The existence of the BLC has also been examined because the channel is considered part of the textbook transmission mechanism. It is still a hotly debated and controversial issue. To my knowledge, there is no paper that reviews the evolution of the last decade. This review tries to fill this gap and focuses on European countries. The paper is divided in Section III.2, which reviews investigations in the spirit of Kashyap and Stein (1995, 2000) and Kishan and Opiela (2000). Other empirical investigations with disaggregated data on European counties from the last decade are analyzed in Section III.3 and labelled further studies. Table 2-4 briefly document the results of the review. The paper concludes with summarizing remarks on the empirical research in Section III.4.

III.2 Investigations in the Spirit of Kashyap and Stein (1995, 2000) and Kishan and Opiela (2000)

The existence of the credit channel – the BLC and the balance sheet channel – has been tested by analyzing cross-sectional differences in types of credit, borrowers and lenders. Empirical research

has studied the different impact of monetary policy actions for non-bank debt such as commercial papers against bank loans (Kashyap, Lamont and Stein 1994, Oliner and Rudebusch 1996), small firms or households against (large) firms (Gertler and Gilchrist 1993, 1994) and small banks against large banks. Inspired by groundbreaking papers of Kashyap and Stein (1995, 2000) and Peek and Rosengren (1995), research of the last decade has focused on different types of lenders. These differences rely on the extent of informational frictions in the financial sector which brings about different bank loan supply responses across banks. The underlying transmission mechanism, BLC, assumes the more difficult it is for a bank to compensate restrictive policy actions, the higher the information costs imposed by its suppliers of funds. For instance, an open market sale causes a deposit drain in banks' balance sheet. In the logic of Modigliani-Miller, banks are able to tap alternative finance sources at no cost since the structure of liabilities does not matter. Once taking information asymmetries into account, this logic might not apply for banks. Bank lending and the asset side of the balance sheet may be affected if banks cannot offset the contraction shock without cost. In passing, the Modigliani-Miller-theorem not only refers to lenders but also to borrowers and claims the irrelevance of finance for them. Dropping the assumption of perfectly distributed information reveals limited opportunities for some borrowers to substitute bank loans when banks cut back lending. These debtors are bank-dependent and finance matters for them. Hubbard (1995, 1998) summarizes this strand of empirical research. Here, I focus on the most recent investigations that examine different types of lenders.

The empirical literature addresses the question of how to estimate market imperfections due to information asymmetries by separating lenders in groups or classes. Common criteria for this separation are a bank's asset size, capitalization and liquidity. These are mainly measured by total assets for size, the ratio of capital to assets for capitalization and the ratio of liquid assets such as securities or interbank deposits to assets for liquidity.

Regarding size, Kashyap and Stein (1995) came up with the idea that small banks have more difficulty raising funds since they face higher information costs and/or a higher external finance premium than large banks. Therefore, they are less able to offset contractionary monetary policy actions and have to reduce their loan supply more sharply than large banks.

Using bank size as measure to generate cross-sectional differences is not precisely in line with theoretical models which stress the relevance of a borrower's net worth. In this light, Peek and Rosengren (1995) argue that a bank's capital may better serve as a proxy and de Bondt (1998) and Kishan and Opiela (2000) were the first to realize this idea in an empirical investigation for Europe and the U.S., respectively. The external finance premium of well capitalized banks should be lower than that of poorly capitalized banks, since they are less prone to moral hazard. Again, banks that face higher information costs ought to respond more strongly to policy actions. Yet, as Worms (2001) depicts, it may be problematic to use capitalization as an indicator. Banks also hold more capital because their risk exposure on the asset side might be higher as well. Hence, better capitalization may reflect higher risks and not lower.

As suggested by Kashyap and Stein (2000) and tested for the U.S., the third criterion for unravelling the heterogeneity among banks is liquidity, since a liquidity buffer may help to shield loans from a restrictive policy measure. Worms (2001) again points out that banks facing particularly high information costs have an incentive to accumulate liquid assets. Moreover, it seems plausible that more risk averse banks have tighter lending standards and therefore prefer to be more liquid. Particularly, the loan demand of these banks might differ from other less liquid banks which provide riskier firms with funds. If the assumption of homogenous loan demand across the banking sector has to be dropped, it appears tricky to single out loan supply effects. So, liquidity as a discriminating variable is problematic as well.

Subsequent to the description and the discussion of the criteria for sorting out the heterogeneity among lenders the presentation of studies working with disaggregated data takes place.

Kashyap and Stein (1995) test cross-sectional differences between banks with different degrees of access to non-deposit financing (e.g., certificates of deposits). These differences stem from capital market imperfections. Under the assumption of homogeneous loan demand across banks, cross-sectional differences in loan behavior will reflect supply effects. Kashyap and Stein (1995) discovered that the effect of monetary policy on lending is more pronounced for those banks suffering from a higher degree of asymmetric information vis-à-vis its suppliers of funds. So the

researchers control for the ability of banks (here proxied by a bank's asset size) to offset an outflow of deposits induced by an open market sale in order to provide bank loans. A bank's asset size and therefore the ability to compensate the drain of deposits are linked to the loan supply and unrelated to the loan demand. The data is retrieved from all federally insured U.S. banks on loans, securities and deposits, and the researchers collected quarterly time series for the time period from 1972:Q1 - 1992:Q2. In their first step, Kashyap and Stein (1995) categorized banks with respect to the costs of rising external funds. As a proxy, they use banks' total assets and claim that larger banks face lower costs of external finance. If small banks faced stronger difficulties in finding external finance, after a monetary policy tightening, they would reduce their loans by more than large ones. With respect to their estimation technique, the authors carry out the investigation by regressing the growth rate of deposits against the lagged change in the federal funds rate, the consumer price index (not seasonally adjusted) and GDP growth, which are taken from the Citibase databank. Kashyap and Stein (1995) repeat this procedure for each of the five bank size classes. This estimation method is carried out for dependent variables other than deposits – loans and securities. Kashyap and Stein (1995) do not label this method explicitly, but one could identify the approach as the distributed lag model because it assumes the effect of the independent variable on the dependent variable is distributed over time. Therefore, if the value of the independent variable at time t changes, the dependent variable experiences some immediate effect at time t and it also experiences delayed effects at times $t + 1$, $t + 2$ up to time $t + p$, for some limit p. The majority of investigations reviewed here apply the autoregressive form of the distributed lag model. However, they find evidence that the loan supply of smaller banks is disproportionately affected by contractionary monetary policy because these banks have more difficulty substituting deposits for non-deposit sources of external finance. This study is seminal for the empirical investigations on the BLC and it follows the existing literature on how to test shocks to internal liquidity and investment spending of non-financial firms, which also face capital market imperfections.

Since the majority of following studies rest on this approach by Kashyap and Stein, a critical remark is due: researchers claim to test the BLC but they fail to insulate this channel from the interest rate channel. Drawing conclusions about the existence of the BLC then turns problematic.

Insulation is important because one cannot exclude that contractionary monetary policy (e.g., an open market sale) induces banks to reduce the loan supply because bonds are an alternative asset which then become more attractive. The BLC states that the reduction of loan supply stems from a drain in deposits caused by the central bank. However, since banks adjust their portfolios with respect to relative prices, the results of Kashyap and Stein (1995) would also be in line with the interest rate channel. If one considers risk premiums and not only a bond rate as a representative financing rate in the interest rate channel, small banks face a higher premium than big banks because they also experience higher informational asymmetries on the capital markets. An open market sale would increase the bond rate and worsen the creditworthiness of smaller banks relative to big banks. Higher risk premium would then cause small banks curb their loan supply. As a consequence, this empirical approach does not corroborate the theoretical statement of proponents of the BLC concerning the impact on investment beyond relative prices. Only if researchers control for relative prices and prove that included relative prices are insignificant, could one make statements whether a (central bank-induced) deposit drain forces banks to reduce the loan supply. Investigations such as the study by Hernando and Martinez-Pagés (2001) or the research in Chapter IV suggest a possible solution of how to overcome this problem.

Cecchetti (1995) also criticizes this empirical research because it finds additional support for capital market imperfection (not for firms but also for banks), instead of providing evidence of the quantitative relevance of the BLC. Instead, empirical research shows that banks cannot or do not shield the loan supply from monetary policy due to capital market imperfections (e.g., by issuing some securities such as certificates of deposits to offset an open market sale). This strand of investigations presents evidence that the Modigliani-Miller logic does not apply for banks and that finance "matters." Yet, this evidence does not prove that monetary policy has effects beyond relative prices.

Moreover, the monetary transmission mechanism does not end with changed bank lending. Kashyap and Stein (1995) examine only the first part of the mechanism that affects banks. As a result, they disregard the question to which extent the examined transmission impacts on

spending. These critical arguments hold for every investigation reviewed in this paper. Exceptions are explicitly noted.

Table 2 and 3 provide a snapshot on reviewed papers that follow Kashyap and Stein (1995), Kashyap and Stein (2000) or Kishan and Opiela (2000). Following the brief summary in Table 2 and 3 each paper is presented and examined en detail.

Abbreviations used in Tables 2-4:

L – loans	L(-t) – lagged loans	FFR – federal funds rate	C – currency	D – deposits
CD – certificates of deposits	Sec – securities	CPI – consumer price index	GDP – gross domestic product	SIZ – size
LIQ – liquidity	CAP – capitalization	AFF – affiliation	IRC – insufficient insulation from the interest rate channel	RE – untested link to the real economy
MMR – money market rate	ALT – alternative investigation method	LIBOR – London Inter-bank Offered Rate	TD – time deposits	GMM – generalized method of moments
Ita – Italy UK – United Kingdom	Spa – Spain Bel – Belgium	Neth – Netherlands EMU – European Monetary Union	Ger – Germany Fra – France	VECM – vector error correction model

Authors	Country Sample	Variables						Result: Which bank characteristic is significant?	Asserted evidence for the BLC	Comment
		Dependent variable	Lagged dependent variables	(Short-term) interest rate	Bank balance sheet items	Control variables	Bank characteristics			
Kashyap and Stein (1995)	USA 1972:Q1-1992:Q2	L	-	FFR	C, Sec, D	CPI, GDP	SIZ	SIZ	Yes	IRC. RE
Brissimis et al. (2001)	Greece 1995:M1-2000:M12	L	L(-t)	MMR; ALT: loan – bond rate	D	CPI, GDP	SIZ, LIQ	LIQ; ALT: SIZ and LIQ	Yes; ALT: Yes	No GMM. IRC; ALT: not in line with the BLC. RE
Hernando and Martinez-Pagés (2001)	Spain 1991:Q1-1998:Q4	L	L(-t)	MMR	D	CPI, GDP	SIZ, LIQ , CAP	None	No; ALT: No	IRC; ALT: BLC is singled out. RE
Topi and Vimunen (2001)	Finland 1995:Q1-2001:Q4	L	L(-t)	MMR	-	CPI, GDP	SIZ, LIQ , CAP	None	No	IRC. RE
Westerlund (2003)	Sweden 1998:M1-2003:M6	L	L(-t)	MMR	D, CD, Sec	(CD, Sec)	SIZ, LIQ , CAP	SIZ, LIQ, CAP	Yes	IRC. RE
Kashyap and Stein (2000)	USA 1976:Q1-1993:Q2	L	L(-t)	FFR	-	GDP	LIQ	LIQ	Yes	IRC. RE
Bichsel and Perrez (2005)	Switzerland 1996:Q1-2003:Q1	L	L(-t)	LIBOR	-	GDP	LIQ, CAP	CAP	Yes	IRC. RE
Kishan and Opiela (2000)	USA 1980:Q1-1995:Q4	L	L(-t)	FFR / Bernanke-Mihov	D, TD, Sec	-	SIZ, CAP	SIZ and CAP	Yes	No control variables. IRC. RE
Loupias et al. (2001)	France 1993:Q1-2000:Q4	L	L(-t)	MMR	-	CPI, GDP	SIZ, LIQ, CAP	LIQ	Yes	IRC. RE

Table 2: Investigations in the Spirit of Kashyap and Stein (1995, 2000) and Kishan and Opiela (2000) (part 1)

Authors	Country Sample	Variables						Result: Which bank characteristic is significant?	Asserted evidence for the BLC	Comment
		Dependent variable	Lagged dependent variables	(Short-term) interest rate	Bank balance sheet items	Control variables	Bank characteristics			
Gambacorta et al. (2001)	Italy 1986:Q1-1998:Q4	L	L(-t)	MMR	-	CPI, GDP	SIZ, LIQ, CAP	LIQ	Yes	IRC. RE
De Haan (2003)	Holland 1991:Q1-1998:Q4	L	L(-t)	MMR	-	CPI, GDP	SIZ, LIQ, CAP	SIZ, LIQ, CAP	Yes	IRC. RE
Worms (2001)	Germany 1992:Q1-1998:Q4	L	L(-t)	MMR		bank-indiv. income, default-risk measure	SIZ, LIQ, CAP	LIQ, CAP	Yes	IRC. RE
De Bondt (1998)	Fra, Ger, Neth, Bel, Ita, UK 1990-1995	L	-	MMR / monetary conditions index	-	GDP	SIZ, LIQ	SIZ, LIQ	Fra: No Ger: Yes Neth: Yes Bel: Yes Ita: No / Yes UK: No	IRC. RE
Favero et al. (1999)	Fra, Ger, Ita, Spa 1992	L	-	-	Bank reserves	-	SIZ, LIQ	None	Fra: No Ger: No Ita: No Spa: No	No control variables. IRC. RE
Altunbas et al (2002)	EMU 1991-1999	L	-	MMR	interbank D, Sec	GDP	SIZ, CAP	SIZ, CAP	Yes	IRC. RE
Ehrmann et al. (2001)	Fra, Ger, Ita, Spa 1992-1999	L	L(-t)	MMR	-	CPI, GDP	SIZ, LIQ, CAP	LIQ	Yes	IRC. RE

Table 3: Investigations in the Spirit of Kashyap and Stein (1995, 2000) and Kishan and Opiela (2000) (part 2)

Brissimis et al. (2001) conduct an empirical investigation for Greece by using bank level, monthly panel data for the period from 1995 to 2000. In the first step the researchers apply the aforementioned method by Kashyap and Stein (1995). Brissimis et al. (2001) test bank characteristics such as bank size (proxied by total assets) and "balance sheet strength" or liquidity (ratio of cash, deposits with other banks and securities to assets). In contrast to bank size, liquidity matters in Greece since results indicate that more liquid banks can insulate their loan supply from changes in monetary policy.

Brissimis et al. (2001) also apply an alternative estimation technique: the linear single error correction model. Thereby, they directly estimate the loan supply function by including deposits and the interest rate spread between the loan and bond rate. This function is aimed to be in line with the loan supply function in the influential paper of Bernanke and Blinder (1988), but this is only partly true since Bernanke and Blinder operate with an altered loan supply function; instead of deposits, the equilibrium on the money market is used to rewrite the loan supply and, hence, the equilibrium on the loan market. Bernanke and Blinder make use of this new loan supply function to construct a substitute for the conventional IS curve that includes the loan market equilibrium. When Bernanke and Blinder replace deposits for money supply, they insert elements from the money market equilibrium into the loan market equilibrium. The CC curve as substitute for the conventional IS curve does not solely refer to the loan market. With this trick, Bernanke and Blinder model the BLC and claim that this channel has an additional affect on real activity since central banks now shift the LM and the CC curve when changing money supply. Hence, this modified loan supply function is crucial for the BLC while the presented and used function by Brissimis et al. (2001) is less problematic and vital for the existence of the BLC. In their regression, bank characteristics (size and liquidity) are integrated and multiplied with deposits because they also shift the loan supply function. According to Brissimis et al. (2001), if loans and bonds are perfect substitutes and thus the spread of rates is zero, there is no BLC. However, results show that the spread is positive and significant and that size and liquidity matter. Larger and more liquid banks can shield their loan portfolio from changes in monetary policy. Additionally, the researchers fail to perform the Generalized Method of Moments (GMM) estimation since estimators may be inconsistent and inefficient due to the inclusion of lagged loans as an independent variable. Usually, the GMM estimation is applied as the following investigation shows.

Hernando and Martinez-Pagés (2001) also apply the Kashyap and Stein (1995)-estimation-technique for Spain. They use a quarterly panel dataset of 216 depository institutions operating in Spain for the period between 1991 and 1998. Researchers tested for three bank characteristics: size and liquidity, which are similarly defined as mentioned above; capitalization as ratio of capital; and reserves to total assets excluding liquid assets and loans to the domestic public

sector. Due to the inclusion of the lagged dependent variable loans on the right-hand-side, the estimator within is inconsistent and ordinary least squares estimation cannot be applied. Thus, the GMM estimation is used to address this problem as suggested by Arellano and Bond (1991). This method ensures efficiency and consistency of the estimators provided that the instruments are adequately defined to take into account the serial correlation properties of the residuals. The method embarks on taking first differences of the model and estimating the resulting model by instrumental variables. As instruments are often used the following variables: lags 2 and 3 of the second difference of the logarithm of loans, lag 2 of the first difference of the bank characteristics and lag 2 of the first difference of the interaction terms such as bank characteristic(s) multiplied by the monetary policy indicator. The macroeconomic variables GDP and inflation control for effects stemming from the loan demand and are assumed exogenous. This estimator brings about more robust estimates if two conditions are fulfilled: the absence of the second-order serial autocorrelation in residuals and valid instrument variables. In order to meet these conditions, there is consensus to indicate AR1 and AR2 tests for the first-order and second-order autocorrelation and to run the Sargan test for the independence of the instruments. Using the GMM estimator, Hernando and Martinez-Pagés (2001) cannot find differences in the response of loan growth to three-month money market rates (as a policy indicator) for Spanish banks of different sizes or different degrees of capitalization. Regarding liquidity, they find some evidence that less liquid banks are more responsive to changes in the policy indicator than liquid banks. Hernando and Martinez-Pagés (2001) also break down total loans to loans to firms, consumer loans and mortgage loans. They fail to observe significant asymmetric responses – among liquid and less liquid banks – by these types of loans to a monetary policy shock. Hence, they come to the conclusion that the differential response of aggregated loans among more and less liquid banks is rather explained by the composition of bank lending and not by actual difference in the loan supply response.

Hernando and Martinez-Pagés (2001) also perform an alternative approach, based on the response to an exogenous shock to deposits. This shock stems from the tax-induced expansion of mutual funds in Spain in this period. Mutual funds shares become attractive substitutes for deposits because the tax on capital gains from those shares was reduced and investors shifted

their financial means from bank deposits to money market and fixed-income mutual funds. The crucial consequences from this innovation are that it is not driven by monetary policy and interest rates and that it brings about reduced deposits. Loan demand remains unaffected by this deposit-reducing shock. Therefore, any impact of the shock on loan growth can be interpreted as a supply effect and, consequently, can be taken as evidence in favor of the BLC. This empirical approach is particularly interesting since it simulates that the interest channel is ineffective because relative prices remain unchanged. The effectiveness of the BLC on the real economy would then depend on this direct quantitative impact of deposits on the loan supply. Strikingly, Hernando and Martinez-Pagés (2001) find no evidence that the sizeable reduction in deposits affects the ability of even smaller, less liquid and less capitalized banks to satisfy loan demand.

Following Kashyap and Stein (1995), Topi and Vimunen (2001) test the BLC in Finland. By using quarterly panel data from 1995 to 2001, the researchers apply the GMM estimation and find no statistical evidence for the BLC. More precisely, they do find support for the hypothesis that GDP growth, inflation and the Bank of Finland tender rate/ECB's main refinancing rate (as an indicator of monetary policy) and lagged bank loan growth explain the dependent variable, log differences of bank loans. Moreover, smaller, less liquid or capitalized banks should face difficulties in tapping alternative financing sources to maintain the loan supply when the central bank induces bank deposits to decrease. The inclusion of proxies for information costs such as size, liquidity and capitalization of Finnish banks does not bring about significant results. Thus, Topi and Vimunen (2001) conclude that heterogeneity among banks does not matter and that the BLC lacks statistical support. They include a dummy variable for the state loan guarantees which enters significantly in their regressions, indicating that the government support for the entire banking sector might have contributed to the increase in the growth rate of loans.

Westerlund (2003) scrutinizes Sweden by using a panel of monthly disaggregated bank balance sheet data for the period of 1998:M1 to 2003:M6. Separating banks by asset size, liquidity and capitalization, Westerlund applies the autoregressive distributed lag model (and GMM estimation) and therefore uses lagged loans, changes in the three month Stockholm interbank offered rate as indicator of monetary policy, and real GDP and CPI to explain the logarithm of

bank loans. Westerlund (2003) also includes logarithm of certificates of deposits and securities to control for alternative lending opportunities. The main findings are: first, the Swedish central bank affects loans since banks are constrained by the limited access to external finance to compensate the drain in deposits; secondly, GDP and CPI should control for demand effects, so that Westerlund assumes homogenous loan demand across banks which leads to his conclusion that the central bank shifts the loan supply; thirdly, the degree of banks' response to monetary policy depends on separating characteristics such as size, liquidity and capitalization; fourthly, firms and households in Sweden seem to be constrained by a drop in the loan supply so that Westerlund concludes that real spending might be affected and the BLC at work.

In the empirical literature of the BLC, Kashyap and Stein (2000) write a seminal paper that is also widely cited. Using panel data at the individual bank level from 1976:Q1 till 1993:Q2, the main result is that central banks have a stronger affect on lending of those banks with less liquid balance sheets. Put differently, less liquidity-constrained banks use their buffer stock to shield loan portfolios from monetary policy shocks. The ratio of securities plus federal funds and assets define size of the buffer stock. Each quarter all federally insured banks provide information about their "condition and income" in Call Reports to the Federal Reserve. As in Kashyap and Stein (1995), the researchers test effects of monetary policy on banks of different sizes. Banks are organized in categories depending on asset sizes of balance sheets. A two-step regression approach is applied. First, they run cross-sectional regression separately for each size class and each time period, with a logarithmic form of loans as the dependent variable and lagged loans in logarithmic form, "balance sheet strength" (i.e., the buffer stock or measure of liquidity constraints as ratio of securities and federal funds to assets for a given size class) and a Federal Reserve-district dummy variable to control for geographical factors as an independent variable. In a second step, the estimators of the "balance sheet strength" of former regressions are used as dependent variables in time series regressions. The right-hand-side is a contemporaneous and lagged monetary policy indicator, lagged real GDP growth and a linear time trend. This two-step approach encounters the simultaneity issue since bank lending is affected by demand and supply shocks. Given that all banks face the same demand shock at one point in time, differences in bank lending mirrors only differences in the supply. The estimators of the "balance sheet strength" of

former regressions are estimated cross-sectionally and measure these differences. Certainly, it is important to know for which size of banks monetary policy matters most. It is also fruitful to discover that the buffer stock shields loans from adjusting because banks that hold liquid assets are better able to respond to adverse shocks. However, this paper focuses on the influence of monetary policy on bank lending in general and fails to insulate the BLC. It is not clear why there is an additional impact of the central bank on the economy beyond the interest rate channel. Identical results are expected if one tests the interest rate channel since this transmission mechanism also encompasses adjustments of the loan rate and, hence, loans. In a nutshell, Kashyap and Stein (2000) fail to empirically insulate the additional impact stated by proponents of the BLC.

Bichsel and Perrez (2005) follow the aforementioned approach by Kashyap and Stein (2000), but test the BLC for Switzerland instead of the U.S. Their unbalanced, quarterly panel and bank level data is obtained from the Swiss National Bank for the period 1996:Q1 till 2003:Q1. An important extension is made by Bichsel and Perrez (2005) because they not only test for liquidity but also for capital base, defined as the ratio between excess minus required capital. They find support for the BLC. Liquidity, in contrast to capital, does not constrain bank lending in the case of changes in monetary policy stance. That is, better capitalized but not more liquid banks shield loan portfolios from impulses of the Swiss National Bank. Yet, as Bichsel and Perrez (2005) admit, the implication of the results for monetary policy is limited due to the concentrated banking market and the small number of undercapitalized banks in Switzerland.

Kishan and Opiela (2000) also find support for the existence of the BLC in the U.S. by using quarterly data on balance sheet items of federally insured commercial banks from 1980:Q1 till 1995:Q4. While Kashyap and Stein (1995, 2000) focus on the bank (asset) size and liquidity, Kishan and Opiela (2000) use the bank size and the bank capital leverage ratio (i.e., equity capital to total asset ratio) as the differentiating characteristics in the banking sector. They stress the role of bank capital in discouraging excessive risk-taking and its function as an indicator of bank health, since capital can absorb various shocks to assets. Therefore, bank capital links regulatory and stabilization policy. Relying on Call Reports, Kishan and Opiela retrieve data on loans,

securities, demand deposits, large time deposits and capital. Federal funds rates and the Bernanke-Mihov indicator[13] proxy monetary policy. After dividing banks into six asset categories, a further subdivision is executed in three capital leverage ratio groups. For each size and each leverage ratio, Kishan and Opiela (2000) regress the growth rate of various types of loans on four lagged values of itself, four lagged values of the change in the federal funds rate (or in the Bernanke-Mihov indicator) and the current period growth in large time deposits and in securities. The latter variables, time deposits and securities, ought to control for "funding" effects on loans within each size and leverage ratio group. They find that small and undercapitalized banks tend to respond mostly to monetary policy. Additionally, Kishan and Opiela (2000) test the responsiveness of time deposits to money market rate changes. Insignificant results for small undercapitalized banks support their hypothesis that these banks do not want to – or are not able to – sell time deposits to finance the Fed-induced drain of demand deposits. It appears odd that they fail to control for the loan demand by inclusion of GDP and CPI, as the majority of investigators do. Therefore, Kishan and Opiela (2000) cannot convincingly assume that the loan demand faced by all banks is homogenous. However, Kishan and Opiela (2000) have an unusual understanding of the interest rate channel because they state that the supply of loans does not adjust to monetary policy. Loans are banks' assets and therefore a part of their portfolio. If one includes banks and bank loans in the traditional IS/LM analysis with assets money and bonds, monetary policy affects interest rates and sets portfolio adjustments in motion. That is, banks modify both assets securities and loans. It appears erroneous to conclude from this view on the interest rate channel that one can find evidence for the existence of the BLC if the loan supply changes after a monetary impulse from the central bank.

For France, Loupias et al. (2001) test the existence of the BLC and separate banks by size, liquidity and capitalization. They retrieve quarterly panel data on bank balance sheets over the period from 1993 to 2000 and the estimation method follows Kashyap and Stein (1995, 2000). In order to account for the autoregressive nature of the model and for the possible endogeneity of bank characteristics, Loupias et al. (2001) use the GMM estimator with the following

[13] This indicator is computed using federal funds rate, non-borrowed reserves, total reserves and other variables such as real GDP. Bernanke and Mihov (1998) explain in detail their method.

instruments: the second and third lags of the quarterly growth rate of loans, the second lag of the bank characteristics and the first difference of the three-month interbank interest rate (as indicator of monetary policy). Contrary to the results for the U.S. displayed by Kashyap and Stein (1995, 2000) and Kishan and Opiela (2000), Loupias et al. (2001) only find support for the hypothesis that liquidity affects bank lending. Size and capitalization do not matter in France.

Gambacorta (2001) corroborates the findings of Loupias et al. (2001) by using Italian panel data covering the period from 1986:Q1 till 1998:Q4. Their approach is also based on Kashyap and Stein (1995, 2000), with the interest rate on repurchase agreements between the Bank of Italy and eligible banks as monetary policy indicator.

De Haan (2003) applies the same estimation technique but uses individual bank data from Netherlands for the period 1990:Q1 – 1998:Q4. The author finds evidence of the BLC in Holland, but only when loans without government guarantee are singled out. This negative effect of monetary policy on unsecured loans particularly affects smaller, less liquid and less capitalized banks.

Worms (2001) executes the approach by Kashyap and Stein (1995, 2000) in combination with the GMM estimation for Germany and finds evidence for the existence of the BLC. As in many other European countries, evidence of former studies is inconclusive. Worms contributes to the existing literature by using individual balance sheet information, retrieving quarterly instead of annual macrodata and monthly balance sheet information from 1992-1998 and taking into account the structure of the German banking sector. With respect to control variables, Worms (2001) is innovative since he does not include GDP and inflation to control for loan demand effects as the mainstream literature applies. Instead, he includes the logarithm of a bank-individual income variable and a bank-individual default-risk measure. The first variable is proxied by an average of real incomes of nine production sectors and the private households. The latter variable is captured by a sectoral average of the number of insolvencies. His main finding is that bank loans decrease following an increase in the three-month interest rate – the lower the share of short-term interbank deposits to total assets. In contrast to U.S., the size of banks does not matter. It

becomes significant only when the author controls for interbank deposits or when very small banks are excluded from the sample. Worms (2001) explains the result with the special structure in the banking sector. Interbank deposits capture the close interbank link in the sector of credit cooperatives and savings banks in Germany. In case of a restrictive monetary policy measure, financial means are channeled from a large super-ordinate central institution to their affiliated smaller bank. Other bank characteristics such as liquidity and capitalization are significant, indicating that more liquid and better capitalized German banks are able to shield their loan portfolios from contractionary monetary policy action. Yet, concerning liquidity, one has to remark that short-term interbank deposits are the main component of a bank's liquid assets and particularly the very small ones. Consequently, an average bank does not reduce liquidity assets other than short-term interbank deposits to moderate policy measures on loans.

On the level of single European countries, de Bondt (1998) is the first empirical contribution to question the existence of the BLC in Europe. So far, contributions have only been made in the U.S. so de Bondt mainly follows Kashyap and Stein (1995) to test the BLC in Germany, Belgium, Netherlands, U.K., Italy and France. He focuses on the bank characteristics of size and liquidity and retrieves disaggregated bank level panel data for the years 1990-1995. Changes in loans are regressed on changes in short-term interest rates (as an indicator of the stance of monetary policy), changes in rates multiplied with the share of liquid assets over deposits and money market funding (liquidity), changes in rates multiplied with (the log of) total assets (size), changes in rates multiplied with liquidity and size and percentage change in real GDP growth. In Germany, the Netherlands and Belgium, de Bondt finds support for the BLC, while in U.K., France and Italy no significant effects are observed. De Bondt also replaces the short-term interest rate as a proxy by a monetary conditions index which additionally takes into account dollar exchange rate fluctuations. Results seem to confirm the existence of the BLC in France and Italy. In U.K., results still show no corroboration of the BLC.

Favero et al. (1999) is also one of the earliest empirical investigations of the BLC in France, Germany, Italy and Spain by using individual bank balance sheet data for the year 1992. The researchers choose 1992 to cancel out possible demand effects stemming from major output

fluctuations which can be observed, for instance, in 1993 but not in 1992. Applying the estimation method of ordinary least squares heteroscedasticity-consistent standard errors, Favero et al. (1999) separate banks in ten groups according to their size. Favero et al. estimate the equation with the percentage change in bank loans from 1991 to 1992 as a dependent variable and percentage change in bank reserves over the same period (as proxy for the stance of monetary policy) and the ratio of cash, securities and reserves to assets at the end of 1991, multiplied with change in reserves as independent variable. Overall, they do not find evidence for the BLC in these four countries. Small banks across Germany, Italy and France provide more loans in case of a restrictive monetary policy and measure and liquidity helps to bolster this expansion. Only large banks in Germany use liquidity as a buffer and shield loans from monetary policy actions. In any country, the lending of other banks does not respond to monetary policy. Despite picking the year 1992, Favero et al. might insufficiently control for loan demand effects by not including variables such as GDP and inflation, as other studies subsequent to this investigation carry out. Consequently, their results may suffer from an identification puzzle.

Altunbas et al. (2002) mainly follow the approaches of de Bondt (1998) and Kishan and Opiela (2000). Therefore, they use annual (panel) bank balance sheets or individual bank level data from 1991 to 1999 for the European Monetary Union (EMU) and for individual countries. Altunbas et al. (2002) retrieve data on loans, GDP, securities, interbank borrowings (as a proxy for time deposits) and deposits to changes in money market rates, which serve as a proxy for the stance of monetary policy. To control for "funding" effects on loans, Altunbas et al. (2002) use securities and interbank deposits. GDP controls for demand factors since they aim to identify the BLC. The regression models are estimated using the random effects panel data approach. They follow Kishan and Opiela (2000) and categorize banks in classes regarding asset size and "capital strength" (i.e., equity capital to total asset ratio). Altunbas et al.'s (2002) main result is that – irrespective of their size – undercapitalized (i.e., the ratio of capital strength is less than 5 percent) banks' lending tends to respond more to a monetary impulse from the central bank. In the EMU, the BLC is mainly transmitted via undercapitalized banks in smaller banking systems.

Ehrmann et al. (2001) conduct an investigation involving not a single-country but aggregated annual data from France, Germany, Italy and Spain for the period of 1992 – 1999. They also apply the aforementioned method by Kashyap and Stein (1995, 2000) and GMM estimation, and explain the contrasting results with reduced information asymmetries in these four countries, which are proxied by size, liquidity and capitalization. Again, in the U.S. small and undercapitalized banks show the strongest response to restrictive monetary policy, while in Europe this outcome can only be observed for less liquid banks. Ehrmann et al. (2001) came up with the argument that the structure of the banking sector affects the distributional effect of the monetary policy on bank lending. In contrast to the U.S., analyzed European counties are characterized by a lower number of bank failures, a stronger governmental role and bank networks. In short, the structure of the banking sector helps reduce informational frictions so that banks show muted reactions in their lending behavior. These aspects might explain why size and capitalization do not matter.

III.3 Further Investigations

Table 4 summarizes the empirical research which does not follow Kashyap and Stein or Kishan and Opiela. Following Table 4 investigations are presented and examined.

Authors	Country Sample	Methodology	Variables	Result: Which bank characteristic is significant?	Asserted evidence for the BLC	Comment
Farinha and Marques (2001)	Portugal 1991:Q1-1998:Q4	Ordinary Least Square	L, MMR, D, CPI, loan and bond rate, CAP	CAP	Yes	Unsolved identification problem. RE
Kaufmann (2001)	Austria 1991:Q1-1998:Q4	Bayesian Framework; Markov Chain Monte Carlo Simulation	L, L(-t), MMR, D, CPI, GDP SIZ and LIQ	LIQ in times of economic slowdown	Yes	IRC. RE
Frühwirth-Schnatter and Kaufmann (2003)	Austria 1990:Q1-1998:Q4	Bayesian Framework; Markov Chain Monte Carlo Simulation	L, MMR, C, Sec, D, CPI, GDP, State of the economy, (To be estimated) Different bank groups	–	Weak support	–
Ashcraft (2006)	USA 1976:Q1-1999:Q4	Ordinary Least Square	L, L(-t), FFR, D, CPI, GDP, SIZ, LIQ, CAP, Affiliation	SIZ, LIQ, CAP, Affiliation	Weak support due to the irrelevance of the BLC for the RE	IRC
Huang (2003)	UK 1975:Q1-1999:Q4	Autoregressive distributed lag model with GMM	L, Clearing banks' base rate, inventories, debt-asset ratio (SIZ), vol. of debt	SIZ	Yes	IRC
Hülsewig et al. (2001)	Germany 1975:Q1-1998:Q4	VECM	Bank equity, (loan rate-MMR), CPI, GDP	–	Unclear	Identification puzzle remains

Table 4: Further Investigations

Farinha and Marques (2001) use Portuguese microdata from 1991:Q1 to 1998:Q4 and depart from the mainstream literature where the estimation method relies on the reduced form equation with variables in differences. Essentially, loans are the dependent variable while lagged loans, a monetary policy indicator, interaction terms such as a policy indicator multiplied by bank characteristic(s) size, liquidity, capitalization and macroeconomic variables such as GDP and inflation are "on the right-hand-side of the equation." Instead, they test the BLC in Portugal by suggesting an alternative technique that aims to estimate the loan supply directly with variables in levels. Farinha and Marques (2001) assume that at the bank level deposits are widely determined by the central bank and are exogenous. This is also valid for the bond interest rate since banks are price-takers in the market for securities. The reduced form equation consists of the logarithm of real loans as the dependent variable and the log of real GDP, inflation, real deposits, the interaction term (real deposits times bank characteristic(s)) and the interest rate on bonds. Farinha and Marques (2001) identify the loan supply curve by including an element they consider to only drive the demand side: the log of real GDP. The bank loan demand curve can also be singled out since real deposits determine the supply curve as an additional regressor. As shown in Chapter II, the loan demand seems to be ill-defined in the seminal paper by Bernanke and Blinder (1988). Correcting this function by explicitly defining the bond function in the first step and the loan demand as an implicit function in line with the budget constraint of nonbanks in the second, brings about a loan demand dependent on deposits. Therefore, the identification problem is not solved as Farinha and Marques (2001) claim. However, the researchers apply the ordinary least squares approach and regress (the log of) real bank loans against (the log of) real deposits and real capital, (the log of) CPI, the Portuguese money market rate Lisbor, and the bond and bank loan interest rate. Additionally, Lisbor, (the log of) real deposits and real capital are multiplied with bank characteristic(s). Their approach is very similar to the method chosen in Chapter IV where a cross-section and a panel analysis are performed. In my investigation the identification problem is solved by explicitly taking into account the bank loan supply: the data is provided by the World Economic Forum which asks business professionals in many countries, "How easy is it to obtain a bank loan in your country with only a good business plan and no collateral?" Contrary to non-supportive results of my investigation, Farinha and Marques (2001) find evidence for the

BLC in Portugal and that the channel may be more important for less capitalized banks. Size and liquidity appear irrelevant.

As for Austria, Kaufmann (2001) investigates both cross-sectional asymmetry (related to bank-specific characteristics such as size and liquidity) and asymmetries over time (potentially related to the overall state of the economy) in Austrian bank lending reaction to monetary policy. The first type of asymmetry is accounted for by including interaction terms as executed by the aforementioned studies, and the second type is captured by latent state-dependent parameters. Estimation is cast into a Bayesian framework and the posterior inference is obtained by applying Markov Chain Monte Carlo simulation methods. Kaufmann (2001) uses quarterly panel data from individual bank balance sheets for the period of 1990:Q1 – 1998:Q4. The results display a significant asymmetric effect of Austrian three-month interest rate changes over time on bank loans. During economic recovery, lagged interest rate changes have no significant effect on lending. Interestingly, the effects are significant during an economic slowdown and liquidity emerges as the bank characteristic that determines cross-sectional asymmetry. Again, size does not matter as a proxy for frictions in financial markets stemming from informational asymmetries.

A bank's exposure to asymmetric information is not directly observable. In their empirical assessment for Austria, Frühwirth-Schnatter and Kaufmann (2003) depart from the mainstream literature since the bank characteristics of size, liquidity and capitalization are often used as proxies for informational frictions, but yet appear less relevant in Europe to sort out whether banks respond differently to monetary policy measures. One explanation for this different result from the U.S. is the aforementioned structure of the banking sector. However, Frühwirth-Schnatter and Kaufmann (2003) do not categorize Austrian banks on the subject of size, liquidity and capitalization beforehand. They estimate the appropriate grouping of banks using individual bank balance sheet data covering the period from 1990:Q1 till 1998:Q4. Concerning the estimation technique, evidence is obtained within the Bayesian framework applying Markov Chain Monte Carlo simulation methods. As a result, banks are separated in three groups according to the groups' average asset total. These groups then differ in reaction to monetary

policy measures. Banks with higher exposure to asymmetric information, such as the group of banks with the lowest average size, show the strongest lending response following a monetary policy action. Yet, as Frühwirth-Schnatter and Kaufmann (2003) document, this support for the BLC is rendered weak since a very small percentage of banks form the smallest group. The vast majority of banks exhibit only minor lending reactions.

Ashcraft (2006) conducts an empirical investigation and stresses the irrelevance of the BLC as a monetary transmission channel. Regarding the methodology, he retrieves annual and quarterly data from Call Reports for the period between 1976 and 1999. Ashcraft (2006) chooses ordinary least squares in a two-step approach, first testing responses of bank lending to monetary policy and second examining the link between monetary impulses, aggregated loans and real activity. He uses annual bank-level data to regress loan growth on insured deposits growth, lagged bank characteristics such as the ratio of securities to assets, a dummy variable for affiliation with a multibank holding company, the ratio of internal capital generation to assets, total assets etc., and the interaction of these characteristics with deposit growth. This regression indicates that the loan growth of banks affiliated with multibank holding companies responds less to deposit growth since affiliated banks have better access to alternative funds once the central bank shifts insured deposits. Affiliation reduces the financial constraints otherwise faced by banks. Ashcraft (2006) also regresses loan growth against lagged loan growth, a set of macro-variables such as the one year federal funds rate, aggregate nominal output growth and the consumer price index, a set of lagged bank characteristics and the interaction between the last two. The result is that monetary policy has little effect on affiliated bank lending. Therefore, his first key finding is – also observed by others in the past – that monetary policy is more effective the greater the share of liquidity-constrained banks within the banking system. Not only the size of the balance sheet, liquidity or capitalization buffer banks, but also affiliation shields loan portfolios from monetary policy impulses. In the second step, Ashcraft (2006) uses quarterly data and aggregates bank figures to the state level, treating the U.S. as a set of state economies. He regresses the state income growth on lagged output growth, lagged macro-variables, lagged bank characteristics and the interaction of the last two. The result is that output growth shows little variation in response

to policy when testing across different market share of constrained banks. This indicates the aforementioned irrelevance of the BLC for the real economy.

So far, the reviewed studies (except Ashcraft 2006) only focus on the first link in the chain of monetary policy transmission and thus disregard the potential impact of the lending behaviour on spending as posed by the BLC. Again, empirical papers examine cross-sectional differences in the banking sector following monetary policy changes. Size, liquidity, capitalization and affiliation are included bank characteristics to proxy informational frictions and to dissolve the identification problem.

Huang (2003) does not separate banks by these characteristics. The researcher follows existing approaches such as those used by Kashyap et al. (1994) and Oliner and Rudebusch (1995, 1996), and focuses on possible asymmetries in the responses of bank customers, namely firms. The BLC stresses that some firms are bank-dependent. Thus, bank loans and other forms of debt such as bonds are not perfect substitutes. In case of restrictive monetary policy, banks shrink lending and firms which have limited access to the capital market reduce investment spending. Huang (2003) uses quarterly balance sheet data for a panel of U.K.-listed non-financial firms, which covers the period between 1975 and 1999, and finds evidence of the BLC in United Kingdom. For constrained firms, tight monetary policy reduces bank loans and decreases the bank-debt ratio. Restricted firms then experience lower debt volume while non-bank-dependent companies find alternative debt finance. This is what the BLC predicts. So, Huang (2003) tests the effect of monetary policy on the debt structure and separates firms according to their dependency on banks. The criterion which splits the sample in dependent and non-dependent companies is the average bank loan-total debt ratio across years. Bank-dependent firms used to be smaller than non-dependent enterprises. The (log of) London clearing bank base rate is chosen as the indicator for British monetary policy. Due to a lagged dependent variable, Huang (2003) applies the GMM estimator. Control variables used are logarithms of inventories as proxy for investment spending and a log of a firm's debt-asset ratios. The latter variable aims at capturing amendments in firm's finance pattern. In order to account for periods of relative restrictive stance of monetary policy or "*tight money*", Huang (2003) includes a dummy variable and tests whether effects of monetary

policy vary across time or symmetrically affect the dependent variable. Furthermore, the researcher examines policy effects on the volume of bank loans and then on the volume of debt. Huang (2003) discovers that in the case of an increase in the interest rate, non-dependent companies raise bank borrowing. Controlling for a relative restrictive policy stance brings about a reduction in bank borrowing, but the magnitude is not as large as that of bank-dependent firms. These mostly small enterprises bear most of the reductions in the bank-debt ratio and the volume of bank loans. One explanation might be that bigger firms have a larger bargaining power so that banks shield the loan supply to these customers from changes in monetary policy. Finally, Huang (2003) tests the link between bank dependence and inventory investment. There is evidence that changes in policy might affect the investment demand of financially constrained firms (i.e., those with higher bank-debt ratios) more than investment spending of companies with easier access to alternative debt finance.

An alternative way to test the BLC is to apply the method of VECM developed by Johansen (1988, 1995) and rests on VAR. Using this technique, a second strand of empirical investigations emerged in the past decade. The pivotal characteristic is that researchers again bring into play aggregated data in time series. Early contributions were made by De Bondt (1999) or by Hülsewig et al. (2001). The latter applied the method of VECM for Germany with aggregate bank loan data covering the period 1975:Q1 till 1998:Q4. Hülsewig et al. (2001) spotted three long-run co-integration vectors which are interpreted as loan supply and loan demand functions. The third equation displays the relationship between a bank's volume of equity, real GDP and the inflation rate. The loan supply is approximated by equity and the spread between the loan rate and the short-term interest rate, which serves as proxy for the stance of monetary policy. The loan demand function is identified by real GDP and the loan rate. On the whole, the study is a good example for the existence of the identification problem. Hülsewig et al. (2001) conclude from their empirical results that monetary policy in Germany is operating through loan supply and loan demand simultaneously. But another interpretation is also plausible since they cannot single out changes in the loan supply which are not related to the loan demand. This shows the essential drawback of using aggregated data and why studies based on VAR mostly refer to the credit channel in their investigations and differentiate less between the BLC and the balance sheet

channel. The latter sub-channel stresses that central bank actions affect the creditworthiness of borrowers since the propagation of monetary impulses is transmitted via adjustments of a borrower's net worth (liquid assets and marketable collaterals) and the external finance premium, as depicted by Bernanke et al. (1996). Restrictive monetary policy actions increase the bank loan rate in the BLC and the premium in the balance sheet channel. Hence, in both credit channel models contractionary central bank measures lead to an increase in financing costs and a decrease in loans and output. The question concerning the existence of the BLC remains open in this strand of empirical literature. Other recent studies such as Holtemöller (2003), Kakes and Sturm (2002), Hülsewig et al (2005) or Dedola and Lippi (2005) also apply the VAR or VECM, and these enquiries suffer from the same shortcomings of the applied method and retrieved data so the focus of this review remains on investigations using microeconomic data.

III.4 Conclusion

On theoretical grounds, Chapter II analyzes and concludes that the BLC does not exist as modeled by Bernanke and Blinder (1988). Up to now, empirical research has produced largely inconsistent results, e.g. Kashyap and Stein (1995), Hernando and Martinez-Pagés (2001) and de Bondt (1988). This is the more revealing as many of these investigations have deficiencies in controlling for other transmission channels that relate to relative prices (Cecchetti 1995, Oliner and Rudebusch 1996). That is, the vast majority of empirical research presented here fails to test the BLC in terms of an isolated monetary policy channel.

The only investigation that succeeds to separate the BLC from other monetary transmission mechanisms is undertaken by Hernando and Martinez-Pagés (2001) for Spain. They are able to eliminate the effects stemming from relative prices such as interest rates and examine the impact of a reform-induced, exogenous restrictive shock to deposits on bank lending. Interestingly, their results do not corroborate the existence of the recently prominent channel. This is in line with the aforementioned theoretical critique expressing the view that monetary impulses are only transmitted via relative prices.

Rather, the researchers presented here mainly test for the extended interest rate channel that investigates the influence of the monetary policy on a special type of credit, bank loans. In this light some investigators find that some monetary policy affects bank lending and some not. Although the following aspects go beyond the scope of this chapter, it is worth mentioning that one reason for this mixed picture could be the applied estimation method or the chosen dataset. Alternatively, other factors such as the different structure of the banking sector may play an important role in explaining why in some countries' monetary impulses are more or less transmitted via bank loans (Ehrmann et al., 2001).

IV Puzzle with the Existence of the BLC – Evidence from a Cross-Sectional and Panel Analysis

IV.1 Introduction

How does monetary policy affect the real economy? This age-old question still churns up economists since the debate has not come to a satisfying end. Scholars have identified several channels of monetary transmission. The BLC is one of them and it has found its place in standard economic textbooks. Yet, after almost two decades of empirical research its existence is still a puzzle. The seminal paper by Bernanke and Blinder (1988) models the BLC for the first time and hence paves the path for economists to test this monetary transmission mechanism. Therefore the BLC serves as the theoretical model for its current controversial empirical research – but it does not exist. This paper – as other investigations – does not find support for the existence of the BLC.

In a nutshell, Bernanke and Blinder pose that the BLC stresses the importance of potential changes in the supply of loans as a result of monetary policy and a subsequent impact on aggregate demand for goods and services, in particular business and residential investments as well as consumer durables. That is, a tightening monetary policy such as an open market sale reduces nonbank deposits at depository institutions ("banks") and bank reserves at the central bank. Therefore, banks have fewer funds available to supply loans and cut back lending. With borrowers depending on bank loans, investment spending is reduced.

Chapter II provides theoretical reasons against the existence of the BLC. In particular, I show that the approach as presented by Bernanke and Blinder (1988) operates with lopsided loan demand, money demand and money supply functions. This invalidates the idea that potential changes in the supply of loans may affect aggregate demand for goods and services. A reduction of loans may restrict an individual investors, but the macroeconomic logic of the IS curve suggests that such a constraint is not binding.

Here, I focus on a contribution to the long body of empirical evidence and present empirical results that support the critique on the BLC by applying ordinary least squares (OLS) of the cross-section and panel data of more than 40 countries.

I restrict myself to an investigation of cross-section data for two reasons. First, the cross-section approach enriches our understanding since prior tests with aggregated bank balance sheet variables (such as loans, deposits, etc.) only employ time series and panel data. The second argument in favor of my approach is that a cross-section of countries allows us to examine many economies around the world, both developed and developing. Studying the literature I found single and group country analyses but not an investigation with more than 40 countries included. Finally, cross-section data exhibit large differences between economies, suggesting that short-term fluctuations are less relevant to the results. This focus on rather long-term differences enriches the current empirical research.

Yet, the results obtained in the cross-section analysis could be blurred by unobserved long-established firm financing patterns in many countries. This could also explain why, in some countries, bank loans are more accessible, and in some less available. In order to sort out this potential downside of the cross-section analysis I conducted a panel data investigation. With fixed effects regression I eliminated the aforementioned possible effect of omitted variables which differ across countries but are constant over time.

IV.2 A Brief Review of the Debate on the Bank Lending Channel

Before the empirical approach is explained it appears fruitful to reproduce its theoretical background. Here I only briefly summarize how Chapter II answers the following question: loans are special due to asymmetrical information, but does standard central bank policy have a direct quantitative impact beyond amendments of relative prices?

The answer is no. The BLC dismisses the logic of the IS curve by claiming that loans constrain investments and thus affect the real economy. While this argument appears convincing for an individual investor, the macroeconomic logic of the IS curve suggests that such a constraint is not

binding. Moreover, the conclusion of a more effective central bank, as presented by Bernanke and Blinder (1988), is essentially based on the CC curve, the constructed substitute for the IS curve. I posit that the construction of the CC curve obfuscates more than it reveals. Furthermore, the IS curve in its conventional logic represents the goods market's reaction to overall finance conditions as determined by the money market. These conditions embrace interest rates for bonds and loans. I show that a plausible inclusion of the loan rate in the functions of money demand and supply and not only in the functions of the loan market (as modelled by Bernanke and Blinder) brings about the textbook IS/LM results. To differentiate between forms of credit enriches our understanding, but it does not seem possible that the inclusion of another credit market brings about an additional impact on the real economy since the bond interest rate in the IS/LM represents all credit interest rates and credit markets. The BLC is also based on a special form of the loan demand function. Once employing an alternative version, the impact of an open market sale on loans is ambiguous, in line with the work of Brunner and Meltzer in the late 1960s. Overall, quantities such as loans and money do not matter since they are by-products and only mirror the stance of monetary policy. Economic decisions such as investment and consumption are driven by relative prices. Even in the case of the liquidity trap, in which money and bonds are perfect substitutes and the interest rate channel is ineffective, the BLC does not provide stimulus for investment as proposed by proponents. The reason is that money and loans are also perfect substitutes in the liquidity trap. Nonbanks primarily demand loans to hold money and not to invest. Hence, contractionary monetary policy reduces loans and money demand, but not investment. A central bank is not able to stimulate the real economy by providing liquidity if banks ration loans to nonbanks due to opaque credit risks of potential debtors. If the economic activity picks up and the repayment ability of debtors improves, banks grant more loans, so that the causality only runs from income to credit and not the reverse. Quantities such as money and credit do not additionally affect aggregate demand.

This question – whether a central bank can overcome bank credit rationing by inducing liquidity – is addressed in the empirical approach. A vital aspect of the investigation is the choice of the dependent variable: I operate with the availability of bank loans in 2006 across 125 countries. In line with economic theory, higher inflation brings about uncertainty and induces banks to ration

credit if they are reluctant or impeded to raise interest rates, for example due to fears of adverse selection and moral hazard. In the approach I use the dependent variable availability of loans (AoL) that covers the question, "How easy is it to obtain a bank loan in your country with only a good business plan and no collateral?" Therefore, banks do not raise the loan rate to curtail credit, they ration. Other empirical investigations operate with loans as a dependent variable which brings about identification problems. Using aggregated loans (instead of the loan supply) forces researchers to develop more sophisticated estimation techniques in order to single out impulses that stem from the supply side and not from the demand on the loan market. In this light, my approach is more direct since I address the loan supply using information about the availability of bank loans.

IV.3 Empirical Approach

In order to get a good grasp on the empirical approach, let us refer to the Figure 4. It exemplifies the understanding of the ECB on how monetary policy works. Here, the transmission of monetary impulses via money and credit is essential.

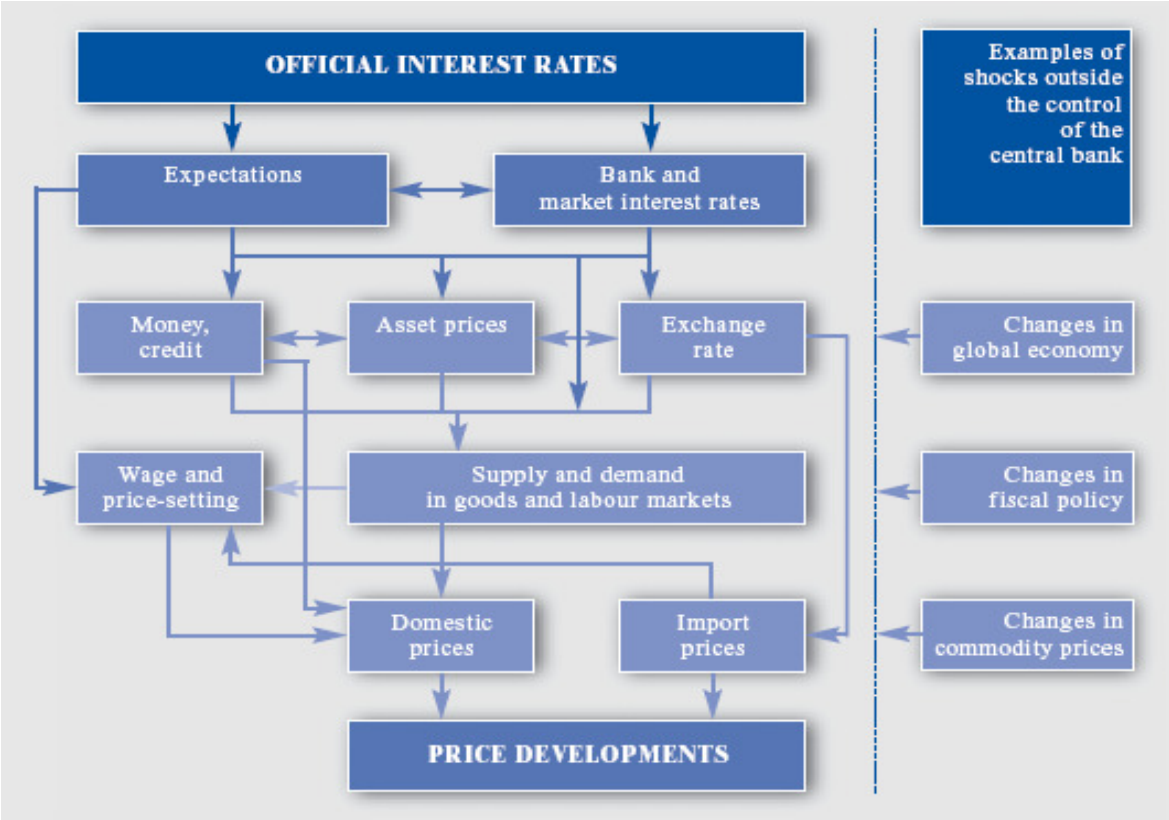


Figure 4: How the ECB Illustrates the Monetary Transmission Mechanism (Source: www.ecb.int[14])

One arrow moves from bank and market interest rates and hits supply and demand in goods and labor markets. This arrow represents the interest rate channel which describes how interest rates affect investments goods and consumer durables. Bank and market interest rates also influence money and credit. This is illustrated by another arrow that indicates interest rates affecting money and credit markets. At this point it becomes controversial. ECB draws a further arrow from money and credit to goods and labor markets, indicating the recently developed and propagated mechanism of the BLC. That is, a central bank has an additional impact on aggregate demand - beyond the traditional interest rate channel- when it alters money and the loan supply. Yet, do money and credit have an isolated impact on aggregate demand?

[14] This figure is extracted from the following document: The Monetary Policy of the ECB (Second Edition, January 2004); Chart 3.1:"A stylised illustration of the transmission mechanism from interest rate to prices"

The response is still no. Changes in money and credit are by-products of monetary policy and are not responsible for variations in aggregate demand. Rather, relative prices account for amendments of demand in the goods markets and are therefore vital for the transmission of monetary impulses. For instance, expansionary monetary policy reduces interest rates (money rises) and enhances investment and aggregate demand via decreasing cost-of-capital. Reduced interest rates also increase money demand (and money) that is not connected to the real economy. Money and aggregate demand correlate only coincidentally since money is a by-product. A similar argument holds for credit and invalidates the idea of the BLC. Increased money – as put forward by the BLC – enhances credit that affects investment. But this line of argument is based on underlying interest rates adjustments such as the loan rate. Once introducing relative prices, money and credit do not account for shifts in aggregate demand since the reduced loan rate makes investments more attractive.

Based on the intuition obtained from this figure, I designed the empirical approach. I focused on the interaction between a central bank and bank lending to work out driving forces of the availability of loans. Proponents of the BLC state monetary policy and changes in money have a direct impact on loans. Credit in turn affects aggregate demand, but I disregard this aspect. I show that money as the only independent variable is significant in explaining the availability of loans. Once I control for income and inflation, the inclusion of interest rates causes money to become insignificant and a by-product. Only interest rates and not quantities such as money account for adjustments of loans. This result is in line with the aforementioned irrelevance of quantities for the transmission mechanism of monetary impulses. In sum, I do not find evidence for the quantitative relevance of the BLC.

IV.4 Methodology of the Cross-Section Analysis

I retrieved the data from three sources: World Economic Forum's Global Competitiveness Report 2006/2007, International Monetary Fund's International Financial Statistics and World Bank's World Development Indicator. The first source collected data during 2006-2007. The latter two sources provide data for 1985 – 2005. Since I opt for a cross-section method, I choose a long time

period to obtain a solid mean of the sample for each country and each variable. For example, the World Economic Forum surveyed 8,000 business professionals from 125 countries in 2006. Other sources mostly provide data for 60 – 120 countries. Consequently, the number of countries and their composition vary with every variable. Since I apply the method of cross-section that contains a wide range of developed and developing countries around the world, the number of observations suffice to grant a solid and reliable analysis.

Using the arithmetic mean to determine average interest rates appears inadequate due to periods of hyperinflation which would then enter excessively. Therefore, I use the geometric mean reflecting the average interest rates appropriately. In general, this investigation focuses on growth rates so that the arithmetic mean is the only valid option in the case of GDP per capita.

As is the case in several cross-country analyses, the problem of heteroskedastic error terms comes up. Thus, the regressions I perform in this paper are White-heteroskedasticity corrected. Otherwise, the basic assumption of an error term with a constant variance can be rejected.[15]

This investigation looks into a cross-section of transition and industrialized economies and developing countries. This implies that variables such as the Consumer Price Index (CPI) vary across economies significantly. The histogram of the average inflation rates in Figure 5 shows that they are not normally distributed.[16]. The assumption of a normal-distribution can easily be rejected on the bases of the Jarque-Bera statistic.[17] If the value of the Jarque-Bera statistic is

[15] The fact that variables vary across countries leads to the decision to control for the heteroskedatsic error term in the regression. This correction is necessary since the dependent variable AoL follows a different, normal distribution. A heteroskedastic error term produces the problem that the estimators obtained from the OLS regression method are not efficient. An unbiased estimator is efficient if it has a smaller variance than the other possible unbiased estimators. In econometric models with heteroskedastic error terms, the regression line obtained from the OLS systematically overstates observations with higher error variances, since the sum of the squared residuals of high variance error terms is likely to be higher and affect the OLS regression more than observations with a lower error variance. The variances of the estimated parameters are not the lowest possible variance and the regression line obtained "favours" the information from the high variance error term group. Therefore, statistical tests such as the t-statistic or the construction of confidence intervals are not reliable. As a result, the White-correction for heteroskedasticity is necessary.

[16] Other included variables are similarly distributed.

[17] The Jarque-Bera-statistic combines skewness and kurtotis. In the case of symmetric or approximately symmetric distribution the skewness statistic is zero or at least close to it. The kurtosis measures the thickness of the tails. If a variable's distribution has rather thick tails it means that it is very common to have large deviations of this

larger than 5.99 the null assumption of normality of the residuals has to be rejected at the 5 percent level.

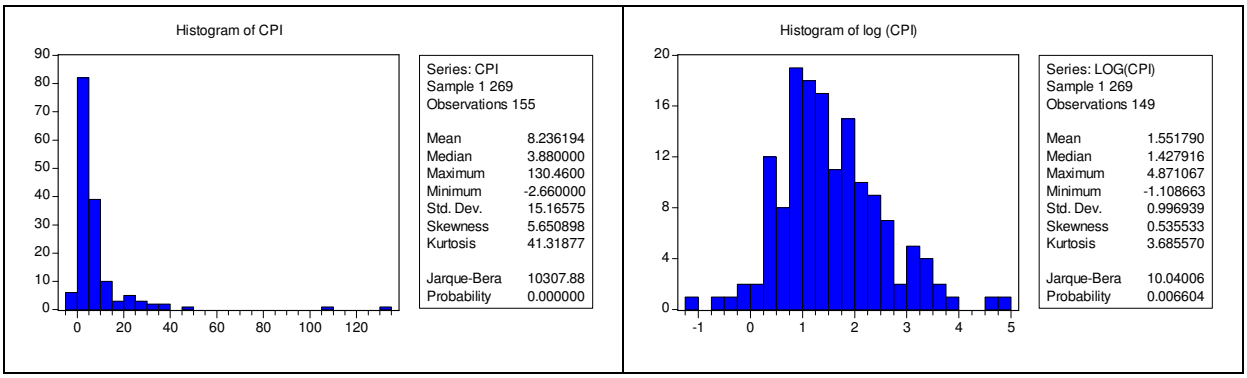


Figure 5: CPI and log (CPI)

Concerning the functional form, I analyze the distribution of variables and plot histograms. Figures 5 and 6 demonstrate the distribution of two variables, AoL and CPI. AoL is approximately normally distributed and an exception in the set of variables. Unsurprisingly, the rest of variables are unevenly distributed. To depict this, I present the histogram of CPI in Figure 5.

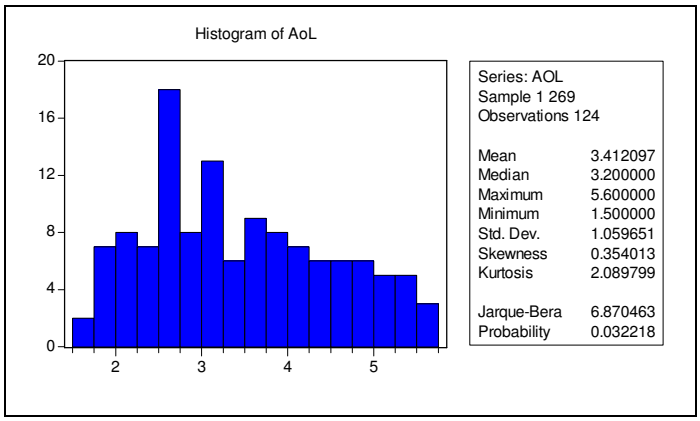


Figure 6: AoL

variable from its mean. One generally accepts a distribution to have thin enough tails if the kurtosis statistic is close to the value of three.

Using the logarithm of CPI, the distribution of average inflation rates becomes approximately normally distributed. Descriptive statistics and in particular, the Jarque-Bera indicator, support the conclusion from the graphical illustration. Skewed distribution of other variables can also be transformed into a nearly normal distribution by computing the logarithm. This is the first hint at the functional form of the OLS.

I also run regressions with the non-logarithmic forms, but non-logarithmic interest rates such as money market rates or risk premium on lending show a highly uneven distribution with some countries being outliers. The assumption of linearity could be rejected for the regressions. Only M2 per GDP is a variable that could also be included in the non-logarithmic form without amending the results obtained in presented regressions.

Figure 7 contains further hints at applying the logarithm. It shows that a logarithmic approach improves the correlation between CPI and AoL since the correlation coefficient drops from -0.26 to -0.46. The use of logarithmic average inflation rates ensures a better interpretation of the link between the average inflation rate and availability of bank loans, where higher numbers display easier access. The scatter plots hint at a possible negative impact. Higher income per capita and systematically lower inflation might ease the access to loans. Again, the logarithm was used to obtain a better comparison between sets of variables. This result also holds for plots of other variables and AoL, given the logarithmic approach (Appendix).[18]

[18] Only M2 per GDP deviates from this result since the transformation does not amend the variable materially. Therefore, the correlation coefficient remains nearly unchanged.

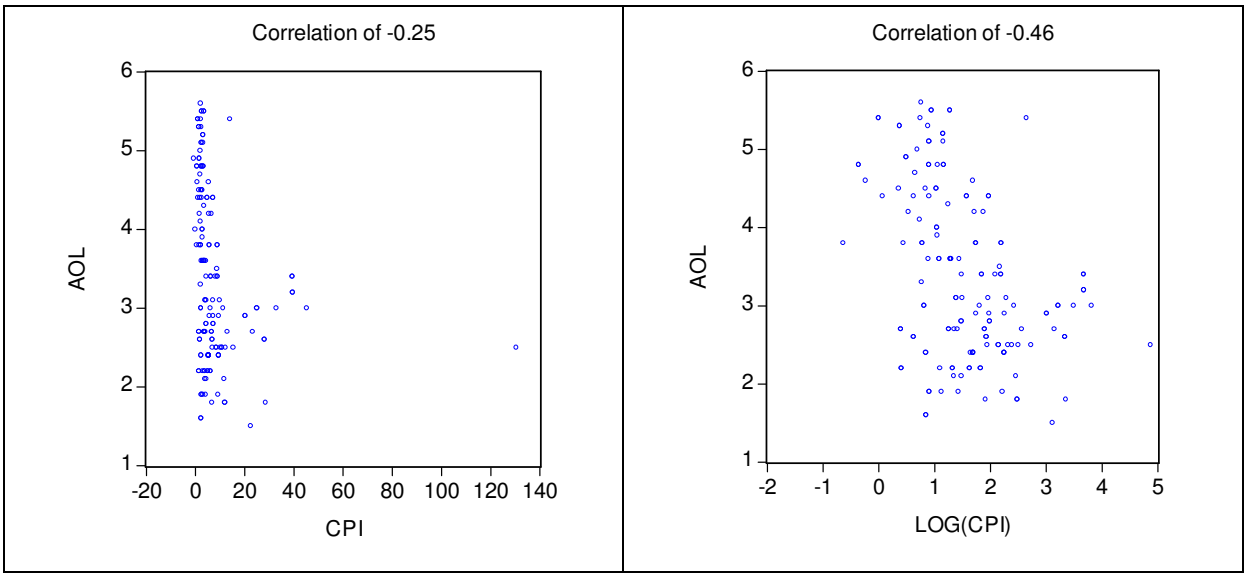


Figure 7: CPI and log (CPI) vs. AoL

As the last test of the functional form, I ran the White-heteroskedasticity test proving that the assumption of homoskedasticity cannot be rejected. The functional form is also confirmed by the results of the test. Based on the F-test approach, the null hypothesis of homoskedasticity is rejected. That is, fitted squared residuals are not systematically related to any known explanatory variables relevant to the model.

IV.5 Empirical Evidence of the Cross-Section Analysis

The results of the first set of regressions are presented in Table 5. The availability of bank loans (AoL) in 2006 is the dependent variable in the first set. Recall the intuition from Figure 4: the proponents of the BLC focus on the loan supply and claim that monetary policy directly affects bank lending, here represented by the availability of loans. Independent variables are explanatory variables in the logarithmic form that shed light on how and to what extent exogenous variables explain the dependent variable AoL. As shown in Figure 4, apparently money also explains bank lending.

Regressing AoL on M2 per GDP brings about the expected results as shown in Table 5, Regression 1. M2 per GDP displays the contribution of money and quasi-money to the

availability of bank loans and thus, it is significant with the t-statistic of 3.34. The first regression supports this insight obtained in the cross-section of 107 countries. An increase of money by 10 percent boosts the availability of loans by 0.56 on the scale from 1 to 7.

In order to run regressions in line with economic theory, I control for money: Nonbanks may either obtain loans from banks or via open market operations from the central bank. The volume of these open market operations between the central bank and nonbanks is well depicted by the central bank reserves. Thus, in Regression 2, I control also for this balance sheet item by retrieving international reserves from the International Financial Statistics (IFS) and subtracting them from money. Then, the perceived availability of loans only refers to bank loans. By comparing results of the first and the second regressions, it becomes clear that the inclusion of international reserves is empirically immaterial for my investigation. Hence, I run further regressions merely with money, M2 per GDP and controlled for this aspect in Regression 8.

Dependent Variable: Availability of Loans in 2006[19]									
Independent Variable	1st LS	2nd LS	3rd LS	4th LS	5th LS	6th LS	7th LS	8th LS	9th LS
Constant	1.34 (2.27)	1.79 (5.63)	-0.81 (-2.78)	-0.89 (-3.14)	-0.55 (-1.45)	0.44 (0.56)	0.71 (0.97)	1.61 (1.36)	-0.70† (-1.02)
M2 per GDP[20], (log.)	0.56 (3.34)	0.45✠ (4.85)	0.26 (4.83)	0.24 (4.91)	0.23 (4.02)	0.28 (1.25)	0.04 (0.18)	-0.08✠ (-0.31)	0.42 (1.85)
GDP per Capita[21], (log.)			0.43 (8.93)	0.44 (9.73)	0.42 (8.85)	0.36 (3.69)	0.40 (4.86)	0.42 (4.56)	0.37 (3.79)
Consumer Price Index[22], (log.)					-0.11 (-1.96)	0.09 (0.80)	-0.07 (-0.72)	0.10 (0.83)	-0.15 (-1.62)
Money Market Rates[23], (log.)						-0.45 (-2.60)		-0.60 (-3.01)	
Risk Premium on Lending[24], (log.)							-0.27 (-2.44)		
Observations	107	94	106	105	95	55	40	52	55
R^2	0.26	0.20	0.59	0.63	0.63	0.62	0.74	0.59	0.59
Jarque-Bera	4.63	4.36	16.20	0.39	0.72	0.35	0.42	0.12	0.05

Table 5: Ordinary Least Square

(NOTES: All t-statistics (in parenthesis) are White-corrected to adjust for heteroskedasticity.
✠ International reserves are subtracted from money;
† Sample of countries restricted to those from Regression 6)

[19] In the World Economic Forum´s Global Competitiveness Report 2006/2007, business professionals in 125 countries answer the following question: „How easy is it to obtain a bank loan in your country with only a good business plan and no collateral? (1=impossible, 7=easy)“

[20] The source for this variable is World Bank: Money and quasi money (M2) as percentage of GDP (code FM.LBL.MQMY.GD.ZS) in order to display the proportion of money to produced goods and services.

[21] See World Bank´s address www.wdi.org for the exact definition of the variable: “GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2000 international dollars.“ The specific code of the variable is NY.GDP.PCAP.KD.

[22] The source of the variable is the IFS: For our purposes of computing an average inflation rate for each country with approximately similar length of the period as basis, it suffices that the variable only takes into account figures from 1996 till 2005. The code differs across countries.

[23] The source of the variable is the IFS: Money market rate´ codes vary from country to country for very short-term interest rates due to differing institutional designs of money markets.

[24] See www.wdi.org for the precise definition of FR.INR.RISK: “The Risk Premium on Lending is the interest rate charged by banks on loans to prime private sector customers minus the "risk free" Treasury bill interest rate at which short-term government securities are issued or traded in the market.”

In the third regression I include the explanatory variable GDP per capita. Theory expects banks to provide more credit in case of a higher level of the banking sector and financial markets. This aspect is proxied by the logarithmic form of GDP per capita. More developed financial systems channels mean more efficiency to those with most the productive projects. According to Mishkin (1992: 115), asymmetric information and problems of adverse selection and moral hazard hamper the channelling of financial means. Thus, the lower asymmetric information is, the more developed the financial system. If problems of adverse selection and moral hazard become reduced, the risk premium reflecting the imperfections in the financial system decreases and banks are induced to provide more loans. The impact of GDP per capita on the availability of bank loans is significant with a t-statistic of 8.93. Increasing the GDP per capita by 10 percent extends the availability of bank loans by 0.43. Including GDP per capita, the impact of M2 per GDP on AoL abates but retains its level of significance. The Jarque-Bera statistic indicates that the third regression exceeds the threshold of 5.99. Indonesia mainly accounts for the uneven distribution of residuals because it performs extraordinary with respect to availability of loans. With 5.4, it is the fourth best country out of 125. While the level of bank lending is comparable to developed countries, the rest of the variables on the right-hand-side relate more to the level of developing variables.[25] Indonesia might have gained momentum with respect to easier access to bank loans in 2006, but other less biased variables are average, representing Indonesia as a developing country. Dropping Indonesia as outlier, the Jarque-Bera indicator improves significantly and displays 0.39, as shown by the fourth regression. The number of observed countries is 105. The variables and R^2 do not change significantly with respect to the third regression.

In the fifth regression the average inflation rate, CPI, is included. By granting loans, banks take inflation rates into account and credit price with respect to the expected level of future inflation rates. Again, higher inflation brings about uncertainty and it induces banks to ration credit if they are reluctant to or impeded from raising interest rates. The inclusion of CPI is aimed at covering this aspect of banking. An alternative and equally valid argument is to incorporate

[25] For instance, Norway also achieves 5.4 in AoL. Indonesia (Norway) performs as follows: log(M2 per GDP): 3.66 (3.99), log(GDP per capita): 6.47 (10.42), log(Consumer Price Index): 2.65 (0.75) and log(Money market rates): 2.68 (1.66).

macroeconomic variables GDP and CPI, which are assumed exogenous, to control for effects stemming from the loan demand. CPI is significant at the 10 percent level. Adding CPI to existing variables slightly mitigates the impact of the M2 per GDP and GDP per capita on AoL. Increasing the average inflation rate by 10 percent, e.g., from 5 percent to 5.5 percent annual inflation, reduces the availability of bank loans by 0.11. The number of countries drops to 95 because data is not available for some countries. R^2 and Jarque-Bera show a satisfying level of 0.63 and 0.72, respectively.

One further explanatory variable for the provision of bank loans is the level of interest rates. Money market rates and the risk premium on bank lending are proxies for the level of interest rates and are included in the sixth, seventh and eighth regressions. Their impact on the availability of loans is significant and negative. A higher level of average money market rates could be the result of contractionary monetary policy. As consequence, banks reduce credit. Likewise, rising risk premiums on lending hints at higher level of uncertainty with respect to economic activity, which also reduces the level of loans supplied. CPI also proxies the uncertainty and hence falls to insignificance in the last three regressions once interest rates are considered. In the seventh regression, CPI becomes negative.

Yet, the most important result of this table is the following: once the level of interest rates and the risk premium is included M2 per GDP falls to insignificance (Regressions 6-8). That is, money does not explain bank lending if one takes interest rates into account. I do not find support for a direct transmission channel running from the quantity of money to the perceived availability of loans. Rather, results support my view that monetary impulses are transmitted via relative prices such as interest rates. Changes in money are only a by-product of monetary policy, for instance. This by-product does not affect the level of loans. On the contrary, interest rates influence the availability of loans via the argument of capital-of-costs for investment and durable consumer goods. This empirical evidence finds no support for the prediction of the BLC that there is an additional channel of monetary transmission mechanism. This additional channel should operate even if the interest rate channel is effective and makes monetary policy more potent in

influencing the real economy. In the sixth, seventh and eighth regressions the number of observations plummets to 55, 40 and 52, respectively. The sample of countries is reduced because including more independent variables makes the mismatch problem of data availability more acute. However, it remains at a level that is still adequate to avoid invalidating the result of the regressions, as shown by following regressions. The fit of the model is satisfying, demonstrating the level of 0.62 in the sixth, 0.74 in the seventh and 0.59 in the eighth regression. The Jarque-Bera statistic points out the normality of residual distribution at the level of 0.35 in the sixth, 0.42 in the seventh and 0.12 in the eighth regression.

In the regression I check whether the declining sample affects presented results. By rewriting the variable "constant" as the ratio of money market rates to itself, the sample is reduced to 55 observations. The ninth regression exhibits the same result as in Regression 5, showing that money apparently explains bank lending, although some explanatory power disappears. However, money still displays weak significance so one can conclude from this test that the declining country sample plays a limited role in explaining the independent variable. Analyzing Regression 6 again, money becomes insignificant and this check indicates that its insignificance results from the inclusion of interest rates and risk premiums, not from changes in the sample.

IV.6 Panel Data Analysis

The cross-section analysis and its results might suffer from omitted variables that could influence the availability of bank loans and interfere with the explanatory power of the independent variables. One may think of potential factors such as the tendency of some economies to tap a firm's internal funds or capital markets as a source of financial means instead of bank loans. In many countries this propensity might be manifested by the established institutional design of the financial system. These could be reasons why bank loans in some countries are more accessible and less available in some.

In order to fortify the results obtained in the cross-section analysis I conduct a panel data investigation. This is possible because the dependent variable, availability of loans, is collected not only for 2006 but also for the second point in time, 2002. Therefore I am enabled to analyze

changes in the dependent variable over time. With fixed effects regression I use the main tool for analysis of panel data. In doing so, I eliminate the potential effect of unobserved variables which differ across countries but are constant over time.

Panel data analysis could suffer from two possible shortcomings: omitted variables vary both across countries and over time, and the unavailability of panel data. The former drawback does not apply to my case because it seems plausible to assume that a firm's financing patterns depend on the manifested structure of the financial system which is different in every country. If the structure changes no erratic large-scale shifts are expected. This assumption especially holds for the period of time given by the limited availability of the data on the accessibility of loans (2002 and 2006). In order to generate a balanced panel I adjust the independent variables. For each of the two data set entries, 2002 and 2006, I calculate an arithmetic mean of independent variables for three previous years. Again, in the World Economic Forum's Global Competitiveness Report 2002 and 2006, business professionals answer the question of how easy it is to obtain a bank loan. In doing so, I assume respondents would take into consideration the evolution of influencing variables over short time period of approximately three years. I repeat this step for 2006 with the only exception that the particular years 2003 – 2005 (instead of 2004 – 2006) are included. Otherwise, the panel was not balanced.

The functional form of regressions remains as applied in the cross-section analysis: logarithm of independent variables. Figure 8 contains further hints at applying the logarithm because it shows that a logarithmic approach improves the correlation between M2 per GDP and AoL. The correlation coefficient rises from 0.36 to 0.44 and hence, the use of logarithm ensures a better interpretation of the link between money and the availability of bank loans. The scatter plots hint at a possible positive impact. Higher ratios of M2 to GDP might be linked to easier access to loans. As in the cross-section analysis, I use the logarithm to obtain a better comparison between sets of variables. This effect is also generated for plots of other independent variables and AoL and can be found in the appendix.

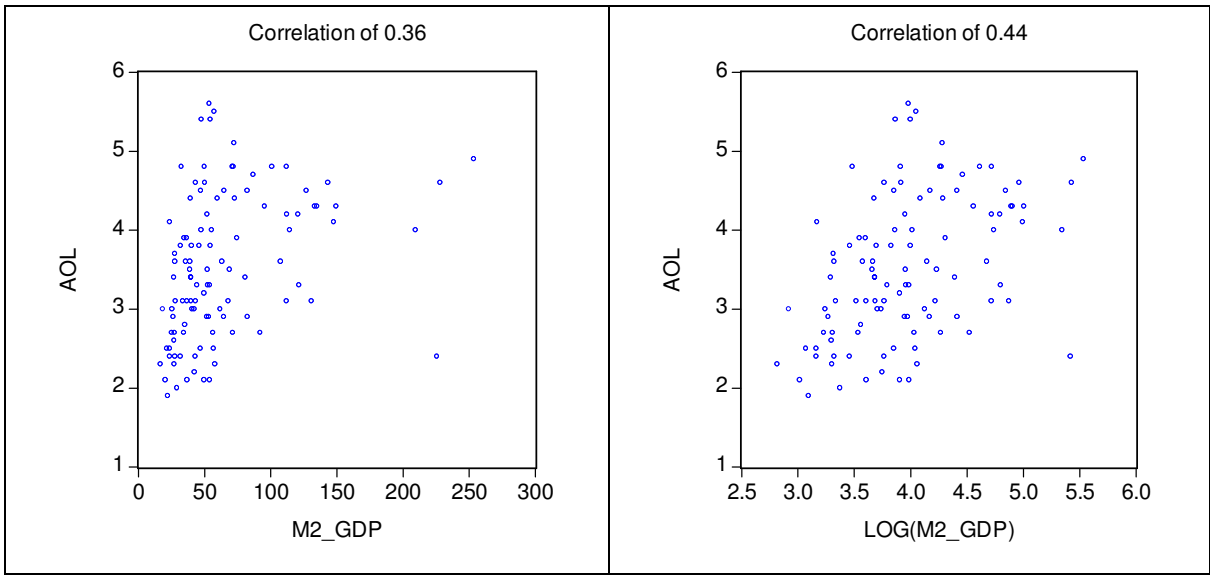


Figure 8: M2 per GDP and log (M2 per GDP) vs. AoL

Table 6 depicts the results from applying the panel ordinary least square. As in the cross-section analysis Indonesia is dropped as outlier. The number of countries included is 54 and every country enters with two observations per point in time.

The approach corresponds to the procedure in the cross-section analysis and the results are presented here. In the first two regressions one can observe that money, again, is significant in explaining the availability of bank loans, although money displays only weak significance once I control for GDP per capita in the second regression. It appears that GDP per capita sufficiently controls for loan demand effects because the inclusion of inflation brings about insignificant results. Hence, the exclusion of inflation is immaterial to the core approach.

The key moment occurs when I introduce money market rates in the third regression because money loses its explanatory power and turns insignificant while money market rates (and GDP per capita) remain the influencing variable. This result also holds if I alter the functional form and run regressions without the logarithm of independent variables. As result, this alteration does not provide support for the hypothesis of the BLC to stand for an additional monetary transmission channel, as depicted by regressions four to six.

Dependent Variable: Availability of Loans in 2002 and 2006[26]						
Independent Variable	1st LS	2nd LS	3rd LS	4th LS	5th LS	6th LS
Constant	1.10 (1.11)	-1.47** (-2.24)	0.52 (0.68)	2.97** (10.71)	2.55** (9.90)	2.91** (11.36)
M2 per GDP	0.61** (2.46)#	0.33* (1.59)#	0.003 (0.04)#	0.009** (2.05)	0.007* (1.81)	0.005 (1.33)
GDP per Capita		0.47** (8.03)#	0.44** (8.89)#		5.63E-05** (8.60)	5.43E-05** (9.39)
Money Market Rates			-0.47** (-5.53)#			-0.03** (-3.47)
Total Panel Observations	108	108	108	108	108	108
R^2	0.77	0.84	0.89	0.76	0.82	0.84
Jarque-Bera	0.07	3.08	2.91	0.32	1.64	0.35

Table 6: Panel Ordinary Least Square (Fixed Effects)

(NOTES: * Significant at 10% level; ** Significant at 5% level;

Variable in log)

IV.7 Conclusion

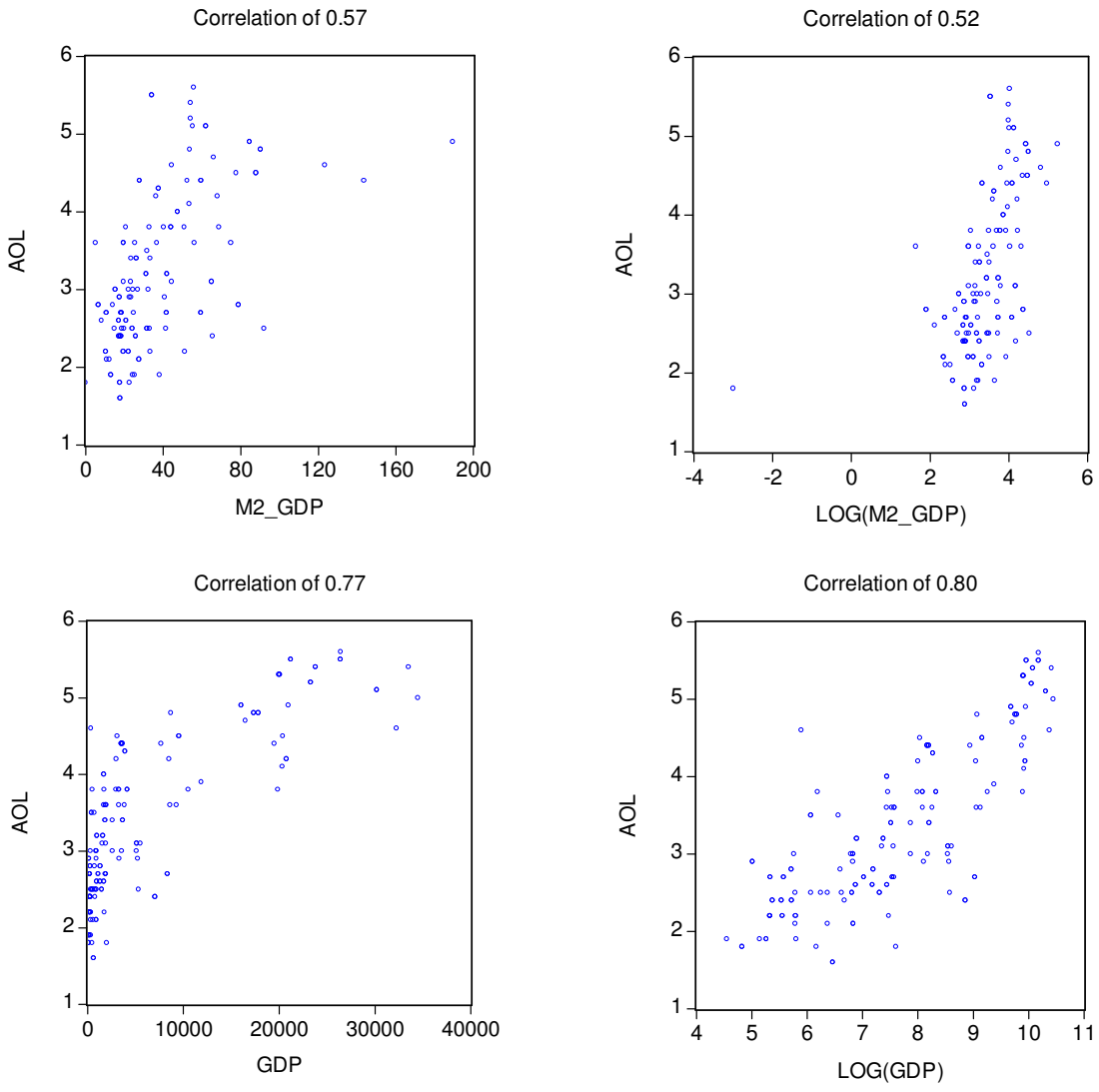
In my cross-section and panel data analysis, I deviate from the mainstream twofold: the sample of developing and developed countries and the availability of loans as a dependent variable. With these choices I expand the scope of the investigation on the BLC and I bypass the identification problem arising in most of other empirical approaches because the mainstream analyzes the response of aggregated bank loans to monetary policy changes. Moreover, I directly test weather monetary policy can overcome banks` credit rationing by injecting liquidity.

My results do not corroborate a direct transmission channel, running from the quantity of money to the perceived availability of loans. Rather, results back up the view that monetary impulses are transmitted via relative prices such as interest rates and asset prices.

[26] In the World Economic Forum´s Global Competitiveness Reports 2002/2003 and 2006/2007 business professionals in 80 and 125, respectively, countries answer the following question: „How easy is it to obtain bank loan in your country with only a good business plan and no collateral? (1=impossible, 7=easy)“

Appendix

Cross-section analysis



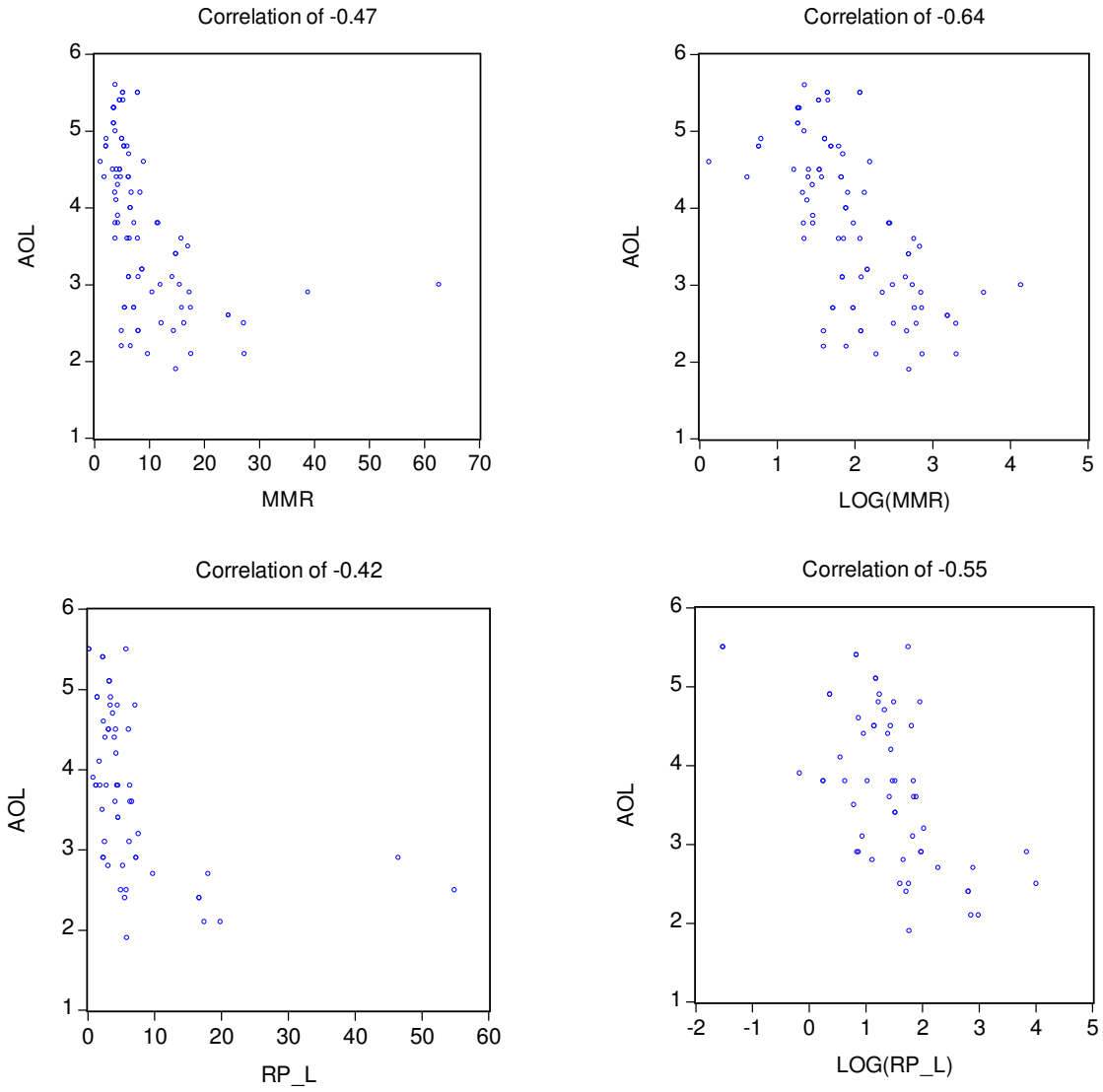


Figure 9: Scatter Plots of Variables in the Cross-Section Analysis

Panel Analysis

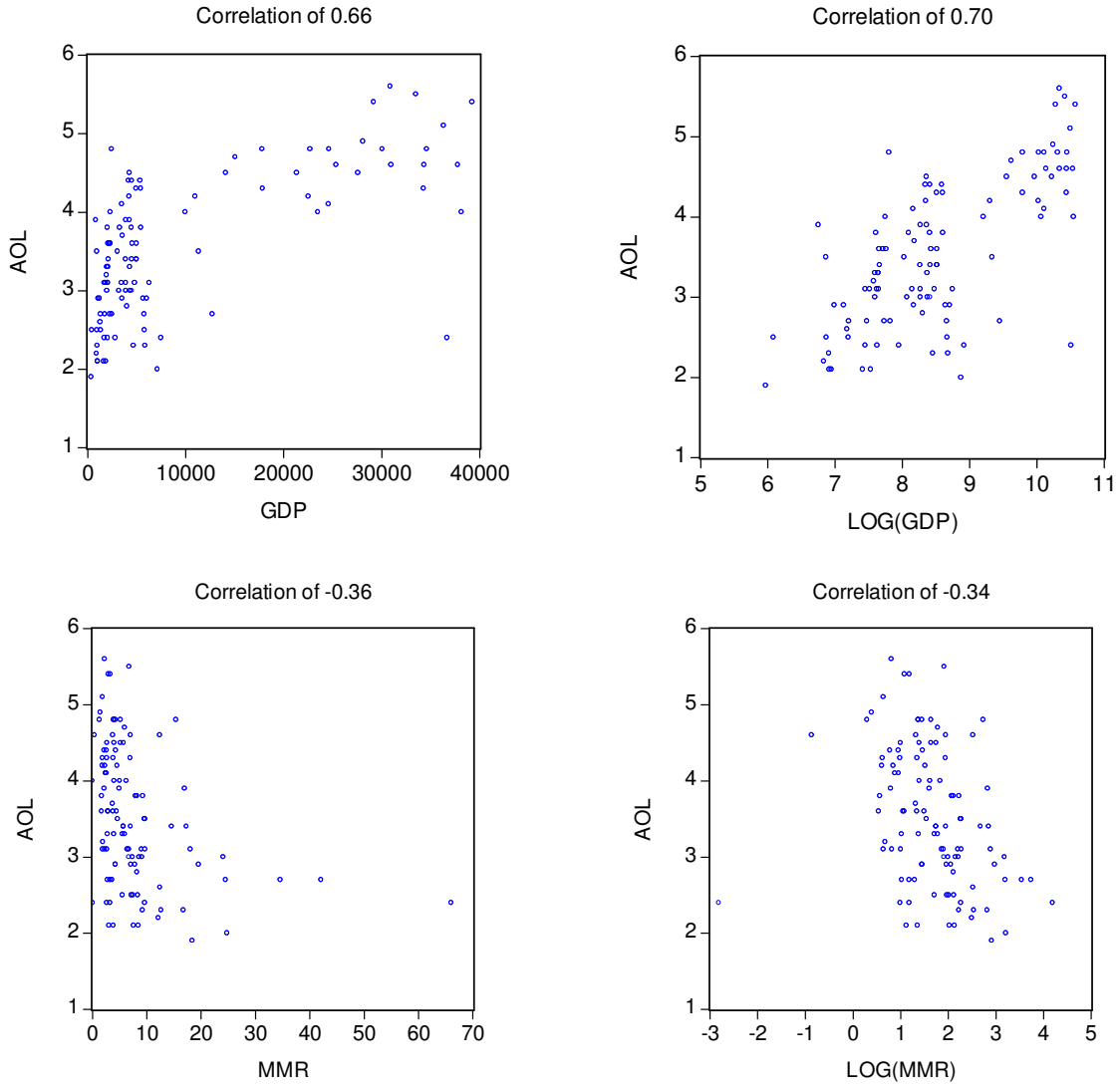


Figure 10: Scatter Plots of Variables in the Panel Data Analysis

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