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*An Empirical Analysis of the Bank Lending Channel in Turkey**

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Abstract

The purpose of this paper is to empirically analyze the role of the banking sector in monetary policy transmission in Turkey covering the period 1988-2009. By exploiting dynamic panel data modeling approaches, the heterogeneity in banks' lending response to changes in policy interest rates is analyzed. Given the changes in the policy stance and developments in the financial system following the 2000-01 crisis, the analysis is further conducted for the two sub-periods, 1988-2001 and 2002-2009, to examine whether there is a change in the functioning of the credit channel. Empirical evidence suggests cross-sectional heterogeneity in banks' response to monetary policy changes during 1988-2009. Regarding the results of pre-crisis and post-crisis periods, it is found that an operative bank lending channel existed in 1988-2001, however its impact became much stronger thereafter. The results also show significant differences in distributional effects of monetary policy due to bank-specific characteristics between two sub-periods.
Keywords: *Monetary Policy, Transmission Mechanisms, Bank Lending Channel, Turkey, Panel Data.*
JEL Classification: *E44, E52, G21.*

Özet. Türkiye'de Banka Kredi Kanalı'nın Ampirik bir Analizi
Bu çalışmanın amacı, Türkiye'de parasal aktarım mekanizmasında bankaların rolünü 1988-2009 dönemi için ampirik olarak araştırmaktır. Dinamik panel veri modelleme yöntemleri kullanılarak, politika faiz oranı değişimine karşı bankaların kredi verme tepkilerindeki farklılaşma analiz edilmektedir. 2000-01 krizi sonrasında politika tutumundaki değişiklikler ve finansal sistemdeki gelişmeler göz önünde bulundurulduğunda, kredi kanalının işleyişinde bir farklılık olup olmadığını incelemek amacıyla, iki alt dönem için, 1988-2001 ve 2002-2009, ayrıca analiz yapılmıştır. Ampirik bulgular, 1988-2009 döneminde, bankaların para politikası değişikliklerine tepkilerinde kesitsel farklılaşma olduğunu göstermektedir. Kriz öncesi ve kriz sonrası dönemlerin sonuçlarına dair, etkin bir banka kredi kanalının 1988-2001 döneminde var olduğu ancak etkisinin ondan sonra daha güçlü hale geldiği bulunmuştur. Bunun yanında, sonuçlar iki alt dönem arasında, para politikasının bankalara özgü özelliklerden kaynaklanan dağılımsal etkilerinde önemli farklılıklar olduğunu göstermektedir.
Anahtar Kelimeler: *Para Politikası, Aktarım Mekanizmaları, Banka Kredi Kanalı, Türkiye, Panel Veri.*
JEL Sınıflaması: *E44, E52, G21.*

I. Introduction

Understanding the transmission mechanism of monetary policy has been subject of long-standing interest among economists. A relatively recent view of monetary transmission mechanism emerged as the 'credit view' in light of information asymmetries and any other frictions in credit markets. The credit channel theories incorporate credit markets into the basic framework and assume that bank loans are unique against other forms of debt. One of the sub-channels' of the credit channel, the bank lending focuses more narrowly on the impact of monetary policy on banks' willingness to provide loans. In this channel the central bank can affect the external finance premium by controlling the level of intermediated loans. Contractionary monetary policy, which decreases the deposits of banks, restricts the supply of loanable funds and lowers banks' ability to lend. As a result, bank dependent borrowers, whose external finance premium has increased, cannot raise funds from other sources and accordingly, reduce their investment and consumption expenditures.

Credit market imperfections are crucial in explaining the unique role of financial intermediaries, particularly banks, to alternative financing methods and further, allow for the bank lending channel to be operative for the transmission of monetary policy shocks. Due to the imperfections in the credit markets, banks with different characteristics respond differently to monetary policy shocks since they have different abilities to raise external finance and shield their loan supply. Moreover, due to these frictions, firms and households have a specific need for bank financing as opposed to alternative external financing, so that any change in the size and/or composition of banks' balance sheet would have an impact on their investment and production decisions, hence on the real economy.

Along these lines, examining whether monetary policy shocks are transmitted differently by banks with different characteristics is equivalent to investigating whether there exists an operational bank lending channel of monetary transmission. By using identification through heterogeneity, one can clearly evaluate bank responsiveness to monetary policy shocks and recognize loan fluctuations that emanate from supply changes, but unrelated to loan demand (Ehrmann, Gambacorta, Martinez-Pages, Sevestre and Worms, 2003; Gambacorta, 2005; Kashyap and Stein, 2000; Kishan and Opiela; 2000).

This paper investigates the bank lending channel of monetary policy for the Turkish economy by specifically focusing on the role of banks in the monetary policy. There are few studies available that focus on the bank lending channel in Turkey, showing conflicting results in terms of the effectiveness of this channel (Aktaş, 2006; Aydın and Igan, 2010; Brooks,

2007; Çavuşoğlu, 2002).[1] In order to shed light on the issue, this study analyzes differences in the response of banks with different characteristics at the micro level and accordingly, assesses the impact of transmission mechanism of monetary policy through the bank lending channel. In this framework, the study examines the lending behavior of banks operating in Turkey over the period 1988-2009. Moreover, recently Turkey has experienced changes in financial regulations which are expected to affect the bank lending channel. This paper would provide a framework for exploring questions of how these developments may have affected the bank lending channel of the monetary transmission mechanism.

This study presents three novelties with regard to the bank lending channel literature in Turkey. First, the analysis covers a larger time series period than all other studies on this issue. Second, Turkish banking sector have undergone considerable transformation with the new regulatory agency (Banking Regulation and Supervision Agency (BRSA)), significant regulatory and structural changes in the aftermath of the 2001 financial crisis. Coupled with the developments in the macroeconomic fundamentals and shifts in the monetary and fiscal policy stance, a change in the functioning of the credit channel is expectable. Thus, utilizing larger time series provides us a laboratory case in analyzing the loan supply response in the sense that 2000-2001 crisis constitute a possible structural break. Accordingly, the sample is divided into two periods as 1988-2001 and 2002-2009, and the model is estimated separately for each sub-period. So that it could be understood whether there exist any time varying characteristics of banks' lending behavior before and after the crisis along with the impact of amendments in the financial regulations on the credit channel. Finally, the study appeals to bank heterogeneity by using bank size and CAMEL type variables as a measure of financial health. CAMEL, which is a supervisory rating system based upon an evaluation of five critical components of bank safety and soundness, stands for capitalization, asset quality, management, earning capability, liquidity. While size, liquidity and capitalization are standard bank characteristics in the literature, a broader measure of financial soundness is used by employing asset quality, management, earnings as additional characteristics.

The structure of the paper is as follows: Following the introduction, section 2 provides the econometric model to be estimated and describes the dataset. Estimation results are presented and discussed in Section 3. Finally, section 4 concludes the paper.

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1 Other than these studies that examine bank lending channel in Turkey by using bank-level data, Kurul- Mutluer (2011) utilize data from Central Bank of the Republic of Turkey Banks' Loan Tendency Survey to provide evidence on the effectiveness of the bank lending channel in a part of her study.

II. The Econometric Model and the Data

The empirical model is based on the simplified version of the model for the bank lending channel which is developed by Ehrmann, Gambacorta, Martinez-Pages, Sevestre, and Worms (2001) in the spirit of Bernanke and Blinder (1988) framework.

In particular, we assume that deposits are demanded for transactions motive and in equilibrium deposits, D, equal money M, and both depend on the monetary policy *(mp)* as follows:

$$D = M = -\delta(mp) + \vartheta \tag{1}$$

where other factors that affect the deposit demand except the monetary policy are denoted by ϑ.

The demand for loans of bank i (L_i^d) is:

$$L_i^d = \varphi_1 y + \varphi_2 p - \varphi_3 r \tag{2}$$

with y referring to real aggregate output, p to price level and r to loan interest rate.

The supply of loans of bank i (L_i^s) depends on the amount of deposits (hence, loanable funds) D available, interest rate on loans r and the monetary policy rate mp, which can be modelled as:

$$L_i^s = \varphi_4 D_i + \varphi_5 r + \varphi_6 mp \tag{3}$$

Here, the monetary policy stance has both direct and indirect effect on the loans supply function. While the direct effect arises due to the presence of opportunity cost for a bank that uses interbank markets to finance its loans, the indirect impact operates through the amount of deposits available, which depends negatively on the monetary policy rate.

Another assumption is that banks are not equally dependent on deposits as a source of financing, and this dependency is tied to their specific characteristics denoted by X_i:

$$\varphi_4 = \phi_0 - \phi_1 X_i \tag{4}$$

When we assume that loan market clears using these equations, we can write the simplified loan supply model as:

$$L_i = ay + bp - c_0 mp + c_1 mp X_i + dX_i + const \tag{5}$$

c_1 is the coefficient of the interaction term of the response of bank lending to monetary policy to bank specific characteristic and its significance suggests the existence of a bank lending channel. The essential assumption being that interest elasticity of banks' loan demand does not depend on bank characteristics, in other words φ_3 should be same across banks.

The empirical specification is a minor modification of the banks' loan supply function in (5) and designed to test whether banks with a different level of financial soundness react differently to monetary policy shocks. Thereby, we interact bank characteristics with the changes in the interest rate, which is the monetary policy indicator, to allow for the differential responses of bank lending to monetary policy shocks.

Instead of modelling in levels, we model the growth rate of bank loans and hence, estimate the model in first differences. This is due to the fact that banks react to a change in the monetary policy by adjusting the new loans. In this sense, the level of loans approximates the existing stock of loans, the flow can be better approximated by the first difference (Ehrmann et al., 2001).

The empirical model is therefore expressed by the following equation:

$$\Delta \log(L_{i,t}) = \alpha_i + \sum_{j=1}^{l} \gamma_j \Delta \log(L_{i,t-j}) + \sum_{j=0}^{l} \beta_j \Delta MP_{t-j} + \sum_{j=0}^{l} \delta_j \Delta \log(GDP_{t-j}) + \sum_{j=0}^{l} \upsilon_j CPI_{t-j}$$

$$+ \mu X_{i,t-1} + \sum_{j=0}^{l} \theta_j X_{i,t-1} \Delta MP_{t-j} + \varepsilon_{i,t} \qquad (6)$$

with $i = 1,...,N$ and $t = 1,....,T$ where N is the number of banks, T is the final year and l is the number of lags. L_{it} are the loans of bank i at time t to private nonbanking sectors. MP represents the monetary policy indicator, GDP denotes the real GDP and CPI is the inflation rate. Bank specific characteristics are given by X_i, which is a matrix of the components of the CAMEL ratios and size. The model further allows for fixed effects across banks, as indicated by the bank specific intercept α_i, which is included to control for other bank specific characteristics that differs across banks but remains constant over time.

In the above equation (6), the growth rate of bank lending, $\Delta \log(L)$, is regressed on changes in the interest rates, ΔMP, controlled by the monetary authority, and on its interactions with the bank specific characteristics. As an indicator variable of monetary policy shocks, interest rate changes are used to capture the effect of monetary policy on bank lending. The bank specific characteristics are included and also interacted with the monetary policy indicator in order to identify the differential lending responses of banks with different balance sheet strength. Real GDP growth, $\Delta \log(GDP)$, is added as a control variable to the model to account for loan demand movements

and effects of macroeconomic developments on bank lending. With better economic conditions, number of projects becoming profitable in terms of expected net present value increases, which in turn causes a rise in the demand for credit (Kashyap, Stein and Wilcox, 1993). Inclusion of this variable is important since it isolates the monetary policy component of interest rate changes and allows us to truly capture the cyclical macroeconomic movements (Gambacorta, 2005).

As mentioned earlier, the main thrust of this paper is that the overall financial strength of a bank, together with its size, may be important for its ability to shield loan supply from policy induced deposit outflows. Accordingly, we employ bank specific characteristics based on CAMEL ratings as a proxy for financial soundness. Indeed, we utilize the components of the CAMEL ratings system rather than using the CAMEL rating as a whole; we compute the relevant ratios using data from banks' balance sheets and income statements and, then, include each of them separately as explanatory variables in the regression equations. The bank specific characteristics can be stated as follows: SIZE, the log of total assets (size), CAP, shareholders' equity to total assets ratio (capitalization), QUAL, loans under follow-up to total loans ratio (asset quality), MANG, real net income to number of branches ratio (management efficiency), EARN, net profit to total assets ratio (earnings capability), LIQ, liquid assets over total assets (liquidity).

An endogeneity problem could arise since CAMEL type ratios are based on balance sheet data and if these variables are strongly correlated with each other, it would be difficult to figure out which balance sheet position causes the other. In order to avoid this endogeneity bias, bank specific explanatory variables enter the model with one lagged value. Furthermore, all bank specific characteristics are normalized with respect to their average across all banks in their respective samples, so that they sum up to zero over all observations. This implies that the averages of the interaction terms are zero and the coefficients β_j can be roughly interpreted as the average monetary policy effect on lending of an average bank. On the other hand, in the case of size variable, normalization is not over the whole period, but with respect to the mean of each single period, in order to remove unwanted trends in size (Ehrmann et al., 2001).

Under this framework, the empirical analysis in this paper utilizes annual bank-level and related macroeconomics data covering the period from 1988 to 2009. The sample period starts from 1988, since the balance sheet banking data is published from 1988 onwards. We try to cover the whole period in which consistent data for balance sheet information is available to capture the changes in the lending behavior in two eras of Turkish financial architecture.

We build an unbalanced panel dataset, which includes deposit banks, investment and development banks operating in Turkey during the period 1988-2009.[2] Some difficulties emerged when dealing with this dataset. First, accounting and reporting standards have undergone some changes during the period under consideration, which can create inconsistency in the time series of this data set. While this can be a potential limitation of the analysis, we believe that it does not affect our results dramatically. Second difficulty concerns the treatment of data regarding mergers and acquisitions, and outliers in order to maintain a consistent panel data set. Under the sample period, a number of banks either merged to or acquired by other banks. Besides, there has been a decline in the number of banks due to failures during restructuring process in the decade. For the analysis, we include those banks that had been subject to mergers and acquisitions or failures in order to minimize the so-called survivalship bias. We discard those banks from the sample which existed for less than five years during the period under consideration.

Annual bank-level data are collected from the balance sheet and income statement information extracted from the Banks Association of Turkey. Other than the bank-level data, we use macro variables, which are collected from the *International Financial Statistics* and *World Economic Outlook* publications of the IMF. Besides the monetary policy indicator, additional macro variables employed in the analysis are the real GDP growth for output growth and average CPI series for inflation. Choosing the best measure of monetary policy stance in Turkey is challenging as monetary policy conduct has undergone several changes during the period analyzed here. In the 1990s, Turkish monetary policy can be characterized by a pegged exchange rate regime, in which the exchange rate was the main policy instrument to control inflation. In the aftermath of the 2000-2001 financial crises, monetary authorities adopt inflation targeting strategy and introduce flexible exchange rate regime as a part of the structural transformation process. More specifically, the transition to inflation targeting began in 2002 with an implicit inflation targeting program and completed by 2006 when the monetary policy strategy becomes fully-fledged inflation targeting regime. With this policy shift, an explicit inflation objective replaces the targeting the domestic monetary aggregates. This policy framework, in which interest rates are adjusted in response to deviations of inflation from a targeted path, puts the Central Bank of Turkey's short term interest rates to be in the forefront of monetary policy (Başçı, Özel, and Sarıkaya, 2007).

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2 Since investment and development banks do not take deposits and have a different funding structure than commercial banks, they do not exactly fall into the theoretical discussion regarding the bank lending channel. However; we still include them into our analysis because although not very large, they extend considerable amount of credit in the system, being important competitors of deposit banks in that sense. Furthermore, their inclusion is favorable for the strength of econometric analysis as they increase degrees of freedom. Nevertheless, the model is estimated separately for the deposit banks as well.

When we look at the preceding literature regarding the choice of monetary policy variable, Bernanke and Blinder (1992) support the short term interest rate under the control of central bank as a good measure of monetary policy shocks. Accordingly, most empirical studies on US use Fed Funds rates as the monetary variable, while others on European economies and emerging countries utilize central bank repo rates or short term money market rates, irrespective of whether countries conduct inflation targeting regimes (Juurikkala, Karas, and Solanko, 2011). As a result, we use the money market interest rate as the main monetary policy indicator in our analysis in line with much of the previous literature and consistent with the Turkish monetary policy. Specifically, the money market rate employed is the weighted average annualized rate in the overnight interbank money.

Table 1 provides summary statistics of the CAMEL type ratios for the whole data set under the period analyzed. Summary statistics of the regressors are further reported for the two sub-periods 1988-2001 and 2002-2009 in Table 2.[3]

Table 1. Descriptive Statistics for the period 1988-2009

Regressors	Observations	Mean	Standard Deviation
SIZE	1241	3.785	3.651
CAP	1208	13.708	12.884
LIQ	1211	42.662	19.270
EARN	1229	2.710	5.500
QUAL	1222	12.341	40.860
MANG	1204	0.047	0.105

Table 2. Descriptive Statistics for the periods 1988-2001 and 2002-2009

1988-2001 period

Regressors	Observations	Mean	Standard Deviation
SIZE	904	2.452	3.121
CAP	892	11.443	11.083
LIQ	889	43.704	18.970
EARN	894	3.020	5.853
QUAL	885	11.364	36.711
MANG	875	0.048	0.104

2002-2009 period

Regressors	Observations	Mean	Standard Deviation
SIZE	337	7.360	2.330
CAP	316	20.100	15.270
LIQ	322	39.790	19.820
EARN	335	1.883	4.314
QUAL	337	14.904	50.122
MANG	329	0.044	0.107

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3 Table 1 and Table 2 summarize the data after corrupt observations are controlled for.

III. Estimation Results and Discussion

To assess the role of banks in the monetary policy transmission in Turkey for the period 1988-2009, we estimate the equation (6) by using the generalized methods of moments for dynamic panel data put forward by Arellano and Bond (1991).[4] In the presence of bank specific fixed effects and possible endogeneity of regressors, GMM estimators would provide efficiency and consistency given that the model is not subject to second-order serial correlation and the chosen instruments are valid. The key results of the study are reported in Table 3, which presents the estimated long run coefficients, their standard errors and the mis-specification test for the regressions. The analysis is conducted both for the whole period 1988-2009, and for the sub-periods 1988-2001 and 2002-2009. The estimation results of each period are presented in each column in the table.

While covering the whole period may fail to capture unique dynamics of the pre and post-crisis periods, we still conduct our analysis for the period 1988-2009 for a preliminary insight into whether the growth of bank loans responds to monetary policy changes. As the results in the first column reports, the response of growth rate of bank loans to a monetary policy shock has the expected negative sign. The significant coefficient of real GDP indicates that the change in economic activity have a positive effect on bank lending. The coefficient of inflation is significant, but has negative sign, which is contrary to our apriori expectations. Except earnings capability and management efficiency, we find significant linear relationship between bank characteristics and the growth rate of loans in this period. While capitalization, liquidity and asset quality seem to influence bank lending positively, size impinges negatively on growth rate of loans. Concerning the distributive effects of monetary policy on bank lending, we detect size and asset quality to be the sources of asymmetric response of banks to monetary policy stance, since the interaction coefficients of these characteristics with the changes in the interest rate is positive and significant. The coefficient of interaction between capital and changes in monetary policy has statistical significance, but the direction of the relationship is opposite of what we expected according to the bank lending channel literature.

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4 We also consider two-step estimation in system GMM developed by Arellano and Bover (1995) and Blundell and Bond (1998); however estimates of our model in difference GMM have a better fit in terms of coefficients significance and provide better statistical diagnostics. Furthermore, Difference-Sargan test statistics rejects the validity of the additional moment conditions used in the system GMM estimations.

Table 3: Regression Results

Dependent Variable: ΔL_t	(I) Sample Period 1988-2009		(II) Sample Period 1988-2001		(III) Sample Period 2002-2009	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
MP	-0.125***	0.019	-0.232***	0.023	-0.375**	0.203
GDP	0.209***	0.087	3.529***	0.126	1.344***	0.582
CPI	-0.422***	0.495	-2.025***	0.179	-0.528	0.136
SIZE	-12.406***	0.709	-11.711***	0.559	-12.335***	4.191
CAP	0.543**	0.290	1.745***	0.215	0.324**	0.229
LIQ	1.094***	0.052	1.364***	0.135	0.625***	0.125
EARN	0.177	0.436	0.558***	0.236	-1.629***	0.299
QUAL	0.495***	0.038	0.434***	0.028	0.443***	0.165
MANG	8.520	25.820	14.682	34.800	274.445***	48.500
*SIZE * MP*	0.061***	0.005	-0.020***	0.009	0.134***	0.042
*CAP * MP*	-0.004**	0.002	0.003	0.002	0.124***	0.011
*LIQ * MP*	-0.001	0.001	-0.009***	0.001	0.021***	0.007
*EARN * MP*	0.002	0.101	0.016***	0.007	0.024	0.037
*QUAL * MP*	0.004***	0.001	0.006***	0.001	0.017***	0.007
*MANG * MP*	0.266	0.668	0.048	0.563	10.210***	3.010
Number of observations	854		586		197	
Sargan test (p-value)	0.917		0.865		0.228	
AR(1), AR(2) (p-value)	0.008, 0.275		0.000, 0.929		0.008, 0.140	

Note: * Significance level of 10%
** Significance level of 5%
*** Significance level of 1%

The second and third columns summarize the results of baseline model estimations for sub-periods 1988-2001 and 2002-2009 respectively. We find considerable differences in the magnitude and direction of coefficients between the two-sub periods, which indicate that there are major differences in the reactions of different types of banks to the monetary policy shocks.

Firstly, our results suggest a significant linear negative relationship between monetary policy changes and loan growth in both periods. So consistent with the bank lending channel, a tightening of monetary policy leads to an expected decrease in the growth rate of loans. When we compare the long run effect of monetary policy on the average bank between the two periods, we see that the magnitude of the estimate of β is larger for the period 2002-2009. In particular, for the first period, the estimated coefficient implies that a 1 per cent increase in the interest rate leads to a decrease in the growth of loans by 0.23 per cent, whereas, the corresponding estimate implies a decline in loan growth by 0.37 per cent for the second period. Therefore, our results suggest a considerably stronger impact of monetary policy changes on the growth rate of loans for the 2002-2009 period, which confirms our prior expectations.

This stronger influence has several concurrent explanations. After the financial crisis of 2000-2001, there have been a number of significant regulatory and structural changes in the Turkish banking sector. As this period corresponds to increased regulation of the sector, intermediation role of banking is expected to get stronger. Hence, due to stronger intermediation by the banking system an increase in the scope of the bank lending channel in the second era is expected.

Furthermore, following the deep financial crisis of 2000-2001 we see the change in the monetary policy regime and improvements in the macroeconomic fundamentals. In this era several developments enhanced the effectiveness of monetary policy; transition to inflation targeting strategy and the introduction of the floating exchange rate regime, as well as weakened fiscal dominance, diminished dollarization and reduced exchange rate pass-through to prices. The new of role of interest rates as the policy tool, coupled with the more responsive aggregate demand to real interest rates have brought about an increase in the effectiveness of monetary policy (Başçı, Özel, and Sarıkaya, 2007).

During the 1990s, Turkey adopted 'hot money' policy of high real interest rates for treasury bills and domestic currency appreciation to attract short term capital to finance the high public sector deficit. Under these circumstances, the banking sector concentrated more on government deficit funding through large, open foreign positions which provide lucrative profits to them. Both public and private banks channelled their funds mainly to the government debt instead of corporate lending and this domestic debt finance policy dynamics has led to the dominance of public debt instruments over the financial market (Bakır and Öniş, 2010). Besides putting fiscal pressure on the money markets, fiscal dominance also constraints the implementation of an independent monetary policy. As a result, the heavy reliance of domestic borrowing associated with the absence of an effective monetary policy have caused the crowding out of private investment by government public debt (Bakır and Öniş, 2010; Çavuşoğlu, 2002). Moreover, Turkish banking sector was associated with high degree of politicization of bank lending and regulation, which resulted in poor supervision and regulation of the sector during this period (Bakır and Öniş, 2010).

However, these conditions have alleviated in the post-crisis era with the launch of the comprehensive economic programme. During the second period, not only there were reforms aimed at restructuring banking and public sector, but the banks also started to operate in the new regulatory environment with the establishment of BRSA. This structural transformation process, which involved measures aimed at restructuring state banks and putting pressure on banks for recapitalization, led to an increase in the profitability of banks

and reduced the fragility of the sector in terms of its ability to withstand the shocks. These remarkable developments in the banking sector, coupled with the decline in real interest rates, inflation and budget deficits, i.e. weakened fiscal dominance, caused the supply of loanable funds to increase. As a result, banks have started to perform their intermediation role more effectively, as they focus more on the provision of credit to households and firms in the aftermath of the 2000-2001 financial crisis. Therefore, our main finding that efficiency of bank lending channel after 2002 has increased is consistent with these developments.

Moreover, our results show that the effects of real GDP on lending have the intuitively expected positive sign in both periods. Hence, bank lending moves in line with macroeconomic trends. However, regarding the difference between the two sub-periods, we find a considerably stronger influence of GDP growth in the first period. This is once again consistent with the explained structural change in the sector. As the banking sector becomes more operative and more active in its role of financial intermediation in 2002-2009 period, the sector's lending behaviour becomes more supply oriented than demand driven, thus the coefficient of GDP is smaller in this period.

As regards the impact of the inflation rate between the two periods, it has a significant coefficient only in the first period, but with a negative sign. This could stem from the chronically high inflation rates and hence, higher uncertainty prevailing during the 1988-2001 period.

Estimation results also show several features of the loan supply response of Turkish banks, based on their balance sheet characteristics. In addition to analyzing how financial strength of banks help them to mitigate the effects of monetary policy shocks, we also examine the direct relationships between bank strength and lending activity in order to understand the importance of banks characteristics for the transmission of monetary policy, i.e. whether they matter for bank lending or not. Outcomes not only reveal the key differences in terms of magnitude and significance of the relationships between growth rate of loans and the bank characteristics, but also of the distributive effects of the monetary policy on the bank lending due to these varying bank characteristics between the two sub-periods.

Our findings show a significant linear negative relationship between bank size and growth rate of loans, which is of similar magnitude, in both sub-periods. This negative coefficient suggests that small banks lend more. This could stem from the presence of relationship lending, where there are strong lending relationship between small banks and small firms. As regards the distributive effects of monetary policy, results show a significant interaction coefficient but of opposite signs for the two sub-periods; namely, the interaction term has a negative sign for the first period and a positive for

the second. Our result for the first period suggests that monetary policy does have greater impact on the lending of large banks. This could be interpreted as bank size not being relevant in capturing the effect of monetary policy on bank lending for that period. The positive coefficient of the interaction term in the second period is consistent with the lending channel story, which presumes large banks buffer monetary policy shocks.

Concerning the relationship between capitalization and the loan growth, the results reveal that the degree of capitalization has a supportive effect on the lending of banks, especially for the first period, where the coefficient has a surprisingly larger magnitude than that of the second period. On the other hand, capitalization affects the banks' reaction to a monetary policy impulse only in the second period due to the positive and significant coefficient of the interaction term. This is consistent with theoretical predictions of the bank lending channel literature, since bank capital provides a signal about banks' creditworthiness and less capitalised banks, which would be perceived as riskier by the borrowers, suffer from asymmetric information problems in the credit markets more and are less able to shield their loan supply in the wake of changes in the interest rates. On the contrary, the interaction coefficient turns out to be insignificant, suggesting no evidence on the distributional effects of monetary policy due to capitalization in the first period. This could be explained by undercapitalization of Turkish banking sector prior to 2002. Moreover, one of the conditions for bank capital to have an impact on lending is that not meeting the minimum capital requirement should be costly and accordingly, banks tend to limit the risk of future capital inadequacy (Gambacorta and Ibanez, 2011; Van den Heuvel, 2002). This does not seem to hold in Turkey for the first period, as banks do not comply with the capital adequacy requirements and as a result, capital constraints do not restrict their lending supply.

In both sub-periods, coefficients of the liquidity ratio are positive and significant; suggesting that highly liquid banks are more likely to expand their supply of loans than less liquid banks. Liquidity is found to have stronger effect on loan supply during the 1988-2001 period, which is explicable by the decline in the liquid assets of the banking sector following the restructuring process with the increased confidence in the economy and improvements in sources of funding. While interaction between liquidity and monetary policy indicator is statistically significant in both periods, it turns out to be negative in the first period, which could result from the risk aversion motive of banks during that period. In this case, banks choose to hold larger amount of securities not as buffer stocks to cushion the adverse effects of interest rate shocks, but to protect themselves against the greater risk. On the other hand, for the second period, positive significant coefficient of the interaction term

suggests buffer stocking behavior.

We find a significant linear effect of earnings capacity on the growth rate of loans in both periods, but the direction of the relationship is opposite of what we have expected in the second period. The coefficient estimate of earnings in the first period suggests that this measure of financial strength has a positive impact on the lending of banks. On the other hand, the coefficient estimate is negative and significant in the second period. This could stem from the fact that banks may have preferred to shift from traditional loan activities to different businesses such as commission and fee based activities for income generation during the post-crisis period. The increase in non-lending operations and non-interest income activities provide banks with additional sources of revenue and as a result, the importance of the traditional loan market as a source of income has lessened. Regarding with the distributive effects of monetary policy, our estimations reveal that earnings make a difference among banks in their reaction to monetary policy shocks only in the first period. However; we fail to find such a significant impact in the period 2002-2009.

The coefficients characterizing the relationship between asset quality and the growth rate of loans are significant and positive for the two periods. The magnitudes of the coefficients are similar in the two periods as well. Since banks' asset quality is perceived as an indicator of default risk by the market, the positive coefficient of the interaction of this characteristic with the monetary policy reveals that banks with better loan portfolios have better ability to raise external funds and, in turn, shield their loan supply following a monetary tightening. In other words, banks with high asset quality portfolios are less prone to the effects of policy shocks in both sub-periods.

Only in the post-crisis era managerial quality affects the growth rate of bank loans and explains the effect of monetary policy on lending. This result is not surprising since underdeveloped regulatory and supervisory framework and high degree of politicization of bank lending can be argued as the defining characteristics of the Turkish banking sector prior to 2000-2001 crisis. But hereafter, banks started to operate in a strong regulatory framework, new corporate governance principles are introduced, full deposit insurance system is replaced by the limited coverage insurance system. For the second period, the positive coefficient of management efficiency implies that financially sound banks with high managerial quality can manage risks of new lending and re-allocate more funds to provision of credit in the next period. Whereas the positive interaction term reveals that banks with high managerial quality suffer from less information friction in the financial markets, face lower cost in raising external funds accordingly, and do not have to restrain their lending following monetary policy tightening. However, results regarding the managerial ability should be viewed with more caution,

since the standard errors for the parameters are slightly large, which could stem from the indicator we used for management component.

We carried estimations with a number of alternative specifications for our model to see the robustness of our findings. First, we estimate an alternative specification where all macro variables are replaced by a complete set of time dummies following Ehrmann et al. (2001). While using the full set of time dummies to eliminate the overall impact of pure time variables has the drawback that the level effect of monetary policy is also captured by these dummies, but this also guarantees the perfect control of the time effect and hence, increases the power of test on the interaction terms (Worms, 2001). Accordingly, we include one lag of the loan growth, contemporaneous and one lag for all other variables. The coefficients of the interaction terms between monetary policy and bank specific characteristics are similar in both models. This provides further support for the results of our baseline model.

Furthermore, we estimate the model just for the deposit banks, since, as mentioned before they are more directly related to the theoretical discussion regarding the bank lending channel. Notably, these results allow us to observe whether there are any differences across bank types as well. It is worth noting that the results do not vary drastically in general. Finally, in order to test whether our results for the second period are affected by the global financial crisis, we carry out another post-crisis estimation by excluding two years at the end; 2008 and 2009. Stronger impact of monetary policy is detected, since the coefficient of monetary policy indicator is slightly larger in this case. The coefficients attached to macroeconomic variables, bank specific characteristics and interaction terms have slight differences in terms of absolute value, but do not change sign and significance. We do not report the results for brevity.

IV. Conclusion

This paper investigates the bank lending channel of monetary transmission mechanism by specifically focusing on the role of banks for Turkey during 1988-2009 period, by exploring how bank specific characteristics affect banks' loan supply and their ability to raise external finance and insulate that supply from the effects of monetary policy shocks. Given the regime change in the monetary policies and increased regulation and restructuring in the financial system, the analysis is further conducted for two sub-periods: 1988-2001 and 2002-2009.

Building on micro level data of the Turkish banking system, the study examines whether monetary policy shocks are transmitted differently by banks with different characteristics utilizing dynamic panel data estimation technique, namely dynamic GMM. We find cross-sectional heterogeneity in banks' response to monetary policy changes, when size, liquidity,

capitalization, asset quality, earnings capability and management efficiency are specified as indicators of bank-specific characteristics in our model. Our results provide support for the existence of the bank lending channel in Turkey in the 1988-2009 period.

Regarding the results of the pre-crisis and post-crisis periods, we find significant differences in the distributional effects due to bank specific characteristics in transmission of monetary policy on banks' credit supply between the two sub-periods. Empirical evidence indicates that an operative bank lending channel existed in the pre-crisis period of 1988-2001, however its impact became much stronger in the post-crisis era following the transformations in the economy. The shift to the inflation targeting, followed by the increase in the effectiveness of monetary policy with weakened fiscal dominance, combined with a new regulatory environment in the financial sector account for the increase in the financial intermediation of banks during the 2002-2009 period. While the results point out an operative bank lending channel due to earnings capability and assets quality in the first period, size, liquidity, capitalization, asset quality and managerial efficiency seem to make a difference in the lending responses of banks to monetary policy for the period 2002-2009. These findings have important policy implications for the conduct of monetary policy in Turkey.

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