BANKS AND MONETARY POLICY TRANSMISSION MECHANISM: AN EMPIRICAL ANALYSIS FOR TURKEY

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_____

Prof. Dr. Meliha Altunışık
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Doctor of Philosophy.

_____

Prof. Dr. Erdal Özmen
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Doctor of Philosophy.

_____

Assoc. Prof. Dr. Elif Akbostancı
Supervisor

Examining Committee Members

Prof. Dr. Erdal Özmen	(METU, ECON)	_____
Assoc. Prof. Dr. Elif Akbostancı	(METU, ECON)	_____
Prof. Dr. Fatih Özatay	(TOBB ETU, ECON)	_____
Assoc. Prof. Dr. Gül İpek Tunç	(METU, ECON)	_____
Assoc. Prof. Dr. Teoman Pamukçu	(METU, STPS)	_____

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Name, Last Name : Ekin Ayşe Özşuca

Signature :

ABSTRACT

BANKS AND MONETARY POLICY TRANSMISSION MECHANISM:
AN EMPIRICAL ANALYSIS OF TURKEY

Özşuca, Ekin Ayşe
Ph.D., Department of Economics
Supervisor : Assoc.Prof. Dr. Elif Akbostancı

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The purpose of this thesis is to empirically explore the characteristics of the monetary transmission mechanism, with a particular emphasis on the role of banks, in Turkey. By looking at the banking sector at the micro level and exploiting dynamic panel data modeling approaches, the heterogeneity in banks' response in terms of their lending and risk-taking to changes in policy interest rates is analyzed. The first essay is an empirical analysis of the bank lending channel of monetary transmission. In this regard, the lending behavior of banks operating over the period 1988-2009 is examined. 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 the 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. Furthermore, there are significant differences in the distributional effects due to bank specific characteristics in the impact of monetary policy on credit supply between the two sub-periods. The second essay investigates the existence of risk-taking channel of monetary policy by using quarterly data over the period 2002-2012. Four alternative risk measures are used in the analysis; three accounting-based risk indicators and a market-based indicator. Our findings show that low levels of interest rates have a positive impact on banks' risk-taking behavior for all risk measures. In terms of bank specific characteristics, our results imply that large, liquid and well-capitalized banks are less prone to risk-taking.

Keywords: Monetary Policy; Transmission Mechanism; Bank Lending Channel; Risk-taking Channel; Dynamic Panel Data.

ÖZ

BANKALAR VE PARA POLİTİKASI AKTARIM MEKANİZMASI:
TÜRKİYE İÇİN AMPİRİK BİR ANALİZ

Özşuca, Ekin Ayşe
Doktora, İktisat Bölümü
Tez Yöneticisi: Doç. Dr. Elif Akbostancı

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Bu tezin amacı Türkiye'de parasal aktarım mekanizmasının özelliklerini, bankaların rolü üzerinde özel bir vurgu ile, ampirik olarak incelemektir. Bankacılık sektörüne mikro düzeyde bakarak ve dinamik panel veri modelleme yöntemleri kullanarak, politika faiz oranı değişimine karşı bankaların kredi verme ve risk-alma tepkilerindeki farklılaşma analiz edilmektedir. Birinci makale, parasal aktarımda banka kredi kanalının ampirik bir analizidir. Bu bağlamda, 1988-2009 döneminde faaliyette bulunan bankaların kredi verme davranışı incelenmiştir. 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 farklılık 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, iki alt dönem arasında, para politikasının kredi arzı üzerindeki etkisinde banka özelliklerinden kaynaklanan dağılımsal etkilerde önemli

farklılıklar vardır. İkinci makale, 2002-2012 dönemi için üçer aylık verileri kullanarak, parasal aktarımda risk-alma kanalının işlerliğinin olup olmadığını araştırmaktadır. Analizde dört alternatif risk ölçüsü kullanılmıştır: üç muhasebe-tabanlı risk göstergesi ve bir piyasa-tabanlı risk göstergesi. Bulgularımız, düşük faiz oranlarının bankaların risk-alma davranışı üzerinde bütün risk ölçüleri için pozitif etkisi olduğunu göstermektedir. Bankalara özgü özelliklerle ilgili olarak, sonuçlarımız, büyük, yüksek likiditeye sahip ve yüksek sermayeli bankaların risk-almaya daha az eğilimli olduğunu ortaya koymaktadır.

Anahtar kelimeler: Para Politikası; Aktarım Mekanizması; Banka Kredi Kanalı; Risk-alma Kanalı; Dinamik Panel Veri.

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CHAPTER 1

INTRODUCTION

Understanding the transmission mechanism of monetary policy has been the subject of long-standing interest among economists. In this respect, many theoretical and empirical studies investigate the issue of transmission mechanisms that assign banks a special role. The relationship between bank behavior and monetary policy is of particular importance since with their special role in financing the economy activity; banks could constitute the linkage between the monetary policy and the real economy. Among the bank-based monetary transmission channels are the credit channel, which comprises two sub-channels namely; the balance sheet and bank lending channels, and the risk-taking channel. While the credit channel grounded on the information asymmetries and frictions in the credit markets, the more recently emerged risk-taking channel gives a more prominent role to the perception and pricing of risk by economic agents.

The purpose of this thesis is to empirically explore the characteristics of the monetary transmission mechanism, with a particular emphasis on the role of banks, in the Turkish economy. The role of the banking institutions in the transmission mechanism is worth studying for Turkey since it has a bank-based financial system. By identifying the heterogeneity in the response of banks to a change in monetary policy, we aim to understand the transmission of monetary policy through banks. Furthermore, our empirical analyses, by looking at the banking sector at the micro level, reveal the sources of these differences in banks' reaction following monetary policy shocks. In this regard, several bank specific characteristics such as; size, liquidity, capitalization etc. are considered as factors which may have an impact on banks' response in terms of their lending and risk-taking to changes in policy interest rates. Accordingly, the role of these characteristics on banks' lending and risk-taking

behavior, together with the distributional effects of monetary policy owing to these individual characteristics is investigated.

This dissertation is organized in five chapters. Following the introduction, the second chapter presents an overview of the recent developments in the Turkish economy and its financial sector. The salient features of the Turkish banking sector over the period 1988-2011 are introduced with an emphasis on the changes in the structure and performance of the industry in the pre-crisis and post-crisis era. Turkish banking sector have undergone considerable transformation with the new regulatory agency, significant regulatory and structural changes in the aftermath of the 2001 financial crisis. Therefore, it is worthwhile to undertake an overview of the developments in the Turkish banking system given these developments in the banking sector coupled with the significant improvements in the Turkish economy.

The third chapter is an empirical analysis of the bank lending channel of monetary policy transmission mechanism in Turkey. Using bank-level data, the study examines the lending behavior of banks operating in Turkey over the period 1988-2009 in an attempt to test whether there exist cross-sectional heterogeneity in banks' response to monetary policy shocks and analyze the impact of several bank specific characteristics on loan growth sensitivities. More importantly, given the changes in the policy stance and developments in the financial system following the implementation of structural reforms in the aftermath of the 2000-2001 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.

This study is expected to contribute to the existing literature by re-examining bank lending channel in Turkey in several aspects. First, the analysis covers a larger time series period than all other studies on this issue. Second, starting in mid 1999-Turkish banking sector entered a novel era with the new regulatory agency and, hereafter it has undergone 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 a larger time series periods provides us a laboratory 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 fourth chapter is an empirical study of the risk-taking channel of monetary policy transmission in Turkey. The mechanism by which monetary policy affects financial institutions' risk perception and/or tolerance has been called the 'risk-taking channel' of monetary policy. It has been recently argued that periods of low interest rates due to expansionary monetary policy, might induce an increase in bank risk-appetite and risk-taking behavior. Against this background, this study investigates the bank specific characteristics of risk-taking behavior of the Turkish banking sector as well as the existence of risk taking channel of monetary policy in Turkey. Using bank- level data over the period 2002-2012, the risk behavior of Turkish banks operating during that period is examined.

To the best of our knowledge, this study is the first one that addresses the relation between low interest rates and bank risk and hence, examines the risk taking channel in Turkey. In addition to that, this study sheds light on the bank specific characteristics which may have an impact on bank risk and also examine the differential responses of banks with different characteristics to monetary policy

shocks in terms of their risk-taking. Furthermore, our computation of risk–taking behavior presents another novelty in the sense that instead of relying on one particular risk measure as done by most studies on the risk-taking channel, we employ alternative risk indicators in an attempt to cover different aspects of risk-taking behavior. Even more, we use accounting-based indicators together with a market-based indicator. Apart from these, the scant empirical literature on risk taking channel focuses mostly on the advanced countries and further, mainly examines the effectiveness of the channel at the international level. Therefore, our study is one of the handful studies in providing empirical evidence for an emerging economy.

The findings of this dissertation about the bank-based channels of monetary transmission would have several policy implications. The empirical evidence from these two essays is expected to demonstrate some basic features of the monetary transmission process in Turkey, which could provide useful information for designing an appropriate and effective monetary policy. Furthermore, the findings would offer useful insights in understanding the links between the financial and real sectors of the economy which can also provide an information basis for financial sector regulations. In this contect, chapter five concludes the thesis.

CHAPTER 2

TURKISH FINANCIAL SYSTEM

In order to have a sound understanding of the bank lending and risk-taking channel in Turkey, this chapter summarizes the recent history of the macroeconomic developments and financial conditions in Turkey. The salient features the Turkish banking sector is presented along with the analysis of the profile of the Turkish banking sector in a descriptive manner.

2.1. Overview of the Recent Developments in the Turkish Economy and Banking Sector

Prior to the 2000-2001 financial crisis, Turkish economy witnessed two decades of chronically high levels of inflation accompanied with volatile economic growth. High public sector deficits and financial climate of fiscal dominance became a major characteristic of the economy. Huge level of public involvement in the economy led to high real interest rates and low maturities. Added to these were large current account deficits and overvalued Turkish lira. Under these circumstances of macroeconomic instability, Turkish economy experienced successive financial crises in the recent past. Eventually, the economy has been in continuing progress since 2001, as a result of the change in macroeconomic practices of policymaking and a series of reforms.

From 1960 to 1979, Turkey followed state-led inward-looking industrialization strategy by implementing import substitution policies and planned developments programs with government-controlled interest and exchange rates. These policies, which were aimed to protect the domestic industrial sectors from foreign

competition, mainly pursued through introduction of quotas, high tariffs and licensing requirements, together with a policy of negative real loan rates to meet funding of the priority sectors in the plan with low cost and similarly, a deliberate foreign exchange policy of an overvalued Turkish Lira to maintain costs of imported goods for these supported sectors low. As in the previous eras, the economy failed to provide resources through domestic savings and consequently, had to heavily rely on public sector, which made use of government borrowing and the Central Bank loans to finance the investments needed for rapid industrialization. Artun (1983) states that Central Bank loans did not lead to a rise in the supply of goods and services, but instead generally used for subsidiary payments and further, these loans were not repaid, which caused a high level of monetary expansion and hence, inflation (BAT, 2008; Altunbaş et al., 2009b).

One of the main striking points of the planned period is that the banking industry had heavily been under state control and influence. While deposit and loan interest rates, bank commission rates and loan limits were established along the lines of the import substitution policy, bank' main function was characterized as financing the investments stated in the development plans. Government aimed to reduce the average fixed costs through merging of small banks in order to develop a stronger financial system. Accordingly, there were strong regulatory entry barriers such that; instead of new foreign banks and commercial banks, government mainly allowed to the establishment of development and investment banks, while only two commercial banks were founded during that period. In such an environment of no risks of interest rates or exchange rate fluctuations and no effective competition, private banks moved towards extensive branch banking to enhance the deposits which they collect with negative real interest rates. Another point to highlight was the emergence of the holding-banks, i.e.; banks owned by industrial conglomerates, as a result of restricted entry conditions and this was encouraged by the state with the aim of increasing private sector investments as well (BAT, 2008; Altunbaş et al., 2009b). To summarize, the domestic financial system was underdeveloped and repressed as a result of controlled interest rates, directed credit practices, high reserve requirements, restrictions on financial intermediation and barriers to market entry in the pre-1980 period (Femise Report, 2005).

However, the use of inflationary methods in financing of industrialization, and the production of the industries mainly for domestic consumption instead of exports, coupled with the dependency of domestic production on imported inputs led to foreign currency shortage and problems in balance of payments (BAT, 2008; Altunbaş et al., 2009b). These problems combined with an economic downturn and accelerated inflation rates caused government to leave the import substitution strategy in the late 1970s and Turkish economy has undergone a radical structural change after 1980.

World economy has entered into a wave of liberalization in 1980s. As a reflection of this, Turkey started to implement a new liberal policy, which is aimed to open the Turkish economy to the rest of world by establishing free market dynamics. Following the 1979-1980 economic crises, Turkey abandoned the import substitution development strategy and adopted an outward-oriented industrialization strategy with the introduction of the January 1980 structural adjustment program. With the aim of supporting this new strategy and restructuring the economy according to the free market rules, flexible exchange rate and positive real interest rate policies were started to be implemented, quantitative controls on imports were eliminated and a new export promotion schemes were introduced, together with the new regulations that were put into effect to liberalize and deepen financial market (BAT, 2008; Altunbaş et al., 2009b).

In line with these, there have been significant changes in the Turkish financial markets following the liberalization of financial prices and policies as a part of the structural adjustment program. The main aim of these reforms was to promote competition and boost efficiency of the financial system, which was bank-dominated and had no effective competition prior to 1980. The removal of interest rate controls and reduction in directed credit practices along with the relaxation of restrictions on the market entry were the main elements of the financial liberalization reforms. The development of the bond and equity market was intent of the program as well (Denizer, 2000).

In this context, legal restrictions on deposit and credit interest rates were eliminated in 1980. However, Turkey experienced the “bankers” crises in 1981-1982, as a

result of the strong competition between the banks and brokerage houses in interest rates and the weak regulatory framework of the banking sector (Kibritçioğlu, 2005). Only after that crisis, the focus shifted to the institutional foundations of the Turkish financial sector and issues related to banking regulation and supervision came into agenda (Ganioğlu, 2008).

Other reforms that were undertaken in the 1982-1989 period can be listed as follows: In 1983, the Saving Deposit Insurance Fund (SDIF) was established to provide insurance for saving deposits and banks had to participate in the SDIF. Furthermore, domestic banks began to open branches in foreign countries (Alp-Yiğit, 2005). Liberalization of foreign exchange trade started in 1984. Turkish residents were permitted to hold foreign currency deposits in domestic banks and at the same time, banks were also allowed to keep foreign currency abroad. Moreover, foreign banks were also permitted to open branches in Turkey. Special finance houses, that function in Turkey as Islamic banks and were renamed as participation banks after recent changes in banking regulations, became a part of the financial system beginning in 1985 as well. With declaration of new banking law in 1985, banks were required to use uniform accounting principles, cover defaulted loans through appropriate provisions and submit their accounts to external auditing. In the same year, goverment securities began to be auctioned as well (Femise Report, 2005). In 1986, the Central Bank established the Interbank Money Market with the purpose of regulating liquidity in the banking sector. Furthermore, the Central Bank began open market operations in 1987. In 1988, the Foreign Exchange and Banknotes Market was introduced in an attempt to achieve market-determined exchange rates. In 1989, all restrictions on capital movements were abolished and foreign exchange operations were liberalized as well. Moreover, Turkish currency became convertible. It can be said that Turkey became a financially open economy after this date (Arın, 1999).

In sum, Turkish financial markets have been opened up to a great extent during the decade of 1980-1989, which had significant effects on the banking sector as well. A large number of banks, both Turkish and foreign, entered into the financial system, increasing the competition. Consequently, the typical deposit banking was replaced by modern banking activities, where customers were offered new products and

services such as consumer loans, credit cards, foreign exchange deposit accounts, leasing, factoring, forfeiting, swap, forward, future, option, automatic cash machines and sales point terminals. In addition, with the use of computer systems and new technologies, accompanied with greater emphasis on staff training, productivity in the sector increased (BAT, 2008; Altunbaş et al., 2009b). In short, this financial liberalization period gave rise to the entry of new financial institutions and new types of financial instruments into the system (Femise Report, 2005).

Another significant development during that period was that financial liberalization led to an increase in the funding options abroad for the financial system, along with large corporations (Kibritçioğlu, 2005). Moreover, there was a shift by depositors from domestic currency to hard currency assets as a result of steadily high inflation environment (BAT, 2008; Altunbaş et al., 2009b).

1990s, which corresponded to the second phase of the Turkey's neoliberal reforms, was characterized by political instability and recurrent financial crisis. During that period, there were high fiscal deficits and in attempt to sustain the deficits, goverments adopted 'hot money' policy of high interest rates on government bonds and appreciation of Turkish lira to attract short term capital flows into the economy. In an environment of macroeconomic instability and weakly regulated financial system, growth of the economy became dependent on speculative short term capital inflows. (Öniş, 2009; Bakır and Öniş, 2010).

Following the financial liberalization period, in 1990s, the banking sector confronted problems stemming from the high public sector deficits, which were largely financed by short-term domestic borrowing, and led to high interest rates on goverment bonds. In line with this, private banks found financing public deficits profitable and consequently, they became vulnerable to changes in the interest rates as the share of government securities in their total assets rose substantially. Moreover, banks started to use the funds that they raised from abroad to purchase goverment securities, which in turn led to an increase in their foreign open positions. The real exchange rate started to appreciate since Central Bank slowed down the devaluation rate in the currency to make the financing of government bonds profitable for banks. As a result, in addition to the interest rate risks, banks were faced with the exchange rate

risk as well (Femise Report, 2005). These accumulated risks in the banking sector and major policy errors in financing the deficit prepared the background for the deep banking and currency crisis in 1994 (Arin, 1999; Celasun, 1998).

Against the environment of huge public sector borrowing requirement and high inflation, there were significant policy mistakes committed on the monetary front that triggered the 1994 currency crisis. Towards the end of 1993, in an attempt to reduce the high levels of public debt stock, goverment tried to decrease interest rates on Treasury bills, several Treasury auctions were cancelled and deficit financing started to rely on Central Bank resources, which all, in turn, resulted in excessive liquidity build-up in the market. These, together with the lowering of Turkey's credit rating, caused some capital flights, as banks, most of which carrying large foreign exchange liabilities and Turkish lira government securities, rushed to foreign currency in order to close their high foreign currency positions. Although the Central Bank heavily intervened the interbank market and increased the overnight interest rates, the decline of the Central Bank's international reserves went on, which end up with a large devaluation (Celasun, 1998).

According to the Banks Association of Turkey (BAT) (1994), financial sector was among the worst affected from the 1994 economic crisis. Accordingly, goverment took severe measures to recover the economy in the aftermath of the crisis. One of them was the introduction of the full deposit insurance system in which goverment provides full guarantee to all savings deposit holders. With this scheme, the goverment aimed to restore confidence in the banking sector. However, this system not only contributed to the development of an unhealthy banking sector with the emergence of adverse selection and moral hazard problems, but also distorted competition between banks (Femise Report, 2005; Kibritçioğlu, 2005; BAT, 2008). On top of full insurance to deposits, other factors such as lax supervision of banks' actions combined with lack of measures for controlling banks' involvement in riskier projects and allowance to the entry of new depository banks into the system, further contributed to the excessive risk-taking behavior of banks during that period.

Among the characteristics of this period was the distortions created by state banks, stemming from their highly politicized lending operations, combined with the lack of

regulations to alleviate the special treatment of them against private banks. The goverments have used these banks for several noncommercial purposes such as, agricultural support, income redistribution and industrial, urban and physical infrastructure development, which caused banks to face the so-called 'duty losses', i.e.; unrecovered costs from duties carried out on behalf of goverment. As these losses were not compensated by the Treasury on time, public banks borrowed at very high interest rates with short maturities from the markets in order to fund their duty losses, which in turn, caused high interest rates on interbank borrowing and a contraction in liquidity of the banking sector (Celasun, 1998). Besides, connected lending was another factor that contributed to the unhealthy structure of the banking sector as most of the new domestic entry into the sector was from large industrial companies establishing their own banks. Moreover, excessive risk-taking behavior of the banks went on, illegal activities of the banking sector increased, and the system was over-branched and over-staffed in the late 1990s (Kibritçioğlu, 2005). In sum, the sector was far away from risk management and good governance principles during that period.

In the late 1990s, macroeconomic instability and structural deficiencies of the financial system remained intact. Unsuccessful policies of the government in disinflating the economy and solving the problems of public sector imbalances, accompanied with political uncertainty continued. Fluctuations in the international markets and crisis in the emerging markets such as; Russia, Brazil, and East Asia, had significant adverse effects on Turkish economy, causing capital outflows and a slowdown in international trade. In addition to these factors, the existing economic problems, coupled with the two great earthquake disasters, led to a severe downturn in the economy (Altunbaş et al., 2009b).

In December 1999, government started a three-year exchange rate based stabilization program with International Monetary Fund (IMF), which included important structural and institutional reforms. While central to the stabilization program were reducing inflation, solving public sector imbalances and fostering economic growth, a crawling-peg regime and a tight monetary and fiscal policy, along with a variety of structural measures, were adopted to achieve these targets (Kibritçioğlu, 2005). The

program entailed reform of the banking sector among its priorities as well. In 1999, goverment passed a new banking law with the aim of strengthening the banking sector, increasing supervision quality and bringing regulations closer to international standards. According to the new banking law, the Banking Regulation and Supervision Agency (BRSA) was established as an independent regulatory and supervisory body in the Turkish banking sector, whereas the Treasury and the Central Bank shared the bank regulatory and supervisory duties prior to the new law.[1] Hence, political influence removed from the supervision of banks. BRSA took over the management of the SDIF, which was under the authority of the Central Bank as well. Furthermore, the new law introduced higher limitations on single borrowers and related parties, tighter risk management and control, limitations on foreign exchange exposures, and new principles in the calculation of the capital adequacy ratio (Femise Report, 2005; Altunbaş et al., 2009b).[2]

Despite some achievements of the program in a short period of time, Turkish economy underwent two consecutive financial crisis; first in November 2000 and then in February 2001. In November 2000, Turkey experienced rapid financial outflows as a result of the extremely risky position of Demirbank, a medium-sized bank, with large amount of goverment securities in its portfolio (Kibritçioğlu, 2005). After that crisis, standing deterioration in economic conditions, combined with political distress, led to an enormous attack on the Turkish Lira in February 2001, which turned into a devastating currency crisis. After the crisis, the goverment decided to abandon the peg and started to apply floating exchange rate regime.

The banking sector was at the heart of the twin financial crises and considered by many economists as the main cause of the crises due to its fragile structure along with weak prudential regulations on the sector. (Günçavdı and Küçükçifçi, 2005; Bakır and Önis, 2010). Combined with structural weaknesses and unhealthiness of the financial system, Turkey's poor economic performance in the form of low

[1] Operation of the BRSA has been subject to several delays, such that it could not become fully functional until September 2000.

[2] According to the BAT, there were no internationally accepted banking principles, problems in the independent auditing process, differences from international accounting applications, lack of satisfactory transparency and competition, inefficiency in the decision processes of auditing and delays in the improvement of bank management quality, which all had adverse effect on the assessment of the banking sector (Altunbaş et. al., 2009).

economic growth, chronic rates of inflation, huge budget deficits, large public debts, high current account deficit, overvalued Turkish lira and high dependency on short term capital flows contributed to the 2000-2001 financial crises.

The crisis was very deep in terms of its impact, since it caused a major collapse in employment and output. While the economy contracted over 9 percent in 2001, the loss in employment was put at more than 1.4 million (Femise Report, 2005; Özkan, 2005). Özkan (2005) states this turmoil as the most serious financial and economic crisis that Turkey has experienced in its post-war history.

The impact of crisis on the financial system was profound and the banking sector shrank dramatically. While the total assets of the banking system dropped by 26 percent, the sector's total loss reached to 77 percent of its total shareholders' equity in 2001 (BAT, 2008). Furthermore, the cutback in the employment in the sector was about 47130 persons, which was 29.7 percent of the total employees of the system as end of 2000. They were mostly high-educated and well-paid as well (Kibritçioğlu, 2005).

Following the crisis, the goverment adopted a new IMF-backed stabilization program, *Transition to a Strong Economy*, which targeted to restructure the economy and achieve lasting macroeconomic stability. The strong structural reforms, prudent fiscal and monetary policy backed by floating exchange rate regime and improved social dialogue were the main pillars of the program, which was aimed to increase the resilience of the economy to withstand against external shocks, ensure timely debt repayments and fiscal discipline, prevent further devaluation, drop inflation, completion of the financial reforms and support the solvency of the banking sector (BAT, 2008; Altunbaş et al., 2009b).

An integral part of the program was the comprehensive Banking Sector Restructuring and Rehabilitation Program with the purpose of eliminating distortions in the financial system and developing a sound link between the real sector and banking sector. Furthermore, bringing the regulation and supervision of the Turkish banking sector closer to EU and international standards was another aim of the program as well. This program had four main pillars: (i) strengthening the private banks, (ii)

operational and financial restructuring of state banks, (iii) resolving the intervened banks, which were transferred to SDIF, (iv) improving the regulatory and supervisory framework. While it is true that implementation of this program imposed substantial burden on the economy, which is estimated to be USD 50 billion, this restructuring program contributed to the increase resiliency and supervision quality of the banking sector (Sayılgan and Yıldırım, 2009).

After initiation of the program, the banking sector has undergone a tremendous restructuring process and many weaknesses that were subsisted for long time have been overcome; in the sense that financially weak banks were either taken over by SDIF or merged with other banks, the financial and capital structure of banks were strengthened, state banks were collected under a joint management, and the duty loss practice of state-owned banks was ended. The Istanbul approach, which is a voluntary debt restructuring process, was introduced in January 2002 in order to accelerate the settlement of bad loans and relieve the pressure on banks' financial standing (Kibritçioğlu, 2005; Femise Report, 2005). The management of the SDIF was separated from the administration of the BRSA in 2003. Furthermore, in July 2004, the full deposit insurance system, which had given rise to moral hazard problems and unequal conditions of operation among banks, was ended and instead, limited deposit guarantee system was put into effect. In June 2005, some updates in the banking act were approved to bring the banking regulatory framework more closely in line with the international standards. In November 2005, the supervisory system was further strengthened with the new regulations regarding foreign exchange exposures, capital adequacy, internal control and risk management, lending limits, conditions to be met by bank owners, bank ownership control in transfer of shares, consolidated and cross-border supervision of banks, accounting standards for financial disclosure purposes and prudential reporting and loan loss provisioning. Furthermore, preparations on transition process of Turkish banking sector to Basel 2, which is fundamentally about better risk management and corporate governance, as well as improved banking supervision and greater transparency, continued as end of 2009.

Overall, in the aftermath of the 2000-2001 crisis, Turkish economy has displayed outstanding economic performance. With the structural transformation process,

impressive improvements have been made by the contribution of successful macroeconomic practices of policymaking, political stability and favorable international environment. Economic growth showed a stable and high trend. After three decades of chronically high inflation environment, Turkey has seen inflation in single digits, which was mainly delivered by a combination of the strong commitment in inflation fighting of the newly independent central bank, along with the adoption of floating exchange rate regime and transition to inflation targeting regime. Attained fiscal discipline has brought a reduction in public sector debt and at the same time, public borrowing interest rate has declined, while its maturity structure has become longer. Significant fall in the interest rates, stronger demand for Turkish Lira, rise in foreign capital inflows, reduction in the risk perceptions of the economic actors, and improved confidence in the economy, can be listed as other positive developments during that period.

Since 2002, the financial system has benefited from the impressive performance in macroeconomic stabilization by increasing confidence in the sector. The improved economic performance, coupled with the implementation of restructuring reforms and re-capitalizing process in the sector, establishment of the independent Banking Regulatory and Supervisory Agency, internationally accepted banking principles brought by laws had all led to positive developments on the banking sector, which has began to contribute to economic development.

The global crisis, which had effects on whole world as of mid-2007, started to have reflections in Turkey in the last quarter of 2008. However, Turkish banking sector proved be resistant to unfavorable shocks; since negative impacts of the global crisis on Turkish banking sector have been very limited. This fact can be partly attributed to the measures adopted by the authorities and organizations to ease the negative effects of the global crisis. Furthermore, the more prudential regulation and supervision, combined with the progress in the financial sector as a result of the structural reforms, enabled the sector to safely welcome the hard days.

2.2. Structure of the Turkish Banking System

2.2.1. Selected Indicators

Turkish financial system has been demonstrating remarkable growth in recent years. total assets of the financial sector reached TL 1,9 billion as of end 2011.[3] On the other hand, Turkey's domestic financial system is yet at the stage of growth. Despite of being well-capitalized and enhancement of prudential regulations, the financial sector in Turkey is small and shallow when compared to that of the developed economies. The ratio of financial assets to GDP was 147.7 percent in 2011.[4]

One of the important features of the Turkish financial system is the predominance of the banking system. Banks in Turkey have traditionally played a major role in financial intermediation, while the importance of non-bank financial institutions is recently increasing as well. At the end of 2011, total assets of the banking system accounts for 88 percent of total assets of the institutions of the financial sector.[5] Turkish banking sector has experienced rapid growth performance following the restructuring program launched after the 2001 crisis (see Figure 2.1). The ratio of banking sector balance sheet size to GDP recorded an increasing trend from 2004 onwards, contributing positively to the development of the financial sector as well. As of end 2011, total assets of the banking sector amounted to TL 1.2 billion and total assets to GDP ratio was 89 percent.[6] When compared with the EU countries, the ratio of the Turkish banking sector balance sheet size to GDP is higher than that of Poland and Romania, however lag behind the EU-27 average which was 350 percent in 2010.

[3] When the Central Bank of the Republic of Turkey (CBRT)'s balance sheet and Istanbul Stock Exchange (ISE) total market capitalization is excluded, it becomes TL 1.4 billion in 2011.

[4] When CBRT's balance sheet and ISE total market capitalization are excluded, it is 106.9 percent in 2011.

[5] When CBRT's balance sheet and ISE total market capitalization are included, it is 67 percent in 2011.

[6] When participation banks are included, the ratio is 93 percent in 2011.

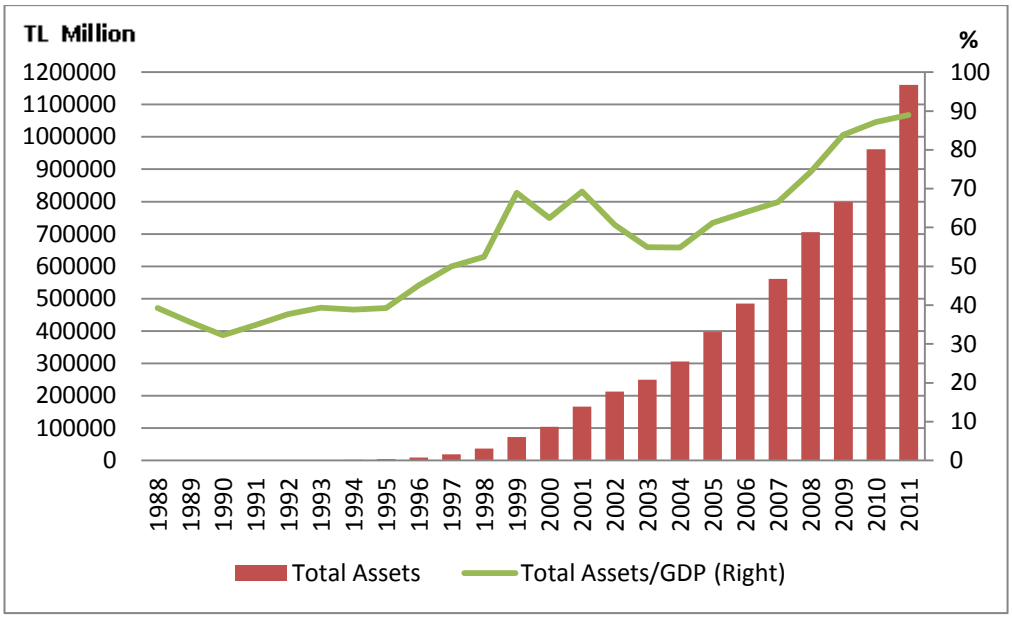

Figure 2.1 Development of the Banking Sector, 1988-2011

Source: Author's calculations based on BAT and International Financial Statistics (IFS).

The ratios of deposits and loans to GDP, which show the financial depth and intermediation level of the banking sector, displayed a significant growth following the restructuring program adopted after the 2001 crisis (see Figure 2.2). During this period, positive developments such as; capital inflows from abroad, stable high growth rates, lower interest rates, lighter public sector borrowing needs, and improved expectations brought about an increase in loan demand and variety of financial intermediary functions of the banking sector (BAT, 2008).

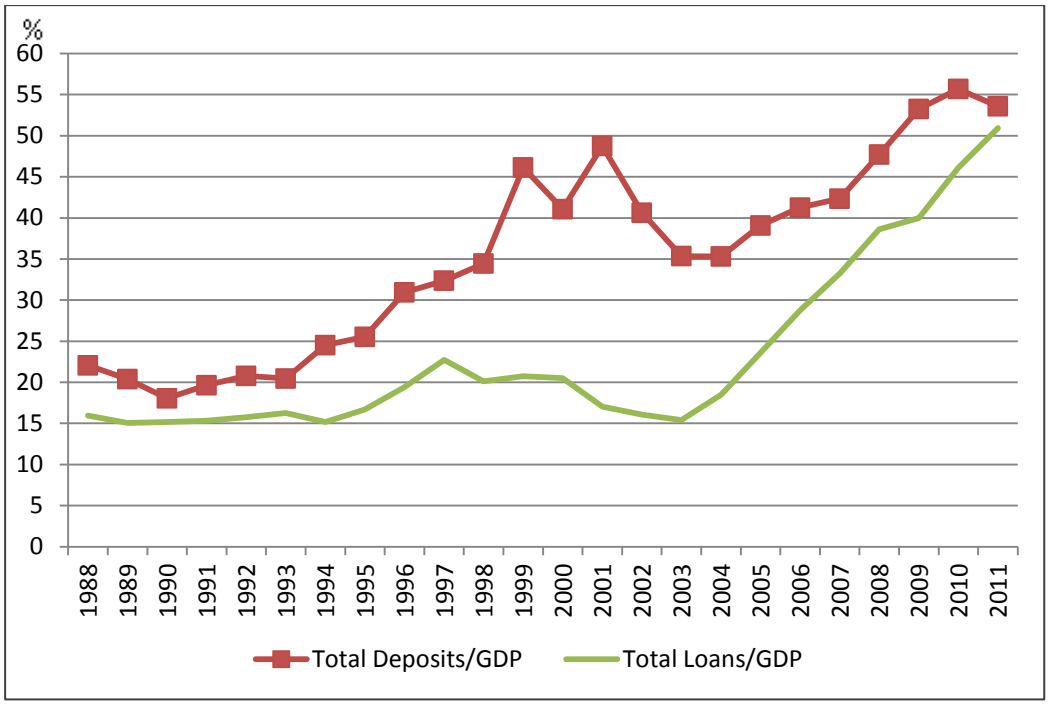

Figure 2.2 Financial Depth of the Banking Sector, 1988-2011

Source: Author's calculations based on BAT and IFS.

The chronic high inflation in 1990s, together with the high borrowing requirement of the government due to high public deficits, caused low loans to GDP ratio. In other words, banking sector devote less resources to extend loans to private sector in order to be able to finance public sector borrowing during 1990s. However, the credit volume of the banking sector started to enlarge in 2003 due to the relative decrease in the public sector borrowings, strengthened financial conditions and positive developments in the restructuring process of the banking sector, together with the maintenance of consumer and investor confidence as a result of economic and political stability (Structural Developments in Banking, 2009). Moreover, the liquidity surplus in the Turkish financial system after 2001 was another factor that encouraged banks to increase their supply of credit. By the end of 2011, the loans to GDP ratio was 51 percent and was still lower than the EU-27 level, which was 190 percent. While financial deepening in Turkey remains behind developed countries, it is above some developing G-20 countries such as; Argentina, Indonesia, Russia, and Mexico (Structural Developments in Banking, 2009).

Traditionally, deposits happened to be the largest source of funding for the Turkish banking sector. As end of 2011, total deposits reached to TL 699 billion and the total deposits to GDP ratio increased to 54 percent. This amount is lower than the EU-27 level, which was about 132 percent in 2011.

The ratio of loans to deposits, which is a significant indicator of the transformation of savings into investments in the economy, followed a decreasing trend in general during 1990s revealing the public sector pressure on available resources (see Figure 2.3). The ratio was quite low due to the decline in credits and the increase in total deposits in 2000-2001. The ratio was about 40 percent in 2002 and since then, it showed a steadily increasing trend, which can be interpreted as banks were re-gaining their main intermediation function (Financial Stability Report, 2005). Only in the 2009 loans to deposits ratio decreased to 75 percent from 81 percent in 2008, which can be attributed to the tighter credit conditions and weaker demand as a result of the global financial crisis.

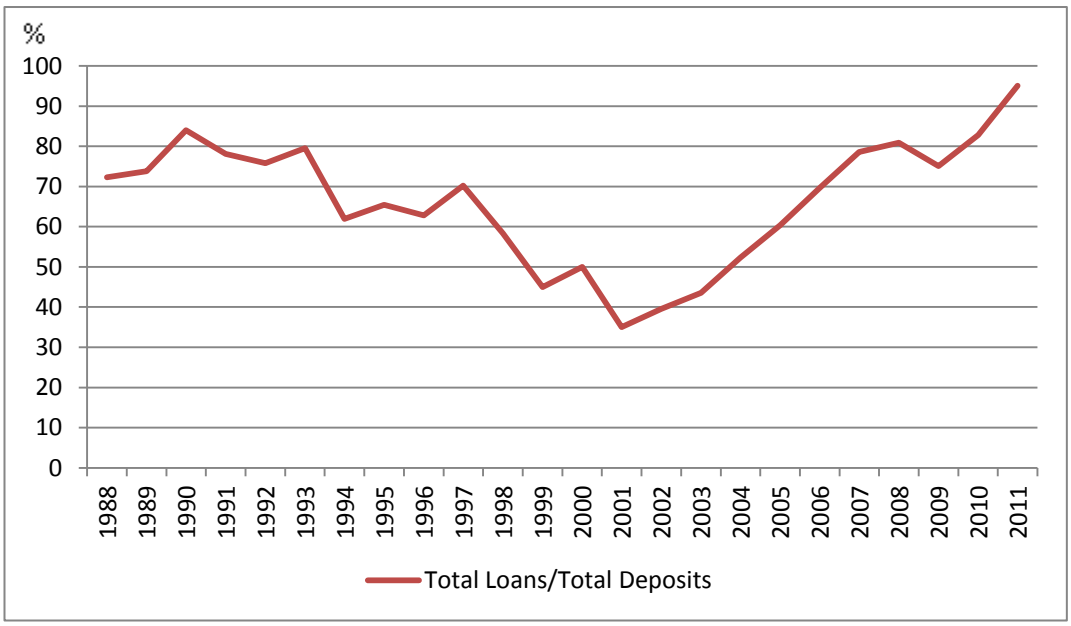

Figure 2.3 Loans to Deposits Ratio, 1988-2011

Source: Author's calculations based on BAT and IFS.

2.2.2. Number of Banks, Branches and Employees

As of end 2011, there are 44 banks in the banking sector, of which 31 are commercial banks and 13 are development and investment banks[7]. This fact reveals the prevalence of deposit banking in Turkish banking sector. The number of banks increased rapidly since 1985 when the economy began to open outward and reached to 81 in 1999 as the highest value. Eventually, 20 banks were failed and transferred to the SDIF within restructuring period of 1999-2003. As a result, some sales, mergers and liquidations lead to a decline in the number of banks in the same period. In the banking sector, there are 45 banks from 2008 and 2010, while the number is 44 in 2011. Another striking change in the general structure of the banking sector is the shift from domestic to foreign-owned banks beginning from 2005 onwards (see Table 2.1). Some of the factors that give rise to the increase in the foreign investors' interest in the sector can be stated as; improved economic and political stability, the strengthening of the capital structure of the system, compliance with international regulations, rise in the efficiency of supervision, and reinforcement of the risk management concept as parts of the restructuring program, together with the inclusion of Turkey to EU negotiation process and convenience of the global environment (BAT, 2008; BRSA, 2009). As a result, the share of foreign banks in the sector has risen substantially from negligible levels.

During pre-crisis period, the presence of full deposit insurance scheme, together with huge budget deficit and high interest rates, caused banks to expand their branch networks to collect deposits from the public and direct them to the government (Damar, 2008). Consequently, the total number of branches increased significantly over the period 1988-2000, reaching to its highest level 7,837 in the 2000. However, instead of causing efficiency gains through economies of scale, such a rapid expansion of branches gave rise not only to large and inefficient branch networks; but also to excess capacity in some markets that the economy cannot support. Such that; the sector was defined as 'overbranched' in 1999 by the International Monetary Fund (Damar, 2008). On the contrary, following 2001 crisis, there was a decline in the number of branches within the sector until 2003. After that, total number of

[7] There are 4 participation banks operating in Turkey, as of 2011. However, they are not included in the analysis due to their different structure and their small share in the banking sector.

branches has continued to grow, especially for private banks, in line with the financial growth.[8] Furthermore, number of the branches of foreign banks has risen as a result of the foreign acquisitions of small-scaled domestic private banks. However, the number of branches is still below its 2000 level until 2008. Despite the global fluctuations, branch number increased in all groups (other than the SDIF) of deposit money banks except development and participation banks in 2009. There were 9,834 branches in the banking system including those abroad; 4,944 of which belong to privately owned commercial banks by the end of 2011 (see Table 2.1).

Table 2.1 Number of the Banks and Branches, 1988-2011

	1988		**1993**		**1998**		**2003**		**2008**		**2009**		**2010**		**2011**	
	Banks	**Branches**	**Banks**	**Branches**	**Banks**	**Branches**	**Banks**	**Branches**	**Banks**	**Branches**	**Banks**	**Branches**	**Banks**	**Branches**	**Banks**	**Branches**
Deposit	52	6528	58	6208	60	7340	36	5949	32	8741	32	8991	32	9423	31	9,792
State owned	8	2711	6	3218	4	2832	3	2317	3	2416	3	2530	3	2744	3	2909
Private	26	2414	32	3085	38	4393	18	3779	11	4290	11	4390	11	4582	11	4944
SDIF							2	175	1	1	1	1	1	1	1	1
Foreign	16	57	20	96	18	115	13	207	17	2034	17	2062	17	2096	16	1938
Non-Depository	8	12	12	20	15	30	14	17	13	49	13	44	13	42	13	42
State owned	4	19	3	26	3	12	3	21	3	23	3	22	3	22	3	22
Private	2	3	6	8	9	14	8	11	6	12	6	15	6	15	6	16
Foreign	1	1	3	3	3	4	3	3	4	14	4	7	4	5	4	4
Total	57	5205	70	6436	75	7370	50	6513	45	8790	45	9027	45	9465	44	9834

Source:BAT

Following the 2000 and 2001 crisis, the number of personnel declined from 174,442 in 1999 to 124,030 in 2003. But after that, there was a continuous increase in the number of employees in the banking sector, which was realized as 181,418 at the end of 2011 (see Figure 2.4).

[8] In the post-crisis period, entry decisions of banks appeared to be in line with economic fundamentals and this could be interpreted as the restructuring program achieved its goal of 'rationalization of branches and personnel' (Damar, 2008).

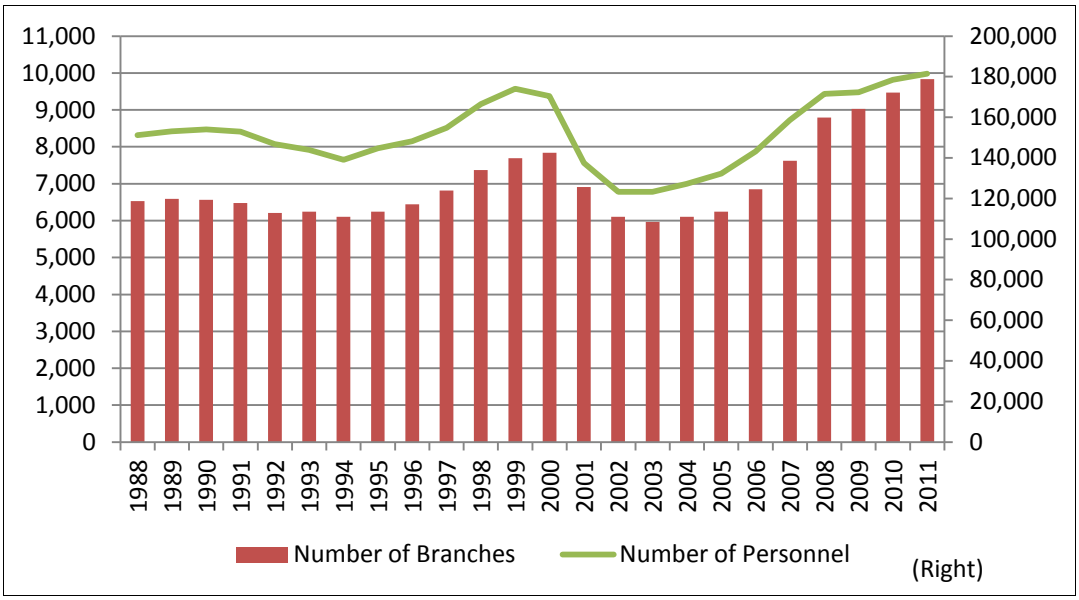

Figure 2.4 Number of Branches and Personnel

Source: BAT

2.2.3. Market Shares by Banking Groups

The share of 11 private banks in the Turkish banking sector total assets was 53 percent in 2011. The three state banks, namely Ziraat Bank, Halk Bank and Vakıfbank, retained a substantial share of 29 percent. Also it could be stated that a few public banks hold a significant portion of the total assets of the system, which is around 30-40 percent in theover the period 1988-2011. In line with the changes in the ownership structures, i.e.; the increase in the number of foreign banks, the share of deposit banks fully owned by foreigners rose to 14 percent in 2011 from only 5 percent in 2005. While the share of development and investment banks within total assets in the sector was 4 percent, the share of the Fund-controlled banks remained below 1 percent as of 2011 (see Figure 2.5).

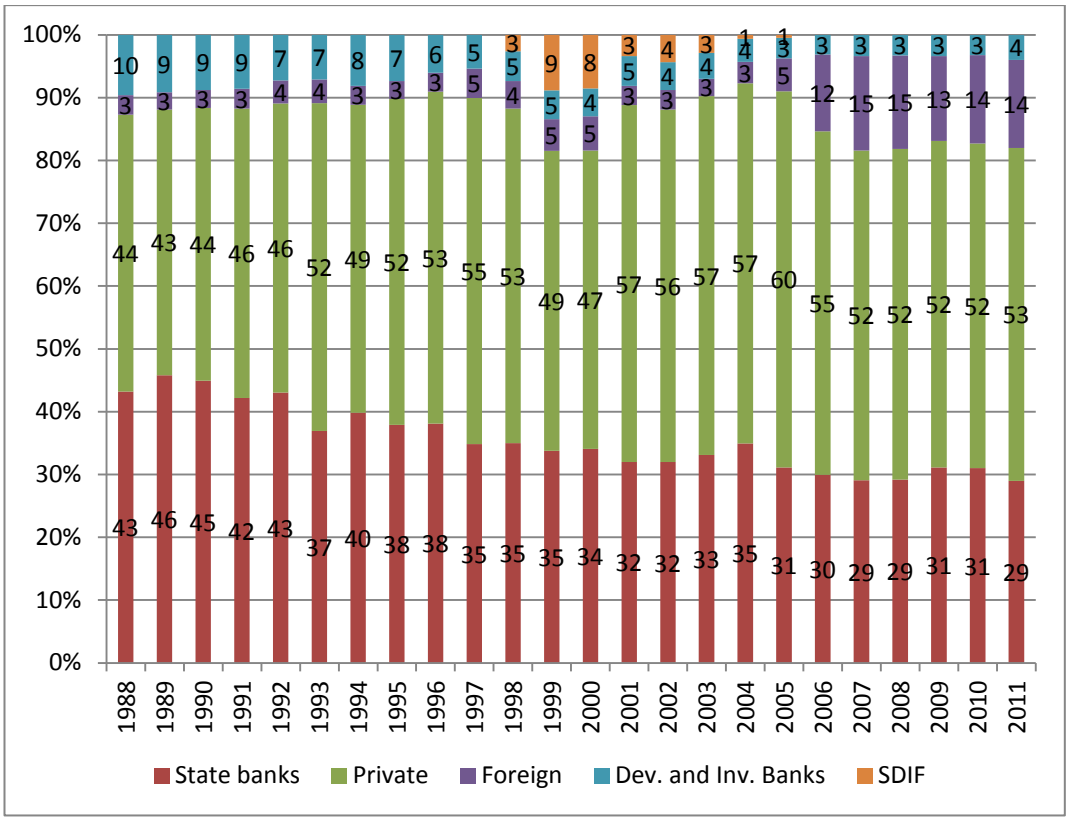

Figure 2.5 Distribution of the Banking Sector Asset Size by Groups

Source: Author's calculations based on BAT.

2.2.4. Concentration

The financial instability in the 1990s and the financial crises in 2000-2001 made a profound impact on the market structure of the Turkish banking system. Concentration in the banking sector regularly decreased in the period 1888-2000, as a result of the factors including the speeding up in new entrances to the sector, high inflation rate, high public borrowings, deposit insurance, increased short-term borrowing from international markets (BAT, 2008). In addition to these factors, deregulation policies, corporational management weaknesses, weaknesses brought by partial supervision and surveillance structure, inadequate risk management concept contributed to the increase in the number of banks and consequently, the sector was composed of relatively large number of small-scaled banks in 2000 (Structural Developments in Banking, 2009) . However; as a result of structural problems and

the developments after the 2000 and 2001 crises, many banks had to exit from the sector and the system shrank dramatically, nevertheless still considered to be overbanked in 2001[9]. In the light of the fundamental developments, the degree of concentration increased in 2000s compared to 1990s.

The Turkish banking system's concentration is relatively high, given that the share of the largest five banks in total bank assets was realized about 60 percent. When the asset size concentration of the Turkish banking sector is compared with the EU, it is above the EU-27 average which was 44 percent in 2009. The share of first five banks in assets, loans, and deposits were 61 percent, 62 percent and 58 percent; respectively, as end of 2011. The largest ten banks have 87 percent of assets, receive 91 percent of total deposits and extend 87 percent of total loans as well (see Table 2.2).

However; if one takes Herfindahl-Hirschman index (HHI), another measure of market concentration, as basis; it is seen that HHI was 855.5 in 2011, suggesting a relative competitive market structure in terms of total assets. Likewise, HHI for total loans was realized as 812.9 by the end of 2011, pointing out to competition for credit customers in the market. Contrarily, in the post-crisis era, there is moderate concentration in the deposit market as per HHI criteria, which stood at 937.8 in 2011, falling below the value of 1000 for the first time since 2003.[10]

[9] During the 2000-2001 crisis, the most significant decrease was in the number of medium-scale banks, while the number of large and small-scale banks did not show major change (Structural Developments in Banking, 2009).

[10] HHI indexes are taken from BRSA Structural Developments in Banking and include participation banks.

Table 2.2 Concentration in the Banking Sector (%), 1990-2011

	1990	1999	2000	2002	2007	2008	2009	2010	2011
Largest Five Banks									
Assets	54	46	46	58	62	62	63	63	61
Deposits	59	50	50	61	64	65	66	66	62
Loans	57	42	42	55	55	58	55	57	58
Largest Ten Banks									
Assets	75	68	68	81	81	86	87	87	87
Deposits	85	69	69	86	86	90	91	91	91
Loans	78	73	73	74	74	84	85	86	87

Source:BAT

2.2.5. Balance Sheet Structure

Factors including; different credit and interest rate policies, macroeconomic instability and uncertainty, environment of high chronic inflation, high public sector borrowing requirement, and varying regulations have all contributed to changes in the asset structure of the Turkish banking sector (see Figure 2.6).

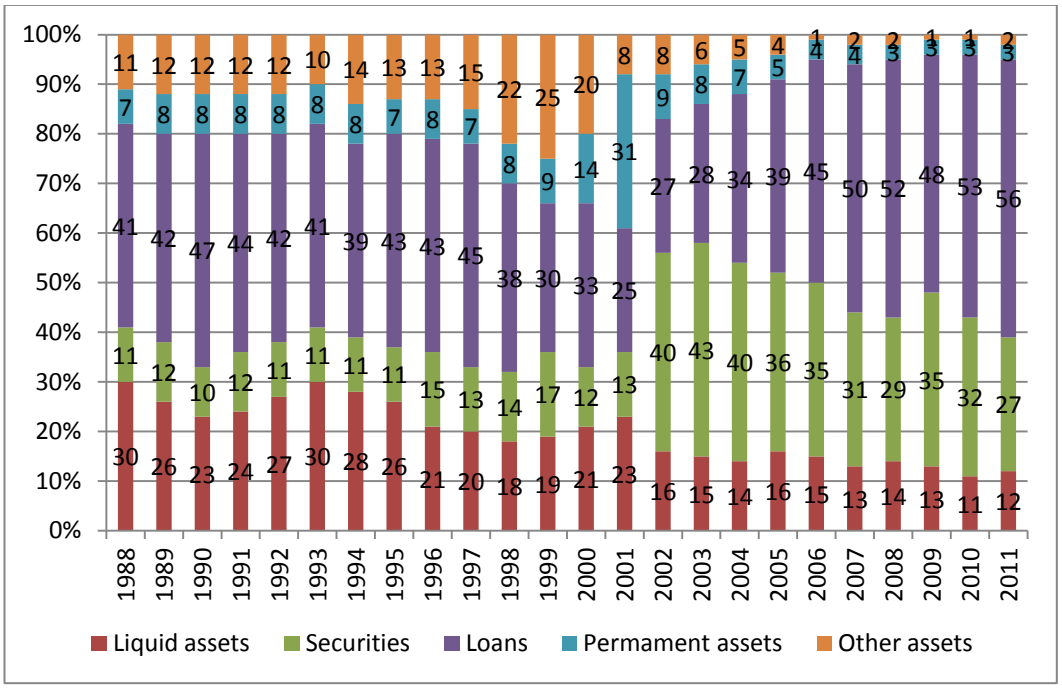

Figure 2.6 Asset Structure of the Banking Sector, 1988-2011

Source: Author's calculations based on BAT.

The share of liquid assets within total assets was about 24 percent on average for the period 1988-2001. Following the restructuring process after the crisis period, the banking sector had a tendency to enhance its investments by decreasing its liquid assets, particularly those in domestic currency, in line with the improved confidence in the sector, advances in sources of funding, fall in inflation and increased stability (Financial Stability Report, 2005). By the end of 2011, the share of liquid assets of the sector in total assets was realized as 12 percent, which was about 23 percent in 2001.

The securities portfolio, which consisted of mainly government debt securities, tend to increase as a result of high public sector borrowings and its share within total assets stood around 12 percent on average for the period 1988-2001. Following the crisis, it rose sharply due to the transfer of goverment securities to state-owned banks against their duty losses, as a part of the comprehensive restructuring program. Besides, the value of the securities portfolio increased as a result of lower interest rates and further, banks were able to increase their loans by reducing their liquid assets with the re-established economic stability during that period (BAT, 2009). Accordingly, the securities had the largest share in assets items between the years 2002-2004 and the value was about 40 percent in 2004. On the other hand, in 2005, the share of securities portfolio in total assets began to decline as a result of the start of the reduction in public sector borrowings together with the rapid rise of the loan portfolio. It increased from 29 percent in 2008 to 35 percent in 2009 due to the increase in the public sector borrowing requirement. It stood at 27 percent by the end of 2011.

The most significant development in the asset structure of the banking sector following the restructuring period is the rise of the share of the loan stock, which has been traditionally an important asset item in the Turkish banking system. During 1990s, the high public sector borrowing needs engendered pressure on the available financial resources, which resulted in lower share of loans within total assets in favor of securities stock. However, there was acceleration in the growth rate of loans from 2003 onwards as a result of increased economic stability, strong economic growth, and positive effects of the restructuring program along with the decreased pressure of the public sector on available sources. Particularly, improved macroeconomic

balances and maintained stability enable banks to extend more loans by holding lower liquid assets in their portfolio. Moreover, increase in the credit volume is in line with the increased variety of financial products and greater emphasis by banks on private banking services, such that; the rise in credit cards and consumer credits during that period. Consequently, the share of loan portfolio as the largest asset item was 56 percent at the end of 2011.

The share of permanent assets, which reduces the liquidity of total assets, decreased substantially as a result of the restructuring period after the crisis. Before 2002, the fixed assets and other assets had a rather large share within total assets, since duty loses of state banks, non-performing loans, and investments on non-financial subsidiaries and participations were included in these items. Following the restructuring period, the share of them began to fall as a result of the issuance of government debt securities to state-owned banks against their duty losses, the sale of real estates and non-financial subsidiaries and participations and decrease in the credit risk (BAT, 2008). The share of fixed assets and other assets in total assets of the banking sector was about 5 percent in total, by the end of 2011.

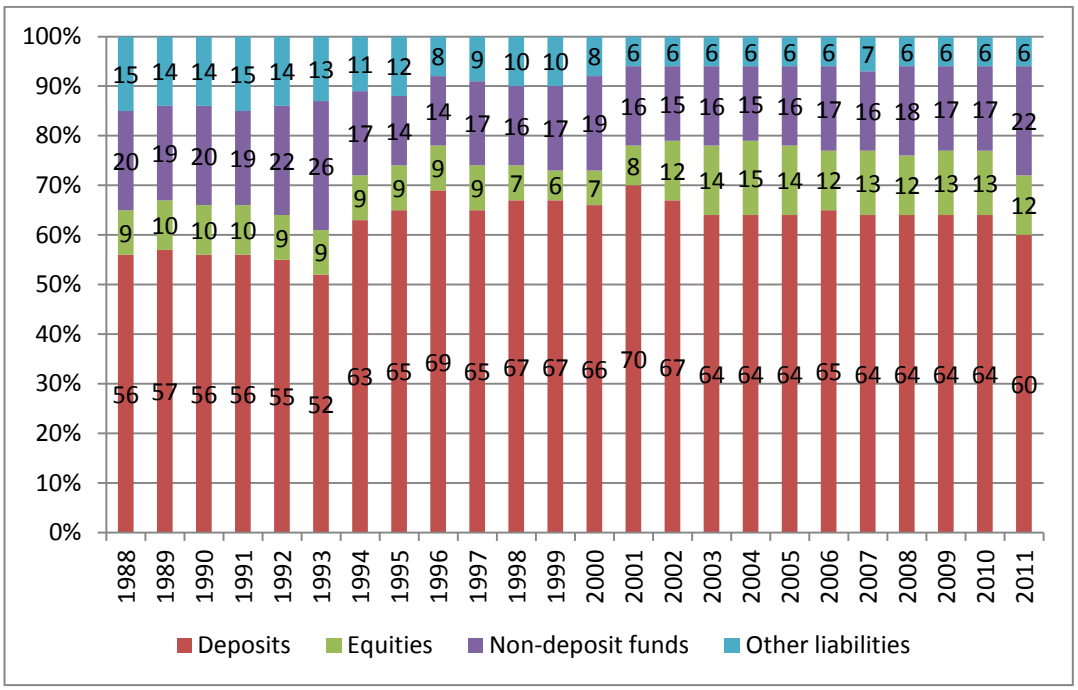

Figure 2.7 Liability Structure of the Banking Sector

Source: Author's calculations based on BAT.

Deposits come out to be the largest source of external funds for the Turkish banking sector and its share has a tendency to increase generally (see Figure 2.7). In 2011, the share of deposits in total liabilities is 60 percent and amounts to TL 699 billion. During 1990s, high chronic inflation caused an increase in the demand for foreign currency denominated deposits. As a result, the share of foreign currency denominated deposits to total deposits reached above 50 percent in 1994 and maintained almost this level until 2003. After that, the share of foreign currency deposits to total deposits began to decline as a result of the gradual increase in economic stability, the fall in inflation and the increased confidence in Turkish Lira. The share of domestic currency denominated deposits in total deposits was about 65 percent, while the share of foreign currency denominated deposits was realized as 35 percent in 2011.

Before 2001, shareholders' equity was restricted as a result of the chronic high inflation environment with low profitability and reduced demand of the private sector stemming from high public sector needs. However, measures taken as a part of the comprehensive restructuring process of the banking sector, which include reinforcement of the capital and shareholders' equity, strengthening of risk-management practices and risk-based audit concepts, harmonization to international law and regulations, combined with decline in inflation rates and rise in profit volume have led to an increase in shareholders' equity and capital adequacy ratio (BAT, 2008). Accordingly, the share of equities within total liabilities has risen for the 2002-2011 period. While it increased from 6 percent in 1999 to 12 percent in 2002, it went further to 15 percent in 2004 and stood at 12-13 percent 2006 onwards. The share of equity in total liabilities was 12 percent in the 2011.

Non-deposits resources, which include funds via foreign borrowing, started to rise following 1980, when the possibility and capability to secure funds from abroad increased as the exchange rate regime changed and the economy opened out (BAT, 2008). However, no significant difference is seen in the share of non-deposit funds within total liabilities of the banking sector during the period 1988-2011, since it was 18 percent on the average in 1988-2001 and stood around 17 percent in the period after the 2002.

The share of balance sheet items called as other liabilities has a higher share during 1990s and followed a decreasing trend afterwards. Other liabilities constituted 6 percent of the total funds on average for the period 2000-2011.

2.2.6. Capital Adequacy

As one of the most important measures of capital adequacy, shareholders' equity to total assets ratio started a rapid rise following 2002 as a result of the reinforcement of capital and shareholders' equity of banks, exclusion of banks with inadequate capital adequacy, merger of such banks, and increased importance given to risk management as a part of the comprehensive restructuring program (BAT, 2008). While the ratio stood around 9 percent on average during the 1988-2001 period, it jumped to 13 percent in the period of 2002-2011 (see Figure 2.8).

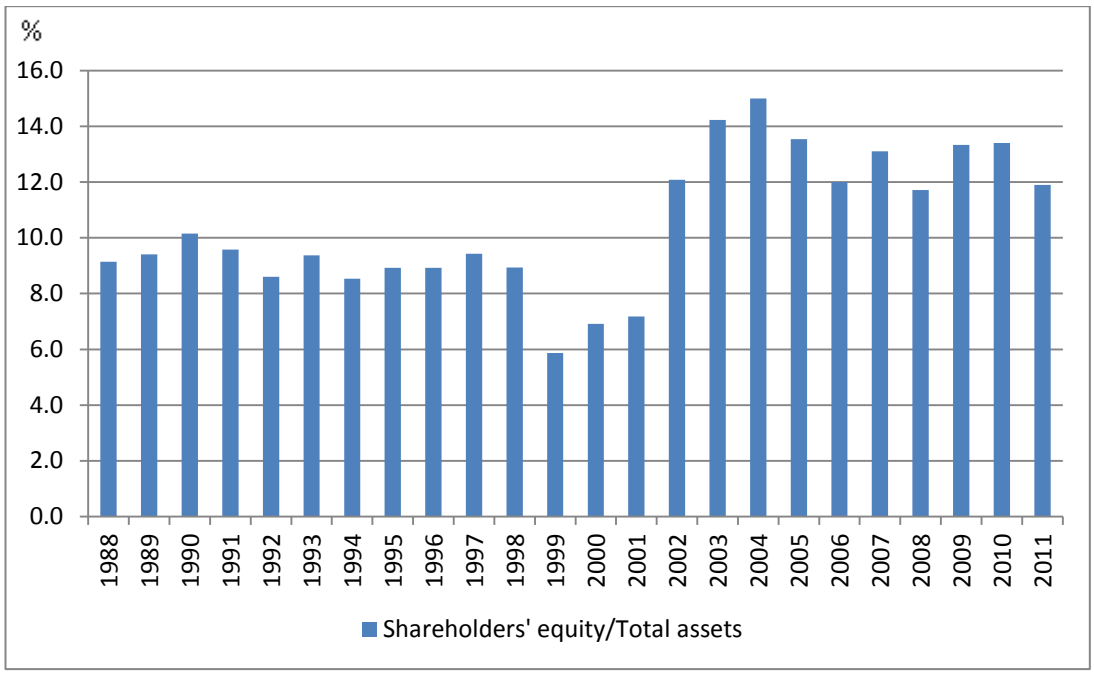

Figure 2.8 Shareholders' Equity to Total Assets Ratio (%), 1988-2011

Source: BAT

Another indicator is the capital adequacy ratio (CAR), which measures a bank's capital as a percentage of its risk-weighted assets. In other words, it is the ratio of own funds to risk weighted assets. This ratio is set to a minimum rate to ensure that

banks hold enough capital for their risky assets. It is perceived as an indicator of confidence against potential risks and hence the health of the bank. The capital adequacy regulations in Turkey are along the lines of the EU.

The minimum capital adequacy ratio is set for each bank at 8 percent and target ratio is 12 percent. When the trend of the unconsolidated capital adequacy ratio for the Turkish banking sector is analyzed, it is observed that it has stood around 20 percent in recent years (see Figure 2.9). The shareholders' equity to risk weighted assets ratio reached to 31 percent in 2003 and then, started to decline as a result of the increase in loan facility until 2008. In 2009, high profits of the banking sector strengthen its regulatory capital and the increase in public securities investment limited the growth of risk-weighted assets. In light of these developments, the capital adequacy ratio of the banking sector increased from 18 percent in 2008 to 20.6 percent in 2009. The increase in risk-weighted assets, together with the surge of credit markets led to a slight fall in the capital adequacy ratio, which was accounted for 19.2 percent, as of 2010 (Financial Stability Report, 2010). Continued credit growth and faster growth of the risk-weighted assets compared to own funds, combined with the rise in the risk weight of long-term other consumer loans had a downward impact of the capital adequacy ratio in 2011 and it realized as 16.7 percent (Financial Stability Report, 2011). Therefore, it can be said that capital adequacy ratio of the Turkish banking sector remained at high levels despite of the global crisis in 2009.

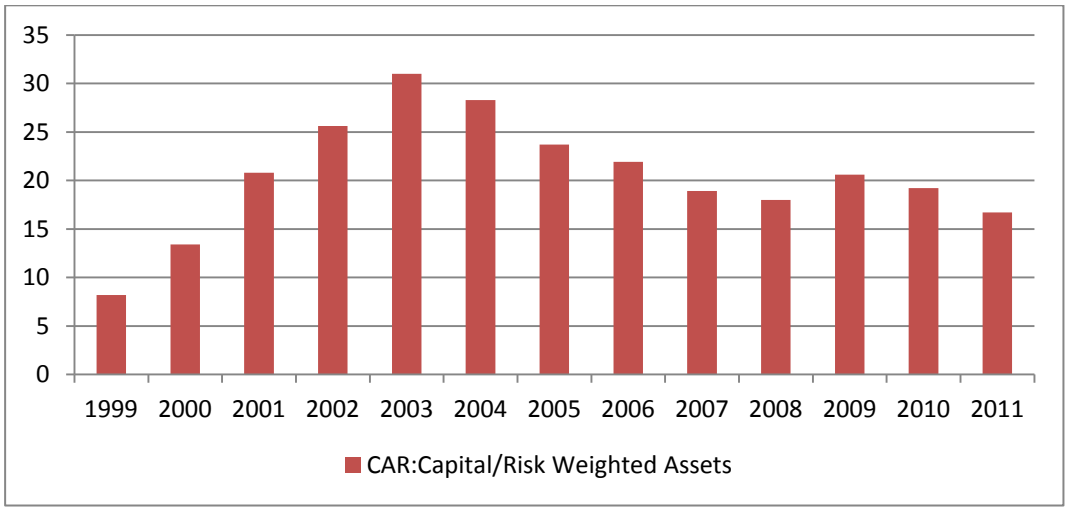

Figure 2.9 Capital Adequacy Ratio, 1999-2011

Source: CBRT

Turkish banking sector has significantly higher capital adequacy ratio when compared to other countries. For instance, the capital adequacy ratio of the European banks is about 12 percent (Financial Stability Report, 2010). The relatively higher figures of capital adequacy ratio in Turkey stems from the fact that the Turkish banking sector has a high portfolio of government debt securities and these are classified in the zero risk-weighted assets (Financial Stability Report, 2005).

2.2.7. Profitability

The profitability indicators of the Turkish banking sector have followed a very fluctuating trend during the period 1988-2011 (see Figure 2.10).[11] In 1990s, profitability ratios were very high; however, in general, they were not sustainable. Steadily high inflation rates , high public sector borrowing needs, economic instability and high real interest rates, together with the fact that holding goverment debt securities necessitated less shareholders' equity than lending activity, are the main reasons for the high return on equity figures observed during this period. As a result of the financial crises and the earthquake disaster the banking sector made significant losses between the years 1999 and 2001 (BAT, 2008; Sayılgan and Yıldırım, 2009). In the 1988-2001 period, the average of return on assets (ROA) and return on equity (ROE) ratios were 2 percent and 23 percent, respectively. The ratios have been relatively stable since 2002 due to fall in inflation, improved economic stability, strengthening capital structure and increase in credit demand. Return on equity, which was realized as 16.5 percent in 2010, dropped to 13.8 percent in 2011, while return on assets was amounted 1.6 percent as end of 2011.

[11] As BAT (2008) states, nominal figures can be misleading in the analysis of the return on equity in the sense that high inflation rates increase the sum of nominal profits, which give rise to higher return on equity levels. Since inflation rates vary significantly between the periods and particularly, are very high and volatile in the pre-crisis period, developments on inflation should be taken into consideration when evaluating return on equity figures.

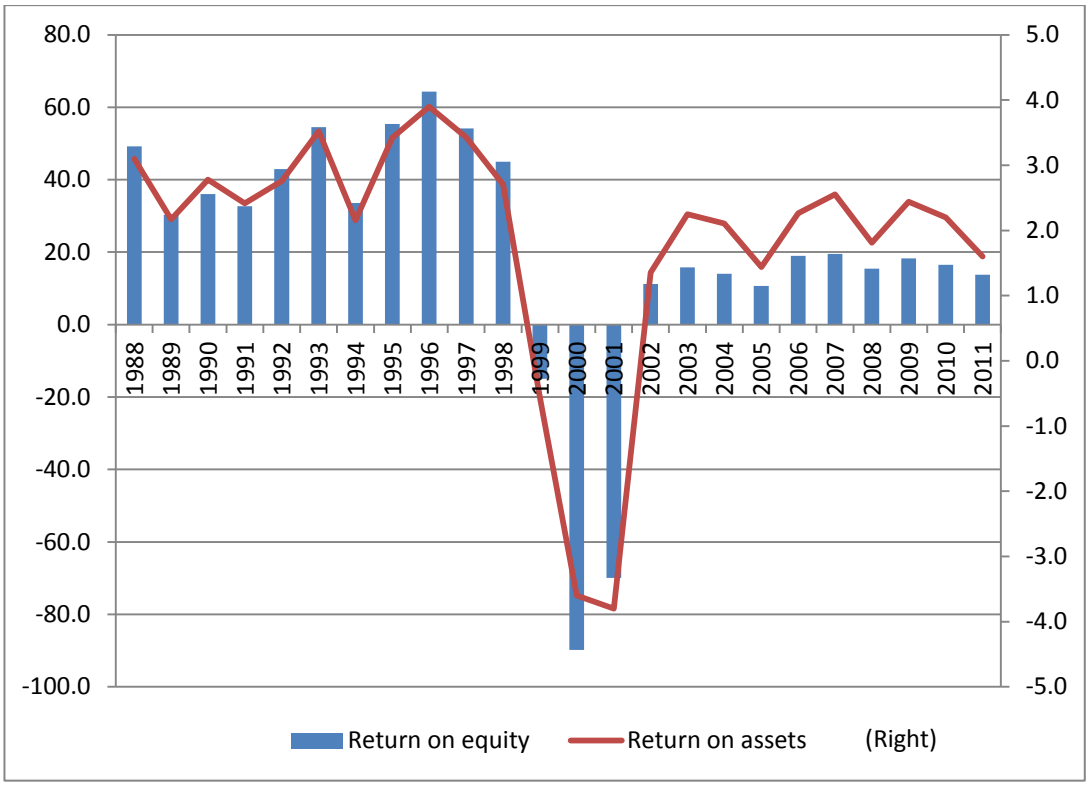

Figure 2.10 Profitability Indicators, 1988-2011

Source: BAT

2.2.8. Structure of the Credit Portfolio

Financing domestic debt via commercial banks has been the major mode for public sector deficit finance following the financial liberalization program of 1980, particularly after the mid 1980s (Aydın et al.,2006). In this manner, steadily high public sector deficits have been financed through short term debts with high costs by the funds of the banking sector during the 1990s. Accordingly, resources of the banks have been used mostly for government expenditure financing (see Figure 2.11). This reliance of domestic borrowing for deficit finance has decreased the amount of funds accessible for the private sector, in the sense that banking sector has directed a significant fraction of its funds to issue government securities for financing budget deficit rather than extending loans to the private sector as a result of high real interest rates. In other words, banking system preference to finance private sector was low and financial intermediation function of banking sector was rather limited. Thus, it could be stated that there exists a crowding-out effect of goverment borrowing on private sector in the credit markets during the pre-crisis period. Aside

from this crowding-out effect, the high public sector borrowing requirement impediments the issuance of the financial instruments from private sector due the attraction of high returns and lower risks of the goverment debt securities and tax arrangements in favor of public sector borrowing. Under these circumstances, loan market could not develop both in depth and diversity of its products during 1990s (BAT, 2008).

On the other hand, financial discipline has been attained and public sector borrowing requirement has reduced with the lower public deficit following the implementation of the restructuring program in the aftermath of the 2000-2001 crisis. Public sector pressure on the financial markets has decreased accordingly. Furthermore, liquidity abundance has come about in the economy due to low interest rates in advanced economies and high economic growth rates around the world (Başçı et al., 2007). These factors, combined with the fall in the real interest rates, have boosted the credit supply of the banking sector and the credit volume started to follow an increasing trend beginning with 2003 onwards (See Figure 2.2). Particularly, the private sector credit to GDP ratio has increased drastically in the post-crisis era (See Figure 2.12).

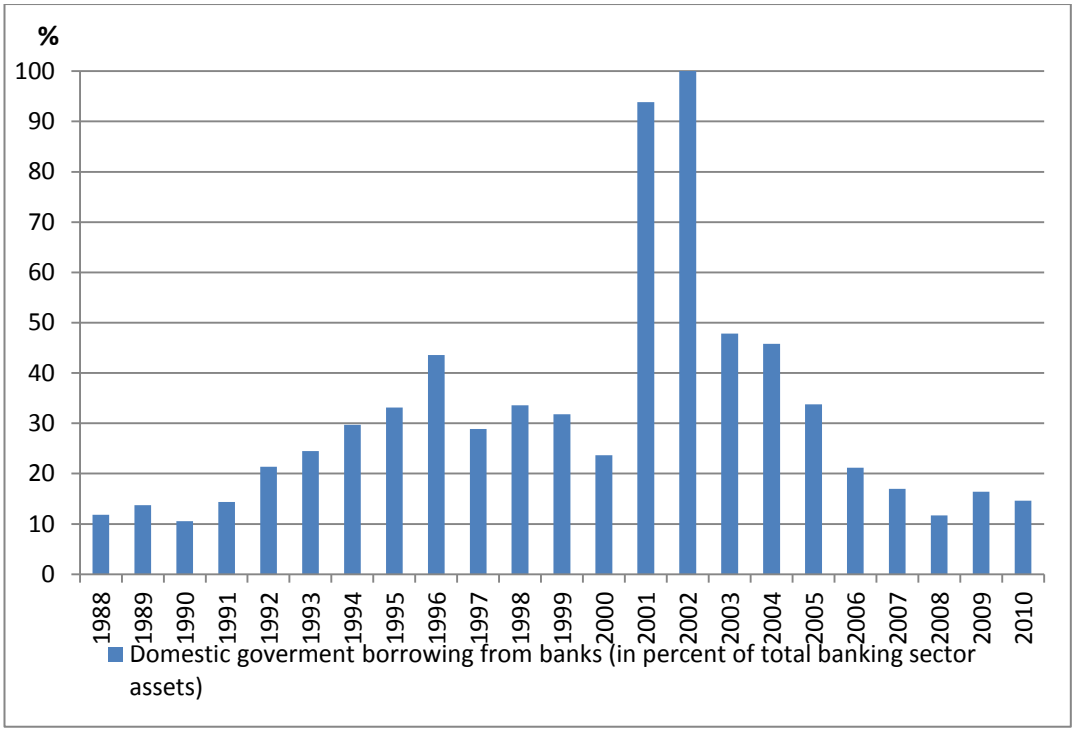

Figure 2.11 Government Debt Financing by Banks, 1988-201

Source: Author's calculations based on BAT and Turkish Treasury.

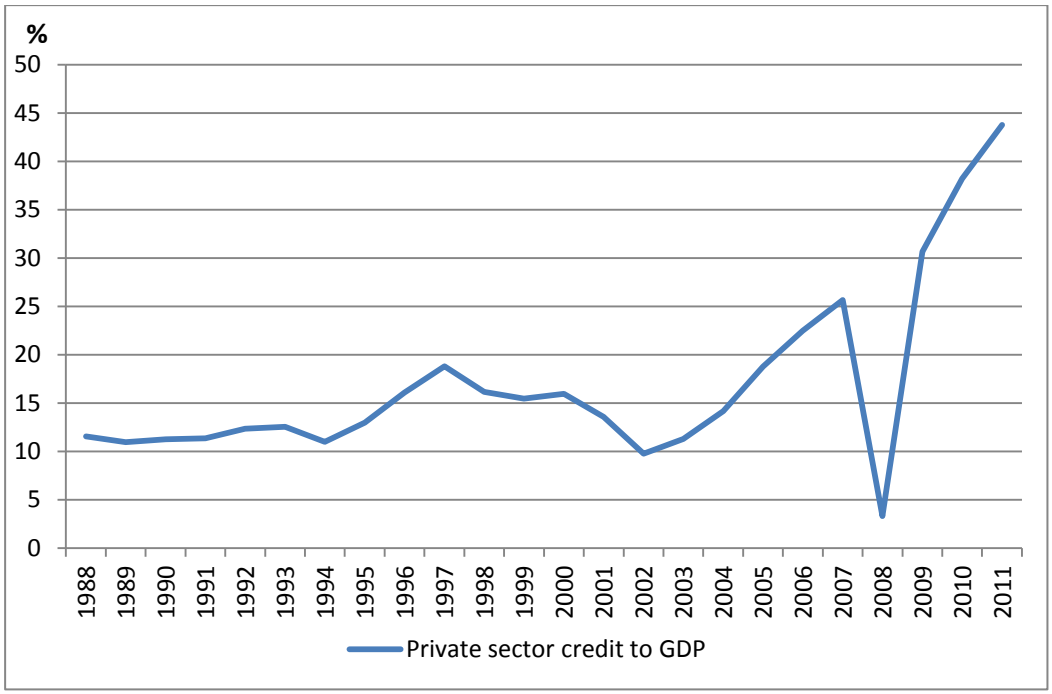

Figure 2.12 Bank Credit to Private Sector (% of GDP), 1988-2011

Source: Author's calculations based on CBRT and IFS.

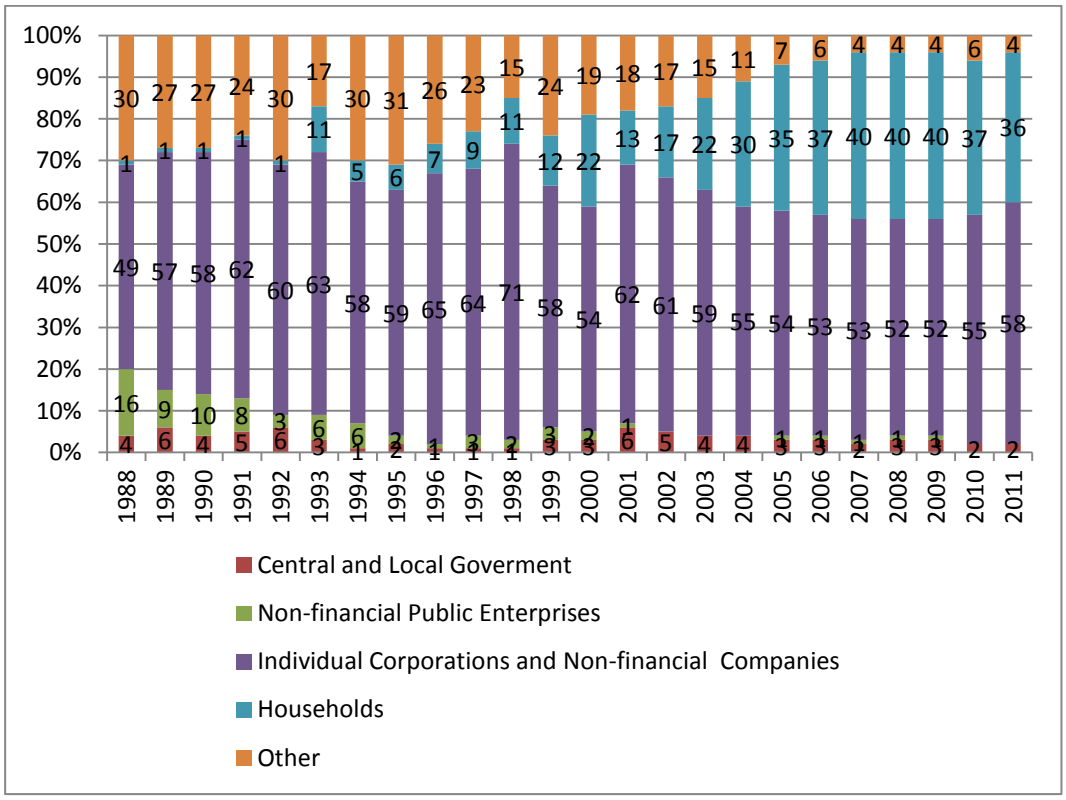

Figure 2.13 Sectoral Breakdown of Bank Loans, 1988-2011

Source: Author's calculations based on CBRT.

Regarding the sectoral distribution of loans extended (see Figure 2.13), it is observed that the share of loans to central and local governments and non-financial public enterprises stood around 6 percent on the average in the period 1988-2011 and about 4 percent of total loans are extended to public sector in the post-crisis period. Following the developments in the banking sector and improvements in the individual banking services after 2002, the share of loans to households within total loans increased to above 20 percent from mostly single digits in the 1990s and reached to 40 percent as of 2009. It was 36 percent in 2011. Loans to individual corporations and non-financial companies had the highest share in the banks' overall loan portfolio, which was 58 percent on the average during 1988-2011 period. Although credit to firms constitutes the foremost part of the banks' loan portfolio throughout the whole period, the share of loans to households showed the most rapid increase in the post-crisis period.

Table 2.3 Distribution of Individual Loans by Type (% share in total loans), 2005-2011

shares in total loans	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Consumer	22	25	29	29	29	28	27
*Housing	10	12	13	13	14	13	12
*Automobile	5	4	3	2	1	1	1
*Consumer and other	7	9	13	14	14	14	14
Individual Credit cards	13	12	12	12	11	9	9

Source: Author's calculations based on CBRT.

As a result of maintenance of financial stability following 2002, banks have started to give more weight to consumer financing in their business strategy and consumer loans have become an important market for the banking sector with its highly competitive and dynamic structure (Structural Developments in Banking, 2009). According to the sub-categories under consumer credit, housing loans and other consumer loans has increased and recorded significant shares within total loan stock in recent years (see Table 2.3). In particular, housing loans was not a primary market with its relatively small volume during 2000-2001 crisis and at the beginning of 2000s, but it has turned into a continuously growing market afterwards and

accordingly, biggest increase was observed in housing loans during the post-crisis period. This stems from the increased capacity to provide long-term resources from abroad due the emergence of the over-the-counter swap market in London, improved economic balances , decreasing interest rates, decline in the shares of security portfolio of in balance sheet, together with the efforts for developing new markets and legal improvements in housing financing area. (Başçı et al., 2007; BRSA, 2009). Consequently, the share of housing loans within total loans stood at 12 percent in 2011. The share of other loans is about 14 percent as well. While automobile loans constitute 1 percent of total loans in 2011, individual credit cards' share tends stay steady following 2002 and realized as 11 percent by the end of 2009, decreasing slightly to 9 percent in 2011.

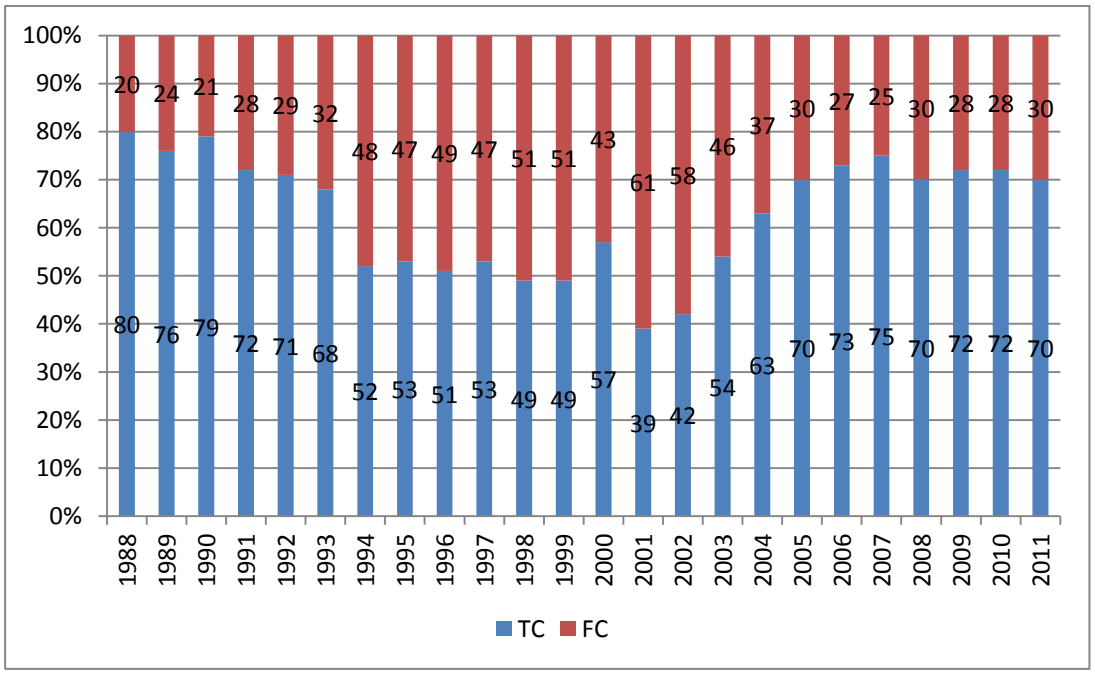

Figure 2.14 Domestic Currency-Foreign Currency Distribution of Loans, 1988-2011

Source: Author's calculations based on BAT.

The DC-FC distribution of loan stock has moved in accordance with the general trend in currency substitution for the whole period (see Figure 2.14). In 1988, foreign currency denominated loans constituted 20 percent of the total loan stock. Except some years, it followed an upward trend in general of the 1990s, which is in line with the prevailing high level of currency substitution during that period. In 2001, the

share of foreign currency denominated items in the total loans reached to its highest value, which was 61 percent. However, parallel with the slowdown of currency substitution, the share of domestic currency denominated items within total loan stock began to rise in the period beginning with 2002 and it reached to 75 percent in 2007. After that, it decreased to 70 percent in 2008 and stood about at 70 percent since then.

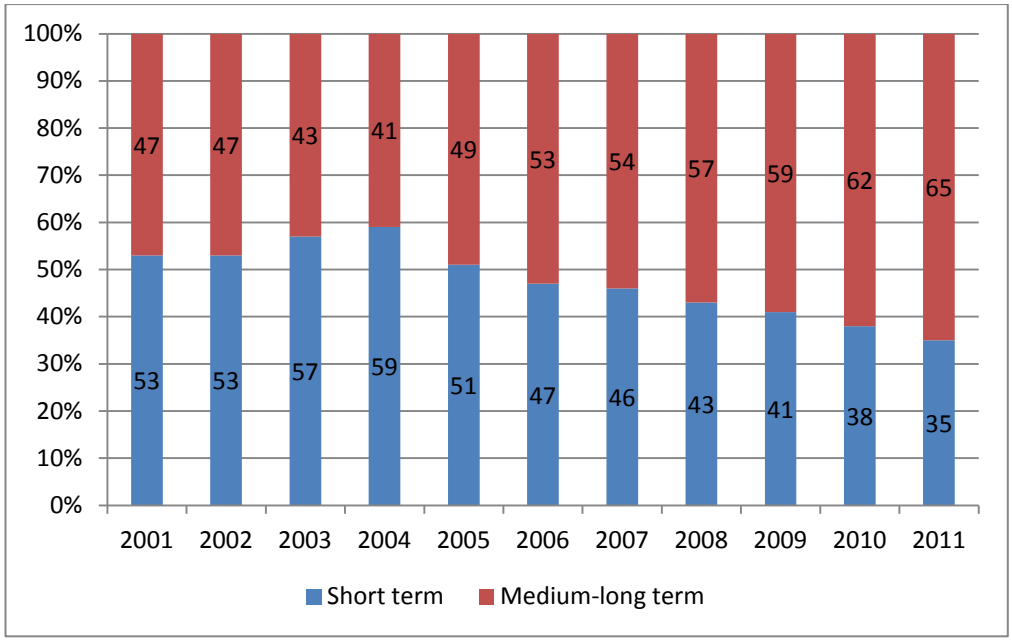

Figure 2.15 Maturity Structure of the Total Loan Portfolio, 2001-2011

Source: Author's calculations based on BRSA.

When the development of the original maturity of loans extended by the banking sector is analyzed, it could be seen that the share of short term loans followed a decreasing trend in the 2002-2011 period (see Figure 2.15). Notably, the maturity of loans lengthened following 2004. While the share of medium and long term loans in total loan portfolio was 41 percent in 2004, it was realized as 65 percent by the end of 2011. The rise in the share of long term loans in total loans mainly stemmed from the increase in the share of the retail loans in total loans, and also from the fact that most of the housing and other consumer loans, which retail loans are comprised of, have maturities longer than 24 months (CBRT, 2008). The extension of loan maturities is favorable for the corporate sector and households; on the other hand, for

the banking sector, it is crucial to extend the maturity of the liabilities in order to lower the risk of maturity mismatch (CBRT, 2011).

After presenting descriptive evidence about the Turkish financial system in this chapter, we will develop and come up with the hypothesis to be tested empirically and accordingly analyze the lending and risk-taking behavior of banks in response to monetary policy shocks by utilizing disaggregated bank- level data in the following two chapters.

CHAPTER 3

AN EMPIRICAL ANALYSIS OF THE BANK LENDING CHANNEL IN TURKEY

3.1. Introduction

Understanding the transmission mechanism of monetary policy has been the subject of long-standing interest among economists. A relatively recent view of monetary transmission mechanism emerged as the 'credit view' in the light of information asymmetries and any other frictions in credit markets. The credit channel theories incorporate credit markets into the basic framework; such that loans are considered explicitly. In contrast to the money view, credit view assumes that bank loans are unique against other forms of debt, that is; bank loans and bonds are imperfect substitutes. The credit market is characterized by the frictions in the capital market like information asymmetries, agency costs, monitoring costs, transaction costs. These information asymmetries between lenders and borrowers in the intermediated credit market create a gap between the costs of external and internal funding, which is being known as the 'external finance premium'. According to the credit view, monetary policy have an effect not only on the interest rate, but also on the external finance premium, which will influence the investment and spending decisions of firms and households.

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 key to explain 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, still because of 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. In other words, banks have cross sectional differences that introduce heterogeneity in their loan supply sensitivity to monetary shocks. 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.

This study will investigate the bank lending channel of monetary policy for the Turkish economy by specifically focusing on the role of banks in the monetary policy. Moreover, recently Turkey has experienced changes in financial regulations which are expected to affect the bank lending channel. This study would provide a framework for exploring questions of how these developments may have affected the bank lending channel of the monetary transmission mechanism.

There are few studies available that focus on the bank lending channel in Turkey and scarce empirical evidence on this issue shows conflicting results in terms of the effectiveness of this channel. It is crucial to address this question and provide extensive evidence for a better understanding of the monetary transmission mechanism. 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.

By looking at the sector as a panel of banks at the micro level, this paper is expected to contribute to the existing literature by re-examining bank lending channel in Turkey in several aspects. More specifically, 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, starting in mid 1999- Turkish banking sector entered a novel era with the new regulatory agency and, hereafter it has undergone 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 a larger time series periods provides us a laboratory 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.

In sum, the study utilizes dynamic panel data estimation technique, namely dynamic GMM, which specifies size, liquidity, capitalization, asset quality, earnings capability and management efficiency as indicators of bank-specific characteristics, in order to examine the response of banks' balance sheet variables to unexpected shocks by for the period 1988-2009. By doing so, the study aims to show if there

exists disproportionate lending responses of banks to monetary shocks, which is fundamental to making the case for the credit channel. Additionally, this study's findings have several policy implications. A clearer understanding of the nature of monetary transmission mechanism would provide useful information for designing an appropriate and effective monetary policy. Furthermore, the results will provide useful insights in understanding the links between the financial and real sectors of the economy which can also provide an information basis for financial sector regulations. This analysis would take account the distributional effect of the monetary policy as well.

This chapter is organized in seven sections. Following the introduction, section 2 provides an overview of transmission mechanism and a brief survey of theoretical and empirical literature on the bank lending channel. Section 3 presents the limited literature on the bank lending channel in Turkey and examines very briefly the relevance of the conditions regarding the bank lending channel for Turkey. The hypothesis to be tested empirically is developed in section 4. In section 5, the data and definition of the variables are described and further, the econometric model and the methodology employed are explained. Then, in section 6 empirical findings of the model, together with the economic interpretations are discussed. Finally, section 7 concludes.

3.2. Literature Review

3.2.1. An Overview of Monetary Policy Transmission Mechanism

The transmission mechanism of the monetary policy is described as the means by which monetary policy influences the economy in general. In other words, monetary policy transmission mechanism is the process through which policy-induced changes in short-term interest rates or the money stock are transmitted into changes in inflation and real variables such as aggregate output and employment (Ireland, 2005). While focusing on the interrelationship between monetary policy and the real

economy, this mechanism also considers the lagged effect of policy-induced changes on the economy.

There seems to be a consensus in macroeconomics that monetary policy has non-neutral effects on real economic activity, at least in the short run. However, there is a great debate on the mechanisms through which the monetary policy exerts its influence as Bernanke and Gertler (1995) refer to it as a 'black box'. Given the complex relationship between monetary policy and the real sector, identification of the mechanisms by which monetary policy affect the economy and the relative importance of the different channels remains as one of the most controversial issues in macroeconomics. Furthermore, how monetary transmission mechanism operates may differ from one economy to another, since it depends on a number of factors including financial structure and macroeconomic environment of the economy. A clearer understanding of the nature of monetary transmission mechanism is crucial, since it would provide useful information for designing an appropriate monetary policy. Besides, this knowledge can be utilized to understand the links between the financial and real sectors of the economy.

There is considerable disagreement on the means by which monetary policy influences economic activity, since there is not one, but many channels, through which this influence is achieved. As a result, there has been a large body of literature on monetary transmission mechanisms. While it is true that policy may work through several channels and these channels are not mutually exclusive, but rather interrelated, the monetary transmission channels in the economic literature can be classified as; the traditional interest rate channel, the other assets price channel and the credit channel (Mishkin, 1996).[12] A brief overview of each of these channels is provided below. After that, an overview of the theoretical and empirical literature on the bank lending channel will be presented.

[12] We overview only the core monetary transmision channels, which have been generally highlighted in the literature. However, this analysis could further be extended, since various other channels; such as cost channel, expactations channel, or risk-taking channel- which is studied in Chapter 4- have been discussed and emerged in recent literature. See, for instance, Mohanty and Turner (2008) for a discussion of new developments in the transmission mechanism for emerging market economies.

3.2.1.1. Interest Rate Channel

According to the conventional Keynesian view of the monetary policy transmission mechanism, often referred to as the 'money view' or 'interest rate view', real economic activity response to monetary policy via interest rate. This view depends on the interest rate sensitivity of spending, since it emphasizes that monetary policy is transmitted through changes in the cost of capital and their impact on investment.

The basic assumption in this view is that there are only two imperfect substitutive assets in the economy: money and bonds. This view relies on the notion that the monetary authority is able to affect the real interest rate by changing the money stock. A reduction of bank reserves resulting from a monetary contraction leads to a decline in the amount of bank deposits and an increase in the nominal interest rate. Under the assumption of price rigidities, the rise in the nominal rates of interest is translated into an increase in the real interest rates which, in turn, raises the cost of capital. This would generate a fall in interest sensitive components of aggregate spending which leads to a decline in aggregate demand and a reduction in output.

There are four basic necessary conditions for the interest rate channel to work: (1) The monetary authority must directly influence the supply of money, for which there are no close substitutes. (2) Prices do not adjust fully and instantaneously which cause central banks to affect real as well as nominal short-term interest rates. (3) Policy- induced changes in the real short-term interest rates influence long terms of interest that do have an effect on household and business spending decisions. (4) Changes in interest-sensitive spending due to a monetary policy innovation match well to associated output responses (Hubbard, 1994).

It has to be noted that the interest rate channel relies on the *Modigliani- Miller theorem (1958)* according to which there are no credit market frictions. Under the assumption of perfect substitution between bank loans and bonds, banks are important only because they create money by issuing demand deposits. Monetary policy is transmitted through changes in bank liabilities, so banks play no role on the asset side of their balance sheet. Furthermore, lending behavior of banks does not

affect firms' investment decision according to Modigliani-Miller theorem (1958), which suggests that the capital structure of the firm is mostly irrelevant. As a result, banking sector plays no role in affecting real economic activity; that is, financial system is simply a veil, in the two assets framework of the money view of the transmission mechanism.

While some economists believe that the interest rate channel is the major channel; that is, interest rates have a significant effect on business and consumer investment spending (Romer and Romer, 1990; Ramey, 1993; Taylor, 1995), many empirical studies do not support the quantitative importance of such an influence. Bernanke and Gertler (1995) highlight some important inconsistencies regarding the traditional interest rate channel and give an overview of empirical studies that show weak cost of capital effects on spending. They observe that a small policy-induced change in the interest rates causes a larger change in the real variables than expected. Besides, they point out the poor correspondence in timing between changes in interest rates and the response of some components of spending such as; inventories and nonresidential investment. Finally, they show that the most significant effect of monetary policy is on long-lived assets that are more sensitive to long run rates, which is puzzling since central bank can control the short run rates, monetary policy is expected to have a strong effect on short run rates of interest.

As a result, lack of support and insufficiency of the interest rate channel to explain the response of the economy to changes in the monetary policy made the case for many economists to explore additional channels of monetary policy.

3.2.1.2. Other Asset Prices Channel

While the money view focuses only on one asset price-the interest rate, monetary policy exerts its influence in the economy through other asset prices beyond the rate of interest. Foreign exchange and equities are the two main assets that receive considerable attention in the literature.

3.2.1.2.1. Exchange Rate Channel

Changes in a country's monetary policy affect the real economic activity not only through changes in the interest rate, but also by creating changes in the exchange rate. With the increasing openness of national economies and transition to flexible exchange rates, the exchange rate channel becomes more important in the analysis of monetary policy transmission.

According to exchange rate channel, a monetary contraction exerts an upward pressure on domestic interest rate. This leads to an increase in the demand for domestic assets, causing an appreciation of the nominal and, at least initially, the real exchange rate. This appreciation of the home currency may affect the spending in two different ways. First is the relative price effect: domestic goods become more expensive relative to foreign goods as a result of this appreciation, resulting a reduction in the demand for domestic goods and hence in aggregate demand. The second is the balance-sheet effect: in countries where households and firms hold foreign currency debts, changes in exchange rates may have a considerable impact on net worth and debt-to-assets ratio provided that such debts are not fully offset by foreign currency assets. In that case, change in exchange rates may result in significant adjustments to spending and borrowing through this balance sheet effect (Kamin et al., 1998).

3.2.1.2.2. Equity Price Channels

Miskin (1996) highlights the Tobin's q theory of investment and wealth effects on consumption as the two additional channels that involve equity prices.

Tobin's q is defined as the ratio of the stock market value of a firm to the replacement cost of capital that is owned by that firm. When q is high, market value

of business firms is higher relative to the replacement cost of capital and new plant and equipment is cheaper relative to the market value of firms. In that case, businesses increase investment spending as they can buy a lot of new investment goods with only small issue of equity. Conversely, if q is low, firms would choose purchasing existing firms instead of investing in new plants and equipments, as market value of firms is low relative to new plants and equipment. Hence, investment would be lower.

Tobin claimed that price of equities fall when there is monetary tightening. From a monetarist viewpoint, if money supply decreases, investors have less money than they want and accordingly, try to increase their holdings of money by reducing their spending. As a result, equity demand decreases which lowers equity prices. From a Keynesian viewpoint, an increase in interest rates following a monetary contraction makes bonds more attractive relative to equities, thereby causing equity prices to fall. Therefore, both views anticipate a fall in equity prices following a decrease in money supply.

In sum, according to this transmission channel, when there is monetary contraction, equity prices decreases and q reduces accordingly, which result a decline in investment and aggregate output.

The other monetary transmission channel through equity prices works through households' consumption. This argument is based on the life-cycle model of consumption developed by Ando and Modigliani (1963), which expresses consumption as a function of an individual's lifetime resources that is made up of human capital, real capital and financial wealth. Changes in the stock prices alter the value of wealth through changes in the value of the financial wealth, since a major component of fiancail wealt is common stocks. In that case, lower stock prices due to monetary tightening reduce households' financial wealth, decreasing their lifetime resources, and as a result, they consume less.

3.2.1.3. Credit Channel

The gap between the conventional money view and empirical findings has led economists to search for other factors that might help to explain how the monetary policy affects the real economic activity beyond its impact through interest rate. A relatively recent view of monetary transmission mechanism emerged as the 'credit view' in the light of information asymmetries and any other frictions in credit markets. While it is true that there has been a great debate on the relative importance of the interest rate and the credit channels, it should be noted that credit channel is not an alternative, but rather, a complementary mechanism that amplifies the interest rate effect of monetary policy.

The credit channel theories incorporate credit markets into the basic framework; such that loans are considered explicitly. In contrast to the money view, credit view assumes that bank loans are unique against other forms of debt, that is; bank loans and bonds are imperfect substitutes. The credit market is characterized by the frictions in the capital market like information asymmetries, agency costs, transaction costs. Due to this credit market imperfections, financial intermediaries, particularly banks, play a significant role on credit markets to lessen the costs of these imperfections and contribute to efficient allocation of resources. These information asymmetries between lenders and borrowers in the intermediated credit market create a gap between the costs of external and internal funding, which is being known as the 'external finance premium'. According to the credit view, monetary policy have an effect not only on the interest rate, but also on the external finance premium, which will influence the investment and spending decisions of firms and households.

There are two sub-channels of credit channel of monetary transmission: the balance sheet (broad credit) channel and the bank lending (narrow credit) channel. While the bank lending channel focuses more narrowly on the lending behavior of banks in the transmission of monetary policy, the balance sheet channel is more general and emphasizes the propagation effect of all financial intermediaries.

3.2.1.3.1. The Balance Sheet Channel

Balance sheet channel emphasize the potential impact of monetary policy on borrowers' balance sheets and hence their ability to borrow. Credit market imperfections may create a wedge between the cost of a firm's external funds and internal funds. This gap, which is referred as the 'external finance premium' by Bernanke and Gertler (1995), is affected by the monetary policy actions. According to the balance sheet channel, the external finance premium facing a borrower should depend on borrower's financial position. Therefore, any change in the quality of borrowers' balance sheets would affect their investment and spending decisions. For example, a rise in the interest rate in response to a tight monetary policy increases borrowers' debt service and decrease the value of their net worth. This lead to an increase firms' real cost of borrowing and thereby lowers their investment (Bernanke and Gertler, 1995). The balance sheet channel is related to the financial accelerator mechanism, since the variation in the external finance premium amplifies the effects on monetary policy on investment and consumption decisions.

3.2.1.3.2. The Bank Lending Channel

The bank lending channel focuses more narrowly on the impact of monetary policy actions on banks' willingness to provide loans. According to the bank lending channel, central bank can affect the external finance premium by controlling the level of intermediated loans. Contractionary monetary policy decreases the aggregate volume of bank deposits. Since banks heavily rely on reservable demand deposits as an important source of fund and find it difficult to raise uninsured external funds, banks' ability to lend decrease. As a result of the fall in the supply of loans, bank dependent borrowers, who cannot raise funds from other sources, reduce their investment and consumption expenditures.

3.2.2. Survey of Literature: The Bank Lending Channel

3.2.2.1. Theoretical Literature

The origin of thought on the bank lending channel goes back at the 'Availability Doctrine' of Roosa (1951), which states the importance and role of credit in conducting effective monetary policy. After that, number of economists such as; Brainard and Tobin (1963), Brunner and Meltzer (1963) and Brainard (1964) refine this argument in their general equilibrium; multi- asset models which include bank loans. However; the empirical evidence which provide strong support for the money view as the main transmission mechanism for monetary policy cause credit view to fall out of favor in the 1960s (see for example Friedman and Schwarz (1963)). The failure to provide a satisfactory theoretical explanation for the existence of credit rationing, which credit view heavily relies on, is another cause of the fall from the grace. On the other hand, the new field of economics of information which emphasize capital market frictions and financial intermediation renew interest in credit channel as of 1970s ((Jaffee and Russell(1976), Townsend (1979), Stiglitz and Weiss (1981) and Diamond (1984)).

Blinder and Stiglitz (1983) resurrect the loanable funds theory to explain how monetary policy has effects on the real economy and present some micro foundations behind the credit view. They state that banks have a special role in the financial system due to asymmetric information on the borrowers' and lenders' side; such that banks specialize in evaluating and monitoring investment projects. They also emphasize the role of the credit rationing mechanism in explaining the transmission of policy shocks to real economic activity. According to Blinder and Stiglitz, as a result of imperfect information and credit rationing, there are no close substitutes of bank loans for some borrowers who are bank-dependent and do not access to alternative means of financing. Within this framework, they assert that monetary policy works through bank credit.

The bank lending channel is theoretically analyzed in an influential paper by Bernanke and Blinder (1988). They extend the well-known IS-LM model by

incorporating the bank loan market as an additional market. The key assumption of this three-asset model is that bank loans and bonds are imperfect substitutes both for banks and borrowers. As a result, monetary policy is transmitted to real economic activity not only through the traditional interest rate channel by changing bond-market rate of interest, but also through lending channel by affecting the bank lending rate.

According to Bernanke and Blinder (1988), there are three necessary conditions that must hold if there is distinct bank lending channel:

1. Intermediated loans and open-market bonds must not be perfect substitutes as liabilities for at least some borrowers. These borrowers must not be able to completely offset a decrease in the supply of bank loans from other sources. It is a breakdown of Modigliani-Miller theory of the irrelevance of capital structure; since if borrowers are indifferent between bank loans and other sources of finance, then the decline in the supply of loans would have no affect on the borrowers.

2. The central bank must be able to influence the supply of intermediated loans. That is, the banking sector must not be able to make up their losses in deposit reserves caused by increased reserve requirements or open market sales of the monetary authority either by issuing non-deposit liabilities or liquidating securities. Otherwise, the banks' loan supply schedule may not be shifted.

3. There must be some sort of imperfect price adjustment that prevents money being neutral. If prices adjust perfectly, a change in nominal money stock would be accompanied by an equivalent change in prices. Under these circumstances, monetary policy would not affect the real economic activity through either lending channel or the conventional money channel.

The third condition is generally accepted to be met in an economy. This condition needs to hold not only for the bank lending channel, but also for the interest rate channel to operate.

Regarding the first condition, some borrowers have to rely on financial intermediaries for financing due to adverse selection and/ or moral hazard in the credit market. Financial intermediaries act as 'delegated monitors' to reduce the costs of asymmetric information problems and circumvent the free-rider problem in public financing. As a result, some borrowers, especially whose monitoring costs are high, are dependent to financial intermediaries to finance their business activities. A contractionary monetary policy, which decreases the supply of loans, would have an adverse effect on these borrowers.

The second condition seems to be most plausible and critical for the existence of the bank lending channel. After a monetary contraction, banks are not able to fully offset the decrease in deposits by selling some of its security holdings or raising non-deposit financing, at least not without suffering from increasing costs. Banks would respond by cutting back on loans when monetary policy tightened due to this extra risk premium. Moreover, while banks hold securities as a buffer against the risk of sudden deposit withdrawal, this is very costly and would not completely insulate against the effects of a monetary policy shock. Hence, it could be stated that at least some part of the banks reduce their loan supply after a contractionary monetary policy.

3.2.2.2. Empirical Literature

3.2.2.2.1. Empirical Works Using Aggregate Data

Some of the empirical studies on the bank lending channel try to test if there is strong relationship between bank loans and macroeconomic output. Relying on a time series model, Bernanke (1983) analyze to what extent the interest rate channel of the monetary transmission can explain the Great Depression. He finds that the decline in output cannot be only explained by monetary influences and disruptive effects of bank panics seem to account for the persistence of Great Depression. As a result, his work provides empirical support on the existence of the lending channel. Bernanke and James (1991) extend this analysis to an international level by using a sample of twenty-four countries. They find that during periods of bank panics, the decline in macroeconomic output cannot be solely explained by the standard factors such as interest rates and fiscal policy.

King (1986) uses the same data as Bernanke (1983) to compare the importance of monetary aggregates and loans in predicting output in US. He finds that the change in the output tends to follow the changes in the monetary aggregates, while change in the volume of loans tends to take place almost at the same time with the change in the output. King considers this finding inconsistent with the lending view.

Bernanke (1986) employs a structural VAR model to analyze whether lending shocks have significant real effects. Unlike King, he presents evidence favoring the importance of bank lending, since the resulting estimates suggest that shocks to loan supply have strong effect on the aggregate demand.

Romer and Romer (1990) follow a qualitative non-statistical approach in order to test whether the monetary authority can significantly affect the real economic activity. They date the shifts in the stance of monetary policy as declared in the Federal Reserve records and find that loan volume respond to shifts in the monetary policy, but with a lag .That is, output and bank loans tend to move at the same time. They consider these results as evidence favoring the money channel. According to them, after a contractionary monetary policy, output drops, which will in turn cause a fall in the bank loan demand. In other words, the movements in bank loans are an endogenous response to changes in output.

Employing VAR analysis, Bernanke and Blinder (1992) investigate the impulse response functions of bank loans to innovations in the federal funds rate. Their results also show a delayed decline in the volume of bank loans after a monetary contraction. Increases in the federal funds rate causes banks to slowly downsize by cutting back loans. The decline in the bank loans in turn depresses economic activity. Their results can be interpreted to be consistent with the propositions of both interest rate and credit channel.

Ramey (1993) examines if the bank lending channel has an independent significant effect on the real economy in the monetary transmission mechanism. Employing a vector error correction model, she compares money velocity with bank loan velocity in explaining the response of output to monetary policy shocks. Ramey shows

evidence favoring the importance of the money channel, rather than the bank lending channel, for affecting the real economic activity.

Kashyap, Stein and Wilcox (KSW, 1993) investigate the relative movements in bank loans and a close substitute – commercial paper- after monetary shocks in order to separate the effect of loan demand from loan supply. According to them, fluctuations in the substitute for bank financing should contain information about the demand for bank loans. That is, all types of finance would be affected if monetary policy solely operates through the usual interest rate channel, whereas only the supply of bank loans would be affected if monetary policy operates through the bank lending channel. Following this logic, the authors examine the movements in the 'mix' variable which they define as the ratio of bank loans to the sum of bank loans plus commercial paper. They find evidence that in response to a monetary contraction, bank loans slowly decrease, while commercial paper volume rises. KSW consider these findings as evidence for the bank lending channel. Hoshi, Scharfstein and Singleton (1993) compare the behavior of bank loans with loans from insurance companies by using aggregate Japanese data. The results show a decline in the fraction of industrial loans following a monetary contraction, which is in favor of the bank lending channel as well.

Oliner and Rudebusch (1996) suggest that using changes in the aggregate financing mix is inadequate unless the heterogeneity of borrowers is taken into account. According to the authors, a monetary contraction reduces the demand for all types of external finance and redirects all types of credit from small to large firms as well. This shift could explain the decline in the credit mix since small firms rely more heavily on bank financing than large firms. In that case, heterogeneity in loan demand would account for the movements in the aggregate debt mix. Using data for the US manufacturing sector, they examine the movement of the mix of bank and non-bank debt for small and large firms separately. They find that after a monetary policy shock, this financing mix does not change either for small firms or for large firms, which does not support the existence of the bank lending channel. In response to the criticism of Oliner and Rudebusch, Kashyap, Stein and Wilcox (1996) state that following a monetary tightening, there is substantial substitution away from bank loans to commercial paper even among large banks.

McMillin (1996) examines the monetary policy transmission in the US during the period 1973-1979 and presents evidence in favor of the bank lending channel. However, once the single contractionary period is excluded, responses of bank loans to monetary policy become insignificant.

3.2.2.2.2. Empirical Works Using Disaggregate Data

As mentioned above, an identification problem exists with studies that use aggregate data since it is very difficult to identify whether the contraction in bank loans is driven by shifts in loan supply or loan demand. This prompted researchers to turn to disaggregated bank-level data to examine cross-sectional differences among banks according to particular balance-sheet characteristics. For instance, small banks encounter more asymmetric information problems in the credit market than large banks and experience higher costs of non-deposit external finance as a result. Under these circumstances, small banks would be affected more and have to reduce their supply of loans following a monetary contraction. That is, banks of different size are expected to respond differently to monetary shocks.

The study by Kashyap and Stein (1995) is the main model used in the literature to study the bank lending channel through disaggregated cross-sectional data. By separating banks by their asset size, they use US data to test the hypothesis that small banks react more strongly to the monetary policy shocks. Indeed, the authors find that the lending volume of small banks decrease more than that of large banks, which is consistent with their hypothesis.

However, one can still argue whether these differential responses are likely to result from loan supply effect or heterogeneous demand for bank loans. Since small banks tend to finance small firms and the economic activity of these firms fluctuates more over the business cycles, the decline in bank loans in the event of monetary contraction could be result of fall in the demand for loans, which is consistent with an interest rate channel. Kashyap and Stein test the response of securities of small and large banks in order to find an answer. If response of small banks' securities is

found to be larger than that of big banks, this could be taken as positive support for the bank lending channel. However, the authors fail to reach conclusive results.

According to the credit view, banks are not able to fully insulate their loans from the effects of a negative monetary shock by issuing non-deposit liabilities or liquidating security holdings. If this is true, then banks with larger buffer stock of cash and securities would have an easier time protecting their loans after a tightening monetary policy. In an attempt to link banks' balance sheet characteristics to effects of monetary policy, Kashyap and Stein (2000) separate banks by their liquidity, which is measured as the ratio of securities to total assets. They find that small banks with the most illiquid balance sheets are the most responsive to monetary policy actions.

Kishan and Opiela (2000) explore and additional differentiating characteristic- a bank's degree of capitalization – along with the asset size to explain the effect of monetary policy on bank loan supply. As argued by Peek and Rosengren (1995) bank capital is a sign of bank's health and indicates the bank's ability to raise funds from alternative sources during monetary shocks. Furthermore, capital requirements like the capital adequacy ratios of the Basel Record, may affect the composition of bank asset portfolios. By classifying banks by their capital leverage ratio, Kishan and Opiela establish that small under-capitalized banks react more strongly to changes in the monetary policy. They interpret this result to be consistent with the bank lending channel, since small and least capitalized banks have difficulty to access other source of funding to continue financing their loans after a monetary tightening.

Ashcraft (2006) states that loan growth of banks affiliated with multi-bank holding companies are less sensitive to changes in federal funds rate than unaffiliated banks' loan growth. According to the author, this is because affiliated banks are able to smooth their loss of insured deposits by issuing uninsured debt. He presents evidence that financial constraints at the bank-level affect the response of lending to monetary policy.

Cetorelli and Goldberg (2008) re-examine the evidence on the lending channel in light of the considerable changes in the size and structure of US banking and try to answer whether globalization changes the lending channel of the monetary transmission. They establish that domestic oriented banks show significant sensitivity to monetary policy in support for the lending view. Furthermore, the authors show that globally oriented US banks rely on internal capital markets in response to domestic monetary shocks. They present evidence favoring an active bank lending channel; however, the strength of this channel decreases as banking sector becomes more globalized.

Other than the empirical works on the bank lending channel concerning to US, most of the research on bank lending channel is mainly concentrated on industrialized countries. The empirical results are mixed, but the majority of the studies find evidence favoring the bank lending channel. Ehrmann et al. (2001), Altunbas et al. (2002) and Angeloni et al. (2002) test the existence of the bank lending channel for the EU area. For the country level, several studies that examine the bank lending channel include: Hernando and Martinez-Pages (2001) for Spain, Farinha and Marquez (2001) for Portugal, de Haan (2001) for Netherlands, Worms (2001) for Germany, Brissimis et al. (2001) for Greece, Westerlund (2003) for Sweden, Gambacorta (2005) for Italy, Bichsel and Perrez (2005) for Switzerland, Horvarth et al. (2006) for Hungary.

Recently, several studies on the bank lending channel have been conducted for developing countries. These can be listed as: Agung (1998) for Indonesia, Park (2003) for Korea, Alfaro et al. (2004) for Chile, Juks (2004) for Estonia, Arena et al. (2006) for Latin American and Asian countries, Juurikkala et al. (2011) for Russia, Mora (2012) for Mexico. In many cases, they find evidence in accordance with the existence of bank lending channel.

3.3. The Bank Lending Channel in Turkey

In this section, the previous studies on the bank lending channel in Turkey, which are rather few in number, are presented and then the relevance of the conditions for bank lending channel is examined.

3.3.1. Previous Empirical Evidence on Bank Lending Channel in Turkey

Recently, more attention has been paid to the implications of the monetary policy on bank credit supply in Turkey; nevertheless the empirical evidence is scant and provides mixed set of results.

Concerning the time series application of bank lending channel in Turkey, Gündüz (2001) estimates a VAR model by using monthly aggregate data for the period 1986-1998 and provides some evidence in favor of the bank lending channel, though limited due to the identification problem. Öztürkler and Çermikli (2007) find a unilateral relationship from monetary policy shocks and a two-way relationship between real credit and industrial production in their study based on VAR model estimation covering the period 1990-2006. Based on a similar empirical approach, Erdoğan and Beşballı (2009) establish that the credit channel operates partially in Turkey. Utilizing a two-regime nonlinear TVAR model, Catik and Karaçuka (2011) analyze the role of credit channel in the monetary transmission mechanism for the period 1986-2009 and find credit tightening to have more impact in economic activity and prices in low inflation regime, suggesting the increasing importance of the bank lending channel after the inflation targeting period.

Among the studies that make use of disaggregated bank- level data to examine the bank lending channel in Turkey, Çavuşoğlu (2002) analyzes the lending behavior of banks for the period 1988-1999 by employing dynamic generalized methods of moments approach. While he establishes that the bank lending behavior is influenced by debt sales to the banking system and by bank specific factors, that is; bank capital ratio and the security-asset ratio, he finds no evidence in support of a bank lending channel, even if size differences are taken into account. Following the two-step

regression approach of Kashyap and Stein (2000), Şengönül and Thorbecke (2005) find out that liquidity has a significant effect on supply of bank loans during 1997-2001 period and interpret this result as an evidence of the lending channel. Using quarterly panel data for the period 2003-2006, Aktaş (2006) tries to answer whether capital-unconstrained banks; i.e., banks with above the average capital adequacy ratio, are affected more by the monetary policy shocks. Based on fixed effects estimation approach, he provides evidence that the bank lending channel operates through the capital adequacy of Turkish banks during that period. Brooks (2007) uses the May-June 2006 financial turbulence as an exogenous shock that prompted a significant tightening of monetary policy to examine the loan supply response of Turkish banks, depending on size, liquidity and capitalization as their balance sheet characteristics. By using a 'difference-in-difference' approach, she finds liquidity to be the significant variable in determining banks' lending behavior in respond to monetary contractions and provides partial evidence that bank lending channel operates in Turkey during that period. Kuşakçıoğlu (2010) studies the loan growth sensitivities of Turkish banks for the period 1998-2009. She investigates the income sensitivity and liquidity sensitivity of bank loan growth with bank size and ownership type controlled by using two-staged least squares regression method. While Kuşakçıoğlu fails to identify cash flow sensitivity of banks, she finds positive relationship between liquidity sensitivity of loan growth of banks and monetary policy shocks, which is more obvious for small banks, and interpret this result in favor of the bank lending channel during that period. In their paper, Aydın and Igan (2010) examine the impact of monetary and fiscal policies on credit growth for the 2002-2008 period. Based on a two-step regression approach, they show that liquidity-constrained banks have sharper decline in their lending following a monetary contraction, and further establish that the impact of monetary policy are stronger for domestic-currency-denominated and medium-to long term credits. Finally, as a result of statistically weak results, they conclude that the bank lending channel of monetary transmission is not strong in Turkey.

3.3.2. Can bank lending channel be a powerful transmission mechanism in the Turkish economy?

The structure of the economy and financial sector may significantly influence the effectiveness of the bank lending channel (Ehrman et al.2003). As mentioned earlier, there are three necessary conditions for the credit channel to be operative in an economy: (1) banks should be dominated sources of intermediated credit, (2) the monetary authority must be able to shift bank's loan supply, (3) some firms and households must be dependent on bank loans. In an attempt to investigate whether the bank lending channel is relevant for Turkish economy, we examine these assumptions by presenting some stylized facts about Turkish banks.

As regards the first assumption, in the period under consideration, banks play a pivotal position in Turkish financial system, like in many emerging economies. Turkey can be classified as a bank-dominated financial system with a small role of other non-bank financial intermediaries, which accounts only about 12 percent of the sector, as of 2011. Bank based financial system becomes especially evident if one takes into account that many non-bank financial institutions are affiliated with banks and specifically, banks control the larger ones. At the same time, another striking characteristic of the Turkish financial sector is the small size of the capital markets. Table 3.1 introduces the various indicators of the Turkish financial system for the 2001-2011 period, Table 3.2 presents those selected indicators for the rest of the world, EU, USA and emerging markets in 2002 and 2010, respectively, to make comparison. While stock market capitalization has displayed a modest upward trend, it is still much lower than in the EU, USA, and the emerging markets. Bond markets are characterized by the predominance of government securities, with no share of the private sector, i.e., absence of private bond market. Although the share of the public sector has followed a nearly decreasing trend during 2001-2011, it still well above that of the emerging markets. In sum, both the small equity and corporate bond markets, together with the underdevelopment of non-bank financial institutions, suggest that domestic credit heavily relies on the banking system in Turkey.

Table 3.1 Selected Indicators of the Financial Sector (% of GDP)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bank Assets	69	61	55	55	61	64	67	74	84	87	89
Capital Markets	80	59	63	63	72	64	70	49	73	77	60
Equities	28	16	21	23	34	30	40	19	37	43	29
Bonds and Bills	51	43	42	40	38	34	30	29	35	33	29
Public	51	43	42	40	38	34	30	29	35	32	28
Private	0	0	0	0	0	0	0	0	0	0	1
Total	**149**	**120**	**118**	**118**	**133**	**128**	**137**	**123**	**157**	**164**	**149**

Source: Author's calculations based on BAT and IFS.

Table 3.2 Selected Indicators of the Financial Sector in Comparison with the World, EU, USA and Emerging Markets (% of GDP), 2002 and 2010

2002	World	EU	USA	EM	Turkey
Bank Assets	264	204	56	145	61
Capital Markets	203	214	287	59	59
Equities	69	66	105	25	16
Bonds and Bills	135	148	182	35	43
Public	51	57	43	20	43
Private	83	91	138	14	0
Total	468	418	343	205	120

2010	World	EU	USA	EM	Turkey
Bank Assets	171	298	99	106	87
Capital Markets	236	273	342	99	77
Equities	87	67	119	58	43
Bonds and Bills	150	206	223	41	33
Public	65	69	77	25	32
Private	84	137	146	16	0
Total	407	571	441	204	164

Source: Author's calculations based on IMF, Global Financial Stability Report (April 2004 and April 2012), BAT and IFS.

Regarding the second condition, participation of non-banking financial institutions in the economy and existence of capital requirements are argued to be two factors that affect monetary authority's ability to shift bank's loan supply (Kashyap and Stein, 1993). Larger participation of non-bank financial institutions in loan supply is assumed to weaken the ability of monetary authority to manage loan supply, since these institutions do not subject to reserve requirements in many countries. Given the fact that non-bank financial institutions constitute only about a slight fraction of the system, we can conclude that this factor do not seem to play a significant role in the loan supply.

As for bank dependence on behalf of borrowers, one must identify the share of bank loans for the financing of firms. Accordingly, we examine the composition of the liability side of the firms' consolidated balance sheet to make an assessment about the share of bank dependent borrowers (see Figure 3.1). Trade credits and bank loans seem to be the two major sources in the firms' overall external financing. While the share of financial debt within total liabilities was 23 percent on average for the period 2000-2010, the highly significant part of financial debt of the firms was bank credits and they constituted 19 percent of the total liabilities on average during the same period. As the second major source of external finance, trade credits had an average share of 15 percent in total liabilities.[13] Çavuşoğlu (2002) presents the average figures of the 1989-1999 period, where the share of financial debt and trade debts within total liabilities was 28 and 16 percent respectively. Moreover, bank loans constituted 22 percent of total liabilities in that period. Although this kind of analysis is somewhat inadequate to reach strong conclusions, the available data suggests bank loans to be the dominant source of external finance, i.e.; corporate sector rely on bank financing in Turkey.

[13] Aydın et. al. (2006) claim that substantially high share of trade credits stems from the low asset tangibility of the corporate sector, together with the informal nature of financial structure of the Turkish firms. In addition to these, steadily high inflation environment and instability in the economy have led short-maturity contracts including trade credits. Yalçın et al. (2005) find that small firms heavily depend on trade credits to finance their activities when compared to the other firm groups, whereas large firms have relatively easy access to bank credits.

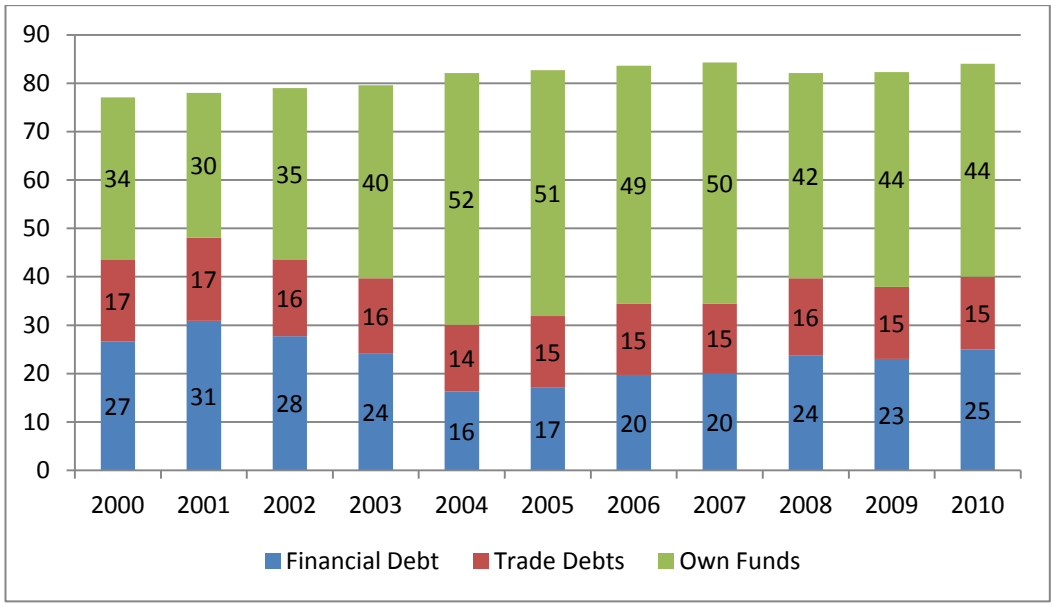

Figure 3.1 The Shares of Corporate Sector Liabilities (%), 2000-2010

Source: Author's calculations based on CRBT Company Sector Accounts.

In sum, conditions for an operational bank lending channel seem to be satisfied and the financial system, which is overviewed in the first section, makes more likely that bank lending channel is at work in Turkey. However; one should still take into account some factors that might reduce the scope of an operational bank lending channel. High concentration of the Turkish banking sector and high degree of public involvement are such factors that work in the contrary direction. Few state owned banks comprised a significant part of the market, having an average share of 36 percent within total assets of the sector from 1988 to 2011. Although the share of public banks has followed a decreasing trend following there restructuring period, it is still high. As public banks are not subject to market forces as the same way private banks do, the strong presence of government in the banking sector reduce the potential effect of the bank lending channel, since state banks face lower degree of informational problems and have cost advantages in raising external finance against private banks and, consequently are more likely to mitigate the impact of monetary policy on their loan supply. Likewise, high market concentration reduces the strength of the bank lending channel, in the sense that large banks can more easily access to external finance. Concentration has increased during 2000s compared with 1990s and the share of top five banks was 61 percent of total assets of the sector by the end of 2011, suggesting a high degree of concentration despite the relatively large number

of banks As a regulatory issue, deposit insurance also act as a weakening factor by reducing the incentive of investors and depositors to monitor the risk exposure of banks (Juks, 2004). The full insurance on deposits, which was put into effect in 1994, may have worked in that direction; however this factor is expected to be less potent with the introduction of limited deposit scheme in 2004.

3.4. Research Design

In this study, the bank lending channel is studied using an empirical analysis based on the identification of the reaction of the loan supply to monetary policy actions. The essential insight being that banks have cross sectional differences that introduce heterogeneity in their loan supply sensitivity to monetary shocks. In other words, the impact of monetary contractions on lending is dependent on banks' ability to raise external finance and to insulate their loan supply, which should be tied to their specific characteristics.

The asymmetric nature of financial frictions gives rise to these cross sectional differences. In the context of the bank lending channel, tighter monetary policy would lead to a reduction in bank deposits that causes a decline in the banks' lending capacity as a result of contraction in liquidity. When faced with such a policy induced deposit shortfall, banks will substitute lost deposits with external forms of finance or sell their securities to protect their loan portfolio. However, external market for funds is not frictionless and unlike deposits, non-reservable funding is not insured. So according to their balance sheet situations, each bank would be subject to differing degree of information asymmetries and face with different funding costs. While less binding adverse selection and moral hazard problems allow some banks to succeed obtaining alternative funding and maintaining their lending activity, others, which are more affected from financial frictions, have a more limited access to non-deposit funding and forced to cut down their supply of credit eventually. Due to the presence of these frictions in the credit market, same monetary impulse would have different effects on the lending of banks with different characteristics. In other words, constrained and unconstrained banks, in terms of their balance sheet strength, respond differently to a given monetary policy stance. 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.

Empirical studies on the bank lending channel have suggested several bank characteristics, such as size and some aspects of the balance sheet strength, as sources of heterogeneity. In this study, we appeal to bank heterogeneity by using bank size and CAMEL-type variables as a measure of overall financial health, following Lijane (2007). CAMEL is a supervisory rating system based on an evaluation of five critical components of bank safety and soundness. CAMEL stands for capitalization, asset quality, management, earning capability, and liquidity.[14] In particular, CAMEL ratings provide us a guide on what variables to choose in order to appeal a broader measure of bank financial soundness, since it is a universally accepted measure for evaluating banks' overall financial condition. However, it has to be noted that all of the measures used in the bank lending literature have their own pros and cons, so the impact of these indicators should be interpreted accordingly by taking account their advantages and disadvantages.

Prior literature has posited bank size as the main source of heterogeneity that could shape loan supply sensitivity to monetary policy (Kashyap and Stein, 1995). Following a monetary contraction, there are differences in the loan quantity adjustment for larger and smaller banks, since the constraints they face vary according to their size. Small banks are exposed to stronger asymmetric information problems in the capital market than the large ones and therefore, encounter more difficulty when trying to raise non-deposit funding in response to monetary contraction. On the other hand, large banks have relatively easier access to external finance, as they suffer from less severe informational problems and face lower agency costs in attracting non-deposit debt instruments. Furthermore, according to the flight-to-quality phenomenon, borrowers shift their financial assets towards large banks, which they consider to be safer and less risky than small banks, during periods of turmoil. As a result, larger banks' lending is assumed to be more insulated

[14] Sensitivity to market risk has been added as the six component to the CAMEL rating system in 1997. Extended version of the rating system had been referred as the CAMELS rating system thereafter. However; sensitivity to market risk is not taken into consideration in this analysis.

from monetary policy shocks and monetary contraction cause small banks to curtail their loan supply to a greater extent than large banks. On the other hand, if loan demand is not assumed to be homogenous, i.e; customers of small banks reduce their loan demand more than that of larger banks following a monetary tightening, then; size would become an insignificant factor in identifying loan supply shifts.

Liquidity is another indicator that is used in the bank lending literature to assess banks' ability and willingness to supply additional loans following a monetary contraction (Stein,1998; Kashyap and Stein, 2000). As a measure of the balance sheet strength, liquidity ratio has been used with the intuition that it allows banks to shield their loan supply from monetary policy shocks. Liquid banks are expected to be able to shield their loan portfolio by drawing down their reserves of cash and securities whenever they have policy-induced deposit shortfall. On the other hand, this is not feasible for relatively illiquid banks. Since they cannot succeed to smooth the effects of monetary tightening, they have to adjust their loan portfolio instead. As a result, banks that hold higher ratios of liquid to total assets are assumed to respond less to the monetary policy shocks.

While it is true that banks hold a large stock of liquid assets as a buffer against deposit outflows and unpredictable withdrawals, there are other incentives for them to do so. For example, banks which are associated with more severe information problems and more trouble in securing alternative funding tend to invest more in securities. Furthermore, excessively risk averse banks and banks that lend more to cyclically sensitive customers tend to hold high levels of liquid assets to insulate themselves (Kashyap and Stein, 2000).

The degree of capitalization has been suggested as another bank characteristic that could shape loan supply sensitivity of banks to monetary policy actions (Peek and Rosengren, 1995; Kishan and Opiela,2000; Van den Heuvel, 2002). Capital is argued to be an indicator of balance sheet strength which can lessen adverse selection and moral hazards problems. Banks with high capital ratios are perceived less risky by the investors, since high level of capital is recognized as an indication of banks' creditworthiness. In this case, such banks have a better ability to absorb shocks to assets market and raise alternative funds more easily and hence; they reduce their

loan supply less than poorly capitalized banks. However, capital to asset ratio may not have such informative power for banks' ability to originate loans, as the degree of capitalization could to reflect the riskiness of the banks' loan portfolio as well (Worms, 2001). In such a case, a high level of capital can be a sign of the banks' risk, because holding capital represents a cost to banks due to its low rate of return. Using risk based capital measures can be a way to overcome this disadvantage.

The aforementioned bank characteristics-namely bank size, liquidity and capitalization- are standard in the literature. Other characteristics, that are asset quality, management efficiency, earnings capability, have been scarcely used in the bank lending literature and are chosen appeal to a broader measure of banks' financial strength in our analysis. Furthermore, these additional variables represent the main innovation of this paper regarding to the analysis of the bank lending channel in Turkey.

Another point that needs to be emphasized is that, recent literature points out some concerns about the adequacy of the standard bank-specific characteristics in capturing precise functioning of the bank lending channel. It is argued that size indicator became less indicative due to changes in the banks' business models and liquidity ratios are distorted by new market funding patterns. Likewise, it is stated that the bank capital may not be that informative, since it fails to capture many of the risks as shown by the 2007-2008 financial turmoil (Altunbaş et al., 2009a). It is not claimed that these characteristics are not important; conversely they have a large impact on the provision of credit and monetary transmission. However, they recommend to take account of other financial factors, that are likely to influence bank lending, together with the standard characteristics for an accurate analysis of the bank lending channel. In light of these, we believe that including the characteristics other than the standard ones, would provide a more precise assessment of the role of banks in the monetary transmission in Turkey.

Therefore, three additional variables are considered in our model. First, earnings capability is included to examine the effects of bank profitability on bank lending responses to monetary shocks. It is assumed that higher earnings provide additional capital for banks, which increase their ability to maintain their lending. Recent

literature on the bank-capital channel underlines that shocks to bank profitability may have persistent effects on bank lending as well. According to this view, when there is decline in profits, banks would reduce their lending if equity capital is low and they cannot issue new equity due to its high cost (Van den Heuvel, 2007). Furthermore, it has to be noted that higher earning capacity can cause to a higher risk tolerance by bank management, which in turn, could lead an increase in lending (Kwan, 2010).

The second measure used in this context is asset quality. As a measure of financial health, asset quality appears to have an impact on the lending activities of banks. Different measures are used for asset quality in the literature like measures which gives an indication of banks' portfolio impairment. Since markets perceive asset quality as a sign of default possibility, it is likely that banks with poor loan portfolios may experience more difficulty when trying to raise external finance and reduce their lending following a monetary tightening. On the contrary, banks with better loan portfolios will be able to shield their loan supply and mitigate the effects of the policy shock (Lijane, 2007).

Finally, management soundness is used as another measure that could shape loan supply sensitivity of monetary shocks. As efficiency increases with the management capability, banks with better management quality are expected to face with less agency costs and asymmetric information problems. As a result, they will do better in shielding their loan supply through their ability to raise external finance following a monetary contraction.

From the above framework, we expect to see differences in lending activities of banks due to variations in their financial strength and their ability to raise external finance, when there is a monetary policy induced reduction in deposits. Accordingly, our main hypothesis is that financially sound banks should have a better ability to smooth policy-induced deposit outflows than banks with a weak financial performance. Banks with stronger balance sheets should be able to raise external finance to replace insured deposits during periods of tight money and as a result, they do not have to reduce their lending drastically when compared with banks with weak financial condition.

Considering these issues, we aim to test whether certain bank specific characteristics affect the loan supply and whether these characteristics affect the impact of monetary shocks on the lending behavior. Clearly one of the goals of this study is to shed light on whether lending of banks respond significantly during monetary policy shocks and whether these responses are more pronounced among financially weak banks. Furthermore, period beginning with 2002 witnessed significant changes and developments in the structure of the Turkish banking system as a result of the tremendous restructuring process and rehabilitation programs following the 2001 banking crisis. Taking into consideration these structural changes, together with the developments in economic fundamentals coupled with a shift in the monetary policy regime, we expect to see a change in the dynamics in the functioning of the credit channel in the post-crisis era. So, the second purpose of this study is to investigate these effects changed in direction and/or magnitude in this new financial environment.

3.5. The Econometric Model and Methodology

3.5.1. Data Description

The empirical work in this study utilizes annual bank-level and related macroeconomics data covering the period from 1988 to 2009.[15] 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. Starting from mid-1999 Turkish banking sector entered a novel era with the new regulatory agency and hereafter, it has undergone tremendous changes through amendments in the financial regulations in the aftermath of the 2001 financial crisis. Thus, utilizing a longer time span provides us a laboratory in analyzing the loan supply response to macroeconomic policy shocks in Turkey, in the sense that 2000-2001 crises constitute a possible structural break. By examining the impact of the lending channel before and after the crises period, we expect to shed light on the changes in the behavior of banks after 2001 in two different monetary policy regimes as well as two different financial structures.

[15] Table A.1 in the Appendix A provide description and symbols of the variables used in the empirical analysis.

Accordingly, we divide our sample into two periods as, 1988-2001 and 2002-2009, and estimate the model separately for each sub-sample.

Bank-level data is taken from the banks' balance sheets and income statements, which is provided by BAT. The frequency of data is annual due to unavailability of quarterly data at the individual bank level prior to 1998. While it is argued that using high frequency data might be more appropriate to capture the adjustment of loans following a change in interest rates, an alternative discussion on the analysis of monetary policy using annual data is provided by Ashcraft (2006:760):

> Kashyap and Stein (2000) use a two-step procedure on quarterly data where they first run a sequence of regressions by cross-section and then use the estimated coefficients in a time-series regression. Newey and McFadden (1994) point out that standard errors from the second stage of a two-step estimator are generally inconsistent. Only when the consistency of the first-stage does not affect the consistency of the second stage will the estimated second-stage standard errors be appropriate. If one combines both steps into one using a generalized difference-in-difference estimation strategy, however, this issue can be entirely avoided. The sacrifice here practically is that one must use a lower frequency of data. As this one-step approach requires that all variables and their interactions with macro variables be present in the regression, it is simply not practical to use quarterly data.

Furthermore, Ashcraft (2006), Gambacorta (2005) and Delis and Kouretas (2011) find that annual data is sufficient to explain the impact of monetary policy rates on bank lending, when they compared their results by using both annual and quarterly data.

We build an unbalanced panel dataset, which includes deposit banks, investment and development banks operating in Turkey during the period 1988-2009.[16] Table A.2 in the Appendix A shows the list of banks in the sample and further, provides some

[16] 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.

information on acquisitions, mergers and exits occurred during the period under consideration. 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 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 as a result of restructuring process during the last 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. Moreover, we discard any bank year observation with credit growth higher than 200 percent in order to eliminate the impact of mergers and acquisitions in line with Aydın and Igan (2010). Furthermore; we discard those banks from the sample which existed for less than five years during the period under consideration. Finally, we apply an outlier rule to the variables of interest, which allows us to drop observations which contain extreme values.

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. The challenge in choosing best measure of monetary policy stance in Turkey is that monetary policy conduct has undergone several changes during the period analyzed here. During 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 program 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 conduct incorporates the practice of a fully fledged inflation targeting regime. With this policy shift, an explicit inflation objective takes place of 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 et al., 2007).

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 Fund 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 whether countries conduct inflation targeting regime (Juurikkala et al,, 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.

Except for the monetary policy indicator, the other macro variables employed in the analysis are the real GDP growth for output growth and average CPI series for inflation. Figure A.1 in the Appendix A illustrates time series of the macro variables.

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 use measures 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, in the sense that we compute the relevant ratios using data from banks' balance sheets and income statements and, then, include each of them separately as a separate explanatory variable in the regression equations. Banks with low ratios are considered weak or unsound, since high ratios are assumed to show overall financial soundness (Lijane, 2007).

In our analysis, empirical proxies, which are utilized to represent research variables similar to those of CAMEL rating system of banks, are as follows: the ratio of shareholders' equity to total assets for capitalization, the ratio of loans under follow-up to total loans for assets quality, the ratio of net income to number of braches for

management efficiency, the ratio of net profit to total assets for earnings capability, the ratio of liquid assets to total assets for liquidity.

Table 3.3 provides summary statistics of these 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 3.4.[17]

Table 3.3 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 3.4 Descriptive Statistics for the periods 1988-2001 and 2002-2009

1988-2001

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

[17]Tables summarize the data after corrupt observations are controlled for.

2002-2009

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

3.5.2. The Econometric Model

At first, in order to have a better understanding about the basis of the empirical analysis, we focus on the simplified version of the model for the bank lending channel which is developed by the Ehrmann et. al. (2003) in the spirit of the Stein (1998) framework.

In the model, the demand for loans of bank *i* (L_i^d) is:

$$L_i^d = \varphi_1 y + \varphi_2 p - \varphi_3 r_{L,i} \quad (3.1)$$

with *y* referring to real aggregate output, *p* to price level and $r_{L,i}$ to loan interest rate and all coefficients being positive. The balance sheet identity of bank *i* , which acts in a loan market characterized by monopolistic competition, is given by:

$$L_i + S_i = D_i + B_i + C_i \quad (3.2)$$

Asset side consisting of banks' loan L_i and banks' security holdings S_i should be equal to the liability side, which includes demand deposits D_i , non-secured funding B_i and the banks' capital C_i.

Additional assumptions are that the bank capital is linked to the level of loans to meet the regulatory minimum capital requirements and banks' security holdings to

the amount of deposit to meet the liquidity requirements, which can be simplified as in (3.3) and (3.4) respectively;

$$C_i = aL_i \tag{3.3}$$

$$S_i = \delta D_i \tag{3.4}$$

The deposits are secured, but not bear interest and they are demanded due to their role as a means of payment. In line with the money-demand function, the deposit demand is inversely related with the interest rate of an alternative risk-free asset r_s , which is taken as the monetary policy rate as;

$$D = -\gamma_0 r_s \tag{3.5}$$

where γ_0 being positive. According to equation (3.5), the deposit is exogenous to the bank in the sense that it cannot influence the amount of deposit demands and it will decline following a monetary contraction, i.e., an increase in the r_s. On the other hand, the bank can raise funds by using external sources, which are unsecured and bank i pay interest rate $r_{B,i}$ for its external finance. The external finance premium over the risk free rate depends on the signal of the banks' health, x_i, which can be observable by the market and is an indication of banks creditworthiness.

$$r_{B,i} = r_s \tag{3.6}$$

where $1 < \mu - \theta_0 x_i$ for $\forall_i$. Bank i can raise unsecured finance provided that it pays at least $r_{B,i}$ and accordingly, it would not be ready to pay more than $r_{B,i}$, as $r_{B,i}$ is a cost factor.

The profit function of bank i is given by;

$$\pi_i = L_i r_{L,i} + S_i r_s - B_i r_{B,i} - \omega_i \tag{3.7}$$

where ω_i refers to the bank specific administrative costs and remuneration costs for the required capital holdings.

When the first order conditions are set to zero, we get the following expression for the optimal amount of loans as;

$$L_i = \frac{\varphi_2}{2}\, y + \frac{\varphi_3}{2}\, p - \frac{\varphi_1 \mu\,(1-\alpha)}{2} r_s + \frac{\varphi_1 \gamma_0 (1-\alpha)}{2} x_i r_s - \frac{\varphi_1}{2} \cdot \frac{\partial \omega_i}{\partial L_i} \qquad (3.8)$$

As we can see from the expression, a monetary policy contraction through an increase in interest rates, r_s , causes a reduction in the deposits according to equation (3.5). Banks are not able to maintain the asset side of their balance sheet unless they increase other sources of funding. However, the bank has to pay a higher interest rate on these funds as a result of the monetary tightening in line with equation (3.6) Since banks pass part of this higher cost to their loan interest rate, $r_{L,i}$, we have a negative coefficient of r_s in the model.

The empirical specification is a minor modification of the banks' loan supply function in (3.8), which is a function of banks' observable characteristics 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.

In contrast to studies which make use of static models in bank lending, we introduce some dynamics in our model to take into account the effects of past loan realizations on current loan realizations following Ehrmann et al. (2001). There are two main arguments to allow for such dynamic effects in the loan supply model. First, current loans may be influenced by past loans due to the close relationship between banks and their customers, which may cause the so-called lock-in effects. In such a stable relationship, the bank has informational monopoly over the customer, and this makes it costly for the borrower to change the bank, since the services of the new bank will be more expensive as it needs to collect information about the new client. Second, monetary policy can also affect lending behaviour with a lag as a result of the long-term contractual commitments. Thus, lagged values of explanatory variables may be relevant to current loans as well (Golodniuk, 2006).

Instead of modelling level of loans, we model growth rate of bank lending and hence, estimate the model in first differences. Firstly, this choice stems from the non-stationarity in data. Furthermore, this approach is more appropriate due to the fact

that banks react to a change in the monetary policy by adjusting the new loans. While it is true that the level of loans approximates the stock of loans, the flow can be better approximated by the first difference (Ehrmann et al., 2001). Therefore, utilizing the model in growth rates would be a more accurate way of analysing bank lending behaviour.

The empirical model is therefore expressed by the following equation:

$$\Delta\log(L_{i,t}) = \alpha_i + \sum_{j=1}^{l} \gamma_j \, \Delta\log(L_{i,t-j}) + \sum_{j=0}^{l} \beta_j \, \Delta MP_{t-j} + \sum_{j=0}^{l} \delta_j \, \Delta\log(GDP_{t-j}) + \sum_{j=0}^{l} \vartheta_j \, CPI_{t-j} + \mu X_{i,t-1} + \sum_{j=0}^{l} \theta_j \, X_{i,t-1} \Delta MP_{t-j} + + \varepsilon_{i,t} \quad (3.9)$$

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 and *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 (3.9), the growth rate of bank lending, $\Delta\log(L)$, is regressed on changes in the interest rates, ΔMP, controlled by 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 loan demand movements and effects of macroeconomic developments on bank lending. With

better economic conditions, the number of projects becoming profitable in terms of expected net present value increases, which in turn causes a rise in demand for credit (Kashyap et al.,1993). In an attempt to identify cross-sectional differences in lending responses, real GDP is generally used to isolate movements in total loans caused by shifts in loan demand. In short, the 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).

The bank specific characteristics, which are employed in our econometric model, 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).

In the above specification, one can clearly test whether certain bank specific characteristics have an effect on loan supply by looking at the statistical significance of the coefficients in the vector μ. Furthermore, estimated values for coefficients β_j and θ_j have greater importance when examining the existence of the bank lending channel. Since it is assumed that banks, in general, cut lending following a monetary

tightening, β_j is expected to be negative. On the other hand, it is assumed that small and financially weak banks react more strongly to a monetary policy shock than financially sound banks. So monetary tightening is expected to depress bank lending less for banks with strong balance sheet, which would be reflected in a positive coefficient of θ_j. It could be verified whether some bank specific characteristics affect the impact of monetary policy shocks on the loan supply by looking at the significance of the coefficients of the interactions of the bank specific characteristics with the monetary policy indicator. In other words, statistically significant coefficients in the θ_j may be interpreted as the existence of distributional effects of monetary policy on bank lending.

Several ways to test the robustness of the estimation results are utilized in past research. For example, some studies run simpler regressions with no bank specific variables or including them one at the time. Some authors introduce additional interaction terms, where two or more bank specific characteristics interact with each other or bank specific variables interact with control variables such as real GDP or CPI (Ehrmann et al., 2001; Gambacorta, 2005). Another modification that is frequently employed is to include a complete set of time dummies instead of the control variables, which is based on the assumption that relevant time effects are captured by the inclusion of these macroeconomic variables (Ehrmann et al., 2001). While using a 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). Following this approach, we consider a model where macro variables are replaced by time dummies and compare the estimated values of the coefficients on the interactions terms between this specification and our baseline model as a sort of specification test.

3.5.3. Econometric Methodology

The inclusion of the lagged dependent variable to the baseline loan supply equation (3.9) incorporates dynamics into the model, necessitating the use of rather more

advanced dynamic panel methods instead of standard panel data estimation techniques.

The first order dynamic panel data regression can be stated as

$$y_{it} = \alpha y_{i,t-1} + \beta x_{it} + u_{it}; \qquad i = 1, \dots, N \quad t = 1, \dots, T \tag{3.10}$$

where α is a scalar, x_{it} can be a vector of current and lagged explanatory variables, *i* denotes cross sectional units and *t* shows the number of time periods.

$$u_{it} = \mu_i + \vartheta_{it} \qquad\qquad E[\mu_i] = E[\vartheta_{it}] = E[\mu_i \vartheta_{it}] = 0$$

Here, the error term has two orthogonal components: the fixed effects μ_i and the idiosyncratic shocks ϑ_{it}.

The inclusion of the lagged dependent variable leads to biased and inconsistent Ordinary Least Squares (OLS) estimators. As y_{it} is a function of μ_i, $y_{i,t-1}$ is also a function of μ_i. Hence, $y_{i,t-1}$ is correlated with the fixed effects in the disturbance term, giving rise to 'dynamic panel bias' (Nickell, 1981). Hence, a transformation of the data is needed in order to remove the dynamic panel bias. In this regard, neither of the within transformation for the fixed effects estimator or the random effects Generalized Least Squares (GLS) estimator is unbiased and consistent in dynamic panel data models.

Anderson and Hsiao (1981) suggest first-difference transformation to eliminate the unobserved heterogeneity and then using $\Delta y_{i,t-2} = (y_{i,t-2} - y_{i,t-3})$ or $y_{i,t-2}$ as an instrument for $\Delta y_{i,t-1} = (y_{i,t-1} - y_{i,t-2})$, if the ϑ_{it} are not serially correlated. However, this instrumental variable estimation method produces consistent, but not necessarily efficient estimators. Arellano (1989) find that for simple dynamic error components model the estimator that uses levels $y_{i,t-2}$ is preferred to one that uses the differences $\Delta y_{i,t-2}$. For instance, for *t=3*, $y_{i,t-2}$ is a valid instrument, whereas $\Delta y_{i,t-2}$ is not available until *t=4*.

Arellano and Bond (1991) propose a Generalized Methods of Moments (GMM), which provides significant efficiency gains compared to the Anderson and Hsiao (1982) estimator, by exploiting the available moment conditions in the first-difference transformation, i.e.; relying on a greater number of instruments. Further, Areallno and Bover (1995) suggest forward orthogonal deviations transform instead of differencing. Verifying the efficiency gains for this approach, Blundell and Bond (1998) show that if data is highly persistent, first-differenced GMM estimators perform poorly as untransformed lags are weak instruments for transformed variables and weak instruments could cause large finite sample biases. Blundell and Bond (1998) build a system estimator with first-differenced instruments for the equations in levels and instruments in levels for the equations in first-differenced. Accordingly, while the estimation for both the levels and first-differenced equation is known as system GMM, that of only the first-differenced equation is called as difference GMM. In what follows, we lay out a brief description of these models.

To be more precise about the statements, we consider the simple autoregressive model with no regressors.

$$y_{it} = \alpha y_{i,t-1} + u_{it}; \qquad i = 1, \dots, N \quad t = 1, \dots, T \tag{3.11}$$

where $u_{it} = \mu_i + \vartheta_{it}$ with $\mu_i \sim IID(0, \sigma_\mu^2)$ and $\vartheta_{it} \sim IID(0, \sigma_\vartheta^2)$ independent of each other and among themselves. Lack of serial correlation is assumed; hence $E[\vartheta_{it}\vartheta_{is}] = 0$ for $t \neq s$.

With these assumptions, the following moment conditions hold for the equations in differences:

$$E = \left[y_{i,t-s}\Delta\vartheta_{it}\right] = 0 \qquad for\ t = 3, \dots, T\ and\ s \geq 2 \tag{3.12}$$

This can also be written as

$$E[Z_i'\Delta\vartheta_i] = 0$$

where Z_i is the matrix of instruments given by

$$\begin{bmatrix} y_{i1} & 0 & 0 & \dots & 0 & \dots & 0 \\ \vdots & y_{i1} & y_{i2} & \dots & 0 & \dots & 0 \\ \vdots & \vdots & \vdots & \dots & \vdots & \dots & \vdots \\ 0 & 0 & 0 & \dots & y_{i1} & \dots & y_{i,T-2} \end{bmatrix} \qquad (3.13)$$

and $\Delta\vartheta_i = (\Delta\vartheta_{i3}, \Delta\vartheta_{i4}, \dots., \Delta\vartheta_{iT})'$. Hence, these moment conditions described above imply that the use of lagged levels dated *t-2* and earlier are valid instruments for the equations in first-differences. That leads to a consistent estimator of α as $N \to \infty$ and T fixed.

The asymptotically efficient GMM estimator based on this set of moment conditions minimizes the quadratic distance $\Delta\vartheta' Z W_N Z' \Delta\vartheta$ for the weight matrix W_N. The one-step consistent GMM estimator is

$$\hat{\alpha} = [\Delta y_{-1}' Z W_N Z' \Delta y_{-1}]^{-1} \Delta y_{-1}^{'} Z W_N Z^{'} \Delta y \qquad (3.14)$$

where $\Delta y_i'$ is the (T-2) vector $(\Delta y_{i3}, \Delta y_{i4}, \dots, \Delta y_{iT})$ and $\Delta y_{i,-1}'$ is the (T-2) vector $(\Delta y_{i2}, \Delta y_{i3}, \dots, \Delta y_{i,T-1})$.

In general, the weight matrix is

$$W_N = \left[\frac{1}{N}\sum_{i=1}^{N} Z_i' \widehat{\vartheta_\iota} \widehat{\vartheta_\iota'} Z_i\right]^{-1} \qquad (3.15)$$

where $\widehat{\Delta\vartheta_\iota}$ are the residuals obtained from the initial consistent estimator $\hat{\alpha}$. The resulting estimator is referred to two-step GMM estimator by Arellano and Bond (1991). The one-step and two-step GMM estimators are asymptotically equivalent if the ϑ_{it} are independent and homoscedastic both across units and over time.

If there are additional regressors x_{it} as in (3.10), then different moment conditions would be available depending on the correlation between x_{it} and two components of the disturbance term.

Under the assumption of lack of serial correlation, we further assume that x_{it} is correlated with the individual effects μ_i, just as y_{it}. If x_{it} are endogenous in the sense that it is correlated with ϑ_{it} and earlier shocks, but uncorrelated with $\vartheta_{i,t+1}$ and subsequent shocks, then lagged values of $x_{i,t-2}$, $x_{i,t-3}$ and longer lags would be valid instruments for the first-differenced equation of equation (3.10). Therefore; (x_{i1},…., $x_{i,t-2}$) should be added to each diagonal element of Z_i in (3.13). If x_{it} is predetermined where x_{it} and ϑ_{it} are also uncorrelated, but x_{it} may be correlated with $\vartheta_{i,t-1}$ and earlier shocks; then $x_{i,t-1}$ became additionally a valid instrument in the first-differenced equation for the period *t*. In this case, (x_{i1},…., $x_{i,t-2}, x_{i,t-1}$) should be added to each diagonal element of Z_i. If x_{it} is strictly exogenous in the sense that x_{it} is uncorrelated with past, present and future shocks, then all the x_{it} are valid instruments for the first-differenced equation of (3.10). Hence, (x_{i1},…., x_{it}) should be added to each diagonal element of the matrix of instruments in (3.13). Also, if we assume that x_{it} is uncorrelated with the unobserved individual effects μ_i, further moment conditions are available. In that case, there are valid instrumental variables for the untransformed levels equation as well.

Arellano and Bover (1995) notes the case where there is a correlation between the level of explanatory variable x_{it}, and the individual effects, but no such correlation exists between the first-differences Δx_{it}, and the individual effects. In that case, suitably lagged differences of Δx_{is} can be used as instruments for the equations in levels for period *t*.

Further, Blundell and Bond (1998) discusses that lagged differences of the dependent variable could be used as instruments for the regression in the level equation depending on the validity of the stationarity assumption about the initial conditions y_{i1}.

To be more precise, we again consider the simple autoregressive panel data model with no exogenous regressors in (3.11). The stationarity condition implies;

$$E[\mu_i \Delta y_{i2}] = 0 \qquad for\ i = 1, \dots \dots, N \qquad (3.16)$$

This condition (3.16) combined with the conditions of the first-differenced model leads to T-2 non-redundant linear moment conditions.

$$E\left[u_{it}\Delta y_{i,t-1}\right] = 0 \qquad for\ i = 1, \dots \dots, N \qquad t = 3, \dots \dots, T \qquad (3.17)$$

This estimator combines T-2 equations in differences with the T-2 equations in levels into a single system, where it uses the lagged first-differences of the series as instruments for the equation in levels and the lagged levels of the series as instruments for the difference equation. Accordingly, the instrument matrix is

$$\begin{bmatrix} Z_i & 0 & 0 & \dots & 0 \\ 0 & \Delta y_{i2} & 0 & \dots & 0 \\ 0 & 0 & \Delta y_{i3} & \dots & 0 \\ \vdots & \vdots & \vdots & \dots & \vdots \\ 0 & 0 & 0 & \dots & \Delta y_{i,t-1} \end{bmatrix} \qquad (3.18)$$

The complete set of second-order moment conditions is given by

$$E[Z_i^* u_i^*] = 0 \qquad (3.19)$$

where $u_i^* = (\Delta\vartheta_{i3}, \dots \dots, \Delta\vartheta_{it,}\, u_{i3}, \dots \dots, u_{it})'$.

Furthermore, Blundell and Bond (1998) provide simulations that compare the finite sample performance of the first-differenced and system GMM estimators and find that system GMM estimator reduces finite sample bias and has much greater precision when the series is highly persistent.

The consistency of the GMM estimators is critically based on the lack of second-order serial correlation in first-differenced residuals; that is $E[\Delta\vartheta_i \Delta\vartheta_{i,t-2}] = 0$. In this context, a test for autocorrelation is proposed by Arellano and Bond (1991) with the null hypothesis of no autocorrelation and is applied to differenced disturbances. Accordingly, two test statistics, AR (1) and AR (2), can be computed to test for the absence of first and second order serial correlation in the first-differenced error. While the test for AR (1) process in first differences is expected to be rejected, the test for AR (2) in first differences is crucial, since it will detect autocorrelation in levels.

Both for the difference GMM and system GMM estimation, the Sargan test of over-identifying restrictions is computed to test the validity of GMM instruments. This test for model specification has the null hypothesis that instruments and errors terms are independent. This test is asymptotically distrusted as χ^2 with degrees of freedom equal to the degree of over-identification. Furthermore, the validity of the additional moment conditions on the system GMM can be tested using a Difference-Sargan test. This statistic is simply the difference between the Sargan test statistic computed from the system GMM and the Difference GMM. It is asymptotically χ^2 with the degrees of freedom equal to the number of instruments used in levels equations.

This study has used two-step GMM estimation, where the standard errors are asymptotically more efficient than the one-step estimation. However, they are downward biased. Accordingly, the standard errors of coefficients are computed by using Windmeijer's (2000) small-sample variance correction. Notably, two-step estimators produce heteroscedasticity-consistent Sargan test as well.

Furthermore, as noted by Roodman (2009), the GMM estimators can generate moment conditions prolifically. Too many instruments may overfit endogenous variables and weaken the power of Sargan test of over-identifying restrictions. Therefore; we limit the number of instruments by using only certain lags instead of all available lags for instruments in order not to cause finite sample bias. Using

deeper lags would reduce our sample size, since the number of banks used in the empirical analysis is not large enough and besides, our models have a high number of regressors as well.

Against this background, we employ GMM for dynamic model panel data models in the empirical analysis of the bank lending behavior. This estimation approach is appropriate for several reasons. First, we want to allow for the dynamic nature of the model by including lags of the loan growth, since choice of current loans may be affected by past loans. We also want to control for unobserved individual effects resulting from considerable differences across banks and the possible simultaneity between the individual effects and explanatory variables. Moreover, we need to account for the potential endogeneity of the regressors, because most of the right-hand-side variables used in the empirical analysis, specifically variables that measure bank financial soundness, are derived from banks' balance sheets and income statements. Hence, we need to deal with the estimation problems introduced by endogeneity and hence, relax the assumption of strict exogeneity of explanatory variables. In sum, the GMM approach allows us to control all of these considerations and provide efficient and consistent estimators and hence, it is superior to alternative estimation techniques.

In the light of these, we estimate equation (3.9) by using the difference GMM approach for dynamic panel data models put forward by Arellano and Bond (1991). [18]

3.6. Estimation Results

In this section, we examine the empirical results of the hypotheses discussed in section 3.4 for the period 1988-2009. The key results of the study[19] are reported in

[18] We also consider two-step estimation in system GMM; 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 3.5**,** 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. Since Turkish banking sector has undergone a massive restructuring process starting in the mid-1999 and Turkish economy witnessed severe economic crises in 2000-2001, which constitute a possible structural break, covering the whole period may fail to capture unique dynamics of the pre and post-crisis periods. However, 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. By estimating our model for the two sub-periods; 1988-2001 and 2002-2009, we aim to examine whether there exist any time varying characteristics of banks' lending behavior before and after the crisis.

The first column presents the estimated coefficients of the baseline model for the whole period 1988-2009. 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. Except management capability and earnings, we find significant linear relationship between bank characteristics and the growth rate of loans in this period. While capitalization, liquidity, asset quality seem to influence bank lending positively, size impinges negatively on growth rate of loans. As regards with 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.

[19] All empirical analyses in this study are done with STATA version 10.

Table 3.5 Regression Results: Baseline Model

Dependent Variable:ΔLt	(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 estimating the baseline model for sub-period 1988-2001 and sub-period 2002-2009 respectively. Our results reveal considerable differences in terms of 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 monetary policy shocks. However, it should be noted that we cannot quantify the effects of monetary tightening on the lending of banks with different characteristics by using these point estimates; we can just utilize them to compare such effects between the two periods.

First of all, the estimation outcomes 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 percent increase in the interest rate leads to a decrease in the growth of loans by 0.23 percent, whereas, the corresponding estimate implies a decline in loan growth by 0.37 percent 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 of the monetary policy in the second period 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. One may expect that the deregulation of the financial system might lessen the sensitivity of banks' lending responses to policy changes and hence, reduce the scope of an operational bank lending channel. Since it is the opposite for Turkish case, we expect to see an increase in the scope of the bank lending channel in the second era due to increased regulation.

First of all, following the influential financial crisis of 2000-2001, the effectiveness of monetary policy has increased as a result of the change in monetary policy regime and improvements in the economic fundamentals. Not only transition to the inflation targeting and the introduction of the floating exchange rate regime, but also weakened fiscal dominance, diminished dollarization and reduced exchange rate pass-through to prices have enhanced the effectiveness of monetary policy. The new of role of interest rates as a policy tool, coupled with a more responsive aggregate demand to real interest rates have brought about an increase in the effectiveness of monetary policy (Başçı et al., 2007).

Furthermore, the post-crisis era was a turning point for the Turkish banking sector with the ongoing radical structural transformation process. During the 1990s, Turkey adopted a '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 (Bakir 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 (Çavuşoğlu, 2002; Bakir and Öniş, 2010). Moeover, Turkish banking sector was associated with a high degree of politicization of bank lending and regulation, which resulted in poor supervision and regulation of the sector during this period (Bakir and Öniş, 2010). In sum, banks focused to finance the state in an environment of macroeconomic instability and underdeveloped regulatory and supervisory infrastructure during the first period.

However, these conditions have alleviated in the post-crisis era with the launch of the comprehensive economic programme. During the second period, not only were reforms aimed at restructuring banking and public sector going on, but the banks also started to operate in the new regulatory environment with the establishment of the 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, caused an increase the supply of loanable funds. 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, rather than to finance government expenditures, in the aftermath of the 2000-2001 financial crisis.

To sum up, bank lending react to monetary policy impulses with greater intensity in the post crisis period. The shift to a new monetary policy regime, followed by an increase in the effectiveness of monetary policy, combined with the development of the banking sector in a new regulatory environment and growing macroeconomic stability could account for the increase in the financial intermediation of banks and hence, the stronger effect of the monetary conditions on the growth rate of loans in the second period.

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 the same way 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 might be in line with the explained structural change in the sector. As the banking sector become more operative and move toward its role as a financial intermediary in 2002-2009 period the sectors' lending behaviour become more supply oriented than demand driven, thus the coefficient of GDP is smaller in this period. However, in the 90s the sectors' main role was to finance government deficits which explains the larger coefficient of the GDP variable.

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.

The estimation results are meant to show several features of the loan supply response of Turkish banks, depending on their balance sheet characteristics. In addition to analyzing how financial strength of banks help banks to mitigate the effects of monetary policy shocks, we also examine the direct relationships between bank strength and lending activity in order understand the importance of banks characteristics for the transmission of monetary policy, i.e. whether they matter for bank lending or not. The 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.

Based on our estimation results, there exists 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 sign for the two sub-periods; namely, it has a negative sign for the first period and positive for the second. This means that in the first period, the larger the bank, the stronger its lending reacts to monetary policy shocks and in the second period, the smaller the bank, the more its loan supply was affected by the event of monetary policy changes. In the period 1988-2001, the interaction of bank size with monetary policy has incorrect sign, suggesting that monetary policy does have a greater impact on the lending of large banks. This is contrary to the expected result in the bank lending channel literature, and it could be interpreted as that bank size is not relevant in capturing the monetary policy effects on bank lending for that period. On the other hand, the positive coefficient of the interaction term in the second period is consistent with the lending channel story, which presumes that lending volume of larger banks are less sensitive to monetary policy conditions than that of smaller banks, i.e. large banks buffer to monetary policy shocks. Therefore, it could be concluded that there exist cross-sectional differences in the response of lending to monetary policy shocks resulting from differences bank size in the 2002-2009 period.

Concerning the relationship between capitalization and the growth rate of loans, the estimation outcomes reveal that capitalization has explanatory power in both periods. The degree of capitalization has a supportive effect on the lending of banks, especially for the first period, where the coefficient has a surprisingly higher 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 result is consistent with theoretical predictions of the bank lending channel literature, since bank capital provides a signal about banks' creditworthiness. Less capitalised banks, which would be perceived as riskier by the borrowers, suffer a higher degree of asymmetric information problems in the credit markets and are less able to shield their loan supply in the wake of changes in the interest rates. Accordingly, banks with high capitalization ratios are less likely to cut back their loan supply in response to a change in monetary policy stance. This finding indicates the presence of a bank lending channel of monetary policy operating through banks' degree of capitalization in the post-crisis period. 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 the undercapitalization of Turkish banking sector prior to the 2000-2001 financial crisis. Moreover, one of the conditions for bank capital to have an impact on lending is that breaking the minimum capital requirement should be costly and accordingly, banks tend to limit the risk of future capital inadequacy (Van den Heuvel, 2002; Gambacorta and Ibanez, 2011). This does not seem to hold in Turkey for the first period, as banks do not comply with the limit of capital adequacy regulations and as a result, capital constraints do not restrict their lending supply. However, in the second period this does not apply, since banks have improved their capital structures as a result of implementation of the Bank Capital Strengthening Programme, which required banks to reach 8 percent capital adequacy ratio. Therefore; our results regarding capitalization, which suggest a change in the way bank loans respond to changes in monetary policy stance between the 1988-2001 and 2002-2009 periods, is relevant; since different regulatory requirements coupled with the change in enforcement of them have altered the effective capital constraint in the post-crisis era.

In both sub-periods, the coefficients on 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, which is in line with the standard expectations of the bank lending channel literature. However, liquidity is found to have a 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. Banks could

avert from liquidity and interest rate risk by holding higher liquid assets in their asset portfolio, which, in turn, enable them to provide new loanable funds at lower cost. In line with the increased confidence in the economy and improvements in sources of funding, banks have decreased liquid assets in their portfolio during the post-crisis era. This fact also signals the increase in the liquidity risk in the second period compared to 1988-2001 period. While interaction between liquidity and monetary policy indicator is statistically significant in both periods, it turns out to be unexpectedly negative in the pre-crisis period. This finding could result from the risk aversion motive of banks during that period. In this case, banks choose to hold higher level of securities not to serve as buffer stocks to cushion the adverse effects of interest rate shocks, but to protect themselves against a greater risk. On the other hand, for the second period, positive significant coefficient of the interaction term suggest buffer stocking behaviour, in the sense that banks with high holdings of liquid assets could shield their loan supply in the wake of monetary tightening simply by drawing dawn their cash and security stocks. This means that less liquid are less able to shield their loan portfolio and more likely to reduce their lending in response to the interest rate shock, which points to an operative bank lending channel in the 2002-2009.

The estimations show a significant linear effect of earnings capacity on the growth rate of loans in both periods, but the direction of the relationship is the 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. This diversification in banks' earnings is a relevant factor in influencing banks' ability to supply credit in the second period. Regarding with the distributive effects of monetary policy, the outcomes of the estimations reveal that earnings make a difference among banks in

their reaction to monetary policy shocks only in the first period. Banks with higher earnings potential and higher franchise value are less likely to suffer from asymmetric information problems in the credit market, so we expect those banks to be less prone to monetary policy. Consistent with this expectation, positive and significant coefficient in this sub-period indicates that financially strong banks with high earnings ratios display weaker loan adjustment in the wake of interest rate changes. However; we fail to find such a significant impact in the period 2002-2009, although the sign of the coefficient of interaction term is as expected.

The coefficients characterizing the linear relationship between asset quality and the growth rate of loans are significant and have correct positive sign for the two periods. They are as of same magnitude in the two periods as well. According to estimation results, asset quality seems to have an impact on lending reaction to monetary conditions in both periods, but with a slight more intensity in the second period. Since banks' asset quality is perceived as an indicator of default possibility by the market, the positive coefficient of the interaction of this characteristic with the monetary policy reveals that banks with better loan portfolios have a 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.

Based on our estimation results, only in the post-crisis era do managerial quality affect the growth rate of bank loans and explain the effect of monetary policy on lending. Management quality is not an important factor in the first period, since both the coefficients of management and its interaction with monetary policy lacks statistical significance although the signs are as expected. This result is not surprising given the poor governance structure of the banking sector before the initiation of the banking restructuring programme. Underdeveloped regulatory and supervisory frameworks and a high degree of politicization of bank lending can be argued as the defining characteristics of the Turkish banking sector prior to 2000-2001 crisis. The sector suffered from moral hazards problems created by the poor regulatory and supervisory infrastructure, inadequately efficient audit activity, corporate governance failures and the full coverage deposit insurance system during that period. State

banks' decision making is highly motivated by political factors, such as subsidizing political constituencies and agriculture sector, which caused the so-called 'duty losses'. Moreover, public banks did not have to comply with many of the regulations applied to private banks and did not have to provide reserves for bad loans, which caused further distortions in the sector. On the other hand, in such a highly politicized bank lending environment, private banks displayed another kind of rent seeking behaviour. As an overwhelming majority of commercial banks were owned by families or industrial groups owned by families, they directed a considerable amount of their funds toward their companies as a result of the lax connected lending rules (Bredenkamp et al., 2009; Bakir and Öniş, 2010). This politicization process combined with the weak regulatory supervision and legal framework resulted in poor risk management mechanisms and corporate governance practices of the banking sector. However, with the establishment of the BRSA and initiation of the banking restructuring programme the sector has underwent through a great deal of rehabilitation and recovery and as a result, banking environment has improved significantly and started to operate in a strong regulatory framework in the post-crisis period. During this period, not only new corporate governance principles are introduced, but also full deposits insurance system is replaced by the limited coverage insurance system. Therefore; our estimation results regarding the management quality is relevant when these improvements are taken into account. For the 2002-2009 period, the significant linear positive relationship between management efficiency and growth rate of loans 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. As regards the distributive effects of monetary policy, the positive interaction term in the post-crisis period reveals that banks with high managerial quality suffer from less information friction in the financial markets, face a lower cost in raising external funds accordingly, and do not have to restrain their lending following monetary policy tightening. This provides evidence for the existence of the bank lending channel operating through management quality in this period. However, the 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.

As a robustness check, we estimate an alternative specification where all macro variables are replaced by a complete set of time dummies. We include one lag of the loan growth, contemporaneous and one lag for all other variables. The estimation results of this specification for the 1988-2009 period, together with the sub-periods, are shown in Table A.3 in the Appendix A. The coefficients of the interaction terms between monetary policy and bank specific characteristics are similar in both models. Since the estimated coefficients in the model with time dummies do not change very much, it could be concluded that our model captures time effects quite well and this provides further support for the results of our baseline model.

Furthermore, we estimate the model just for the deposit banks, since 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. We report the results of these estimations for the sample of deposit banks in Table A.4. in the Appendix A. It is worth noting that the results do not vary drastically in general. The results for the 1988-2009 period presented in the first column of Table A.4. show that coefficients attached to macroeconomic variables and bank-specific characteristics have slight differences in terms of absolute value, but do not change sign and significance. Among the individual bank characteristics, the only exception is the earnings capability, which is found to be positive and significant for deposit banks. Regarding the distributive effects of monetary policy on bank lending, capitalization and earnings are found to be sources of asymmetric response of deposit banks to monetary policy stance, contrary to results including development and investment banks. As shown in the second column of Table A.4, the estimation results for the deposit banks over the period 1988-2001 are in line with that of the whole sample. However, stronger impact of monetary policy is detected for the deposit banks, since the coefficient of the monetary policy indicator is slightly larger in this case. In terms of direction and magnitude, coefficients of bank specific characteristics and their interactions with the interest rate remain similar with the results for all banks operating under the period 1988-2001, which is presented in the second column of Table 3.5. Only the coefficient associated with the interaction between bank size and monetary policy indicator changes sign, but is no longer significant. Third column of Table A.4 shows the

results for the commercial banks during the period 2002-2009, which are very similar with those obtained for all banks. In this case, none of the coefficients change sign or turn out insignificant, however many of them have lower significance level. In terms of magnitude of coefficients associated with bank specific characteristics, the impact of size and capital are found to be stronger on deposit banks, whereas the impact of liquidity and asset quality seems to be stronger for the development and investment banks. Regarding the distributive effects, size, liquidity, asset quality and managerial efficiency seem to have higher effect in the heterogeneous lending responses of deposit banks to monetary policy.

Finally, we also consider that banks may exhibit differences in their credit supply following monetary policy shocks with respect to their ownership types. Public sector banks may have higher ability to shield their loan supply in response to monetary policy shocks, because they have a relatively easier access to alternative external funds. More specifically, examining the impact of bank ownership in the lending channel of monetary policy transmission is important for Turkey, where state-owned banks account for a significant portion of the assets- nearly one third- and loan portfolio of the banking sector. Accordingly, we separately estimate our baseline model for sample of privately-owned banks. The results of these regressions are presented in Table A.5 in the Appendix A. We find that monetary policy induced change in interest rates has a noticeably higher impact on the credit supply of private banks in the post-crisis era, since the magnitude of the coefficient of monetary policy indicator is bigger than that in the baseline model for the entire sample. Furthermore, coefficient of the inflation rate turned out significant in this case. On the other hand, ownership status of banks does not seem to lead any significant differences in the lending behaviour in response to monetary policy actions during the pre-crisis period. Contrary to the results for the sample including public sector banks, interaction of capitalization with change in interest rate is found to have a positive and significant coefficient. Besides, the coefficient of earnings capability with interest rate changes is surprisingly not significant for the private banks over the 1988-2001 period.

3.7. Conclusion

This study investigates the role of banks in the monetary transmission mechanism in Turkey for the 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 financial system following the implementation of structural reforms and shift to inflation targeting regime in the aftermath of the 2000-2001 crisis, the analysis is further conducted for the two sub-periods: 1988-2001 and 2002-2009.

Building on micro level data on the Turkish banking system covering the period 1988-2009, the study examines whether monetary policy shocks are transmitted differently by banks with different characteristics by 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 specification. Thus, our results support the hypothesis that the bank lending channel exists 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 do to bank specific characteristics in the impact 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 transformation process in the economy. The shift to a new monetary policy regime, followed by an increase in the effectiveness of monetary policy, combined with the development of the banking sector in a new regulatory environment and growing macroeconomic stability could 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.

CHAPTER 4

AN EMPIRICAL ANALYSIS OF THE RISK TAKING CHANNEL OF MONETARY POLICY IN TURKEY

4.1. Introduction

The 2008 global financial crises has shown that even the world's most advanced financial systems are vulnerable to crisis and, failure or collapse of the international financial markets could have destructive effects on the real economies all around the world. The major credit expansion and the burst of a series of asset bubbles in the property markets fanned the flame for this turmoil, which resulted in disruptions in the global credit markets and endangered financial stability of the economy worldwide.

Policymakers and researchers have questioned the reasons behind the crisis, trying to provide some explanations on the forces behind the fragility of the global financial system. There seems to be a consensus on some possible causes of the crisis such as; the failure in the regulatory and supervisory frameworks, development of complex credit market instruments and poor governance practices. On the other hand, central banks are also blamed for putting on too accommodative monetary policies, which started a strong debate among economists. This argument posits that a prolonged period of extremely low interest rates and lax liquidity conditions encourage financial institutions to take on more risk. The supporters of this view argue that monetary policy is an important driving force in the emergence of the financial crisis. This claim becomes even more controversial, as many central banks lowered interest rates in response to the crisis in an attempt to overcome recession.

In the light of these developments, the debate over the relationship between monetary policy and financial stability has been intensified. During the pre-crisis period, central banks mostly disregard financial stability aspect, since the conventional wisdom for the practice of monetary policy was solely to maintain price stability. Ensuring price stability was thought to be the best contribution of central banks to enhance economic progress, whereas macroprudential tools are assumed by regulatory and supervisory authorities. Furthermore, developments in the credit transfer techniques that comes with financial innovation was often regarded as contributing to financial stability (Duffie, 2008; Altunbaş et al., 2010). However, as the global crisis displays that monetary policy actions may have consequences on financial stability, the role of the financial stability considerations in monetary policy decisions and ways to modify the existing monetary policy frameworks taking account of macro imbalances have come into question vigorously. Moreover, this turmoil suggest that monetary transmission mechanism might be more complex than it was previously thought to be, such that; its impacts are not limited on inflation and aggregate demand in the short-term, but indeed go beyond that and embrace the risk-taking tendency of economic agents with longer and unknown lags as well (Angeloni et al., 2010).

The question of how monetary policy affects banks' risk-taking incentives is key to the aforementioned policy debate. This discussion attracted considerable attention and formed the basis for the theory of risk-taking channel of monetary policy transmission that emerged recently. In short, risk-taking channel posits that an expansionary monetary policy for an extended period of time have an impact on risk perceptions or attitudes of banks. In other words, prolonged period of low interest rates induce banks to take more risk in their portfolio. In this case, the result is not only an increase in lending in line with the traditional transmission mechanisms, but the risk-taking channel also implies an increase in riskiness of lending, i.e.; a deterioration in the quality of portfolios. In this instance, monetary policy actions could contribute to the buildup of financial imbalances via its impact on risk attitudes, which could eventually result in a financial crisis.

Notably, banks play a prominent role both in the credit and risk-taking channel of monetary transmission mechanism, but in a different way. In the credit channel, a decrease in the interest rates lead to a rise in asset values, thereby increasing the collateral or net worth of the borrower and improving the debtors' repayment capability. In this case, banks are willing to increase the supply of loans to this borrower because it is less risky to lend money. In other words, there is no change in their risk tolerance and even, end up with a better risk position. On the other hand, the risk taking channel goes beyond to the effects of the interest rates on the riskiness of the borrower, but it is more about the behavior of banks, i.e. banks' incentives to undertake risk regarding the supply of credit. In that case, banks increase their lending as result of the increase in their risk appetite. To put differently, banks are willing to take on higher risks or to increase their credit supply for the same level of risk (Gaggl and Valderrama, 2010). Apart from these, it could also be stated that in some way, the risk-taking channel builds on the bank lending channel. While the bank lending channel assumes that banks' conditions are not neutral for monetary policy transmission mechanism, the risk-taking channel takes one step further and assumes that the direction of causality may run from monetary policy to bank risk (Altunbaş et al., 2010).

As a relatively recent issue of monetary transmission mechanism, risk-taking channel does not have a specific definition, but indeed, it is a common term used for various mechanisms at work, which are all mutually inclusive. While this new monetary policy channel has its gray areas at the time being, it deserves close exploration for a fuller understanding the link between the monetary policy and financial stability and to draw clear- cut policy conclusions.

The findings regarding the risk-taking channel have potentially important implications for the conduct and design of monetary policy, as a better understanding of risk taking channel may provide an insight for monetary authorities to adjust their policies in order to mitigate the adverse consequences of their polices on bank risk-taking and in turn, avoid the buildup of risks in the financial system. If policymakers understand banks' risk-taking incentives and focus on the potential impact of their polices on bank risk, they may find answers to when and how to be more cautious

and what factors they should take into account in their policy design. Furthermore, understanding the risk-taking channel would provide us comprehension regarding the macroeconomic implications of bank supervision and regulation as well.

The above-mentioned policy debate specifically identifies the period from early to mid 2000s as which policy interest rates had been too low for too long in the US and Europe and regards this period as the main driver for the increase in risk-taking. It has to be noted that this discussion is more loosely related to the Turkish case, because not only policy rates are not too low when compared to the United States or Europe, but also the monetary policy is not too accommodative for an extended period of time. Nevertheless, we believe that there is a strong case for studying risk-taking channel in Turkey for a number of reasons. First of all, while it is true that interest rates are not as low as that of some countries like, US, UK, France, etc., we can still claim that interest rates reached historically low levels; i.e. below their historical norms, in Turkey in the period following the 2000-2001 financial crisis if country-specific conditions and dynamics are taken into account. Furthermore, monetary authorities adopted implicit inflation targeting from 2002 to 2006, and moved on to explicit inflation targeting from 2006 onwards. Risk-taking channel is more likely to prevail under this policy framework with decreased levels of uncertainty, and hence, in that sense, Turkey provides an ideal setting to empirically analyze the link between low interest rates and bank risk-taking. Bank-based financial system of Turkey is another factor that may increase the potency of a risk-taking channel as well. In this sense, we place particular emphasis on how monetary policy actions impact risk perception and risk-taking of banks. Therefore, our analysis regarding the risk-taking channel focuses on investigating the relationship between the stance of monetary policy and banks' risk appetite.

Against this background, this paper aims to analyze the impact of monetary policy stance on Turkish banks' risk during the 2002-2012 period. This study is innovative in several respects. To the best of our knowledge, this study is the first one that addresses the relation between low interest rates and bank risk and hence, examines the risk-taking channel in Turkey, bringing additional insights to the monetary transmission mechanism in Turkey. In addition to that, this study sheds light on the

bank specific characteristics which may have an impact on bank risk and also examine the differential responses of banks with different characteristics to monetary policy shocks in terms of their risk-taking. Furthermore, our computation of risk–taking behavior presents another novelty in the sense that instead of relying on one particular risk measure as done by most studies on the risk-taking channel, we employ alternative risk indicators in an attempt to cover different aspects of risk-taking behavior. Even more, we use accounting-based indicators together with a market-based indicator. Apart from these, the scant empirical literature on risk taking channel focuses mostly on the advanced countries and further, mainly examines the effectiveness of the channel at the international level. Therefore, our study is one of the handful studies in providing empirical evidence for an emerging market.

There are some important caveats that need to be asserted before going into details of our analysis. First, we do not make any inferences on the optimality of risk choices of banks, as from a theoretical viewpoint, it may be optimal for a bank to engage in riskier projects when interest rates are low and further, it may also be the socially optimal outcome of monetary policy during recession periods as well. To put it in another way, this higher risk-taking may be a result of optimal adjustment and hence, is not necessarily the sign of banks acting less responsible or taking risks in an excessive way. (De Nicolo et al., 2010; Apel and Claussen, 2012). Second, there is a part of literature positing that risk-taking channel principally refers to new risk, i.e. new loans. In other words, it refers to incentives of banks to engage in ex-ante risky projects. Along these lines, it is crucial to distinguish between the realized risk and new risk to draw an accurate inference concerning the relationship between monetary policy and bank risk-taking. This necessitates the use of comprehensive data on individual bank loans from credit registers, which provides information on lending standards, loan performance etc. Unfortunately, such detailed data is not available for Turkey. Actually data on individual loans borrower characteristics is confidential in most cases and available for very few countries that maintain a credit register (Altunbaş et al., 2010). Accordingly, it is not surprising that there are only a handful of studies in the literature (Jimenez et al., 2009; Ioannidou et al., 2009; Lopez et al., 2010; 2012), which make use of such detailed data to analyze the interest rate-bank risk nexus. In short, as we would have preferred to work on such comprehensive

datasets that convey more information, it would not be wrong to say that this study is somewhat limited by the availability of the data.

In this study, we empirically test for the existence of the risk-taking channel by analyzing the panel of banks operating in Turkey for the period 2002-2012, using four different risk indicators. We control for a number of factors that may have an impact on banks' risk such as macroeconomic activity, stock market returns, and banking market structure. We further analyze the relationship between low interest rates and bank risk relatively to bank-specific characteristics, namely size, liquidity and capitalization. Finally, we examine whether there exists heterogeneous response of banks in terms of their risk-taking decisions in a low interest rate environment, stemming from their individual characteristics.

Our results, obtained by using GMM for dynamic panel data developed by Arellano-Bover (1995)/ Blundell-Bond (1998), provide some evidence for the existence of a risk-taking channel of monetary policy for Turkish banks, when assessed using four alternative risk measures.

The remainder of this chapter is organized as follows: The next section offers a survey of theoretical and empirical literature on the risk taking channel. Section 3 describes the data used in the analysis. Section 4 presents the econometric model and methodology. After that, in section 5 the estimation results and their interpretations are discussed. Finally, Section 6 concludes.

4.1. Literature Review

4.2.1. Theoretical Background of the Risk-Taking Channel

The elements of the theory of risk-taking channel can be traced in the theoretical propositions of some previous studies such as; Gibson (1997); Keeley (1990); Allen and Gale (2000;) Dell' Ariccia and Marquez (2006); Rajan (2006), and Matsuyama

(2007).[20] Although some of the mechanisms have been discussed previously, the term 'risk-taking channel' of monetary policy is firstly appeared in a paper written by Borio and Zhu (2008) in which they point to the potential relationship between low interest rates and increased bank risk-taking. Specifically, Borio and Zhu (2008) describe the risk-taking channel of monetary transmission mechanism as "the impact of changes in policy rates on either risk perceptions or risk-tolerance and hence on the degree of risk in the portfolios, on the pricing of assets, and on the price and non-price terms of the extension of funding."

Risk-taking channel could operate in several different ways. First one is through the effect of low interest rates on valuations, income and cash flows. A reduction in interest rates boosts asset prices and collateral values as well as incomes, which in turn, lead to a reduction in risk perception and/or increase in risk tolerance. Evidence for the impact of higher wealth on risk tolerance lie in the downsized estimates of probabilities of default, loss given default, and volatilities. Therefore, reduced volatility tends to release risk budgets and encourages positions of higher risk in rising markets. A complementary argument is provided by Adrian and Shin (2010) who suggest that after a positive shock to asset prices as a result of lower interest rates, the value of bank's equity relative to its debt increase, thereby leading to a reduction in leverage. The drop in leverage lead to spare capacity on the balance sheet such that equity is now larger than it is necessary to meet the Value-at-Risk.[21] Accordingly, bank would respond to this fall in leverage by increasing its holdings of risky securities. Adrian and Shin (2010) further posits that these adjustments in the bank balance sheets, which are determined by the changes in measured risk, in turn, amplify business cycle movements.[22]

Another mechanism the risk-taking channel may operate through is the 'search for yield (Rajan, 2006). In a low interest rate environment, the incentives of asset managers to engage in more risky projects rise for a number of reasons. Primarily,

[20] Disyatat (2010) proposes a reformulation of the bank lending channel, in which monetary policy affects, primarily banks' balance sheet strength and risk perception.

[21] This can be applied to the widespread use of Value-at-Risk models for economic and regulatory capital purposes (Danielssson et al., 2004).

[22] In this mechanism the risk-taking channel includes not just new assets or loans, but also the valuation of assets outstanding in portfolios of banks.

this mechanism predominantly works through the relationship between the low levels of short-term interest rates and sticky target rate of returns. These sticky target rates of return may reflect psychological or behavioral aspects, such as money illusion. Alternatively, they may reflect the nature of contracts, together with the institutional and regulatory constraints. Some financial institutions, such as pension funds and insurance companies, which have long-term commitments, have to match the yield they promised on their liabilities to the yield they obtain from their assets in order to avoid default on their commitments. As they have nominal liabilities predefined at long-term fixed rates, when interest rates are low these institutions shift to riskier assets with higher yields, in order to meet their obligations. Because in that case, investing in safe assets (such as highly-rated government bonds) would not generate the necessary returns as it would if interest rates were high. Moreover, a similar mechanism could be in place whenever managerial compensation is linked to absolute yields. In a low interest rate environment, lower yields on safe assets imply a lower compensation for managers that choose to invest in safe assets, giving managers higher incentives to invest in more risky assets. In all cases, the effect of the channel becomes stronger as the resulting gap between the market and target rates becomes larger.

Similarly, very low interest rates usually bring about a reduction in the spread between lending and deposit rate of banks, which would squeeze profit margins of banks and increase their incentives for search for yield. Putting main emphasis on the existence the informational asymmetries among banks, Keeley (1990) and Dell' Ariccia and Marquez (2006) suggest that lower interest rates drives adverse selection problems down, which in turn lead to a higher competition together with credit expansion. Accordingly, banks have more incentives to search for yield and hence, engage in riskier projects with higher expected returns to increase their profit margins. Consequently, banks relax their lending standards and increase their risk-taking.

Monetary policy could also affect risk-taking through the communication policies and characteristics of the reaction function of the central bank. In this context, a higher transparency and predictability accompanying monetary policy to future policy decisions could reduce market uncertainty, which in turn, release risk budgets

of banks and increase their risk-taking. This is the 'transparency effect'. Similarly, the expectation that the central bank reaction function is effective in cutting off large downside risk creates an 'insurance effect'. In other words, if market participants expect that the central bank will ease monetary policy in the face of a negative shock, which threatens stability of the system, then they would tend to take on more risk. (Borio and Zhu, 2008). Indeed, it is not the low rates themselves, but rather the implicit promise of low rates (in case if it is needed) that causes this typical moral hazard problem. Therefore, this effect, which is also known as the Greenspan or Bernanke put, works through the expected lower interest rates (De Nicolo et al., 2010).[23] Likewise, Diamond and Rajan (2009)[24] states that banks would take on more risk if they anticipate that monetary authority would lower the interest rates to bail them out. Moreover, the authors suggest keeping monetary policy tighter than the level suggested by underlying economic conditions in good times to reduce banks' incentives to undertake liquidity risk. In their formal model, Farhi and Tirole (2009) show that borrowers may choose to increase their interest rate sensitivity to macroeconomic conditions following bad news about future liquidity needs. This would in turn, lead to time inconsistent monetary policy, not for the standard inflation bias reason in the central banks' preferences, but rather to the higher macroeconomic exposure to interest rates.

The effects of monetary policy on risk-taking can also operate through habit formation. In their paper, Campell and Cochrane (1999) show that agents become less risk-averse during periods of expansion, since their consumption increases relative to normal levels. Hence, lower monetary policy rates, by increasing real economic activity, may lead to a reduction in the degree of investors' risk aversion. This mechanism is in along the lines of findings from literature on asset-pricing models, which predict higher credit spreads in the long run following low interest

[23] However, De Nicolo et al. (2010) state that the level of the policy rate has implications for the magnitude of this effect. They posit that when rates are high, there is greater room for monetary stimulus than when rates are low; accordingly higher rates will correspond to greater risk-taking. Basically, an easy stance of monetary policy decreases this moral hazard problem by reducing room for further monetary expansion.

[24] In their paper, Diamond and Rajan (2009) present a model with no uncertainty from asset side of banks' balance sheets; however failure risk can come from substantial deposit withdrawals. Easing of monetary policy increases the attractiveness of bank playing on the mismatch between short-term deposits and long-term projects. Hence, low interest rates contribute to bank investment in illiquid assets and also to leverage, resulting in higher risk of failure.

rate periods (Longstaff and Schwartz, 1995; Dufresne et al., 2001) (Altunbaş et al., 2010). Another similar mechanism is that when the economy has experienced a prolonged period of low risk and low interest rates, economic agents may became too complacent, in the sense that their anticipations about the future may be too optimistic by the prevailing situation. As Yellen (2011) states economic actors, which hold assets with greater credit risk exposure, may not fully appreciate, or demand appropriate compensation for, potential losses in such an environment (Apel and Clauessen, 2012).

In close spirit to habit formation, Berger and Udell (2003) introduced the institutional memory hypothesis to explain the procyclicality of bank lending and bank loan performance problems. They suggest that banks may undertake significantly more risk during expansions as a result of the deterioration in the capacity of bank loan officers to recognize potential loan problems as time passes since banks' last loan bust, and a subsequent loosening in the credit standards.

All of the above mentioned mechanisms are the candidate driving forces behind the risk-taking channel. Although being diverse, they may tend to work at the same time as well. Furthermore, it should be noted that none of these proposed explanations is more important than the other, as there is no conclusive evidence regarding the relative importance of them. In part, this is due to the lack of theoretical models, which reveal the details of either potential mechanism and allows the precise understanding of their characteristics. The risk-taking channel is a relatively recent area of monetary economics; hence the theoretical literature is still being developed and is rather limited for the time being. There are only a handful studies that present formal models where several mechanisms of the risk-taking channel act together. In what follows, we briefly summarize the studies that explicitly analyze the risk-taking channel in theoretical models.

Dubecq et al. (2009) provide a model with risk-shifting where the level of interest rates affects the risk perception of some investors and risk exposure by others. They argue that situation of uncertainty with respect to regulatory constraints may cause market participants to form wrong inferences on risks. In that case, the increase in the observed asset prices would be interpreted as a lower aggregate risk in the

economy, while indeed asset prices were driven by higher risk-taking by financial intermediaries. In other words, in their theoretical model, regulatory arbitrage in conjunction with fuzzy capital requirements leads to uncertainty about financial intermediaries' risk exposure and this problem is more severe in the case of low interest rates, in the sense that lower interest rates increase the scale of underestimation of risk, which in turn amplifies the overpricing of risky assets.

Dell' Ariccia et al. (2010) use a static model to assess the impact of prolonged easy monetary policy on bank risk-taking. In their model, banks' risk appetite increase in prolonged periods of lax monetary conditions, however the net effect of monetary policy depends on the balance of the interest rate pass-through, risk shifting and capital structure. When banks are allowed to adjust their capital structures, monetary easing leads to an increase in leverage, which in turn lowers incentives to monitor, thereby increasing risk. On the other hand, if bank capital is fixed, then the balance would depend on the degree of bank capitalization: in well-capitalized banks monitoring will decrease, i.e. risk increase, with lower policy rates, whereas the opposite is true for the highly levered banks.

Agur and Demertzis (2010) develop a general-form dynamic model with endogenous risk profiles in an attempt to account for the role of monetary policy on financial markets' risk appetite. A monetary authority that concerns with financial stability objective adjusts its instrument in two ways. First, central bank has to be conservative and would set higher rates on average. Hence, it is willing to put a deflationary pressure on the economy to avoid the buildup of risks. Second, the monetary authority cut the policy rate sharply in reaction to negative shocks, but for a short period of time, since banks adjust their portfolio towards risky projects only when they foresee that interest rates remain low for a prolonged period of time. In other words, in the case of a negative shock, the central bank with financial stability objective would be more aggressive than the traditional policy oriented one, i.e. the one concerned only with inflation or output.

Valencia (2011) develops a dynamic model to understand what may lead banks to increase risk-taking when monetary policy rates are low. In the model, a decrease in risk-free rate increases profitability of lending by reducing funding costs and

increasing the surplus the monopolistic bank can extract from borrowers. Because of limited liability, this increased profitability have an affect only on upside returns, hence banks increase leverage and take risk excessively. Furthermore, the author shows that capital requirements can reduce the impact of banks' risk-taking, but cannot eliminate entirely since the incentives to take excessive risk intensify when interest rates are low and accordingly, he proposes regulations that is contingent at the state of the economy, such as counter-cyclical regulatory policies, for financial stability.

Cociaba et al. (2011) present a dynamic general equilibrium model to examine the link between interest rate policy and risk-taking. In their model, they find optimal interest rate policy and evaluate the consequences of deviating from the optimal policy. The interest rate policy affects risk taking by changing the amount of safe bonds that intermediaries use as collateral in the repo market. They find that in a model with properly priced collateral, lower than optimal interest rates reduce risk-taking. After that, they also add to the model the possibility that intermediaries can augment their collateral by issuing assets whose risks are underestimated by credit rating agencies. In the presence of such mispriced collateral, lower than optimal interest rates increase risk-taking and amplify the severity of recessions.

Ganzalez-Aguado and Suarez (2011) develop a dynamic corporate financing model in an attempt to rationalize some of the empirical evidence regarding the risk-taking channel of monetary policy and they investigate the impact of risk-free interest rate on corporate leverage and default. In their model, firms' financing problem is influenced by moral hazard between the firms and outside financiers together with entrepreneurial wealth constraints; whereas interest rates determine the outside financiers' opportunity costs of funds. Firms start up with leverage ratios larger than their long-term targets and adjust it gradually via earnings retention. The authors find that interest rate cuts and rises have asymmetric effects on leverage and also the responses to interest rate changes are heterogeneous across firms. They further find that interest rate shifts have different implications for leverage and default in the short-run and in the long-run. While interest rate shifts increase the aggregate default rate in the short-term, higher rates cause to lower default rates in the long-run as they induce lower target leverage across all firms.

4.2.2. Empirical Evidence on the Risk-taking Channel

Although the risk-taking channel of monetary transmission is still not well-understood, an increasing number of empirical studies have been produced to analyze whether there is a relationship between low interest rates and bank risk-taking and attempt to clarify characteristics of the risk-taking channel. Nevertheless, the empirical studies regarding risk-taking channel are still few in number. In what follows, we briefly summarize these studies and their main findings.

There are two groups of studies; those using macro data and examine the relationship between monetary policy and different aggregated risk measures, and others using micro data to provide micro-level panel evidence for the impact of interest rate changes on individual bank' risk-taking behavior. The number of empirical studies that rely on micro data to analyze the risk-taking channel has been rapidly increased in recent years. Furthermore, some of the macro and micro studies utilize data from lending surveys to shed light on another interesting perspective of the risk-taking channel of monetary policy transmission.

Some studies use macro data to analyze the link between monetary policy and risk, but they are fewer in number when compared with the list of studies that employ micro data. Angeloni et al. (2010), by using vector autoregression (VAR), provide time series evidence on the risk-taking channel for the US and Europe. They employ three different measures of risk: the ratio of consumer and mortgage loans to total loans for bank funding risk; bank leverage (defined as the ratio of assets to deposits) for bank asset side risk; and the stock market volatility for general corporate sector risk. The authors provide evidence that the stance of monetary policy affects, with lags, bank risk-taking, however the strength, profile and significance of the impact of monetary policy on bank risk depends on the risk measure employed and is different between the US and Euro area. Specifically, they find that a decrease in monetary policy rates has a significant positive influence on bank balance sheet risk both in the US and the Euro area, and a significant positive influence on bank leverage only in the US. On the other hand, the effects on the stock market volatility are insignificant in both areas.

Eickmier and Hoffman (2010) use factor-augmented autoregressive model (FAVAR) estimated on quarterly US data covering the period 1987-2007 in order to investigate the role of monetary policy on the three imbalances that were observed prior to the global financial crisis; namely, high house price inflation, strong private debt growth and low credit risk spreads. As measure of bank risk, they employ several important credit risk spreads such as; spread of the 3-month Eurodollar deposit over the 3-month T-bill rate or spread of the C&I loan rate over the 2-year T-bill rate. Their empirical analysis shows a negative response of various credit risk spreads to a decline in monetary policy rates, providing supportive evidence in favor of risk-taking channel.

While not exactly testing the propositions of the risk-taking channel, Bekaert et al. (2010) provide a characterization of the dynamic links between risk, economic uncertainty and monetary policy for the US. They decompose VIX[25] into two components; risk aversion and uncertainty, and, show that interactions between each of the components and monetary policy are rather different by using a simple VAR system for the period from 1990 to 2007. Loose monetary policy decreases risk aversion in the medium term, whereas high uncertainty is found to lead to looser monetary policy stance in the near-term future.

Another group of studies utilize both macro and micro level data in their analysis. Among these studies, De Graeve et al. (2008) rest on an integrated micro-macro model that captures the feedback between bank-level distress and the macro economy. By using German bank and macro data during the period 1995-2004, they measure banks' probability of default, estimated from a logit model including CAMEL ratings, and then combine this microeconomic model with a structural VAR. Consequently, they find a reduction in German banks' probability of distress following a monetary loosening. Furthermore, the responses differ across banking groups, for instance distress responses are larger in absolute terms for small cooperative banks, and these heterogeneous dynamics may reflect banks' alternative business models.

[25] The Chicago Board Options Exchange Volatility Index (VIX) essentially measures the 'risk-neutral' expected stock market variance for the US S&P500 index.

De Nicolo et al. (2010) attempt to illustrate the effect of monetary policy stance on bank risk- taking in the US through two different approaches. First, the authors employ the quarterly survey on the terms of business lending and construct two ex-ante measures of risk-taking from this survey: the average internal risk rating and the average relative spread between loan rates and the effective federal funds rate. Their results reveal that policy rate has a negative impact both on risk rating and spread, and further this negative effect is less pronounced, if the banking sector is characterized by low capitalization. In the second exercise, they investigate the impact of changes in policy rates on the overall riskiness of banks' asset portfolios by using bank-level data from Call Reports. Using the ratio of risk-weighted assets to total assets as the measure bank risk, they find strong negative relationship between real interest rates and the riskiness of banks' assets. The increase in the risk-weighted assets in response to the decline in policy rate is smaller in absolute terms if the bank is poorly capitalized. Therefore, the authors suggest that low policy rates are associated with greater risk-taking, but this relationship depends on the health of the banking system. Moreover, this effect is likely to be more important in good times, whereas to be less pronounced in times of financial stress.

Based on a FAVAR, Buch et. al (2010) use both time series and bank-level data for the US from the Call Reports over the period 1985-2008 to explore the net effect of macroeconomic shocks, mainly monetary policy, on bank risk. Using the share of non-performing loans in total loans as an indicator of bank risk, they find a decline in bank risk following an expansionary monetary policy shock, similar to the findings of De Graeve et al. (2008), but not to the findings of other empirical studies that provide evidence in favor of the risk-taking channel. Regarding sources of heterogeneity across banks, results show that the negative response of bank risk to a monetary policy shock is smaller for banks with high capital ratios, while it is higher for banks that are highly engaged in real estate lending. On the other hand, size has found to have no significant effect on the risk response to monetary policy shocks.

In their later study, Buch et al. (2011) employ FAVAR to provide evidence on the link between monetary policy, commercial property prices and bank risk for the US during the period 1997-2008. They use the Federal Reserve's survey of terms of business lending, which enables them to model the reactions of banks' new lending

volumes and prices together with the riskiness of new loans. While they do not find evidence for increased risk-taking for the entire banking system following a monetary expansion or an unexpected increase in property prices, they show that the impact of monetary policy loosening on risk-taking is not uniform across different banking groups i.e., different bank groups respond differently to expansionary monetary shocks. Small domestic banks undertake more new risk, whereas foreign banks lower it and large domestic banks do not significantly change their exposure to new risk.

Karapetyan (2011) employs aggregate quarterly data for the over the period 1979-2010 to explore the impact of expansionary monetary policy, in the form of low key interest rates, on risk-taking of banks in Norway. The author employs the share of troubled loans and alternatively a bank risk index calculated from a logit model based on balance sheet data, as measures of banks' risk-taking. His results do not show statistical evidence for the risk-taking channels, since low key policy rates do not cause a higher share of troubled loans or an increase in other measure of bank risk.

The empirical studies on the risk-taking channel mostly use micro data; i.e. data based from individual banks, both at the individual country level or for groups of countries. Among these studies, Jimenez et al. (2009) employ confidential data from the Spanish credit register on individual loans at the bank-borrower level covering the period 1984-2006. Approximating risk by ex-ante loan characteristics together with the ex-post loan performance, they investigate the relationship between changes in monetary policy stance and the risk level of individual bank loans. They find that low interest rates affect the credit risk of Spanish banks in two different ways. In the short run, lower interest rates reduce the risk of default of outstanding loans, implying that lower rates reduce the interest burden of the previous borrowers. However, lower interest rates prior to loan origination lead banks to grant more risky new loans. In the medium term, banks soften their lending standards in the sense that they lend more to borrowers with a bad credit history or with high uncertainty as a result of higher collateral values and search for yield. Hence, they find that lower interest rates improve the quality of the loan portfolio in the short term, whereas increase the loan default risk in the medium term. The authors also show that small

banks, savings banks and cooperative banks, banks that are net debtors on the interbank market undertake more risk than others. Therefore, they posit balance sheet strength, moral hazard and bank ownership as factors shaping the effect of monetary policy on bank risk. In addition, they find that banks with lower levels of capital expand credit to riskier firms more when compared with the highly capitalized banks.

As one of very few studies providing evidence outside the US or Europe, Iannidou et al. (2009), use individual bank data from public credit registry of Bolivia together with bank balance sheet and income statements over the period 1999-2003 in order to examine whether there exist a risk-taking channel. Since the economy is fully dollarized in the period under consideration, they employ US federal funds rate as an exogenous monetary policy indicator. Notably, they investigate the impact of changes in interest rates not only on the quantity of new loans, but also on their interest rates, since they access to loan pricing. The authors find similar evidence to that of Jimenez et al. (2009), suggesting that a reduction in interest rates prior to loan origination increases the probability of loan default. Moreover, they find that banks also reduce the loan rates they charge to risky loans compared with what they charge to less risky ones, when interest rates are low.[26] Their results on bank characteristics show that banks with lower liquid assets and a lower level of funds from foreign institutions take more risk.

Altunbaş et al. (2010) analyze the risk-taking channel by using quarterly balance sheet data of 643 stock-listed banks in the EU-15 and the US over the period 1998-2008. They use expected default frequency (EDF), a forward looking indicator of risk, as a proxy for risk taking. Furthermore, the authors considered the deviation of interest rate from a benchmark level to evaluate the relative stance of monetary policy.[27] The study provides evidence in favor of risk-taking channel, since a negative deviation of the short-term interest rate from the benchmark level, i.e. expansionary monetary policy, leads to an increase in the probability of default. This result still holds when authors use alternative proxies for bank risk such as EDF with

[26] This finding is contradicting with the 'search for yield' hypothesis, since it implies that banks do not price additional risk taken (Gaggl and Valderrama, 2010).

[27] They use the natural interest rate and interest rates implied by Taylor rules (with interest rate smoothing and with no interest rate smoothing) rate as benchmark levels.

longer time horizon, idiosyncratic component of bank risk etc. Regarding bank characteristics, small, liquid and well-capitalized banks are found to be less risky.

Applying a similar methodology and the same database with Altunbaş et al. (2010), Gambacorta (2009) considers the time-span of the expansionary monetary policy by using the number of consecutive quarters in which interest rates have been below the benchmark. He shows that the increase in EDF is higher for banks in the US, where the federal funds rate were below the benchmark for 17 consecutive quarters between 2002 and 2006, than for banks in Europe where the policy rate was below the benchmark for 10 quarters. In sum, the author finds evidence of a significant link between an extended period of low interest rates prior to crisis and banks' risk-taking, consistent with the risk-taking channel hypothesis.

Tabak et al. (2009) uses individual bank- level data for commercial banks operating in Brazil over the period from 2003 to 2009 in order to analyze the risk-taking channel of monetary policy transmission. Their results indicate that lower interest rates lead to an increase in banks' credit risk exposure, supporting the existence of the risk-taking channel. Furthermore, liquidity and bank size are found to have a positive relation with risk. When the authors control for ownership in the analysis, they also find that state owned and foreign banks have different risk-taking profile.

Brissimis and Delis (2010) analyze the impact of monetary policy on bank lending, risk-taking and profitability for the US and Euro area. In the part of their study regarding risk-taking channel, the authors are rather more concerned with whether interest rates have a differential effect on bank risk due to certain characteristics of bank balance sheets. They analyze the heterogeneous response of banks in the US and 12 Euro area countries covering the period in 1994-2007 in terms of their risk-taking decisions following a change in monetary policy. Further, they choose liquidity, size and market power as bank specific characteristics and find that the impact of a monetary policy change on credit risk is lower for well-capitalized and liquid banks.

Michalak (2010) investigates the nexus between low-levels of interest rates, monetary policy decisions, the banking market structure, and bank risk-taking by

using a dataset of stock-listed bank holding companies for EU-9 plus Switzerland during the period 1997-2008. The author utilizes EDF as the risk indicator. In line with Altunbaş et al. (2010), his results indicate that low short-term interest rates reduce default rates of outstanding loans and that an extended period of short-term interest rates below a theoretical benchmark level cause a reduction in risk perception and/or increase in risk tolerance in Western European banks. Moreover, he finds that an increase in competition in the loan market, which is proxied by the Boone-indicator[28], leads to higher fragility.

Following very closely the research by Jimenez et al. (2009), Lopez et al. (2010) employs a dataset from the Credit Register from Colombia, which contains detailed information on individual commercial bank loans over the period 2000-2008 to examine the effect of monetary policy stance on bank risk-taking. By using duration models, they find a significant link between low interest rates and risk-taking in Colombia. Their empirical results reveal that lower interest rates raise the probability of default on new loans but reduce that on outstanding loans, consistent with the findings of Jimenez et al. (2009). Furthermore, the authors posit that the risk-taking channel of monetary policy depends on some bank, loan and borrower characteristics. Regarding bank characteristics, they find that small and highly leveraged banks are more willing to take risks.

Lopez et al. (2012) is in line with the Lopez et al. (2010), but this time authors use detailed information on consumer loans in addition to commercial loans, in order to examine whether there is a risk-taking behavior of banks when they grant loans to households and further, compare the incidence of risk-taking channel in both loan categories. Being the first paper that investigates the risk-taking channel in case of consumer loans, the paper presents empirical evidence which shows that Colombian banks undertake more risk when the level of interest rates are low and the response of commercial loans to interest rates is higher than in the case of consumer loans.

[28] Boone indicator is a new competition indicator, which enables to measure competition of bank market segments, such as the loan market. It is based on the notion that more efficient firms gain higher market shares as well as higher profits and this effect is stronger the higher the competition in the respective market is (Van Leuvensteijn et al. 2007).

The authors also find that small banks undertake more extra risk and grant more loans to risky borrowers when interest rates are low.

Delis and Kouretas (2011) examine low interest rates on bank risk using a large dataset of quarterly balance sheet data from banks in the 16 Euro area countries for the period 2001-2008. They are more concerned with the level of interest rates instead of monetary policy changes in their study. The ratio of risky assets to total assets and the ratio of non-performing loans to total loans being their risk indicators, they estimate risk equations by using various interest rates. The authors find that low interest rates increase bank-risk taking substantially, while this result is robust to different specifications and to the use of annual data. Furthermore, their empirical analysis reveals that the impact of low interest rates on risk assets is lower for well-capitalized banks, but it is amplified for banks with high off-balance sheet items.

Delis et al. (2011) examine the impact of US monetary policy on bank risk-taking by using two alternative micro datasets: quarterly balance sheet data from Call Reports and data on new loans from the syndicated loan market. They present empirical evidence that low interest rates tend to decrease loan portfolio risk of a bank in the short–run, but increase it in the long-run. Furthermore, their finding remains robust to different specifications and to different sub-periods and samples, suggesting positive evidence for the risk-taking channel of monetary policy transmission in the US since the 1990s.

A number of studies examine risk-taking with respect to lending standards. These studies use answers from surveys of lending behavior among banks (e.g. the Bank Lending Survey for the Euro area, the Senior Loan Officer Survey for the US) to explore whether monetary policy affects the lending practices of banks. In general, these surveys provide information about the strictness of the lending criteria, but not about the absolute level of strictness. Instead, questions in the surveys imply qualitative questions and accordingly, allow to examine whether lending standards have changed relative to the recent past. Net loosening of credit standards is considered to indicate enhanced access to credit by low quality borrowers. It should be noted that while these studies examine the impact of lower policy rates on banks' lending standards, they do not say anything about the banks' riskiness after they had

loosened their standards and at the same time, the softening standards do not necessarily imply an increase in risk.

Lown and Morgan (2006) conduct VAR analysis using a measure of bank lending standards collected by the Federal Reserve and find no changes in standards in response to shocks to the federal funds rate. Instead, the authors show that lenders change loan rates broadly with the federal funds rate. Furthermore, they find a negative relationship between banks' capital to asset ratio and their lending standards.

Using the information from bank lending survey in Euro area, Maddaloni et al. (2008) examine the impact of monetary policy on bank risk-appetite during the period 2002-2008. They find weaker lending standards both for the average and riskier loans when interest rates are lowered. Banks loosen their credit standards mainly by decreasing spreads on average loans, and also by reducing collateral requirements and covenants as well as by increasing loan amount and maturity. The impact of relaxing credit standards is found to be stronger for loans to nonfinancial firms. Furthermore, the authors find that holding rates low for prolonged periods of time soften credit standards even further. While they find a stronger impact of overnight rates on credit standards in case of securitization, their analysis also reveals that larger banks tend to react less to overnight rates, particularly in their lending to small and medium-sized enterprises.

Maddaloni and Pedyro (2011) use data from lending surveys in both the Euro area and US and analyze the impact of low interest rates on lending standards that apply to firms and households over the period 2003-2008.[29] Their analysis reveals that low short-term interest rates soften standards, however this result does not hold for the long-term interest rates. Moreover, they find that securitization activity, weak supervision for bank capital and prolonged periods of low interest rates strengthen the impact of softening.

[29] The authors also run some regressions using only data for the US to exploit the longer time series dimension and hence, they start the analysis from 1991 in that case.

In general, we could state that there is much international empirical evidence in favor of the risk-taking channel, i.e. low interest rates lead to greater risk-taking. Notably, most of the existing empirical literature on the risk-taking channel provide evidence for the US and Euro area, whereas very few studies provide evidence for emerging markets. Specifically, these are Ioannidou et al. (2009) for Bolivia, Tabak et al. (2010) for Brazil and Lopez et al. (2010, 2012) for Colombia and all of them present empirical evidence on the existence of such a channel. None of the empirical studies have been published so far have specifically examined the risk-taking channel in Turkey. In this context, our study is the first empirical study for Turkey and also expected to contribute to the scant literature on the risk-taking channel in emerging markets. In what follows, we lay out our empirical assessment based on alternative risk indicators.

4.3. Data Description

The empirical analysis to assess the risk-taking channel of monetary policy relies on an unbalanced panel dataset, which consist of deposit banks and development and investment banks operating in Turkey over the period 2002q1-2012q1. We employ quarterly data which are considered to be more appropriate for capturing the short-term effect of monetary policy changes on bank risk (Altunbaş et al., 2010).

The sample period is chosen to start from 2002, since the 2000-2001 financial crisis constitute a structural break in the Turkish economy and hereafter there have been significant improvements in macroeconomic fundamentals with the implementation of a comprehensive economic program, coupled with changes in the conducts of macroeconomic policymaking. Furthermore, in the period following the 2000-2001 financial crisis, Turkish banking system has undergone a tremendous restructuring process and has been highly regulated with the amendments in the financial regulations as BRSA became fully operational. During that period, distortions in the financial sector have been eliminated, supervision quality has been increased, regulations have been brought to international standards, private banks were strengthened, operation of the state banks were restructured and new products have

been introduced. Accordingly, our analysis aims to cover this new era in which banks have started to operate in a completely different macroeconomic scene and financial architecture following the 2000-2001 crisis. Furthermore, there is a shift towards an environment of low inflation rates and interest rates in the post crisis era as explained in more detail in the Introduction. While interest rates reached drastically high levels in the pre-crisis period, they started fall hereafter and remained at historically low levels in recent years. Thus, this is an additional reason for why we limit the sample period to these dates, since the pre-crisis era is not convenient to explain the theoretical discussion regarding the relationship between the short-term interest rates and bank risk-taking.

Quarterly bank-level data are collected from the balance sheet and income statement information extracted from Bank Association of Turkey. EDF data is obtained from Moody's KMV. While the three month interbank rate, seasonally adjusted real GDP and industrial production index are extracted from OECD Economic Outlook database, stock market returns are gathered from the electronic data delivery system of CBRT.

Our sample covers 53 banks that have been active in Turkey during the period under consideration. Unfortunately, EDF data is only available for 14 Turkish banks and we have been able to access these banks' EDF data for the period 2007q1-2012q1. Accordingly, we study this sample separately. Table B.1. in Appendix B shows the list of these banks in the whole sample and further, provides some information on acquisitions, mergers and failures occurred over the full time period. All the banks that have been operated at least one year during the period under consideration are involved. Furthermore, those observations for which data on our main bank-level variables are either not available or contain extreme values are discarded by applying an outlier rule.

Table B.2 in the Appendix B briefly describes all variables employed in the empirical analysis. Table 4.1 and Table 4.2 report summary statistics of the whole sample (sample 1) and EDF sample (sample 2), respectively.[30] Summary statistics

[30] Table 4.1 and Table 4.2 summarize the data before corrupt observations are controlled for.

present that both samples consist enough heterogeneous observations. Table B.3 and Table B.4 provide the correlation matrix between these variables for the whole sample and EDF sample, correspondingly and they indicate that correlations are not higher than acceptable levels. The top left side of Table B.3 shows the correlation between the alternative accounting-based risk measures employed in this study. The correlation is always significant and while it is positive between non-performing loans ratio and standard deviation of returns on assets, it is negative between non-performing loans ratio and z-index. Furthermore, the correlation between z-index and standard deviation of return on assets is high as expected.

Table 4.1 Summary Statistics for Sample 1

Variable	Number of Observations	Mean	Std. Dev.	Min	Max
NPL	1748	18,790	66,661	0,000	851,300
Z-INDEX	1877	3,036	1,374	-1,948	9,226
STDROA	1890	2,544	3,798	0,001	22,977
ΔMP	1837	-1,337	2,379	-15,400	13,860
NRGAP	1890	0,031	3,781	-6,861	6,586
TGAP	1890	0,897	1,406	-1,005	4,545
ΔGDP	1890	1,441	2,229	-6,100	5,200
ΔSM	1784	0,002	0,163	-0,322	0,333
HHI	1890	944,618	30,625	866,702	993,264
SIZE	1889	7,222	2,361	1,007	12,044
LIQ	1889	42,847	25,159	1,500	99,800
CAP	1889	27,525	24,833	-112,105	100,000

Table 4.2 Summary Statistics for Sample 2

Variable	Number of Observations	Mean	Std. Dev.	Min	Max
EDF	290	1,390	1,890	0,010	13,210
ΔEDF	276	0,070	1,400	-8,470	10,170
ΔMP	280	-0,630	1,730	-4,750	3,500
NRGAP	294	-2,100	2,120	-3,660	3,610
TGAP	294	-0,062	0,582	-1,005	0,792
ΔIP	294	0,870	4,250	-10,200	6,400
ΔSM	266	-0,002	0,166	-0,322	0,333
SIZE	294	9,910	1,450	6,690	11,990
LIQ	294	28,770	9,520	6,000	51,600
CAP	294	14,120	8,380	6,200	61,100

In what follows, we comment on the choice of our bank risk-taking and explanatory variables.

The choice of measures accounting for banks' risk is of particular importance for our empirical analysis. Measuring risk is a complicated issue and there is no specific proxy for bank risk-taking, First of all, risk taking refers to the amount of uncertainty a lender is willing to hold in his/her portfolio. For a bank, this corresponds to the division between risky and risk-free assets in its balance sheet, but we cannot always observe this portfolio composition. Therefore, some alternative measures have been used to measure the extent of banks' risk tolerance (Gaggl and Valderrama, 2010). The previous literature suggests using either accounting-based measures or market-based measures. In the light of these, we proxy risk-taking behavior of banks by using three alternative accounting-based indicators, namely the ratio of non-performing loans to total loans, z-index and standard deviation of return on assets, in addition to one market-based indicator, which is the EDF. These indicators are considered to reveal different type of risk related information and reflect diverse aspects of risk-taking, hence each has its own advantages and disadvantages as measures of bank-risk taking. In other words, neither of them is more accurate or superior to another, but rather complementary to each other in capturing the main dimension of bank risk. Accordingly, in an effort to confirm and complement our results, we choose to experiment with various risk measures for examining the relationship between changes in interest rates and bank risk –taking in our analysis.

The first measure of bank-risk taking utilized in this study is the ratio of non-performing loans to total loans, which is an extensively used accounting based indicator of bank fragility. This ratio gives an indication of the asset quality in terms of the potential adverse exposure to earnings and market values of equity due to worsening loan quality. Accordingly, non-performing loans ratio is generally viewed to reflect credit or loan portfolio risk of a bank and higher levels of this ratio indicate a riskier loan portfolio since a part of non-performing loans would probably result in losses for the bank (Delis and Kouretas, 2011). Unlike the other measures for bank risk such as z-index or standard deviation of bank's return on assets, which reflect the insolvency risk, this measure directly refers to credit risk and hence, more strongly related to the theoretical discussion provided in section 3.2. However, it should be noted that this measure is a backward looking indicator and might be subject to managerial judgment (Fiordelisi et al., 2010).

The second indicator constructed from balance sheet information accounting for bank risk is the z-index, which is a universal measure of individual bank fragility.[31] It is a proxy for the probability of bank's insolvency and inverse measure of its overall risk. Z-index combines in a single measure the profitability, leverage and return volatility. It is given by the ratio:

$$Z_i = \frac{ROA_i + E/TA_i}{\sigma(ROA_i)} \qquad (4.1)$$

where ROA_i is the return on assets for bank i, E/TA_i represents the equity to total assets ratio for bank i and $\sigma(ROA_i)$ stands for the standard deviation of return on assets of bank i over the period under study. It shows the number of standard deviations a return realization has to fall so as to deplete equity capital. In other words, it represents the probability of a negative shock to profits that forces bank to default (Yeyati and Micco, 2003). While z-index increases with higher profitability and capitalization levels, it decreases with unstable earnings captured by the standard

[31] For studies using z-index as a measure of financial soundness or risk-taking, see ,among others; De Nicolo et al. (2003), Demirgüç-Kunt et al. (2006), Angkinand and Wihlborg (2008), Berger et al. (2009), Tabak et al. (2010), Delis et al. (2011).

deviation of return on assets. Therefore, larger values of z-index imply higher bank stability and lower overall risk i.e.; lower risk-taking.

We calculate bank specific z-indexes by using net profits to total assets and equity to total assets ratios respectively. Following Cihak et al. (2009), we use a three-year rolling time window for calculating standard deviation of returns on assets $\sigma(ROA_i)$ in order to depict the changing pattern of return volatility of banks.[32] Furthermore, given that z-index is highly skewed, we use natural logarithm of z-index, which is normally distributed, following Leaven and Levine (2009).

An important point to note is that, z-score comprises the return or loss on all activities of the bank, whereas non-performing loans ratio is directly related to traditional banking activities (Angkinand and Wihlborg, 2008). Furthermore, a higher probability of default may stem from the general macroeconomic conditions, which may have an impact on the components of z-index exogenously. In that case, this variable may not necessarily show the risk taking incentive of banks (Delis et al., 2011). In other words, while non-performing loans ratio corresponds to loan risk, this measure is better viewed as insolvency risk. When these drawbacks of z-index are taken into account, we favor non-performing loans ratio more from the standpoint of our analysis.

Finally, standard deviation of bank's asset returns is employed as the third proxy for banks' risk exposure derived from accounting information. Besides using z-index, which is a compound measure of bank risk, we choose to examine volatility of asset returns separately as a more simple measure. Again, we use a three-year rolling time window to calculate standard deviation of returns on assets $\sigma(ROA_i)$.

In addition to the classic measures derived from the accounting data, we use, as an additional measure of bank risk, EDF, which relies on market information and is computed by Moody's KMV. Build on Merton (1974) model of corporate bond pricing, EDF is a forward looking measure that refers to the probability that a

[32] We also experiment to calculate $\sigma(ROA_i)$ by using different number of quarters, but results are found to be very similar.

company will fail to make a scheduled debt payment within a given time horizon. It is calculated using data on banks' financial statements, stock market information and stock market, and Moody's proprietary bankruptcy database. Financial institutions, central banks, supervisors and investors use EDF figures to observe the health of both individual banks and whole financial system[33] (Fiordelisi et al., 2010). Besides, this indicator has been widely employed as a measure of risk-taking in the recent related empirical literature as in Gambacorta, 2009; Altunbaş et al., 2009a, 2010; Fiordelisi et al., 2010; Huang et al., 2010. Accordingly, we include one-year EDF as an ex-ante measure of credit risk into our analysis. A limitation of using Moody's EDF is that it restricts sample to 14 banks, as EDF data is not available for all banks in our sample. Nonetheless, we have chosen to analyze that sample separately for which we had the necessary information covering the 2007q1-2012q1 period.

In addition to bank risk-taking measures, interest rate variable is another key measure to our analysis since the main focus of our study is to examine the impact of interest rate changes on risk-taking by banks. Many empirical studies (Jımenez et al. (2009); Ioannidou et al.(2009); Brissimis and Delis (2010); Tabak et al. (2010); Delis and Kouretas (2011)) have employed the change in overnight rates, quarterly interbank rates or the German interbank rates as a of measure monetary policy stance with the assumption that interest rates has reached to historical low levels. However; it is difficult to separate the impact of monetary policy changes on bank risk-taking on two different areas: first, the risk of outstanding loans and second, banks' appetite to take on new risk. As pointed out in section 3.2 in more detail, a drop in the interest rates has a positive direct impact on lending portfolios whereas a fall in the interest rates below the benchmark has a negative effect since 'search for yield' causes an overall increase in new risk-taking (Altunbaş et al., 2010). In the light of these, we include both the quarterly change in the interbank interest rate to control for the direct effect of interest rates on bank risk-taking and the deviation of interest rate from a benchmark level to assess the monetary policy stance following Altunbaş et al. (2010). Since a drop in interest may not necessarily imply excessive low rates, a benchmark would provide a measure for how low is actually low and as we are

[33] See for instance; ECB (2011), IMF (2012).

concerned with the impact of relatively low rates, this approach is more closer to our empirical propositions.

More specifically, the crucial point is to what extent the interest rate that is significant for the banks' risk-taking is determined by monetary policy, since the fact that interest rates are low does not necessarily imply that central bank is conducting an expansionary monetary policy. It could also be the case that the general level of interest rates, or the natural interest rate, is low for reasons which have nothing to do with the monetary policy and indeed the central bank may have just adjusted its policy to this low interest rates. In that case, banks would take on more risk due to low general level of interest rates, but unrelated with the monetary policy. Accordingly, examining the relationship between short-term interest rates and risk-taking may be interesting in itself, but it does not necessarily imply that there is a risk-taking channel acting through monetary policy. Because; not the low interest rates themselves, but the impact of the difference between short real interest rate and the natural rate should be ascribed to the monetary policy. Therefore, one needs to distinguish the general level of interest rates and monetary policy in order to capture the impact of monetary policy on risk-taking, i.e. the link between the risk-taking and how expansionary monetary policy is (Apel and Claussen, 2012).

Another point to note is that interbank interest rates may be endogenous to general macroeconomic conditions. Moreover, causality may run in both directions between interest rates and bank-risk taking, if monetary authority takes interest rate decisions by considering credit market conditions. However, this is does not seem to hold exactly for Turkey, since the CBRT did not systematically take into account banking sector conditions on its policy rate decisions. Furthermore, as stated by Aydın and Igan (2010) endogeneity of the policy is less of a problem as policies have been designed to act anchors following the 2000-2001 crisis. Nevertheless, employing a specific benchmark level would still provide us an exogenous measure of monetary policy stance and is more favorable for the purposes of our analysis.

Considering all these and in line with Gambacorta (2009) and Altunbaş et al. (2010), we adopt a benchmark measure, which is the difference between the real short-term interest rate and the 'natural interest rate', calculated by means of the Hodrick-

Prescott filter. Alternatively, we employ another interest rate gap measure, which is dictated by Taylor rule [34], as in Altunbaş et al. (2010). In order to ensure robustness, we experiment with this measure as well; however we use natural interest rate gap as our main measure of relative monetary policy in the analysis, since estimating Taylor rule type of interest rate gap presents some well-known limitations and may result in different findings with respect to other indicators.[35]

As the primary concern of this study is the relationship between bank risk and monetary policy, we control for a number of factors including bank specific characteristics and macroeconomic conditions that may have an effect on bank risk-taking attitude in an attempt to isolate the impact of monetary policy. By doing so, we expect to shed light on which of these factors do have an impact on risk of the banks as well.

Turning to macroeconomic variables, we control for the state of the macroeconomic conditions by GDP growth in our specification. Following Altunbaş et al. (2010), we include the quarterly changes in stock market returns to capture improvements in borrowers' net worth and collateral.[36] We further include HHI, which is a widely used measure of concentration and a proxy for competition in the literature, to account for the impact of market concentration on bank-risk taking. HHI is calculated as the sum of squared market shares in terms of total assets of all banks.

[34] First presented in Taylor (1993),Taylor rule suggests a simple way to formulate monetary policy. It stipulates how the central bank should change its policy rate as output and inflation deviated from certain levels. Algebraically, it could be expressed as: $i_t = r^* + \beta_\pi(\pi_t - \pi^*) + \beta_y(y_t - y_t^*)$, where i_t is the policy interest rate, r^* is equilibrium real interest rate, π_t is the inflation rate, π^* is the target inflation rate and $(y_t - y_t^*)$ is the output gap (the deviation of the actual GDP from its long-term potential level). Taylor (1993,2001) proposed setting $\beta_\pi = \beta_y = 0.5$.

[35] For instance, Apel and Claussen (2012) state that using Taylor rate as a measure of the degree of expansionary monetary policy is problematic, because Taylor rate is typically based on a constant, long-term neutral real interest rate. More specifically, when inflation is on target and at the same time, production is equal to its potential, the policy rate must be at the long-term normal (natural) level. Furthermore, another drawback of Taylor rule is that it may lead to serious different findings depending on the methods employed in calculating the output gap and/or real interest rates, since they are unobservable.

[36] To capture the evolution of asset prices, Altunbaş et al. (2010) employ quarterly changes in the housing price index as well. However, we could not use this measure in our model, since it is not available for Turkey.

We expect individual bank characteristics to affect the impact of monetary policy on banks' risk exposure as bank incentives are at the centre of the functioning of the risk-taking channel (Altunbaş et al., 2012). At the bank-level, we control for liquidity, capitalization and size as appealing measures of bank financial soundness that show the banks' ability and willingness to supply additional loans, since these factors may affect the risk-taking behavior of banks. We use the ratio of liquid assets to total assets for liquidity; the ratio of shareholders' equity to total assets for capitalization; and natural logarithm of total assets for size.

4.4. The Econometric Model and Methodology

Our empirical approach to test whether changes in monetary policy stance affect bank-risk-taking relies on a series of panel regressions. First, we present the models that use accounting-based risk indicators and then, introduce the specifications with EDF as our dependent variable.[37]

The following baseline model is used to assess the impact of low short-term interest rates on accounting-based bank risk measures:

$$r_{i,t} = \alpha + \beta r_{i,t-1} + \sum_{j=0}^{1} \gamma_j \Delta MP_{t-j} + \sum_{j=0}^{1} \delta_j NRGAP_{t-j} + \sum_{j=0}^{1} \theta_j \Delta GDP_{t-j} + \epsilon_{i,t} \quad (4.2)$$

with $i=1,\ldots\ldots,N$ and $t=1,\ldots\ldots, T$ where N is the number of banks and T is the final quarter. $r_{i,t}$ represents one of our accounting based indicator namely, change in non-performing loans ratio, z-index or standard deviation of banks' asset returns. In the above equation (4.2), each risk indicator is regressed on changes in monetary policy indicator (ΔMP), which is three- month interbank rate; the natural interest rate gap ($NRGAP$); and nominal GDP growth rate (ΔGDP). In all estimations, we include

[37] The period analyzed and the number of banks is different for models employing EDF and other risk measures.

time effects to control for unobservable time-varying shocks that might influence monetary policy stance and banks' risk-taking appetite.

The estimated value of the coefficient of the natural interest rate gap variable is the primary focus of our analysis, since it is associated with the risk-taking channel and shows whether banks take more risk when interest rates are below benchmark level. Accordingly, we expect the coefficient of the natural interest rate gap to be negative. On the contrary, the coefficient of the interest rate is expected to be positive as lower interest rates are supposed to decrease bank risk on the outstanding loans, i.e. at the short run. Regarding the nexus between the output growth and bank risk-taking, the relationship is not clear. On the one hand, number of profitable projects could rise with better economic conditions, thus reducing the overall credit risk of the banks (Kashyap et al., 1993; Altunbaş et al., 2010). On the other hand, banks might increase their lending and undertake more risk in search for yield despite of the favorable economic conditions.

We extend the baseline model by introducing quarterly changes in the stock market returns (ΔSM):

$$r_{i,t} = \alpha + \beta r_{i,t-1} + \sum_{j=0}^{1} \gamma_j \Delta MP_{t-j} + \sum_{j=0}^{1} \delta_j NRGAP_{t-j} + \sum_{j=0}^{1} \theta_j \Delta GDP_{t-j} + \sum_{j=0}^{1} \varphi_j \Delta SM_{t-j} + \epsilon_{i,t} \quad (4.3)$$

We expect to find a negative coefficient for this variable, since a rise in asset prices would increase the collateral value and reduces the bank risk.

Then, we account for the banking industry concentration using Herfindahl-Hirschman Index *(HHI)*, leading to equation (4.4) below:

$$r_{i,t} = \alpha + \beta r_{i,t-1} + \sum_{j=0}^{1} \gamma_j \Delta MP_{t-j} + \sum_{j=0}^{1} \delta_j NRGAP_{t-j} + \sum_{j=0}^{1} \theta_j \Delta GDP_{t-j} + \omega HHI_t + \epsilon_{i,t} \quad (4.4)$$

Previous literature on the banking market concentration and bank fragility provide mixed results; while some studies (e.g. De Nicolo et al., 2004; Boyd et al., 2006; De Nicolo and Loukoianova, 2007; Uhde and Heimeshoff, 2009) find a positive relationship between risk of bank failure and concentration, the others (e.g.Beck et al., 2006; Schaeck et al., 2006; Schaeck and Cihak, 2007; Yeyati and Micco, 2007) suggest that an increase in banking market concentration is associated with lower level of risk taking and hence, lower probability of failure. Non-performing loans and banking market concentration are found to be uncorrelated in some studies as well (e.g. Jimenez et al., 2007). Against this background, we don't have a particular expectation regarding the impact of our concentration measure on bank risk-taking.

We also consider bank-specific variables including size ($SIZE$), liquidity (LIQ), and capitalization (CAP), which may affect the relationship between bank risk and monetary policy. The choice of the bank specific characteristics are in line with the previous empirical literature on the bank lending channel (Kashyap and Stein, 2000; Kishan and Opiela, 2000; Van Den Heuvel, 2002; Ehrmann et al.,2003) To this end, we estimate equation (3.5) that relates changes in the riskiness of banks to their individual characteristics, together with the macroeconomic conditions:

$$r_{i,t} = \alpha + \beta r_{i,t-1} + \sum_{j=0}^{1} \gamma_j \Delta MP_{t-j} + \sum_{j=0}^{1} \delta_j NRGAP_{t-j} + \sum_{j=0}^{1} \theta_j \Delta GDP_{t-j} + \tau SIZE_{i,t-1} + \phi LIQ_{i,t-1} + \psi CAP_{i,t-1} + \epsilon_{i,t} \quad (4.5)$$

where all bank specific characteristics refer to *t-1* primarily to avoid endogeneity bias. Furthermore, all of them are normalized with respect to their average across all banks in their respective samples.[38]

Regarding the impact of capital, liquidity, and size on bank risk-taking, the theoretical and empirical literature provides contradictory results. Hence, the signs of the coefficients of these bank-specific characteristics are ambiguous. Concerning the

[38] In what follows, we will modify the baseline model with the interaction effects. As stated in Delis and Kouretas (2011) "A problem with the inclusion of interaction effects is the severe multicollinearity between the multiplicative term and its constituents." Hence, we deal with this problem by normalizing the bank-specific variables.

impact of bank capital on risk, we expect to find a negative coefficient as higher equity capital provides a buffer to withstand negative shocks and implies more prudent bank behavior. This expectation is in line with empirical literature that predominantly supports the view that higher levels of capital help banks to raise their probability of survival and their profitability during times of crisis (Berger and Bouwman, 2010). On the contrary, higher capital ratios might be associated higher overall risk if there are agency problems between managers and shareholders that lead to excessive risk-taking via managerial rent-seeking or if regulators force riskier banks to increase their capital (Altunbaş et al., 2012). Focusing on the impact of liquidity on bank risk, while liquid banks are considered to be more risk averse, it could be the contrary since they may take on more risk as a result of the higher cost of holding liquid assets with low returns. If we turn to the impact of size; on the one hand, large banks may undertake higher levels of risky assets since they are more capable in managing risk and have an easier access to external funds when needed. On the other hand, larger banks may be more risk-averse, which can be attributed to tighter supervision and better access to capital markets (Delis et al., 2011).

In the final specification, we aim to analyze whether monetary policy fluctuations have a differential effect on bank-risk taking attitude owing to certain individual balance sheet characteristics following the similar approach extensively used in the empirical studies of the bank lending channel. For this reason, we re-formulate equation (4.2) and include the interactions of the NRGAP variable with our bank specific characteristics; liquidity, capitalization, and size, respectively.

$$r_{i,t} = \alpha + \beta r_{i,t-1} + \sum_{j=0}^{1} \gamma_j \Delta MP_{t-j} + \sum_{j=0}^{1} \delta_j NRGAP_{t-j} + \sum_{j=0}^{1} \theta_j \Delta GDP_{t-j} +$$

$$\zeta SIZE_{i,t-1} * \Delta NRGAP_t + \lambda LIQ_{i,t-1} * \Delta NRGAP_t + \kappa CAP_{i,t-1} * \Delta NRGAP_t + \epsilon_{i,t} \quad (4.6)$$

By estimating the above equation (4.6), we expect to shed light on whether there exists heterogeneity in the impact of monetary policy (actually in a too low direction) on bank-risk taking. More specifically, the significance of the coefficients associated with the interaction terms between monetary policy and bank characteristics shows the distributional effects of monetary policy due to these characteristics, allowing the

identification of changes in risk-taking following a change in the monetary policy. In this framework, we expect that the impact of a monetary policy change on bank risk taking will be lower for big, liquid and well-capitalized banks.

Next, we present the specifications based on EDF to examine the link between low interest rates and bank-risk taking. For our EDF sample, which comprises a panel of 14 banks with the data covering the period 2007q1-2012q1, we first consider the following generic equation:

$$\Delta EDF_t = \alpha \Delta EDF_{t-1} + \beta \Delta MP_{t-1} + \gamma NRGAP_{t-1} + \delta \Delta IP_{t-1} + \varepsilon \qquad (4.7)$$

with *t=1,….., T* where *T* is the final quarter. Quarterly changes in expected default frequency (ΔEDF) is regressed on its one year lag,; the change in monetary policy indicator (ΔMP); the natural interest rate gap ($NRGAP$); the change in industrial production index (ΔIP);[39] seasonal dummies (SD) in the equation (3.7), which is the best fitted model in terms of coefficient significance.

In general, we follow with the same strategy which we adopted in the analysis using accounting-based measures for the bank risk. To this end, we estimate the following equations:

$$\Delta EDF_t = \alpha \Delta EDF_{t-1} + \beta \Delta MP_{t-1} + \gamma NRGAP_{t-1} + \delta \Delta IP_{t-1} + \varphi \Delta SM_{t-1} + \varepsilon \qquad (4.8)$$

$$\Delta EDF_t = \alpha \Delta EDF_{t-1} + \beta \Delta MP_{t-1} + \gamma NRGAP_{t-1} + \delta \Delta IP_{t-1} + \theta HHI + \varepsilon \qquad (4.9)$$

$$\Delta EDF_t = \alpha \Delta EDF_{t-1} + \beta \Delta MP_{t-1} + \gamma NRGAP_{t-1} + \delta \Delta IP_{t-1} + \tau SIZE_{t-1} + \phi LIQ_{t-1} + \psi CAP_{t-1} + \varepsilon \qquad (4.10)$$

[39] In the models that we use EDF as our dependent variable, we have employed change in the industrial production index instead of the growth rate of GDP; because the GDP data for 2012q1 is not available at the time of this study.

$$\Delta EDF_t = \alpha\Delta EDF_{t-1} + \beta\Delta MP_{t-1} + \gamma NRGAP_{t-1} + \delta\Delta IP_{t-1} + \zeta SIZE_{i,t-1} +$$

$$\lambda LIQ_{i,t-1} * \Delta NRGAP_t + \kappa CAP_{i,t-1} * \Delta NRGAP_t + \varepsilon \quad (4.11)$$

The models have been estimated using the generalized methods of moments (GMM) estimator for dynamic panel data models developed by Arellano and Bover (1995) and Blundell and Bond (1998)[40] (see section 3.5.3 for details). This approach allows us to cope with a number of identification challenges and hence, it is the appropriate estimation method for several reasons.

We choose to estimate a dynamic empirical model, in which we introduce the lagged dependent variable among regressors that accounts for the persistence and dynamic nature of risk, as many empirical and theoretical studies indicate that bank-risk taking behavior is highly persistent. Delis and Kouretas (2011: 846) present four theoretical reasons to explain the dynamic nature of bank risk:

> First, persistence may reflect the existence of intense competition, which tends to alleviate the risk-taking of banks (e.g. Keeley, 1990; Cordella and Yeyati, 2002). Second, relationship-banking with risky borrowers will have a lasting effect on the levels of bank risk-taking, despite the fact that dealing repeatedly with the same customer will improve efficiency. A similar mechanism would prevail given bank networks or if the banking industry is opaque. Third, to the extent that bank risk is associated with the phase of the business cycle, banks may require time to smooth the effects of macroeconomic shocks. Fourth, risks may persist due to regulation. In particular, deposit guarantees or capital requirements may exacerbate moral hazard issues, leading to inefficient and risky investments over a considerable period of time.

Another point other than these theoretical considerations is the fact that a dynamic formulation approximates the potential impact of stock variables on flow variables better. When these are all taken into account, the application of a dynamic panel data model is more appropriate, since a static model would be biased under these conditions.

[40] All empirical analyses in this study are done with STATA version 10.

Furthermore, interest rates are considered to be endogenous in bank risk equations. In other words, the direction of causality between monetary policy and bank risk is not obvious and hence, it is needed to control the reverse causality as a special form of endogeneity. Other than the monetary policy variable, some of the control variables are not strictly exogenous as well. The potential endogeneity between risk and bank specific characteristics, which are explanatory variables in our model, presents another identification problem. In this context, the GMM estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998) is the convenient strategy as it accommodates both for the persistence of risk and possible endogeneity of bank specific characteristics by using appropriate instruments, which are their lagged levels.[41]

This estimator ensures efficiency and consistency, provided that the dynamic regression model is not subject to second-order serial correlation and that the instruments used are valid. Accordingly, we employ AR(1) and AR(2) tests for first and second-order autocorrelation. While first-order autocorrelation could be expected in the first differenced residuals, the p-value of AR(2) should be large accepting the null hypothesis of no serial correlation of order two in first differences of the errors. Because higher order autocorrelation would imply that lags of the dependent variable is not actually endogenous and, hence bad instruments. Furthermore, the validity of the instruments is checked by using Sargan test for over-identifying restrictions.

In the next section, we will proceed with the presentation and interpretation of the results of our empirical analysis.

4.5. Estimation Results

Estimation results for non-performing loans ratio, z-index, standard deviation of the return on assets and EDF with the natural interest rate gap variable are respectively reported in Tables 4.3, 4.4, 4.5 and 4.6. We first consider the results of the models that use the three accounting-based risk measures namely; non-performing loans

[41]Another benefit of the Blundell- Bond estimator is that it does not breakdown in the presence of unit roots as well. For proof; see Binder et al.(2003) (Delis and Kouretas, 2011).

ratio, z-index and standard deviation of the return on assets, as the dependent variable and then proceed with the models with EDF as the risk-taking measure.

In tables 4.3, 4.4, 4.5 regression specification (I) reports our baseline regression results obtained from the estimation of equation (4.2) with the Blundell-Bond estimator. Regression specifications (II) and (III) presents the estimation results of equations (4.3) and (4.4) augmented with the stock market return and concentration measures to account for the impact of asset prices and banking market concentration on banks' risk-taking, respectively. Regression specification (IV) reports the outcomes of the estimation of equation (4.5), which comprises bank-specific characteristics namely; size, liquidity and capitalization to control for the effect of these individual bank characteristics on the relationship between monetary policy and bank-risk. Finally, regression specification (V) presents the results obtained from the estimation of equation (4.6) and shows the distributional effects of interest rates on bank risk-taking due to individual bank characteristics.

Table 4.3 Regression Results: NPL

Dependent variable:NPL	(I) Baseline Model		(II) Accounting for stock market effect		(III) Accounting for market concentration		(IV) Bank Specific Characteristics		(V) Distributional effects due to bank characterisitcs	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
ΔNPL_{t-1}	0.581***	0.001	0.580***	0.001	0.576***	0.001	0.576***	0.001	0.583***	0.001
ΔMP_t	0.119***	0.004	0.091***	0.009	0.086***	0.006	0.106**	0.016	0.065***	0.009
ΔMP_{t-1}	0.158***	0.004	0.163***	0.008	0.162***	0.009	0.184***	0.100	0.134***	0.014
$NRGAP_t$	-0.046***	0.004	-0.041***	0.004	-0.036***	0.005	-0.060***	0.005	-0.046**	0.022
$NRGAP_{t-1}$	-0.043***	0.003	-0.060***	0.006	-0.062***	0.008	-0.030***	0.010	-0.013*	0.011
ΔGDP_t	-0.423***	0.004	-0.371***	0.004	-0.363***	0.005	-0.401***	0.119	-0.347***	0.014
ΔGDP_{t-1}	-0.139***	0.005	-0.098***	0.005	-0.092***	0.006	-0.140***	0.008	-0.043***	0.008
ΔSM_t			-0.001***	1.870						
ΔSM_{t-1}			-0.004***	1.250						
HHI					-0.020***	0.001				
$SIZE_{t-1}$							-0.256***	0.026		
LIQ_{t-1}							-0.054***	0.001		
CAP_{t-1}							-0.006***	0.001		
$SIZE_{t-1} * NRGAP_t$									0.300***	0.008
$LIQ_{t-1} * NRGAP_t$									0.031***	0.001
$CAP_{t-1} * NRGAP_t$									0.026***	0.001
Sample period	2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4	
Number of observations	1388		1388		1388		1388		1388	
Sargan test (p-value)	0.289		0.311		0.692		0.415		0.309	
AR(1), AR(2) (p-value)	0.011, 0.226		0.000, 0.415		0.000, 0.325		0.008, 0.297		0.000, 0.223	

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

We start with the results of the models using non-performing loans ratio as dependent variable. As shown in Table 4.3, the monetary policy stance measured by the change in the short term interest rate enters the regression specification (I) as being significantly positive at the one percent level, suggesting that a decrease in short term interest rates has a positive impact on the loan portfolio quality and thereby, financial soundness of banks. In other words, bank risk-taking (i.e. banks' non-performing loans ratio) decreases if interest rates are lowered. This is consistent with the findings of the previous empirical literature (Jimenez et al., 2009; Altunbaş et al., 2010) that lower short term interest rates reduce the credit risk of outstanding loans. Lower rates make loan repayment easier by decreasing the interest burden of the borrowers, which in turn, lead to lower loan default rates. As stated in Altunbaş et al. (2010) the drop in the quality of the loan portfolio is probably further strengthened by the reduction of banks' funding liquidity costs following the decrease in the short term interest rates (Diamond and Rajan, 2009; Adrian and Shin, 2009). Another point to note is that this positive impact of low interest rates on credit risk of bank portfolios might also stem from the fact that the volume of outstanding loans outweighs the new loans in the short term, and hence this effect primarily corresponds to a shorter-term phenomenon as it has also been established as a short-term effect of low interest rates by Jimenez et al. (2009).

The natural rate gap, which is the difference between the real short-term interest rate and the natural interest rate, has a negative and significant coefficient. This result implies that when short-term interest rates are below a benchmark level, banks increase their risk-taking. In other words, relatively low levels of interest rates cause either a decrease in risk perception or an increase in risk tolerance. This result gives evidence of a change in risk perception or risk tolerance and accordingly, it confirms the impact of the risk-taking channel of monetary policy transmission. This finding is consistent with Altunbaş et al. (2010) as well.

If we look at the estimation results from specification (I) in Table 4.3, we see that if the interest rate is 100 basis points below the natural interest rate value, the average probability of loan default increases by 0.09 percent after a quarter and by 0.2 in the long run. Therefore; the strength of the risk-taking channel, i.e. the negative effect of low interest rates on banks' risk profile, increases in the long-run.

Concerning the impact of macroeconomic variables, GDP growth enters the regression significantly negative at the one-percent as shown in first column of Table 4.3, implying that the probability of loan default is negatively related with the growth rate of GDP. Favorable economic conditions is associated with an increase in the number of projects becoming profitable in terms of expected net present value, and which in turn lead to a reduction in overall credit risk of a bank (Kashyap and Stein, 1993; Altunbaş et al., 2010). Moreover, borrowers would earn more and accordingly, their capability to pay back their loans would be higher in times of good economic outlook. This result is consistent with the findings of Gambacorta (2009), Altunbaş et al. (2010) and Lopez et al. (2012), whereas it is in stark contrast to Delis and Kouretas (2011) who provide evidence of a positive relationship between GDP growth and risk in the European banking sector. One possible interpretation for this positive relationship is that in times of good macroeconomic stance banks tend to grant more credit in search for high yield, and also soften their screening standards. However, as our results indicate this is not the case for Turkish banking system.

The results displayed in regression specification (II) of Table 4.3 show that the coefficient for the change in stock market return is significant and negative, which is consistent with our prior expectations. This result indicates that an increase in stock market prices cause a reduction in banks' risk. A possible interpretation is that a boost in assets prices leads to an increase in collateral value and hence, borrowers' net worth, which in turn result in a lower overall credit risk. In addition to that, increase in asset prices may also have an impact on the bank risk via a higher value for banks' securities portfolio. This finding is in line with Borio and Zhu (2008) and Altunbaş et al. (2010). However, it should be noted that with regard to the risk-taking channel of monetary policy, it is posited that the boosts in asset and collateral values lead to a change in risk perception or risk tolerance, making both borrowers and banks to accept higher risk-taking in the long run.

As regression specification (III) in Table 4.3 reports, the concentration measure HHI appears to be negative and statistically significant at the one per-cent level. As higher values of HHI imply more concentration and possibly less competition, the negative coefficient of this variable suggests that as concentration in the Turkish banking sector increases or conversely competition decreases, non-performing loans

ratio and hence; the loan risk of banks declines. With regard to the risk-taking channel of monetary policy, this result supports the search for yield hypothesis put forward by Rajan, (2006) and the transmission mechanism implied in Dell' Ariccia and Marquez (2006), as it suggests that intensified competition lead to higher pressure on profits, which in turn creates incentives for banks to search for higher yield and engage in more risky projects, resulting in excessive risk-taking. Other than this, in more competitive markets banks are expected to earn less informational rents from their relationship with borrowers, which might reduce their incentives to tightly screen borrowers and, eventually cause an increase in bank fragility (Boot and Greenbaum, 1993; Allen and Gale, 2000, 2004; Beck, 2008; Michalak, 2010).

However, this result should be evaluated cautiously since the related literature regarding the impact of the banking market structure on bank fragility posits that structural measures of competition like concentration ratios and non-structural measures of competition of measures, calculated from firm level data are different proxies and accordingly, measures different aspects of competition in the market.[42] Therefore, results of the analysis might be sensitive to the market structure variable employed. However, as our primary concern is not on the bank market concentration-financial fragility nexus, this point is not critical from the standpoint of our analysis.

As regression specification (IV) in Table 4.3 reports, the three bank-specific characteristics enter the regression significantly negative at one-percent level. The negative coefficient of the size variable implies that larger banks take on lower levels of non-performing loans and hence, have a better loan portfolio quality. In other words, loan risk tend to be lower in larger banks, which gives support to the hypothesis that larger banks are more risk averse than smaller banks. Larger banks may be able to diversify loan portfolio risks more efficiently stemming from their comparative advantages in providing credit monitoring services (Carletti and Hartmann, 2003; Demsetz and Strahan, 1997) and higher economies of scale and scope (Berger *et al.*, 2007; Allen and Liu, 2007). Furthermore, larger banks may

[42] Furthermore, there are some studies in the empirical literature saying that concentration might not be a good measure of the degree of competitiveness in banking system (e.g. Beck et. al, 2006); high concentration banking markets may indeed be competitive.

ration credit more heavily, as they lend fewer borrowers with higher credit quality, the loan portfolio quality and hence, financial soundness of the bank would increase (Michalak, 2001).

Notably, our result regarding bank size is contrary to the 'too big to fail' paradigm. Large banks may have greater incentives to take risk than smaller banks as a result of the moral hazard problems created by 'too big to fail' paradigm. Additionally, it could be high competition that could provoke larger banks to engage in more risky projects. However, this does not seem to be the case for Turkey, since Turkish banks operate in a monopolistic competitive structure, instead of a competitive environment, as stated in Abbasoğlu et al. (2007) and Yaldız and Bazzana (2010). When these are taken into account, our result on the size variable is reasonable and also consistent with our prior expectations. Notably, the coefficient associated with the size variable is significantly larger than that of liquidity and capital, suggesting size as a more effective indicator in risk-taking behaviour of banks when compared to the other two characteristics.

With regard to bank-specific variables, the coefficient of liquid assets to total assets is negative and significant in the regression specification (IV) in Table 4.3, suggesting that banks with higher liquidity levels tend to have lower non-performing loans and hence, face lower loan risk. Banks that are more liquid are perceived as being safer by the market, as they could be able to meet unexpected withdrawals by liquidating their assets promptly. Accordingly, banks carry higher level of securities to serve as buffer stocks to cushion the adverse effects of shocks and hence, to protect themselves against risk. On the other hand, it could be the case that liquid banks undertake more risk, since holding liquid assets with low yields cause higher costs, which in turn prompts banks to shift their investments towards more risky projects. However, this does not seem to hold for the Turkish banking system. Furthermore, the negative impact of liquidity on bank risk is contrary to the regulatory hypothesis, which states that regulators encourage banks to hold more liquidity to cover the risks being taken (Altunbaş et al., 2007). Therefore, our results suggest that banks in Turkey choose to keep certain amounts of risk-free securities in their balance sheet mainly because of the risk mitigating character of the liquid assets. In other words, the level of liquid assets in banks' balance sheets is primarily

driven by their risk aversion motives. Finally, our result regarding liquidity differs from Jimenez et al. (2009) and Iannidou et al. (2009), who find positive relationship between bank liquidity and risk, whereas it is in line with Gambacorta (2009) and Altunbaş et al. (2010).

Among the bank-specific characteristics, capital enters the regression specification (IV) significant and negative, showing that well-capitalized banks carry less non-performing loans and have a lower risk-taking. The negative impact of capital on bank risk suggest that banks with higher equity to assets ratios have less moral hazard incentives to take on more risk and tend to behave more prudently. Accordingly, they hold capital as buffers against assets side risk to withstand losses, together with the effect of strict capital requirements. This result confirms the expectation that well-capitalized banks are more risk averse than their not so well-capitalized peers. Furthermore, it could also be inferred that well-capitalized banks in Turkey do not tend to engage in risky projects in an attempt to maximize revenues. Another interpretation is that regulators or markets do not force riskier banks to accumulate capital (Altunbaş et al. 2012), that is to say they do not have to offset risk by higher levels of capitalization. Moreover, our result is in line with the moral hazard hypothesis, which suggests that when the level of bank capital is low, bank managers have more incentives to take on excessive risk stemming from the existence of agency problems between bank managers and shareholders (e.g. managers undertake risk which are entirely borne by the owners) (Fiordelisi et al., 2010). In sum, we could state that in the Turkish banking system, banks with higher capital levels tended to have a better loan portfolio quality and enjoy lower levels of credit risk.

Finally, regression specification (V) in Table 4.3 presents estimation results for size, liquidity, and capitalization interaction with the natural rate gap, showing the distributional effects of changes in monetary policy stance on bank risk due to individual bank characteristics. In other words, these results shows whether certain bank characteristics lead to heterogeneous response in bank risk-taking related to monetary policy. The coefficients of the interactions between the natural rate gap and bank characteristics; size, liquidity, and capital, enter the regression positive significantly at the one-percent level, suggesting that banks with different

characteristics maintained different risk strategies when interest rates are relatively low during the period under consideration.

Regarding the distributional effects of low interest rates on bank risk, our result implies that larger banks are able to absorb the impact of low interest rates on non-performing loans and thus, on their credit risk. In other words, the impact of a monetary policy change in a too low direction would have a higher effect on the level of risk of smaller banks. While banks on average undertake higher loan risk in the relatively low interest rate periods, larger banks do not have to engage in more risky projects in search for yield, as they have more power in the market for interbank resources and could also rely on different businesses for income generation and diversify their earnings. As this is not the case for smaller banks, their risk-appetite increases more than their larger counterparts when interest rates are low.

Concerning with the distributional effect of capital on the interest rates-bank risk nexus a positive and significant coefficient is found on the interaction term of the capitalization with natural rate gap. This result suggests that the insulation effects on risk in response to low interest rates are lower for banks with higher equity to total assets ratio. As higher levels of equity capital serve banks as buffer against excess loan losses and hence, to withstand to adverse shocks, more capitalized banks tend to increase risk-taking to a smaller extent than less-capitalized ones.

The positive and significant coefficient of the interaction term of liquidity with the natural rate gap shows that the impact of low interest rates on non-performing loans is diminished for banks with higher liquidity ratios. As banks could avert from higher risk exposure by holding more liquid assets in their portfolio, liquid banks are less vulnerable to risk-taking. In other words, banks with higher levels of liquid assets, which are more risk averse, would have lower incentives to engage in risky projects in a low interest rate environment. On the contrary, the impact of low interest rates on risk-taking would be stronger for banks with less liquid balance sheets.

Table 4.4 reports the estimations results when z-index is used as the dependent variable, in an attempt to see whether our results hold when this measure is considered as a proxy for bank risk. Since z-index is an inverse measure of overall

bank risk, i.e. higher the value of z-index lower the risk, we expect the opposite signs on the estimated coefficients when the z-index replaces the other risk measures used in our analysis as the dependent variable and hence, one should interpret the results accordingly.

Table 4.4 Regression Results: Z-index

Dependent variable: Z-index	(I) Baseline Model		(II) Accounting for stock market effect		(III) Accounting for market concentration		(IV) Bank Specific Characteristics		(V) Distributional effects due to bank characterisitcs	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
Z_index_{t-1}	0.773***	0.004	0.760***	0.005	0.746***	0.007	0.756***	0.001	0.750***	0.006
ΔMP_t	-0.090***	0.004	-0.114***	0.009	-0.118***	0.009	-0.108**	0.001	-0.115***	0.009
ΔMP_{t-1}	-0.044***	0.004	-0.043***	0.007	-0.046***	0.008	-0.039***	0.001	-0.471***	0.006
$NRGAP_t$	0.064***	0.003	0.062***	0.005	0.058***	0.006	0.060***	0.001	0.061**	0.006
$NRGAP_{t-1}$	0.014***	0.001	0.021***	0.003	0.027***	0.003	0.018***	0.001	0.021*	0.004
ΔGDP_t	0.047***	0.003	0.098***	0.010	0.077***	0.008	0.098***	0.002	0.099***	0.010
ΔGDP_{t-1}	0.061***	0.005	0.093***	0.010	0.081***	0.008	0.091***	0.002	0.093***	0.001
ΔSM_t			0.002***	2.340						
ΔSM_{t-1}			0.002***	2.980						
HHI					-0.001***	0.001				
$SIZE_{t-1}$							-0.093***	0.004		
LIQ_{t-1}							0.001***	0.002		
CAP_{t-1}										
$SIZE_{t-1} * NRGAP_t$									-0.006***	0.004
$LIQ_{t-1} * NRGAP_t$									0.0006	0.003
$CAP_{t-1} * NRGAP_t$										
Sample period	2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4	
Number of observations	1783		1783		1783		1783		1783	
Sargan test (p-value)	0.197		0.217		0.183		0.129		0.113	
AR(1), AR(2) (p-value)	0.001, 0.896		0.000, 0.513		0.000, 0.881		0.000, 0.557		0.001, 0.336	

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

Regression specification (I) in Table 4.4 presents the estimation results for the baseline model. While we find a positive and significant coefficient for the natural rate gap variable, the coefficient for the change in the short term interest rate is negative and significant, confirming our previous finding on the risk-taking channel. The negative coefficient of the monetary stance measured by the change in short term interest rate implies that softer monetary conditions decrease banks' overall risk, similar to the result that we find for the non-performing loans, which is a measure for loan portfolio risk. Accordingly, we could interpret this result as lower interest rates make loan repayment easier for borrowers which would result in lower loan default rates and hence, lower overall riskiness of banks. The positive coefficient of the natural rate gap variable suggests that interest rates below the natural interest rate benchmark lead to an increase in banks' appetite for risk, giving evidence to risk-taking channel. Regarding the macroeconomic variables, GDP growth enters the regression significantly positive at one per-cent level. Moreover, the stock market returns variable is significantly positive at the one-percent level as regression specification (II) in Table 4.4 shows. The signs of the GDP growth and stock market returns variables reconfirm the results of our baseline model with NPL as our dependent variable.

On the other hand, introducing the HHI to account for the market concentration, this variable enters the regression significantly negative at the one-percent level as shown in the regression specification (III) in Table 4.4. This outcome is in contrast to our result regarding market concentration when non-performing loans ratio is employed as banks' risk measure, since it implies that riskiness of banks rises when concentration in the market increases or inversely competition decreases. In other words, it indicates that increasing the banking market concentration has a negative impact on the Turkish banks' financial soundness. That is to say, the direction of the impact of concentration on bank risk differs for these two measures of bank risk. This could stem from the fact that these indicators measure diverse aspects of bank risk; while z-index measures the overall risk by taking into account the return on assets, capitalization level and the return volatility, non-performing loans ratio accounts only for the risk arising from loan portfolio of banks. When these are taken into consideration, our results regarding the impact of market concentration on non-performing loans and z-index can be interpreted as, while lower levels of

concentration in the Turkish banking sector lead to riskier loan portfolios, it depresses the overall riskiness of banks stemming from all of the operations alongside the supply of credit. Therefore, it could be the case that banks may hold higher capital or use other risk management methods to mitigate higher loan risk and hence, have safer portfolios overall (Berger et. al., 2009).

Concerning the impact of bank specific variables on z-index[43], while size enters the regression significantly negative at one-percent level, liquidity has a positive and significant coefficient in regression specification (IV) in Table 3.4. The negative coefficient of size variable implies that large banks tend to engage in more risky projects and exposed to more overall bank risk. We do not interpret this result as a contradiction to our previous finding on the impact of size on bank risk, suggesting that larger banks take on lower levels of credit risk. Indeed, we interpret those opposing results as, while larger banks hold considerably less non-performing loans and have less risky loan portfolios than their smaller counterparts; smaller banks enjoy greater overall stability as a result of their higher capitalization levels. That is to say, since a higher value for z-index either comes from higher capital and/or earnings level or lower variability in earnings, it would be the case that the lower overall risk of smaller banks may result from their high levels of capitalization, as smaller banks tend to be better capitalized in Turkish banking system. The positive and significant coefficient of liquidity supports our previous finding that liquid banks are more risk averse. In other words, banks holding higher levels of liquid assets in their portfolio are associated with lower overall risk.

Regarding the distributional effects of low interest rates on overall bank risk owing to individual bank characteristics, we find only bank size to have a distributional effect in regression specification (V) in Table 4.4. This result suggests that the impact of low interest rates on riskiness is less severe for larger banks. This result may seem inconsistent with our previous result regarding bank size in specification (IV), which implies that larger banks have less overall risk. However, this result could be interpreted as larger banks have superior hedging techniques to reduce

[43] Among bank-specific characteristics, capitalization is not included as an explanatory variable in the regression where z-index is employed as dependent variable; since the ratio of equity to total assets is used to compute z-index as well.

portfolio volatility, which enables them to buffer the impact of low interest rates on the overall risk. Furthermore, liquidity does not seem to have a distributional effect when z-index is used as proxy for risk-taking as its coefficient is found to be insignificant in regression specification (IV) in Table 4.4. However, z-index is rather a measure of insolvency risk and more loosely related to our considerations on risk-taking, we favor non-performing loans ratio as a measure of bank-risk taking more. Therefore, it could be suggested that the distributional effect of liquidity on the low interest rates –bank risk nexus is better captured in non-performing loans equations.

Table 4.5 Regression Results: STDROA

Dependent variable: STDROA	(I) Baseline Model		(II) Accounting for stock market effect		(III) Accounting for market concentration		(IV) Bank Specific Characteristics		(V) Distributional effects due to bank characterisitcs	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
$STDROA_{t-1}$	0.559***	0.007	0.538***	0.008	0.449***	0.008	0.409***	0.013	0.543***	0.012
ΔMP_t	0.014***	0.002	0.032***	0.002	0.039***	0.002	0.030**	0.002	0.031***	0.002
ΔMP_{t-1}	0.054***	0.002	0.053***	0.002	0.056***	0.002	0.057***	0.002	0.052***	0.003
$NRGAP_t$	-0.010***	0.001	-0.008***	0.001	-0.012*	0.001	-0.006***	0.001	-0.008***	0.001
$NRGAP_{t-1}$	-0.027***	0.001	-0.022***	0.001	-0.020***	0.001	-0.026***	0.001	-0.021**	0.002
ΔGDP_t	-0.020***	0.002	-0.045***	0.002	-0.027***	0.002	-0.046***	0.002	-0.046***	0.002
ΔGDP_{t-1}	-0.034***	0.001	-0.049***	0.001	-0.036***	0.001	-0.049***	0.001	-0.048***	0.002
ΔSM_t			0.0001	7.300						
ΔSM_{t-1}			0.0001	4.650						
HHI					-0.007*	0.0001				
$SIZE_{t-1}$							-0.169***	0.007		
LIQ_{t-1}							-0.0011*	0.001		
CAP_{t-1}							-0.010*	0.040		
$SIZE_{t-1} * NRGAP_t$									0.011**	0.007
$LIQ_{t-1} * NRGAP_t$									0.001***	0.002
$CAP_{t-1} * NRGAP_t$									0.005***	0.001
Sample period	2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4	
Number of observations	1730		1730		1730		1730		1730	
Sargan test (p-value)	0.143		0.158		0.155		0.168		0.189	
AR(1), AR(2) (p-value)	0.000, 0.598		0.000, 0.691		0.000, 0.838		0.000, 0.733		0.000, 0.784	

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

Table 4.5 reports the estimation results when standard deviation of return on assets, our third accounting-based risk measure, is used as the dependent variable. Our main findings are reiterated. While coefficient of the change in short-term interest rate is positive and significant, the coefficient of the natural rate gap variable remains negative and highly significant, which are consistent with our results obtained by using the non-performing loans ratio and z-index. Besides, the sign of the GDP variable and HHI index remain robust as well. On the other hand, in contrast to our previous results, the coefficient of the stock market returns variable has incorrect sign and is found to be insignificant in regression specification (III) in Table 4.5. The coefficients of our bank-specific characteristics are negative and significant, suggesting that large, liquid and well-capitalized banks are more risk averse. Therefore, regarding the individual bank characteristics' impact on risk, our volatility of assets returns regression (IV) in Table 4.5 confirms the findings to those of non-performing loans ratio equations. Furthermore, previous findings regarding the distributional effects of size, capital and liquidity in the regression specification (V) in Table 4.3 continue to hold when return volatility is used as the dependent variable.

Table 4.6 Regression Results: EDF

Dependent variable: ΔEDF	(I) Baseline Model		(II) Accounting for stock market effect		(III) Accounting for market concentration		(IV) Bank Specific Characteristics		(V) Distributional effects due to bank characteristics	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
ΔEDF_{t-1}	0.149***	0.022	0.129***	0.033	0.121***	0.019	0.128***	0.049	0.109***	0.100
ΔMP_{t-1}	0.446***	0.104	0.265***	0.040	0.211***	0.025	0.409***	0.078	0.417***	0.089
$NRGAP_{t-1}$	-0.208***	0.048	-0.144*	0.050	-0.118***	0.042	-0.154***	0.068	-0.109***	0.058
ΔIP_{t-1}	-0.045*	0.027	-0.024*	0.019	-0.088***	0.006	-0.014*	0.033	-0.054*	0.024
ΔSM_{t-1}			-0.002*	0.001						
HHI					-0.053***	0.002	-0.956*	1.642		
$SIZE_{t-1}$							-0.058*	0.098		
LIQ_{t-1}							-0.336***	0.168		
CAP_{t-1}									-0.928***	0.025
$SIZE_{t-1} * NRGAP_t$									0.006**	0.004
$LIQ_{t-1} * NRGAP_t$									-0.005*	0.003
$CAP_{t-1} * NRGAP_t$										
Sample period	2007q1-2012q2		2007q1-2012q2		2007q1-2012q2		2007q1-2012q2		2007q1-2012q2	
Number of observations	262		262		262		262		262	
Sargan test (p-value)	0.585		0.423		0.412		0.383		0.214	
AR(1), AR(2) (p-value)	0.150,0.198		0.140,0.138		0.380,0.178		0.007, 0.379		0.017, 0.256	

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

Table 4.6 reports the coefficient estimates obtained from the estimation of equations (4.7)-(4.11), using EDF as the dependent variable and a different sample than previous estimations. The estimation results in Table 4.6 verify that the risk-taking channel is still in place when a market-based risk indicator, EDF, is used as the risk measure. The results from the EDF variable corroborate our results established so far. First of all, the coefficients associated with the monetary policy indicator and natural rate gap measures have the correct signs and are significant. Therefore, a fall in monetary policy still reduces bank risk measured with EDF by lowering the credit risk on outstanding loans and risk-taking channel is still in place; as banks take on more risks when interest rates are below the benchmark rate. The coefficient of the industrial production index, which we include to control for macroeconomic activity, is negative and significant at ten-percent level in all regression specifications in Table 4.6, showing a negative relation between good economic conditions and bank risk. Furthermore, the stock market index variable enters the regression specification (II), supporting our previous finding that a boost in asset prices lead to a reduction in overall credit risk by increasing collateral values. In regression specification (III), the coefficient of the HHI is found to be negative and significant, which is consistent with our previous finding in the non-performing loans ratio regression. As regression specification (IV) reports, the effects of size, liquidity and capital on bank risk are negative, implying that large, liquid and well-capitalized tend to take on less risk. Note that the results are similar to the one obtained in the non-performing loans ratio regression. However, in this case bank size and liquidity lose on statistical significance, but remain significant at ten percent. Turning to distributive effects, the positive and significant coefficients of the interaction term between bank characteristics and natural rate gap confirms our previous finding that the impact of low interest rates on bank risk is less severe for large, liquid and well capitalized banks. Consequently, our results are very similar to those observed when accounting-based risk measures are employed as the dependent variable.

The robustness of these results has been checked by considering an alternative benchmark dictated by Taylor rule instead of natural rate gap variable as a measure of accommodative monetary policy. In an attempt to confirm our previous results and to see if we could detect the risk-taking channel yet again, using Taylor rule gap, we

rerun equations (4.2)-(4.6) for non-performing loans ratio, z-index and standard deviation of return on assets and equations (4.7)-(4.11) for EDF as dependent variables. The construction of the Taylor rule gap measure is discussed in detail [44] and further, the results of the estimations are provided in the Tables B.5- B.9 in the Appendix.

In general, the results are very similar and consistent with those for the models that use the natural rate gap as a measure of monetary policy stance. Notably, the sign and the significance of the coefficients attached to the monetary policy indicator and the benchmark measures do not change drastically. However, the magnitude of these coefficients has changed in most cases. Specifically, the magnitude of the coefficient for Taylor rule gap is higher compared with that of the coefficients attached to natural rate gap (except the models where EDF is employed as the risk measure), suggesting a stronger risk-taking channel.[45] In other words, the results are even more in favor of the existence of a risk-taking channel when a Taylor rule dictated benchmark is employed. The coefficients associated with the stock market returns and HHI have correct signs and are found to be significant in most specifications. Regarding impact of the bank-specific characteristics on bank risk and the distributive effects owing to these certain characteristics, there are some slight changes in terms of significance and magnitude of the coefficients. Remarkably, some coefficients change sign, but no longer are significant.

To conclude, the effects of change in the short term interest rate on banks' risk is positive, whereas the impact of short term monetary policy rate below the benchmark rate on risk-taking is negative, irrespective of the variable used to proxy bank risk-taking. Thus, the results of our analysis provide evidence in favor of existence of a risk-taking channel in Turkey during the period considered.

[44] The derivation of a Taylor rule for Turkey could be subject to many criticisms, however our main point is not to analyze monetary policy rule or examine the efficiency of Turkish monetary policy regime, but just to provide a simple benchmark in order to assess the relative stance of the monetary policy. Therefore, the concerns regarding whether it is reasonable to approximate the behavior of the CBRT by the proposed Taylor rule is beyond the scope of this study.

[45] This is especially true for the specifications which use the non-performing loans ratio as the dependent variable, since the magnitude of coefficient of the Taylor rule gap variable is significantly high.

4.6. Conclusion

The recent global financial crisis that unfolded into recession in 2008 has raised many questions about the conduct of monetary policy. Particularly, it has drawn attention of researchers and policy makers to the relationship between monetary policy and financial stability and has brought this issue to the forefront of the economic policy debate. Moreover, it has motivated some recent developments in the theory of monetary policy transmission mechanism. As one of these developments, the risk-taking channel of monetary policy (Borio and Zhu, 2008) is a recent theory that examines the potential link between monetary policy and risk perceptions in the financial markets. Particular emphasis has been put on how monetary policy stance impacts risk perceptions and risk appetite of financial intermediaries. According to the propositions of the risk-taking channel, very low levels of interest rates following monetary expansions may induce an increase in the risk-taking of banks and financial institutions, leading a shift in the supply of credit.

The mechanisms through which monetary policy may impact banks' and other financial institutions' risk-taking are complex, including several different aspects. Risk-taking channel could operate through 'search for yield' in the presence of rigid nominal target returns, which may reflect either nature of contracts or behavioral aspects such as money illusion. Other set of effects operate through the procylical valuation of assets, incomes and cash flows, whereas another way the risk-taking channel may operate is through the communication policies and reaction function of the monetary authority, such as the insurance effect produced by the perception that the central bank reaction function is effective in cutting off large downside risk. Apart from these, there exist many other theoretical explanations about the operation of the risk-taking channel as well.

Although the empirical literature on risk-taking channel is growing, it is rather limited for the time being. In addition to the fact that risk-taking channel is a relatively recent issue, the difficulty to separate its effects from the other transmission channels and complexity to measure risk has been other some other factors that give rise to this admittedly scant literature as well. However, an increasing number of recent studies explore the potential interaction between

monetary policy stance and banks' risk-taking in an attempt to assess if a risk-taking channel of monetary policy is actually take place. Most of them provide evidence of the existence of this channel, establishing that monetary policy is not neutral from a financial stability perspective.

This study contributes to the growing empirical literature on the risk-taking channel of monetary policy by investigating the bank specific characteristics of risk-taking behavior of the Turkish banking sector as well as the existence of risk taking channel of monetary policy in Turkey. In particular, it is the first study that investigates the evidence of this channel in Turkey. Moreover, it adds to the literature on risk-taking channel by providing evidence from a emerging market as most studies of the existing studies are related to developed countries.

Using bank- level quarterly data over the period 2002-2012, a dynamic panel model is estimated to examine risk of Turkish banks in response to changes in monetary policy stance. Our sample accounts for 53 banks that have been active in Turkey during the period. To deal with the potential endogeneity between risk and bank specific characteristics, which are explanatory variables in our model, the GMM estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998) is used. Four alternative risk measures are used in the analysis; three accounting-based risk indicators and a market-based indicator- EDF.

We find evidence that low levels of interest rates have a positive impact on banks' risk-taking behavior for all the risk measures. Specifically, we find that the effects of change in the short term interest rate on banks' risk is positive, whereas the impact of short term monetary policy rate below the benchmark rate on risk-taking is negative, irrespective of the variable used to proxy bank risk-taking. Regarding the bank-specific characteristics, we find that size, liquidity and capitalization affect risk-taking behavior. While we find that liquid and well-capitalized banks to take on higher credit risk, an interesting result is found about the relationship between size and banks' risk-taking. Larger banks hold considerably less non-performing loans and have less risky loan portfolios than their smaller counterparts; smaller banks enjoy greater overall stability as a result of their higher capitalization levels. Moreover, our empirical analysis reveals that large, liquid and well-capitalized banks

are less prone to take risks in response to a change in monetary policy stance. In sum, although it is not possible to draw firm conclusions, our study provides evidence in favor of the existence of a risk-taking channel in Turkey over the period 2002-2012.

CHAPTER 5

CONCLUDING REMARKS

A comprehensive assessment of banks' performance and their incentives do not only matter for a successful design of monetary policy; but also necessary for the effective functioning of the banking sector. Moreover, the 2008 global financial crisis reminds us that fragility of the financial institutions can trigger a disruption in the financial markets, resulting in devastating effects on the real economy. Accordingly, in the wake of the global crisis recent research lead to the emergence of the risk-taking channel as a new strand of monetary policy transmission mechanism and has intensified the discussion regarding the bank lending channel, along with the reformulation of it.

Against this background, this dissertation seeks to identify whether data covering the period 1988-2012 in Turkey assign monetary policy a significant role in altering banks' lending and risk-taking behavior. We find that monetary policy has a significant impact on the banking sector in Turkey. In our empirical analysis, we find that banks in the market do not respond uniformly to monetary policy changes and this differential response of banks in terms of their lending and risk-taking stem from a number of bank characteristics. Our analysis showed that financially sound banks follow different strategies regarding their lending and risk-taking than banks with weaker balance sheets in Turkey.

There are some recent papers that suggest a reformulation of the traditional bank lending channel, since structural changes in the business model of banks, together with financial integration has changed the nature of today's financial environment. In his paper, Disyatat (2010) suggest reconsideration of the traditional bank lending

channel to make it more consistent with the salient features of the modern financial systems, together with the new interpretation of the existing evidence for the bank lending channel and potential alternative identification strategies that may be adopted. The author further states that bank lending channel could not be operative under inflation targeting framework, since central banks do not need to adjust reserves in the case of a change in the stance of monetary policy; i.e. they set the policy rate and then, the quantity of reserves demanded is interest rate-inelastic. Hence, there is no direct link between reserves and bank lending. On the other hand, our empirical results regarding the bank lending channel suggest a change in the lending behavior of banks and a stronger bank lending channel in the aftermath of the 2000-01 financial crisis under an inflation targeting environment. The objections regarding the traditional bank lending channel do not contradict with our results, since the criticism is about the premise about the policy rates and reserves. The mechanism of household portfolio rebalancing, which presumes that policy actions changing the opportunity cost holding deposits act as catalyst for portfolio rebalancing that affects the level of deposits, could still be in place. An alternative explanation is put forward by Radia (2010:7):

> However, it remains possible that monetary policy could affect the volume of deposits held by banks both through demand and supply channels in a world with no binding reserve requirements. Importantly, any first or second round effect on deposits still constitutes an effective policy induced shock to the liability side of bank balance sheet and can give rise to a bank lending channel.

In addition to these, it should be noted that there has been a steady incrase in the amount of funds that the Turkish banking sector raised from abroad in recent years, which could act as another factor to limit the potency of operation of a traditional bank lending channel.

In sum, substantial changes in the global financial markets and the associated changes in the monetary policy making in the recent decade have obviously altered the channels of the monetary transmission. These developments present some new

challenges to monetary authorities worldwide, not just for Turkey, in understanding the channels through which their policy instruments impact the real economy.

In the light of these facts, our findings point to several policy considerations. First of all, when setting monetary policy, central bank should take into account the banking sector conditions since our empirical results suggest that monetary policy and financial stability are interrelated. In other words, monetary policy is not neutral from a financial stability perspective and, hence monetary policy is able to mitigate or at least, offset some negative consequences of financial instabilities on the real economic activity. Accordingly, examining the credit lending and risk-taking of banks can guide policy makers in providing advice on the possible actions that could help in maintaining financial stability. Furthermore, the fact that bank specific characteristics; such as capitalization and liquidity, seem to play a central role in Turkish banks' lending and risk-taking behavior shows the power of the effective regulation and supervision over these characteristics. This impact is further corroborated by our findings regarding the functioning of the bank lending channel in the post-crisis era with the new regulatory agency. Therefore, efficient regulation and supervision is an important factor in providing prudent bank behavior. Moreover, the global financial crisis and debates regarding the role of the risk-taking channel in that crisis bring about policy discussions on macroprudential regulations and supervision. As stated in Apel and Claussen (2012), if the risk-taking channel is at the heart of the emergence of the global crisis, there could be two possible explanations about why the supervision and regulatory activities at the micro level did not detect the excessive risk-taking before the financial crisis. First one is that methods which microprudential supervision and regulation used before the financial crisis were not developed enough to notice the risks in the individual bank- level, suggesting strengthening the traditional microprudential supervision and making it more effective as a solution. The second explanation is that these methods of microprudential regulations were well-developed; however risk could build up at the macro level, and in that case, the problems in individual institutions did not seem serious enough for microprudential regulation to be on the alert. This view underlines the importance and need for macroprudential regulation and supervision. Notably, the interaction between macroprudential regulation and monetary policy is an important issue for Turkey as well.

While the literature on the impact of monetary policy on bank lending in Turkey is somewhat more extensive, the corresponding effect on bank risk-taking has not been investigated yet, leaving many areas for future research. Accordingly, many interesting extensions for further research can be made in both of these bank-based monetary transmission channels. If it is available, it will be of interest to work on more disaggregate bank-level data on loans that convey more information in order to understand how these channels act in more detail. Furthermore, it would be worthwhile to study the behavior of bank lending standards following monetary policy changes by using bank lending surveys, which provide information about the strictness of the lending criteria on new loans. The CBRT Banks' Loan Tendency Survey is conducted rather for a short time period, hence not allowing for a time series analysis, whereas we unfortunately could not be able to obtain survey data on individual bank level to build a panel dataset and accordingly, supplement our analysis further by empirically examining the relationship between monetary policy and bank lending standards. If we could have been able to access to this data, it would be interesting to examine lending standards as an extension of this study. Apart from these data limitations, the risk-taking channel could also be studied in relation with the systemic risk in a multi-country framework. The analysis could also be developed by accounting for additional bank characteristics that are informative about banks' business models and may have an impact on their risk-taking incentives. While the third chapter examines how monetary policy affects banks' risk-taking, the analysis regarding the bank lending channel could further be extended by adding bank risk conditions to investigate whether there is a bank lending channel operating via bank risk in Turkey.

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APPENDICES

APPENDIX A. APPENDIX TO CHAPTER 3

Table A.1 Description of Variables

Variable	Symbol	Description
Loans	L	Outstanding loans extended by banks
Interest rate	MP	Money market interest rate
GDP	GDP	Real GDP at constant 1998 prices
Inflation rate	CPI	Average consumer price index
Size	SIZE	Log of total assets (million TRY)
Capitalization	CAP	Shareholders 'equity-to-total assets*100
Liquidity	LIQ	Liquid assets-to-total assets*100
Earnings	EARN	Net profits-to-total assets*100
Asset Quality	QUAL	Loans under follow -up-to-total loans*100
Management Capability	MANG	Real net income-to-number of branches*100

Table A.2 Banks in the Dataset

Name of the Bank	Type	Ownership category	
Adabank A.Ş.	Deposit	Domestic private	
Ak Uluslararası Bankası A.Ş.	Deposit	Foreign subsidiary	Acquired by Akbank T.A.Ş in 2005
Akbank T.A.Ş.	Deposit	Domestic private	
Aktif Yatırım Bankası A.Ş.	Development and Investment	Domestic private	
Alternatif BankA.Ş	Deposit	Domestic private	
Anadolubank A.Ş	Deposit	Domestic private	
Arap Türk Bankası A.Ş.	Deposit	Foreign subsidiary	
Bank Mellat	Deposit	Foreign branch	
Bank Kapital Türk T.A.Ş.	Deposit	Domestic private	Merged under the name Sümerbank A.Ş. and dissolved in 2001
Bank Pozitif Kredi ve Kalkınma Bankası	Development and Investment	Foreign subsidiary	
Birleşik Fon Bankası A.Ş.	Deposit	Domestic public	
Birleşik Türk Körfez Bankası A.Ş.	Deposit	Domestic private	Merged under the name Osmanlı Bankası A.Ş. in 2001.
Birleşik Yatırım Bankası	Development and Investment	Domestic private	Dissolved in 1999
Citibank A.Ş.	Deposit	Foreign subsidiary	
Credit Agricole Yatırım Bankası Türk A.Ş.	Development and Investment	Foreign subsidiary	
Credit Lyonnais S.A.	Deposit	Foreign branch	Acquired by Credit Agricole Indosuez Türk Bank A.Ş. (Credit Agricole Yatırım Bankası Türk A.Ş.) in 2004
Demirbank T.A.Ş.	Deposit	Domestic private	Acquired by HSBC Bank A.Ş. in 2001
Denizbank A.Ş.	Deposit	Foreign subsidiary	
Deutsche Bank A.Ş.	Deposit	Foreign subsidiary	
Diler Yatırım Bankası	Development and Investment	Domestic private	
Ege Giyim Sanayicileri Bankası A.Ş.	Deposit	Domestic private	Dissolved in 2002
Egebank A.Ş.	Deposit	Domestic private	Merged under the name Sümerbank A.Ş. and dissolved in 2001
Eskişehir Bankası T.A.Ş	Deposit	Domestic private	Merged under the name Etibank A.Ş. and dissolved in 2001
Etibank A.Ş.	Deposit	Domestic private	Dissolved in 2001
Eurobank Tekfen A.Ş.	Deposit	Foreign subsidiary	
Fiba Bank A.Ş.	Deposit	Domestic private	Acquired by Finans Bank A.Ş. in 2003
Finans Bank A.Ş.	Deposit	Foreign subsidiary	
Fortis Bank A.Ş.	Deposit	Foreign subsidiary	
GSD Yatırım Bankası A.Ş.	Development and	Domestic private	

Table A.2 continued

Name of the Bank	Type	Ownership category	
	Investment		
Habib Bank Limited	Deposit	Foreign branch	
HSBC Bank A.Ş.	Deposit	Foreign subsidiary	
İktisat Bankası T.A.Ş.	Deposit	Domestic private	Transferred to Bayındırbank A.Ş. (Birleşik Fon Bankası) in 2002
İller Bankası	Development and Investment	Domestic public	
İMKB Takas ve Saklama Bankası A.Ş.	Development and Investment	Domestic private	
ING Bank A.Ş.	Deposit	Foreign subsidiary	
ING Bank N.V.	Deposit	Foreign branch	Dissolved in 2003
İnterbank A.Ş.	Deposit	Domestic private	Merged under the name Etibank A.Ş. and dissolved in 2001
JPMorgan Chase Bank N.A.	Deposit	Foreign branch	
Kentbank A.Ş.	Deposit	Domestic private	Transferred to Bayındırbank A.Ş. (Birleşik Fon Bankası) in 2002
Kıbrıs Kredi Bankası Ltd.	Deposit	Foreign branch	Dissolved in 2000
Koçbank A.Ş.	Deposit	Domestic private	Acquired by Yapı ve Kredi Bankası A.Ş. in 2006
Marmara Bankası A.Ş.	Deposit	Domestic private	Dissolved in 1994
Merrill Lynch Yatırım Bank A.Ş.	Development and Investment	Foreign subsidiary	
Milennium Bank A.Ş.	Deposit	Foreign subsidiary	
Milli Aydın Bankası T.A.Ş.	Deposit	Domestic private	Acquired by Denizbank A.Ş. in 2002
Nurol Yatırım Bankası A.Ş.	Development and Investment	Domestic private	
Osmanlı Bankası A.Ş.	Deposit	Foreign subsidiary	Acquired by Türkiye Garanti Bankası A.Ş. in 2001
Pamukbank T.A.Ş.	Deposit	Domestic public	Acquired by Türkiye Halk Bankası A.Ş. in 2004
Park Yatırım Bankası A.Ş.	Development and Investment	Domestic private	Dissolved in 2000
Sınai Yatırım Bankası A.Ş.	Development and Investment	Domestic private	Acquired by Türkiye Sınai Kalkınma Bankası in 2002
Societe Generale (SA)	Deposit	Foreign branch	
Sümerbank A.Ş.	Deposit	Domestic private	Merged under the name Oyak Bank A.Ş.(ING Bank A.Ş.) and dissolved in 2002
Şekerbank T.A.Ş	Deposit	Domestic private	
Taib Yatırım Bank A.Ş.	Development and Investment	Foreign subsidiary	
Tekfen Yatırım ve Finansman Bankası A.Ş.	Development and Investment	Domestic private	Acquired by Bank Ekspres A.Ş.(Eurobank Tekfen A.Ş.) in 2001
Tekstil Bankası A.Ş	Deposit	Domestic private	
The Royal Bank of Scotland N.V.	Deposit	Foreign branch	

Table A.2 continued

Name of the Bank	Type	Ownership category	
Toprakbank A.Ş.	Deposit	Domestic private	Transferred to Bayındırbank A.Ş. (Birleşik Fon Bankası A.Ş.) in 2002
Turkish Bank A.Ş	Deposit	Domestic private	
Turkland Bank A.Ş.	Deposit	Foreign subsidiary	
Türk Ekonomi Bankası A.Ş.	Deposit	Domestic private	
Türk Eximbank	Development and Investment	Domestic public	
Türk Ticaret Bankası A.Ş.	Deposit	Domestic private	Dissolved in 2002
Türkiye Cumhuriyeti Ziraat Bankası A.Ş.	Deposit	Domestic public	
Türkiye Emlak Bankası A.Ş.	Deposit	Domestic public	Acquired by Türkiye Halk Bankası A.Ş. in 2001
Türkiye Garanti Bankası A.Ş.	Deposit	Domestic private	
Türkiye Halk Bankası A.Ş.	Deposit	Domestic public	
Türkiye İmar Bankası T.A.Ş.	Deposit	Domestic private	Dissolved in 2003
Türkiye İş Bankası A.Ş.	Deposit	Domestic private	
Türkiye İthalat ve İhracat Bankası A.Ş.	Deposit	Domestic private	Dissolved in 1994
Türkiye Kalkınma Bankası A.Ş.	Development and Investment	Domestic public	
Türkiye Sınai Kalkınma Bankası A.Ş.	Development and Investment	Domestic private	
Türkiye Turizm Yatırım ve Dış Ticaret Bankası A.Ş.	Deposit	Domestic private	Dissolved in 1994
Türkiye Tütüncüler Bankası Yaşarbank A.Ş.	Deposit	Domestic private	Merged under the name Sümerbank A.Ş. and dissolved in 2001
Türkiye Vakıflar Bankası T.A.O.	Deposit	Domestic public	
Ulusal Bank T.A.Ş.	Deposit	Foreign subsidiary	Merged under the name Sümerbank A.Ş. and dissolved in 2001
Unicredit Banca di Roma S.p.A.	Deposit	Foreign branch	Dissolved in 2008
Yapı ve Kredi Bankası A.Ş.	Deposit	Domestic private	
Yurt Ticaret ve Kredi Bankası A.Ş. (Yurtbank)	Deposit	Domestic private	Merged under the name Sümerbank A.Ş. and dissolved in 2001
WestLB AG	Deposit	Foreign branch	

Note: The table is based on author's gathering of information on the records provided as of 27 December 2010 by the Banks Association of Turkey. The statute of many banks has been subject to some changes during the period analyzed and these are not reported in the table for the sake of brevity. Accordingly, the ownership category reports the current status for the banks operating as end of 2009, while it is based on the status at time of the exit for the closed banks.

Table A.3 Regression Results with Time Dummies

Dependent Variable:ΔLt	(I) Sample Period 1988-2009		(II) Sample Period 1988-2001		(III) Sample Period 2002-2009	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
SIZE	-20.177***	4.075	-15.461***	5.452	-9.382*	5.464
CAP	0.586**	0.646	1.608***	0.302	0.932***	0.467
LIQ	0.934***	0.162	1.365***	0.125	0.385***	0.171
EARN	0.275	0.938	0.799**	0.546	-1.589***	0.982
QUAL	0.400***	0.188	0.534***	0.136	0.615***	0.228
MANG	10.150	0.159	19.163	35.352	189.275***	68.371
SIZE*MP	0.053***	0.052	-0.025**	0.019	0.156*	0.200
CAP*MP	-0.011***	0.009	0.007*	0.004	0.934***	0.015
LIQ*MP	-0.002	0.031	-0.005***	0.001	0.012***	0.008
EARN*MP	0.011	0.018	0.004*	0.006	0.079*	0.069
QUAL*MP	0.005**	0.003	0.006	0.003	0.045***	0.014
MANG*MP	0.162	1.247	0.186	0.626	6.047*	5.994
Number of observations	854		586		197	
Sargan test (p-value)	0.492		0.386		0.242	
AR(1), AR(2) (p-value)	0.070, 0.934		0.002, 0.556		0.020, 0.146	

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

Table A.4 Regression Results for Deposit Banks

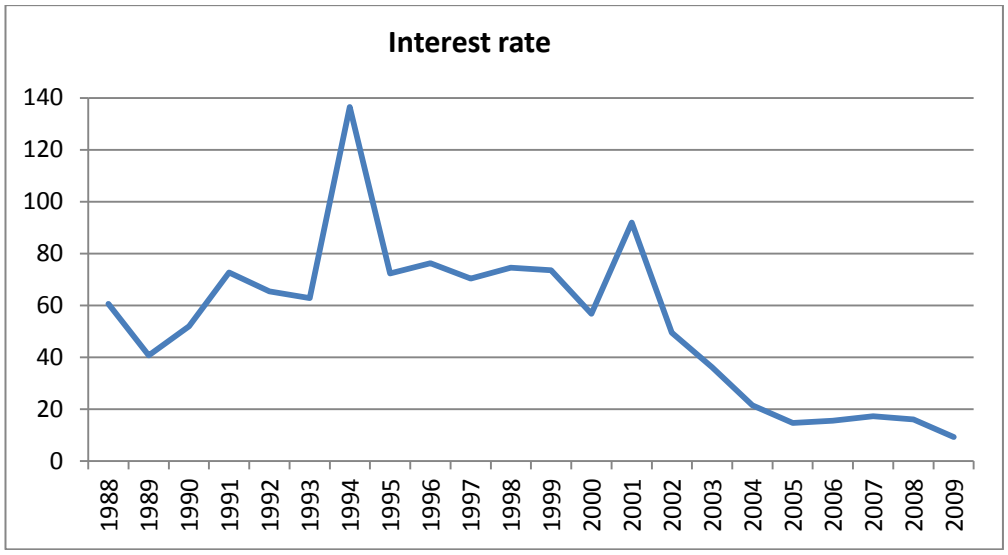
Dependent Variable:ΔLt	(I) Sample Period 1988-2009		(II) Sample Period 1988-2001		(III) Sample Period 2002-2009	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
MP	-0.122***	0.030	-0.282***	0.090	-0.391***	0.369
GDP	0.488***	0.160	3.540**	0.226	0.567**	0.194
CPI	-0.242***	0.087	-1.914***	0.272	-0.961	0.042
SIZE	-12.654***	0.968	-10.281***	0.946	-29.544***	0.834
CAP	0.832***	0.309	2.369***	0.263	1.385**	0.194
LIQ	1567***	0.288	1.849***	0.257	0.334*	0.353
EARN	1,553***	0.579	0.689**	0.391	-2.210***	0.839
QUAL	0.449***	0.044	0.237**	0.144	0.285***	0.673
MANG	24.803	58.489	14.334	46.949	268.150***	67.779
SIZE*MP	0.069***	0.008	0.015	0.012	0.506***	0.202
CAP*MP	0.025***	0.002	0.004	0.004	0.090**	0.065
LIQ*MP	-0.005***	0.001	-0.008***	0.002	0.036*	0.043
EARN*MP	0.030***	0.010	0.033***	0.013	0.518	0.142
QUAL*MP	0.013***	0.002	0.005***	0.002	0.039*	0.055
MANG*MP	0.857	0.582	-0.248	1.319	29.385***	5.771
Number of observations	728		505		165	
Sargan test (p-value)	0.483		0,789		0.374	
AR(1), AR(2) (p-value)	0.005, 0.522		0.000, 0.319		0.057, 0.174	

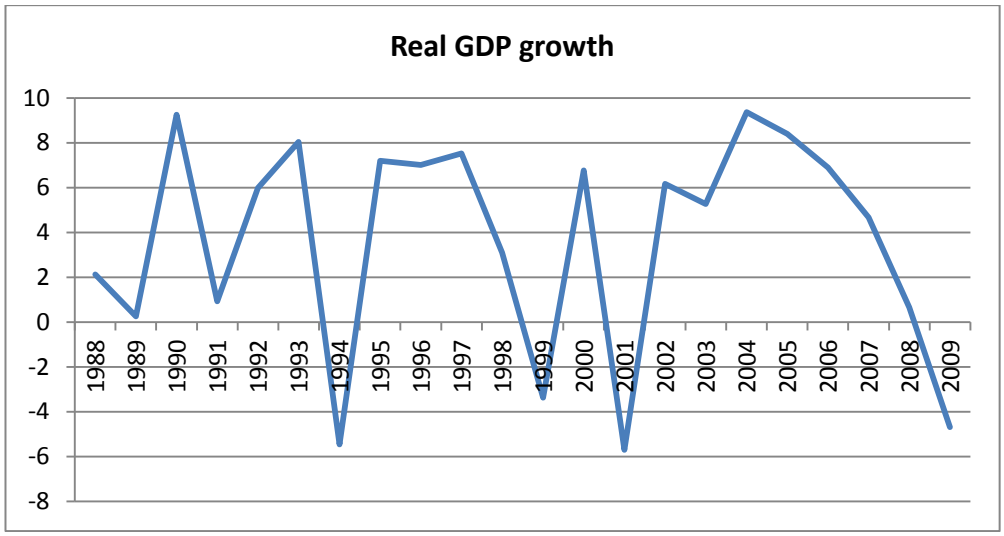
Note: * Significance level of 10%
** Significance level of 5%
*** Significance level of 1%

Table A.5 Regression Results with respect to Ownership: Private Banks

Dependent Variable:ΔLt	(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	-0.115***	0.036	-0.227***	0.017	-0.661***	0.223
GDP	0.363***	0.162	2.249***	0.105	1.371***	0.473
CPI	-0.489***	0.086	-1.460***	0.179	-0.561*	0.200
SIZE	-12.461***	1.081	-11.506***	1.113	-11.500***	4.436
CAP	0.846***	0.397	2.490***	0.420	0.431**	0.301
LIQ	1.077***	0.085	1.480***	0.106	0.663***	0.160
EARN	0.142	0.419	1.052***	0.341	-1.164***	0.394
QUAL	0.433***	0.052	0.303**	0.194	0.426***	0.271
MANG	18.307	34.404	11.988	36.263	220.647***	51.174
SIZE*MP	0.063***	0.008	-0.005***	0.010	0.241***	0.093
CAP*MP	-0.006***	0.004	0.003*	0.004	0.011*	0.019
LIQ*MP	-0.001*	0.001	-0.007***	0.001	0.025***	0.017
EARN*MP	0.004	0.012	0.009	0.011	0.038	0.075
QUAL*MP	0.005***	0.002	0.012***	0.003	0.021***	0.011
MANG*MP	0.730	1.054	0.622	0.832	11.641**	8.433
Number of observations	760		518		178	
Sargan test (p-value)	0.518		0.583		0.449	
AR(1), AR(2) (p-value)	0.000, 0.293		0.000, 0.764		0.009, 0.130	

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





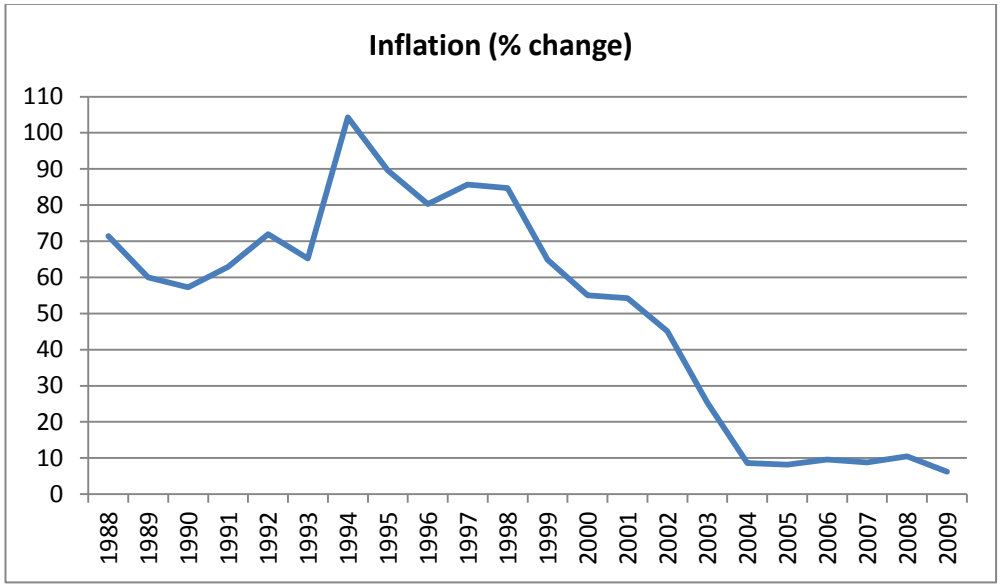


Figure A.1 Time series of Macro Variables

APPENDIX B. APPENDIX TO CHAPTER 4

Table B.1 Banks in the Dataset

Name of the Bank	Type	Ownership category	
Adabank A.Ş.	Deposit	Domestic private	
Ak Uluslararası Bankası A.Ş.	Deposit	Foreign subsidiary	Acquired by Akbank T.A.Ş in 2005
Akbank T.A.Ş.	Deposit	Domestic private	
Aktif Yatırım Bankası A.Ş.	Development and Investment	Domestic private	
Alternatif BankA.Ş	Deposit	Domestic private	
Anadolubank A.Ş	Deposit	Domestic private	
Arap Türk Bankası A.Ş.	Deposit	Foreign subsidiary	
Bank Mellat	Deposit	Foreign branch	
Bank Pozitif Kredi ve Kalkınma Bankası	Development and Investment	Foreign subsidiary	
Birleşik Fon Bankası A.Ş.	Deposit	Domestic public	
Citibank A.Ş.	Deposit	Foreign subsidiary	
Credit Agricole Yatırım Bankası Türk A.Ş.	Development and Investment	Foreign subsidiary	
Credit Lyonnais S.A.	Deposit	Foreign branch	Acquired by Credit Agricole Indosuez Türk Bank A.Ş. (Credit Agricole Yatırım Bankası Türk A.Ş.) in 2004
Denizbank A.Ş.	Deposit	Foreign subsidiary	
Deutsche Bank A.Ş.	Deposit	Foreign subsidiary	
Diler Yatırım Bankası	Development and Investment	Domestic private	
Eurobank Tekfen A.Ş.	Deposit	Foreign subsidiary	
Fiba Bank A.Ş.	Deposit	Domestic private	Acquired by Finans Bank A.Ş. in 2003
Fibabanka A.Ş.	Deposit	Foreign subsidiary	
Finans Bank A.Ş.	Deposit	Foreign subsidiary	
Fortis Bank A.Ş.	Deposit	Foreign subsidiary	Acquired by Türk Ekonomi Bankası A.Ş. in 2011.
GSD Yatırım Bankası A.Ş.	Development and Investment	Domestic private	
Habib Bank Limited	Deposit	Foreign branch	
HSBC Bank A.Ş.	Deposit	Foreign subsidiary	
İller Bankası	Development and Investment	Domestic public	
İMKB Takas ve Saklama Bankası A.Ş.	Development and	Domestic private	

Table B.1 continued

Name of the Bank	Type	Ownership category	
	Investment		
ING Bank A.Ş.	Deposit	Foreign subsidiary	
ING Bank N.V.	Deposit	Foreign branch	Dissolved in 2003
JPMorgan Chase Bank N.A.	Deposit	Foreign branch	
Koçbank A.Ş.	Deposit	Domestic private	Acquired by Yapı ve Kredi Bankası A.Ş. in 2006
Merrill Lynch Yatırım Bank A.Ş.	Development and Investment	Foreign subsidiary	
Nurol Yatırım Bankası A.Ş.	Development and Investment	Domestic private	
Pamukbank T.A.Ş.	Deposit	Domestic public	Acquired by Türkiye Halk Bankası A.Ş. in 2004
Societe Generale (SA)	Deposit	Foreign branch	
Şekerbank T.A.Ş	Deposit	Domestic private	
Taib Yatırım Bank A.Ş.	Development and Investment	Foreign subsidiary	
Tekstil Bankası A.Ş	Deposit	Domestic private	
The Royal Bank of Scotland N.V.	Deposit	Foreign branch	
Turkish Bank A.Ş	Deposit	Domestic private	
Turkland Bank A.Ş.	Deposit	Foreign subsidiary	
Türk Ekonomi Bankası A.Ş.	Deposit	Domestic private	
Türk Eximbank	Development and Investment	Domestic public	
Türkiye Cumhuriyeti Ziraat Bankası A.Ş.	Deposit	Domestic public	
Türkiye Garanti Bankası A.Ş.	Deposit	Domestic private	
Türkiye Halk Bankası A.Ş.	Deposit	Domestic public	
Türkiye İmar Bankası T.A.Ş.	Deposit	Domestic private	Dissolved in 2003
Türkiye İş Bankası A.Ş.	Deposit	Domestic private	
Türkiye Kalkınma Bankası A.Ş.	Development and Investment	Domestic public	
Türkiye Sınai Kalkınma Bankası A.Ş.	Development and Investment	Domestic private	
Türkiye Vakıflar Bankası T.A.O.	Deposit	Domestic public	
Unicredit Banca di Roma S.p.A.	Deposit	Foreign branch	Dissolved in 2008
Yapı ve Kredi Bankası A.Ş.	Deposit	Domestic private	
WestLB AG	Deposit	Foreign branch	

Note: The table is based on author's gathering of information on the records provided as of 01 April 2011 by the Banks Association of Turkey. The statute of many banks has been subject to some changes during the period analyzed and these are not reported in the table for the sake of brevity. Accordingly, the ownership category reports the current status for the banks operating as end of 2011, while it is based on the status at time of the exit for the closed banks.

Table B.2 Description of the Variables

Variable	Symbol	Description
Expected Deafult Frequency	EDF	Expected Default Frequency (1 year ahead)
Non-performing loans	NPL	Non-performing loans (gross)-to-total loans*100
Z-index	Z_index	Computed as the sum of the ratio of return on assets (ROA) and the ratio of equity to total assets divided by the standard deviation of ROA. Calculated at the three-year rolling time window.
Standard deviation of ROA	STDROA	The standard deviation of return on assets; calculated three-year rolling time window.
Interest rate	MP	Short-term interbank rate
Natural rate gap	NRGAP	Difference between short-term interbank rate and the natural interest rate
Taylor Rule Gap	TGAP	Difference between short-term interbank rate and that generated by a standard 'Taylor Rule'
GDP growth	GDP	Quarterly changes in real GDP at constant 1998 prices, seasonally adjusted
Industrial production index	IP	Quarterly changes in industrial production index
Stock markets returns index	SM	Continuously compounded percentage rate of return based on daily ISE-100 index
Herfindahl-Hirschman index	HHI	Herfindahl-Hirschman index computed as the sum of squared assets market share of banks
Size	SIZE	Log of total assets (million TRY)
Liquidity	LIQ	Liquid assets-to-total assets*100
Capital	CAP	Shareholders 'equity-to-total assets*100

Table B.3 Correlation Matrix for Sample 1

	NPL	Z-INDEX	STDROA	MP	NRGAP	TGAP	ΔGDP	ΔSM	HHI	SIZE	LIQ	CAP
NPL	1.000											
Z-INDEX	-0.105	1.000										
	(0.000)											
STDROA	0.121	-0.832	1.000									
	(0.000)	(0.000)										
MP	-0.061	0.366	-0.371	1.000								
	(0.011)	(0.000)	(0.000)									
NRGAP	-0.032	0.002	-0.004	0.313	1.000							
	(0.183)	(0.091)	(0.085)	(0.000)								
TGAP	-0.031	0.094	-0.123	0.405	0.589	1.000						
	(0.225)	(0.000)	(0.000)	(0.000)	(0.000)							
ΔGDP	0.079	-0.123	0.120	-0.009	-0.368	-0.096	1.000					
	(0.001)	(0.000)	(0.000)	(0.700)	(0.000)	(0.000)						
ΔSM	0.051	0.120	-0.076	-0.184	-0.304	-0.104	0.292	1.000				
	(0.034)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)					
HHI	0.008	0.319	-0.255	-0.301	-0.319	-0.339	0.187	0.263	1.000			
	(0.716)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
SIZE	-0.021	0.256	-0.324	-0.256	-0.006	-0.213	-0.045	0.014	0.147	1.000		
	(0.373)	(0.000)	(0.000)	(0.000)	(0.778)	(0.000)	(0.063)	(0.550)	(0.000)			
LIQ	-0.034	-0.172	0.112	0.046	0.015	0.008	-0.029	0.010	-0.017	-0.226	1.000	
	(0.163)	(0.000)	(0.000)	(0.055)	(0.513)	(0.732)	(0.226)	(0.678)	(0.463)	(0.000)		
CAP	0.009	0.114	0.268	-0.010	-0.018	-0.052	0.017	0.069	0.069	-0.520	0.038	1.000
	(0.691)	(0.000)	(0.000)	(0.680)	(0.446)	(0.022)	(0.483)	(0.004)	(0.004)	(0.000)	(0.113)	

Note: p -values in paranthesis.

Table B.4 Correlation Matrix for Sample 2

	EDF	MP	NRGAP	TGAP	ΔIP	ΔSM	HHI	SIZE	LIQ	CAP
EDF	1.000									
MP	0.151	1.000								
	(0.011)									
NRGAP	0.208	0.486	1.000							
	(0.000)	(0.000)								
TGAP	0.130	0.537	0.656	1.000						
	(0.026)	(0.000)	(0.000)							
ΔIP	-0.137	-0.381	-0.396	-0.412	1.000					
	(0.022)	(0.000)	(0.000)	(0.000)						
ΔSM	-0.337	0.040	-0.354	-0.483	0.395	1.000				
	(0.000)	(0.498)	(0.000)	(0.000)	(0.000)					
HHI	-0.132	-0.310	-0.462	-0.260	0.254	0.169	1.000			
	(0.028)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)				
SIZE	-0.046	-0.213	-0.002	-0.229	0.045	-0.060	0.029	1.000		
	(0.443)	(0.000)	(0.966)	(0.000)	(0.453)	(0.320)	(0.628)			
LIQ	-0.132	0.145	0.019	0.121	-0.010	0.029	-0.065	0.308	1.000	
	(0.027)	(0.015)	(0.758)	(0.037)	(0.866)	(0.621)	(0.312)	(0.000)		
CAP	-0.130	-0.062	-0.225	-0.042	0.115	0.243	0.071	-0.093	0.379	1.000
	(0.030)	(0.301)	(0.000)	(0.472)	(0.055)	(0.000)	(0.230)	(0.121)	(0.000)	

Note: p -values in paranthesis.

Definition of Taylor Rule Gap

We compute the Taylor rule gap (TGAP) as the difference between the three months interbank rate and the rate implied by the simple Taylor rule according to the formula:

$$i_t = r^* + \beta_\pi(\pi_t - \pi^*) + \beta_y\,(y_t - y_t^*).$$

Following Kannan (2008) and Khakimov (2010), we set 10 per cent real interest rate as the long-run real interest rate for Turkey. We use quarterly changes in the Consumer Price Index (CPI) extracted from OECD Economic Outlook Database. As the CBRT announces only annual end-of-year inflation target, we convert end-of-year inflation targets to quarterly series. Real GDP data is taken from the the electronic data delivery system of the CBRT. The base year of national accounts is 1998=100. The seasonally adjusted series is then used to obtain the potential GDP by employing the classical Hodrick-Prescott filter. We set $\beta_\pi = 0.75$ and $\beta_y = 0.25$ given the heavy weight the CBRT put reducing inflation. Following the standard set-up for the Taylor rule, we put equal weights on inflation and output by setting $\beta_\pi = \beta_y = 0.5$ and hence, construct an alternative Taylor rule gap as well. Very similar results are obtained when this measure is used, however we report the results with the Taylor rule gap calculated by setting $\beta_\pi = 0.75$ and $\beta_y = 0.25$, which provide better fit.

Table B.5 Regression Results: NPL (Taylor Gap)

Dependent Variable:NPL	(I) Baseline Model		(II) Accounting for stock market effect		(III) Accounting for market concentration		(IV) Bank Specific Characteristics		(V) Distributional effects due to bank characteristics	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
ΔNPL_{t-1}	0.583***	0.003	0.582***	0.005	0.580***	0.004	0.578***	0.008	0.586***	0.001
ΔMP_t	0.217***	0.050	0,236***	0.070	0.119***	0.070	0.235***	0.135	0.223***	0.159
ΔMP_{t-1}	0.124***	0.001	0.148***	0.080	0.098***	0.050	0.120***	0.114	0.153***	0.132
$TGAP_t$	-2.858***	0.209	-2,688***	0.530	-2.686***	0.047	-2.862***	0.434	-2.653***	0.106
$TGAP_{t-1}$	-2.558***	0.176	-2.421***	0.355	-2.100***	0.030	-2.434***	0.261	-2.820***	0.050
ΔGDP_t	-0.630***	0.005	-0.621***	0.007	-0.575***	0.004	-0.634***	0.008	-0.621***	0.007
ΔGDP_{t-1}	-0.073***	0.002	-0.086***	0.007	-0.096***	0.005	-0.113***	0.006	-0.017***	0.100
ΔSM_t			-0.023***	0.980						
ΔSM_{t-1}			-0.027***	0.680						
HHI					-0.015***	0.009				
$SIZE_{t-1}$							-0.310***	0.224		
LIQ_{t-1}							-0.001***	0.011		
CAP_{t-1}							-0.011***	0.008		
$SIZE_{t-1} * TGAP_t$									0.502***	0.330
$LIQ_{t-1} * TGAP_t$									0.062***	0.002
$CAP_{t-1} * TGAP_t$									0.072***	0.002
Sample period	2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4	
Number of observations	1388		1388		1388		1388		1388	
Sargan test (p-value)	0.490		0.413		0.547		0.318		0.386	
AR(1), AR(2) (p-value)	0.930, 0.310		0.810, 0.224		0.000, 0.305		0.160, 0.283		0.310, 0.274	

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

Table B.6 Regression Results: Z-index (Taylor Gap)

Dependent variable: Z-index	(I) Baseline Model		(II) Accounting for stock market effect		(III) Accounting for market concentration		(IV) Bank Specific Characteristics		(V) Distributional effects due to bank characteristics	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
Z_index_{t-1}	0.767***	0.005	0.770***	0.008	0.768***	0.001	0.766***	0.010	0.720***	0.010
ΔMP_t	-0.014***	0.004	-0.013***	0.004	-0.021***	0.007	-0.010***	0.006	-0.017***	0.004
ΔMP_{t-1}	-0.003***	0.003	-0.002***	0.003	-0.005***	0.001	-0.002***	0.005	-0.003***	0.005
$TGAP_t$	0.163***	0.210	0.130***	0.400	0.177***	0.501	0.129***	0.620	0.186***	0.507
$TGAP_{t-1}$	0.126***	0.301	0.159***	0.309	0.092***	0.450	0.147***	0.400	0.154***	0.401
ΔGDP_t	0.144***	0.004	0.014***	0.006	0.017***	0.008	0.011***	0.007	0.015***	0.007
ΔGDP_{t-1}	0.032***	0.004	0.028***	0.004	0.032***	0.003	0.031***	0.006	0.037***	0.006
ΔSM_t			0.015***	1.050						
ΔSM_{t-1}			0.018***	0.940						
HHI					-0.001***	0.001				
CAP_{t-1}							-0.059***	0.030		
$SIZE_{t-1}$							0.002***	0.002		
$SIZE_{t-1} * TGAP_t$										
LIQ_{t-1}									-0.038***	0.030
$LIQ_{t-1} * TGAP_t$									0.003***	0.002
$CAP_{t-1} * TGAP_t$										
Sample period	2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4	
Number of observations	1783		1783		1783		1783		1783	
Sargan test (p-value)	0.216		0.282		0.381		0.289		0.391	
AR(1), AR(2) (p-value)	0.001, 0.667		0.001, 0.463		0.001, 0.607		0.001, 0.657		0.001, 0.576	

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

Table B.7 Regression Results: STDROA (Taylor Gap)

Dependent variable: STDROA	(I) Baseline Model		(II) Accounting for stock market effect		(III) Accounting for market concentration		(IV) Bank Specific Characteristics		(V) Distributional effects due to bank characteristics	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
$STDROA_{t-1}$	0.649***	0.007	0.652***	0.007	0.650***	0.007	0.602***	0.110	0.647***	0.007
ΔMP_t	-0.002	0.001	-0.001	0.001	0005**	0.002	-0.003**	0.010	-0.002	0.010
ΔMP_{t-1}	0.007***	0.001	0.006***	0.002	0,009***	0.001	0.008***	0.001	0.007***	0.001
$TGAP_t$	-0.087***	0.120	-0.053***	0.140	-0.095***	0.170	-0.065***	0.130	-0.083***	0.130
$TGAP_{t-1}$	-0.112***	0.120	-0.146***	0.130	-0.078***	0.180	-0.125***	0.120	-0.103***	0.110
ΔGDP_t	-0.012***	0.001	-0.012***	0.002	-0.014***	0.001	-0.009***	0.015	-0.010***	0.001
ΔGDP_{t-1}	-0.022***	0.001	-0.017***	0.001	-0.022***	0.001	-0.020***	0.012	-0.019***	0.001
ΔSM_t			0.019***	1.190						
ΔSM_{t-1}			0.037***	2.240						
HHI					0.001***	0.0001				
$SIZE_{t-1}$							-0.082***	0.060		
LIQ_{t-1}							-0.001***	0.004		
CAP_{t-1}							0.004	0.005		
$SIZE_{t-1} * TGAP_t$									0.016***	0.020
$LIQ_{t-1} * TGAP_t$									-0.0001	0.003
$CAP_{t-1} * TGAP_t$									0.0004**	0.002
Sample period	2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4		2002q1-2011q4	
Number of observations	1730		1730		1730		1730		1730	
Sargan test (p-value)	0.195		0.262		0.265		0.283		0.385	
AR(1), AR(2) (p-value)	0.000, 0.244		0.000, 0.137		0.000, 0.198		0.000, 0.219		0.000, 0.262	

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

Table B.8 Regression Results: EDF (Taylor Gap)

Dependent variable: ΔEDF	(I) Baseline Model		(II) Accounting for stock market effect		(III) Accounting for market concentration		(IV) Bank Specific Characteristics		(V) Distributional effects due to bank characteristics	
	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error	Coeff.	S. Error
ΔEDF_{t-1}	0.170***	0.070	0.111***	0.022	0.120***	0.009	0.156***	0.017	0.165**	0.065
ΔMP_{t-1}	0.196***	0.023	0.145***	0.018	0.108***	0.017	0.150***	0.033	0.167***	0.032
$TGAP_{t-1}$	-0.115**	0.041	-0.116***	0.033	-0.159***	0.045	-0.090*	0.089	-0.149**	0.060
ΔIP_{t-1}	-0.008*	0.004	-0.017*	0.007	-0.008	0.005	-0.008*	0.005	0.0009	0.011
ΔSM_{t-1}			-0.013**	0.036						
HHI					-0.014***	0.003				
$SIZE_{t-1}$							-0.133*	0.398		
LIQ_{t-1}							-0.010*	0.019		
CAP_{t-1}							-0.013*	0.042		
$SIZE_{t-1} * TGAP_t$									0.085*	0.067
$LIQ_{t-1} * TGAP_t$									0.014*	0.014
$CAP_{t-1} * TGAP_t$									0.017	0.006
Sample period	2007q1-2012q2		2007q1-2012q2		2007q1-2012q2		2007q1-2012q2		2007q1-2012q2	
Number of observations	262		262		262		262		262	
Sargan test (p-value)	0.297		0.299		0.565		0.791		0.688	
AR(1), AR(2) (p-value)	0.013, 0.106		0.018, 0.114		0.015, 0.105		0.020, 0.189		0.025, 0.100	

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

APPENDIX C. CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: Özşuca, Ekin Ayşe
Nationality: Turkish (TC)
Date and Place of Birth: 10 August 1984 , Ankara
Marital Status: Single
Phone: +90 (532) 4084100
email: aysozs@yahoo.com

EDUCATION

Degree	Institution	Year of Graduation
MS	METU Economics	2007
BA	Ankara University Economics	2005
High School	METU College, Ankara	2001

WORK EXPERIENCE

Year	Place	Enrollment
2007-September 2012	Cankaya University Department of Economics	Phd Scholar
2006-2007	Çankaya University Department of Economics	Research Assistant
2003 August	Deloitte, Ankara	Intern

FOREIGN LANGUAGES

Advanced English

HONOURS and AWARDS

TÜBİTAK-BDP Scholarship for Phd, 2011

METU Graduate Course Performance Award, 2009

Graduated with rank three from Department of Economics, Ankara University, 2005

SOFTWARE KNOWLEDGE

Microsoft Office, Stata, E-Views

APPENDIX D. TURKISH SUMMARY

Para politikası aktarım mekanizmasını anlamak makro ekonomi yazının en önemli ve en çok tartışılan konularından biri olmuştur. Bu bağlamda, bir çok teorik ve ampirik çalışma parasal aktarımda bankaların rolünü incelemiştir. Banka davranışı ve para politikası arasında ilişki, bankaların ekonomik aktiviteyi finanse etmedeki özel rolü nedeniyle ayrıca önem taşımaktadır. Bu doğrultuda, bankaların parasal aktarımdaki rolünün anlaşılması para politikası ve reel ekonomi arasındaki ilişkinin anlamaya yardımcı olacaktır. Bankalar üzerinden işleyen parasal aktarım kanalları arasında bilanço kanalı (balance sheet channel) ve banka kredi kanalı (bank lending channel) alt kanallarını kapsayan kredi kanalı (credit channel) ve risk alma kanalı (risk-taking channel) bulunmaktadır. Kredi kanalının temelini kredi piyasalarındaki asimetrik bilgi (asymmetric information) ve sürtünmeler (frictions) oluştururken, daha güncel olarak ortaya çıkan risk alma kanalı ekonomik birimlerin risk algılama (perception) ve fiyatlama davranışlarına vurgu yapmaktadır.

Banka ağırlıklı bir finansal sisteme sahip olan Türkiye için bankaların parasal aktarımdaki rolünü anlamak özellikle önem taşımaktadır. Bunun yanında, 2000-2001 krizlerini takip eden dönemde başlayan yeniden yapılandırma ve bu doğrultuda uygulanan yapısal reformlar sonucunda Türk bankacılık sektöründe çok önemli gelişmeler yaşanmıştır. Bu dönemde, kamu bankaları finansal ve operasyonel olarak yeniden yapılandırılmış, özel bankalar daha sağlıklı bir yapıya kavuşmuş, sistemde etkin denetim ve gözetim mekanizmasını sağlamaya yönelik kurumsal ve yasal düzenlemeler yapılmıştır. Bu kapsamda atılan adımlardan bir tanesi de 2000 yılında faaliyete başlayan Bankacılık Denetleme ve Düzenleme Kurumu'nun kurulması olmuştur. Bütün bu gelişmeler ışığında, Türk bankacılık sektörü on yılı aşkın bir süredir çok daha etkin ve rekabetçi bir yapıya kavuşmuştur. Bankacılık sektöründe yaşanan gelişmeler yanında, 2001 krizi sonrasında uygulanmaya başlayan ekonomik program ile enflasyon tek haneli rakamlara gerilemiş, daha yüksek ve istikrarlı büyüme oranları gerçekleşmiş, mali disiplin sağlanarak kamu kesiminin borçlanma gereği azalmıştır. Makro ekonomik değişkenler de yaşanan bu olumlu gelişmelerin yanında para politikası uygulamalarında da önemli değişiklikler olmuş ve Türkiye'de

2002 yılında örtük enflasyon hedeflemesi rejimi uygulanmaya başlanmış, 2006 yılında ise örtük olmayan enflasyon hedeflemesine geçilmiştir. Son on yılda para politikası uygulamalarında ve bankacılık sektöründe yaşanan bütün bu gelişmeler parasal aktarımda bankaların rolünün incelenmesini daha da ilginç bir hale getirmektedir. Yukarıda saydığımız bütün unsurlar bizi bankacılık sektörünün parasal aktarım mekanizmasındaki rolünü ampirik olarak incelemek ve böylelikle Türkiye'deki aktarım mekanizmasının özelliklerini daha iyi anlamak konusunda motive etmiştir.

Bu tezin esas amacı Türkiye ekonomisi için para politikası aktarım mekanizmasında bankaların rolünü ampirik olarak araştırmaktır. Bu bağlamda, bankaların para politikası değişikliklere karşı tepkilerindeki farklılaşmalar incelenmiş ve bankaların farklı tepki verip vermediğinin sınanması ile bankalar üzerinden işleyen aktarım mekanizmasının anlaşılması hedeflenmiştir. Aynı zamanda ampirik analizlerimiz bankacılık sektörüne mikro düzeyde bakarak bu tepki farklılıklarının kaynaklarını da ortaya çıkarmaktadır. Daha açık bir şekilde ifade edecek olursak, analizimiz banka davranışının hangi faktörlerden nasıl etkilendiğini ortaya koymaktadır. Bu bağlamda, politika faiz oranlarına karşı bankaların kredi verme ve risk alma davranışları üzerinde etkisi olabilecek büyüklük, likidite oranı ve sermaye yeterliliği gibi bir takım banka özellikleri analize dahil edilmiştir. Sonuçta, bu özelliklerin bankaların kredi arzı ve risk alma davranışı üzerindeki rolü ve bu özelliklere bağlı olarak para politikasının dağılımsal etkileri (distributional effects) araştırılmıştır.

2. Bölümde Türkiye ekonomisi ve finansal sektöründe son dönemde yaşanan gelişmeler gözden geçirilmiştir. Türk bankacılık sektörünün özellikleri 1988-2011 dönemi için, sektörün yapısı ve performansında kriz öncesi ve kriz sonrasında meydana gelen değişimlere vurgu yapılarak incelenmiştir. Yukarıda da belirtildiği gibi, Türk bankacılık sektörü 2001 krizini izleyen dönemde yeni denetleme ve düzenleme kurumunun faaliyete geçmesi ve bir dizi yapısal reform sonucunda yeniden yapılandırılarak çok önemli bir dönüşüm geçirmiştir. Ekonomide yaşanan gelişmeler de göz önünde bulundurulduğunda bankacılık sektöründe yaşanan değişikliklerin ayrıntılı olarak değerlendirilmesi önem taşımaktadır.

3. Bölümde Türkiye'de para politikası aktarım mekanizmasının banka kredi kanalı ampirik olarak incelenmektedir. Türkiye'de banka kredi kanalı hakkında yapılmış çok az sayıda çalışma mevcuttur ve bunlar banka kredi kanalının işlerliğine dair karma sonuçlar vermektedir. Bu durum parasal aktarımda bankaların rolünün daha ayrıntılı biçimde incelenmesini gerekli kılmaktadır.

Kredi piyasasını da dikkate alacak şekilde IS-LM modelinin değiştirildiği kredi kanalının bir alt kanalı olan banka kredi kanalına (ya da banka borç verme kanalı) göre para politikasındaki değişikler öncelikle bankaların bilançolarının yükümlülük tarafını etkiler, daha sonra bilançoların varlık tarafını da etkileyerek verebilecekleri kredi miktarını ve kredi faizini değiştirir. Daha başka bir ifadeyle, para politikasındaki değişiklikler bankaların kullanabilecekleri fon miktarını ve fon maliyetini değiştirerek bankaların kredi verme konusundaki istekliliğini etkiler. Bu değişiklikler, banka kredisinden başka borç bulma olanağı olmayan hanehalkı ve firmaları, başka bir deyişle; dış finansmanda bankalara bağımlı olan kesimleri olumsuz yönde etkileyerek harcamalarının azalmasına neden olur. Sonuçta banka kredi kanalı ile para politikası reel ekonomi üzerindeki etkisini ortaya koymuş olur.

Makro ekonomi yazınında banka kredi kanalı ile ilgili geniş bir literatür mevcuttur. Bu çalışmalardan bir bölümü, zaman serisi verileri kullanarak banka kredi arzı miktarının para politikası değişiklerini takip edip etmediğini incelemiştir. Ancak aktarım mekanizmasının bütün kanalları aynı anda çalıştığından zaman serisi kullanan çalışmalarda bir tanımlama hatası (identification problem) ortaya çıkmakta ve bu yöntem kanalların birbirinden ayrı olarak tespit edilmesini zorlaştırmaktadır. Daha açık bir ifadeyle, faiz oranının düşmesi sonucunda banka kredi miktarındaki azalma daha düşük kredi talebinden- geleneksel faiz oranı kanalı- ve/veya daha düşük kredi arzından-banka kredi kanalı kaynaklanıyor olabilir. Bu tanımlama sorununu çözmek amacıyla, araştırmacılar banka kredi kanalını banka düzeyinde veri kullanarak panel veri analiz yöntemleriyle araştırmaya yönelmiştir. Banka düzeyinde veri kullanılması, para politikası değişikliklerinin bankaların kredi arzı üzerinde meydana getirdiği farklılaşmanın incelenmesine ve dolayısıyla, banka kredi kanalının işleyip işlemediğinin anlaşılmasına olanak sağlamaktadır. Bunun arkasındaki temel

mantık şudur: Kredi piyasalarındaki eksiklikler (imperfections) nedeniyle farklı özelliklere sahip bankaların dış finansman sağlama yeteneğinde ve maliyetinde farklılıklar olacaktır. Bankaların kaynak yaratma maliyetlerindeki bu asimetri yüzünden, para politikası şoklarına karşı banka kredi arzında meydana gelen değişmeler, bankaların özelliklerine bağlı olarak birbirinden farklı olacaktır. Merkez bankasının daraltıcı bir para politikası uygulamasına, bazı bankalar kredi arzını azaltarak tepki verirken, daha az maliyetle ve daha kolay dış finansman sağlayabilen diğerleri kredi arzlarını bu olumsuz etkiden koruyabilecektir. Sonuç olarak, para politikası değişikliklerine karşı bankaların kredi verme davranışlarındaki farklılaşmanın incelenmesi yoluyla, banka kredi miktarındaki değişimlerin kredi talebinden kaynaklanan etkisi arındırılmış, sadece kredi arzından kaynaklanan bölümü ortaya konulmuş olacaktır. Bu çalışmada da bu yaklaşım kullanılmıştır.

Bu tez Türkiye'de banka kredi kanalı ile ilgili literatüre göre çeşitli yenilikler taşımaktadır. Bunlardan ilki, çalışmamızın mevcut çalışmalardan çok daha uzun bir dönemi, 1988-2009, kapsamasıdır. İkincisi, yukarıda belirtildiği gibi 2000-2001 krizinden sonra Türkiye ekonomisi ve bankacılık sektörü çok önemli değişikler yaşamış ve büyük bir dönüşüm geçirmiştir. Dolayısıyla 2000-2001 ekonomik krizi muhtemel bir yapısal kırılma (structural break) teşkil etmektedir. Bankalar kriz öncesi ve kriz sonrası dönemlerde çok farklı bir finansal ortamda faaliyette bulunduğundan, çalışmamız uygulanan yapısal reform ve düzenlemelerin banka kredi kanalına nasıl etki ettiğini incelemekte ve krizden sonra banka kredi kanalının işlerliğinde bir farklılık olup olmadığını araştırmaktır. Son olarak, çalışmamız banka farklılıklarını, finansal sağlamlık göstergesi olarak büyüklük ve CAMEL benzeri mali oranlar kullanarak ele almıştır. CAMEL çeşitli ülkelerin bankacılık denetim otoriteleri tarafından kullanılan bir derecelendirme sistemidir ve bankaların finansal güvenilirliğini ve sağlamlığını gösteren beş bileşenden oluşmaktadır. Bu bileşenler sermaye yeterliliği (capital adequacy), varlık kalitesi (asset quality), yönetim yeterliliği (management adequacy), gelirler (earnings) ve likiditedir (liquidity). Büyüklük, sermaye yeterliliği ve likidite banka kredi kanalı literatüründe kullanılan standart özellikler olmakla birlikte, çalışmamızda varlık kalitesi, yönetim yeterliliği ve gelirleri ek banka özellikleri olarak kullanmaktadır. Ancak bu noktada bu tezin Türkiye'deki bankalar için CAMEL dereceleri hesaplamadığı ya da bu

derecelendirme sisteminin Türkiye'de kullanılabilirliliğini tartışmadığını belirtmekte fayda vardır. Çalışmamızda sadece CAMEL bileşenlerini esas alınarak bankaların finansal sağlamlıklarının bir ölçüsü olarak bu bileşenleri temsil eden mali oranlar kullanılmıştır. Daha açık bir deyişle, banka özellikleri CAMEL bileşenleri göz önünde bulundurularak seçilmiş ve bu bileşenleri temsil eden mali oranlar modelimizde ayrı birer açıklayıcı değişken olarak kullanılmıştır. Bu çerçevede, bankaya özgü özellikleri gösteren değişkenler olarak büyüklük için toplam varlıkların logaritması, sermaye yeterliliği için öz kaynakların toplam varlıklara oranı, varlık kalitesi için takipteki kredilerin toplam kredilere oranı, yönetim yeterliliği için şube başına reel net kar, gelirler için net karın toplam varlıklara oranı, likidite için ise likit varlıkların toplam varlıklara oranı kullanılmıştır.

Bu doğrultuda, 1988-2009 yılları arasında Türkiye'de faaliyet gösteren bankalardan meydana gelen dengesiz panel veri seti (unbalanced panel dataset) oluşturulmuştur. Türkiye'de para politikasının banka kredi arzı üzerindeki etkisini analiz etmek için banka kredilerindeki büyümenin bağımlı değişken olduğu ve bu değişkenin gecikmeli değerinin bağımsız değişken olarak yer aldığı dinamik bir panel modeli kullanılmıştır. Modelde yer alan diğer bağımsız değişkenler ise; para politikası değişikliklerini gösteren para piyasası faiz oranındaki değişiklikler, kredi talebini kontrol etmek için kullanılan reel gayrisafi yurtiçi hasıla ve enflasyon oranı, büyüklük ve CAMEL benzeri oranlardan oluşan banka özellikleri ve bu özellikler ile para politikası değişiklikleri arasındaki etkileşim terimleridir (interaction terms). Tahminler, bu spesifikasyon çerçevesinde, ilk olarak 1988-2009 için, sonrasında da iki alt dönem; 1988-2001 ve 2002-2009, için dinamik panel yöntemlerinden biri olan ve Arellano ve Bond (1991) tarafından geliştirilen fark genelleştirilmiş momentler metodu tahmincisi (difference generalized methods of moments estimator) kullanılarak yapılmıştır.

Panel regresyon sonuçları Türkiye için 1988-2009 döneminde banka kredi kanalının varlığına işaret etmektedir. Banka kredilerindeki büyümenin faiz oranına tepkisi beklentilere uygun olarak negatif yönlüdür. Bu dönemde, yönetim yeterliliği ve gelirler hariç, banka özellikleri ve banka kredi arzı arasında istatistiksel olarak

anlamlı doğrusal ilişki bulunmaktadır. Sonuçlar sermaye yeterliliği, likidite ve varlık kalitesinin banka kredi arzını pozitif yönde etkilediğini göstermektedir. Buna karşılık büyüklük ve banka kredileri arasında ters yönlü bir ilişki mevcuttur. Ayrıca büyük ve varlık kalitesi daha iyi olan bankaların para politikasına daha az duyarlı oldukları görülmektedir.

1988-2001 ve 2002-2009 alt dönemlerine ait panel regresyon sonuçları analiz edildiğinde ise, katsayıların büyüklük ve işaretlerinde önemli farklar olduğu görülmektedir. Bu durum kriz öncesi ve kriz sonrası dönemde banka kredi kanalının işleyişinde farklar olduğuna işaret etmektedir. Bu bağlamda, panel regresyon sonuçlarına göre banka kredi kanalı her iki dönemde de etkin olarak çalışmakta, ancak etkisi kriz sonrası dönemde daha güçlü hale gelmektedir. Bu sonuç pek çok şekilde açıklanabilir. Öncelikle, 2000-2001 krizi sonrasında para politikası yapısındaki değişiklik ve ekonomik göstergelerdeki iyileşmeler para politikasının etkinliğini arttırmıştır. Bunun yanında, 2001 öncesi dönemde çok yüksek olan kamu kesimi borçlanma gereği finansal piyasalar üzerinde baskı yaratmış, bu da bankaların özel kesime kredi olarak aktarabilecekleri kaynakları devlet iç borçlanma senetleri ile bütçe finansmanına aktarmasına sebep olmuştur. İç borç finansmanının bankalar üzerinden gerçekleştiği bu durum, merkez bankasının bağımsız bir para politikası uygulamasına da engel olmuştur. Sonuç olarak, bütçe açıkları finansmanın iç borçlanma ile sağlanmasıyla birlikte etkin bir para politikasının uygulanamamasının finansal ötelemeye (financial crowding out) neden olduğu söylenebilir. Öte yandan, kriz sonrası dönemde, etkin bir para politikası uygulanması ve iç borç finansmanının finansal piyasalar üzerinde yarattığı baskının azalması sonucunda bu durum değişmiş ve bankaların özel sektöre sağladığı krediler önemli ölçüde artmıştır. Bunlara ek olarak, 2000-2001 ekonomik krizini takip eden dönemde bankacılık sektöründe uygulanan yapısal reformlar sonucunda, düzenlemeler uluslararası iyi uygulamalara yakınlaşmış ve denetim daha etkin hale gelmiştir. Faaliyet ortamında yaşanan bu gelişmeler doğrultusunda, bankaların bilanço yapıları güçlenmiş ve ekonomik faaliyetin finansmanında oynadıkları rol artmıştır. Sonuç olarak, bankaların kriz sonrası dönemde finansal aracılık faaliyetlerini daha etkin bir biçimde gerçekleştirdiği, başka bir deyişle; kaynaklarını bütçe açıklarını finanse etmek yerine

özel sektöre kredi olarak aktararak büyümenin finansmanında daha fazla rol oynadıkları söylenebilir.

Her iki alt dönem için banka özellikleri ve kredi arzı arasındaki ilişkiye baktığımızda, panel regresyon sonuçları büyüklük, sermaye yeterliliği, likidite ve varlık kalitesinin hem 1988-2001 hem de 2002-2009 dönemleri için istatistiksel açıdan anlamlı olduğunu göstermektedir. Gelirler değişkeni de her iki dönemde istatistiksel olarak anlamlıdır; ancak katsayı işaretleri iki dönem arasında farklılık göstermektedir. Buna karşılık, yönetim kalitesi sadece 2002-2009 dönemi için istatistiksel olarak anlamlı çıkmıştır.

Para politikasının dağılımsal etkilerine ilişkin ampirik bulgular, kriz öncesi dönemde sadece gelirler ve varlık kalitesinin parasal şokların bankaların kredi verme davranışları üzerinde yarattığı etkilerin farklılaşmasında rol oynadığını göstermektedir. Öte yandan, büyüklük, sermaye yeterliliği, likidite, varlık kalitesi ve yönetim etkinliği kriz sonrası dönemde kredi arzı değişmelerindeki farklılaşmada rol oynayan bankalara özgü özellikler olarak ortaya çıkmaktadır.

Çalışmamızda, Türkiye'de parasal aktarımda banka kredi kanalının işleyip işlemediğini test etmek için geliştirdiğimiz modelin dirençliliğini (robustness) sınamak için ayrıca çözümlemelerde bulunulmuştur. İlk olarak, makro değişkenler çıkartılıp zaman kuklalarını (time dummy) katılarak modelin başarısı incelenmiştir. Daha sonra, model sadece mevduat bankalarından oluşan bir örneklem ile tahmin edilmiş ve böylelikle parasal şoklara karşı mevduat bankaları ile yatırım ve kalkınma bankalarının kredi verme davranışı arasında bir fark olup olmadığı tespit edilmeye çalışılmıştır. Sonuçlar önemli ölçüde değişmemektedir. Son olarak, model sadece özel bankalardan oluşan bir örneklem için tahmin edilerek, bankaların mülkiyet yapıları göz önüne alındığında sonuçların değişip değişmediği araştırılmıştır.

4. Bölüm parasal aktarım mekanizmasında risk alma kanalının Türkiye için ampirik bir analizidir. Bildiğimiz kadarıyla, Türkiye'de risk alma kanalı ile ilgili yapılmış

olan bir çalışma mevcut değildir ve bu durum bizi parasal aktarımın risk alma kanalının Türkiye'de var olup olmadığını test etmek için motive etmiştir.

2008 küresel finansal krizi dünyadaki en gelişmiş finansal sistemlerde bile kırılganlık gözlenebileceğini ve uluslararası finansal piyasalardaki bir başarısızlık ya da aksaklığın tüm dünyayı ekonomik açıdan sarsabilecek sonuçlara neden olabileceğini göstermiştir. ABD' deki aşırı kredi genişlemesi ve varlık fiyatlarında oluşan balonun patlamasıyla başlayan kriz hızla tüm dünya ekonomilerinde etkisini göstermiş ve tüm dünyada finansal istikrarı tehdit eden boyutlara ulaşmıştır. Bu süreçte, politika yapıcılar ve araştırmacılar krizin arkasındaki nedenleri sorgulayarak, küresel finansal sistemdeki kırılganlığın arkasındaki nedenleri açıklamaya çalışmışlardır. Karmaşık finansal ürünlerin ortaya çıkması, düzenleme ve denetimin az olduğu finansal kesimlerin var olması, yönetişim (governance) uygulamalarının yetersiz olması gibi bazı faktörlerin yanı sıra para otoritelerinin 2000'li yılların başından itibaren uyguladığı düşük faiz politikasının küresel krizin başlıca nedenlerinden biri olduğu öne sürülmüştür. Bu görüş, uzun süren çok düşük faiz oranları (prolonged period of low interest rates) ve likidite bolluğunun finansal kurumların risk iştahını arttırdığını savunmaktadır. Bu gelişmeler, para politikası ve finansal istikrar arasındaki ilişkiye dair tartışmaları gündeme getirmiştir. Küresel krizden önce, fiyat istikrarının sağlanması ve korunması merkez bankalarının temel hedefiyken, bu para politikası uygulamasının fiyat istikrarını sağlayarak finansal istikrara katkı yapacağı düşünülüyordu. Başka bir deyişle, küresel kriz öncesinde fiyat istikrarına odaklı para politikası uygulanmakta ve finansal istikrar yeterince gözetilmemekteydi. Bunun yanında, makro ihtiyati araçların düzenleme ve denetleme kurumları yetkisinde olduğu düşünülmekteydi. Buna karşılık, küresel kriz para politikasının finansal istikrar üzerinde etkileri olabileceğini göstermiş ve bu da beraberinde para politikasının finansal istikrarı da gözetecek şekilde nasıl tasarlanabileceğine ilişkin tartışmaları gündeme getirmiştir. Bunlara ek olarak, küresel kriz parasal aktarım mekanizmasının daha önce düşünülenden daha karmaşık olabileceğini, daha açık bir deyişle; sadece enflasyon ve talep üzerindeki kısa dönem etkileriyle sınırlı kalmayıp bunun ötesine geçebileceğini ve ekonomik birimlerin risk alma eğilimlerinde daha uzun dönemli etkiler yaratabileceğini akıllara getirmiştir.

Para politikasının bankaların risk alma iştahlarını nasıl etkilediği sorusu yukarıda bahsedilen politika tartışmalarının merkezinde yer almaktadır. Söz konusu tartışma son zamanlarda ortaya çıkan parasal aktarım mekanizmasında risk alma kanalının temelini oluşturmuştur. Kısaca özetlemek gerekirse, risk alma kanalı uzun bir dönem boyunca uygulanan genişletici para politikasının bankaların risk algısı ya da risk alma davranışı üzerinde etkisi olduğunu öne sürmektedir. Diğer bir deyişle, uzun süren düşük faiz oranları bankaları portföylerindeki riski arttırmaları yönünde teşvik etmektedir. Bu durumda, sonuç sadece geleneksel aktarım mekanizmalarının ön gördüğü şekilde kredi arzında bir artış olmayacak, aynı zamanda verilen kredilerin riskliliği de artacaktır. Bu koşullar altında, para politikası bankaların risk alma davranışları üzerindeki etkileri yoluyla finansal kırılganlıkların oluşmasına neden olabilecektir.

Parasal aktarımda risk alma kanalı birçok farklı mekanizma üzerinden çalışmaktadır. Bunlardan ilki, düşük faiz oranlarının valüasyonlar (valuations), gelirler (incomes) ve nakit akışı (cash flows) üzerindeki etkisi yoluyla gerçekleşmektedir. Faiz oranlarında meydana gelen bir düşüş varlık fiyatları ve teminat değerlerinde, ve de aynı zamanda gelirlerde, bir artışa sebep olarak risk algısında bir azalmaya ya da risk toleransında bir artışa yol açacaktır. Başka bir mekanizma getiri arayışıdır (search for yield). Düşük faiz oranlarının hüküm sürdüğü bir ortamda, varlık yöneticilerinin daha riskli projelere yatırım yapma istekleri pek çok nedenden dolayı artacaktır. Temel olarak bu mekanizma, düşük faiz oranları ve esnek olmayan (katı) hedef getiri oranları (sticky target rate of returns) arasındaki ilişki üzerinden çalışmaktadır. Buna benzer şekilde, çok düşük faiz oranları bankaların kredi ve mevduat faiz oranları arasındaki farkın açılmasına yol açarak kar marjlarını (profit margin) daraltır ve böylelikle yüksek getiri arayışı isteklerini yükselmesine sebep olur. Bu mekanizmaların yanı sıra, para politikası risk alma davranışlarını merkez bankalarının reaksiyon fonksiyonu (central bank reaction function) ve iletişim politikaları üzerinden de etkileyebilir. Bu bağlamda, merkez bankasının gelecekteki para politikasına kararlarına ilişkin daha yüksek şeffaflık (transperancy) ve öngörülebilirlik (predictability) göstermesi belirsizliği azaltarak bankaların risk alma iştahında artışa neden olabilecektir. Bu 'şeffaflık etkisi' (transparency effect) olarak bilinmektedir. Benzer şekilde, eğer ekonomik birimlerde, ekonomik ve finansal sistemin istikrarını

tehdit edebilecek herhangi bir negatif şok karşısında merkez bankasının müdahale ederek genişletici para politikası uygulayacağı yönünde bir beklenti varsa, bu risk iştahlarının yükselmesine ve daha yüksek risk almalarına neden olur. Bu etki ise 'sigorta etkisi' (insurance effect) olarak adlandırılmaktadır.

Parasal aktarım mekanizmasının risk alma kanalı ile ilgili hızla gelişen literatüre rağmen, bu konuda yapılan çalışma sayısının hala çok sınırlı olduğu görülmektedir. Bunlarda bazıları makro veri kullanırken, büyük bir bölümü mikro banka verilerini kullanmaktadır. Ayrıca, bu çalışmaların çoğu ABD ve Avrupa Birliği ülkeleri gibi gelişmiş ülkeler için risk alma kanalının işlerliğine dair kanıt aramaktadır. Literatüre bakıldığında, gelişmekte olan ülkelerden sadece üçü için para politikasının bankaların risk alma davranışı üzerindeki etkilerini panel veri analiz yöntemleri kullanarak inceleyen çalışmalar olduğu görülmektedir. Bunlar Bolivya için Ioannidou ve diğerleri (2009), Brezilya için Tabak ve diğerleri (2010) ve Kolombiya için Lopez ve diğerleri (2010, 2012) 'dir. Bu durum, yükselen piyasa ekonomileri için risk alma kanalının ayrıntılı olarak incelenmesini gerekli kılmaktadır.

Çeşitli unsurlar bizi Türkiye'de risk alma kanalını araştırmamız için motive etmiştir. Öncelikle şunu belirtmekte fayda vardır ki, Türkiye'deki faiz oranları ABD veya Avrupa Birliği üyesi ülkelerdeki kadar düşük değildir ya da Türkiye'de çok uzun bir dönem boyunca genişletici para politikası uygulanmamıştır. Ancak Türkiye ekonomisinin kendi koşulları ve dinamikleri göz önünde bulundurulduğunda, 2000-2001 krizini takip eden dönemde faiz oranlarının tarihsel olarak çok düşük düzeylere ulaştığı gözlenmektedir. Bunun yanı sıra, bu dönemde uygulanmaya başlayan enflasyon hedeflemesi rejimi ile belirsizlik azalmıştır. Risk alma kanalının belirsizliğin daha az olduğu ortamlarında daha etkin bir şekilde işlediği öne sürülmektedir. Bunlara ek olarak, Türk finansal sisteminin banka ağırlıklı yapısı da hesaba katıldığında, Türkiye düşük faiz oranları ve banka risk alma davranışı arasındaki ilişkiyi ampirik olarak incelemek için ideal bir ortam oluşturmaktadır.

Bilgimiz dahilinde, bu tez Türkiye'de para politikası aktarım mekanizması ve bankaların risk alma davranışı arasındaki ilişkiyi araştıran, diğer bir deyişle,

Türkiye'de parasal aktarım mekanizmasında risk alma kanalının var olup olmadığını test eden ilk çalışmadır. Aynı zamanda, bu tez yukarıda bahsedildiği gibi henüz gelişmemiş olan yükselen piyasa ekonomilerine ilişkin risk alma kanalı literatürüne de katkı sağlamaktadır. Bunların dışında, çalışmada kullanılan risk ölçüleri pek çok bakımdan risk alma literatürüne göre yenilik taşımaktadır. İlgili yazında genellikle tek bir risk göstergesi kullanılmasına karşılık, çalışmamızda dört adet alternatif risk değişkeni kullanılmıştır. Bunlardan üç tanesi muhasebe bazlı (accounting-based) bir tanesi de piyasa bazlıdır (market-based).

Bu çalışma, para politikası ve bankaların risk alma arasındaki ilişkiyi, 2002-2012 dönemi için üçer aylık veriler kullanarak araştırmaktadır. Başka bir deyişle, para politikası değişiklilerinin bankaların risk iştahı üzerindeki etkisi incelenerek Türkiye'de bu dönem için risk alma kanalının var olup olmadığı test edilmektedir. Bu bağlamda, ilgili dönemde faaliyette bulunan 53 bankayı kapsayan dengesiz panel veri seti oluşturulmuştur. Muhasebe tabanlı risk değişkenlerinin bağımlı değişken olarak kullanıldığı modeller bu örneklem ile 2002:1-2011:4 dönemi için tahmin edilmiştir. Buna karşılık, piyasa tabanlı risk değişkeni verisinin sadece örneklemdeki 14 banka için mevcut olması ve bu bankalara ait verilere ancak 2007:1-2012:1 dönemi için ulaşılabilmesi nedeniyle, piyasa tabanlı risk değişkenin bağımlı değişken olduğu modeller, bu daha küçük örneklem kullanılarak ve 2007:1- 2012:2 dönemini kapsayacak şekilde tahmin edilmiştir.

Bankaların riski için kullanılan değişkenlerin seçimi ampirik analizimiz için büyük önem taşımaktadır. Riski ölçmek karmaşık bir konudur ve bankaların risk alma davranışını ölçebilecek belirli bir gösterge yoktur. Çalışmamızda alternatif risk ölçüleri kullanılarak bu sorun çözülmeye çalışılmıştır. Bu doğrultuda, geri dönmeyen krediler oranı (non-performing loans ratio), z-indeksi (z-index) ve aktif karlılığının standart sapması (standard deviation of return on assets) olmak üzere üç tane muhasebe bazlı risk değişkeni ve bunlara ek olarak piyasa bazlı bir risk ölçüsü olan beklenen temerrüt frekansı (EDF- expected default frequency) kullanılmıştır. Bu değişkenlerin her biri riskle ilgili farklı bilgiler içermekte ve risk alma davranışının farklı bir yönünü göstermektedir. Dolayısıyla, risk ölçüsü olarak her birinin kendine

göre olumlu ve olumsuz tarafları vardır. Bu değişkenlerden birincisi, geri dönmeyen kredilerin toplam kredilere bölünmesiyle bulunan geri dönmeyen krediler oranıdır. Bu oran bankanın kredi portföy riskini yansıtmaktadır. Geri dönmeyen krediler oranının yüksek olması daha yüksek riske işaret etmektedir. İkinci risk ölçüsü, z-indeksidir. Z-indeksi bankanın aktif karlılığı ile öz kaynaklarının toplam varlıklarına oranı toplamının aktif karlılığının standart sapmasına bölünmesi şeklinde hesaplanmaktadır. Bankaların aktif karlılığında meydana gelen değişimleri doğru bir biçimde yakalayabilmek için aktif karlılığının standart sapması üç yıllık dönemleri kapsayacak şekilde kayan pencereler (three- year rolling time windows) kullanılarak hesaplanmıştır. Z-indeksi ile toplam risk arasında ters orantı mevcuttur. Farklı şekilde ifade edecek olursak, daha yüksek bir z-indeksi daha düşük banka riskine işaret etmektedir. Bu değişkenlerin yanında, aktif karlılığının standart sapması ayrıca üçüncü risk değişkeni olarak kullanılmıştır. Muhasebe bazlı bu risk göstergelerine alternatif olarak, piyasa bilgilerine dayanan ve Moody's tarafından yayınlanan beklenen temerrüt frekansı analizde kullanılan dördüncü risk değişkenidir. Beklenen temerrüt frekansı ileriye-dönük (forward-looking) bir risk ölçüsü olup, bir şirketin belli bir zaman aralığında temerrüde düşme olasılığını göstermektedir. Bu gösterge son dönemde risk kanalıyla ilgili literatürde risk ölçüsü olarak sıkça kullanılmaktadır. Bu doğrultuda, bir yıllık beklenen temerrüt frekansı ileriye dönük kredi riski göstergesi olarak analizimize dahil edilmiştir.

Risk değişkenleri dışında, başka bir önemli nokta analizde kullanılacak para politikası göstergelerinin seçilmesidir. Literatüre bakıldığında, pek çok çalışmanın faiz oranların çok düşük olduğu varsayımı yaparak, doğrudan gecelik faiz oranı ya da üç aylık bankalar arası faiz oranındaki değişikleri kullandığı görülmektedir. Öte yandan, para politikasının bankaların risk alma davranışları üzerindeki etkisini iki farklı alanda birbirinden ayırmak oldukça zordur. Bunlardan birincisi, bankaların bilançolarında var olan kredilerin riski (risk of outstanding loans) ; ikincisi ise, bankaların yeni risk alma konusundaki iştahıdır (appetite to take on new risk). Faiz oranındaki bir azalmanın kredi portföyü riski üzerinde doğrudan pozitif bir etkisi varken, faiz oranlarının gösterge düzeyin altına düşmesi bankaların getiri arayışı nedeniyle yeni risk alma iştahını arttırmaktadır. Bunlara uygun olarak, çalışmamızda faiz oranının bankaların riski üzerindeki doğrudan etkisini kontrol etmek için

bankalar arası faiz oranındaki üçer aylık değişmeler, para politikası tutumunu değerlendirmek için de faiz oranının belirli bir gösterge düzeyden sapma ölçüsü kullanılmıştır. Öte yandan, faiz oranında bir azalma illaki çok düşük faiz oranı olduğu anlamına gelmemekte, bu bakımdan bir gösterge düzeyin kullanılması faiz oranının gerçekte ne kadar düşük olduğu konusunda bilgi vermektedir. Sonuç olarak, bu yaklaşımın ampirik önermelerimize daha uygun olduğu söylenebilir. Bu doğrultuda, temel gösterge düzeyi değişkeni olarak, kısa dönem reel faiz oranı ve Hodrick-Prescott filtresi (Hodrick-Prescott filtresi) yöntemiyle hesaplanan doğal faiz oranı (natural rate of interest) arasındaki fark kullanılmıştır. Buna ek olarak, basit bir Taylor kuralına (Taylor rule) göre hesaplanan alternatif gösterge değişkeninden de yararlanılmıştır. Ancak Taylor kuralının hesaplanması ve tahmin edilmesindeki belli başlı sorunlar ve kısıtlamalar nedeniyle doğal faiz oranı temel gösterge olarak kabul edilmiş, öte yandan Taylor kuralına dayalı gösterge değişkeni kullanılarak modelin dayanıklılığı test edilmiştir.

Risk ve faiz oranı değişkenlerinin yanı sıra, ampirik modele bankların risk alma davranışlarını etkileyebilecek pek çok faktör dahil edilmiştir. Bu doğrultuda, makroekonomik koşulları yansıtmak için reel gayri safi yurtiçi hasıla, bankadan borç alan birimlerin öz varlık ve teminatlarında meydana gelen değişikleri kontrol etmek için hisse senedi piyasa getiri oranları (stock market returns), piyasa yoğunlaşmasının etkisini değerlendirmek için de Herfindahl-Hirschman indeksi (HHI) kullanılmıştır. Bunlara ek olarak da bankların risk alma davranışı üzerinde etkili olabilecek bankalara özgü özelliklerden büyüklük, sermaye yeterliliği ve likidite dikkate alınmıştır. Büyüklük için toplam varlıkların logaritması, sermaye yeterliliği için öz kaynakların toplam varlıklara oranı, likidite için ise likit varlıkların toplam varlıklara oranı kullanılmıştır.

Türkiye'de para politikasının bankaların risk alma davranışları üzerindeki etkisini analiz etmek için geliştirilen ve geri dönmeyen krediler oranı, z-indeksi, aktif karlılığının standart sapması ve beklenen temerrüt sıklığının bağımlı değişken olarak yer aldığı dinamik modellerin tahmini, dinamik panel yöntemlerinden biri olan ve Arellano/ Bover (1995) ve Blundell/ Bond (1998) tarafından geliştirilen sistem

genelleştirilmiş momentler metodu tahmincisi (system generalized methods of moments estimator) kullanılarak yapılmıştır.

Geri dönmeyen kredilerin bağımlı değişken olarak yer aldığı panel regresyon sonuçları incelendiğinde, beklentilere uygun sonuçların elde edildiği görülmektedir. Öncelikle, faiz oranındaki değişiklik katsayısı pozitif ve istatistiksel açıdan anlamlı çıkmıştır. Bu bulgu, kısa dönem faiz oranında bir azalmanın bankaların portföy kalitesi üzerinde olumlu bir etkisi olduğunu göstermektedir. Daha açık bir şekilde ifade edecek olursak, daha düşük kısa dönem faiz oranı bankaların vermiş oldukları kredilerin riskini azaltmaktadır. Bu durum, daha düşük faiz oranının bankadan kredi ile borçlanan birimlerin ödemek zorunda olduğu faiz yükünü hafifleterek borcun geri ödenmesini kolaylaştırması ve böylelikle temerrüde düşme riskini azaltması ile açıklanabilir. Kredi portföyündeki bu iyileşme, daha düşük faiz oranı sonucunda azalan bankaların likidite finansman maliyetleri nedeniyle de güçlenmektedir. Ayrıca düşük faiz oranının bankanın kredi portföy riskinde meydana getirdiği bu olumlu etkinin, kısa dönemde bankaların halihazırda vermiş oldukları kredi miktarının verecekleri yeni kredi miktarına göre daha fazla olmasından kaynaklanabileceği göz önünde bulundurulmalıdır. Bu nedenle, düşük faiz oranının kredi portföy riski üzerindeki olumlu etkisini bir kısa dönem etkisi olarak yorumlamak daha doğrudur. Buna karşılık, kısa dönem reel faiz oranı ve doğal faiz oranı arasındaki fark olarak hesaplanan değişkenin katsayısı negatif ve istatistiksel açıdan anlamlı çıkmıştır. Bu sonuç, kısa dönem faiz oranın belli bir gösterge seviyeden düşük olması durumunda bankaların risk alması davranışında bir artış olduğu anlamına gelmektedir. Başka bir deyişle, göreli olarak düşük faiz oranı bankaların risk algısında azalma veya risk toleranslarında artış meydana getirmektedir. Bu bulgu, parasal aktarım mekanizmasında risk alma kanalının işlerliğini doğrulamaktadır.

Bunlara ek olarak, panel regresyon sonuçları incelendiğinde, makro ekonomik değişkenlerden reel gayri safi yurtiçin hasılanın negatif bir katsayıya sahip olduğu ve dolayısıyla, kredileri geri ödeyememe riskinin büyüme oranıyla ters yönde bir ilişki içinde olduğu görülmektedir. Benzer şekilde, sonuçlar hisse senedi piyasası getirisinin de bankaların kredi riski üzerinde negatif etkiye sahip olduğunu

göstermektedir. Bu bulgu, hisse senedi fiyatlarındaki artışın teminat değerinde ve bu yolla, borç alanların net değerinde bir artışa sebep olarak daha düşük kredi riskine yol açması şeklinde yorumlanabilir.Aynı zamanda, varlık fiyatlarındaki artış, bankaların menkul değer porföyünün değerlenmesine sebep olarak da risk üzerinde etki gösterebilir. Konsantrasyon ölçüsü ile ilgili sonuçlara bakıldığında, Herfindahl-Hirschman indeksinin negatif ve istatistiksel açıdan anlamlı olduğu görülmektedir. Bu bulguya göre, Türk bankacılık sektöründe yoğunlaşma arttıkça ya da rekabet azaldıkça bankaların kredi riski azalmaktadır. Bu sonuç risk alma kanalı dikkate alınarak yorumlandığında ise, getiri arayışı hipotezi ile tutarlı olduğu söylenebilir. Şöyle ki; artan rekabet karlar üzerinde daha büyük bir baskı yaratarak, bankaların getiri arayışı isteklerini arttırır ve daha riskli projelere girmelerine sebep olur. Ancak risk ve yoğunlaşma arasındaki ilişkiye dair sonuçlar kullanılan alternatif piyasa yapısı göstergelerine göre farklılık gösterebilecektir. Sonuçlar yorumlanırken bu durum da dikkate alınmalıdır.

Bankalara özgü özelliklerle ilgili sonuçlara göre, büyüklük, sermaye yeterliliği ve likidite bankaların risk alma davranışı üzerinde etkili olan ölçütler olarak ortaya çıkmaktadır. Ampirik analizimiz, Türkiye'de büyük, daha yüksek likidite ve sermaye yeterliliğine sahip olan bankaların daha düşük kredi riskine ve daha güçlü bir kredi portföyüne sahip olduğunu göstermektedir. Diğer bir deyişle, bu özelliklere sahip bankaların daha yüksek ölçüde riskten kaçındığı (risk averse) söylenebilir. Son olarak, büyüklük, sermaye yeterliliği ve likiditenin, kısa dönem reel faiz oranı ve doğal faiz oranı arasındaki farkı gösteren değişkenle etkileşimleri pozitif ve istatistiksel açıdan anlamlı çıkmıştır. Bu sonuçlar, ilgili banka özelliklerinin para politikası şoklarına karşı bankaların risk alma davranışlarında farklılaşmaya neden olduğunu göstermektedir. Ayrıca bu bulgu farklı özelliklere sahip bankaların incelenen faiz oranın göreli olarak düşük olduğu dönemde farklı risk stratejileri izlediği şeklinde yorumlanabilir. Analiz sonuçlarına göre, büyük, daha yüksek likidite ve sermaye yeterliliğine sahip bankalar düşük faiz oranlarının kredi riskleri üzerindeki etkisini daha başarılı bir şekilde engelleyebilmektedir. Başka şekilde ifade edecek olursak; düşük faiz oranlarına sebep olacak genişletici bir para politikasının risk üzerindeki etkisi küçük, likidite ve sermaye yeterliliği daha düşük olan bankalar için daha yüksektir.

Z-indeksinin, aktif karlılığının standart sapmasının ve de beklenen temerrüt sıklığının bağımlı değişken olarak kullanıldığı diğer modellerden elde edilen sonuçlar da geri dönmeyen kredilerin yer aldığı modelin bulgularını destekler niteliktedir. Bunlara ek olarak, parasal aktarımda risk alma kanalının işleyip işlemediğini test etmek üzere geliştirdiğimiz modelin dirençliliğini sınamak için gösterge değişken olarak kısa dönem faiz oranı ve Taylor kuralına göre hesaplanan oran arasındaki fark kullanılarak ayrıca çözümlemelerde bulunulmuştur. Tahminlerden elde edilen sonuçlar, önceki bulguları desteklemektedir. Özetlemek gerekirse, panel regresyon analizlerinden elde edilen sonuçlar, kullanılan bütün alternatif risk ölçüleri için, düşük faiz oranlarının bankaların risk alma davranışı üzerinde etkili olduğunu ortaya koymaktadır. Çeşitli makro ekonomik değişkenler ve bankaya özgü özellikler bankaların risk alma iştahı üzerinde etkili olan faktörler olarak dikkat çekmektedir.

Sonuç olarak, bu tezdeki ampirik bulgular Türkiye'de para politikasının bankacılık sektörü üzerinde önemli bir etkisi olduğuna işaret etmektedir. Çalışmamız, Türkiye'de banka kredi kanalı (1988-2009 dönemi için) ve risk alma kanalının (2002-2012 dönemi için) işlerliği lehinde bir ampirik kanıt sağlamaktadır. Başka bir deyişle, Türkiye'de para politikası banka kredi kanalı ve risk alam kanalı üzerinden ekonomiyi etkileyebilmektedir. Analizlerimizde, bankaların para politikası değişikliklerine aynı şekilde tepki vermedikleri ve bankaların kredi verme ve risk alma davranışlarındaki bu fraklılaşmanın çeşitli banka özelliklerinden kaynaklandığı görülmektedir. Buna göre, Türkiye'de bilanço yapıları daha güçlü bankalar finansal olarak daha güçsüz bankalara göre farklı kredi verme ve risk alma stratejileri izlemektedir.

Bulgularımız çeşitli politika çıkarımlarına işaret etmektedir. İlk olarak, merkez bankası para politikası kararlarını alırken bankacılık sektörünün durumunu göz önünde bulundurmalıdır, çünkü ampirik bulgularımız para politikası ve finansal istikrar arasında bir ilişki olduğunu göstermektedir. Bu bağlamda, para politikası finansal istikrarsızlıkların reel ekonomi üzerindeki bazı olumsuz etkilerini engelleyebilmekte ya da en azından dengeleyebilmektedir. Buna bağlı olarak, bankaların kredi verme ve risk alma davranışlarının incelenmesi, politika yapıcılara

finansal istikrarı sağlama konusunda uygulayacakları politikalar konusunda yol gösterebilecektir. Bunların dışında, sermaye yeterliliği ve likidite gibi çeşitli banka özelliklerinin bankaların kredi arzı ve risk alma iştahı üzerinde önemli bir rol oynaması, bu özellikler üzerinde etkin düzenleme ve denetimin gücünü ortaya koymaktadır. Bu etki Bankacılık Denetleme ve Düzenleme Kurumu'nun aktif olarak faaliyete başladığı 2001 krizi sonrası döneme ilişkin banka kredi kanalının işlerliğine dair bulgumuz tarafından da desteklenmektedir. Dolayısıyla etkin düzenleme ve gözetim, bankaların ihtiyatlı davranış içerisinde olmaları açısından büyük önem taşımaktadır. Bunlara ek olarak, küresel finansal kriz ve risk alma kanalının krizdeki rolü ile ilgili gerçekleşen tartışmalar makro ihtiyati tedbirlerinin önemini gündeme getirmiştir. Küresel kriz, mikro ihtiyati düzenlemelerin makro düzeyde gelişen risklere karşı yetersiz kalabileceğini ve bu nedenle, mikro ihtiyati düzenlemelerin makro ihtiyati tedbirlerle desteklenmesi gerektiğini ortaya koymaktadır. Para politikası ve makro ihtiyati tedbirler arasındaki ilişki Türkiye açısından da önem arz etmektedir.

Bu tezin konusu olan bankalar üzerinden işleyen her iki parasal aktarım kanalı- banka kredi kanalı ve risk alma kanalı- farklı yönleriyle gelecek araştırmalara konu olabilir. Örneğin, para politikası ve bankaların kredi verme standartları arasındaki ilişki, bankaların yeni kredi verme standartlarındaki sıkılık hakkında bilgi veren Türkiye Cumhuriyeti Merkez Bankası'nın banka kredileri eğilim anketi kullanılarak incelenebilir. Ayrıca parasal aktarımda banka kredi kanalı ile ilgili analiz bankaların risk durumları hesaba katılarak genişletilebilir ve böylelikle Türkiye'de banka kredi kanalının risk üzerinden işleyip işlemediği test edilebilir. Ancak şunu belirtmekte fayda vardır ki; bankalar üzerinden işleyen bu aktarım kanallarının Türkiye'de nasıl işlediğini daha iyi ve ayrıntılı biçimde anlayabilmek için daha detaylı veri setlerine ihtiyaç vardır.

APPENDIX E. TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☒

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : Özşuca

Adı : Ekin Ayşe

Bölümü : İktisat

TEZİN ADI (İngilizce) : Banks and Monetary PolicyTransmission Mechanism: An Empirical Analysis for Turkey

TEZİN TÜRÜ : Yüksek Lisans ☐ Doktora ☒

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. ☒

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: