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Abstract

This paper investigates whether there are differential effects of monetary policy across bank size, liquidity and capitalization in some selected MENA countries namely Egypt, Jordan, Morocco and Tunisia, to test for the presence of the bank lending channel. It uses a panel of bank balance sheet data to estimate the response of bank lending to changes in monetary policy. The role of bank capital, size and liquidity in the transmission of monetary policy is studied. Using a large set of micro data, we test the assumptions that the effect of a change in the monetary policy stance on a bank's lending activity depends on its capital, the bank capital channel, and on its liquidity base.

ملخص

تبحث هذه الورقة ما إذا كان هناك تأثيرات مختلفة للسياسة النقدية متعلق بحجم البنك والسيولة النقدية المتاحة لدية ورسملة العائد في بعض البلاد المختارة في الشرق الأوسط وشمال أفريقيا مثل مصر والأردن والمغرب وتونس, وذلك لكي نختبر وجود قناة للإقراض في تلك البنوك. تستخدم الورقة قائمة بيانات من ميزانيات عمومية لعدد من البنوك لكي تقدر ردود أفعال البنوك في الإقراض تبعاً للتغيرات في السياسة النقدية. تدرس الورقة دور رأسمال البنك وحجمه والسيولة المتاحة له في تحولات السياسة النقدية وباستخدام عدد كبير من المعلومات الدقيقة نستطيع أن نختبر فروق تأثير التغير في السياسة النقدية على نشاط الإقراض والتي تعتمد على رأسمال البنك وقنوات الرأسمال وعلى قاعدة السيولة لديه.

1. Introduction

A critical element of the monetary policy process is knowledge of the quantitative effects of policy actions. In recent years, the focus of literature on developed countries has been given to the role of credit markets, and in particular of banks (Kashyap et al., 1993; Kashyap and Stein, 1994). On the one hand, theoretical literature has been developed on the basis of recent developments in financial contracts under asymmetrical information. On the other hand, empirical research has increasingly included financial variables, especially bank lending, to analyze the effectiveness of monetary policy.

At least three alternative views of the role of banks in the monetary transmission mechanism (MTM) have been proposed by the literature. First, there is the standard money view of monetary policy where bank loans have no special role. Monetary shocks affect output through changes in monetary aggregates, as in the traditional IS-LM model. Bank loans are simply determined by demand and consequently tend to move with investment and output. In this case we can think of money causing both output and lending. The second approach consists of the narrow credit channel or the bank lending channel (Bernanke and Blinder, 1988). Under this explanation changes in monetary policy directly affect banks' balance sheets with a reduction in bank loans, which in turn affect output. In this case, output changes are directly caused by changes in bank loans. The bank lending channel operates as follows. Subsequent to a monetary tightening, the reserves of banks decrease and bank deposits fall because of reserve requirements. If the decline in deposits cannot be offset by other funds (for instance, non-deposit funds that are not subject to reserve requirements), or by a decline in bank's securities holdings, the interest rate may increase and the loans supply may be reduced, thereby negatively affecting real activities. If banks are unable to perfectly substitute this drop in deposits by an increase in non-insured debt, the cost of raising such debt goes up. As a result the supply of loans falls, depressing real activity. The third view is called the broad credit channel. According to this view, monetary policy affects interest rates and output in a way similar to the money channel or influences output through a different channel. A monetary tightening reduces firms' collateral or cash flow, which makes it more risky to lend some firms and implies a flight to quality lending.

Despite the revival of interest in the role of banks in monetary policy over the last two decades, the precise role played by banks in that process remains a subject of controversy. Interest in the "bank lending channel" has been boosted by the growing literature on asymmetric information in financial markets, and also by the fact that large fluctuations in the aggregate economy are often brought about by small shocks under the hypothesis of the financial accelerator (Bernanke et al., 1996). This revival of interest has also been intensified by the Asian currency crisis and its aftermath. For the bank lending channel approach, the role of banks in propagating monetary policy impulses emanates not only from their liabilities but also from their assets. Studies of the bank lending channel are chiefly motivated by the fact that monetary tightening can have distributional consequences. While bank loans are a primary source of finance to small and medium firms, large firms have a variety of financial sources. They can get finance through financial markets. As a consequence, small and medium firms will bear the full brunt of a cutback in bank loans. Third, knowing of the existence of the lending channel is useful for pursuing relevant policy actions. If bank capital is depleted in recessions, the lending channel weakens, and consequently, conventional prescriptions for a recession may not work. The injection of capital into the banking sector might be a better option than an expansionary monetary policy and/or a fiscal one.

While the monetary policy in the MENA region remains under-researched in general, this is particularly true for MTMs. The strategic importance of the role of banks in propagating the monetary policy impulses is so far under-researched. The current idea about the way

monetary policy is transmitted to the real economy is still unclear, and the empirical evidence is still scarce and tends to be limited to the aggregate economy. Nevertheless, it is a fact that companies in the majority of MENA countries are still bank-dependent and that the presence of financial frictions — specifically credit rationing — has often been mentioned. Under these circumstances, the credit channel is a plausibly important channel of monetary transmission. This channel is expected to play an important role when capital markets are underdeveloped or when access to financial markets is limited (Kashyap et al., 1993). Again, a weak regulatory framework or a lack of transparency in accounting standards could further contribute to making investors more reluctant to buy non-insured bank debt.

This paper attempts to overcome the methodological shortcomings in previous studies by making use of micro banks' balance sheet data for four MENA countries, namely Egypt, Jordan, Morocco and Tunisia. More specifically, this paper aims at answering the following questions: How do banks in MENA countries react to a tightened policy? Do MENA banks' characteristics (size, capitalization, liquidity, etc.) play a specific role in transmitting monetary policy impulses? If so, how can policymakers take advantage of these characteristics when designing their monetary policies?

The paper is organized as follows. Section 2 sheds some light on the theoretical identification of the bank lending channel; it presents a theoretical background which constitutes a base for the pure mechanism of the bank lending channel. Section 3 provides the literature review on the empirical evidence of the bank lending channel around the world. Section 4 presents some information about the reality of bank lending in the MENA region as well as a brief description of how monetary policy in general is conceived in the four countries in this study. Section 5 establishes the theoretical framework to be exploited in this study. Econometric modeling and a description of the dataset and used variables appear in Section 6. Empirical results as well as the main policy implications are discussed in Section 7. The main findings and conclusions are presented in Section 8.

2. The Bank Lending Channel: Identification through Heterogeneity

There is a wide consensus between central bankers and economists that monetary policy works through interest rates. A restrictive monetary policy induces an increase in interest rates, which in turn leads to a reduction in spending by interest sensitive sectors of the economy such as housing and consumer purchases of durables. This is the so-called interest rate channel or money view. In this standard view of transmission mechanism there is nothing special about bank lending. The interest rate mechanism does not depend on the types of assets banks hold. The same reaction would happen regardless of the share of loans or securities held by banks (Bernanke and Blinder, 1988). The interest rate channel describes the effects of monetary policy on the attraction of investment and saving that prevail when financial markets are complete. Changes in monetary policy trigger changes in the cost of capital and yield on savings, which in turn exert an influence on spending decisions.

Besides, monetary policy may directly limit the ability of banks to provide new loans, making credit less available to borrowers that are more dependent on bank financing. This view states simply that restrictive monetary policy works not only by raising interest rates but also by directly restricting bank credit. This is the so-called credit channel or credit view. This idea dates back to the 1950s. The chief characteristic of this channel is that restrictive monetary policy could depress economic activity without large changes in interest rates. Such process takes place by reducing banks' ability to supply loans, forcing firms and businesses to downsize their spending. The credit channel emphasizes the importance of banks in propagating monetary policy impulses. Unlike the interest rate channel, the credit channel relies on the notion that financial markets are incomplete. Although these two channels depart

in stressing the relevance of financial considerations they are none the less deemed complementary, and consequently, can coexist simultaneously.

The credit channel can be split into two basic channels of monetary transmission, as a result of information problems in credit markets, that are the bank lending channel and the balance sheet channel (Kashyap and Stein, 2000). When monetary authorities pursue an expansionary monetary policy, banks' reserves and deposits increase, which in turn brings about an increase in the quantity of bank loans available. Under such circumstances, the bank lending may be operative, and eventually this increase in loans will bring about a rise in investment spending. A principal implication of the credit view is that monetary policy will have a greater effect on expenditures of smaller firms, that are more dependent on bank loans, than on large firms which can have easier access to finance through the stock and bond markets.

As for the balance sheet channel, it arises from the presence of asymmetric information in credit markets, particularly with respect to adverse selection and moral hazard. The lower the net worth of business firms, the more severe the adverse selection and moral hazard problems are from lending to these firms. Lower net worth reduces the collateral for loans, and so losses from adverse selection are higher. A decline in net worth, which raises the adverse selection problem, thus leads to decreased lending and investment. Expansionary monetary policy, which causes a rise in equity prices, raises the net worth of firms and so leads to higher investment spending and aggregate demand because of the decrease in adverse selection and moral hazard problems. An important feature is that it is the nominal interest rate that tends to affect firms' cash flow the most, because long-term debt is typically fixed and thus has little impact on firms' cash flow.

Several economists, using aggregate time series data, have attempted to identify the credit channel by studying the behavior of the aggregate credit following a monetary tightening (King, 1986; Romer and Romer, 1990; Bernanke and Blinder, 1992; Ramey, 1993; Kashyap and Stein, 1994). They found, using the VAR methodology, that an unanticipated hike in the interest rate (the measure of stance of monetary policy) is followed by a decline in loans. At first glance, the decline in bank loans seems to be consistent with the credit view. For credit view advocates, a restrictive policy shifts the bank curve supply to the left pushing down the quantity of loans supplied by banks. As surprisingly as it may appear, the same result would occur (loans decline) even though the credit channel is not operative. A restrictive monetary policy could shift leftwards the banks' demand curve causing a decline of bank loans; this process is fully consistent with the interest rate channel. In fact, subsequent to a monetary tightening, money demand declines, and bank loans contract because of the high correlation between monetary and credit aggregates. Thus, different schedules movements give rise to the same phenomenon, namely loans contraction which has been described in the literature as the supply-demand puzzle. It implies that bank loans contraction is consistent with both lending and interest rate channels. In short, the evidence that loans contract subsequent to a monetary tightening is not sufficient to prove the presence of the bank lending channel.

To check whether the credit lending channel is operative or not, one could attempt to identify whether bank loans contraction corresponds to a leftward supply curve or rather to a leftward demand curve. If the bank lending channel is at work, a monetary tightening will shift the supply schedule of bank loans. However, the same policy action could trigger a parallel move in supply and demand curves, which would reflect the coexistence of both lending and interest rate channels. By itself bank loans contraction is not necessarily a consequence of a leftward shift in the supply schedule.

Another solution could rely on the cross sectional implications of the bank lending channel. Individual bank balance sheet data may be used to empirically test the implication of the lending channel. The basic idea behind this approach is that monetary policy shocks should

have an asymmetric impact on bank lending, if the bank lending channel is operative. The differences in bank responses to the same policy shock occur due to variations in the financial strength of bank balance sheets and in the ability of the banks to substitute insured deposits by external finance. The banks' ability to replace deposits with other forms of financing depends heavily on the strength of their balance sheets. In other words, this approach relies on the hypothesis that some bank-specific characteristics influence only loans supply and not loans demand. Thus, the sensitivity of loans supply to monetary policy actions can be captured by these characteristics. Three main characteristics have been suggested in the literature, namely size, capitalization and liquidity.[1] To analyze microeconomic foundations that may affect the strength of bank lending channel, the following two conditions must hold (Bernanke and Blinder, 1988; Kashyap and Stein, 1995). The first condition is that firms should not be able to completely compensate reduced supply of commercial bank loans from other sources, such as borrowing from the public via bonds. The second one is that monetary policy actions have to be effective in affecting loans supply. In other terms, banks must not be able to offset the decrease in deposits brought about by a restrictive monetary policy by raising funds from any other source such as getting finance from financial markets. While the first condition seems easier to check, the second requires careful empirical examination since it may differ from one country to another. The banking sector's institutional arrangements may weaken the power of the bank lending channel. The topmost arrangements are capital adequacy regulation and participation of non-banking financial institutions in the loans supply. Capital adequacy regulation restricts the supply of loans that a bank can make by the amount of available capital and leaves less room for loan response to monetary policy. The Central Bank cannot control loans issued by non-banking financial institutions, which implies lower overall capacity of loans to affect the economy.

3. Literature Review

The difficulty to empirically identify the bank lending channel using aggregated time series data has led some researchers to recourse to a new methodology based on a panel data approach. Kashyap and Stein (1995) provided the starting point to this new strand of empirical literature, which received a major impetus by disaggregated data availability mainly in the U.S. and the EU. Kashyap and Stein (1995) sought to assess the impact of a monetary tightening on the volume of bank loans using U.S. data. Specifically, they tested the hypothesis that a monetary contraction downsizes the lending volume of small banks more than that of large banks. However, their methodology suffers from a limitation; how banks with a large buffer stock of liquid assets can insulate their loans from the effects of monetary policy actions. For a bank of a given size, a contractionary monetary policy would bring about loans to decline less the more liquid a bank is. In order to improve the inference, Kashyap and Stein (2000) went ahead and introduced liquidity characteristic in their analysis. They reported that small banks are on average more liquid than large banks which may mitigate the effectiveness of the bank lending channel. Thus in separating banks, not only by size but also by liquidity, they found that smaller banks with the least liquid balance sheets were more responsive to policy actions.

Kishan and Opiela (2000) extended the above analysis by further considering a bank's degree of capitalization. Bank capital is an indicator of bank health and therefore an indicator of a bank's ability to raise funds from alternative sources during contractionary monetary policy periods. Moreover, prudential supervision — in particular capital adequacy requirements — may affect the composition of bank asset portfolios in the sense that well capitalized banks are less constrained during periods of tight monetary policy, since these banks can isolate, to some extent, their loan portfolio from monetary shocks. The authors showed empirically

[1] See, for instance, Peek and Rosengren (1995).

using U.S. quarterly data over the period [1980:1-1995:4] for 13,042 commercial banks that the smallest and least capitalized banks are the most responsive to monetary policy. However, for large banks responses to monetary policy impulses are not significant implying that a bank lending channel may not hold in total. It is worth noting that Kishan and Opiela's (2000) model was estimated by OLS method and the authors did not discuss the relevance of their econometric specification.

Empirical studies on bank lending channel using individual bank data began to appear in Europe with De Bondt (1998, 1999). However, these two studies did not permit reaching a clear-cut conclusion since the results were dependent on the monetary policy indicator as well as on the econometric methodology used. Favero et al. (1999) investigated the response of bank loans to a monetary tightening in 1992 in France, Germany, Italy and Spain. They found no evidence of the bank lending channel in any of the investigated countries.

Adopting the same approach as Kashypap and Stein (1995), Altunbas et al. (2002) investigated evidence of the lending channel using annual data covering the period 1991-1999 across 11 European countries. The econometric methodology used was unlike past researches. The authors considered an ARDL model for loans where changes in loans are regressed on their lagged value as well as on current and lagged values of changes in the monetary policy measure, growth in bank securities holding and growth in interbank borrowings. They also run three additional regressions for deposits, securities and interbank borrowings in order to emphasis which balance sheet item is the most responsive to the policy. The models were estimated through the random effect panel data approach. The authors concluded that undercapitalized banks (of any size) tend to respond more to a change in policy. As far as the banking systems of France, Germany, Italy and Spain were concerned, their empirical results found, in contrast to previous research, evidence for the bank lending channel in Italy and Spain.

Recently, the individual country analysis has been emphasized. For instance, in case of The Netherlands, De Haan (2001) estimated a structural model using individual quarterly bank data over the period [1990:1-1997:4] for 25 banks. This analysis made distinction between different types of loans (loans with and without state guarantees, households, and firms, long-term and short-term loans). It also distinguished between demand deposits and time deposits. In addition to bank characteristics, the author investigated the strength of the lending channel according to the bank's market orientation (retail banking, wholesale banking and foreign banking). The author estimated a dynamic panel specification by the Generalized Method of Moments (GMM) suggested by Arellano and Bond (1991). He came to the conclusion that the lending channel is operative in The Netherlands; better still, he argued that the impact of monetary policy may depend on the market segment in which a bank operates. More specifically, he showed that monetary actions affected banks lending to firms more than those lending to households.

Similar studies for Greece by Brissimis et al. (2001) and for Portugal by Farinha and Marquez (2001) led to the existence of an operative bank lending channel. Brissimis et al. (2001) ran estimations for a structural model that separated long- and shot-run dynamics for 12 banks using monthly data over the period [1995:01-1999:12]. The authors considered only bank liquidity and size as banks' characteristics, and estimated their model by the SUR weighted least squares method. They concluded that large and liquid banks shield themselves from the effects of monetary tightening. Farinha and Marquez (2001) made use of a substantially different econometric methodology by estimating a structural model while taking into consideration explicitly long- and short-run relationships. The estimation was carried out with the POLS method developed by Chiang and Kao (2001) using quarterly data for 18 Portuguese banks' balance sheets over the period [1990:1-1998:4]. Their findings

corroborated the hypothesis that the bank lending channel was operating via bank balance sheets in Portugal.

Gambacorta (2005) took up the question of whether banks reacted differently to monetary policy shocks in Italy. The specification considered by the author is very similar to that used by Kashyap and Stein (1995). Loan growth is regressed on a monetary policy indicator as well as its interaction with bank characteristics, bank securities holding, inflation and GDP growth to control for demand effects. The model allowed for fixed effects across banks and was estimated by GMM method using quarterly data covering the period [1986:1-2001:4]. The author found that the bank lending channel is operative in Italy. He also showed that the impact of monetary policy on total deposits is greatest for less capitalized banks. However, he provided contrary evidence with regards to the role of bank size. Specifically, he pointed out that bank size appears to be irrelevant, and small banks are not more sensitive to policy compared to large banks.

Hosono (2006) examined how banks' responses to monetary policy varied according to their balance sheet using yearly Japanese bank data covering the period [1975-1999]. Estimating a fixed bank effect model using GMM two-step method, he found evidence that supports the lending channel for banks that are smaller, less liquid and more abundant with capital.

Pruteanu-Podpiera (2007) studied the effects of monetary policy changes on loans and characteristics of loans supply using a panel of quarterly time series data for 33 Czech commercial banks for the period [1996:1-2001:4]. She concluded that the bank lending channel was operative. The fixed effect model considered, which is very similar in spirit to that used by Kashyap and Stein (1995) and Altunbas et al. (2002), was estimated by GMM method.

Some rare studies dealt with the bank lending channel outside Europe and the U.S. For instance, Alfaro et al. (2003) showed that the lending channel was operative in Chile during the 1990s. In the same vein, Golodniuk (2006) sought to test for the bank lending channel in Ukraine using a sample of 149 banks over the period [1998-2003]. The econometric specification he used was the same as that of Altunbas et al. (2002). Since securities' holding was found to be insignificant, the author instead considered interbank borrowings. The model which allowed for fixed effects was estimated by GMM method. The results put forward by Golodniuk (2006) provided evidence for the lending channel in Ukraine, and showed that the higher the capitalization the less sensitive a bank was to changes in monetary policy.

Empirical investigations on the relevance of the bank lending channel in MENA countries are lacking. As far as we know, Sengonul and Thorbecke (2005) is an exception. In this research, the authors investigated how monetary policy affected bank lending in Turkey using monthly balance sheet data for a sample of 60 banks over the period [1997:01-2001:06]. They found that restrictive policies rather impacted banks with less liquid balance sheets. Finally, it is worth noting that to the best of our knowledge no single study has yet dealt with this issue in Arab countries despite its strategic importance for the design of these countries' monetary policies.

4. The Lending Channel and the Monetary Policy in MENA Countries: An Overview

While monetary policy in MENA countries remains under-researched in general, this is particularly true for MTMs. The strategic importance of the role of banks in propagating the monetary policy impulses is so far under-researched. The quantity of research on developing countries is limited with that on MENA countries being even more so. At the present time, how exactly is monetary policy transmitted to the real economy remains unclear, and the empirical evidence is scarce and tends to be limited to the aggregate economy. Nevertheless, it is a fact that companies in the majority of MENA countries are still bank-dependent and

that the presence of financial frictions — specifically, credit rationing — has often been mentioned. Under these circumstances, the credit channel is a plausibly important channel of monetary transmission. This channel is expected to play an important role when capital markets are underdeveloped or when access to financial markets is limited (Kashyap et al., 1993). Again, a weak regulatory framework or a lack of transparency in accounting standards could further contribute to making investors more reluctant to buy non-insured bank debt.

A priori one may expect that the lending channel to be operative in MENA countries and many reasons may support this belief. The number of bank-dependent borrowers and specifically small and medium enterprises (SMEs) is high. For instance and for 2004, the share of SMEs in total enterprises in Jordan, Egypt, Tunisia and Morocco was estimated to be, respectively, 93, 90, 83 and 86 percent. Due to the high cost of direct finance compared with the small size of overall financing needs, these SMEs are more likely to be bank-dependent.

Besides, the importance of financial markets in facilitating economic policies is widely accepted. The development of efficient and liquid money market — the market for treasury bills, certificates of deposits (CDs), and interbank deposits — allows monetary policy to operate through interest rates. In most MENA countries financial markets as well as short term securities markets are still underdeveloped, and corporate bond markets are even less developed. The underdeveloped nature of these markets has deep implications on the design and conduct of the monetary policy. Thus, subsequent to restrictive monetary policy, MENA banks are inclined to cut back on the amount of loans they make seeing that other options cannot be pursued; these options consist of selling some of their security holdings (T-bills) or raising more non-deposits financing (CDs, bonds or equity). In spite of some similarities the four MENA countries share (the under-developed financial markets, the lack of transparency, and weak credibility of monetary authorities, etc.), the conduct of the monetary policy differs from one country to the other. It is worth noting that one chief feature that characterizes the four countries is their relatively independent monetary policy. In what follows, we describe with some details the conduct of the monetary policy in each country considered in this study.

***Egypt*:** The Egyptian monetary authority chose to target the exchange rate like most MENA countries. This policy has focused on the exchange rate using it as the anchor for its economic program. A severe macroeconomic crisis witnessed by the country prompted policymakers to embark on a series of monetary and financial reforms. By the end of 1999, the Egyptian monetary authority was prompted to adopt a crawling peg regime. This strategy was instituted around a more flexible exchange rate regime. Meanwhile, the Central Bank of Egypt (CBE) started to pursue a tight monetary policy to stabilize the economy and reduce inflation rates. The monetary authority occasionally intervened to maintain the exchange rate within the bands specified in the policy. By 2003, exchange rate stability was replaced by price stability, and inflation became the CBE's primary target. By 2006, Egypt still did not have any explicitly stated nominal anchor, but rather monitored various indicators in conducting monetary policy. The CBE intends to put in place a formal inflation targeting framework to anchor monetary policy once the fundamental prerequisites are met. During the transition period, the CBE intends to meet its inflation objectives by steering short term interest rates, keeping in view the developments in credit and money supply, as well as a host of other factors which may influence the underlying rate of inflation. In order to regulate the money supply and control price rises, the CBE introduced corridor rates for overnight deposit and lending since 2004. The Egyptian monetary authority has recently established an interbank market for foreign exchange that is a prerequisite for Egypt's transition to a unified flexible exchange rate system.

Jordan: The Jordanian monetary policy aims at preserving the stability of its currency. Its primary objective is to maintain a pegged exchange rate with the U.S. dollar. Official interest rates have moved and continue to move in reaction to changes in U.S. interest rates preserving the stability of international reserves. Prior to mid-1995 the Central Bank of Jordan (CBJ) used an intermediate monetary aggregate target (M2) to support its monetary policy objective. This framework worked well for Jordan until 1995 when the money multiplier's volatility increased, resulting in significant errors in forecasting the reserve money level. It seemed that the CBJ policymakers' preoccupation with preserving confidence in the local economy through stable demand for the local currency (Dinar) and through comfortable levels of reserves was a topmost concern. Since mid-1995, the CBJ adopted an accommodating policy and used the CD auction rate as the operating target to achieve exchange rate stability. Thanks to imperfect asset substitutability, the CBJ had some independence in setting the interest rate spread. It targeted the interest rate through varying its offering of auctioned CDs. By targeting the CD rate, the CBJ attempts to influence bank deposits and lending rates to induce changes in the demand for the local currency.

***Morocco*:** The role of Moroccan monetary policy was reshaped at the beginning of the 1990s. Credit restrictions were relaxed and the new monetary policy was based on indirect control instruments. The primary objective of the Moroccan monetary policy, as defined in the new 2005 Bank Al-Maghrib (BAM) statutes, is the maintenance of price stability. It includes the intermediate targets as well as the rules and the procedures. The monetary policy seeking to ensure that the rate of growth in means of payments was in line with ensuring that the productive sector enjoyed adequate funding. The Moroccan monetary authority firstly carried out a monetary targeting strategy with announced growth rates of M3 (and recently of M1) as the main operational targets. The current practice of monetary policy implementation requires the existence of rather strict capital account restrictions. The Moroccan monetary authority officially adopted a fixed exchange rate regime in the early 1990s. Despite their official target — stability of the currency — price stability also represented one of the main policy-making elements. The Moroccan monetary policy framework is still an informal quantitative framework. Since the beginning of the 1990s, the Moroccan monetary authority decided to pursue an exchange rate policy of pegging the local currency (Dirham) to an undisclosed basket of currencies. On the other hand, restrictions on capital movements were maintained. These restrictions, which are applied to residents, are more concerned with capital outflows than inflows. The capital account restrictions have allowed the authorities to maintain the pegged exchange rate along with an independent monetary policy.

Tunisia: The chief objectives of the Tunisian monetary policy in legislation include preserving the value of the currency as well as supporting the economic policies of the government. To this purpose, the monetary authority decided to carry out a stability-oriented monetary policy strategy at the end of 1980s. The monetary policy formulation focused on determining the proper growth of an intermediary aggregate according to the quantity equation of money. The target for the growth in the intermediary monetary target was derived by inserting forecasts for the rates of change in prices and output as well as in the velocity of the intermediary target expected to occur. Commitment to this target intended to make the commitment to price stability credible. Targeting the broad money growth (M2 since 1988, and M3 since January 2003), in addition to pursuing a highly managed exchange rate regime, represents the core of the current monetary framework. The Central Bank of Tunisia (BCT) derives, from the growth target for broad money, the ancillary target for the monetary base by assuming a stable multiplier. Considering the projected path of the broad money on the one hand, and having at its disposal an estimate of the required increases in net domestic credit on the other hand, the BCT derives the credit expansion to the public sector that is deemed consistent with these projections. The amount of credit expansion is estimated given a

separate assessment of the private sector credit needs. Finally, the BCT determines the amounts of liquidity to be distributed through the refinancing facilities by taking into account the projected net international reserves as well as the credit requirement of the agricultural sector. These amounts need to be fine-tuned on a weekly basis in the light of the supposed financing needs of commercial banks. By 2008, Tunisia still maintained relatively strict control on capital account transactions.

5. Theoretical Framework

The empirical test of the lending channel we intend to pursue takes Ehrmann et al.'s (2003) model as a benchmark. The market for bank deposits is described through an equilibrium relationship where deposits (D) are assumed to be equal to money (M) with both being functions of the interest rate (MP) set by the monetary authority. Thus, the model is defined as follows:

$$M = D = -\psi MP + \chi \tag{1}$$

with χ being a constant.

Bank i faces a loan demand $\left(L_i^d\right)$ that depends on economic activity (y), on the inflation rate (π), and on the loan nominal interest rate $\left(R_L\right)$ through the following relationship:

$$L_i^d = \phi_1 y + \phi_2 \pi - \phi_3 R_L \qquad \phi_1 > 0 \quad \text{and} \quad \phi_3 > 0 \tag{2}$$

Loan demand is supposed to be positively related to economic activity, and negatively related to the loan nominal interest rate. The coefficient associated to inflation, namely ϕ_2, could be either positive or negative in close relation with the nature of the steady-state equilibrium in the economy.

The loan supply by bank i $\left(L_i^s\right)$ is a function of the available amount of money (or deposits) (D), the loan nominal interest rate $\left(R_L\right)$, and the monetary policy instrument(s) (MP), where the instrument can be either the interest rate set by the Central Bank or the reserve requirements rate on deposits or both. The direct impact of the policy interest rate represents the opportunity costs for banks when banks make use of the interbank market as a liquidity source. Thus, loan supply is given by the following expression:

$$L_i^s = \mu_i\left(x_i\right)D_i + \phi_4 R_L - \phi_5 MP \qquad \phi_4 > 0 \quad \text{and} \quad \phi_5 > 0 \tag{3}$$

In addition, it is assumed that not all banks are equally dependent on deposits. In particular, the model considers that the impact of a change in deposits is smaller the lower the bank characteristics related to size, liquidity and capitalization $\left(x_i\right)$.[2] This is defined as follows:

$$\mu_i\left(x_i\right) = \mu_0 - \mu_1 x_i \tag{4}$$

The equilibrium condition in the lending market plus equations (1) to (4) result in the following reduced form of the model:

$$L_i = \frac{1}{\phi_3 + \phi_4}\left(\phi_1\phi_4 y + \phi_2\phi_4\pi - \left(\phi_5 + \mu_0\psi\right)\phi_3 MP + \mu_1\psi\phi_3 MP x_i + \mu_0\phi_3\chi - \mu_1\phi_3\chi x_i\right) \tag{5}$$

Expression (5) can be expressed in a more compact form as follows:

$$L_i = \beta_0 + \beta_1 y + \beta_2\pi - \beta_3 MP + \beta_4 MP x_i - \beta_5 x_i \tag{6}$$

Coefficients β_k, $k = 0,1,\cdots,5$ are determined in an appropriate manner from expression (5) as functions of initial parameters μ_0, μ_1 and ϕ_h, $h = 1,\cdots,5$. The coefficient β_4 relates the

[2] x_i stands for either a single bank characteristic or a set of characteristics.

reaction of bank i's loans to the monetary policy interacting with its characteristics (size, capitalization and liquidity). Under the model assumptions, a significant coefficient implies that the monetary policy affects the supply of loans. An implicit identifying assumption is that the interest rate loan demand elasticity does not depend on the bank characteristics (x_i). In other words, the coefficient ϕ_3 is the same for all banks. The assumption of homogeneous reaction of the loan demand is crucial for the identification of the monetary policy effects on loan supply; it rules out the cases where, for example, small or large bank customers are more sensitive to interest rate changes. Such an assumption seems quite reasonable for the MENA countries considered in this research in view of the fact that bank loans are the main source of finance in these countries, with few substitutes available, even for large firms (see the previous section). In addition, the empirical model allows for asymmetric responses of bank loans to changes in the economic activity and in the inflation rate by interacting such variables with bank characteristics.

6. Econometric Modeling and Data Description

Econometric Modeling

The relevance of the bank lending channel has been a controversial issue and the results have been rather mixed and inconclusive due to a fundamental identification problem. It is not a simple task to disentangle whether consumers and firms are more affected by a slowdown in economic activity and a subsequent reduction in credit demand or by a reduction in the loan supply as predicted by the lending channel. A fall in aggregate lending after a monetary contraction may be driven by demand rather than supply. In that case, other transmission channels (e.g. changes in interest rates or the exchange rate) may bring about an economic downturn and bank lending follows passively. Studies that analyze the response of aggregate credit to monetary shocks in the spirit of Bernanke and Blinder (1992) are therefore inconclusive with regards to the existence of a bank lending channel. One way to bypass such difficulty is to resort to micro-data. Micro-data and panel data techniques allow for bypassing such difficulty. When using micro-data, the response of bank lending can be analyzed in combination with other hypotheses that follow from the underlying theoretical literature. Information asymmetries, for instance, are presumably more relevant for particular categories of borrowers.

The econometric model that we intend to run relates the observed variation in the growth rate of bank loans to its lags as well as to a monetary policy indicator, a set of control variables to account for the general economic situation (and consequently for demand factors), certain bank characteristics, and the interaction between the bank characteristics and the monetary policy indicator.

This paper makes use of a model specification that permits to assess the effectiveness of the lending channel. The model specification, inspired by that of Kashyap and Stein (1995), also allows us to check whether bank lending responds to monetary policy shocks, and, if so, whether there are important cross-sectional differences in the responses of banks with varying characteristics. In order to perform this analysis, we use as bank characteristics bank size, capitalization and liquidity. The model specification also captures the existence of linear relationships between bank characteristics and bank lending. Thus, the underlying econometric model is written as follows:

$$\Delta \log L_{i,t} = \xi_i + \delta_1 \Delta \log L_{i,t-1} + \sum_{j=0}^{p} \alpha_j \Delta MP_{t-j} + \gamma^x x_{i,t-1} + \sum_{j=0}^{p} \varphi_j^x \Delta MP_{t-j} x_{i,t-1}$$
$$\sum_{j=0}^{p} \omega_j \pi_{t-j} + \sum_{j=0}^{p} \eta_j \Delta \log y_{t-j} + \varepsilon_{i,t} \qquad (7)$$

Individual banks are denoted by i $(i = 1, \cdots, N)$, and t $(t = 1, \cdots, T_i)$ indicates the time observation for each variable. T_i is the number of time periods available for each bank i, and p is the number of lags. $L_{i,t}$ is the amount of loans by bank i in year t to private non-banks. ΔMP represents the first difference in the nominal interest rate used as a measure of monetary policy. $\Delta logy$ is the annual growth rate of real GDP. Finally, π is the annual inflation rate. Inflation and the growth rate of real GDP are included to control for economic activity and cyclical patterns. It is worth noting that since we are working with annual data, the maximum lag that has been considered is two years (p=2). This is quite consistent with the fact that monetary policy shocks can propagate for no longer than two years. Coefficients associated to variable ΔMP determine a response to a monetary shock by a representative bank. Bank specific characteristics are given by the x_i variables such that $x_i \in \{\text{size, liquidity, capitalization}\}$. It is assumed that bank characteristics will affect loans growth rate in a linear fashion. Besides, bank specific characteristics are allowed to interact with the monetary policy indicator and control variables (real GDP growth and inflation).

Interaction with the control variables allows banks with different values of the bank characteristic to respond differently to business cycles. It also permits the bank characteristics to have a different impact on banks in each phase of the business cycle. Coefficients associated to variable $x_i \Delta MP$, which indicates the interaction term with monetary policy measures, describe how responses differ according to bank characteristics (weak and strong banks). These cross-terms allow for testing the asymmetric effects of monetary policy on individual banks. The test for the bank lending channel amounts to checking whether the coefficients of interaction terms are statistically significant or not. If so, the lending channel could be considered as operative. If, in addition, the coefficients on these cross terms are positive and statistically significant while the coefficient associated to ΔMP is negative, then the lending channel is at work. Conversely, if the coefficients on the interaction terms do not differ significantly from zero, then there are no loan supply effects from monetary policy at least based on this methodology. It is worth noting that bank characteristics variables, either in their linear forms or in the first order interaction terms, have been included in their lagged forms. The rationale behind such writing is that bank characteristics are nothing but bank balance sheet items, and as such they might be highly correlated with the loan variable $L_{i,t}$.

The econometric model that we intend to run relates the observed variation in the growth rate of bank loans to its lags, a monetary policy indicator, a set of control variables to account for the general economic situation (and consequently for demand factors), certain bank characteristics, and – the key term of the analysis – to the interaction between the bank characteristic and the monetary policy indicator. Obviously, the model should allow for bank-specific effects. The parameters of the model have to be estimated by the generalized method of moments (GMM). According to the available data, the treatment of incomplete panels is imperative. Indeed, the available panel dataset for the four MENA countries is unbalanced since each variable is observed over a varying time length. The dynamic structure provided in the econometric specification (7) leads to more efficient and consistent estimators given through the GMM methodology. This technique, developed essentially by Arellano and Bond (1991), is more employed in the context of dynamic panels. It provides convergent estimators and derives from the instrumental variables principles. It also makes up for problems of correlation between the lagged dependent variable included in the vector of explanatory variables and the error term $\varepsilon_{i,t}$ as well as between some explanatory variables and the unobserved bank-specific term ξ_i. As mentioned by Pruteanu-Podpiera (2007) for the context of bank lending studies, the methodology also accounts for possible endogeneity of some variables, as is probably the case with bank characteristics.

From an econometric point of view, the GMM procedure is based on a set of orthogonality conditions between the error terms and some instrumental variables. Estimation procedure is conducted in order to assure convergence of these orthogonality conditions to zero. The obtained estimator follows from a minimization of an appropriate quadratic form. Improvements are introduced like the two-step estimator developed by Arellano and Bond (1998). In comparison with the earlier procedures, the later reduces the dimensionality of the instruments which permits to avoid the over-fitting risk but still takes into account the presence of heteroskedastic consistent standard errors. The difference between one-step and two-step estimation consists in the specification of an individual specific weighting matrix. The two-step estimation uses the one-step's residuals, so it is more efficient. But, Arellano and Bond (1991) mention that Monte-Carlo simulations suggest that the asymptotic standard errors for the two-step estimators can be a 'poor guide' and so the inferences should be based rather on the one-step estimators.

Consistency of the GMM estimator depends on the validity of the instruments. To address the issue we consider two specification tests suggested by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). The first is the Sargan test of over-identifying restrictions, which tests the overall validity of the instruments. Under, the null hypothesis of the validity of the instruments, the statistic associated with this test has a chi-squared distribution with (J-K) degrees of freedom where J is the number of instruments and K the number of the independent variables in the regression. The second test examines the assumption of no serial correlation in error terms. We test whether the differenced error term is second-order serially correlated. Under the null hypothesis of no second-order correlation, the statistic associated with this test has a standard-normal distribution. Failure to reject the null hypotheses of both tests confirms the validity of our specifications.

Data Sources and Variables Description

We use bank-level data from BankScope, a database maintained by International Bank Credit Analysis Ltd. (IBCA), and the Brussels-based Bureau van Dijk. BankScope contains bank financial statements used in a number of other cross-country studies. For each considered MENA country, a panel data including all banks (commercial banks, savings banks, cooperative banks, and bank holding companies). We use data from consolidated accounts, if available, and otherwise from unconsolidated accounts (to avoid double-counting). Datasets were not available for a uniform period for each bank in each country. Consequently, the number of observations varies across our sample banks leading to conducting estimations over an unbalanced panel data. Thus, the period covered by the study varies globally from 1989 to 2007. From this dataset, we count 29 banks for Egypt, 11 for Jordan, 8 for Morocco, and 12 for Tunisia. Data on macroeconomic variables are drawn from the IMF IFS CD-ROM (March 2008) whereas the interest rates are drawn from the publications of national central banks or websites.

In order to identify the loan supply effects, three bank specific characteristics are used: size (Size), liquidity (Liq) and capital adequacy (Cap). Three measures are calculated in the following way:

$$\mathrm{Size}_{i,t} = \log \mathrm{A}_{i,t} - \frac{1}{\mathrm{N}_t}\sum_{i=1}^{\mathrm{N}} \log \mathrm{A}_{i,t} \tag{8}$$

$$\mathrm{Liq}_{i,t} = \frac{\mathrm{LA}_{i,t}}{\mathrm{A}_{i,t}} - \frac{1}{\mathrm{T}_i}\left(\sum_{t=1}^{\mathrm{T}_i} \frac{1}{\mathrm{N}_t}\left(\sum_{i=1}^{\mathrm{N}} \frac{\mathrm{LA}_{i,t}}{\mathrm{A}_{i,t}}\right)\right) \tag{9}$$

$$Cap_{i,t} = \frac{C_{i,t}}{A_{i,t}} - \frac{1}{T_i}\sum_{t=1}^{T_i}\left(\frac{1}{N_t}\sum_{i=1}^{N}\frac{C_{i,t}}{A_{i,t}}\right) \quad (10)$$

Bank size is measured through total assets variable (A). Liquidity is measured by the ratio of liquid assets to total assets (LA variable), and capital adequacy is given by the ratio of capital to total assets (C variable). The three measures are normalized to make the average measure of a characteristic add up to zero over all the observations. This allows us to interpret the coefficients of the monetary policy indicator directly as the overall measure of monetary policy effect on loans. It is worth noting that size is normalized with respect to the average of a specific time period, while the other two measures are normalized with respect to the entire sample average. This calculation eliminates undesirable trends in the size measure (Ehrmann et al., 2003). The interaction terms, namely SizeΔMP, LiqΔMP and CapΔMP, average therefore to zero as well so that parameter on x is directly interpretable as the overall monetary effect.

7. Empirical Results

The logic we stick to when starting to estimate the different specifications of the theoretical model is the following: The first order interaction terms were included jointly into the original specification and then tested down for their join significance, and the irrelevant ones were dropped. Since the chief objective of this study is to check whether the monetary authorities can affect loans supply, it becomes necessary to account for loan demand movements. Variables such as real GDP or inflation rate have traditionally been added to the model.

Before moving to estimation results, it is judicious to remind that we would expect the following coefficient estimates from our analysis to have signs as follows: Real GDP growth (the y variable) and inflation (the π variable) enter positively; in other words, the distributional lag coefficient should at least sum to a positive number ($\omega>0$ and $\eta>0$). The linear effects of bank liquidity and capitalization is expected to be positive ($\gamma^x>0$ for x=liquidity and capitalization), whereas size is expected to enter negatively; this negative sign could be justified by the fact that bank loans exhibit stationary size distribution ($\gamma^x<0$ for x=size).

As for the first order interactions terms, they measure the effect of monetary policy which is expected to be weaker among larger, more liquid or better capitalized banks. Here, the underlying assumption is that size is a proxy for information friction or problems (adverse selection, moral hazard) so that smaller banks being more opaque, have greater difficulties in restructuring their portfolio of loans and other assets ($\varphi^x>0$ for x=size, capitalization and liquidity; it is worth noting that for φ^x is nothing but $\frac{\partial^2 L_{i,t}}{\partial x_{i,t}\partial MP_t} > 0$). Indeed, large banks may find it easy to raise funds to offset the effects of contractionary monetary policy. They can use these funds to grant loans. But, as rates increase they can lose loans to a substitute source of financing. The effect of capital on the response of loans to monetary policy changes is positive. As banks become better capitalized the amount of loans it provides becomes less sensitive to the policy. Specifically, we will focus on the following three hypotheses:

Hypothesis 1: $\frac{\partial^2 L_{i,t}}{\partial A_{i,t}\partial MP_t} > 0$,

Hypothesis 2: $\frac{\partial^2 L_{i,t}}{\partial Liq_{i,t} \partial MP_t} > 0$,

Hypothesis 3: $\frac{\partial^2 L_{i,t}}{\partial K_{i,t} \partial MP_t} > 0$,

where $L_{i,t}$, $A_{i,t}$, $Liq_{i,t}$ and $K_{i,t}$ denote, respectively, bank i's loans, assets, liquid assets and capital in year t. MP denotes the appropriate interest rate measuring the monetary policy stance. It is worth reminding that higher values of MP correspond to tighter monetary policy. It should be emphasized that the rationale behind accounting for the first order interaction terms is that the effect of monetary policy on bank loans should depend to a large extent on the balance sheet strength of the bank.

In the model we consider, the existence of a bank lending channel can be assessed through the sign and significance of the interaction coefficients (the φ^X coefficients) measuring the differential impact of monetary policy on bank lending according to banks' size, liquidity, and/or capitalization. If small, illiquid and undercapitalized banks faced stronger difficulties in finding external finance after a monetary policy tightening, they would reduce their loans by more than large, liquid and capitalized ones. Given the negative impact of an interest rate increase on bank lending, this should translate into a positive and significant estimate of the interaction coefficient between monetary policy and banks' characteristics.

Egypt: Since we are primarily interested in checking the existence of the bank lending channel, it is necessary to verify on the one hand whether all the coefficients on ΔMP_{t-j} are negative, and on the other hand whether the first order interaction coefficient are positive or not, as explained above.

As far as Egypt is concerned, it stands out from the estimates results reported on Table 1 that the sign of the coefficients on MP variable is as expected and statistically significant. With respect to the monetary policy impact, we found that, in all specifications (specification 1 to specification 8), the long-run multipliers of monetary policy have the expected negative sign and are significantly different from zero for the average bank in the sample (according to each of the bank characteristics considered).This would indicate that monetary policy, as measured by the discount rate, is effective in affecting the loans dynamics. The total (or long-run) effect of monetary policy is about 3.2, which is relatively high when compared to the results reported by studies on industrialized countries.[3] Such finding would signify that if the Egyptian monetary authority increases the interest rate by 1 percentage point, loans tend to decline by 3.2 percent on average.

With regards to the first order interactions terms that stand for the effects of bank characteristics on the banks reaction to monetary policy, the empirical results also suggest that capitalization does play an important role in shaping the reaction of banks to monetary policy. Surprisingly, the sign is negative, which suggests that when facing a monetary policy shock, well-capitalized banks display a stronger response. Liquidity standing is not very important in explaining lending response to monetary policy (all liquidity measures are insignificant, that is the interaction terms $Liq_{i,t-1}\Delta MP_{t-j}$ are far from being significant. Besides, size seems to play a significant role in affecting the way banks respond to monetary policy changes.

[3] The total effect of the monetary policy on loans is computed as $(\alpha_0+\alpha_1)/(1-\delta_1)$.

The effects of the macroeconomic variables that account for demand movements are robust across the different specifications. The long-run elasticity of credit to GDP is always significant and larger than one. The response of credit to prices is always negative and significant. It is worth noting that the coefficient on inflation picks up both the positive effect of inflation on nominal loan growth and the potential negative effects of higher inflation via higher nominal interest rates. It seems that, in the case of Egypt, the second effect has the upper hand.

Jordan: The linear effects of bank size and capitalization are respectively negative and positive as expected. The negative sign of the coefficient on size reveals a significant linear negative relationship between bank size and the growth of total client loans; this could be justified by the fact that bank loans exhibit stationary size distribution. Liquidity does not seems to play an important role in shaping the reaction of Jordan banks to policy changes. Indeed, whatever the specification we consider the coefficient on liquidity is always non significant. On another front, the distributional effects of monetary policy due to bank size appear to be significant and positive as expected by the theory indicating a significant non linear relationship between size and loans growth. Still, the distributional effects of monetary policy due to capitalization is different from one period to another as shown notably by cross-product term coefficients (the coefficients on the variables $Cap_{t-1}MP_t$ and $Cap_{t-1}MP_{t-1}$). These coefficients alternate in sign, albeit the total effect (or the long-run effects) as measured by the long-run coefficient has the correct sign.[4] The different signs of these coefficients could be interpreted as follows: during the first period (at time t), and when faced with a monetary tightening, a well capitalized bank reacts more strongly than a less capitalized one. In the following period, it is rather the opposite that happens; a less capitalized bank displays a stronger response. It is worth noting, however, that the magnitude of the long-run effect (the overall effect) is relatively weak.

As for the effects of the macroeconomic variables, they do not seem to play any significant role in loans behavior. These results are robust across the different model specifications considered in Table 2. The long-run elasticity of credit to real GDP growth is always positive but not significant. Likewise, the response of credit to inflation is not significant, albeit positive.

With respect to the monetary policy impact we find that, in all model specifications, the long-run multipliers of monetary policy have the expected negative sign and are significantly different from zero for the average bank in the sample. Better still, this finding is robust with regards to the inclusion of each bank characteristic considered. In sum, the results of Jordan tend to confirm that the bank lending channel may be operative.

Morocco: With respect to the monetary policy impact we find that, in all model specifications, the long-run multipliers of monetary policy have the expected negative sign and are significantly different from zero for the average bank in the sample. Better still, this finding is robust with regards to the inclusion of each bank characteristic considered. In sum, the results of Morocco tend to confirm that the bank lending channel may exist.

The inspection of estimation results for Morocco (see Table 3) indicates that the linear relationship between bank characteristics (size, liquidity and capitalization) are far from being significant, and this finding is robust to different model specifications. As for the distributional effects, the inspection of the coefficients on the different first order interaction terms show that liquidity as well as size do play a significant role in affecting the reaction of banks to monetary policy. As far as size is concerned, the empirical results indicate that the

[4] The long-run coefficient of a variable is computed as the sum of its coefficients (of its lags and current values, where applicable) divided by one minus the sum of the coefficients of the lags of the dependent variable.

sign of the cross product term $Size_{t-1}MP_t$ is negative as expected. Its p-value is about 11 percent, which is acceptable. Regarding the distributional effects of monetary policy due to liquidity, it appears statistically significant but of different signs for the two considered periods — the interaction coefficient has a negative sign for the first period and a positive sign for the second period. This means that in the first period, the more liquid the bank, the less was its lending affected by the monetary policy conditions, and in the second period, the more liquid the bank, the more its lending reacted to the monetary policy conditions. Finally capitalization does not seem to affect loans growth rate either linearly or nonlinearly. In other words, capitalization does not make a difference to banks in their reaction to monetary policy changes. Likewise, bank size does not appear to play any significant role in affecting bank loans reaction to monetary policy change. All the cross products between the size variable and the interest rate are not statistically significant.

This does not necessarily mean a change in their lending behavior, but when accounting for the development of interest rates, the result could be interpreted as indicating a relatively stronger reluctance to lend to the more liquid banks. That is, in the first period, which was marked by monetary policy tightening, the more liquid banks' growth rate of loans decreases more than that of the less liquid banks. Further, in the second period, characterized by a decrease in interest rates, the more liquid banks' lending grows at a slower pace than that of the less liquid banks. We would be inclined to interpret this result as pointing to a broad credit channel.

As for the effects of the macroeconomic variables, they do not seem to play any significant role in loans behavior. These results are robust across the different model specifications considered in Table 2. The long-run elasticity of credit to real GDP growth is always positive but not significant. Likewise, the response of credit to inflation is not significant, albeit positive in sign.

Tunisia: With respect to the monetary policy impact we find that, in all model specifications, the long-run multipliers of monetary policy have the expected negative sign and are significantly different from zero for the average bank in the sample. Better still, this finding is robust with regards to the inclusion of each of the bank characteristics considered. In sum, the results of Tunisia tend to confirm that the bank lending channel may exist.

The most important feature of the empirical estimates in the case of Tunisia is that only the linear effects of bank size is significant and has a correct sign; the other two banks characteristics, namely capitalization and liquidity do not play any role at least in their direct (linear) relationship to loans behavior. As for the distributional effects of monetary policy due to bank characteristics, only that due to size is statistically significant. The first order interaction terms of liquidity and capitalization do not seem to play an important role in shaping the reaction of Tunisian banks to monetary policy changes; this finding seems to vary across the specifications. Though the cross products of size with monetary policy indicator alternate in sign (the coefficient on $Size_{t-1}MP_t$ is negative and that on $Size_{t-1}MP_{t-1}$ is positive), the total effects is nonetheless positive as predicted by the theory. The negative sign signifies that the bigger the bank, the more affected was its lending by the monetary policy conditions. In contrast, the positive sign implies that the bigger the bank, the less its lending reacted to the monetary policy conditions. What is rather important for a policymaker is the total effect which is positive, as expected, indicating by the same way that big banks react less to changes in policy on average. In sum, the distributional effects (the significant non linear relationship between size and loans growth) as well as linear effects of size speak about the existence of a bank lending channel in Tunisia.

Finally, the effects of the macroeconomic variables (real GDP growth and inflation) is somewhat mitigated. The long-run elasticity of loans to real GDP growth is always positive and statistically significant as expected in all the specifications. However, the response of loans to inflation is not

significant, albeit positive. This finding could be explained by the fact Tunisia did in fact witness a high inflation period.

8. Conclusion

The bank lending channel focuses on the special role of banks in propagating monetary policy impulses. The two necessary conditions for the existence of the bank lending channel are the ability of central banks to impact on the supply of bank loans and the dependency of borrowers on bank loans. For empirical investigation of the bank lending channel in MENA countries we use the approach that builds on the standard panel regression. The evidence on the bank lending channel is obtained by estimating a bank loan function that takes into account not only the monetary policy indicator and macroeconomic variables, but also bank-specific differences in the lending reaction to monetary policy actions such as size, liquidity and capitalization. The main question is whether there are certain types of banks that show a relatively strong decrease in lending after monetary tightening.

The paper's findings turn out to be heterogeneous among MENA countries. For Jordan the results seem to be consistent with the fact that lending by banks with a relatively weak capital base reacts more to a change in the monetary policy stance than lending by better capitalized banks. Likewise, size plays a significant role in shaping the response of Jordanian banks to monetary policy changes. Size turned out to be an important bank characteristic that affects the way Tunisian banks react to monetary policy changes. For Morocco, only liquidity appears to play a role in this context. These findings constitute a sensible evidence for the existence of a bank lending channel in these countries.

As for Egypt, the evidence for the existence of the bank lending channel is not convincing. Liquidity and size do not seem to exhibit any significant role. Capitalization while being significant, affects the responses of the banks to monetary policy change in a rather unusual manner. Indeed, well capitalized banks seem to respond strongly to monetary policy when compared to less capitalized ones. In principal, undercapitalized banks are more affected by a monetary policy than an average bank, which is consistent with bank lending channel hypothesis. One explanation that one may put forward in this context is that well capitalized banks could be less liquid. In all cases, the evidence on the existence of a bank lending channel in Egypt is rather weak, and more analysis should be done to reach clear-cut conclusions.

The results of this paper could be very useful to policymakers in MENA countries. If bank capital sinks into recession, the bank lending channel weakens. In such case, pursuing traditional prescriptions that consist of adopting an expansionary monetary policy would be fruitless, and would bring about inflationary pressure without boosting real activity. A more rational and effective policy would consist of injecting capital into the banking sector in order to help. On another front, monetary integration feasibility has to take interest in the study of differences in the "bank lending channel" among potential union countries. Heterogeneity in the structure of financial intermediation and in the degree and composition of firms' and households' debt could imply differences in the effectiveness of the monetary transmission mechanisms in the potential union countries area. If countries, aiming to make up the union, have asymmetric bank lending channels, then an active monetary policy that responds to information from financial indicators produces very great benefits. The optimal monetary policy is therefore influenced not only by the magnitude of the variance of the shock but also by its point of origin. Its propagation within the union depends therefore upon the characteristics of the country that has been hit by the disturbance.

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Table 1: GMM-in System Estimates for Egypt; One-Step Results

Variables	1	2	3	4	5	6	7	8
Loans(-1)	-0.195**	-0.226***	-0.138**	-0.161***	-0.155** (0.0774)	-0.186***	-0.155** (0.075)	-0.174*** 0.06
	(0.0917)	(0.0771)	(0.0671)	(0.0427)	-2.972** (1.353)	(0.0703)	-1.677** (0.751)	-1.243** 0.622
MP	-2.819***	-1.88***	-1.495***	-1.237*	-1.877*** (0.615)	-2.429** (0.988)	-1.885***	-2.523*** 0.533
	(0.791)	(0.703)	(0.463)	(0.692)		-2.571***	(0.424)	-0.0115 (0.0263)
MP(-1)	-1.341***	-2.0675***	-0.789***	-1.392***		(0.657)	-0.00617	1.218
	(0.486)	(0.558)	(0.265)	(0.312)			(0.0257)	(0.966)
Size(-1)	-0.0153 (0.0221)	-0.00893					1.164	-1.125*
	1.174	(0.0144)					(1.0681)	(0.685)
Size(-1)*MP	(0.781)	1.681**					-0.984	-0.00224**
	0.641	(0.784)					(0.608)	(0.000918)
Size(-1)*MP(-1)	(0.717)	0.453					-0.00287***	0.071
		(0.689)					(0.0011)	(0.0564)
Liq(-1)			-0.0025**	-0.00221*			0.0602	0.00418 (0.0364)
			(0.001)	(0.00121)			(0.0516)	-0.00363
Liq(-1)*MP			0.061	0.0613			0.0086	(0.00547)
			(0.0664)	(0.0683)	-0.00786 (0.00884)		(0.033)	-0.126
Liq(-1)*MP(-1)			0.0554 (0.0435)	0.0567	-0.52*		-0.00221	(0.215)
				(0.047)	(0.288)	-0.00654	(0.00654)	-0.5***
Cap(-1)					-0.403** (0.161)	(0.0083)	-0.136	(0.164)
						-0.457*	(0.209)	0.327
Cap(-1)*MP						(0.278)	-0.476*** (0.14)	(0.349)
						-0.365*		0.249
Cap(-1)*MP(-1)						(0.142)		(0.239)
						0.509*		-0.152
Growth		0.448		0.207		(0.302)		(0.19)
		(0.357)		(0.345)		0.228		0.504*** (0.169)
Growth(-1)		0.657		0.026		(0.225)		-0.00327 (0.039)
		(0.863)		(0.245)	0.042*** (0.009)	0.188		
Inflation		0.295		-0.122		(0.146)		
		(0.223)		(0.268)		0.532** (0.215)	0.0504***	
Inflation(-1)		0.571*** (0.145)		0.422**		-0.0428*	(0.0109)	
	0.0477***	-0.388	0.0564***	(0.174)		(0.0235)		
Constant	(0.00795)	(0.38)	(0.012)	0.0221				
				(0.0498)				

Table 1: (cont'd)

Variables	1	2	3	4	5	6	7	8
F-Statistic	2.82**	6.83***	6.46***	12.69***	4.13***	12.86***	5.77***	8.09***
Sargan test	371.39***	399.86***	282.03***	331.3***	341.08***	370.84***	431.81***	478.11***
Serial correlation test	-1.62	-1.71*	-1.88*	-2.07**	-2.16**	-2.05**	-2.22**	-2.39**
Nb. of banks	29	29	29	29	29	29	29	29
Nb. of observations	388	388	388	388	388	388	388	388

This table presents the results of one-step system GMM estimation for the available sample of 29 Egyptian banks over the 1988-2007 periods. The dependent variable is loans expressed in differences of logarithms. The nature of GMM method leads to the introduction of the lagged dependent variable (loans(-1)). The monetary policy instrument MP is measured through discount rate expressed in differences. Beside the instantaneous effect (variable MP), a lagged effect is taken into account through introduction of lagged variable MP(-1). Banks characteristics size (variable Size), liquidity (variable Liq) and capitalization (variable Cap) are introduced either separately or together. For each case, the characteristic is considered in the lagged form, in a lagged form interrelated with MP and a lagged form again interrelated with MP(-1).

For Sargan test, the null hypothesis indicates that the used instruments are not correlated with the residuals.

For the test of serial correlation, the null hypothesis indicates that the errors in the first-difference regression exhibit no second-order serial correlation.

Standard errors of estimates are reported in parentheses.

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively.

Table 2: GMM-in System Estimates for Jordan; One-Step Results

Variables	1	2	3	4	5	6	7	8
Loans(-1)	0.31***	0.311***	0.311***	0.358***	0.319***	0.32***	0.279***	0.27***
	(0.049)	(0.0374)	(0.0585)	(0.05)	(0.0434)	(0.0489)	(0.087)	(0.0755)
MP	0.0193***	0.018**	0.02***	0.0172*	0.0197***	0.0195***	0.0204***	0.02***
	(0.00642)	(0.0077)	(0.00673)	(0.00913)	(0.00555)	(0.00737)	(0.00375)	(0.005)
MP(-1)	-0.0217***	-0.02***	-0.0209***	-0.0196***	-0.0223***	-0.0221***	-0.0226***	-0.0219***
	(0.0044)	(0.0052)	(0.00558)	(0.00703)	(0.00545)	(0.00665)	(0.003)	(0.00385)
Size(-1)	-0.0392**	-0.03					-0.0778**	-0.0788**
	(0.0188)	(0.0185)					(0.035)	(0.034)
Size(-1)*MP	-0.0132	-0.0133					-0.0081	-0.00787
	(0.0102)	(0.0104)					(0.00646)	(0.0064)
Size(-1)*MP(-1)	0.0168*	0.016*					0.0164*	0.0164**
	(0.00882)	(0.00861)					(0.00856)	(0.00836)
Liq(-1)			-0.00224	-0.00106			-0.00194	-0.0022
			(0.00167)	(0.00168)			(0.00215)	(0.00216)
Liq(-1)*MP			0.000316	0.000375			0.0002	0.00026
			(0.000514)	(0.00056)			(0.00026)	(0.000269)
Liq(-1)*MP(-1)			-0.000092	-0.000224			6.13e-06	3.54e-06
			(0.000396)	(0.000416)			(0.000213)	(0.000207)
Cap(-1)					0.0028*	0.00254**	0.00512*	0.0051*
					(0.00148)	(0.00126)	(0.00276)	(0.00264)
Cap(-1)*MP					-0.00159***	-0.0016***	-0.00177***	-0.00176**
					(0.000414)	(0.000383)	(0.000683)	(0.000689)
Cap(-1)*MP(-1)					0.0013***	0.00132***	0.00117***	0.00117***
					(0.000333)	(0.00035)	(0.000426)	(0.000442)
Growth		0.149		0.16		0.0907		0.112
		(0.14)		(0.126)		(0.131)		(0.126)
Growth(-1)		0.0575		0.0852		0.0457		0.0395
		(0.0618)		(0.0766)		(0.05)		(0.0537)
Inflation		-0.04		-0.136		-0.159		-0.01
		(0.334)		(0.35)		(0.394)		(0.332)
Inflation(-1)		0.0718		-0.152		0.119		0.056
		(0.301)		(0.294)		(0.286)		(0.265)
Constant	0.0538**	0.0403**	0.0433**	0.038**	0.0568***	0.051***	0.0561***	0.0475**
	(0.0227)	(0.0161)	(0.0201)	(0.0149)	(0.0193)	(0.0185)	(0.0193)	(0.0198)

Table 2: (Cont'd)

Variable	1	2	3	4	5	6	7	8
F-Statistic	302.77***	469.21***	123.26***	101.11***	216.04***	871.24***	12947.87***	8.56e+08***
Sargan test	107.19***	134.03***	118.32***	129.61***	118.96***	130.54***	142.61***	138.22***
Serial correlation test	-2.78***	-2.72***	-2.75***	-2.66***	-2.6***	-2.65***	-2.64***	-2.68***
Nb. of banks	11	11	11	11	11	11	11	11
Nb. of observations	142	142	142	142	142	142	142	142

This table presents the results of one-step system GMM estimation for the available sample of 11 Jordanian banks over the 1989-2007 periods. The dependent variable is loans expressed in differences of logarithms. The nature of GMM method leads to introduction of lagged dependent variable (loans(-1)). The monetary policy instrument MP is measured through Discount rate expressed in levels. Beside the instantaneous effect (variable MP), a lagged effect is taken into account through introduction of lagged variable MP(-1). Banks characteristics size (variable Size), liquidity (variable Liq) and capitalization (variable Cap) are introduced either separately or together. For each case, the characteristic is considered in the lagged form, in a lagged form interrelated with MP and a lagged form again interrelated with MP(-1).

For Sargan test, the null hypothesis indicates that the used instruments are not correlated with the residuals.

For the test of serial correlation, the null hypothesis indicates that the errors in the first-difference regression exhibit no second-order serial correlation.

Standard errors of estimates are reported in parentheses.

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively.

Table 3: GMM-in System Estimates for Morocco; One-Step Results

Variables	1	2	3	4	5	6	7	8
Loans(-1)	0.257*** (0.051)	0.261***	0.273***	0.322***	0.225***	0.259***	0.306***	0.332*** (0.048)
	0.94**	(0.0291)	(0.0432)	(0.0416)	(0.049)	(0.0312)	(0.0546)	1.796**
MP	(0.473)	1.491*** (0.533)	1.626*** (0.424)	1.629**	1.444*** (0.426)	1.579*** (0.492)	1.604*** (0.421)	(0.778)
	-2.622** (1.244)	-2.752	-2.473** (0.969)	(0.76)	-2.753*	-3.104	-2.732**	-2.997*
MP(-1)	-0.00421	(1.803)		-2.825*	(1.484)	(2.0259)	(1.0849)	(1.659)
	(0.0182)	-0.00568		(1.592)			0.0025	-0.00578 (0.027)
Size(-1)	2.495	(0.0183)					(0.0265)	1.244
	(1.819)	2.328					1.2	(1.576)
Size(-1)*MP	-4.255	(1.74)					(1.537)	-0.292
	(4.384)	-4.304					0.266	(2.754)
Size(-1)*MP(-1)		(4.508)	-0.0000858				(2.52)	0.000187
			(0.000058)				0.0000548	(0.00021)
Liq(-1)			0.0877***	0.000016			(0.000261)	0.071***
			(0.0302)	(0.000102)			0.078** (0.0352)	(0.0188)
Liq(-1)*MP			-0.144***	0.073***			-0.139*** (0.03)	-0.125***
			(0.0403)	(0.0186)			0.00274	(0.0316)
Liq(-1)*MP(-1)				-0.138***			(0.00462)	0.00413
				(0.0471)	0.00244	0.00323	-0.0931	(0.00447)
Cap(-1)					(0.00442)	(0.00326)	(0.192)	-0.0141
					-0.683	-0.4	0.415	(0.195)
Cap(-1)*MP					(0.51)	(0.347)	(0.484)	0.46
					0.749	0.646		(0.499)
Cap(-1)*MP(-1)					(0.737)	(0.732)		0.00678 (0.232)
		-0.0378				-0.037		-0.0742
Growth		(0.25)		0.000374		(0.255)		(0.235)
		0.0124		(0.24)		-0.00674 (0.211)		0.786*** (0.219)
Growth(-1)		(0.191)		-0.0842		1.246*** (0.309)		-0.745*
		1.282*** (0.356)		(0.242)		-0.842*		(0.427)
Inflation		-0.905*		0.741***		(0.464)		0.0327***
		(0.497)		(0.218)		0.0212	0.0316***	(0.0127)
Inflation(-1)	0.03*** (0.0041)	0.0237* (0.0122)	0.0347***	-0.687*		(0.0136)	(0.00562)	
			(0.00527)	(0.379)	0.0315***			
Constant				0.0335***	(0.00552)			
				(0.0118)				

Table 3: (Cont'd)

Variable	1	2	3	4	5	6	7	8
F-Statistic	8.52***	49.09***	595.37***	48.83***	20.3***	2.73e+08***	567.02***	21.41***
Sargan test	91.47***	115.25***	110.9***	111.6***	104.98***	116.09***	115.4***	106.79***
Serial correlation test	-1.61	-1.71*	-1.71*	-1.71*	-1.5	-1.63	-1.67*	-1.71*
Nb. of banks	8	8	8	8	8	8	8	8
Nb. of observations	121	121	121	121	121	121	121	121

This table presents the results of one-step system GMM estimation for the available sample of 8 Moroccan banks over the 1988-2007 periods. The dependent variable is loans expressed in differences of logarithms. The nature of GMM method leads to introduction of lagged dependent variable (loans(-1)). The monetary policy instrument MP is measured through the Treasury bill rate expressed in differences. Beside the instantaneous effect (variable MP), a lagged effect is taken into account through introduction of lagged variable MP(-1). Banks characteristics size (variable Size), liquidity (variable Liq) and capitalization (variable Cap) are introduced either separately or together. For each case, the characteristic is considered in the lagged form, in a lagged form interrelated with MP and a lagged form again interrelated with MP(-1).

For Sargan test, the null hypothesis indicates that the used instruments are not correlated with the residuals.

For the test of serial correlation, the null hypothesis indicates that the errors in the first-difference regression exhibit no second-order serial correlation.

Standard errors of estimates are reported in parentheses.

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively.

Table 4: GMM-in System Estimates for Tunisia; One-Step Results

Variables	1	2	3	4	5	6	7	8
Loans(-1)	0.2**	0.186**	0.179**	0.229**	(0.0934)	0.176***	0.189**	(0.0837)	0.158**	(0.0736)	0.164**	(0.0825)
	(0.0889)	(0.094)	(0.0802)	-0.0132**		(0.0623)	-0.0108*		-0.00838		-0.011	(0.00679)
MP	-0.00611	-0.0117*	-0.0072	(0.00643)		-0.00705	(0.00648)		(0.00537)		0.00326	
	(0.00493)	(0.00624)	(0.00574)	0.00529		(0.0059)	0.00337		0.00267		(0.00561)	
MP(-1)	0.00353	0.00412	0.00443	(0.00545)		0.0027	(0.00523)		(0.00528)		-0.075	
	(0.00479)	(0.00507)	(0.00553)			(0.00554)			-0.0721	(0.0638)	(0.0663)	
Size(-1)	-0.0918	(0.0713)	-0.12**	(0.0553)					-0.0272*	(0.015)	-0.025*	
	-0.025**	-0.022*							0.0322**		(0.014)	
Size(-1)*MP	(0.0127)	(0.012)							(0.0134)		0.0305**	
	0.034**	0.0351**							5.03e-06		(0.0129)	
Size(-1)*MP(-1)	(0.015)	(0.0146)							(0.000643)		0.000051	
				0.000532					0.0000952		(0.000643)	
Liq(-1)			0.000614	(0.00105)					(0.00015)		0.00009	
			(0.00111)	0.0002					-0.0000822		(0.00015)	
Liq(-1)*MP			0.000174	(0.000184)					(0.000205)		-0.0000836	
			(0.000173)	-0.000256					0.0034		(0.000205)	
Liq(-1)*MP(-1)			-0.000261	(0.00031)					(0.0047)		0.00314	(0.0051)
			(0.00031)				0.00334	(0.0072)	-0.000859		-0.0005	
Cap(-1)					0.00292	(0.0085)	0.00115		(0.0014)		(0.00133)	
					0.00103		(0.00138)		0.000071		-0.000218	
Cap(-1)*MP					(0.00143)		-0.00172		(0.00142)		(0.00134)	
					-0.00155		(0.00171)				-0.0414	
Cap(-1)*MP(-1)					(0.00183)		-0.067				(0.23)	
		-0.12		-0.148			(0.224)				0.206**	(0.0944)
Growth		(0.197)		(0.237)			0.238**	(0.105)			-0.171	
		0.223**	(0.105)	0.218*			-0.127				(0.385)	
Growth(-1)		-0.0375		(0.112)			(0.405)				0.493	
		(0.414)		-0.0208			0.538				(0.653)	
Inflation		0.708		(0.42)			(0.575)				0.0651***	
		(0.56)		0.764			0.0584*	(0.0312)	0.071***	(0.015)	(0.0215)	
Inflation(-1)		0.0544**	(0.027)	(0.593)								
	0.0471***			0.0535	0.0598***	(0.02)						
Constant	(0.017)		0.0492***	(0.0332)								
			(0.0174)									

Table 4: (Cont'd)

Variable	1	2	3	4	5	6	7	8
F-Statistic	9.3***	43.64***	7.09***	177.3***	7.48***	100.87***	213.56***	1.43e+08***
Sargan test	100.24***	129.88***	95.03***	128.74***	94.26***	129.87***	153.03***	149.83***
Serial correlation test	-2.58***	-2.56***	-2.33**	-2.32**	-2.41**	-2.45**	-2.55**	-2.55**
Nb. of banks	12	12	12	12	12	12	12	12
Nb. of observations	166	166	166	166	166	166	166	166

This table presents the results of one-step system GMM estimation for the available sample of 12 Tunisian banks over the 1990-2007 periods. The dependent variable is loans expressed in differences of logarithms. The nature of GMM method leads to introduction of lagged dependent variable (loans(-1)). The monetary policy instrument MP is measured through Money Market rate expressed in levels. Beside the instantaneous effect (variable MP), a lagged effect is taken into account through introduction of lagged variable MP(-1). Banks characteristics size (variable Size), liquidity (variable Liq) and capitalization (variable Cap) are introduced either separately or together. For each case, the characteristic is considered in the lagged form, in a lagged form interrelated with MP and a lagged form again interrelated with MP(-1).

For Sargan test, the null hypothesis indicates that the used instruments are not correlated with the residuals.

For the test of serial correlation, the null hypothesis indicates that the errors in the first-difference regression exhibit no second-order serial correlation.

Standard errors of estimates are reported in parentheses.

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively.