The Effect of Transparency Shocks on Iranian Banks' Lending Behavior

Seyed Ali Madanizadeh[1], Mohammad Hossein Rahmati[1][†], Sorena Rahi[1], Sepehr Ekbatani[2], and Mohammad Hamed Hajisadegh[1]

[1]Department of Economics, Sharif University of Technology
[2]Department of Economics, University of California Los Angeles

December 3, 2020

Abstract

In this paper, we empirically explore lending channel through a regulatory shock. Using a panel fixed-effect estimation on the monthly Iranian banking system data, we identify the effects of a transparency shock imposed by the regulator on the banks' behavior: The Embezzlement Scandal of 2011. Our goal is to assess the effects of this shock on the supply of credit. Results show that the tighter supervision of the regulator resulted in 16% and 24% decline in the supply of loans and off-balance sheet activity of the banks respectively. We find that the private banks that did not have easy access the central bank's credit, were affected more severely.

JEL Classifications: E50, F51, G01, G21
Keywords: Banking, Shocks, Sanctions, Embezzlement, Transparency

[†]Corresponding author: rahmati@sharif.edu.

1 Introduction

Banks' lending may be affected by monetary or regulatory shocks in addition to other supply and demand shocks. In this paper, we identify the effect of a regulatory and supervisionary shock on the lending channel of banks and specifically we explore how banks behave in response to a transparency shock. We use monthly data for Iranian banks and show how a tight regulatory shock has affected both on-balance-sheet loan and off-balance-sheet activities of banks.

Iran's banking sector had faced numerous severe shocks during the period of 2006-2013. The embezzlement scandal of 2011 were the most important ones that put Iran's banking system to the test. The scandal increased the attention to the banks' operations by the regulator. As a result of the scandal, suddenly, supervisory role of the Central Bank of Iran and the judiciary system increased.

This increase in supervision changed the operations and the balance sheets of the banks considerably. Following the scandal, as shown in figures 1 and 2, the real lending in the banking system declined. In addition, real off-balance sheet activities of the banks involved in the scandal were also reduced. As noted before, the effect of the scandal was somewhat like increasing the supervision and transparency in the banking system. So, in a sense, this paper is examining the effect of supervision and transparency shocks on the behavior of banks.

Our contribution is the identification of the lending channel using the sudden embezzlement scandal shock. To examine the effect of the shock on the banks' operations we identify the effect of the shock on the banks' lending behaviors such as "real loans", "loan to asset ratio", "real loans in domestic currency", "real loans in foreign currencies", and "real off-balance sheet activities". Part of the increase or decrease in a bank's loans can be attributed to its assets changes. Therefore, loan to asset ratio captures such probable volatilities. Some of the banks' activities do not appear on their balance sheets but they're still part of the banks' operations. The variable "off-balance sheet activity"tries to shed light on that part of the banks' activities.

We use a difference-in-difference regression to estimate the difference of the variables before and after the scandal shock. To isolate the effect of the scandal shock, we control for the other shocks that happened in the same period of time. The U.S. led sanctions on the banking system were another important shock that cut off the connection of banking sector with the world. Additionally, The Public Housing Project[1] led by the government was another large shock for the banking system. To isolate these shocks, we use bank-time dummies for The sanction on each bank and those banks involved in the public housing project.

Moreover, we control for the financial health indices of banks to make our analysis better identified. Finally, we control for the debt to the central bank as it was a channel that could help banks to combat the shocks.

The results show that the supply of loans is decreased at least by 16 percent in the banks involved in the embezzlement. We find out that private banks are the ones with the most reaction to this shock. We show that the ratio of lending to assets is lowered around 4.6 percent. The involved banks reduced their real off-balance sheet activities around 24 percent and in this case state-owned banks were more affected due to tighter supervisions. In the absence of a credit scoring system, and with lack of tight supervision and regulation a considerable part of the loans got defaulted. When the supervision increased the banks got reluctant to grant loans.

The rest of the paper is structured as follows: We review the literature related to our study in Section 2. In sections 3,4, and 5 we present our data, empirical strategy, and the results, respectively. Section 6 concludes the paper.

_____

[1]See Section 4

2 Literature Review

This paper focuses on the lending channel of financial frictions through which the real side of the economy is affected by changes in the nominal side, whether it be changes in monetary policy or external shocks such as sanctions or fraud. Following the contentions made by Friedman and Schwartz and the complementary work by Bernanke regarding the great depression of 1929 and how fears of a bank run instigated a deliberate decrease in bank lending which in turn led to real effects lengthening the great depression until 1933, it has become a known fact that changes in monetary policy do in fact affect the real side of the economy through what has been coined "the lending channel". There has been substantial empirical work dedicated to the identification and proof of the existence of such a channel (Blinder and Stiglitz, Bernanke and Blinder, and Bernanke and Gertler). The goal of our paper, however, is not to assess whether the lending channel empirically exists, as done so by the works like those mentioned above, but to identify whether an exogenous shock to the bank in fact affects its supply of loans, and to what extent. ???

The main empirical work related to this paper is Kashyap and Stein. Following Bernanke and Blinder, they argue that banks respond differently to monetary shocks regarding their different characteristics like size. They show that the response of banks with lower liquidity ratio -defined as the ratio of securities to assets- is more pronounced compared to those with higher liquid assets. They also demonstrate that this effect is mostly attributed to smaller banks. Our paper is similar to the work presented as we analyze the effect of a regulatory exogenous shock instead of a monetary policy shock. We argue that the such a regulatory exogenous shock that hit the Iranian banks operated through the lending channel and lowered the supploy of loans by the involved banks.

There have also been numerous other works dedicated to identifying the lending channel in other countries. For example, Ferri and Kang show that such a channel had been at work during the Korean economic crisis. They demonstrate that reduction in bank lending worsened the crisis through

intensifying the liquidity constraints faced by those relying on bank credit. In another example, De Haan et al. use individual bank level data between 1990-1997 for the Netherlands and show that loan supply reacts to monetary policy shocks, and this reaction is different for certain type of banks. They find evidence that the lending channel in Netherlands works only for unsecured debt, while state secured lending are not affected by monetary policy shocks. Moreover, the authors demonstrate that the negative effect of monetary policy is more pronounced for smaller banks and those with lower liquidity and capital. They also distinguish the effect of such shocks with respect to different markets in which banks operate in, reacting differently to households compared to corporations. For Turkey, several studies have been conducted that prove the existence of a lending channel in this country with response to monetary policy shocks (GÜNDÜZ, Sengonul and Thorbecke*, and Brooks et al.). For Brazil, deMello and Pisu use aggregate monthly data for the period 1995-2008 and find co-integrating vectors for the supply and demand of loans using a Vector Error Correction Model. They find a negative correlation between loan supply and a monetary policy instrument, suggesting the existence of a lending channel.

In another approach, Kishan and Opiela segregate U.S. banks into three distinct categories based on their size measured by assets, as well as their capital ratios. Using data for 1980-1995, they show that bank size and capital can affect its response to monetary policy shocks. For example, the loans of small under-capitalized banks are shown to be more responsive to policy shocks. Following this approach, Altunba, Fazylov, and Molyneux find similar results for European countries during 1991-1999.

In contrast, Kakes, Sturm, Maier, et al. use 1970-1997 data on German banks to argue against the relevance of the lending channel. They show that German banks isolate their loan portfolios by offsetting the effects of monetary policy through adjusting their securities. Similarly, Ludi, Ground, et al. disprove the existence of the bank lending channel for South Africa using a Structural VAR model.

But perhaps the most creative and informative work in the literature can be ascribed to Jiménez, Ongena, Peydró, and Saurina who published four papers on the subject using 23 million observations on bank loans in Spain. In their most relevant work, Jimenéz et al. analyze the balance-sheet channel for firms and banks to distinguish between the supply and demand sides of credit. They show that the bank balance sheet channel of monetary policy transmission works by reducing lending in crisis times. Firms' balance-sheets heterogeneity, however, affect lending in both good times and crisis times, and neglecting this channel will cause identification problems. Jimenéz et al. deal with analyzing monetary policy shocks which are considered to be endogenous shocks responding to the current state of the economy, so that neglecting the demand side of credit would arise against endogeneity concerns. Our work, however, deals with the effect of exogenous shock of the embezzlement scandal which completely removes the risk of such concerns.

Another line of research that could be used to provide more understanding for our analysis is related to papers that assess the economies of scale in banking, and analyze the bank's cost and production functions. Following Bell and Murphy, one could view the exogenous shocks of sanctions and the scandal as negative productivity shocks affecting the bank's production function, increasing the cost of services, and lowering output.

In a recent work regarding the structure of the Iran's banking system, Madanizadeh and Mahmoudzadeh present clear facts on the movements of aggregate lending in Iran's economy over the past decades. Based on this paper, the aggregate lending to GDP ratio experienced two distinct sharp drops in 2007 and 2011 after over ten years of increasing before 2007. Taking a closer look at the Iran economy over the recent period, one could also see large recessions, as well as increases in the deposit interest rates. Thus, the sharp drops in lending could be viewed as supply shocks as it has also been indicated by Karimirad. Identifying the main sources of supply shocks affecting Iran's banking system could therefore, be of substantial importance to understand the function of the financial sector, facilitate policy analysis, and also help further research into the links between

the financial sector and the real side of the economy.

Our goal in this paper is to use the limited available data to identify mechanisms through which the bank lending has dropped due to a supervisionary exogenous shock that hit the Iran's economy during the period of 2006-2013. The motivation behind this paper is that finding a significant exogenous shock that affected lending behavior of the banks can be a key factor to explain the real effects that followed in Iran economy; and it can be used as an instrument to identify the lending channel in future studies.

3   Data

We use the data of balance sheets and income statements of all banks (31 banks) operating in Iran for the years 2007 to 2013 [2]. We observe the transformation of Iran's banking system functioning over the period 2007:4-2013:10. Tables 1 and 2 present the relevant summary statistics of the Iranian Banking system in that period. The statistics show a huge heterogeneity in banks' balance sheets depending on their type of ownership. This implies that each bank, based on their type of ownership, could have been affected to a different extent as a result of an exogenous shock.

The whole banking system can be categorized into 2 groups based on ownership: state-owned banks (commercial and specialized) and Private banks (privatized banks and purely private banks). The ???? 8 state-owned banks have nearly 80 percent of all deposits, but their loans are just around 62 percent of total loans in the banking system. On average, Loan to Asset ratio in the banking system is somewhat around 50 percent. As we show below real lending and real off-balance sheet activities declines after the embezzlement scandal. It motivates us to explore different aspects of lending channel in the banking system to see if we can find any connection between the "scandal", tighter supervision and tighter lending.

---

[2]Data is provided by the Monetary and Banking Research Institute (MBRI) of Central Bank of Iran.

To normalize the data, we deflate nominal variables by M2(Total Liquidity in the Banking System) and generate real values for our analysis. Therefore, variables do not have any monetary units. The reason behind the choice of M2 over CPI goes back to the source of their calculation. The Consumer Price Index is calculated using prices from the real side of the economy and thus follows a process that is different than those of monetary variables, which are the focus of this paper[3]. However, M2 is generated from the nominal side of the economy and is a better choice for deflating the variables in our study.

---

[3]Nonetheless, robustness checks show that not much difference is observed from using either CPI or M2.

Table 1: Bank Categories and Summary Statistics for 2013:10

Type of Bank	Count	Loan to Asset Ratio			Deposits			Loans			NPL		
		Mean	SD	Share	Mean	SD	Share	Mean	SD	Share	Mean	SD	Share
State-Owned (Commercial)	3	0.49	0.05	0.11	391,066	328,990	0.48	260,486	227,622	0.24	57,026	52,094	0.24
Privatized	4	0.52	0.06	0.15	62,767	30,875	0.10	242,196	194,971	0.30	97,760	148132	0.56
State-Owned (Specialized)	5	0.64	0.09	0.24	157,610	150,821	0.32	251,874	257,376	0.38	23,859	15,939	0.17
Private	19	0.35	0.18	0.50	12,793	23,617	0.10	13,923	18,080	0.08	1,164	3,977	0.03
Total	31	0.50	0.19	1	156,059	166,582	1	192,120	184,757	1	44,948	65,350	1

Notes: Except for the "Loan to Asset Ratio" variable, which has no units, the rest of data are measured in one-billion rials.

∞

Table 2: Bank Categories and Summary Statistics for 2013:10 (Continued)

Type of Bank	Count	Off-Balance Sheet			Foreign Loans			Domestic Loans		
		Mean	SD	Share	Mean	SD	Share	Mean	SD	Share
State-Owned (Commercial)	3	55,479	36,798	0.06	240,024	210,174	0.22	20,462	17,531	0.41
Privatized	4	296,307	106,504	0.44	0.10	.04	0.00	0.08	0.04	0.00
State-Owned (Specialized)	5	76,119	36,668	0.14	43,979	60,617	0.78	207,582	277,060	0.59
Private	19	49,677	53,576	0.35	0.02	0.02	0.00	0.01	0.01	0.00
Total	31	119,395	100,956	1	71,001	29,875	1	57,011	161,138	1

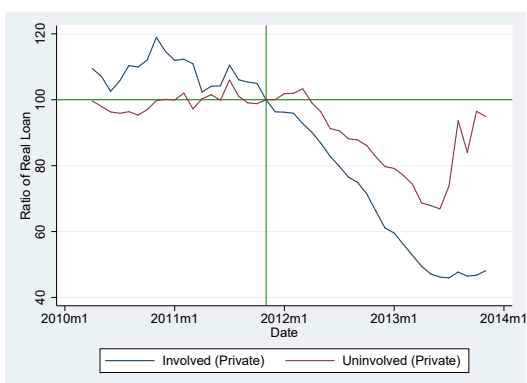Notes: All of the numbers are measured in one-billion rials.
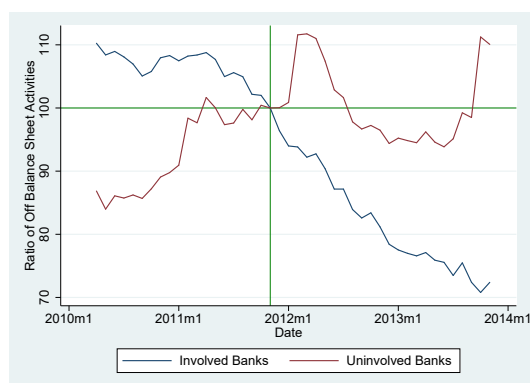
Figure 1: Real Loans Evolution

Figure 2: ROB Activities Evolution

3.1 The Embezzlement Scandal of 2011

The great embezzlement scandal of 2011 was one of the major shocks in the Iran's banking sector over the past 10 years, which affected the whole banking system. Six banks were involved in this embezzlement by issuing fake letters of credit (LC) to acquire assets, and inflating their off-balance sheet activities. This scandal, which incorporated around 30,000 Billion Rials (3 Billion Dollars as of 2011) of funds, in turn, was discovered after four years and led to widespread media coverage and the legal prosecution of those involved. After the scandal, the supervision became tighter and tighter and more severe transparency rules imposed by the central bank as a regulator.

Our contention in this paper is that the resulting shock of the scandal had a far more impact than it has been given credit to, resulting from the tighter supervision. In figure 1, we present real loans and real off-balance sheet (ROB) activities of banks, normalized to 100 for the date of scandal, to show the evolution of credit before and after the shock. It shows that after the embezzlement scandal, both of these credit variables have declined for the involved banks more severly.

4 Empirical Strategy

As mentioned earlier, our goal is to assess how the exogenous transparency shock can affect the

banking system, and particularly its lending behavior. To this end, we focus on the real loans granted by banks and the off-balance sheet activities of banks as our main dependent variables. We also employ the ratio of loans to assets for robustness checks. Moreover, in order to make our story complete, we look at several other balance sheet variables such as deposits, and the liquidity ratios of the banks, to investigate the lending channel that the embezzlement scandal of 2011 has affected the banks.

We employ a difference-in-difference analysis on our monthly banking panel data to identify the effects of the exogenous shock of embezzlement scandal in 2011. We use fixed effects for banks and months to allow us to clearly identify the effects on lending.

We employ the following fixed effects model as our baseline specification:

$$
\begin{aligned}
BV_{it} =& cons + \beta_1 Embez_{it} + \beta_2 Embez6_{it} + \beta_3 Embez6_{it} * t + B'_{it}\beta_4 + \beta_5 Debt2CB_{it} \\
& + \beta_6 PublicHousing_{it} + \beta_7 Sanction_{it} + \beta_8 Sanc_{it} * t + \beta_9 Small_{it} + \mu_i + \tau_t + \varepsilon_{it}
\end{aligned} \tag{1}
$$

where BV_{it} is the banking variable being analyzed such as real loans, off-balance sheet activities, deposits, or liquidity ratio. $Embez_{i,t}$, is a dummy variable that takes the value of 1 for all the banks in the embezzlement scandal after it was discovered. $Embez6_{i,t}$, is the 6-month lagged variable for $Embez_{i,t}$. $Sanction_{i,t}$ is a dummy variable, that for each bank, takes the value of 1 with a lag when the bank is sanctioned. Moreover, B_{it} is the vector of balance sheet and/or off-balance sheet variables being controlled for, and $Debt2CB_{it}$ represents each bank's debt to the central bank instrumented with the debt of all other banks to the central bank at the same month. Together, B_{it} and $Debt2CB_{it}$ constitute as the financial health controls; $PublicHousing_{it}$ is also a dummy variable controlling for the public housing project, and $Small_{it}$ is a dummy variable for small banks. μ_{it} represents bank fixed effects and τ_t represents month fixed effects.

As mentioned earlier, our model incorporates a set of control variables to clearly identify the effect of exogenous embezzlement shock on the Iranian banking system:

1. **Financial Health:** Following the literature[4], we control for the heterogeneity in the financial health of banks, defined by the following variables:

   (a) Each banks' real debt to the central bank, in logarithmic form, instrumented with the sum of other banks' real debt to the central bank (also in logarithmic form) to control for endogeneity. We contend that this variables should be controlled for, as banks have used the loose pocket of the central bank[5] to borrow in order to prevent the fall in their lending through debt to some extent. However, since loans themselves affect debt to CB, an issue of reverse causality arises, for which the sum of the other banks' debt to CB has been used as an instrumental variable to resolve this issue.

   (b) The liquidity, capital, and NPL to asset ratios of the banks to control for the heterogeneity in the strength of the banks' balance sheets.

2. **Small:** A dummy variable representing small banks with a low amount of assets is controlled, to incorporate the size differences between large and small banks.

3. **Public Housing Project:** A dummy variable representing the Public Housing Project started from April 2011, which had been initiated by the government through one of the state professional(or development) banks, and its effects eventually propagated through the banking system, affecting the balance sheets of many banks. This project was at first aimed to create housing for low income groups, yet the poor execution of the project raised the debt of the involved bank substantially, and eventually, the central bank had to print great sums of money in order to finance the project.

4. **Sanctions:** During the period 2006-2011, many Iranian banks were sanctioned by the United

---

[4]See Shin and Bernanke et al.

[5]On many occasions, the Central Bank of Iran, due to inefficient legal institutions and lack of independence, has had to bail banks out of their debts

States and the European Union. Therefore, such an occurrence must be controlled for each bank individually based on the exact time they were sanctioned. Both the level and the slope of this shock is controlled for in our model.

5. **Time and Bank Fixed Effects:** in order to control for variations in time and the banks.

Moreover, the standard errors are clustered on banks in all specifications.

More complicated models are subsequently defined to try and distinguish pre, and post embezzlement effects, as well as the effect of bank ownership by using interaction terms. A general category of state and private banks has been defined where state banks would incorporate both state owned and state professional banks, and private banks would include both private and privatized banks.

5 Results and Interpretation

5.1 Real Loans

Table 3 analyzes the effect of the transparency shock on real lending, where in either of the first four columns, we change the controls used for our analysis. Columns (1) and (2) both shows that the banks involved in the embbezlement scandal have reduced their lending by 17%. Column (3) shows that without controlling for the heterogeneity in the financial health of the banks, the effect of the scandal cannot be observed from those banks that were involved, yet it is overestimated for all banks. It can be seen that in all cases the level of lending in the involved banks is decreased after the scandal (with a lag) but the growth rate of lending is not changed. To see this we turn to $Embez_{it}$ and $Embez_{it} * t$. In the first row of table 3 we observe that in different cases, lending in the involved banks is decreased between 14.2 percent and 17.7 percent. Second row measures the growth rate of lending. None of them are statistically significant at conventional levels. So the growth rate is not

affected by the transparency shock. This means that this transparency shock only had a level effect on real lending.

Table 3: The Effect of Transparency Shock on Real Loans

	(1) log(Real Loan)	(2) log(Real Loan)	(3) log(Real Loan)	(4) log(Real Loan)	(5) log(Real Loan)
Embezzlement(Lagged-Involved)	-.177**	-.165**	-.142	-.165**	
	(-2.55)	(-2.18)	(-0.71)	(-2.18)	
Embezzlement(Lagged-Involved)Xt	-.000497	.000308	-.0171	.000308	
	(-0.07)	(0.04)	(-1.06)	(0.04)	
Embezzlement(Lagged-All)	.157*	.145*	.391**	.145*	.159*
	(1.96)	(1.84)	(2.15)	(1.84)	(1.70)
State OwnedXEmbezzlement(Lagged)					-.14
					(-1.43)
State OwnedXEmbezzlement(Lagged)Xt					.00812
					(1.12)
PrivateXEmbezzlement(Lagged)					-.181**
					(-2.45)
PrivateXEmbezzlement(Lagged)Xt					-.00707
					(-0.73)
Constant	-2.39***	-2.49***	-3.74***	-4.87***	-2.31***
	(-5.84)	(-7.20)	(-34.05)	(-14.56)	(-7.42)
Small_Banks	Y	Y	Y	N	Y
Ownership_Controls	N	N	N	N	Y
Financial_Health_Controls	Y	Y	N	Y	Y
Public_Housing	Y	Y	Y	Y	Y
Sanctions	N	Y	Y	Y	Y
Bank_Fixed_Effects	Y	Y	Y	Y	Y
Time_Fixed_Effects	Y	Y	Y	Y	Y
Bank_Cluster	Y	Y	Y	Y	Y

t statistics in parentheses
All Regressions are clustered on Banks and contain time and bank fixed effects.
All variables have been deflated using M2.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Column (5) analyzes the effect of the scandal based on bank type, whilst using all controls, where we only observe a negative effect from private involved banks on lending, while involved state banks seem to have been unaffected. In this case we observe that the effect of embezzlement scandal on state owned banks' lending level is negative but statistically insignificant. Private owned banks' lending level, however, is statistically significant. The shock decreased private owned banks' level of lending by 18.1 percent. Again the growth rate is not significant neither in state owned nor in private owned banks. The third row shows the effect of embezzlement scandal on all banks not just those involved. This shows that the invilved banks have reduced lending by around 30% relative to the whole baking system, showing huge effect following aftermath of a supervisionary transparency shock.

5.2   Loan to Asset Ratio (LAR)

In order to better analyze the effect of this shock, we must take into account that these changes may have occurred due to changes in the composition of the balance-sheet portfolio, to acquire more assets, other than loan, in times of high risk and uncertainty. Thus, it is plausible that as a robustness check, we should also assess the ratio of lending to assets, in order to control for such concerns, and to see how banks have changed the share of their assets that they chose to lend.

Table 4 presents results for our model [6]. Columns (1) to (4) show that loan to asset ratio has declined in involved banks after the transparency shock. Just like the real loans, the effect on growth rate is insignificant. Unlike the real loan, not only the scandal affected the loan to asset ratio of involved banks negatively but also it affected the same direction the whole banking system, too. The third row shows that if we control for financial health index, we observe that the scandal have decreased loan to asset ratio between 4.64 and 5.5 percentage point. When we separate banks by

---

[6]As a robustness check, we also ran the model with one minor change: the liquidity ratio of the banks was not controlled for, as the ratio of liquidity to assets and the ratio of lending to assets move together. However, results were not affected, and were consistent in both models

their ownerships, there are new significant effects. First of all, the effect of the shock on the private owned banks' level of loan to asset ratio is almost 13 times as of state owned banks'. The shock lowered LAR by 8.58 percentage point for private owned banks and 0.654 for state owned ones. Second of all, the effect of the scandal on the slope of LAR is different in state owned and private owned banks. The change in the slope is positive and significant in state owned banks but it is negative and insignificant in private owned banks. It means LAR pace of growth started to increase in state owned banks after the transparency shock.

Table 4: The Effect of Transparency Shock on Loan to Asset Ratio

	(1) Loan to Asset	(2) Loan to Asset	(3) Loan to Asset	(4) Loan to Asset	(5) Loan to Asset
Embezzlement(Lagged-Involved)	-.0487*	-.0484*	-.0541	-.0484*	
	(-1.92)	(-1.70)	(-1.48)	(-1.70)	
Embezzlement(Lagged-Involved)Xt	.00161	.00162	.000164	.00162	
	(1.32)	(1.28)	(0.08)	(1.28)	
Embezzlement(Lagged-All)	-.055***	-.055***	-.0795**	-.055***	-.0464***
	(-3.63)	(-2.93)	(-2.32)	(-2.93)	(-2.58)
State OwnedXEmbezzlement(Lagged)					-.00654
					(-0.23)
State OwnedXEmbezzlement(Lagged)Xt					.00306**
					(2.48)
PrivateXEmbezzlement(Lagged)					-.0858***
					(-2.80)
PrivateXEmbezzlement(Lagged)Xt					.000451
					(0.31)
Constant	.537***	.535***	.508***	.405***	.616***
	(5.69)	(6.00)	(30.79)	(3.85)	(7.85)
Small_Banks	Y	Y	Y	N	Y
Ownership_Controls	N	N	N	N	Y
Financial_Health_Controls	Y	Y	N	Y	Y
Public_Housing	Y	Y	Y	Y	Y
Sanctions	N	Y	Y	Y	Y
Bank_Fixed_Effects	Y	Y	Y	Y	Y
Time_Fixed_Effects	Y	Y	Y	Y	Y
Bank_Cluster	Y	Y	Y	Y	Y

t statistics in parentheses
All Regressions are clustered on Banks and contain time and bank fixed effects.
All variables have been deflated using M2.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.3 Real Loans Based on Home or Foreign Currency

Now we investigate the effect of the tranparency shock on the lending channel from the perspective of the currencies of the loans. We view lending as either those made in the Iran's currency (Rials), and those made in foreign currencies. In order to do so, we run our model on each of these separate categories of loans: Rial Loans, and Non-Rial Loans. Tables 5 and 6 demonstrate our results for these two categories, respectively.

In Table 5, we observe how it was in fact real lending in Rials (Home Currency) that were affected by the scandal, and only through private banks.
Changes in the growth rate of home currency loans is not significant in any regression, meaning that we only had a level effect, just as before. We find that when when we control for the sanctions and financial health indices, the level of Rial loan is decreased by 15.4 percent. However the level of real rial loans has increased by 12.9 percent for the whole banking system. After controlling for the ownership status there is a negative and highly significant effect on private owned banks. There is no significant effect on state owned banks.

Table 6 is organized similarly, yet different results are obtained. It is observed that the banks that were involved in the scandal did not change their lending in foreign currency. However, a general negative effect on all banks is present. Involved banks, however, gradually increased their lending as time went by, which was due to an increase through state-owned banks.

Table 5: The Effect of Transparency Shock on Real Rial Loans

	(1) log(Real Rial Loans)	(2) log(Real Rial Loans)	(3) log(Real Rial Loans)	(4) log(Real Rial Loans)	(5) log(Real Rial Loans)
Embezzlement(Lagged-Involved)	-.172**	-.154**	-.0481	-.154**	
	(-2.42)	(-2.15)	(-0.23)	(-2.15)	
Embezzlement(Lagged-Involved)Xt	-.00346	-.00213	-.0255	-.00213	
	(-0.48)	(-0.30)	(-1.60)	(-0.30)	
Embezzlement(Lagged-All)	.153	.129*	.365**	.129*	.141*
	(1.61)	(1.65)	(2.06)	(1.65)	(1.69)
State OwnedXEmbezzlement(Lagged)					-.0627
					(-1.11)
State OwnedXEmbezzlement(Lagged)Xt					-.00394
					(-0.70)
PrivateXEmbezzlement(Lagged)					-.24***
					(-3.04)
PrivateXEmbezzlement(Lagged)Xt					.000058
					(0.01)
Constant	-2.58***	-2.75***	-3.76***	-5.05***	-2.67***
	(-6.81)	(-8.43)	(-37.98)	(-15.46)	(-8.25)
Small_Banks	Y	Y	Y	N	Y
Ownership_Controls	N	N	N	N	Y
Financial_Health_Controls	Y	Y	N	Y	Y
Public_Housing	Y	Y	Y	Y	Y
Sanctions	N	Y	Y	Y	Y
Bank_Fixed_Effects	Y	Y	Y	Y	Y
Time_Fixed_Effects	Y	Y	Y	Y	Y
Bank_Cluster	Y	Y	Y	Y	Y

t statistics in parentheses

All Regressions are clustered on Banks and contain time and bank fixed effects.

All variables have been deflated using M2.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: The Effect of Transparency Shock on Real Non-Rial Loans

	(1) log(Real Non-Rial Loans)	(2) log(Real Non-Rial Loans)	(3) log(Real Non-Rial Loans)	(4) log(Real Non-Rial Loans)	(5) log(Real Non-Rial Loans)
Embezzlement(Lagged-Involved)	-.133	-.0878	-.113	-.0878	
	(-0.30)	(-0.19)	(-0.29)	(-0.19)	
Embezzlement(Lagged-Involved)Xt	.0783*	.0723**	.0311	.0723**	
	(1.90)	(2.05)	(0.75)	(2.05)	
Embezzlement(Lagged-All)	-1.66***	-1.26***	-1.08***	-1.26***	-1.34***
	(-3.35)	(-3.08)	(-2.94)	(-3.08)	(-3.04)
State OwnedXEmbezzlement(Lagged)					-.403
					(-0.75)
State OwnedXEmbezzlement(Lagged)Xt					.126***
					(3.89)
PrivateXEmbezzlement(Lagged)					.208
					(0.44)
PrivateXEmbezzlement(Lagged)Xt					.0266
					(0.70)
Constant	-1.25	-1.37	-6.56***	-7.71***	-.715
	(-0.56)	(-0.70)	(-25.62)	(-3.58)	(-0.36)
Small_Banks	Y	Y	Y	N	Y
Ownership_Controls	N	N	N	N	Y
Financial_Health_Controls	Y	Y	N	Y	Y
Public_Housing	Y	Y	Y	Y	Y
Sanctions	N	Y	Y	Y	Y
Bank_Fixed_Effects	Y	Y	Y	Y	Y
Time_Fixed_Effects	Y	Y	Y	Y	Y
Bank_Cluster	Y	Y	Y	Y	Y

t statistics in parentheses
All Regressions are clustered on Banks and contain time and bank fixed effects.
All variables have been deflated using M2.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.4 Real Off-Balance Sheet (OBS) Activities

Following the same logic developed earlier, we now focus on another credit channel variable, the off-balance sheet activities conducted by banks. These OBS activities were the key ones before the embezzlement scandal was discovered, where banks inflated such activities by granting forged letters of credit. Table 7 evaluates the effect of embezzlement. It can be seen that the results from off-balance sheet activities are much similar to that of the rela loans, yet it seems as if only the involved banks were affected. Also, column (6) shows a negative level effect on state-owned banks after the scandal, along with a negative gradual effect from private banks.

The effect of embezzlement on the level of real off-balance sheet activities in involved banks is significant except for regression 3 that there is no control for financial health index. The shock have decreased the level of real OBS between 23.8 and 26.6 percent. Column 5 says that the state owned banks have had a dramatic decline in the level of real OBS. Their real OBS was declined by 33 percent while the same effect on the private owned banks is not significant. The growth rate of real OBS in state owned is not affected but it has decreased in private owned banks by 2.24 percent per month.

Table 7: The Effect of Transparency Shock on Real Off-Balance Sheet Activities

	(1) Log(ROB)	(2) Log(ROB)	(3) Log(ROB)	(4) Log(ROB)	(5) Log(ROB)
Embezzlement(Lagged-Involved)	-.266*	-.238*	-.238	-.238*	
	(-1.85)	(-1.73)	(-1.40)	(-1.73)	
Embezzlement(Lagged-Involved)Xt	-.00846	-.00876	-.0196	-.00876	
	(-0.65)	(-0.73)	(-1.40)	(-0.73)	
Embezzlement(Lagged-All)	.0633	.146	.186	.146	.15
	(0.37)	(0.83)	(0.90)	(0.83)	(0.83)
State OwnedXEmbezzlement(Lagged)					-.33**
					(-2.16)
State OwnedXEmbezzlement(Lagged)Xt					.00496
					(0.39)
PrivateXEmbezzlement(Lagged)					-.14
					(-0.80)
PrivateXEmbezzlement(Lagged)Xt					-.0224*
					(-1.69)
Constant	-1.91***	-2.08***	-4.18***	-8.24***	-1.93***
	(-3.04)	(-3.43)	(-33.72)	(-11.74)	(-3.09)
Small_Banks	Y	Y	Y	N	Y
Ownership_Controls	N	N	N	N	Y
Financial_Health_Controls	Y	Y	N	Y	Y
Public_Housing	Y	Y	Y	Y	Y
Sanctions	N	Y	Y	Y	Y
Bank_Fixed_Effects	Y	Y	Y	Y	Y
Time_Fixed_Effects	Y	Y	Y	Y	Y
Bank_Cluster	Y	Y	Y	Y	Y

t statistics in parentheses
All Regressions are clustered on Banks and contain time and bank fixed effects.
All variables have been deflated using M2.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.5 Mechanisms of Propagation

In order to further discuss how banks have been affected by shocks in more general terms, it seems plausible to analyze their effect on other variables as well. In what follows, we briefly assess the evolution of real deposits of banks to see the other side of the big picture painted in previous sections.

We run the extended model on this variable while omitting liquidity ratio, as there is a direct one-to-one relationship between the liquidity ratio and deposits. Table 8 shows that the non-involved banks have experienced a rise in deposit accumulation, implying how people have perhaps switched from those involved banks to those that were not involved. The fact that such non-involved banks have been able to accumulate more deposits after the shock could explain how they were less affected in the contraction of their lending, as they may have had more resources to make loans on.

Table 8: The Effect of Transparency Shock on Real Deposits

	(1) log(Real Deposits)	(2) log(Real Deposits)	(3) log(Real Deposits)	(4) log(Real Deposits)	(5) log(Real Deposits)
Embezzlement(Lagged-Involved)	-.0277	-.00641	-.111	-.00641	
	(-0.47)	(-0.10)	(-1.10)	(-0.10)	
Embezzlement(Lagged-Involved)Xt	-.0037	-.00199	-.0115	-.00199	
	(-0.74)	(-0.37)	(-1.27)	(-0.37)	
Embezzlement(Lagged-All)	.182**	.143**	.519***	.143**	.147**
	(2.50)	(2.19)	(3.34)	(2.19)	(2.27)
State OwnedXEmbezzlement(Lagged)					-.0446
					(-0.54)
State OwnedXEmbezzlement(Lagged)Xt					.00406
					(0.57)
PrivateXEmbezzlement(Lagged)					.0378
					(0.54)
PrivateXEmbezzlement(Lagged)Xt					-.00781
					(-1.53)
Constant	-2.59***	-2.81***	-3.31***	-5.3***	-2.73***
	(-12.42)	(-16.73)	(-41.15)	(-26.64)	(-18.33)
Small_Banks	Y	Y	Y	N	Y
Ownership_Controls	N	N	N	N	Y
Financial_Health_Controls	Y	Y	N	Y	Y
Public_Housing	Y	Y	Y	Y	Y
Sanctions	N	Y	Y	Y	Y
Bank_Fixed_Effects	Y	Y	Y	Y	Y
Time_Fixed_Effects	Y	Y	Y	Y	Y
Bank_Cluster	Y	Y	Y	Y	Y

t statistics in parentheses
All Regressions are clustered on Banks and contain time and bank fixed effects.
All variables have been deflated using M2.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6 Concluding Remarks

In this paper, we evaluate the effect of a supervisionary tranparency shock on the lending channel of the banking system. We use 10 years of the Iranian banking system data which has an overlap with the embezzlement scandal of 2011 in which six banks were discovered to have been issuing forged credit to acquire assets. We identify this effect by running a fixed effect regression at the bank level and identify it from other shocks like sanctions, the large governmental housing project, recession and many other negative lending supply shocks.

The results show a significant negative impact of the embezzlement scandal of 2011 on the supply of loans of the involved banks. Real loans, loan to asset ratio, real off-balance sheet activities were all negatively affected by the scandal for the involved banks. We also find that other not-involved banks experienced a rise in their deposits and thus their lendings following such a shock, meaning that the involved bank reduced their deposit-taking acitivities as well.

These results contend that the transparent environment that was enforced throughout the banking system after the discovery of the embezzlement forced banks to behave accordingly, and thus affirms the role of supervision in the banking system.

References

Altunba, Yener, Otabek Fazylov, and Philip Molyneux. "Evidence on the bank lending channel in Europe." *Journal of Banking & Finance* 26, no. 11 (2002): 2093–2110.

Bell, Frederick W, and Neil B Murphy. "Economies of scale and division of labor in commercial banking." *Southern Economic Journal* (1968): 131–139.

Bernanke, Ben S. *Non-monetary effects of the financial crisis in the propagation of the Great Depression*, 1983.

Bernanke, Ben S, et al. *The financial accelerator and the credit channel*. Tech. rep. 2007.

Bernanke, Ben S, and Alan S Blinder. "The federal funds rate and the channels of monetary transmission." *The American Economic Review* (1992): 901–921.

Bernanke, Ben S, and Mark Gertler. *Inside the black box: the credit channel of monetary policy transmission*. Tech. rep. National bureau of economic research, 1995.

Blinder, Alan S, and Joseph E Stiglitz. *Money, credit constraints, and economic activity*, 1983.

Brooks, Petya Koeva, et al. *Does the bank lending channel of monetary transmission work in Turkey?* Tech. rep. International Monetary Fund, 2007.

De Haan, Leo, et al. *The credit channel in the Netherlands: evidence from bank balance sheets*. Tech. rep. Citeseer, 2001.

deMello, Luiz, and Mauro Pisu. "The bank lending channel of monetary transmission in Brazil: A VECM approach." *The Quarterly Review of Economics and Finance* 50, no. 1 (2010): 50–60.

Ferri, Giovanni, and Tae Soo Kang. "The credit channel at work: lessons from the financial crisis in Korea." *Economic Notes* 28, no. 2 (1999): 195–221.

Friedman, Milton, and Anna Schwartz. *A monetary history ofthe United States*, 1963.

GÜNDÜZ, Lokman. "Monetary Transmission and Bank Lending in Turkey." *Quarterly Economics and Finance Review* 5, no. 18 (1997): 13.

Jimenéz, Gabriel, et al. "Credit supply versus demand: Bank and firm balance-sheet channels in good and crisis times." *European Banking Center Discussion Paper* 3 (2012).

Kakes, Jan Isaac, Jan-Egbert Sturm, Philipp Maier, et al. "Monetary transmission and bank lending in Germany." *Kredit und Kapital* 34, no. 4 (2001): 505–525.

Karimirad, Ali. "Tracing the Ups and Downs of the Use of Real Side Indexes in Determining the Influence of the Financial Sector" (2016).

Kashyap, Anil K, and Jeremy C Stein. "What do a million observations on banks say about the transmission of monetary policy?" *American Economic Review* (2000): 407–428.

Kishan, Ruby P, and Timothy P Opiela. "Bank size, bank capital, and the bank lending channel." *Journal of Money, Credit and Banking* (2000): 121–141.

Ludi, Kirsten L, Marc Ground, et al. "Investigating the bank lending channel in South Africa: a VAR approach" (2006).

Madanizadeh, Seyed Ali, and Amineh Mahmoudzadeh. "Iran's Banking System: Past, Present, and Future" (2016).

Sengonul, Ahmet, and Willem Thorbecke*. "The effect of monetary policy on bank lending in Turkey." *Applied Financial Economics* 15, no. 13 (2005): 931–934.

Shin, Hyun Song. "Bank capital and monetary policy transmission." In *panel remarks at the" ECB and its Watchers XVII" conference, Frankfurt*, vol. 7. 2016.