IV. Special Topics

IV.1. Inflation, Inflation Volatility and Financial Constraints in Turkey[11]

Abstract

In this study, we analyze the effect of inflation levels and volatility on capital market imperfections and financial constraints in Turkey. By using a micro level data set, we find that the boom and boost cycles in the GDP and investment are correlated with the capital market imperfections and financial constraints which are among the determinants of business cycles in Turkey. We show that the inflation level and volatility result in an increase in the financial constraints, and inflation volatility is more effective than level in the increasing of financial constraints. While the inflation level is more effective than volatility during the high inflation periods, the inflation volatility becomes more important than level during the periods of disinflation or low inflation level. Moreover, we also analyze these findings in terms of sector, firm size and age, and find that inflation level and volatility have a higher effect on financial constraints in the manufacturing sector, small firms and new/ young firms.

IV.1.1 Introduction

The relationship between inflation and economic growth is one of the fundamental concerns of macroeconomics. The low inflation level and high growth rate are among the main objectives of the policy makers. Presently, the primary objective of the most central banks is to achieve and maintain price stability. The result that inflation rate adversely affects economic growth played a crucial role in the emergence of this policy framework. High or unstable inflation has caused a rise in inflation uncertainty. In addition to the costs of an expected high inflation rate, inflation uncertainty leads economic agents to slowly respond to the signals in the market and changes in the relative prices. Moreover, it causes the emergence of negative expectations about the future, and leads decision-

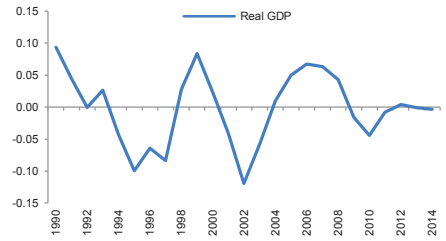
[11] The findings of an ongoing study are summarized.

makers to add a specific risk premium to long-term contracts. This situation results in high interest rates and low investment levels in the real economy. Moreover, misunderstanding changes in the relative prices leads economic units to shift their savings from long-term productive investments towards short-term non-productive investments, and ends with a change in the investment composition (Artan, 2008).

After the financial liberalization of the economy in the early 1980s, Turkey experienced highly volatile business cycles (Graph IV.1.1). We first decompose the deviations in real GDP by the expenditure approach. Then we conclude that the deviations in real GDP arise from investment and consumption, and the deviation in consumption is more volatile than investment (Graph IV.1.2). In addition, Graph IV.1.3 shows there is a similar movement in the cash flows and investments of real sector firms in the BIST. The strong relationship between cash flow and investments implies the presence of financial constraints and capital market imperfections. These frictions and imperfections cause an increase in the sensitivity of investments to boom and boost cycles in financial markets.

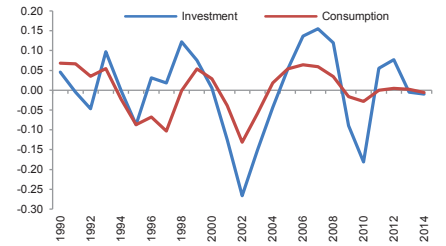
A neoclassical theory of investment, as detailed by Modigliani and Miller (1958), states that, under perfect capital markets, a firm's investment decision is not related with the financial structure of the firm, and the future expected profit opportunities and the user cost of capital are the main determinants of a firm's investment decision. However, under imperfect capital markets which can be the result of issues like information asymmetries, there will be a premium for external funds over internal funds due to the possible adverse selection and moral hazard problems between lenders and borrowers. Under such structures, internal funds play a crucial role in the firm's investment decisions, and investment will be positively affected from the changes in the internal funds. Many studies in the related literature analyze the effects of firms' financial structures on their investments by using the Euler equation approach. Günay and Kılınç (2011) tested the presence of financial constraints for Turkey by using the Euler equation approach. They found that the nontradable sector is more volatile in Turkey over the business cycle and this asymmetry is strongly related with aggregate credit movements.

Chart IV.1.1
Percentage Deviations of GDP from HP Trend



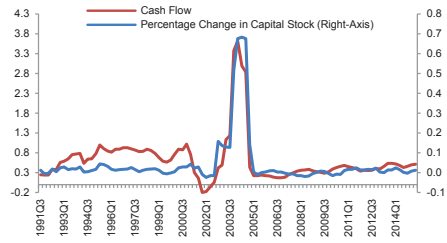
Source: TurkStat

Chart IV.1.2
Percentage Deviations of Consumption and Investment from HP Trend



Source: TurkStat

Chart IV.1.3
Cash Flow and Change in Capital Stock



Source: BIST

In this study, first we analyze the presence of financial friction in Turkey for the period of 1990-2015. Then, we explore the effect of inflation levels and volatility on capital market imperfections and financial constraints in Turkey. Moreover, we check these findings with regards to sub-periods, sector, firm size and age.

IV.1.2 Data Set and Methodology

The analysis conducted via the dynamic panel data methodology is based on data covering the 1990Q1-2015Q2 period. The data set includes the non-financial 356 firms listed in the BIST. By using the Euler equation approach, we analyze the effect of capital market imperfections and financial constraints on firms' investment decisions. Then, we show the effect of the inflation level and volatility on financial constraints. As in Bond and Meghir (1994), we use the following model:

$$\left(\frac{I}{K}\right)_{i,t} = \beta_1 \left(\frac{I}{K}\right)_{i,t-1} + \beta_2 \left(\frac{I}{K}\right)^2_{i,t-1} + \beta_3 \left(\frac{\Pi}{K}\right)_{i,t-1} + \beta_4 \left(\frac{Y}{K}\right)_{i,t-1} + d_t + \eta_i + v_{i,t} \quad (1)$$

$(I/K)_{i,t}$ denotes the firm's investments at time t, $(\prod/K)_{i,t-1}$ denotes the firm's cash flow at time t-1, $(Y/K)_{i,t-1}$ denotes the firm's net sales at time t-1. All variables are normalized with the lagged value of the firm's tangible capital stock. d_t and η_i denote time and firm fixed effects, respectively. Under the case of no financial constraints, we have the following properties for the coefficients: $\beta_1 \geq 1$, $\beta_2 \leq -1$, $\beta_3 < 0$ and $\beta_4 \geq 0$.[12]

We use the Euler equation approach in our analysis since it controls for the effects of expectations on investment decisions. According to Model 1, a positive relationship between investment and current cash flow, which is the basic internal finance option for the firm, shows us the presence of financial constraints (Bond et al., 2003). Therefore, under the case of no financial constraints, β_3 must be negative. Eventually, we look at the sign of the lagged cash flow or profits variable in equation (1) to test the financial constraints. So, the positive coefficient of lagged cash flow (β_3>0) will indicate the presence of financial constraints.

[12] For details, see Bond ve Meghir (1994).

Following Brown et al. (2009), we include the contemporaneous value of cash flow or profits to avoid the omitted variable bias, and see the positive relationship between contemporaneous cash flow and investment. If this coefficient is positive ($\beta_3>0$), then it will indicate the presence of financial frictions.

$$\left(\frac{I}{K}\right)_{i,t} = \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2\left(\frac{I}{K}\right)^2_{i,t-1} + \beta_3\left(\frac{\Pi}{K}\right)_{i,t} + \beta_4\left(\frac{\Pi}{K}\right)_{i,t-1} + \beta_5\left(\frac{Y}{K}\right)_{i,t} + \beta_6\left(\frac{Y}{K}\right)_{i,t-1} + d_t + \eta_i + v_{i,t} \quad (2)$$

Although we tested the presence of capital market imperfections with Model 1, we couldn't analyze the presence of financial frictions due to the aforementioned issues. Therefore, firstly we test the presence of capital market imperfections using Model 1, and then we make a detailed analysis of the financial frictions with Model 2. The positive and significant coefficient of contemporaneous cash flow in Model 2 show us there will be a risk premium for external funds over internal funds due to information asymmetries. Making a positive and significant effect of internal funds on investment decisions implies that investments are financially constrained.

After testing the presence of financial constraints, we analyze the effects of inflation level and volatility on the financial constraints. To that end, we add the values of the inflation rate level and volatility at time t-1, and their interaction with sales and cash flow to the Model 2.[13] These interacted terms show the effects of inflation level and volatility on financial constraints, respectively. Due to potential endogeneity problems among explanatory variables, we use the generalized method of moments (GMM). Additionally, the dummy variables are used for each quarter to get rid of a possible seasonality problem.

Table IV.1.1
Investment and Capital Market Imperfections

Dependent V. : Investment Independent V.	RE	FE	GMM
Investment_{t-1}	-0.045***	-0.071***	-0.086***
	(0.007)	(0.000)	(0.007)
(Investment_{t-1})^2	-0.002	0.001	0.012*
	(0.736)	(0.785)	(0.078)
Sales_{t-1}	0.000	0.002***	0.004
	(0.133)	(0.000)	(0.141)
Cash Flow_{t-1}	0.016***	0.015***	0.017**
	(0.000)	(0.000)	(0.020)
Constant	0.033***	-0.023***	
	(0.000)	(0.000)	
Observations	19,535	19,535	18,936
R^2	0.018	0.021	
AR(1)			0
Hansen(p-value)			0.133
AR(2)			0.0927

Table IV.1.2
Investment and Financial Frictions

Dependent V. : Investment Independent V.	RE	FE	GMM
Investment_{t-1}	-0.014	-0.037	-0.165***
	(0.578)	(0.126)	(0.000)
(Investment_{t-1})^2	-0.000	0.002	0.015**
	(0.933)	(0.617)	(0.046)
Sales	0.000	0.001	0.014***
	(0.915)	(0.651)	(0.000)
Sales_{t-1}	-0.000	0.001	0.012***
	(0.919)	(0.682)	(0.000)
Cash Flow(C.F.)	0.037***	0.038***	0.046***
	(0.000)	(0.000)	(0.000)
(C.F.)_{t-1}	-0.001	0.001	0.009
	(0.843)	(0.801)	(0.185)
Constant	0.027***	0.012**	
	(0.000)	(0.035)	
Observations	19,302	19,302	18,895
R^2	0.068	0.071	
AR(1)			0.001
Hansen(p-value)			0.146
AR(2)			0.133

[13] We calculate inflation volatility using a 36-month moving average method. We also adjust it for the inflation level using the method of coefficient of variation due to the instability of the inflation level during the period of analysis.

IV.1.3 Empirical Results

Table IV.1.1 shows the regressions using Model 1 and different regression methods. None of the coefficients of sales and cash flows are in line with the perfect capital markets hypothesis. The coefficients of cash flows have positive and significant effects on investments in all methods. Therefore, we can strongly reject the hypothesis of perfect capital markets.

We then add current sales and cash flows to the regressions to quantify the financial market imperfections as in Brown et al. (2009). Table IV.1.1 shows the regressions using Model 2 and different regression methods. With the help of Model 2, we get rid of some issues of Model 1 such as omitted variable bias. The coefficients of cash flows have positive and significant effects on investments in all our specifications. This strongly indicates the presence of financial constraints.

The next step is analyzing the effect of inflation levels and volatility on financial constraints. To that end, we add the values of inflation level and volatility at time t-1, and their interaction with sales and cash flow to Model 2. According to the results summarized in Table IV.1.3, the coefficients of interacted terms (β_8 and β_{11}) indicate the effects of inflation level and volatility on the financial constraints. The first three columns in Table 4 indicate the effects of inflation level and volatility on the financial constraints using random, fixed and GMM methods, respectively. In the third column, we give the standardized coefficients in order to compare the effects of inflation level and volatility on financial constraints. According to the regression results, inflation level and volatility increase the financial constraints without noticing regression methods. The third regression indicates that the effect of inflation volatility on financial constraints is roughly two times more than inflation level. Consequently, we conclude that inflation level and volatility increase the financial constraints, and internal funds affect investment decisions positively and significantly due to the external financing premium between internal and external funds.

Table IV.1.3
Investment, Inflation Level and Volatility, and Financial Frictions

	Dependent Variable : Investment			
		(1)	(2)	(3)
	Independent Variables	RE	FE	Std(GMM)
B_1	Investment_{t-1}	-0.009	-0.033	-0.109***
		(0.662)	(0.116)	(0.002)
B_2	$(\text{Investment\_\{t}-1\})^2$	-0.008	-0.005	-0.076
		(0.201)	(0.370)	(0.150)
B_3	Sales	0.001	0.001	0.633***
		(0.762)	(0.481)	(0.000)
B_4	Sales_{t-1}	-0.001	0.000	0.472***
		(0.749)	(0.782)	(0.002)
B_5	Cash Flow(C.F.)	-0.076***	-0.076***	-1.260***
		(0.000)	(0.000)	(0.000)
B_6	(C.F.)_{t-1}	-0.009	-0.009	-1.068***
		(0.424)	(0.385)	(0.000)
B_7	Inflation_{t-1}	0.000**	0.000	-0.483***
		(0.047)	(0.292)	(0.000)
B_8	Inflation _{t-1}*C.F.	0.000***	0.000***	0.431***
		(0.003)	(0.006)	(0.000)
B_9	(Inflation *N. A.)_{t-1}	-0.000***	-0.000***	0.193***
		(0.008)	(0.005)	(0.003)
B_{10}	Inf. Volatility(I. V.)_{t-1}	0.012	0.017	0.087
		(0.444)	(0.277)	(0.237)
B_{11}	(I. V.)_{t-1}* C.F.	0.420***	0.423***	1.313***
		(0.000)	(0.000)	(0.000)
B_{12}	(I. V. * C.F.) _{t-1}	0.059	0.068	1.057***
		(0.217)	(0.152)	(0.000)
B_0	Constant	0.022***	-0.012**	
		(0.000)	(0.050)	
	Observations	19,302	19,302	18,895
	R^2	0.133	0.136	
	AR(1)			0.002
	Hansen(p-value)			0.181
	AR(2)			0.833

Table IV.1.4
Sub-Periods

	Dependent Variable : Investment Independent Variables	Std(GMM)	Std(GMM)
B_1	Investment_{t-1}	0.095**	-0.061
		(0.018)	(0.360)
B_2	(Investment_{t-1})^2	-0.215***	-0.001
		(0.000)	(0.957)
B_3	Sales	0.012***	0.011**
		(0.002)	(0.029)
B_4	Sales_{t-1}	0.002	0.001
		(0.210)	(0.681)
B_5	Cash Flow(C.F.)	0.026	-0.084
		(0.706)	(0.194)
B_6	(C.F.)_{t-1}	0.203***	-0.024
		(0.000)	(0.525)
B_7	Inflation_{t-1}	-0.001	0.010
		(0.169)	(0.178)
B_8	Inflation_{t-1}*C.F.	0.001**	-0.005
		(0.042)	(0.492)
B_9	(Inflation*C. F.)_{t-1}	-0.001**	-0.003
		(0.012)	(0.426)
B_{10}	Inf. Volatility(I. V.)_{t-1}	0.781*	-0.261**
		(0.086)	(0.016)
B_{11}	(I. V.)_{t-1} * C.F.	-0.025	0.795***
		(0.910)	(0.005)
B_{12}	(I. V. * C.F.)_{t-1}	-0.512***	0.205*
		(0.001)	(0.059)
B_0	Constant	0.095**	-0.061
		(0.018)	(0.360)
	Observations	8,214	10,681
	R^2	252	323
	AR(1)	0.01	0.000
	Hansen(p-value)	0.0970	0.167
	AR(2)	0.368	0.286

These relationships are also examined by sub periods. The progress of the inflation level since 1990 moved at a high but relatively stable path until the currency crisis occurred in early 1994. Then, it rose very quickly after the crisis and moved at very high and unstable path up to 2002. With the beginning of the disinflation period in 2002, it decreased sharply and gained stability by reaching single digits. Therefore, the analysis period is divided into two distinct periods which are the periods of a high and unstable inflation rate (1990Q1-2003Q4), and a low and stable inflation rate (2004Q1-2015Q2). The first and second regressions in Table IV.1.4 represent these periods, respectively. We also give the standardized coefficients in order to compare the results of regressions. According to the results, the inflation level is more effective during the periods of high and unstable inflation rates, whereas inflation volatility is more effective instead of inflation level during the periods of low and stable inflation rates.

Table IV.1.5
Sectors (Manufacturing vs. Non-manufacturing)

	Independent Variables	Std(GMM)	Std(GMM)
B_1	Investment_{t-1}	-0.053	-0.153**
		(0.215)	(0.018)
B_2	(Investment_{t-1})^2	-0.144***	0.008
		(0.001)	(0.897)
B_3	Sales	0.689***	0.529***
		(0.006)	(0.000)
B_4	Sales_{t-1}	0.541***	0.133
		(0.005)	(0.287)
B_5	Cash Flow(C.F.)	-1.465***	-0.689**
		(0.003)	(0.029)
B_6	(C.F.)_{t-1}	-1.084***	-0.304
		(0.000)	(0.136)
B_7	Inflation_{t-1}	-0.267***	-0.205*
		(0.000)	(0.089)
B_8	Inflation_{t-1}*C.F.	0.435***	0.191***
		(0.001)	(0.004)
B_9	(Inflation*N. A.)_{t-1}	0.092	0.077
		(0.246)	(0.190)
B_{10}	Inf. Volatility(I. V.)_{t-1}	-0.089	0.026
		(0.139)	(0.864)
B_{11}	(I. V.)_{t-1} * C.F.	1.671***	0.835**
		(0.001)	(0.014)
B_{12}	(I. V. * C.F.)_{t-1}	1.127***	0.457**
		(0.000)	(0.036)
B_0	Constant	-0.053	-0.153**
		(0.215)	(0.018)
	Observations	13,329	5,566
	R^2	212	144
	AR(1)	0.01	0.000
	Hansen(p-value)	0.602	0.820
	AR(2)	0.664	0.778

The first and second regressions in Table IV.1.5 indicate the effects of inflation level and volatility on financial constraints for manufacturing and non-manufacturing sectors, respectively. We also give the standardized coefficients in order to compare the results of regressions and indicate the effects of inflation level and volatility on financial constraints for manufacturing and non-manufacturing sectors, respectively. According to the results, the effects of inflation level and volatility on financial constraints in the manufacturing sector are higher than in non-manufacturing sectors. The changes in the composition of investment and shifting economic units' savings from long-term productive investments towards short-term non-productive investments which are the results of high inflation level and volatility can be the reasons why the effect in the manufacturing sector is higher than the non-manufacturing sectors. With the manufacturing sector being more constrained, we can conclude that credit movements become an important determinant of boom-bust cycles. Therefore, the asymmetry between the manufacturing and non-manufacturing sectors at the micro level can generate the observed asymmetrical aggregate response of sectors over the business cycle.

The first regression in Table IV.1.6 indicates the effects of inflation level and volatility on financial constraints on the basis of firm size. We also give the standardized coefficients in order to compare the results of regressions. The dummy variable, D takes the value of 1 for the firms that have a bigger size than the median value and 0 for other firms and indicate the marginal differences between large and small firms in terms of the effect of inflation level and volatility on financial constraints. According to the results, the effects of inflation level and volatility on financial constraints in small firms are higher than in large firms. Various studies have shown that small companies are faced with a more serious asymmetrical information problem and thus are exposed to higher financing constrains while borrowing. These factors may be the reasons why the effect in small firms is higher than in large firms.

Table IV.1.6
Firms' Size and Age

	Dependent Variables : Investment		
		Firm Size	**Firm Age**
	Independent Variables	**Std(GMM)**	**Std(GMM)**
B_1	Investment_{t-1}	-0.123*	0.200
		(0.058)	(0.318)
B_2	(Investment_{t-1})^2	-0.001	-0.563
		(0.996)	(0.255)
B_3	Sales	-0.700***	0.486***
		(0.005)	(0.010)
B_4	Sales_{t-1}	0.727***	-0.466***
		(0.003)	(0.009)
B_5	Cash Flow(C.F.)	0.144	-1.173*
		(0.678)	(0.064)
B_6	(C.F.)_{t-1}	-0.546***	-0.090
		(0.007)	(0.821)
B_7	Inflation_{t-1}	-0.148***	0.167**
		(0.001)	(0.030)
B_8	Inflation_{t-1}*C.F.	0.166*	0.327**
		(0.077)	(0.039)
B_9	(Inflation*C. F.)_{t-1}	0.119	-0.427**
		(0.214)	(0.016)
B_{10}	Inf. Volatility(I. V.)_{t-1}	0.042	-0.028
		(0.422)	(0.625)
B_{11}	(I. V.)_{t-1}* C.F.	0.133	1.197*
		(0.753)	(0.088)
B_{12}	(I. V. * C.F.) _{t-1}	0.395*	0.275
		(0.088)	(0.507)
B_{13}	D*Inflation_{t-1}	0.228***	-0.208*
		(0.000)	(0.091)
B_{14}	D*Inflation_{t-1}*C.F.	-0.236**	-0.792***
		(0.045)	(0.001)
B_{15}	D*(Inflation*C. F.)_{t-1}	0.246***	0.605***
		(0.001)	(0.005)
B_{16}	D*Inf. Volatility(I. V.)_{t-1}	0.173**	0.084
		(0.047)	(0.403)
B_{17}	D*(I. V.)_{t-1}* C.F.	-1.091**	-1.743**
		(0.028)	(0.034)
B_{18}	D*(I. V. * C.F.) _{t-1}	0.026	1.090
		(0.936)	(0.108)
B_0	Constant	0.011	0.020
		(0.403)	(0.150)
	Observations	19,302	19,302
	R^2	356	356
	AR(1)	0.002	0.001
	Hansen(p-value)	0.067	0.075
	AR(2)	0.397	0.817

The second regression in Table IV.1.6 indicates the effects of inflation level and volatility on financial constraints on the basis of firm age. We also give the standardized coefficients in order to compare the results of regressions. The dummy variable, D, takes the value of 1 for the older firms (their ages are bigger than the median value) and 0 for new firms. and indicate the marginal differences between new and older firms in terms of the effect of inflation level and volatility on financial constraints. According to the results, the effects of inflation level and volatility on financial constraints in new firms are higher than older firms. The related financial literature shows that firms with a longer history are more resilient to macroeconomic as well as firm-specific developments (Gertler, 1988; Oliner and Rudebusch, 1992). Therefore, older firms may have the opportunity to borrow with more favorable credit conditions compared to new companies. As older firms have a long-established lending-borrowing relationship with banks, banks have wider knowledge about these firms and can follow them more closely and effectively which decreases the asymmetrical information problem and thus corporate borrowing costs (Bharath et. al, 2009). These differences between new and older firms in terms of borrowing costs may be the reasons why the effect in new firms is higher than older firms. Consequently, the effects of inflation level and volatility on financial constraints in new firms are higher than older firms.

IV.1.4 Conclusion

In this study, first we analyze the effect of inflation levels and volatility on capital market imperfections and financial constraints in Turkey. By using a micro level data set, we find that the boom and boost cycles in GDP and investment are correlated with the capital market imperfections and financial constraints which are among the determinants of the business cycle in Turkey. We also show that inflation level and volatility result in an increase in financial constraints, and inflation volatility is more effective than inflation level in the increase of financial constraints.

While the inflation level is more effective than volatility during the period of a high and unstable inflation rate in sub-periods, the inflation volatility becomes more important than level during the period of disinflation or low inflation level. Regarding sectors, we found the effects of inflation level and volatility on financial constraints in the manufacturing sector is higher than in non-manufacturing sectors. We also found that the effects of inflation level and volatility on financial constraints in small and new firms are higher than large and older firms, respectively.

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IV.2. Risk and the Strength of Financial Amplification: Evidence From Loan-Level Data[14]

Abstract

The literature on financial amplification acknowledges firms' indebtedness as the main factor affecting firms' cost of borrowing. Moreover, recent literature has emphasized economic uncertainty, namely, the time-variation in cross-sectional uncertainty (risk) for explaining firms' costs of borrowing and aggregate business fluctuations (e.g. Christiano, Motto, and Rostagno, 2014).

In this paper, using micro-level data, we show that the sensitivity of firms' cost of borrowing to indebtedness (in other words, the strength of the financial amplification) could be significantly explained by the risk (in both statistical and economical sense). Furthermore, we provide empirical evidence on how borrowing costs depend on bank and firm characteristics.

IV.2.1 Introduction

Recent literature has emphasized the importance of allowing for time-variation in cross-sectional idiosyncratic uncertainty, namely risk, in explaining business cycles (e.g Christiano, Motto and Rostagno, 2014; CMR hereforth). In particular, the risk shocks that directly affect the strength of movements in the external finance premium in response to changes in borrowers' leverage have been described as the most important shock driving the business cycles. Aggregate implications of such shocks in financial amplification models is well known in the literature, e.g. a higher risk leads to a higher strength of financial amplification (CMR, 2014; Fendoglu, 2014; among others). Yet, little is known whether such implications hold at a micro level. In this paper, using loan-level data, the strength of the financial amplification is estimated for Turkey, with a further examination of whether the risk affects the strength. A key feature of Bernanke, Gertler and Gilcrist (1999, BGG) type of financial accelerator models is that the external finance

[14] The findings of an ongoing study are summarized.

premium, a major conduit of financial disturbances to the real economy, depends on borrowers' indebtedness, namely the leverage. In these models, the levels of financial constraints faced by the company are shown to be inversely related to the strength of firms' balance sheets. As borrowers' financial health deteriorates, it becomes harder for them to repay their debts in response to unfavorable shocks. The subsequent domino effect leads to an adverse cycle of the equilibrium rise in the premiums they pay over the risk-free rate, a lower investment demand, a fall in asset prices, a deterioration in balance sheets, and in turn, a further rise in premiums and a further decline in economic activity.

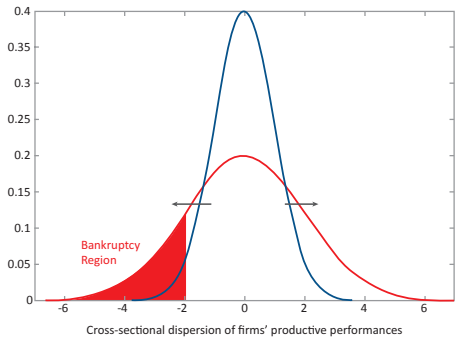
The strength of such a cycle, namely the strength of financial amplification, is the rate at which the premium moves in response to changes in firms' leverage. In response to a rise in this sensitivity, the strength of influence of unfavorable shocks on external financial conditions rises. The CMR emphasize that these fluctuations can be explained by the risk shock which are important for business cycles. At a macro level, the key relationship that drives the financial amplification can formally be shown as

$$EFP_t = S_t(.)(Leverage)^{\chi} \qquad (1)$$

where, EFP denotes the external finance premium firms pay over the risk-free rate Leverage denotes borrowers' aggregate leverage, and χ is a positive constant. $S_t(.)$ denotes the strength of financial amplification, an increase in which raises the cost of external finance for a given change in the leverage. Figure IV.2.1 conceptualizes how changes in risk affect $S_t(.)$.

Due to asymmetric information in financial markets, lenders could observe only the cross-sectional dispersion of firms' idiosyncratic productive performances at the time the credit contract is made. In practice, that amounts to lenders not being able to forecast perfectly the returns of projects that they finance. CMR show that a rise in dispersion (an unfavorable risk shock) implies stronger asymmetric information and makes it more likely that a higher measure of firms will go bankrupt. Banks in turn face a higher expected cost of monitoring such firms. In this regard, the risk of banks' overall loan portfolio rises. In turn,

Chart IV.2.1
Firm Performance
(Change in Risk)



Source: CBRT

banks in equilibrium charge a higher premium to borrowers for a given change in the leverage. In other words, the strength of financial amplification rises.

At a micro level, this relationship can be written as:

$$EFP_{i,b,l,t} = S_t(\sigma_{i\epsilon}\tau_{A|B,t})(Leverage)^{\chi} \quad (2)$$

where i denotes firm i, b denotes bank b, and l denotes loan type l. Having i, b and l subscripts for EFP imply that a firm can borrow from different banks with different contractual rates with different loan types. S_t captures the strength of financial amplification and is assumed to be a function of cross-sectional dispersion of firms' idiosyncratic productive performances. Therefore, we consider micro-level risk measures widely used in the literature, cross-sectional dispersion in stock returns, profit growth, cash flow growth, and size (Bloom, 2009; CMR,2014; Arellano et al., 2014). In calculating the cross-sectional dispersion, we also consider an account payable turnover rate which is directly related to a firm's efficiency in meeting debt obligations.

Along these lines, we arrive at the estimable equation below:

$$Z_{i,b,t} = \beta_1 S_t\left(\sigma_{i\epsilon}\tau_{A|B,t}\right)(Leverage) + \beta_2(Leverage) + \alpha \mathrm{F_{i,t}} + \mathrm{B}_{b,t} + \mathrm{X}_{i,b,t} + R_t + \mu_i + \nu_b + \varepsilon_{i,b,t}$$

where $Z_{i,b,t}$ denotes the borrowing rate for the loan received by firm i from bank b at time t denotes firm-specific variables other than leverage that can potentially affect the loan rate. B b, t denotes bank-specific variables. $X_{i,b,t}$ denotes lags of the dependent variable which potentially capture the remaining relevant factors at a bank-firm level that we do not study explicitly; e.g., tenure of relationship of firm i with bank b. R_t denotes common macroeconomic variables; e.g., the risk-free rate. μ_i and ν_i capture unobserved time-invariant characteristic of firms and banks, respectively.

IV.2.2 Data set and Methodology

Our sample consists of unbalanced panel data for about 300 publicly-traded nonfinancial firms for the period 2003Q1-2014Q4 and obtained from Borsa Istanbul and Central Bank of Turkey credit-level data. These firms are matched with the level of firm-bank lending rates and with the banks' balance sheets and income statements. To ease potential endogeneity in the estimation (e.g. the loan interest rate being correlated with firms' indebtedness or the error term of the lagged values of the dependent variable), we estimate the empirical model, as given in the equation, by the Arellano and Bover (1995)-Blundell and Bond (1998) system GMM estimator. The validity of the instrument cluster is confirmed with various test statistics.

The results included in Tables IV.2.1 and IV.2.2 suggest that the aggregate implications of risk that affect the strength of amplification, hold at a micro-level as well. A higher risk increases the sensitivity of the loan rate to firm's leverage. On average, around 1/3 to 2/3 of the strength is explained by the risk. Moreover, a higher risk, e.g. a one standard deviation increase in the risk, is estimated to increase the strength of amplification significantly, by about 10% to 15%, depending on the risk measure. Moreover, banks take into account the cross-sectional dispersion of the productive performance of firms across the economy as well as the riskiness of their own loan portfolios. The results also show how firms or bank characteristics matter for the loan rate. Based on various risk definitions, leverage turns out to be statistically and economically significant in affecting the loan rate. In particular, a 10% point increase in the leverage ratio is estimated to increase the loan rate by about 23 basis points.

Moreover, a firm twice as large is estimated to borrow with a rate about 17 basis points lower. A firm twice as old borrows with a loan rate 54 basis points lower. Last, better growth prospect for a firm, a rise in the market-to-book value or the stock return, lower the loan rate. For instance, a one-standard deviation increase in a firm's stock return (a 0.2 unit of increase) is estimated to lower the loan rate by about 14 basis points. Larger, more efficient or profitable banks offer loans at lower rates. An increase in the risk-free rate of return or a decline in real growth increase the interest on the loan rates.

Macroeconomic variables also matter for the loan rate. Conditional on firm balance sheet variables, a 5% annual increase in the quarterly real GDP (i.e. a one-standard deviation increase) is estimated to lower the loan rate by about 40 basis points. Similarly, a 1%-point decline in the risk-free rate is estimated to lower the loan rate by about 40 basis points. The results are also in line with some of the stylized facts on the cross-sectional risk documented in the related literature, e.g. Bloom (2009) and Gilchrist (2014), in that risk is countercyclical along business cycles.

IV.2.3 Concluding Remarks

Risk shocks that have a direct effect on the strength of financial amplification have been emphasized as one of the main drivers of business cycles. This paper shows that this effect holds at the micro level. Moreover, banks take into account the cross-sectional dispersion of the productive performance of firms across the economy (overall economic uncertainty or risk) and the riskiness of their own loan portfolio in setting the loan rate.

It is worthwhile emphasizing that macro-prudential policies and monetary policy should take into account those risks and their effects in terms of the effectiveness of those policies.

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Table IV.2.1
Bank-Firm Level Risk and Strength of Financial Amplification (Firm Characteristics)
(Dependent V.: Loan Rate; Set of Firms: All firms that engage in a credit transaction with at least one bank)

	Cross-Sectional Standard Deviation					
	(1)	(2)	(3)	(4)	(5)	(6)
Loan Rate (lag)	0.454***	0.531***	0.525***	0.528***	0.530***	0.524***
	(0.070)	(0.067)	(0.066)	(0.066)	(0.066)	(0.067)
Leverage	2.200**	0.819	1.487***	1.696***	1.356***	0.364
	(0.876)	(0.591)	(0.380)	(0.371)	(0.473)	(0.676)
Log(Real Assets)	-0.184***	-0.154***	-0.162***	-0.155***	-0.152***	-0.158***
	(0.055)	(0.046)	(0.049)	(0.048)	(0.048)	(0.050)
Fixed Assets / Total Assets	-0.237	-0.294	-0.330	-0.320	-0.267	-0.351
	(0.420)	(0.357)	(0.370)	(0.351)	(0.354)	(0.364)
Log(Age)	-0.511***	-0.428***	-0.395***	-0.394***	-0.418***	-0.428***
	(0.156)	(0.123)	(0.121)	(0.124)	(0.123)	(0.128)
Market-to-book Value	-0.123***	-0.097***	-0.098***	-0.094***	-0.093***	-0.094***
	(0.046)	(0.032)	(0.035)	(0.036)	(0.035)	(0.036)
Stock Return	-0.637**	-0.357	-0.594**	-0.932***	-0.864***	-0.879***
	(0.268)	(0.231)	(0.256)	(0.228)	(0.235)	(0.229)
Real GDP Growth	-0.085***	-0.060***	-0.075***	-0.066***	-0.069***	-0.063***
	(0.018)	(0.018)	(0.017)	(0.016)	(0.016)	(0.016)
Risk-free Rate	0.397***	0.322***	0.333***	0.330***	0.327***	0.332***
	(0.041)	(0.031)	(0.030)	(0.030)	(0.030)	(0.031)
Leverage * sd(Stock Return)		8.557***				
		(2.378)				
Leverage * sd(Profit Growth)			0.394***			
			(0.089)			
Leverage * sd(Cash Flow Growth)				0.411***		
				(0.152)		
Leverage * sd(Real Assets)					8.050*	
					(4.460)	
Leverage * sd(Acc. Payables Turnover)						9.681**
						(3.934)
% of Strength explained by Risk		59.39	26.63	15.21	34.82	82.72
Increase in the Strength (%) in response to a 1-std increase in risk		16.97	20.99	9.86	11.61	13.79
Observations	4,588	4,588	4,588	4,588	4,588	4,588
Number of firm-bank id	795	795	795	795	795	795
AR(1)-p	0.00	0.00	0.00	0.00	0.00	0.00
AR(2)-p	0.96	0.89	0.85	0.90	0.88	0.90
AR(3)-p	0.68	0.73	0.71	0.73	0.74	0.72
Diff-Hansen-GMM	0.86	0.62	0.67	0.88	0.79	0.68
Hansen-p	0.12	0.19	0.15	0.13	0.16	0.13
N. of instruments	514	557	556	556	557	556

Notes: This table presents system GMM regressions of loan rate on firm-, bank- and firm-bank- specific variables. AR(q)-p values are the p-values from the Arellano-Bond (1991) test of qth-order serial correlation in error terms. Diff-Hansen-GMM is the p-value for the test of validity of GMM instruments. Hansen-p is the p-value for the test of validity of all instruments. ***,**, and * denote significance levels at 1%, 5%, and 10%, respectively. All regression include quarter fixed effects, industry fixed effects and bank fixed effects.

Table IV.2.2
Bank-Firm Level Risk and Strength of Financial Amplification (Bank and Firm Characteristics)
(Dependent V.: Loan Rate; Set of Firms: All firms that engage in a credit transaction with at least one bank)

	Cross-Sectional Standard Deviation					
	(1)	(2)	(3)	(4)	(5)	(6)
Loan Rate (lag)	0.453***	0.519***	0.513***	0.507***	0.514***	0.509***
	(0.071)	(0.067)	(0.066)	(0.066)	(0.067)	(0.067)
Leverage	2.287**	1.285**	1.326***	0.993**	1.674***	0.362
	(0.931)	(0.504)	(0.445)	(0.480)	(0.540)	(0.497)
Bank Size	-1.099***	-0.585**	-0.592**	-0.593**	-0.688***	-0.525**
	(0.337)	(0.246)	(0.250)	(0.255)	(0.248)	(0.249)
Return on Equity	-0.058	-0.035	-0.031	-0.018	-0.032	-0.032
	(0.066)	(0.061)	(0.062)	(0.065)	(0.062)	(0.063)
Net Interest Revenue/Equity	-0.020**	-0.024***	-0.023***	-0.022***	-0.022***	-0.024***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
NPL Ratio	-0.185**	-0.212***	-0.213***	-0.175**	-0.200**	-0.210***
	(0.082)	(0.080)	(0.078)	(0.078)	(0.081)	(0.080)
Real GDP Growth	-0.106***	-0.082***	-0.092***	-0.089***	-0.088***	-0.081***
	(0.021)	(0.019)	(0.018)	(0.019)	(0.018)	(0.018)
Risk-free Rate	0.324***	0.288***	0.301***	0.316***	0.290***	0.298***
	(0.032)	(0.028)	(0.027)	(0.030)	(0.027)	(0.027)
Leverage * sd(Stock Return)		4.277***				
		(1.423)				
Leverage * sd(Profit Growth)			1.078***			
			(0.293)			
Leverage * sd(Cash Flow Growth)				2.979***		
				(0.874)		
Leverage * sd(Real Assets)					4.885	
					(4.923)	
Leverage * sd(Acc. Payables Turnover)						8.202***
						(2.179)
% of Strength explained by Risk		38.74	36.60	53.27	-	83.29
Increase in the Strength (%) in response to a 1-std increase in risk		12.23	14.95	18.22	-	18.93
Observations	4,586	4,586	4,586	4,586	4,586	4,586
Number of firm-bank	795	795	795	795	795	795
AR(1)-p	0.00	0.00	0.00	0.00	0.00	0.00
AR(2)-p	0.92	0.92	0.88	0.97	0.89	0.95
AR(3)-p	0.64	0.63	0.66	0.63	0.68	0.68
Diff-Hansen-GMM	0.45	0.79	0.66	0.56	0.82	0.27
Hansen-p	0.06	0.17	0.12	0.09	0.14	0.06
N. of instruments	518	561	560	560	561	560

Notes: This table presents system GMM regressions of loan rate on firm-, bank- and firm-bank- specific variables. AR(q)-p values are the p-values from the Arellano-Bond (1991) test of qth-order serial correlation in error terms. Diff-Hansen-GMM is the p-value for the test of validity of GMM instruments. Hansen-p is the p-value for the test of validity of all instruments. ***,**, and * denote significance levels at 1%, 5%, and 10%, respectively. All regression includes quarter fixed effects, industry fixed effects and bank fixed effects.

IV.3. Reserve Requirement Ratios and Credit Growth[15]

Summary

The aims for using reserve requirements has evolved over time and so the number of studies in the literature about reserve requirements and their effectiveness has increased. Especially after the 2008-2009 global financial crisis, reserve requirements have been used frequently as macro-prudential measures.

In this study, the impact of changes in reserve requirement ratios on firm loans is examined using detailed micro data in bank-firm level. The empirical results show that an increase in reserve requirement ratios has a significant and negative impact on TL and FX credit growth. Furthermore, results indicate that the wider the difference between the upper and lower band of reserve requirements according to the maturity of liabilities, the longer the maturity of credit. In other words, the higher rate imposed by the CBRT to the short-term liabilities in the reserve requirements has led to the longer-term of credit.

IV.3.1 Introduction

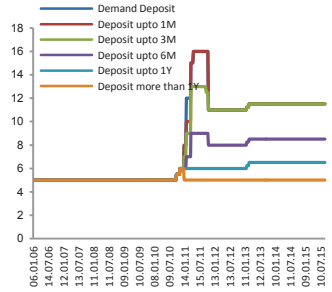
Reserve requirements ratio is applied as an active policy instrument by central banks. Central banks of emerging markets, especially, have frequently relied on this policy instrument after the 2008-2009 global financial crisis. Central banks of advanced economies implemented monetary expansions to mitigate the effects of global financial crisis and this resulted in excessive capital flows to emerging markets. Low cost of funding and excessive capital flows lead to rapid and excessive credit growth in these countries. Excessive credit growth has increased the fragility of the banking sector especially in emerging markets and, according to Mendoza and Terrones (2012) this situation has been associated with the economic and financial crisis.

[15] The findings of an ongoing study are summarized.

The CBRT adopted a new monetary policy framework called the policy mix after the 2008-2009 global financial crisis. In the new policy mix, while maintaining price stability is the priority goal, contributing to the financial stability becomes a supportive objective in the monetary policy framework. In this framework, required reserves and other macro prudential tools as well as weekly repo rates, the interest rate corridor and funding strategy are jointly used as complementary tools for credit, interest rate and the liquidity policy, respectively.

In the literature, Reinhart and Reinhart (1999) establish required reserves as a tool for mitigating the impact of foreign exchange interventions on domestic money supplies during times when developing countries deal with the volatility of capital flows. Montoro (2011) constructs a New Keynesian model with a banking sector and an interbank market that are constrained by capital and liquidity restrictions. In this model, he finds that introducing reserve requirements can complement monetary policy in stabilizing the business cycle when the economy is subject to demand shocks, but not under supply shocks. Glocker and Towbin (2012) also analyze the use of reserve requirements in preserving price stability and sustaining financial stability. Their results imply that reserve requirements are in favor of a price stability objective only if financial frictions are non-trivial and are more effective if there is a financial stability objective and debt is denominated in foreign currency. Mimir, Sunel and Taskin (2012) construct a monetary DSGE model with a banking sector, in which banks are subject to time-varying reserve requirements adjusted countercyclical to expected credit growth. The authors find that the countercyclical reserve policy reduces the volatilities of key real macroeconomic and financial variables compared to a fixed reserve policy.

Chart IV.3.1
TL Reserve Requirement Ratios
(Percent)



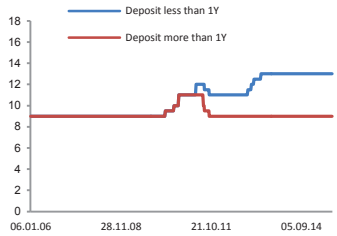
Source CBRT

In this study, we explore the response of corporate loan growth with respect to the changes in the reserve requirements by using micro level bank-firm credit data. In particular, the impact of the change in the required reserve ratios differentiated according to currency and maturity liabilities on credit growth is analyzed. The results show that an increase in reserve requirement ratios has a significant and negative impact on credit growth.

IV.3.2 Data and Methodology

In this study, the data from the Banks Association of Turkey - Risk Center that include loan information at the firm-bank level is used monthly. The data sets consist of 18 million observations of firm-bank loan transactions and covers almost all of the transactions in the corporate loan universe. Moreover, reserve requirement ratios, the industrial production index, inflation and Turkish monetary policy data are obtained from the CBRT'S website; the interest rates of the ECB and the FED are obtained from their websites accordingly. The time span of the study is 2006-2014. Table IV.3.1 shows descriptive statistics. New lending is derived from the stock of credit data and its natural logarithm is used.

Chart IV.3.2
FX Reserve Requirement Ratios
(Percent)



Source CBRT

Table IV.3.1
Descriptive Statistics

	Number of Observations	Average	Minimum	Median	Maximum	St. Deviation
TL Loans						
Log (Short-term Loans)	14963371	8.72	0.00	8.96	21.28	2.62
Log (Medium-term Loans (MT))	1849309	10.31	0.00	10.41	20.03	1.87
Log (Long-term Loans (LT))	1371610	9.65	0.00	10.20	20.26	2.63
Total	18184290	8.95	0.00	9.23	21.28	2.60
TL Loans						
Log (Short-term Loans)	860700	10.63	0.00	10.85	20.04	2.27
Log (Medium-term Loans (MT))	226728	11.24	0.00	11.25	21.23	2.27
Log (Long-term Loans (LT))	204292	11.30	0.00	11.31	21.11	2.50
Total	1291720	10.84	0.00	10.99	21.23	2.33
RRR Variables						
Δ RRR - TL	96	0.06	-2.11	0.00	3.91	0.53
Δ MBRR - TL	96	0.07	-4.39	0.00	3.54	0.74
Δ RRR - FX	96	0.03	-0.67	0.00	1.00	0.18
Macro Variables						
Δ Industrial Production Index	96	0.60	-17.00	-0.57	21.46	8.07
Δ Inflation	96	0.64	-1.43	0.52	3.27	0.83
Δ CBRT's Monetary Policy Stance	96	0.01	-1.59	-0.02	1.87	0.45
Δ ECB Effective Interest Rate	96	-0.04	-0.69	-0.01	0.33	0.17
Δ FED Effective Interest Rate	96	-0.05	-0.97	0.00	0.07	0.16

Credits are classified as short-term credit with maturities less than 1 year, medium-term credit with maturities is between 1-2 years and long-term credit with maturities more than 2 years. The changes in reserve requirements are calculated as the weighted average of the banking sector separately for TL and FX (Graph IV.3.1 and Graph IV.3.2). Moreover, the maturity based reserve requirement (MBRR) is defined as the difference between the upper and lower band of reserve requirements according to the maturity of liabilities. The Turkish industrial production index, inflation, the CBRT's monetary stance, the effective interest rates of the ECB and the FED are used as control variables for the macroeconomic environment.

In this study, the following model was used separately for TL and credit growth to analyze the effects of the changes in reserve requirements on firms' loan growth.

$$KB_{ibt} = \beta_0 + \beta_1 \Delta ZK_t + \sum_k \beta_k X_t + \text{DummyMT}_{b,i,t} + \text{DummyLT}_{b,i,t} + \gamma_i + \pi_b + \varepsilon_{itb}$$

here, KB_{ibt}, shows the natural logarithm of the new lending loan of the firm i in the bank at time t, ΔZK_t shows the monthly weighted average change of reserve requirement ratios, X_t shows macro variables, the dummy medium-term (MT) and long-term (LT), γ_i shows the fixed effect variable of the firm i, π_b shows the fixed effect variable of the bank b and ε_{ib} shows the residual term.

IV.3.3 Results

Table IV.2.2 displays six different estimation results. The first model includes the quarter fixed effects, the bank fixed effects are added to the second model, and firm fixed effects are inserted in the third one. These three models demonstrate that an increase in reserve requirement ratios has a negative and statistically significant effect at 1% on TL credit growth. When macro variables are added to the model as control variables, the estimated coefficient decreases but it is still significant. Moreover, monetary tightening of CBRT has a negative and significant effect on credit growth as well. As can be seen in the fifth and sixth columns, enhancing the model with the year-quarter fixed effects does not change the results and similar results are obtained.

Table IV.3.2
New Lending and RRR-TL

	TL New Lending					
	1	2	3	4	5	6
Δ RRR - TL	-0.020***	-0.014***	-0.013***	-0.005***	-0.008***	-0.012*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.006)
Dummy Medium-Term Loans(MT)	1.615***	1.705***	1.619***	1.618***	1.471***	1.471***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Dummy Medium-Term Loans (LT)	0.919***	1.057***	1.237***	1.236***	1.040***	1.040***
	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Δ CBRT's Monetary Policy Stance				-0.047***	-0.035***	-0.037***
				(0.001)	(0.001)	(0.001)
Δ Inflation				0.010***	0.007***	0.006***
				(0.001)	(0.001)	(0.001)
Δ Industrial Production Index				0.001***	0.002***	0.001***
				(0.000)	(0.000)	(0.000)
Δ RRR – TL* Δ CBRT's Monetary Policy Stance						0.060***
						(0.012)
Δ RRR – TL* Δ Inflation						-0.029***
						(0.009)
Δ RRR – TL* Δ Industrial Production Index						0.001
						(0.001)
Constant Term	8.610***	8.605***	9.928***	9.917***	9.781***	9.781***
	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)
Bank Fixed Effect	No	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	No	No	Yes	Yes	No	No
Firm Year-Quarter Fixed Effect	No	No	No	No	Yes	Yes
Year-Quarter Fixed Effect	Yes	Yes	Yes	Yes	No	No
Number of Observations	18,184,290	18,184,290	18,184,290	18,184,290	18,184,290	18,184,290
R^2	0.050	0.129	0.438	0.438	0.669	0.669
Adjusted R^2	0.05	0.13	0.42	0.42	0.49	0.49

The impacts of changes in FX reserve requirements on FX credit growth is explored in Table IV.3.3. Similar results of Table IV.3.2 are obtained showing that an increase in FX reserve requirement ratios leads to a decline in FX credit growth. When Turkish macro variables are added to the model in the fourth column, the results do not change. The ECB and FED effective interest rates are included in the fifth column to control for the effects of these central banks' monetary stance and similar results are obtained. Finally, an increase in FX reserve requirement ratios has a negative and statistically significant effect at 1% on FX credit growth.

Table IV.3.3
New Lending and RRR-FX

	FX New Lending					
	1	2	3	4	5	6
Δ RRR - TL	-1.359***	-1.384***	-1.337***	-1.548***	-1.400***	-1.344***
	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.023)
Dummy Medium-Term Loans(MT)	0.613***	0.569***	0.192***	0.195***	0.197***	0.140***
	(0.011)	(0.011)	(0.009)	(0.009)	(0.009)	(0.012)
Dummy Medium-Term Loans (LT)	0.697***	0.655***	0.427***	0.435***	0.442***	0.446***
	(0.014)	(0.014)	(0.011)	(0.011)	(0.011)	(0.016)
Δ CBRT's Monetary Policy Stance				0.182***	0.235***	0.165***
				(0.005)	(0.005)	(0.006)
Δ Inflation				0.007***	0.011***	0.054***
				(0.002)	(0.003)	(0.004)
Δ Industrial Production Index				0.024***	0.025***	0.020***
				(0.000)	(0.000)	(0.000)
Δ ECB Effective Interest Rate					-1.176***	-0.930***
					(0.023)	(0.034)
Δ FED Effective Interest Rate					-0.516***	-0.404***
					(0.019)	(0.026)
Constant Term	10.762***	10.767***	10.931***	10.899***	10.949***	10.618***
	(0.015)	(0.015)	(0.027)	(0.027)	(0.027)	(0.031)
Bank Fixed Effect	No	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	No	No	Yes	Yes	No	No
Firm Year-Quarter Fixed Effect	No	No	No	No	Yes	Yes
Year-Quarter Fixed Effect	Yes	Yes	Yes	Yes	No	No
Number of Observations	1,291,720	1,291,720	1,291,720	1,291,720	1,291,720	1,291,720
R^2	0.041	0.076	0.455	0.461	0.463	0.701
Adjusted R^2	0.04	0.08	0.43	0.43	0.43	0.49

Table IV.3.4 presents results of the impact of changes in maturity based reserve requirement on TL credit growth. Results indicate that an increase in MBRR has a significant and negative effect on TL credit growth in the first three models. Moreover, medium-term and long-term credits are affected by these increases less than short-term credits are. In other words, the higher rate imposed by the CBRT to the short-term liabilities in the reserve requirements has led to the longer-term of credit. Similar results are obtained when macro variables are added to the model as shown in the fourth and fifth columns. Last, the firm-year-month fixed effects are included in the sixth column and thus monthly variables are dropped from the model. Still, the wider the difference between the upper and lower band of reserve requirements according to the maturity of liabilities, the longer the maturity of credit.

Table IV.3.4
New Lending and MBRR-TL

	TL New Lending					
	1	2	3	4	5	6
Δ MBRR - TL	-0.022***	-0.022***	-0.022***	-0.019***	-0.017***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
Dummy Medium-Term Loans(MT)* Δ MBRR - TL	0.016***	0.031***	0.045***	0.046***	0.033***	0.026***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)
Dummy Medium-Term Loans (LT)* Δ MBRR - TL	0.045***	0.060***	0.063***	0.063***	0.055***	0.054***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)
Dummy Medium-Term Loans(MT)	1.614***	1.702***	1.616***	1.615***	1.468***	1.346***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)
Dummy Medium-Term Loans (LT)	0.916***	1.053***	1.232***	1.232***	1.036***	0.834***
	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.009)
Δ CBRT's Monetary Policy Stance				-0.048***	-0.036***	
				(0.001)	(0.001)	
Δ Inflation				0.009***	0.006***	
				(0.001)	(0.001)	
Δ Industrial Production Index				0.001***	0.001***	
				(0.000)	(0.000)	
Constant Term	8.611***	8.605***	9.928***	9.918***	9.782***	9.788***
	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.009)
	No	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effect	No	No	Yes	No	No	No
Firm Fixed Effect	No	No	No	Yes	Yes	No
Firm Year-Quarter Fixed Effect	Yes	Yes	Yes	No	No	No
Firm Year-Month Fixed Effect	No	No	No	No	No	Yes
Number of Observations	18,184,290	18,184,290	18,184,290	18,184,290	18,184,290	18,184,290
R^2	0.050	0.129	0.438	0.438	0.670	0.799
Adjusted R^2	0.05	0.13	0.42	0.42	0.49	0.41

IV.3.4 Conclusion

In this study, we explore the response of corporate loan growth with respect to the changes in the reserve requirements by using micro level bank-firm credit data. Obtained results show that an increase in reserve requirement ratios has a negative and statistically significant effect credit growth. Similar results are obtained when Turkish macro variables are added to the model as control variables. Similar results are also obtained for FX credit growth when there is an increase in FX reserve requirement ratios. Furthermore, the higher rate imposed by the CBRT to the short-term liabilities in the reserve requirements has led to the longer-term of credit.

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IV.4. Resolution Through Creditors and Shareholders: Bail-in

The global financial crisis has revealed that government supports for bailing-out systemically important banks is highly costly. The expectation that too big to fail and systemically important banks will be bailed-out by government interventions encourages banks to take more risk, creates an implicit subsidy that provides an advantage in the cost of funding and reveals a moral hazard problem. An important part of the reform agenda established after the global financial crisis is to end the too big to fail problem. In this context, the Financial Stability Board (FSB) issued the key attributes for effective resolution regimes. The aim of the principles is to resolve failed financial institutions without using public resources, without interrupting the critical services provided by financial institutions, and without disrupting the financial system. In this respect, a resolution tool named "bail-in" was developed. In the bail-in, the claims of shareholders and unsecured creditors are written down or converted into equity in order to absorb losses and recapitalize the financial institution. Thereby, the aim is to resolve the failed financial institution within a framework that creditors and shareholders bear the cost of resolution without public support. Bail-in is an important element of the toolkit to solve the too big to fail problem.

Turkey has been closely following reforms regarding resolution activities initiated after the global financial crisis. The BRSA and SDIF continue to work in coordination on subjects related to resolution powers, resolution funding, coordination and information sharing to comply with the Key Attributes published by the FSB.

IV.4.1 Introduction

It was revealed during the global financial crisis that any stress on a systemically important financial institution or its liquidation as a result of this stress can cause a risk to financial stability. A systemically important financial institution can affect financial stability in three ways: (i) credit risk due to failing to fulfill its obligations; (ii) liquidity risk as a result of fire sales of assets; (iii) contagion risk due to spreading panic to other financial institutions.

Banks provide important services to the economy such as taking deposits from households and firms, lending to its customers, offering payment systems and insurance. Accordingly, the daily activities of households, corporate and public sectors rely on such critical functions. During the financial crisis, some governments supported and rescued big banks to protect their financial stability from these risks. Bailing out banks allowed the financial system to continue to function and prevented the domino effects arising from failing banks that may cause severe damage to the real economy. On the other hand, bank rescue programs increased the burden on public finance. Indeed, according to IMF estimates, the banking crises between 2007 and 2011 increased the public debt to GDP by around 18 percent (IMF, 2014).

Developing effective and reliable resolution regimes for banks under stress is important in the sense of reducing the burden on tax payers and breaking the negative cycle between public debt and the banking crises. Unless such resolution regimes exist, authorities will continue to confront the dilemma of increasing risks to financial stability due to allowing banks to default and spreading the loss to the taxpayers through bailing out financial institutions via public support.

IV.4.2 Government Interventions and Moral Hazard

Government interventions in the global financial crisis occurred in the form of credit guarantees, asset purchases and direct capital injections. Even though these interventions helped reduce the systemic risk, they also lead to an increase in moral hazard.

The bail-out expectations affect the behaviors of managers and owners of financial institutions. This expectation reduces the cost of risk taking. Especially prior to the crisis, the expectations regarding bail-outs of financial institutions reduced the funding costs of some too big to fail banks. This funding cost advantage is called an implicit guarantee. Creditors expected that the governments were going to intervene and the large banks were not going to default on their debt even if the financial institutions went bankrupt. Therefore, creditors gave loans at

lower rates to the banks compared to the situation where there is no expectation of government support. According to the IMF estimates, the funding advantage is 15 basis points in the USA, 20-60 basis points in the UK, and 60-90 basis points in the euro zone (IMF, 2014)[16]. These low funding rates provide a competitive advantage for the systemically important banks compared to the other banks. This directs the systemically important banks to make risky and highly leveraged transactions.

IV.4.3 Reform Agenda After Crisis

A broad reform agenda was formed after the global financial crisis. An important part of the reform agenda is to end the too big to fail problem. In this context, the aim is to determine systemically important, i.e. too big to fail, banks and to increase their resiliency. In addition, steps are being taken to reduce losses in case of defaults of the financial institutions. The FSB issued the Key Attributes of effective resolution regimes. These Key Attributes set out regulations needed in the default of systemically important financial institutions. The Key Attributes cover different aspects of resolution regimes such as scope and aim of resolution and resolution powers. They also involve a resolution toolkit including bail-in. The aim of effective resolution regimes is to maintain critical functions of financial institutions and absorb losses without using taxpayers' funds.

IV.4.4 What is and is not Bail-in?

Bail-in implies that creditors and shareholders should bear the resolution costs. In the bail-in, claims of shareholders and unsecured creditors are converted into equity or written down in order to absorb losses and recapitalize the financial institution. This is achieved based on the creditor hierarchy in the solvency law.

[16] Credit default swaps (CDS) and credit rating were used in the IMF study to calculate the funding advantage. In the first method, realized CDS premiums and CDS premiums calculated from share prices were compared. In the second method, the funding advantage was estimated by using rating upgrades due to public guarantee with credit ratings and a bond rate spread comparison between systemically important banks and other banks.

The main idea is to restructure the liabilities and prevent the default risk of financial institution. For this purpose, the financial institution needs to restore the capital position at or above the minimum capital requirement set by the regulatory authority. This can be achieved by conversion to equity/write offs or capital injections by new shareholders. Thereby, the failing bank is resolved with a framework in which creditors and shareholders bear the losses without use of public funds.

In bail-in, the financial institution continues to operate and maintains its critical functions. There is no disruption to the financial system in this way. The capital level needed to maintain the critical functions and set by regulatory authority is met. This bail-in mechanism gives extra time for the authorities and the management of the institution to find substantial solutions (such as restructuring activities, adopting a new business plan) to the problems of the failing firm.

Bail-in is not an alternative to the contingent convertible capital instruments. Although both means recapitalization via creditors, the latter as a financial instrument has features of debt in terms of specific coupon payments at certain dates but also can be written down or converted into equity in cases where the core capital ratio decreases below a certain threshold. Bail-in is a resolution tool rather than a financial instrument. It represents the legal power of the resolution authority. It can be used by the resolution authority without management permission of management of a firm, its shareholders or creditors and the court.

IV.4.5 How does Bail-in Work?

It is better to work with a typical balance sheet of a bank to understand the bail-in mechanism. A simple bank balance sheet is shown below as an example. The assets of the bank are worth of TL 200. It includes cash (TL 10), securities (TL 90) and loans (TL 100). On the liability side, there are secured liabilities (TL 100), deposits (TL 60), unsecured liabilities (TL 25) and subordinated debt (TL 5). Therefore the bank has TL 10 as equity.

Initial Balance Sheet

Cash	TL 10	Secured Liabilities	TL 100
Securities	TL 90	Deposits	TL 60
Loans	TL 100	Unsecured Liabilities	TL 25
		Subordinated Debt	TL 5
		Equity	TL 10

Let us suppose that the bank has a loss of TL 12 due to non- performing loans. Then, the bank does not have the adequate capital to continue its functions and enters into resolution. Equity and subordinated debt initially absorb losses. Since the loss exceeds the equity, TL 2 of subordinated debt will be written down.

Step 1. Loss Absorption

Cash	TL 10	Secured Liabilities	TL 100
Securities	TL 90	Deposits	TL 60
Loans	TL 88	Unsecured Liabilities	TL 25
		Subordinated Debt	TL 3
		Equity	TL 0

Equity is wiped out and TL 2 of subordinated debt is written down.

In second step, the bank should be recapitalized to continue its activities, to restore market confidence, and to meet minimum capital requirements. The capital position of the bank is improved by converting the remaining subordinated debt (TL 3) and some of the unsecured liabilities (TL 7) into equity.

Step 2. Post Bail-in

Cash	TL 10	Secured Liabilities	TL 100
Securities	TL 90	Deposits	TL 60
Loans	TL 88	Unsecured Liabilities	TL 18
		Equity	TL 10

TL 3 of subordinated debt and TL 7 of unsecured liability are converted into equity

IV.4.6 Other Resolution Tools and Bail-in

There are two other resolution tools, namely the purchase and assumption model and the bridge bank. In the purchase and assumption model, another bank purchases good assets and assumes liabilities of a failing bank. In the bridge bank tool, the resolution authority establishes a new bank and the good assets and liabilities of the failing bank are transferred to this bank.

Bail-in is especially appropriate for financial institutions having capital difficulty. Furthermore, the purchase and assumption model and bridge banks are resolution tools for default and aims to ensure the orderly liquidation of a failing bank. On the other hand, the main objectives of bail-in are that the failing bank continues its activities and bank runs are prevented. All of the resolution tools aim to maintain financial stability, yet each tool has its advantages and disadvantages.

In bail-in, there is no need to seek another institution to purchase the failing financial institution. It can be difficult especially for large and complex banks to find a buyer due to time constraints. This makes bail-in attractive since it can be implemented quickly and prevents fire sales of assets in the financial system. In the purchase and assumption model where assets and liabilities of a failing bank are transferred to an existing bank, due diligence is required to ensure that rights of creditors are not violated. There is no urgent need to find a buyer in the bridge bank model where assets and liabilities of a failing bank are transferred to a bank established by a resolution authority. However, the bridge bank should be sold sooner or later. While troubled assets are left behind in the purchase and assumption model and the bridge bank, bail-in does not propose an explicit solution for troubled assets. Therefore, further recapitalization and implementation of a financial institution's restructuring plan following the bail-in is important.

IV.4.7 What are the Effects of Bail-in?

Bail-out expectations provide a funding advantage to the banks. Given that bail-in would reduce this implicit support, it might affect the funding costs. On the other side, removal of public support will improve market discipline and banks' funding costs will be more related to its underlying risks.

Higher funding costs may change the liability structure of banks. In order for banks to lower funding costs and circumvent bail-in, they may tend to hold more capital, contingent convertible capital instruments or short term secured funding (Zhou et al., 2012). Therefore, it is vital that banks maintain bail-inable liabilities in their balance sheets. The Total Loss Absorbing Capacity (TLAC) for global systemically important banks (G-SIBs) is in force for this purpose (Box IV.1.1).

There are contagion risk concerns for bail-in since financial institutions can invest in each others' debt instruments. As a matter of fact, failure of a bank causes a shock for another financial institution investing in the debt instruments issued by the failing bank. Although investors that invest in debt instruments of a failing bank absorb losses, the bail-in prevents more tax payers from bearing the burden of public rescue packages. The Basel Committee developed a regime to limit the spread of shock from one G-SIB to another.

Box IV.4.1 Total Loss Absorbing Capacity

Bail-in enables claims other than the secured and insured to be converted into equity or written down. The total loss absorbing capacity (TLAC) steps in at this point. TLAC ensures that bail-inable instruments are maintained in the balance sheet. In other words, claims other than insured and secured should take place in the liability side of the balance sheet during resolution.

TLAC and other regulations, which are for restoring confidence for resolution without public funds, aims to remove implicit public guarantees for G-SIBs. All of the banks will be able to compete on a level playing field thanks to the removal of implicit public supports. At the same time, it is expected that the holders of claims eligible to convert into equity or write down monitors G-SIB more carefully.

What is Total Loss Absorbing Capacity?

TLAC is to ensure that G-SIBs have the loss absorbing and recapitalization capacity necessary so that critical functions can be continued without taxpayers' funds or financial stability being put at risk in case of possible resolution.

The definition of TLAC and how it is implemented are disclosed in the standard published in November 2015. According to this standard, TLAC is composed of two parts. The first one is an 8% minimum capital adequacy ratio defined in the Basel capital standards. Also, G-SIBs should hold additional loss absorbing instruments with some criteria in addition to the Basel III capital requirement. In this context, the Basel III capital requirement and additional loss absorbing capacity forms TLAC.

The FSB TLAC term sheet defines external and internal TLAC. External TLAC means the total TLAC eligible instruments of each resolution group[17] of a bank. Internal TLAC means the total TLAC eligible instruments held in material sub-groups where settled in host jurisdictions. The main objective of internal TLAC is to facilitate co-operation between home[18] and host[19] authorities and the implementation of effective cross-border resolution strategies by ensuring the appropriate distribution of loss-absorbing and recapitalization capacity within resolution groups outside of their resolution entity's home jurisdiction. In other words, internal TLAC assures that the resolution group of home jurisdiction shares the burden in case of the loss of a material subsidiary located in the host jurisdiction and that the material subsidiary can be resolved properly. According to the TLAC Quantitative Impact Study published by the Basel Committee on November 2015, TLAC shortfalls of G-SIBs varies between EUR 307 billion and EUR 1,406 trillion under different scenarios.

The resolution entity in home jurisdiction invests in TLAC instruments issued by the material subsidiary. Loss incurred by the material subsidiary is absorbed by the resolution entity in this way. It is better to explain the internal TLAC structure with a simple example. In the following example, the material subsidiary has TL 30 of asset size, TL 4 of TLAC eligible liabilities and TL 3 of equity. The

[17] A resolution entity and any entities that are owned or controlled by a resolution entity either directly ("direct subsidiaries") or indirectly through subsidiaries of the resolution entity ("indirect subsidiaries") and that are not themselves resolution entities or subsidiaries of another resolution entity form a resolution group.
[18] Home jurisdiction is where financial institution is monitored on consolidated basis.
[19] Host jurisdiction is where the financial institution is not monitored on a consolidated basis; rather, where subsidiaries are located.

resolution entity invests in TL 4 of TLAC instruments of the material subsidiary. When the material subsidiary incurs TL 6 of loss, the loss is initially absorbed by equity. Equity which is worth TL 3 is inadequate to cover the losses, so other TLAC liabilities step in. The remaining loss is absorbed by the resolution entity.

Step 1. Issuance of internal TLAC

Resolution Entity			
Loans	TL 96	Deposits	TL 82
Material Subsidiary TLAC	TL 4	TLAC	TL 18
Total Assets	TL 100	Total Liabilities	TL 100

Material Subsidiary			
Loans	TL 30	Deposits	TL 23
		Other TLAC Liabilities	TL 4
		Equity	TL 3
Total Assets	TL 30	Total Liabilities	TL 30

Resolution entity invests in the issued TLAC instruments of material subsidiary.

Step 2. Loss absorption together with resolution entity

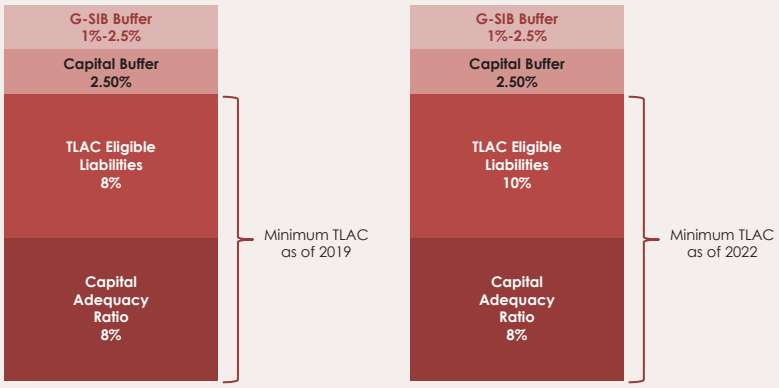
Resolution Entity			
Loans	TL 96	Deposits	TL 82
Material Subsidiary TLAC	TL 1	TLAC	TL 15
Total Assets	TL 97	Total Liabilities	TL 97

Material Subsidiary			
Loans	TL 24	Deposits	TL 23
		Other TLAC Liabilities	TL 1
Total Assets	TL 24	Total Liabilities	TL 24

Material subsidiary has TL 6 of loss. Accordingly, equity absorbs losses at first. In case where capital is inadequate other TLAC liabilities are to cover losses.

In addition to Basel III capital requirements, as of 1 January 2019, minimum TLAC of G-SIBs must be at least (i) 16% of the resolution group's RWAs and (ii) 6% of the Basel III leverage ratio denominator. As of 1 January 2022, these ratios must be 18% and 6.75% respectively. Any applicable regulatory capital buffer should be met in addition to TLAC minimum requirements. The host authority calculates the internal TLAC such that each material sub-group must have 75% to 90% of the external minimum TLAC requirement that would apply to the material sub-group if it were a resolution group. The G-SIBs that fail and enter resolution should come back into compliance with the FSB TLAC standard within 24 months as long as they continue to be designated as G-SIBs.

Diagram IV.4.1.1. TLAC Applications



Which instruments are eligible for TLAC?

TLAC is highly related to creditor hierarchy in the sense of implementation. Creditor hierarchy indicates who gets paid first in case of default. Subordination can be statutory, contractual or structural. Secured and insured claims are senior to the unsecured claims in general payment order. Shareholders absorb losses initially; that is, they are at the most subordinated level in case of default.

TLAC eligible and ineligible instruments can be differentiated in the creditor hierarchy and the no creditor worse off principle. Therefore, in order to be a TLAC eligible instrument, some of the criteria are that the liabilities should be unsecured and uninsured, more than 1year to resolve comfortably, and comply with creditor hierarchy. TLAC should be issued by resolution authority with some exceptions. The following instruments are excluded from being TLAC instruments: insured deposits, short term deposits, liabilities arising from derivatives, debt instruments with derivative-linked features such as structured notes, liabilities arising other than through a contract (such as tax liabilities) and any liabilities that are exempt from bail-in legally or may create a material risk of successful legal challenge or valid compensation claims when written down or converted into equity by a resolution authority.

Even though creditor hierarchy and the no creditor worse off principle are taken into account, due to the different conditions and regulations of the countries, there are some exceptions. For instance, it is possible that a certain amount of instruments ranking pari passu with excluded instruments may be counted as TLAC. Credible ex-ante commitments to recapitalize a G-SIB in resolution and temporary resolution funding may count towards a G-SIB's minimum TLAC. These exemptions are restricted such that such liabilities should be at most 2.5 % of risk weighted assets as of 1 January 2019 and 3.5 % as of 1 January 2022.

Conclusion

The global financial crisis has revealed the cost of bailing-out systemically important banks with government interventions. The expectation that systemically important banks will be bailed-out encourages banks to take more risk and create an implicit subsidy that provides an advantage in cost of funding.

A set of principles has been published for the orderly resolution of systemically important banks within the reform agenda created after the crisis. The aim of the principles is to resolve financial institutions without using public resources, without interrupting the critical services provided by financial institutions, and without disruption of the financial system. In this respect, a new resolution tool, bail-in, has been developed. In bail-in, creditors and shareholders bear the cost of resolution; thereby, the financial institution is able to operate without public support.

The effective implementation of bail-in requires that the resolution authority has the necessary legal powers. For the resolution of an internationally active financial institution, resolution actions should be recognized by other jurisdictions. In order to ensure bail-in is implementable, it is necessary that banks have bail-inable financial instruments, in other words loss absorbing capacity. The final Total Loss-Absorbing Capacity standard published recently by the FSB will ensure that global systemically important banks have sufficient loss absorbing capacity.

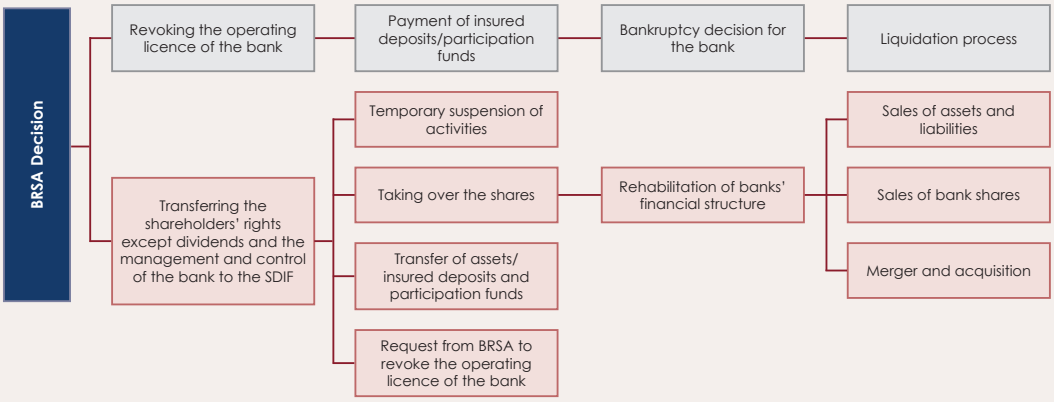
In conclusion, bail-in is not a magic wand to end the too-big-to-fail problem itself; however, it is an important element of the toolkit to solve this problem.

Box IV.4.2 Resolution Regime in Turkey

In Turkey, provisions regarding the resolution regime are described in Banking Law No. 5411. Within this framework, the BRSA and SDIF take part in the resolution process. While the BRSA initiates the resolution, the SDIF is the resolution authority that executes the resolution process.

The BRSA notifies the SDIF if it requires the bank to take corrective, rehabilitative, or restrictive measures as a result of supervision and then the SDIF develops a resolution plan. According to Article 71 of the Banking Law, if the bank has not taken the required measures or even if having taken the measures, the financial structure has not been strengthened, the BRSA may revoke the operating permission of the failed bank (Article 106) or transfer the shareholders' rights except dividends and the management and supervision of the bank to the SDIF (Article 107) (Figure 1).

Diagram IV.4.2.1. Bank Resolution Process in Turkey



In case the operating permission of a bank is revoked, the management and control of the bank are transferred to the SDIF. First of all, the SDIF pays the insured deposits/participation funds and requests the bankruptcy of the failed bank on behalf of the depositors and participation fund holders. Bankruptcy requests shall be decided upon within six months, at the latest. If the court decides bankruptcy against a bank, the process of liquidation through bankruptcy is started. If the court rejects the bankruptcy, the Fund Board may execute the voluntary liquidation of the bank. In liquidation through bankruptcy, the Fund participates in the committee of bankruptcy as a privileged creditor and liquidates the banks having the duties and powers of the bankruptcy office, the creditors' meeting and the bankruptcy administration. The liquidation of assets and liabilities of banks in the process of voluntary liquidation is executed by the Fund according to a prepared liquidation plan.

When a bank's management and control is transferred to the SDIF along with its shareholders' rights except dividends, the resolution process varies according to whether the SDIF takes over the bank's shares or not. The SDIF may suspend the activities of the bank temporarily. If the shares are taken over, the aim is to rehabilitate these banks and make them active in the financial system again. Therefore, the Fund can take measures such as increasing capital, making deposits, giving advances, cancelling the penalty liabilities at the CBRT, and purchasing the affiliates, real estate and other assets of the bank, provided that the amount of insured deposits and participation funds is not exceeded. The Fund is authorized to transfer the asset and liabilities of the bank, sell the banks' shares and merge it with another bank. If the shares are not taken over by the SDIF, after transferring the insured deposits and some assets to another bank, the Fund liquidates the unsold part of the bank. As another option, the Fund may request the BRSA to revoke the operating license of the bank. The SDIF should complete the resolution process within 9+3 months.

Five banks' operating licenses were revoked and taken into liquidation process and twenty banks' management and control along with shareholders' rights except dividends were transferred to the SDIF between the years 1994-2003. The Turkish resolution regime has been improved following the 2000-2001 banking crisis.

Turkey closely follows the reforms related to resolution activities taken after the global financial crisis. The SDIF has submitted the draft law to the Parliament to take legal powers that are needed to regulate the bridge bank model and the purchase and assumption model. These models will accelerate the resolution process and enable selling the bank even if the shares are not taken over by the SDIF. The BRSA and SDIF work in coordination on subjects related to resolution powers, resolution funding, coordination and information sharing to comply with the Key Attributes published by the FSB.

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