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Article

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MONETARY TRANSMISSION AND BALANCE SHEET CHANNEL IN PAKISTAN: An Investigation using Firm-level Data

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Abstract

Central banks use diverse monetary policy instruments to maintain the inflation rate and real output. The impact on the real economic activity of the changes made in monetary policy is realised over the course of diverse channels of the Monetary Transmission Mechanism (MTM). The current study examines the balance sheet channel of MTM with reference to non-financial corporations in Pakistan in the last seven years. Employing a two-step system GMM estimation framework, the following features of the results are highlighted. Rising interest rates translate into a deteriorating interest coverage ratio and, ultimately, a weaker financial position. Sector-wise analysis exhibits a less pronounced negative relationship for firms belonging to the services sector. The findings strongly favour the theory of asymmetric MTM effects and suggest that the balance-sheet channel applies to all firms, but it is pertinent for small firms.

Keywords: Monetary Transmission Mechanism, Balance Sheet Channel, Interest Coverage Ratio.
JEL Classification: E52, E58.

I. Introduction

The ultimate challenge for a central bank is to achieve its objectives of maintaining the rate of inflation and its expectations, full employment and the economic welfare of a country through conducting the monetary policy. For this purpose, central banks use a diversified range of policy instruments. The effects of monetary impulses are not transmitted directly to the macroeconomic aggregates such as employment, output and inflation. The transmission has proceeded through several channels of monetary policy transmission identified in the literature. The efficacy of monetary transmission channels remains a subject of debate in macroeconomics since the influential work of Bernanke (1986) and continues until today. The process is complex as it is bounded by long, variable and uncertain time lags, which makes it difficult for policymakers to predict and assess the precise effects of monetary policy on the real sector.

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Neoclassical and non-neoclassical are the two basic types of monetary transmission mechanism (MTM) distinguished in the literature. Neoclassical channels are the traditional channels of monetary policy which presume that the capital markets operate in an environment of perfect information. Exchange rate, asset-price, interest rate and expectations channels are the examples. In contrast, non-neoclassical channels assert that information asymmetry prevails in the credit markets and can be divided in to two distinctive, though related theories: the bank-lending or the narrow credit channel, and the balance sheet or the broad credit channel. Figure 1 provides an illustration of the main transmission channels through which the changes in interest rates can be imparted to the economy.

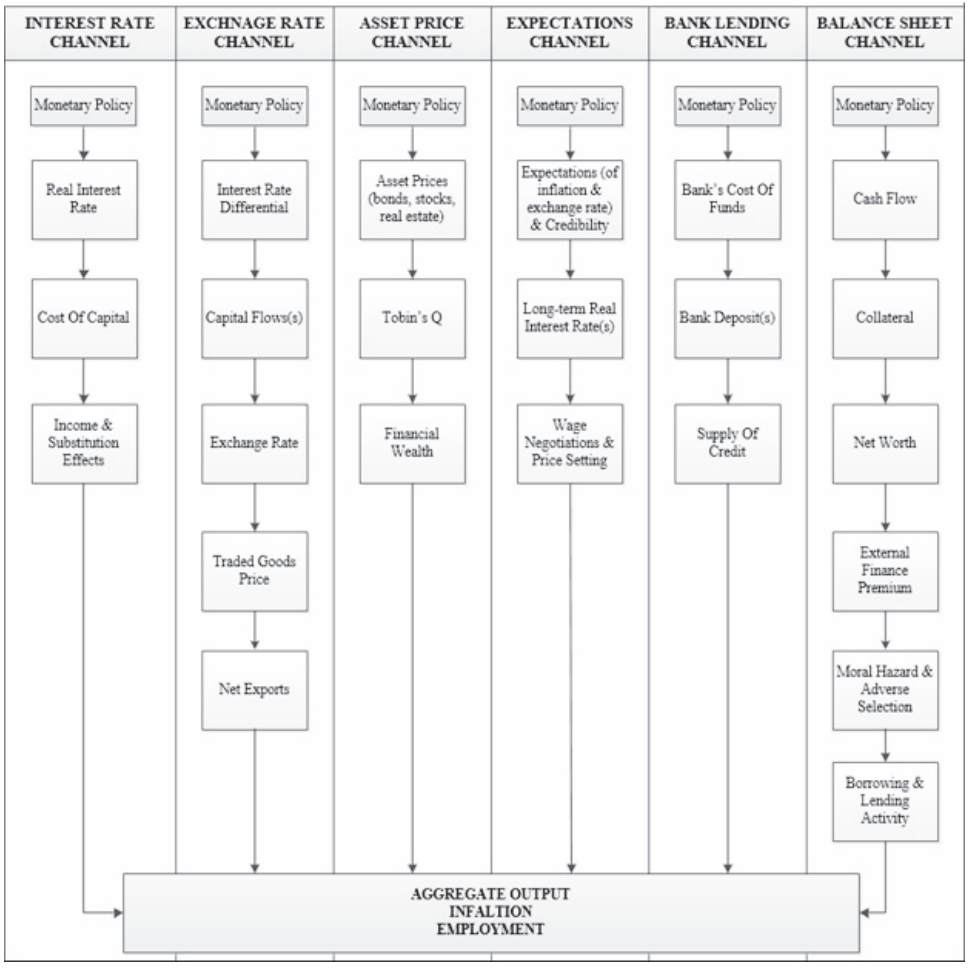

FIGURE 1

How Monetary Policy Works - The Transmission Mechanism

To better understand the mechanism, evaluating the empirical evidence on them is necessary. Most of the previous empirical studies on the effectiveness of MTM have focused on the interest rate channel, resulting from the standard Keynesian theory. In recent empirical research, much of the interest has been rekindled in analysing the importance of the credit view for determining real economic activity. The transmission mechanism of monetary policy through credit channel has been approached by different empirical studies like Dajcman and Tica (2017), Booasang (2016), Malinowska (2016) Sagovic and Sikic (2016), Dwenger, et al., (2015), Cambozoglu and Karaalp (2013), Shabbir (2012), Alfarisy, et al., (2011), De Oliveira (2009) Black and Rosen (2007), Guariglia and Mateut (2006) and Mizen and Yalcin (2003). Among these studies, the work of Dwenger, et al., (2015), Guariglia and Mateut (2006) and Mizen and Yalcin (2003) found important pieces of evidence which need to be highlighted.

Laibson., et al., (2021) investigated the consequences of monetary and fiscal policy in a heterogeneous-agent model with present-biased temporal preferences. The model includes a liquid asset and liquid home equity, which may be used as collateral for loans. Present bias amplifies the impact of fiscal policy by significantly increasing households' marginal willingness to consume (MPC). The influence of monetary policy is amplified by present bias, while the pace of monetary transmission is slowed. However, current bias creates an incentive for families to delay refinancing their mortgages, slowing the rate at which this monetary channel works. Similar results were demonstrated by Slacalek, et al., (2020), who examined the impacts of monetary policy on household consumption expenditures by investigating a number of transmission mechanisms that work through both direct and indirect channels. The study quantifies all of these routes in the eurozone. Outcomes indicate that the indirect labour income channel and the housing wealth impact are important drivers of the aggregate consumption response to monetary policy and explain cross-country variation.

Given the heavy reliance on bank financing, Dwenger, et al., (2015) examined the effectiveness of bank lending and firms' balance sheet channel in Germany for the 2004-2010 period. Additionally, the study aims to inspect whether the 2007-2008 financial crisis caused real distress outside the US economy. The dataset comprises the financial statements of the firms and the banks with which each firm has a relationship. Employing Instrumental Variable (IV) regressions, they distinguish the responses of both the financial and non-financial firms and found that the banks have a significant role in transmitting the international crisis. Banks reduce credit supply which subsequently condenses the net worth of constrained firms, followed by a decline in their overall borrowing. These effects cause a substantial decline in real firm investment. The results suggest that relationship lending is important in Germany as firms cannot fully substitute bank loans from a relationship bank with finances provided by other banks or institutions.

Using a first-difference GMM approach, Guariglia and Mateut (2006) found that trade credit and balance sheet channels operate together in the UK, and the for-

mer conduce to deteriorate the latter. Equations of the error-correction inventory investment augmented with the coverage ratio and the accounts-payable-to-assets ratio (a measure of trade debt) have been specified for the empirical analysis. Introducing accounts payable in the model lowers the coefficient of interest coverage ratio and its significance. The results align with the proposition, which proves that the firms facing borrowing constraints, as a second option, switch to trade credit as a substitute for bank credit intended to solve the liquidity crisis. The findings suggest that trade credit channel mitigates the impacts of traditional credit channel intended to slow economic activity.

Extending the Gertler and Gilchrist (1994) and Oliner and Rudebusch (1996) approaches, Mizen and Yalcin (2003) test the financing behaviour of firms in the UK under different monetary conditions. The authors rely on balance sheet information on manufacturing firms from 1990 through 1999. Three different measures of the financial mix are used as dependent variables – short-term debt to current liabilities, total debt to total liabilities, and short-term debt to total debt. Moreover, firms are classified into size categories based on turnover, balance sheet composition and number of employees. They show that following a monetary contraction, small, young and riskier firms are more disadvantaged as they face a substantial reduction in the financial mix. They tend to reduce short-term borrowings and shift to non-debt liabilities. Firms which are highly indebted are more sensitive to policy changes and observe a massive reduction in cash flows as they have heavy debt-servicing burdens. Overall, the study supports the existence of bank-lending and broad-credit channels.

The broad credit channel typically affects the strength of firms' balance sheets and their ability to access new external finance. It operates through businesses that are credit-constrained in the sense that non-bank loans are an imperfect substitute for bank loans and internal funds. A tightening in monetary policy promptly increases the interest expenditure, shrinks net cash flows, and dampens the financial condition of the borrowing firms. A key concept underlying the functioning of the balance sheet channel is the external finance premium, interpreted as the difference between the cost of external credit and the cost of credit internally available to the firms. External finance is usually more costly than internal finance because of the frictions and associated costs that credit lenders encounter for assessing and monitoring borrowers' financial prospects and actions in the presence of financial market imperfections. This premium becomes more expensive in times of tight monetary regimes since the lenders have a lower willingness to accommodate as it becomes more likely for owners of the firm to engage in risky investments. This causes a decrease in lending.

The borrowers' or firms' demand for loans also decreases because a higher cost of debt can cause the probability of financial distress to increase later. Rising interest rates tend to increase inventory costs, which are generally financed with short-term credit. In turn, this lowers the inventory and investment activity in the economy, thereby also reducing the demand for firms' products. Consequently, this may reduce

firms' revenue and creditworthiness over time. Endogenous changes in external finance premiums are augmented by Adjustments in monetary policy that affect the short-term interest rates. Thus, the balance sheet channel is also known as a "financial accelerator" as it pronounces the effects of monetary policy to the economy through its impact on firm balance sheet strength.

This study trails a structural model approach to provide a clearer picture of the balance sheet channel, as highlighted in Figure 1. It aims to examine the evidence for a balance sheet channel in Pakistan, contributing to the well-established literature on the transmission mechanism. We document the effects of monetary shock in terms of firm-specific characteristics. The study seeks to ascertain whether there is a significant discrepancy between the responses of small and large firms. Following the approach suggested by Gertler and Gilchrist (1994), classify firms according to their asset size to assess their accessibility to financial institutions. In addition, investigate the heterogenous responses of different sectors to monetary policy shocks over the period of study.

The remainder of the paper is organised as follows. Section II describes the proposed methodology and model specifications. Section III propounds the empirical results, followed by the conclusion policy recommendation presented in Section IV.

II. Data and Empirical Methodology

1. Main features of the data

We have used the data of 168 non-financial firms with balance sheet information which spans the period 2012 to 2018. These companies are listed in the Pakistan Stock Exchange (PSX) Ltd. and broadly belong to the textile, cement, chemical, petroleum, food, and manufacturing sector. The information on corporations comes from the annual financial statements issued by the State Bank of Pakistan. We have constructed a strongly balanced panel by excluding the firms with an incomplete annual report set.

Table 1 reports the yearly information on total assets organised by industry groups and firm sizes. It quotes mean values for the logarithm of total assets by economic groups. Our sample is composed of 168 firms in total, of which 82 are textile firms, 18 chemical firms, 14 cement firms, 14 petroleum firms, three mineral firms, three food firms and 32 firms from the services sector (electrical, communications, motor and manufacturing). We have limited our analysis to very few firms in other sectors due to the unavailability of the data. As it is evident, large firms include cement, petroleum and chemical sectors, whereas small firms typically comprise the textile sector followed by the services sector.

ICR is the dependent variable we feature throughout the study, following Bernanke and Gertler (1995) and Booasang (2016). It is defined as 'the ratio of the

TABLE 1

Sectoral data of all firms with yearly information

	All Firms		Large Firms		Small Firms	
Sectors	N	Size	N	Size	N	Size
Textile	82	21.82	38	22.78	44	20.98
Chemical	18	22.14	11	23.29	7	20.34
Cement	14	23.22	14	23.22	-	-
Motor	11	21.45	4	22.16	7	21
Mineral	3	22.29	-	23.49	3	21.5
Electrical	5	22.21	3	23.19	2	20.75
Food	3	21.82	-	22.92	3	20.74
Petroleum	14	24.57	14	24.57	-	-
Communications	9	23.24	8	23.52	1	21.07
Manufacturing	12	21.97	7	22.89	5	21.04
Total	180		106		74	

Source: Authors'estimation.

sum of interest payments and profits to the interest payments by non-financial corporations'. ICR measures how often a firm can service its debt with its available earnings. In other words, it is an aspect of a firm's solvency and thus determines its position and trajectory (firm financial distress). The set of explanatory variables includes profitability, collateral, liquidity, short-term debt (STD), long-term debt (LTD), size and policy rate.

Profitability is denoted by the return on assets, expressed as the percentage of net income of a firm in relation to its average total assets. Firms with rising profits tend to have a greater chance to meet their interest expenses on the debt timely.

Size is measured in terms of total assets reported on a firm's balance sheet. We have used the 40^{th} percentile of total assets as the boundary between the two size groups. Our study treats a firm as small when the value of the logarithm of its total assets is less than the 40^{th} percentile, whereas a firm is classified as large when the value of the logarithm of its total assets is above the 40^{th} percentile.

Collateral is the ratio of non-current assets to total assets. It is a measure of the tangibility of a firm and is positively related to the ICR. Rising collateral values increase the net worth of a firm, making it easier to generate funds from the financial market and adjust its expenses.

A quick ratio is used to gauge a firm's liquidity position.[1] According to pecking-order theory, higher liquidity mitigates the demand for short-term external resources

[1] The quick ratio is the ratio of the sum of account receivables, short-term investments and cash to current liabilities. It excludes fewer liquid assets such as inventory and thus is considered a better barometer of a firm's capability to settle its short-term obligations with its most liquid assets.

as firms prefer internal financing. This implies that the higher the quick ratio, the better the position of the firm. Thus, we expect a positive relation between the interest coverage ratio of the firm and its measure of liquidity.

Finally, the main component of firms' long-term and short-term debts are the loans from financial institutions, which are interest-rate charged, of which some are secured, and some are unsecured.

2. The Estimation Technique and Post-Estimation Diagnostics

To test the predictions from the empirical and theoretical literature regarding the balance sheet channel of MTM in Pakistan, we employ a Generalised Method of Moments (GMM) estimator. More specifically, we use a two-step System GMM estimator proposed by Blundell and Bond (1998).[2] The GMM estimation is convenient for databases like ours with few time periods and many units; with a dynamic dependent variable, depending on its past observations; with explanatory variables that are not strictly exogenous even after controlling for an unobserved effect, meaning correlated with past and possibly current observations of the error term; with fixed effects, indicating overlooked heterogeneity; and with heteroskedasticity and autocorrelation within individual units' errors, but not across them.

This study undertakes some post-estimation diagnostics introduced by Roodman (2006) to validate the model specifications. The following tests apply Sargan's statistic (to test for the over-identification) and the Arellano-Bond test (to test for the serial correlation of the residuals). The null hypothesis under the Sargan test states that the over-identifying restrictions are valid, meaning the instruments are exogenous. If the p-value is large, we will fail to reject the null hypothesis, implying that the instruments are not correlated with the errors and hence are determined to be valid [Sargan (1958)]. The Arellano-Bond test, also known as the m2 test, is asymptotically distributed as a standard normal variable with a null hypothesis stating that there is no serial correlation of the differenced errors at order 2. It tests for the serial correlation in the idiosyncratic errors. Usually, the first differences of independently and identically distributed idiosyncratic errors are serially correlated, which allows us to reject the null hypothesis of no serial correlation in the first-differenced errors at order 1. However, it does not imply the misspecification of the model. Not accepting the null hypothesis at higher orders indicates that the moment conditions are not valid, so the model is incorrectly specified.

[2] The Generalized Method of Moments (GMM) was initially proposed by Hansen (1982) and since then has been one of the immensely used methods of estimation for Dynamic Panel Data (DPD) models. Arellano and Bond (1991) later transformed the model into first differences (DIF) to wipe out the individual-specific effects. However, Blundell and Bond (1998) argued that the DIF estimator possesses poor finite sample properties and thus generates biased estimates. They extended the model by incorporating a set of supplementary restrictions on the preliminary moment conditions. The resulting estimator is popularly designated as the system (SYS) GMM estimator.

3. Empirical Specification

The baseline econometric model takes the functional form of Equation (1). Firms are represented by subscript *i* and years by subscript *t*.

$$ICR_{it} = \alpha_i + \beta_1 ICR_{i,t-1} + \beta_2 Rate_t + \beta_3 X_{it} + \in_{it} \quad (1)$$

Where ICR_{it} denotes the interest coverage ratio for a given firm *i* and each year *t*. $Rate_t$ is the interest rate set by the SBP and $\in_{it}$ is the error term. X_{it} includes the firm profitability $PROF_{it}$; collateral $COLL_{it}$; the level of firm liquidity, LIQ_{it}; the logarithm of total assets, $LNASSETS_{it}$ and the short-term and long-term debts accumulated by a firm, denoted by STD_{it} and LTD_{it}.

To greatly expand the understanding of the relationships among variables, we model the interaction between the policy rate and some firm-specific variables, as in Equation (2).

$$ICR_{it} = \alpha_i + \beta_1 ICR_{i,t-1} + \beta_2 Rate_t + \beta_4 X_{it} + \beta_5 Rate_t * X_{it} + \in_{it} \quad (2)$$

Where X_{it} is the vector of independent variables as described above. $Rate_t*X_{it}$ refers to the interaction between the policy rate and firm-specific variables like collateral, profit, liquidity and size.

In the third step, we repeat the previous analysis as in Equation (1) by incorporating in the regressions a dummy variable called 'SIZE', which assigns the value 1 for the firms having their logarithm of total assets less than the 40th percentile and 0 otherwise.

$$ICR_{it} = \alpha_i + \beta_1 ICR_{i,t-1} + \beta_2 Rate_t + \beta_3 X_{it} + \beta_4 SIZE_{it} + \in_{it} \quad (3)$$

Finally, to verify whether the effects of monetary policy disturbances have a different impact on the interest coverage of different types of industries, we use Equation (4) and construct a dummy variable called 'SECTOR'. It equals one if the firms belong to the textile sector, 2 for the firms from the services sector, and 0, otherwise. The other sectors consist of fewer firms, meaning fewer observations, and include chemical food, minerals, petroleum and cement sectors. Since we have very few firms in our dataset from other sectors and GMM estimation requires grander observations, we treat them all as one for the analysis in Equation (4).

$$ICR_{it} = \alpha_i + \beta_1 ICR_{i,t-1} + \beta_2 Rate_t + \beta_3 X_{it} + \beta_4 SECTOR_{it} + \in_{it} \quad (4)$$

III. Results and Discussion

The summary statistics for key model variables are presented in Table 2, including standard deviations, minimum and maximum values and mean values. It focuses on the full sample and the subsamples based on size. There are 67 small firms and 101 large firms. As we can easily verify from the statistics, smaller firms cannot manage their liquidity and borrow from the market compared to large firms. In contrast, on average, large firms have greater shares of long-term and short-term debt than small firms. The Larger firms have easy access to external sources of funds and have more fixed assets as a proportion of total assets, and are more liquid as compared to small firms.

TABLE 2

Financial Characteristics of Firms with Yearly Information

		N	Mean	Std. Dev	Min	Max
Interest coverage ratio	All Firms	1239	5.12	8.8	-26.28	85.91
	Small Firms	513	4.35	7.09	-17.75	47.55
	Large Firms	726	5.73	9.76	-15.01	85.91
Profit	All Firms	1250	8.72	8.98	0.01	92.86
	Small Firms	514	8.25	8.36	0.01	74.47
	Large Firms	736	9.04	9.39	0.01	92.86
Size	All Firms	1252	22.27	1.55	18.83	26.64
	Small Firms	514	20.94	0.77	18.83	22.75
	Large Firms	738	23.2	1.25	20.91	26.64
STD	All Firms	1105	20.32	1.83	11.45	25.33
	Small Firms	447	19.18	1.31	12.52	21.85
	Large Firms	658	21.09	1.73	11.45	25.33
LTD	All Firms	1109	20.39	1.9	11.62	26.74
	Small Firms	448	19.11	18.98	12.31	20.91
	Large Firms	661	21.25	1.79	11.62	26.74
Liquidity	All Firms	1229	1.28	3.08	0.01	50.26
	Small Firms	501	0.83	1.29	0.01	20.68
	Large Firms	728	1.59	3.83	0.04	50.26
Collateral	All Firms	1252	0.57	0.19	0.03	1
	Small Firms	514	0.55	0.19	0.12	0.98
	Large Firms	738	0.57	0.19	0.03	1

Source: Authors'estimation.

Table 3 exhibits correlation coefficients between the set of main variables. Predictably, interest rate correlates negatively with the firm interest coverage ratio and debts. The correlation between coverage ratio and short and long-term debts is negative. Firm size, collateral and liquidity are subject to a positive correlation with the coverage ratio. Firm size also correlates positively with short-term and long-term debts, which is in line with the arguments presented previously, i.e., large firms have the ability to borrow debt because they have a lower possibility of bankruptcy than smaller firms.

On the other hand, firms' profitability correlates differently with short and long-term debts. However, the correlation is negligible and insignificant but is positive with long-term debt and inverse with short-term debt. This may be because profitable firms are more likely to access long-term debt. The correlation between collateral value and debt levels is positive and significant because tangible assets can serve as collateral for loans; the larger the tangible assets, the higher the probability that the company will repay the loans.

1. Estimates of the Baseline Model

We exclude the firms that did not report complete information on one or more key variables. Therefore, after screening our data as aforementioned, the empirical analysis is confined to 823 observations on 168 firms. Column (1) of Table 4 details the estimates of our baseline specification [Equation (1)] for the whole period, whereas

TABLE 3

Correlation Matrix

	1	2	3	4	5	6	7	8
1. Interest coverage ratio	1							
2. Collateral	0.001	1						
3. Profit	0.302	-0.036	1					
4. Liquidity	0.127	-0.07*	0.063*	1				
5. STD	-0.068	0.004	-0.084*	0.006	1			
6. LTD	-0.004	0.093*	0.04	0.232*	0.449*	1		
7. Size	0.066	0.031	0.011	0.181*	0.714*	0.761*	1	
8. Policy rate	-0.161	-0.013	0.059*	0.156*	-0.037	0.011*	-0.096*	1

Source: Authors' estimation.
Note: * denotes p-value <0.05.

Columns (2), (3), and (4) summarise our regression results with interaction terms [Equation (2)] performed on the full sample. We also test for the over-identification of instruments via the Sargan test. The p-value is large for all four regressions, sug-

TABLE 4

The Effect of Monetary Policy on Firms in Pakistan:
An Empirical Analysis of Balance Sheet Channel

	(1)	(2)	(3)	(4)	(5)
Interest Coverage Ratio (-1)	0.15172***	0.147571***	0.16028***	0.15375***	0.15445***
	(0.0017)	(0.0019)	(0.0013)	(0.00176)	(0.0506)
Policy Rate	-0.07934***	-0.14874***	-3.82531***	-0.08079***	-0.4406***
	(0.0107)	(0.0128)	(0.0946)	(0.0105)	(0.0345)
Collateral	12.604***	13.258***	14.638***	12.679***	
	(0.6889)	(0.6453)	(0.3129)	(0.6365)	
Size	1.6279***	1.60231***		1.5124***	1.6958***
	(0.10112)	(0.1049)		(0.1069)	(0.1101)
Liquidity	0.144208***	0.14153***	0.05231***		0.16011***
	(0.00663)	(0.0074)	(0.0046)		(0.0067)
Profit	0.16219***		0.39052***	0.15939***	0.17384***
	(0.00551)		(0.00352)	(0.00527)	(0.00432)
STD	-0.6540***	-0.6225***	-0.16803***	-0.63268***	-0.78519***
	(0.04701)	(0.0480)	(0.0248)	(0.04544)	(0.05064)
LTD	-1.73015***	-1.6914***	-1.4644***	-1.6917***	-1.67073***
	(0.09067)	(0.0960)	(0.0382)	(0.09427)	(0.094)
Profit*Rate		0.01165***			
		(0.0004)			
Liq*Rate				0.00738***	
				(0.00046)	
Size*Rate			0.1622***		
			(0.0043)		
Coll*Rate					0.62481***
					(0.05549)
No. of firms	168	168	168	168	168
No. of observations	823	823	823	823	823
Sargan test (p-value)	117.6 (0.643)	115.3 (0.594)	142.3 (0.499)	118.7 (0.615)	116.95 (0.661)
AR (2) test (p-value)	1.061 (0.289)	1.053 (0.284)	0.746 (0.456)	1.069 (0.285)	0.985 (0.324)

Source: The author's estimates are attributed to the data collected from the annual reports of the non-financial firms listed at the Pakistan Stock Exchange, PSX. Published by the State Bank of Pakistan.
Note: The standard errors are shown in parentheses. *** denotes p-value<0.05.

gesting that the over-identifying restrictions are valid, and thus, the null hypothesis cannot be rejected. One more significant diagnostic in our empirical analysis is the AR test for autocorrelation of the residuals. The statistic for second-order autocorrelation suggests that we fail to reject no autocorrelation of order 2. This verifies that the Arellano-Bond model assumptions are satisfied.

Following the first column of Table 4, coefficients of basic variables in the model are highly significant at a 5 per cent level. As hypothesised to test the balance sheet effect, in Pakistan, policy-induced changes directly hit the debt burden of firms measured by ICR. As expected, the coefficient of the variable 'Rate' has a negative sign and is significant. On average, one standard deviation rise in policy rate depresses the coverage ratio by 7.93 per cent.

When assessing firm-specific characteristics, we find all these characteristics as highly significant with the expected sign, i.e., in line with the theory. The estimates for the impact of STD and LTD on the interest coverage of firms suggest a negative relationship, with statistical significance, implying that the higher the debts, the more difficult it becomes to make interest payments on time as firms face a larger increase in interest payment rates. Profit is positively related to the dependent variable, showing that for every one per cent increase in profit, the ability of the firms to cover the interest expenses is predicted to increase by 16 per cent. Similarly, liquidity's positive coefficient (0.14421) signals that by tapping both the resources of finance, i.e., internal and external, firms are able to manage and run the business. The firm's asset structure, as approximated by collateral, is positive and significant, showing that providing collateral enhances the creditworthiness of the borrowers as it curbs their incentives for moral hazard. As is common knowledge and quoted in the table, a firm's size tends to have a positive ($\beta_8 = 1.6279$) influence on the debt-servicing capacity of a firm measured by ICR.

2. Estimation with Interaction

Table 4, columns (2), (3), (4), and (5) (based on Equation 2) show the dynamics, which are similar to the dynamics of aggregate series apart from the inclusion of the following interactive terms: an interaction term between the size of a firm and interest rate (Size*Rate); an interaction between profit and interest rate (Profit*Rate), an interaction between liquidity and interest rate (Liq*Rate), and interaction between collateral and interest rate (Coll*Rate). Just as evidently, the coefficients of every interaction term are highly significant, indicating that the balance sheet position of the firms shapes the impact and strength of monetary shock on their financial health.

The results in the last four columns of Table 4 clearly show that the estimated interest rate coefficient, β_2, increases prominently. We are more importantly concerned about the sign of interaction of the dummy variable, 'size', with the shock variable. The coefficients of interaction terms are small in magnitude except for that with the size of a firm (0.1622), highlighting the need for further exploring the impacts of mon-

etary policy shocks by digging deep at the reactions of large versus small firms. Considering interactions among monetary policy indicator and some firm-specific characteristics, the results support our previous findings.

3. Sectoral patterns versus firm-level heterogeneity

Table 5 quantifies the behaviour of small and large firms by estimating Equation (3). The results appear to point in the expected direction. The empirical evidence potentially shows that the response of small firms would be in accordance with the prediction of the broad credit theory of monetary transmission. An increase in the monetary policy rate by one per cent deteriorates the interest coverage ratio of small firms by 40.5 per cent while it crushes the coverage ratio of large firms by 21.1 per cent. Importantly, the point estimates on the rate for small and large firms, -0.4050 and

TABLE 5

The Impact of Monetary Policy on Firms in Pakistan:
Accounting for firm-level heterogeneity

	(1) Small Firms	(2) Large Firms
Interest Coverage Ratio (-1)	0.0783*	0.2051*
	(0.0046)	(0.0090)
Policy Rate	-0.4050*	-0.2112*
	(0.0097)	(0.0027)
Profit	0.2859*	0.17042*
	(0.0062)	(0.0018)
Liquidity	0.2890*	0.0517*
	(0.1005)	(0.0024)
LTD	-0.7436*	-1.356*
	(0.0360)	(0.0413)
STD	-0.4255*	-0.1701*
	(0.0328)	(0.0168)
Collateral	11.947*	18.041*
	(0.7282)	(0.3692)
Observations	332	491
No. of firms	67	101
Sargan test (p-value)	(0.9972)	94.06 (0.566)
AR (2) test (p-value)	(0.8815)	0.580 (0.326)

Source: Author's estimates attributed to the data collected from the annual financial statement reports of the non-financial firms published by the State Bank of Pakistan.
Note: The standard errors are shown in parentheses: * denotes p-value <0.05.

-0.2110, are greater than the corresponding estimate for the full sample declared in Column I of Table 5, specifically -0.07934. Short-term debt is also negatively related to ICR, indicating that with a credit crunch, the STD of small firms reduce by approximately 43 per cent, whereas the drop in STD is 17 per cent for large firms. Notably, the Sargan test appears to perform better for this model with large and small firms, suggesting that differentiating the effect of firm-level improves the specification of the model. Table 5 shows that large and small firms react very heterogeneously to monetary shocks. Small firms are very sensitive to these shocks than large firms.

Now turn to investigate the impact of monetary policy on different sectors of the economy. To this extent, we estimate our final regression Equation (4). The category 'other' comprises the sectors with fewer firms, meaning fewer observations, and includes chemical, food, minerals, petroleum and cement sectors. Since we have very few firms in our dataset from other sectors and the number of instruments is greater

TABLE 6

The Effect of Monetary Policy on Firms in Pakistan:
Accounting for sectoral heterogeneity

	(1) Textile	(2) Services	(3) Other
Interest Coverage Ratio (-1)	0.0274*	0.0433*	0.4591*
	(0.0036)	(0.0052)	(0.0106)
Policy Rate	-0.361*	-0.0055*	-0.1052*
	(0.0073)	(0.0547)	(0.0339)
Profit	0.1721*	0.1785*	0.3293*
	(0.0031)	(0.0284)	(0.0150)
Liquidity	1.4106*	0.1623*	0.0258*
	(0.0461)	(0.0846)	(0.0086)
LTD	-0.1291*	-1.4556*	-1.5541*
	(0.0135)	(0.1056)	(0.0106)
STD	-0.1574*	-0.3137*	-0.441*
	(0.0718)	(0.1781)	(0.0815)
Collateral	3.0171*	15.088*	2.6091*
	(0.5085)	(2.9627)	(0.7705)
Observations	448	135	236
No. of firms	82	32	53
Sargan test (p-value)	77.76 (0.999)	19.12 (1.000)	37.95 (1.000)
AR (2) test (p-value)	1.539 (0.124)	0.385 (0.699)	0.31115 (0.756)

Source: Author's estimates attributed to the data collected from the annual financial statement reports of the non-financial firms published by the State Bank of Pakistan.
Note: The standard errors are shown in parentheses: * denotes p-value <0.05.

than the total observations, the Sargan test statistic is found to be weak when separate regressions are executed for every sector. Therefore, treat them all as one unit for simplicity. Hence, textile, services and other sectors include 82, 32 and 53 firms.

The empirical results in Table 6 show that a tightening in monetary policy increases interest expenses and intensifies the chances of suffering bankruptcy costs. In the case of the textile sector, the effect is more pronounced. The policy rate attracts a negative, relatively large, and significant coefficient (0.36), which suggests that if the policy rate increases by one standard deviation, the interest coverage capability of the textile sector decrease by 36 per cent. Although small, for the services sector, the coefficient (0.005) suggests that one standard deviation rise in policy rate decreases interest coverage by 0.5 per cent. As regards the 'other' sectors, a one standard deviation increase in policy rate decreases the coverage ratio by about 11 per cent. Neither the Sargan test nor the test of second-order autocorrelation indicates problems with the model specification or the choice of instruments.

IV. Concluding Remarks

The present study has aimed to investigate the mechanism through which monetary policy events affect the firms' financial position via the balance sheet channel. By using the system GMM approach, this study finds that small firms are much more vulnerable to monetary shocks than large firms. Analysing sectoral responses, observe the insensitivity of the services sector to interest rate changes, whereas the effects are strongly pronounced for the textile sector.

It is essential to highlight some potential caveats of the study. Due to data limitations, we have conducted the empirical analysis by using the annual data of firms. The analysis of the MTM can further investigate the credit channel by using the quarterly data or including additional controls, which might give additional information regarding the relationship between monetary policy and firms' balance sheets. Moreover, the linkage with the alternative version of the credit channel, i.e., the narrow credit channel, is also essential for isolating changes in the supply of loans from the demand for loans in response to monetary shocks.

Moreover, finally, the relative roles of alternate sources of external finance, namely trade credit, in the transmission mechanism should be evaluated in periods when there is rationing in bank lending. Many recent empirical studies, contrary to the mainstream literature, have found that increasing trade credit issuance during contractionary monetary policy regimes weakens the strength of the balance sheet channel of transmission of monetary policy.

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