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INTERMEDIATION COST and FINANCIAL FRAGILITY

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Abstract

This paper studies implications of intermediation costs in credit markets. The presence of intermediation costs increases the amount of risky projects therefore results in financial fragility. Moreover, for an open economy that has a perfectly liberal capital account, prudent firms finance their projects from foreign markets therefore shrinking the domestic credit markets. The theoretical predictions of our model gains support by Turkish data for the 1991 – 2004 period. Data suggests that an increase in intermediation costs results in an increase in non-performing loans, and an increase in foreign financing (shrinking of domestic credit markets). We argue that minimization of these costs improves financial soundness.

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1. Introduction

In August 2004, Vice Prime Minister Abdüllatif Şener indicated the concerns for growing current account deficit and blamed the acceleration in the consumer credits as the main reason. The immediate "precaution" that was taken by the ministry of finance was to increase The Resource Utilization Support Fund (RUSF) on consumer credits by five percent from its previous level of 10 percent and eliminate it on commercial credits.[3] The motivation had two aspects; one is to reduce the access to consumer credit through increasing the costs of funds and the other is the so-called "signaling effect", where agents are assumed to derive the motivation towards reducing current account deficit! The latter idea develops as follows: according to the government the quick growth in consumer credits lead to two end-results; first an increase in financial fragility by increasing risks associated with the possible repudiation of consumer credits and second is an increase in economic fragility through worsening of current account deficits. With growing demand for foreign goods, it is natural that imports increase and leads to greater deficits on current accounts.

In this study we will not discuss the justification for the policy of the targeting of current account deficit, but rather analyze the immediate and direct implications of intermediation costs on credit markets.

Financial intermediation is costly; costs arise from asymmetric information between the lender and the borrower. If borrower's choice of the project can only be known with a noise (by the lender) then it is natural for the lender to require a risk premium. Higher willingness to pay at a higher risk premium leads to an increase in the frequency of choices of riskier projects, which may eventually lead to credit rationing (Stiglitz and Weiss 1981). The presence of asymmetric information in credit contracts also makes it difficult for the lender to repatriate the assets of a defaulted firm, which brings about costs in the monitoring process. In this regard, these costs create a wedge between the riskless rate and the cost of credit (Townsend 1979).

The risk premium in the setting of asymmetric information has important implications on the choice of projects and business cycle. Bernanke et al. (1999) argue that an increase in the risk

[3] RUSF is a non – tax deductions on the use of consumer and investment credit. It is reduced from 3% level to 0% on commercial credits lines. During the time a further raise of 10% was also in the agenda. During the writing of the paper it has not been implemented, yet.

premium, which can be resorted to two sources; an endogenously created within the system through an increase in the variance of the projects and exogenously introduced by government in terms of taxes or by lenders in terms of transaction costs, leads to amplification of the business cycle. We call the latter distortion as intermediation costs.

We define intermediation costs as all taxes and costs associated with banking intermediation. An increase in these costs induces an increase in the gross cost of borrowing, keeping the credit rate constant. These costs bear important implications on aggregate fluctuations. Besci et al. (1999) argue that small changes in these costs result in deviation from high to low – employment equilibrium and vice versa. In their setting this shift is a result of intertemporal substitutability and distortionary due to changes in the relative prices.[4]

Our approach is to bring these two lines of literature with a simple model and then test the predictions of the model with data. Our model addresses that an increase in the risky projects increases the possibility of non – performing loans and consequently leading to an increase in foreign financing. Empirical results support these two predictions.

The next section describes the environment that links intermediation costs to non – performing loans, which is followed by the theory of financial deepening. In section four the extent of the intermediation costs in Turkish banking sector is examined. Section five tests the predictions of the theoretical model using Turkish data. Finally, section six concludes.

2. The environment

Our model is of Stiglitz and Weiss (1981) with intermediation costs. We also represent variables with time subscript to keep track of the lead – lag relationship between the variables that allows us to easily shift to the regression analysis.

Our continuum of firms has a portfolio of investment projects. Firms do not have enough resources to finance these projects; therefore they would like to have access to credit markets to cover the rest of the costs. Each of these projects can be differentiated according to the risk incorporated. Firms have full information about the risks of the projects, which are not

[4] The issue is further discussed in the context of capital flows by İmrohoroğlu and Kumar (2004). They examine the variation in returns due to intermediation costs and are able to explain why middle-income countries attract higher capital flows. This in turn is also linked to the amplification of business cycles.

observed by lenders however, have a prior on the distribution. In an environment where interest rates are increasing, firms are more inclined to choose riskier projects since these involve higher returns in good times. Therefore, given the distribution, banks can deduce the risks of the projects by comparing the average return in the market to the one that firms are willing to pay.

Let's denote the average return in credit markets with r^* and call it the optimal interest rates for banks. In other words in a perfectly competitive banking sector, r^* describes the zero profit condition. Let's denote intermediation costs with t, therefore we can decompose the optimal interest rate as the real rate of return, r, and the transaction costs. This relationship is presented in equation (1).[5]

$$r^* = r + t \tag{1}$$

With zero intermediation costs, the optimal interest rate will be equal to the real rate of return. Denote the risks of projects with λ and the firm's net return on a project is G, which is unobservable by the bank. Therefore, for a firm and project pair we can write the cumulative distribution function with $F(G, \lambda)$ with an associated probability distribution function $f(G, \lambda)$. Let's assume that the number of risky projects increase with increasing λ.

When firms borrow, B, with a gross payment $(1+r+t)$, they will default on the project if return and the collateral, C, provided is less than the total cost of borrowing.

$$B_t(1 + r_t + t_t) \leq C_t + G_t \tag{2}$$

Therefore, banks' net return can be represented as

$$\kappa_{t+1}(G, r^*) = \min\left[G_t + C_t, B_t(1 + r_t + t_t)\right] \tag{3}$$

Equation (3) implies that the net return to the bank is decreasing in intermediation cost. We will prove this in two steps. The first step is that for any interest rate with intermediation

[5] Let's assume that riskless rate is zero. Also assume that intermediation costs enter into equations additively. The predictions of the model will not change due to these assumptions.

costs, only those, who choose riskier projects ($\lambda > \lambda^*$), are willing to borrow from the bank. This is a result of the increase in expected return with increasing risks. Therefore, only riskier projects can finance the borrowing costs.

The net return to the borrower is the comparison of the loss of collateral in case of default and the payment that will be made if there is no default. Equation (4) displays this tradeoff.

$$\pi_{t+1}(G, r) = \max\left[G_t - B_t(1 + r_t + t_t), -C_t\right] \tag{4}$$

Notice that on aggregate λ^* guarantees zero return for borrowers,

$$\Pi_{t+1}(r^*, \lambda^*) = \int_0^{\infty} \max\left[G_t - B_t(1 + r_t^* + T_t), -C_t\right] dF(G, \lambda^*) = 0 \tag{5}$$

The second step is the increase in risks (λ^*) with intermediation cost. Simply take the partial derivative of Equation (5) with respect to t:

$$\frac{d\lambda^*}{dt_t} = \frac{B_t \int_{(1+r_t+t_t)B_t - C_t}^{\infty} dF(G, \lambda^*)}{d\Pi_{t+1} / d\lambda^*} > 0 \tag{6}$$

The numerator on the right hand side is positive. The bounds on the integral are found for those firms that can pay back their debt. The denominator is positive as a function of chain rule. To demonstrate that we need to make use of the assumption that increasing risks lead to increases in return from projects. In Equation (4) we showed that net return to the borrower is a positive function of the net return to the project. This concludes our second step.

As can be seen by Equation (6), increasing intermediation costs reduces the return to lenders and therefore, deteriorates banks' balance sheets. The reason is with increasing costs only the firms with riskier projects are among the pool of firms that will demand credit.

3. The Theory of Financial Deepening

The immediate impact of increasing intermediation costs is the worsening of the financial position of the borrower. As described in the previous section this increase also worsens the financial position of the bank. Financial institutions are very well developed to be able to offer various borrowing instruments. Therefore, with severe competition in the sector they will offer the least costly instruments to attract borrowers. One alternative to domestic financing is the foreign borrowing. Financial institutions can avoid the costs incurred by taxes by utilizing this alternative.

In our setup lets assume that there are two type of borrowing instruments, domestic, B, which includes intermediation taxes and foreign, O, with associated gross rate of returns R and P, respectively. These instruments are gross substitutes in lenders' and borrowers' portfolios. Denote the total credit demand with T, therefore we can represent the cost minimization problem of the borrower as follows,

$$\min_{\{B,D\}} T = RB + PO \tag{7}$$

The demand correspondence to the minimization problem is given below,

$$\begin{bmatrix} if\ \ R \le P \text{ then } \left(B = \frac{T}{R}, O = 0 \right) \\ if\ \ R > P \text{ then } \left(B = 0, O = \frac{T}{P} \right) \end{bmatrix} \tag{8}$$

If we combine Equation (2) and (7), and denote total credit supply with *M* we will obtain the equilibrium in credit markets.

$$M = \int_0^{\infty} \frac{T}{\min\{R, P\}} dF(G, \lambda) \tag{9}$$

Notice that R includes intermediation costs. In the short – run an increase in intermediation costs will increase the gross cost of borrowing for domestic financing. This will shift credit contracts from domestic to foreign financing. Later domestic credit markets shrink and

worsen financial deepening. In the long – run arbitrage will require the rates of return for both sources of financing are equal.[6]

4. Taxes and Other Burden on Intermediation process

Taxes on financial contracts are indeed shocks to financial contracts. Suppose a tax, on intermediation, is levied after both deposit and loan contracts made. This would change the tax burden of holders of savings accounts and users of loans, since taxes are paid after interest rates accrue.

Turkish banks have always been heavily and frequently taxed, therefore observed various shocks in their history (Table 1). Since taxes are calculated as a fraction of interest rates, the high and volatile inflation and interest rates lead to shocks with different magnitudes and increase in the tax burden. In 2002 total taxes paid due to intermediation process were YTL 10.9 billion that accounts for five percent of total asset and 30.1 percent of total net worth of the banking sector. The decomposition of the burden among the borrowers and lenders is also striking. The total payment made by banks was YTL 3.2 billion and depositors paid YTL 7.7 billion (Türkan et al. 2003).

In Turkey, one can observe three types of taxations in intermediation process. 1) Withholding taxes and fees that are levied on depositors (fees were terminated by the end of 2003) 2) Indirect taxes on banks in terms of reserve and liquidity requirements 3) Banking and insurance transaction taxes and resource utilization support fund fees paid by the borrowers. These taxes have significantly raised the spread between net income paid to depositors and the cost to the borrowers.

We calculate the total intermediation cost as the sum of the withholding taxes, fees which is a percentage of the withholding tax, banking and insurance transaction taxes (BIT), and resource utilization support fund (RUSF).[7, 8] The cost variable which is presented in Equation

[6] We avoid presenting the derivative of M with respect to *t* to save space and avoid confusion.
[7] Deposit interest rate include withholding tax and fee whereas credit interest rate does not include banking and insurance transaction taxes (BIT) and resource utilization support fund (RUSF). We mean, BIT and RUSF was further taken from the user of credit.
[8] The intermediation cost variable is both affected by the magnitude of deposit and credit nominal interest rates. The withholding tax is a percentage of deposit interest rates and BIT and RUSF are calculated as a percentage of

(10) is displayed in Figure 1. Notice that, especially in the post 1999 period, the frequency in the change of the taxes and other burden increased.

$$T_t = WT_t * (1 + F_t) + BIT_t + RUSF_t \qquad (10)$$

In this equation, T denotes total taxes and other burdens on intermediation process while WT and F denote withholding tax and fees on deposit interest rate, respectively. These two are treated as a burden for the user of credit since an increase in the cost of deposit further increases the cost of credit for the private sector. This variable will be used as the right hand side explanatory variable in our regressions to indicate the extent of intermediation costs.

5. Data and Empirical Application

We use monthly data for the 1990 – 2004 period from Central Bank of Turkey. To utilize data for the empirical strategy we need to have a representation of model predictions. We believe that non – performing loans (NPL) is a good candidate for identifying risky projects therefore firms. We can represent this relationship as below,

$$NPL_{t+1} = \omega(\lambda_t) \qquad (11)$$

Our assumption implies ω`(λ)>0. Equation (11) describes a possible non – linear relationship between *NPL* and λ. An increase in risky projects leads to an increase in defaulted projects one period later. In this study we linearly approximate the relationship addressed in (11). Figure 3 displays the time series development of *NPL* in our sample period. It is a growing series and contains a unit root.[9] Notice that model prediction implies an increase in *NPL* due to an increase in the transaction costs. A simple regression of *NPL* on intermediation cost will lead to a bias estimate of the coefficient. The reason is the necessity to control for other developments that may lead to an increase in the *NPL* other than intermediation costs. We believe that the *spread* between the credit cost and the deposit rate is a good proxy to serve as

credit market interest rates. On the other hand, reserve requirement is simply a percentage of the total deposit level, therefore affects the quantity and therefore price of credit.

[9] Augmented Dickey Fuller Test is used with optimal lag-length selection is made through (Ng and Perron 2001). We do not display the results to save space.

a control variable.[10] We observe that especially in the post 2001 crisis period spreads decline significantly due to stabilization policies.

The rate of return represented by *spread* will control for the changes in the pool of risky projects due to changes in interest rates. One problem with the simple difference between these two variables is that the deposit rate includes the withholding tax and fees.[11] We need to separate this cost from the deposit rate.[12] Figure 2 displays the spread between credit and deposit rates excluding these taxes. Moreover, according to the data, *NPL* inherits inertia and we have to include lag values of the dependent variable as explanatory variables.

During the sample period Turkey observed three aggregate shocks. The first is the banking crisis of 1994, second is the global Asian crises and earthquake in Turkey corresponding to the years 1998 and 1999, respectively, and the third is the domestic banking crisis in November 2000 and February 2001. To control for these shocks we believe that *spread* variable is sufficient due to its immediate reaction to crises. However, for robustness, we also conducted our regressions incorporating these shocks through with dummy variables, namely D94, D9899 and D0011. A plot of these dummy variables is presented on Figure 4.[13] We can

[10] Non-performing loans (NPL) move counter-cyclically with the business cycle. During growth (troughs) we see lower (higher) NPL ratios and vice. The extensive literature on the topic points out this empirical evidence from developed economies with developed financial markets. In other words, this relationship is observed in a financially deep market. Turkey's credit market is growing, however, very shallow compared to developed economies. In addition, the catch up process in credit ratios is still intact. This would suggest that during credit expansions, and GDP growth NPL can be pro-cyclical, therefore would lower the correlation between the business cycle and NPL. Moreover, especially in the post 2001 crisis period, the restructuring of public banks also contributed to the level of NPL's where we still a continuous growth in the ratio of NPL to credit base till the end of the sample period (Figure 3). This could sound counter intuitive, but during a recovery from a financial crisis it takes sometime to dissolve NPL's. So in emerging economies like Turkey one would expect a weak correlation between GDP growth and NPL. For the sample period of 1990Q1 – 2004Q4, I calculated a correlation coefficient of 15 percent for these two variables. Still in the study, we used the Spread variable to control for the business cycle and other factors that may affect NPL's.

[11] In practice, intermediation costs on credit is added on top of the announced credit rate whereas costs in deposits is already included in the deposit rate.

[12] (Ersel and Filiztekin 2004) investigate the relation between taxes on credit markets and credit demand in Turkish banking sector. The only analyzed the interaction between the cost of credit and credit demand since they argue the not much variation in intermediation costs. As can be observed from Figure 1 there is enough variation to test for the effect of the intermediation costs on non – performing loans. They revealed that credit market is not work properly in Turkey due to the high macroeconomic uncertainty and high public sector borrowing while they could not find significant relation between the cost of credit and demand for credit in Turkey. They finally conclude that use of credit from banking sector is a financial means to be applied in extreme conditions rather than an alternative financing source.

[13] During this period, 21 private banks were repatriated by Savings Deposit Insurance Fund (SDIF). The loans of these banks were firstly treated as non-performing loans. Later, these loans were restructured with the Istanbul Approach which is the legal framework aiming at ensuring the continuation of the firms that are in credit agreement by defaulted banks. The Istanbul Approach was introduced by the Banking Regulation and Supervision Agency (BRSA). In accordance with the "Financial Restructuring Framework Agreements" (FRFA) and through tying these agreements to "Financial Restructuring Contracts" within three years as from the date of

test this hypothesis with the following linear regression with the percentage change in the NPL's as the endogenous variable.

$$NPL_t = c + \beta T_{t-1} + \sum_{i=1}^{I} \alpha NPL_{t-i} + \gamma spread_{t-1} + \sum_{j=1}^{J} \lambda_j D_j + u_t \qquad (12)^{14}$$

If the model is true the coefficient β has to be positive. Moreover, it will be unbiased. To jointly control for the crises we can assume both γ and λ's to be both different from zero. Nevertheless, although these parameters are representing the sensitivity of the control variable we expect them to be positive since a shock to the economy must leave some financial contracts unfulfilled. To check for the individual control we either set γ or all λ's to zero. The results are presented in Table 2. Columns two and three represent the latter case. As predicted by the model we find a positive and significant β coefficient. Although β changes in magnitude, it is still significant and positive in all regressions.

The second implication of our model is the worsening of financial deepening with rising intermediation costs. In this analysis, our explanatory variable is the ratio of long – term foreign financing to total credit demand. We use annual data from Central Bank of Turkey for the 1991 – 2004 period. A quick look at Figure 5 addresses the increase in foreign financing as compared to domestic financing in the period of analysis. Therefore, we use the percentage change for this variable to prevent explosion. On the other hand, adding too many control variables will sacrifice the power of the regression since we have only 14 observations. Therefore, we used a parsimonious representation by setting all λ's to zero. Both domestic and foreign credits are in foreign currency terms however the ratio is label free.

We regress the ratio of foreign to domestic financing to intermediation costs and the spread between the cost of domestic borrowing and LIBOR. Similar to Equation (12) we use *spread* as the control variable. LIBOR is used as a proxy for the cost of foreign financing. If the predictions of our model are true we expect the coefficient η to be positive since increasing costs of domestic financing through intermediation costs will lead to an increase for foreign

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their approval by the BRSA, restructuring or rescheduling of bank receivables has become possible. Additional financing to debtors, if necessary, may also be provided under the approach (BRSA 2003). About 5 billion USD of non-performing loans was restructured with Istanbul Approach.

[14] We also looked into the interaction between the non-linear exogenous variables i.e. squared lag of NPL, and the dependant variable and we could not find a significant relationship.

financing. The results are presented on Table 3. As expected the coefficient is positive, however not significant, which is only a partial support to our model. The reasons can be twofold; first the model suggests that rates of return will be equal in the long run due to arbitrage, therefore it is the final cost to the borrower that is more relevant for demand for credit. The second is the lack of data and three aggregate shocks in the analysis period. The first reason sounds more likely since we observe a high and significant coefficient for *spread*. The second will simply add to the power of the regression.

$$\left(\frac{FC}{DC}\right)_t = c + \eta T_{t-1} + \mu spread_{t-1} + \varepsilon_t \qquad (13)$$

To analyze this issue further and check for robustness of our results. We ask the following question. If intermediation costs are more for domestic sources of credit, regardless of the currency that the contract is written, this will motivate both lenders and borrowers to foreign financing. In this respect, a simple ratio of credit supplied from foreign resources to foreign currency credit from domestic resources must be positively correlated with intermediation costs. A simple correlation coefficient between these two variables is 0.32.[15]

All these results support the predictions of our model and indicates that exogenously created intermediation costs distorts markets and lead to an increase in the non – performing loan contracts that deteriorates the financial positions of the banks. This in turn results in greater financial fragility. In this setting optimal tax rate, in a partial equilibrium setting, for the government is **zero**, which will minimize the distortions on the financial sector.

As indicated in the introduction the proposed increase in intermediation may/may not solve problems created by the current account deficit, however it will certainly contributes to greater financial fragility.

[15] We did not run the regression in (13) since the data for domestic foreign currency credit begins at 1996 we do not have too much degrees of freedom to run a robust regression.

6. Conclusion and Further Research

Intermediation is costly due to asymmetric information and implies greater volatility in business cycle. Government policies aiming at adding to these costs would worsen the financial position of both firms and banks. Our simple model is tested for the case of Turkey and received empirical support by the data.

We believe that we answered two major questions that were absent in the empirical literature of financial fragility. One is the link between greater financial fragility and intermediation costs and the second is the shrinking domestic credit markets as a result of these distortions.

For further research we need to address the treatment of reserve requirements of the Central Bank and its implications as an added cost in credit markets. In some sense it is relevant since these deposits at the Central Bank has an opportunity cost to the Banking sector and for a constant reserve multiplier leads to the contracting credit markets therefore increasing cost of credit. There are ways to deal with it in our setting, however is not within the scope of the paper, that only focuses on intermediation costs.

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Table 1: Tax Burden of Intermediation Process*

Deposit Interest Rate	**% 20.0**
Net Deposit Interest Rate to Savings Deposits Holders **(Excluding withholding tax, Fund Tax and Special Transaction Tax)**	**% 16.3**
Cost of Loans to Banks, **(Reserve requirement, Liquidity, deposit insurance premium, BRSA Premium, Banking & Insurance Transaction Tax, Resource Utilization Support Fund (RUSF), Stamp Tax, Fees, etc. – under condition zero Profit of Banks and 3 percent of RUSF)**	**% 25.5**
Cost of Loans to Banks, **(Reserve requirement, Liquidity, deposit insurance premium, BRSA Premium, Banking & Insurance Transaction Tax, Resource Utilization Support Fund (RUSF), Stamp Tax, Fees, etc. – under the condition; zero profit for Banks and zero percent of RUSF)**	**% 24.9**
Cost of tax and other burden due to intermediation (**under the condition; 3 percent of RUSF)**	% 9.2
Cost of tax and other burden due to intermediation (**under the condition; 0 percent of RUSF)**	% 8.6

* Our calculations are based on Türkan et al. (2003).

Table 2 – Transaction Costs and Risky Projects

Endogenous Variable: Percentage Change in NPL_t

	I	II	III
C	-0,229***	-0,311***	-0,142***
	(0,06)	(0,083)	(0,042)
T_{t-1}	0,009***	0,012***	0,006***
	(0,002)	(0,003)	(0,002)
$Spread_{t-1}$	0,0004***	0,0007***	
	(0,0001)	(0,0002)	
D94	0,077***		0,110***
	(0,015)		(0,023)
D9899	0,097***		0,111**
	(0,055)		(0,057)
D0011	0,043***		0,057***
	(0,025)		(0,024)
$D(lnNPL_{t-1})$	-0,228**	-0,171**	-0,215***
	(0,065)	(0,073)	(0,067)
# of Obs.	177	177	177

* 10 percent, ** 5 percent, *** 1 percent significance levels. The numbers in parenthesis display standard deviation.

Table 3 – Financial Deepening (1991-2004)

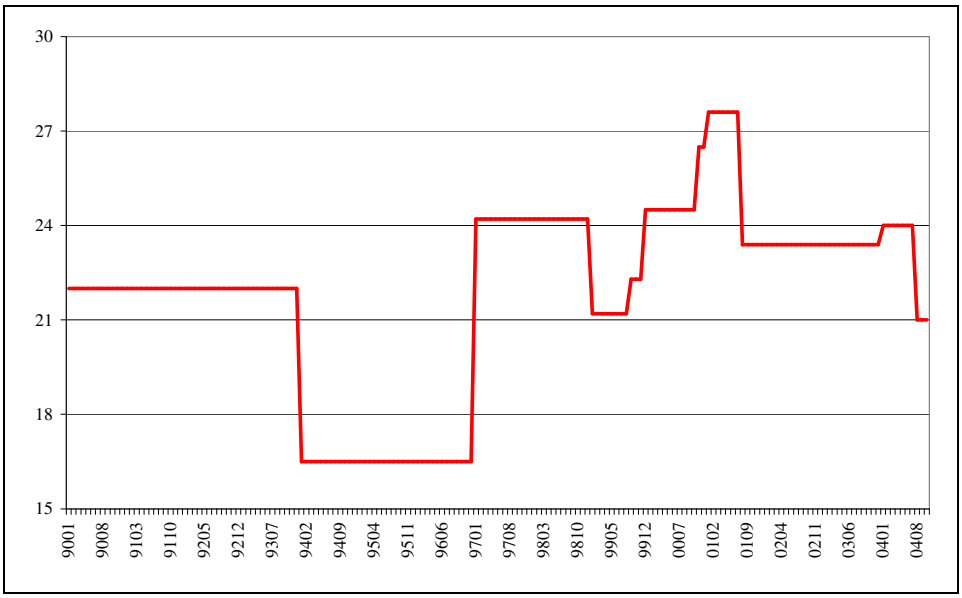
Endogenous Variable: Percentage Change in $(FC/DC)_t$

	$(FC/DC)_t$
C	-0,53
	(0,59)
T_t	0,02
	(0,02)
$Spread_t$	0,004**
	(0,002)
# of Obs	14

* 10 percent, ** 5 percent, *** 1 percent significance levels. The numbers in parenthesis display standard deviation.

Figure 1: Taxes and Other Burdens on Financial Intermediation*

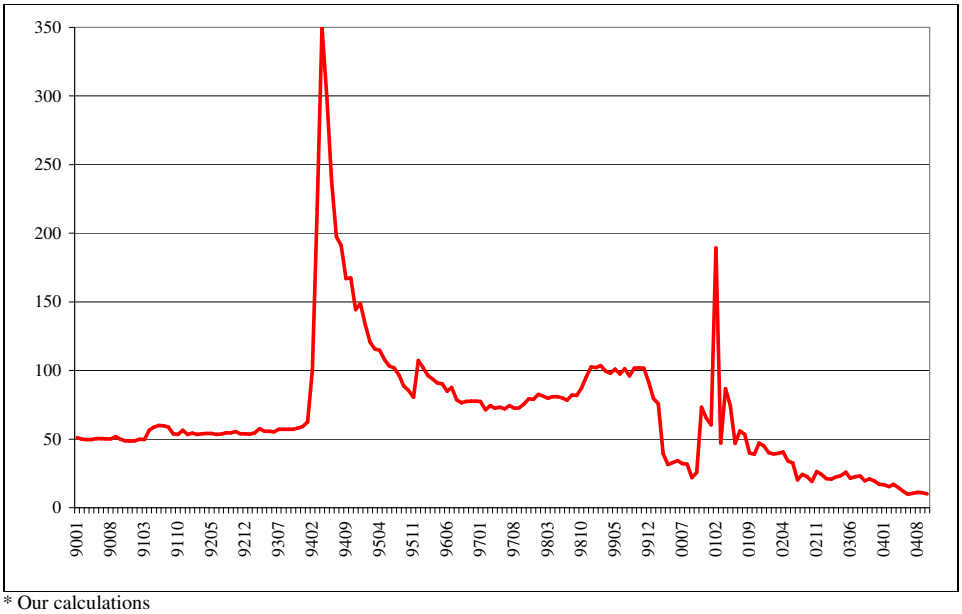
(%)



*: Our calculations.

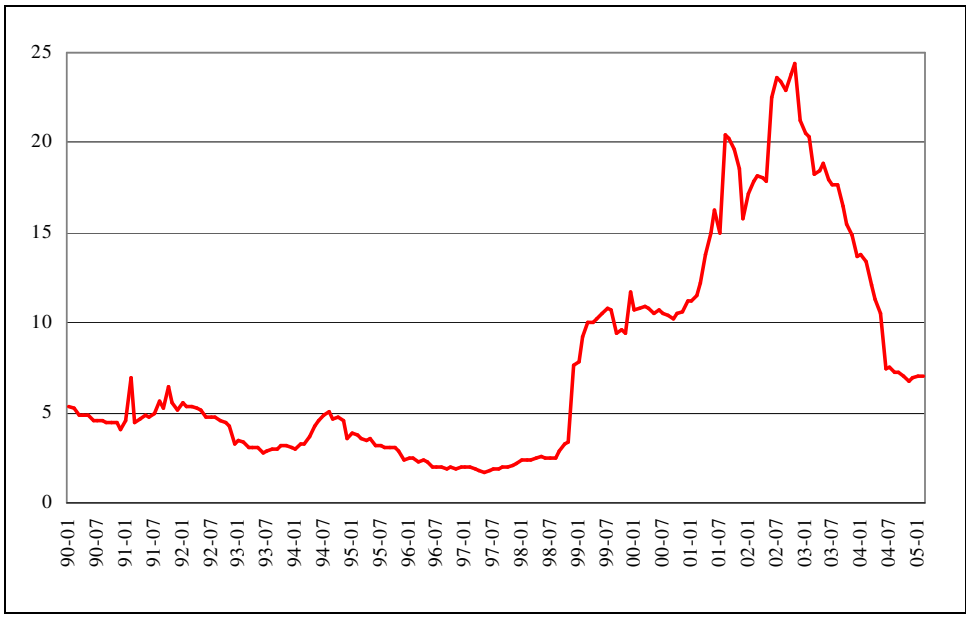
Figure 2: Credit and Deposit Interest Difference

(Excluding Tax and Other Burden-%)*



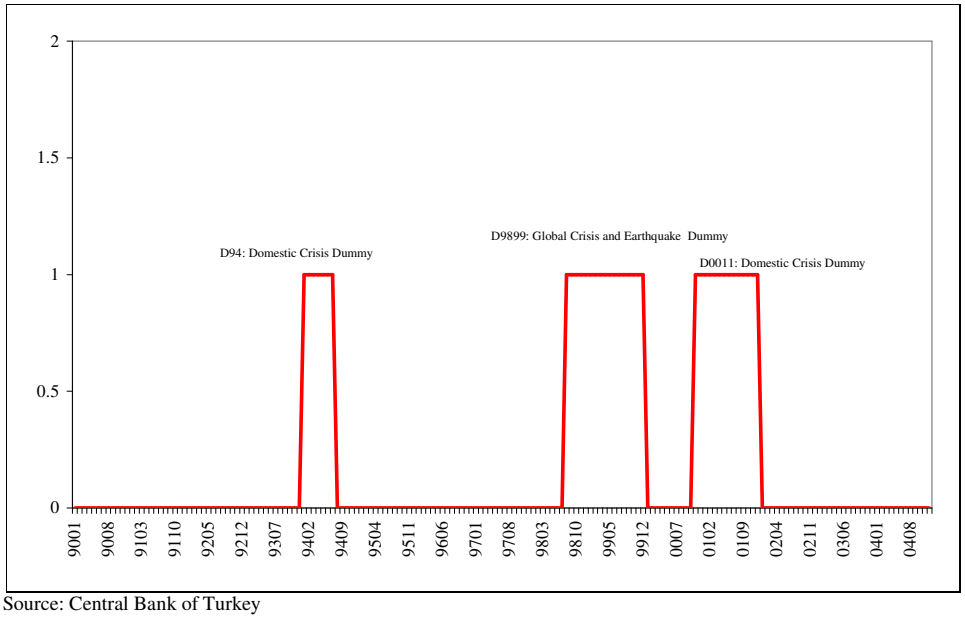
* Our calculations

Figure 3: Non-Performing Loans/Gross Loans



Source: Central Bank of Turkey

Figure 4: Dummy Variables



Source: Central Bank of Turkey

Figure 5: Ratio of Long-Term External Financing to Total Domestic Credit

(%)