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How do Firms Respond to Changes in Interest Rates? Evidence from the Firm-level data in Pakistan (2015– 2024)

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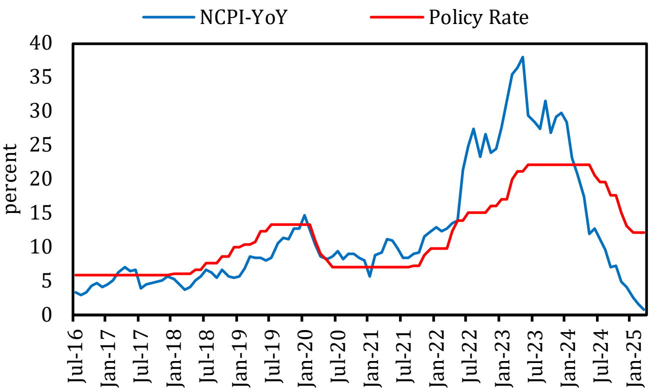
I. Introduction[1]

Interest rates serve as the primary monetary policy tool employed by central banks to maintain price stability and anchor inflation expectations. In response to the recent surge in global inflation, central banks around the world implemented a series of interest rate hikes to rein in inflationary pressures and Pakistan was no exception. The headline inflation in Pakistan rose to an all-time high of 38 percent in May 2023, with a substantial increase in the core inflation to around 20 percent. The central bank's proactive monetary tightening proved instrumental in reducing the inflation pressures and anchoring inflation expectations, with headline inflation declining to 0.7 percent by March 2025 (**Figure 1**). However, the central bank's decision to increase the interest rates to fight inflation is often met with skepticism by the business community. This is based on the perception that interest rate increases the borrowing cost of the firms that in turn lead to a further increase in inflation when these firms pass on that burden to their customers.[2] This concept in monetary economics is referred to as the cost channel of monetary policy.

Figure 1: Trend in Interest Rate and Inflation in Pakistan



Source: State Bank of Pakistan

While most of the research is focused on the demand-side transmission of monetary policy, numerous studies have highlighted the supply-side effects of monetary policy including Blinder (1987); Christiano, Eichenbaum, and Evans (1997); and Valli (1979, cited in Gaiotti and Secchi 2004). These studies have found evidence in support of the cost channel of the monetary policy i.e. an increase in the interest rates leads to increase in the prices. However, the existing literature on this conjecture (cost channel) is largely mixed and remains controversial. For instance, Barth and Ramey (2001) argue that while the cost channel may be more pronounced in the short run, demand-side effects tend to dominate in the long run. Besides this, the studies on short-term impact of monetary shocks on inflation are often characterized by significant identification and specifications issues (Balke and Emery, 1994). For instance, the observed positive correlation between interest rates and prices, known as the 'price puzzle', may not indicate a structural relationship. Instead, it could also result from the proactive nature of central bank policy, where the central bank raises interest rates in anticipation of future inflation (Sims, 1992).

The literature available on the cost channel of monetary policy in Pakistan is mostly focused on macro variables. For instance, Munir, Tufail, and Ahmed (2022) have found evidence in

[2] For instance, see https://www.brecorder.com/news/40233412

support of cost-channel in the presence of monetary and financial shocks in Pakistan. Similar conclusions were also reached by Javid and Munir (2010) and Chaudhry et al (2015).

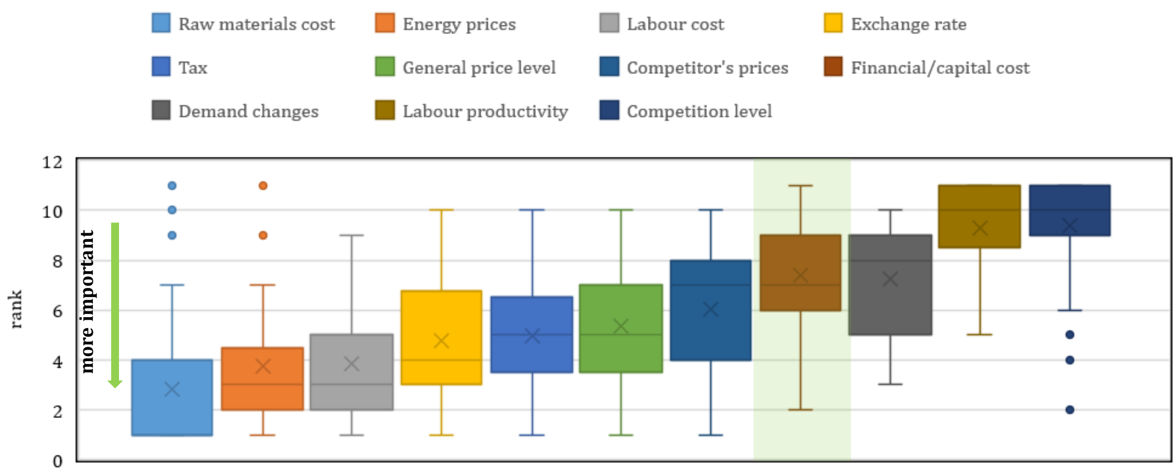
The objective of this study is to explore the micro-data of listed companies in Pakistan to analyze how firms are affected and how they react to changes in the interest rates? Understanding the supply-side impact is important because it can give critical insights to policy makers with respect to presence of cost-channel in Pakistan. Besides this, much of the research has focused on investigating the demand channel of monetary policy and the supply-side studies are mostly conducted on macro data in Pakistan. To address this gap, this study provides insights into how monetary policy affects the financial health and investment decisions of non-financial firms, and how these effects vary by sectoral characteristics.

II. How important are interest rates in shaping firms' price increase decisions?

Before we explore the financial data of listed companies, we analyze the qualitative insights available from SBP's Price and Wage Setting Behavior Survey (2022). According to the responses of 1,237 firms from various manufacturing and services sectors of Pakistan, financial cost is not amongst the most important factors that lead to increase in the prices of goods and services (Inayat & Naeem, 2025). Instead, cost of raw materials, energy prices, labor cost, exchange rate and taxes are the top five factors that lead to increase in the prices of goods and services. **Figure 2** shows that financial/capital cost is ranked one of the lowest when it comes to its role in increasing the price of good and services in Pakistan. Only 3 out of 37 sectors surveyed i.e. Food and beverage services, Computer programming, and consultancy, and Real estate sectors rank financial and capital cost as one of the top 5 factors that lead to increase in the prices of their services. Interestingly, all of these sectors belong to the non-manufacturing sector. In fact, non-manufacturing firms ranked financial/capital costs as more important in their price increase decisions compared to manufacturing firms.

This finding suggests that the impact of contractionary monetary policy on increasing the prices through the cost channel may be limited in Pakistan. These results could be due to a host of factors such as timing of the survey, low level of financial leverage, and firms' adaptability to changes in interest rates through better cash flow management strategies. In the next section, we have discussed these aspects in detail.

Figure 2: Industry view on Price Pressures: Which Factors Matter the Most?



This box plot is based on firms' responses from the Price and Wage Setting Behavior Survey. Each box plot represents how 37 different sectors perceive the importance of various cost pressures in driving price increases for their main product or service.

III. How are firms impacted by the changes in the monetary policy? Insights from the firm-level data

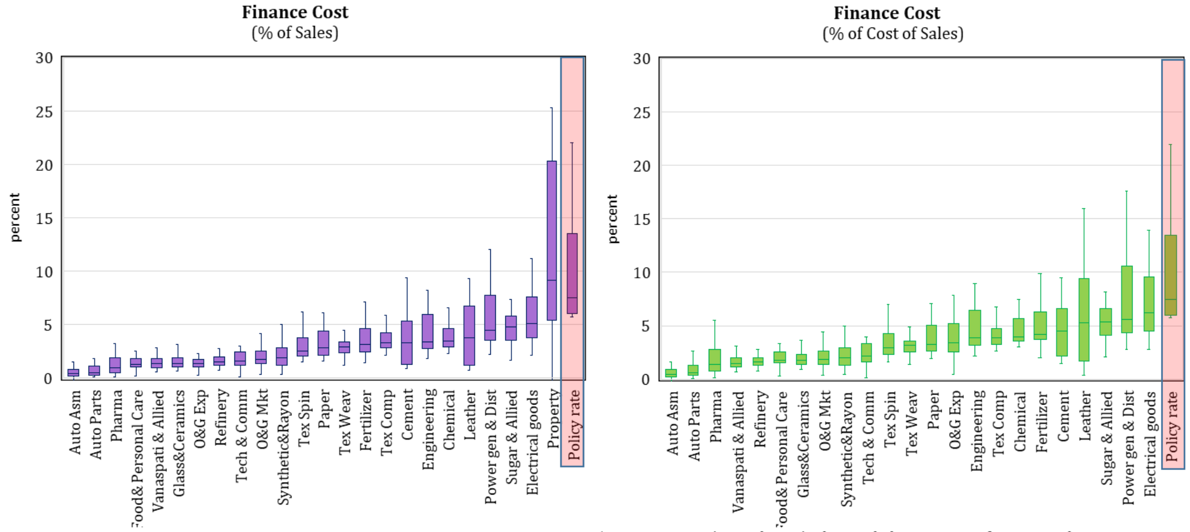
To analyze the underlying reason behind the survey findings and gauge how the firms react to changes in the interest rates, we have used quarterly data of 176 non-financial listed companies of the Pakistan Stock Exchange (PSX). These companies belong to 24 different sectors with data spanning from 2015Q1 till 2024Q3. Importantly, we have restricted the sample to only those companies that were in business and have demonstrated a reasonable level of accuracy in reporting their financial statements during the review period. For instance, a few companies were dropped from the sample because either they were not in the business during the initial years of our sample period or might have been delisted during the later years of our sample period. This was done to ensure the consistency of the sample. For example, if a large company is delisted from the PSX but remains in the business, the sectoral level financial data will register a sharp decline that is not driven by any macroeconomic fundamental. Excluding such companies from the sample is often considered undesirable given the fact that it leads to a survivorship bias in the sample, however, this is not the problem in our case. This is because in our data set, the companies only got delisted but continued to remain in the business.

Aggregating this firm-level information at the sectoral level, we have analyzed multiple aspects of monetary policy on the financial performance and financial decisions of the 24 sectors in our sample. To answer the key question of how the cost structure and profitability of different sectors is affected in response to changes in the monetary policy, we have analyzed the adaptability of the sample companies using indicators like finance cost to sales ratio (and finance cost to cost of sales), degree of financial leverage, capital expenditure, liquidity management, etc. By evaluating these indicators, we aim to draw insights into firms' adaptability and strategic responses to monetary policy shifts. Some of these stylized facts are detailed below:

i. Around half of the sectors have a finance cost to sales ratio of less than 5 percent

While we have gained valuable insights from the survey data about the relative importance of the finance cost for the manufacturing and non-manufacturing firms, it is important to analyze the significance of finance cost through the financial statements of the listed companies. Though the sample size is fairly small compared to the companies responded to in the survey, this approach has several advantages as well. First, it is not limited to a single time period and second, it focuses exclusively on firms operating within the highly documented sectors of the economy that enhances the credibility of the analysis. **Figure 3** shows the distribution of finance costs across different sectors, measured as a percentage of sales (left graph) and a percentage of cost of sales (right graph). The policy rate is highlighted on the right side of both graphs as a reference point for comparison.

Figure 3: How important are the finance costs?



*property sector is not shown in the graph due presence of extreme values.

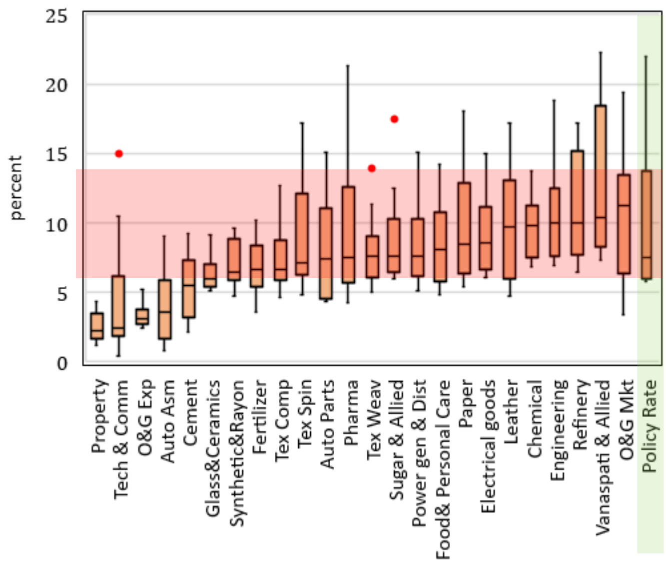
The graphs indicate significant variation in the finance cost burden across sectors. Around 12 out of 24 sectors have a finance cost to sales ratio of less than 5 percent, even during the periods of very high interest rates (22 percent). Most of these sectors also have a low finance cost to cost of sales ratio. This implies that these sectors are less vulnerable to interest rate hikes due to their lower reliance on debt financing, or access to cheaper credit. Besides this, around 8 sectors have a finance cost to sales ratio (and cost of sales) that exceeds 5 percent but remains less than 10 percent. Around 4 sectors bear a disproportionate finance cost burden, making them more exposed to interest rate hikes: property, electrical goods, power generation and distribution, and leather.

These differences may arise due to differences in the relative cost of debt, leverage ratios, pricing power and industry characteristics. The following sections of this study examine each of these factors in detail.

ii. Nearly two-thirds of sectors restrict their average cost of debt under 15 percent

We measure the cost of debt as the ratio of finance cost incurred during the year to the average interest-bearing debt during the year (Francis et al., 2005; Piot & Missonier-Piera, 2007; Pittman & Fortin, 2004; Zoido, 1998, as cited in Lorca, Sánchez-Ballesta, & García-Meca, 2011). The sectoral analysis of the cost of debt reveals significant heterogeneity in the borrowing rates paid by companies (**Figure 4**). The oil and gas marketing stands out with one of the highest cost of debt, primarily on account of higher liquidity requirements due to stuck up funds in the circular debt, reflecting their relatively inelastic demand for loans. On the other hand, property, technology and communication, Oil and gas exploration, Auto assemblers, Cement, Fertilizer and Textile ranks most attractive in terms of their low cost of debt. Each sector has its unique reason for a relatively lower cost of debt. For instance, Textile companies benefitted from having access to subsidized schemes, while Cement and Fertilizer companies having shorter/negative cash operating cycle and access to SBP's concessional financing schemes help them lower their cost of debt.[3] To sum up, around 4 sectors face periods with relatively high cost of debt including Oil and gas marketing, Vanaspati and allied, Refinery and Engineering. Nearly 16 sectors restrict their average cost of debt under 15 percent, reflecting their ability to tap-in concessional financing, generate alternative sources of funding either through utilizing cash balances, suppliers' credit or through better inventory management to avoid borrowing at higher rates; and through a higher share of long-term debt in the overall borrowing mix.

Figure 4: Sector-wise Cost of Debt*



*Debt includes all long-term and short-term liabilities except trade and other payables and accrude interest

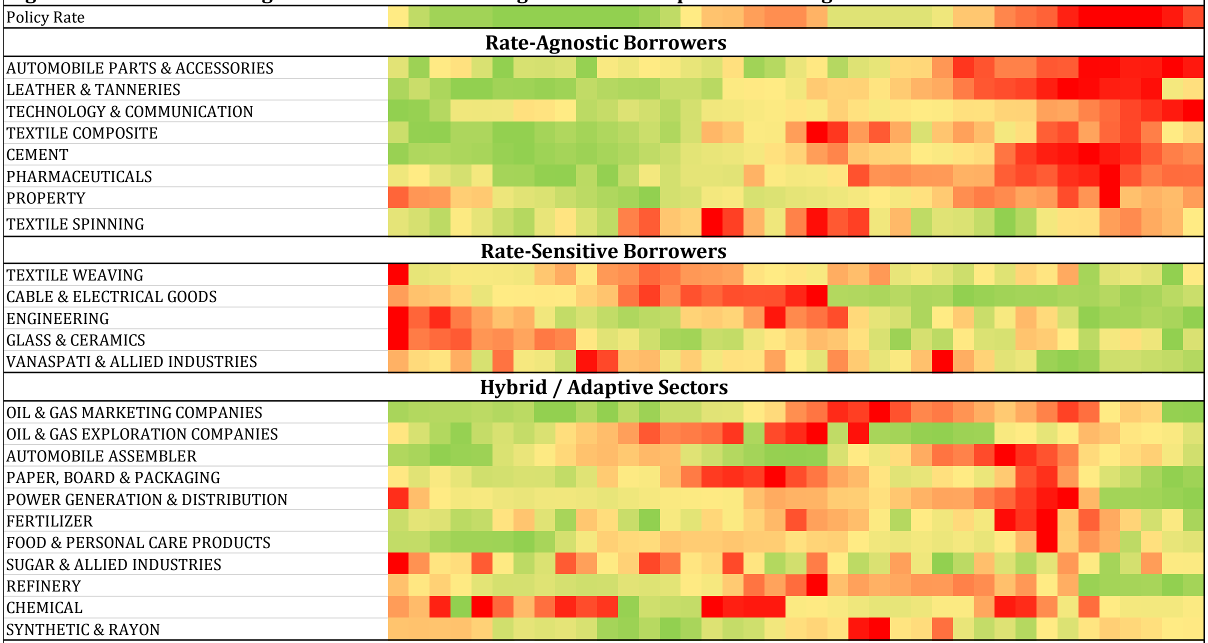
iii. Two-thirds of sectors deleverage in response to rising interest rates

It is interesting to note that response of non-financial firms to changes in the monetary policy is not uniform across sectors (**Figure 5**). We can see three different types of responses: i) firms that increases their leverage when interest rates increases, we call them rate-agnostic borrowers; ii) firms that deleverage during periods of high interest rates, we call them rate-sensitive borrowers; and iii) hybrid/adaptive sectors that initially increases their borrowings but eventually manage to deleverage during very high interest rates. To make our analysis simple, we assume that both rate-sensitive and hybrid/adaptive sectors, that make around 67 percent of our sample, have a standard reaction function of leverage to changes in the interest rates. However, 8 out of 24 sectors (33 percent), either increase their leverage or fail to reduce it significantly in response to rising interest rates, which highlights inability of these firms to avoid borrowing at higher rates, perhaps due to an increase in the demand for working capital loans.

There are various factors behind this unconventional response of these firms. First, Textile sector remained largely hedged with interest rates given their access to concessionary refinance

[3] Negative cash operating cycle occurs when a company receives cash from its customers before it has to pay its suppliers.

Figure 5: Sector-wise Changes in the Financial Leverage of Firms in Reponses to Changes in the Interest Rates



Note: This heat map does not take into account the relative debt levels across sectors. For example, the leverage ratio of Automobile Assembler, technology & communication may be very low compared to the Oil and Gas Marketing companies, which cannot be interpreted from this heat map.

schemes such as EFS and LTFF.[4] Therefore, the attractive rates and arbitrage kept the borrowing appetite for export-oriented sectors intact. Likewise, sectors like Cement and Autoparts benefitted from SBP's concessional financing schemes like LTFF that allowed them to borrow during high-interest rate environment. This is also evident from **Figure 4** that these sectors managed to keep their cost of borrowings low even at high interest rates. Second, for Pharmaceuticals and Leather, the borrowings increased due to higher working capital requirements amid rising input costs. Long-whiskers in **Figure 4** corresponding to these sectors reflect their inability to avoid borrowing at higher rates. Given their low pricing power, Pharma sector benefits from an overall low leverage ratio that insulates the sector's earnings from high interest rates (**see Figure 3**), while Leather faces cost pressures (**Figure 3, right panel**).

iv. Firms front-load investments when interest rates are expected to rise

On a macroeconomic level, higher interest rates are associated with lower investments, also explained by Mankiw 2007 and Blanchard 2017 in their textbooks.

On a contemporaneous basis (**Figure 6a**), the impact of interest rates on the firms' investment decision is not very pronounced. In fact, it shows that firms typically tend to invest slightly higher when the interest rates are in the 10 – 15 percent range, even higher than the period when the interest rates are less than 10 percent. However, when the interest rates increase beyond 15 percent, the investments in property, plant and equipment drop in our sample sectors.

To address this counterintuitive result, incorporating the transmission lags of monetary policy into the analysis makes the relationship between interest rates and firms' investment decisions more pronounced (**Figure 6b**). Firms place greater weight on current interest rates as a baseline

[4] These two refinancing schemes (EFS and LTFF) are set to phase out at the end of a 5-year transition period beginning from July 2023 (Source: International Monetary Fund (2023). Country Report No. 23/260. Washington D.C.: IMF)

Figure 6a: How interest rates affect the Firms' CAPEX*

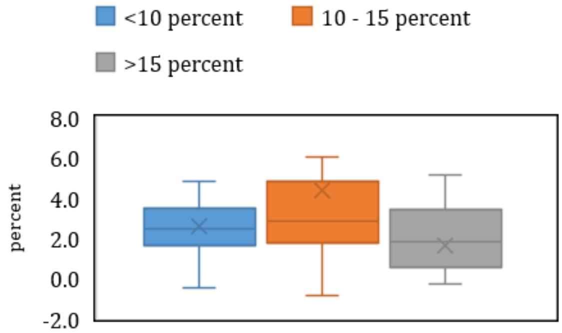


Figure 6b: How interest rates affect the Firms' CAPEX (3 Qtr Lag)*

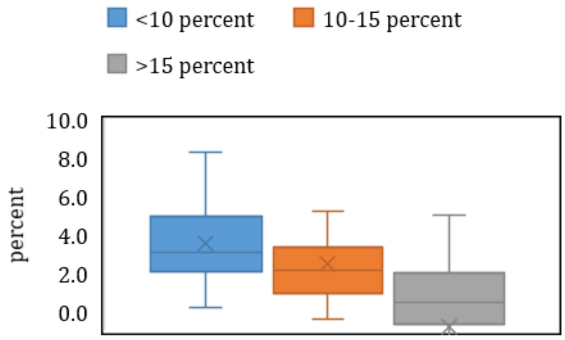
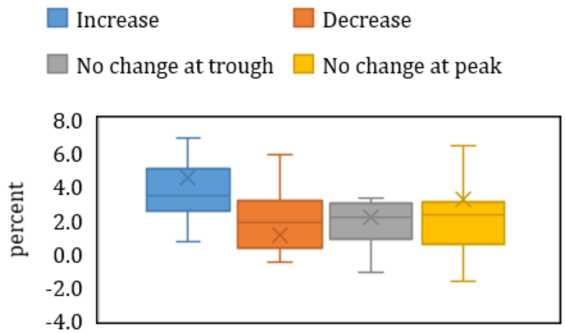


Figure 6c: How interest rate expectations affect the Firms' CAPEX*



*The box plot represents the distribution of average quarter-on-quarter growth in property, plant and equipment across various non-financial sectors in our sample. The averages were computed based on the change in interest rates from the preceeding quarter.

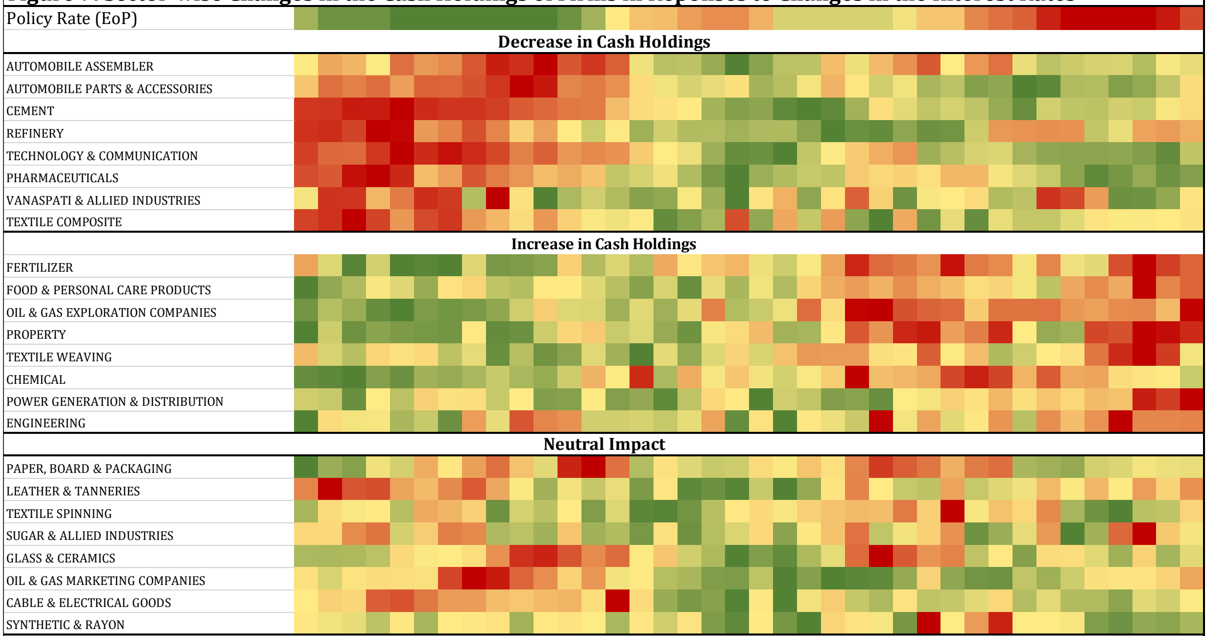
when making future investment decisions, but expectations about the direction of future rate changes also play a critical role. It is evident from **Figure 6c** that if the interest rates are increasing, i.e. firms expect interest rates to increase in future, they tend to front load their investment decision at the start of the tightening cycle. Whereas, in the case of, falling interest rates and status quo scenarios, the firms adopt a business-as-usual strategy, the investments tend to stabilize at a lower level than in the case of increase in interest rates. This finding is similar to the results of Sharpe & Suarez, 2015 where 68 percent of the CFO's indicated that investments are not sensitive to any decline in the interest rates. The commonly cited reasons in this study were ample cash reserves or cash flows; low level of interest rates (both in absolute terms and relative to firm's rate of return); and firm's investment function is more dependent on the product demand and long-term plans instead of current interest rate levels.

v. Only one-third of sectors reduce cash holdings in response to higher interest rates

Interest rates affect not only the capital expenditure of firms but also their liquidity management. This includes the changes in their cash holdings, inventory management, trade credits, short-term borrowings and degree of leverage. It is interesting to see how non-financial firms in Pakistan have reacted to changes in the interest rates.

Theoretical studies claim a negative relationship between corporate cash holdings and interest rates (Baumol, 1952 and Tobin, 1956). However, Stone, Gup, & Lee (2018) found contrasting evidence for the US firms, concluding a positive relationship between cash holdings and

Figure 7: Sector-wise Changes in the Cash Holdings of Firms in Reponses to Changes in the Interest Rates*



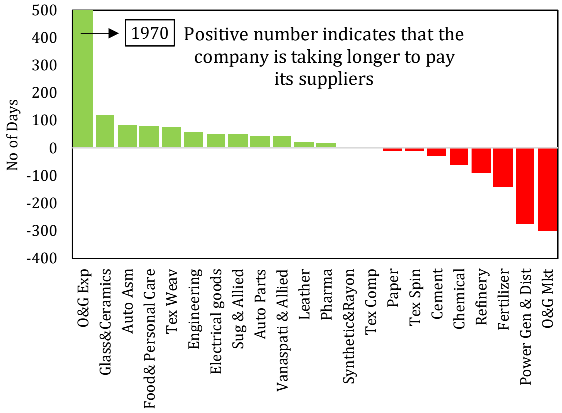
*Cash holdings are calculated using the sum of cash and short term investments as percentage of total assets of the firm

interest rates. To analyze this relationship in the context of Pakistan, we have used ratio of cash and short-term investment to total assets. **Figure 7** shows the three different classifications of sectors based on their response to changes in monetary policy. The first category of sectors (8 out of 24 sectors) has significantly reduced their cash holdings as the interest rates have gone up. These include sectors like Auto, Cement, Refinery, Technology and communication, Pharmaceutical, Vanaspati, and Textile composite. Their behavior is consistent with the theoretical framework of increasing opportunity cost of holding cash that in turn leads to lower cash holdings as argued by Baumol (1952) and Tobin (1956). The second category (8 out of 24 sectors) comprises those sectors that have increased their cash holdings despite increase in the interest rates. These include fertilizer, FMCG, Oil & gas exploration, Textile weaving, Chemical, Power generation & distribution and Engineering. This in contrast with the theory but aligns with the results found in the study of Stone, Gup & Lee (2018). Finally, the remaining 8 sectors out of 24 have maintained their cash holdings and it seems like the interest rates have little or no impact on the cash holdings of these sectors. To sum up, if we combine the second and third categories of the sectors in our sample, i.e. around 16 out 24 sectors, the impact of monetary policy on their cash holdings is not very pronounced.

vi. Cash operating cycle worsens at the peak of interest rate cycle

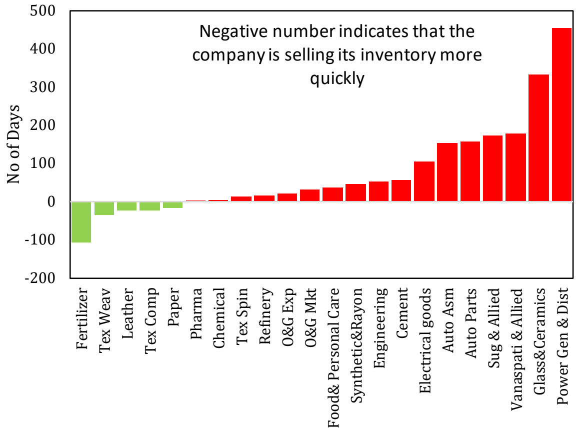
Another important element of working capital management is through optimizing the cash operating cycle of the firm. It indicates the time from paying for inventory/raw materials to collecting cash from customers, measuring how long cash is tied up in operations. **Figure 8d** shows that for most of the sectors the cash operating cycle deteriorates when the interest rates peak compared to the level at the start of the tightening cycle. Only 7 out of 22 sectors show improvement in the cash operating cycle at the peak interest rates that effectively reduces their

Figure 8a: Change in Days Payable Outstanding (Start vs End of Monetary Tightening Cycle)*



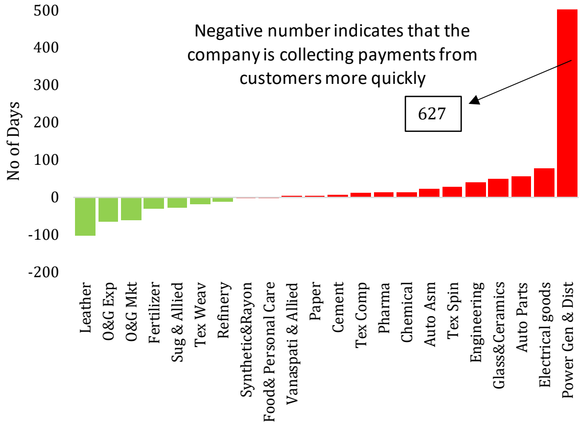
* Average of two-quarters prior to the start of easing and tighteing cycles

Figure 8b: Change in Days Inventory Outstanding (Start vs End of Monetary Tightening Cycle)*



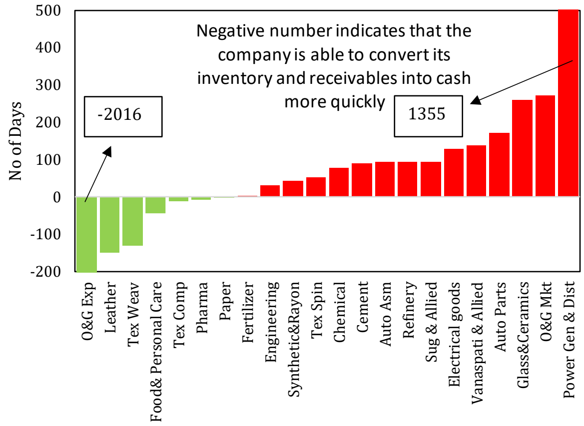
* Average of two-quarters prior to the start of easing and tighteing cycles

Figure 8c: Change in Days Sales Outstanding (Start vs End of Monetary Tightening Cycle)*



* Average of two-quarters prior to the start of easing and tighteing cycles

Figure 8d: Cash Operating Cycle (Start vs End of Monetary Tightening Cycle)*



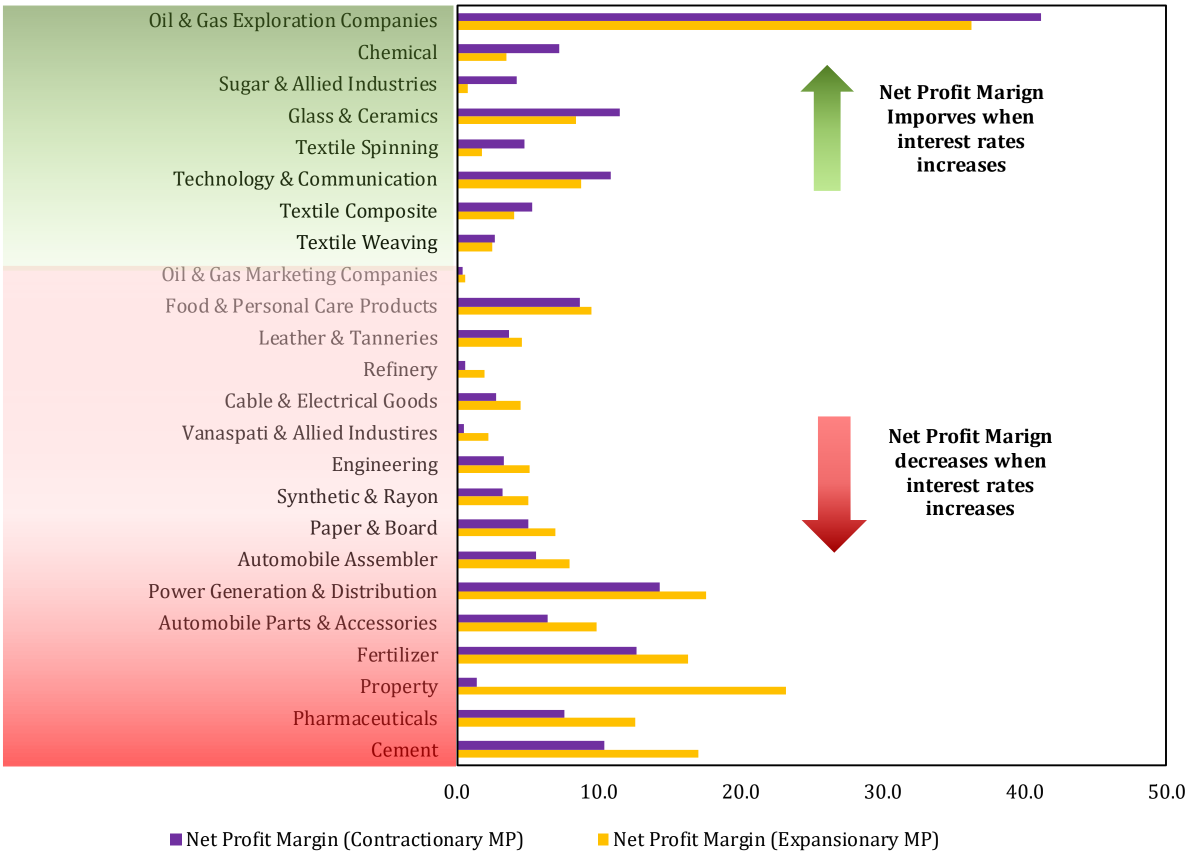
* Average of two-quarters prior to the start of easing and tighteing cycles

reliance on loans to meet their working capital needs.[5] For the remaining 15 sectors, the cash operating cycle worsens at the peak of the interest rate cycle compared to the trough.

It is interesting to see that most of the sectors (13 out of 23) take longer to pay back their supplier's credit at the peak interest rates (**Figure 8a**). However, since firms find it more challenging to sell their inventory quickly at high interest rates, the cash conversion cycle of inventory deteriorates for most of these sectors (**Figure 8b**). This combined with some worsening in the cash recovery period from the debtors (**Figure 8c**) lead to a worsening of the cash operating cycle of most of the firms. This result is in line with findings of Bernanke and Gertler (1995), and Ramey (1992) that suggest that aggregate inventories and receivables increases relative to sales during the periods of monetary contraction. As a result, despite a disincentive to borrow at higher interest rates, firms are forced to take loans to meet their working capital needs or otherwise arrange additional working capital through liquidation of assets / investments.

[5] Property and Technology and Communication sectors was excluded from the analysis due to the presence of outliers and the distinct nature of the business.

Figure 9: Impact of Monetary Policy on Net Profit Margins*



* Note: Sectors at the top of this chart indicates those sectors that are able to increase their net profit margins when interest rates increases, while those at the bottom represent those whose profitability is negatively affected.

vii. Profitability declines for two-thirds of the sectors as interest rates increase

It is evident that the impact of monetary policy is not symmetric across sectors (**Figure 9**). Around 33 percent of the sectors (8 out of 24) witness increase the profitability (net profit margin) when the interest rates increase, highlighting offsetting impact of other factors that help these firms improve their profitability. Further analysis of these sectors reveals that 5 out of 8 sectors are rate sensitive (or hybrid) sectors i.e. the sectors that have the capacity to decrease their leverage when interest rates increase. The remaining three sectors are Textile composite, Textile spinning, and Technology and communication. For the Textile sector, the concessionary financing schemes, export centric business model helped them to circumvent higher borrowing costs. On the other hand, Technology and communication sector benefits from diversified revenue streams and exposure to foreign clients, which supports topline growth while helping to keep financing costs in check. In contrast, the remaining 16 sectors recorded a decrease in their profitability as interest rates rose.

viii. Assessment of Sectoral Exposure to Interest Rate Shocks

The impact of monetary policy is different across sectors. The degree to which the firms can pass on the impact of an increase in the finance cost to their consumers depends on a number of factors like how significant these costs are, the ability of the firms to avoid borrowing at higher rates, and the nature of demand. Based on the analysis we have done in this study, we have categorized the sectors into three main categories i.e. most vulnerable, resilient performers, and low-risk sectors (**Table 1**). However, these results should be interpreted in light of the evolving dynamics of individual sectors. For example, during our sample period, the textile sector demonstrated resilient performance. Yet, with the gradual phase-out of SBP's concessionary financing schemes, the sector has become increasingly exposed to interest rate risk due to its higher reliance on borrowings.

IV. Conclusion:

Our analysis shows that financial cost overall is not a dominant driver of price increases across sectors. Despite high interest rates, more than half of the sectors (in the sample) maintain an average cost of debt below 15 percent, owing to concessional financing schemes and adaptability of the firms to reduce borrowing during periods of high interest rates. Most firms respond to rising interest rates by deleveraging, delaying their payments to their suppliers and reducing their capital expenditure at high interest rates. However, when the firms expect interest rates to rise further, they tend to front-load their investments. High interest rates also prolong their inventory cycle that reflects demand contraction in the economy. In addition, most of the

Table 1: Assessment of Sectoral Exposure to Interest Rate Shocks

Category	**Sectors**	**Weight in GDP**	**Share in Private Sector Credit**
Most vulnerable* (High/medium leverage, high finance cost, worsened margins)	Cable & Electrical Goods, Property, Leather & Tanneries, Refinery, Engineering	6.9 percent	7.1 percent
Resilient performers (Low/medium leverage, low finance cost, improved or stable margins)	Glass & Ceramics, Textiles, Oil & Gas Exploration, Chemical, Sugar, Technology and Communication	6.5 percent	30.7 percent
Low-risk sectors (Low/medium debt, low finance cost, neutral operating impact)	Pharmaceutical, Synthetic & Rayon, Fertilizer, Paper, Board and Packaging, Auto Assembler, Cement	1.6 percent	8.1 percent

*Power Generation sector fits the criteria of most vulnerable category given its relatively higher reliance on debt financing and high finance cost. However, due to its take-or-pay agreements with the government, this sector took only a minimal hit on its profitability. Therefore, this sector was excluded from this group.

sectors experience a decline in profitability during monetary tightening hinting towards lower ability of the firms to transfer the entire burden of rising costs to its consumers.

In summary, firms adapt to rising interest rates by deleveraging, relying on concessionary financing, delaying their capital expenditures, and compromising on their profitability margins. However, the results of this study should be interpreted in light of its data limitations. The sample period covers data pertaining to only one complete interest rate cycle. Further, this study presents key stylized facts and insights from the firm-level data that highlight a few factors which may weaken the cost-channel of monetary policy in Pakistan. Future research work can build on the initial findings of this study to empirically examine the cost-channel of monetary policy in Pakistan and to generalize key results over a longer period.

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