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Impact of External Shocks and Exchange Rate Movements on Retail and Wholesale Prices in Pakistan: A Granular Level Analysis

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Abstract: This study assesses the impact of external shocks and exchange rate movements on prices. The main benefit of this granular analysis is its ability to capture heterogeneous impacts across different products and geographical areas, which is often overlooked in macro-level studies. The model includes four global shocks: global inflation, US industrial production, global food inflation, and global oil prices. Regarding domestic factors, exchange rate, inflation expectations, and inflation persistence are considered. The dependent variables are prices, including 356 items from the Urban Consumer Price Index (CPI), 244 items from the Rural CPI, and 110 items from the Wholesale Price Index (WPI), all measured monthly. The results show that global food prices have the most significant influence on both national CPI and WPI inflation, while global oil prices have the least impact on consumer and wholesale inflation in Pakistan. Domestically, the exchange rate shows the highest pass-through effect on inflation, with inflation expectations and persistence having comparatively lower impacts.

Keywords: Exchange Rate, Global Shocks, Oil Price Shocks, Inflation, Prices, Pass-Through.

JEL Classification: E31, Q41.

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Impact of External Shocks and Exchange Rate Movements on Retail and Wholesale Prices in Pakistan: A Granular Level Analysis*

1. Introduction

The New Keynesian Phillips Curve (NKPC) framework emphasizes two key determinants of inflation: inflation expectations and real marginal cost. This is based on the rational expectations theory, where agents form expectations about future economic variables in a forward-looking manner. Extensions to the basic NKPC include introducing backward-looking elements (adaptive expectations) to account for inertia or persistence in inflation, leading to the Hybrid NKPC. Additionally, for small-open economies like Pakistan that are vulnerable to global supply-side dynamics, the NKPC framework incorporates supply-side shocks such as exchange rate fluctuations and other global shocks (Dua & Guar; 2010; Forbes, 2019).

Due to the strong theoretical foundations of the NKPC and its variants, this paper uses the NKPC framework. In the New Keynesian Phillips Curve (NKPC) framework, inflation is primarily driven by economic activity and inflation expectations. The NKPC includes forward-looking components, such as expected future inflation, along with current economic slack and nominal rigidities. These rigidities—originating from menu costs, frictions, and contractual constraints—prevent firms from frequently adjusting their prices. However, when firms do have the opportunity to reset prices, they base their decisions on both current and anticipated economic conditions. This forward-looking behavior makes expected inflation a key factor in determining actual inflation within the NKPC framework.

In the hybrid version of the NKPC, where firms also consider past prices, lagged inflation becomes an additional determinant. Real marginal cost, which indicates the state of economic activity, is another key driver: it increases during periods of strong demand and tight resource constraints, contributing to inflation, and decreases when demand is weak, easing inflation pressures.

* The views expressed in this paper are those of the authors not State Bank of Pakistan.

Furthermore, Batini et al. (2005) expand the NKPC by including the exchange rate along with economic activity indicators as additional determinants of inflation. Considering both the theoretical basis and empirical evidence, we adopt the NKPC framework to analyze how sensitive retail and wholesale prices in Pakistan are to external and exchange rate shocks.

A small open economy like Pakistan is especially vulnerable to external shocks and fluctuations in the exchange rate. Therefore, estimating the exchange rate pass-through (ERPT) is vital in Pakistan's context. The literature shows mixed results regarding the importance of ERPT. For example, Hyder and Shah (2005) report low ERPT to both wholesale prices (WPI) and consumer prices (CPI), while Siddiqui and Akhtar (1999), Choudhri and Khan (2002), Choudhri and Hakura (2006), and Jaffri (2010) find no significant evidence of ERPT.

One possible explanation for these mixed results is sectoral heterogeneity, which may have biased the ERPT estimates. Mumtaz, Oomen, and Wang (2006) point out that such heterogeneity can distort dynamic regression results. Therefore, it is important to measure ERPT using disaggregated price data instead of relying solely on aggregate price levels.

Furthermore, we aim to quantify the intensity of these shocks across various sub-indices of CPI and WPI using the NKPC framework. Importantly, the empirical methodology addresses distortions caused by base effects by utilizing month-on-month changes in prices and other explanatory variables, as done in Hayashi et al. (2015). Another key aspect of this analysis is the use of micro-level price data. This approach is vital because aggregate price indices often overlook the heterogeneity among different products, which can lead to estimation bias (Mumtaz, Oomen, and Wang, 2006).

We present two main findings:

1. Among external shocks, global food prices have the most significant impact on consumer (CPI) and wholesale (WPI) inflation, while global oil prices have the least impact on inflation in Pakistan.
2. Regarding domestic shocks, we find that the exchange rate has the highest pass-through effect on inflation, whereas inflation expectations and persistence have comparatively lower impacts.

Existing studies analyze the pass-through of these supply-side shocks and their divergence across different countries and industries (Choi et al., 2018; Cunado and Perez, 2005; Finck and Tillmann, 2022; Jongrim et al., 2023). They can be broadly categorized into two main themes: the first focuses on assessing the impact of exchange rate pass-through on domestic prices, while the second examines the effects of external shocks, such as oil price fluctuations, on domestic inflation. The following section discusses the existing studies on these two strands of literature.

2. Literature Review

Exchange rate pass-through (ERPT)

Exchange rate pass-through (ERPT) is generally defined as the extent to which exchange rate changes are reflected in the prices of domestic goods and services over time. The topic is of particular interest to central banks, whose key goals include inflation and price stability. Academic surveys by Menon (1995), Mishkin (2008), and Burstein and Gopinath (2014) comprehensively document the various works conducted previously and recently on ERPT. ** The focus of these studies has, however, been on advanced economies and the magnitude of ERPT in those regions.

In emerging economies, the empirical literature generally reports a higher pass-through magnitude compared to developed economies; mostly in the range of 0.20 to 0.50 percent in the long run. Choudhri and Hakura (2006) reported that, in a large sample of emerging market economies during 1979-2000, the average one-year ERPT was 0.26 percent (with some individual pass-through as high as 0.40 percent). Similarly, Goldfajn and Werlang (2000) studied 71 developed and emerging market countries and found that the pass-through in consumer prices is relatively higher in emerging market economies than in developed economies.

Table 1: Selected Empirical Literature on Exchange Rate Pass-through in Pakistan

Authors	Methodology and Data	Variables	Key Findings
Siddiqui and Akhtar (1999)	Co-integration, Error-correction Model; Annual data, 1972 - 98	CPI, WPI (foreign), CPI (foreign), GDP, M2, bond yields	No significant causal relationship between changes in exchange rate and domestic prices.
Choudhri and Khan (2002)	VAR, Difference Model; Quarterly data, 1982:01 – 2001:02	CPI, WPI, foreign CPI, real effective exchange rate (REER)	No evidence of a significant pass-through of rupee depreciations to consumer prices both in the short run as well as after two years.
Hyder and Shah (2005)	Recursive VAR; Monthly data, 1988:01 – 2002:12	Oil price, Quantum Index of Manufacturing (QIM), M2, WPI, CPI, bilateral Pak rupee-US dollar nominal rate	ERPT is higher in WPI than CPI prices. After one year, given one percent change in exchange rate, pass-through to WPI and CPI prices stood at 0.15 and 0.11 percent, respectively. Also, the exchange rate pass-through to consumer prices have further weakened after the free float of Rupee/Dollar parity in July 2000 and resultant structural changes in the economy.
Choudhri and Hakura (2006)	Difference Model; Annual data, 1979 – 2000, 71 countries	CPI, foreign CPI, nominal effective exchange rate (NEER)	Pakistan specific results: No evidence of pass-through of rupee depreciation to consumer prices even after two years (negative/close to zero).
Jaffri (2010)	Difference Model; Monthly data, 1995:01 – 2009:03	CPI, NEER, foreign CPI, REER misalignment	Both short-run and long-run ERPT to consumer price inflation in Pakistan is very low (close to zero). Also, rupee overvaluation in the previous period significantly reduced inflation in managed exchange rate regime. However, coefficient of lagged real exchange rate misalignment is low but remains significant in whole sample.

Source: Author's compilation based on the reviewed literature

In the case of Pakistan, Table 1 presents recent empirical studies on ERPT in the country. The results from these studies generally indicate little to no impact of exchange rate changes on domestic prices in Pakistan. For

instance, Siddiqui and Akhtar (1999), Choudhri and Khan (2002), and Choudhri and Hakura (2006) find no causal link between exchange rate fluctuations and domestic prices. Conversely, Hyder and Shah (2005) report statistically significant but low ERPT to both wholesale prices (WPI) and consumer prices (CPI). More recently, especially after the 2008 balance of payments crisis, Jaffri (2010)—by including the misalignment of the Pakistani rupee in real terms as an additional explanatory variable—also finds no evidence of pass-through to domestic prices.

The pricing-to-market (PTM) literature, introduced by Krugman (1987) and popularized in open macroeconomics by Betts and Devereux (1996), has opened a new field of research by emphasizing the importance of incomplete pass-through. The weak sensitivity of import prices to exchange-rate movements is now well documented, and it contradicts the standard view of a complete pass-through of currency shocks into consumer prices. Macroeconomists have long studied how prices respond to exchange rates; one notable example is Engel (1993). The empirical work of Goldberg & Hellerstein (2007), Nakamura (2008), and Nakamura and Steinsson (2010) highlights some important differences in price dynamics at the retail versus wholesale levels.

Furthermore, using a large panel dataset on prices at the barcode for a cross section of retailers in the United States, Nakamura (2008) finds that only 16 percent of the variation in prices is common across stores selling the same product. Sixty-five percent of the price variation is shared among stores within a particular retail chain (but not across different chains), while 17 percent is idiosyncratic to the store and product. The results indicate that most of the observed price variation stems from retail-level rather than manufacturer-level demand and supply shocks.

Gaulier et al. (2008) examine exchange-rate pass-through at the product level across many countries. The empirical analysis indicates that pricing behaviors are dichotomous, with complete pass-through in about 25 percent of sectors and significant pricing-to market in the others. The average long-run pass-through coefficient is nearly 80 percent; however, this masks a strong heterogeneity of pass-through behavior among sectors. This research clearly shows that pass-through is incomplete in the short run, with a short-run ERPT coefficient around 0.5 or 0.6, meaning a 10 percent appreciation of the exporter's currency results in a 5 to 6 percent increase in foreign prices (measured in the importer's currency). Over the long term, pass-through tends to be higher and close to 1, although differences across countries still exist.

A significant portion of the related empirical literature focuses on estimating ERPT coefficients using macro (i.e., aggregate) data. Relying on aggregate price indices has the disadvantage of overlooking ERPT heterogeneity across different products. This oversight means that the relative effects of macroeconomic and industry-specific variables on pass-through cannot be accurately identified. Mumtaz, Oomen, and Wang (2006) demonstrate that neglecting sectoral heterogeneity can lead to estimation bias, especially in the context of dynamic regression estimates.

External Shocks

Besides the exchange rate, external factors such as global output and fluctuations in worldwide oil prices also influence domestic inflation outcomes. The recent COVID-19 pandemic offers a clear example: inflation initially declined globally but was followed by a sharp increase in many countries. This surge was mainly driven by a rebound in global demand as businesses and travel restarted, combined with supply chain disruptions and volatile commodity prices. These pressures were further amplified by geopolitical tensions in Europe and the Middle East. In this context, it is important to analyze the connections between external shocks and inflation.

Existing studies on the topic present mixed results. Some findings suggest that local inflation is primarily driven by global factors, while others conclude that external factors have a limited impact on domestic inflation. For instance, Ciccarelli and Mojon (2010), Neely and Rapach (2011), Charnavoki and Dolado (2014), and Mumtaz and Surico (2012) have shown that global inflation significantly influences domestic inflation trends. Similarly, a recent study by (Jongrim et al. 2023) concluded that global shocks have become more important in explaining domestic inflation over time. They found that global shocks play a more significant role in explaining domestic inflation compared to global oil prices. They discovered that about 26 percent of the variation in domestic inflation is explained by global shocks, whereas only 4 percent is explained by oil price shocks. Similarly, studies have been conducted exclusively on the impact of global oil prices on domestic inflation. For example, (Choi et al., 2018) found that a 10 percent increase in global oil prices leads to a 0.4 percentage point increase in domestic inflation, while Cunado and De Gracia (2005) found a weak impact of global oil prices on consumer prices in six Asian countries.

Regarding studies that support the idea that domestic factors play a major role in explaining inflation, Förster and Tillmann (2014) found that

country-specific factors account for most of the inflation in both emerging and industrialized economies. Similarly, Parker (2018), analyzing a large sample of developing countries, provides evidence supporting the influence of domestic drivers of inflation, while only certain factors, such as oil and food, are affected by global shocks.

Therefore, in this context where there is no consensus on the role of global shocks and oil prices in explaining domestic inflation, and where most studies conducted on Pakistan show no significant impact of exchange rate pass-through on consumer prices, it is important to examine these linkages using micro-level data. This study investigates how changes in exchange rates and global shocks, especially global oil prices, affect domestic inflation in Pakistan.

Inflation Persistence and Inflation Expectations

The price-setting behavior of firms emphasizes the significance of both inflation inertia and inflation expectations in determining current inflation. In Pakistan, Mukhtar and Yousaf (2014) estimate both the simple and hybrid versions of the New Keynesian Phillips Curve (NKPC). Their results indicate that, while expected inflation and the output gap significantly influence inflation, the hybrid model shows a stronger influence of lagged inflation. Incorporating external factors into the hybrid NKPC, Riffat, Yousaf, and Mukhtar (2016) also highlight the significant influence of past inflation. Similarly, Tauseef, Chaudhary, and Tauheed (2024) demonstrate that inflation dynamics in Pakistan are largely driven by inertia, indicating the prevalence of adaptive expectations. On the other hand, Satti (2007) and Saqib (2024) emphasize the important role of forward-looking expectations in determining inflation. Hyder and Hall (2020) estimate both versions of the NKPC for Pakistan's agriculture, manufacturing, and services sectors. Their results indicate that the manufacturing sector shows more forward-looking behavior compared to the services and agriculture sectors.

This paper investigates the pass-through effects of exchange rate movements, international oil prices, U.S. industrial production (US IPI), global consumer prices (world CPI), and global food inflation on disaggregated prices in Pakistan. To improve the model specification, we include dummy variables to account for major global and domestic shocks, such as geopolitical events, the global financial crisis, COVID-19, domestic floods, and other local disruptions. We exclude the federal funds rate

because global demand is proxied by the US IPI, while supply shocks are captured through international oil prices.

However, there is growing concern about China's increasing role in global demand and supply dynamics. Traditionally, global demand has been measured by U.S. production activity, overlooking economic developments in China. This approach stems from several factors: the dominance of U.S. consumption in global demand, better data quality and availability, strong global financial ties with the U.S., broader spillover effects, and the overall influence of U.S. economic activity on the global economy.

The rest of the paper is organized as follows: Section 3 describes the data and methodology, Section 4 presents the empirical results, and Section 5 concludes with implications and suggestions for future research.

3. Data and Methodology

The data sample includes the prices of a total of 710 items: 356 items from the Urban Consumer Price Index (CPI), 244 items from the Rural CPI, and 110 items from the Wholesale Price Index (WPI). The sample covers the period from July 2016 to March 2024 on a monthly basis. Regarding explanatory variables, the exchange rate is used to assess the impact of exchange rate pass-through, while global oil prices, world food prices, US industrial production, and the World CPI are included to capture the effects of global shocks, following the approach of Jongrim et al. (2023). The summary statistics for these variables are presented in Table 2.

Table 2: Summary Statistics of the Variables

	Exchange rate	Global Oil Price	US Industrial Production	World CPI	World Food Inflation	GX1*	…	GX710*
Mean	1.16	0.42	1.22	0.20	0.45	1.51		1.25
Median	0.51	0.28	3.01	0.20	1.00	0.52		0.00
Std. Dev.	2.62	3.04	9.90	4.81	4.12	4.78		3.10
Skewness	1.23	0.67	-0.56	-2.39	-0.84	1.03		2.54
Kurtosis	7.94	5.01	5.70	29.18	4.20	4.29		9.94
Observations	92	92	92	92	92	92		92

Source: Authors' calculations based on data of Pakistan Bureau of Statistics
Sample Period: July 2016 – March 2024
* For presentation purposes, the summary statistics of only first and last items of the CPI and WPI are shown in the table.

Using the price data, the percentage change in inflation is calculated for each of these 710 items to be used in the models. Similarly, explanatory variables are also measured as percentage changes for model estimation. This approach ensures that the variables are stationary for estimations. We estimated the model with simple OLS to empirically investigate the role of external shocks on inflation in Pakistan, while controlling for seasonality using the recursive estimation technique of (Jiang et al., 2021). The model treats inflation as the dependent variable, with right-hand side variables including percentage changes in the exchange rate; external shocks are modeled using global oil prices, world food prices, US industrial production, world CPI, and seasonal dummies. Domestic output gap is used as a control variable. We specifically use MoM change to avoid the issue of the base effect, as suggested by (Hayashi et al. 2015).

Furthermore, we analyze the hybrid NKPC specification to measure the role of persistence and expectations. With commodity-level data, there is no risk of reverse causality; therefore, we use the OLS method to estimate the hybrid NKPC as follows.

$$\pi_{i,t} = \alpha_i + \sum_{j=1}^{12} \beta_{i,j}^{b} * \left(\pi_{i,t-j}\right) + \sum_{j=1}^{12} \beta_{i,j}^{f} * \left(\pi_{i,t+j}\right) + \sum_{j=1}^{12} \kappa_{i,j} * \left(\hat{Y}_{t-j}\right) + + \sum_{j=1}^{12} \beta_{i,j} * \left(\mathrm{ER_{t-j}}\right) + \sum_{j=1}^{12} \delta_{i,j} * \left(\mathrm{Oil_{t-j}}\right) + \sum_{j=1}^{12} \theta_{i,j} * \left(\mathrm{W_{t-j}^{food}}\right) + \sum_{j=1}^{12} \gamma_{i,j} * \left(\mathrm{IP_{t-j}^{US}}\right) + \sum_{j=1}^{12} \kappa_{i,j} * \left(\mathrm{W_{t-j}^{CPI}}\right) + \sum_{j=1}^{11} \eta_j * SD_j + \mu_{i,t} \quad (1)$$

Where $\pi_{i,t}$ is MoM inflation of i[th] item at month t, $\mathrm{ER_t}$ is MoM change in the exchange rate at month t, $\mathrm{Oil_t}$ is MoM change in the global oil prices at month t, $\mathrm{W_t^{food}}$ is MoM change in the world food prices at month t, $\mathrm{IP_t^{US}}$ is MoM change in the industrial production of the US at month t, $\mathrm{W_t^{CPI}}$ is MoM change in the world CPI at month t, $\hat{Y}_t$ is the domestic output gap at month t, and SD_j is the seasonal dummy for each month.

To capture the impact of inflation persistence, a single equation Hybrid NKPC is estimated for all items in the CPI and WPI baskets. Inflation persistence is estimated by summing the significant coefficients ($\beta^b$of the lead of inflation in equation 1. Although the inflation expectations variable can be derived from the SBP-IBA Consumer Confidence Survey, the bi-monthly frequency of this survey restricts the degrees of freedom of the model. Therefore, we consider the lead of realized inflation as an indicator of inflation expectations.

Regarding lag selection, we use the General to Specific approach based on Hendry (1995). In this process, all maximum lags of potential regressors are initially included in the baseline set of determinants. Only the selected lags, determined by imposing any information criterion, are included in the final model. The procedure starts by choosing the variable with the lowest p-value, then adds the next lowest p-value variable if the first is already included. Both variables are then evaluated against a criterion based on p-values for potential removal. Any variable with a p-value exceeding this criterion is eliminated. Next, the following variable is added, and at each step, all previously included variables are reevaluated against the removal criterion. This continues until the lowest p-value among the remaining variables exceeds the specified stopping criteria.

4. Results and Discussion

In the first step of the empirical analysis, we checked the stationarity of the variables. Table 3 summarizes the Augmented Dickey-Fuller (ADF) test results for our variables. We found that all the variables were stationary at levels. The model suggests that external shocks have a very limited pass-through effect on the disaggregated prices in Pakistan.

Table 3: Augmented Dickey Fuller Test*

Explanatory Variables	t-statistic	P-Value
Exchange Rate (MoM Change)	-7.07	0.00
Oil (MoM Change)	-6.96	0.00
US Indus Production (MoM Change)	-5.59	0.00
World CPI (MoM Change)	-1.6	0.1
World Food (MoM Change)	-7.09	0.00
Dependent Variable		
X1	-8.06	0.00
⋮		
X710	-7.19	0.00

Source: Authors' calculations
* Null Hypothesis: The series has a unit root

Figure 1 illustrates the effect of global prices on the individual items of Urban-CPI, Rural CPI, and WPI. The kernel density is adjusted for each item's relative importance using their weights in the aforementioned indices. The graph clearly shows that most items remain unaffected by global inflation. The cumulative distribution, displayed in Figure A1 in the

annexure, indicates that about 50 percent of CPI items experience a positive pass-through of global prices within 12 months, while only 35 percent of WPI items do so in the same period. However, it is important to note that WPI items with a pass-through greater than zero tend to have a higher magnitude compared to CPI items. This is reflected in the slope of the CPI and WPI Cumulative distribution curves in Figure A1 in the annexure. Overall, a 100 basis point increase in global inflation results in an 18 basis point decrease in NCPI and a 22 basis point decrease in WPI over 12-month period (Table 4). The seemingly counterintuitive negative effect of global inflation on domestic inflation may be explained by subsidies and administered prices within Pakistan's CPI and WPI baskets.

The second external shock we examined using our model is global food prices (Figure 2). This shock is important to include because food has a significant weight in the CPI basket and makes up a substantial part of our trade, excluding petroleum products. CPI rural inflation tends to be less affected compared to urban inflation. Wholesale prices, however, show a greater impact than retail prices, possibly because of a higher share of imported goods in the WPI basket. Notably, the effect of global food prices has a stronger impact on domestic prices than the overall global inflation, as discussed above. Our estimates indicate that a 100 bps increase in global food prices leads to a 33 bps rise in the NCPI and a 49 bps rise in the WPI over a 12-month period (Table 4).

Table 4: 12-Month Cumulative Impact of selected shocks (100 bps) on Inflation in Pakistan

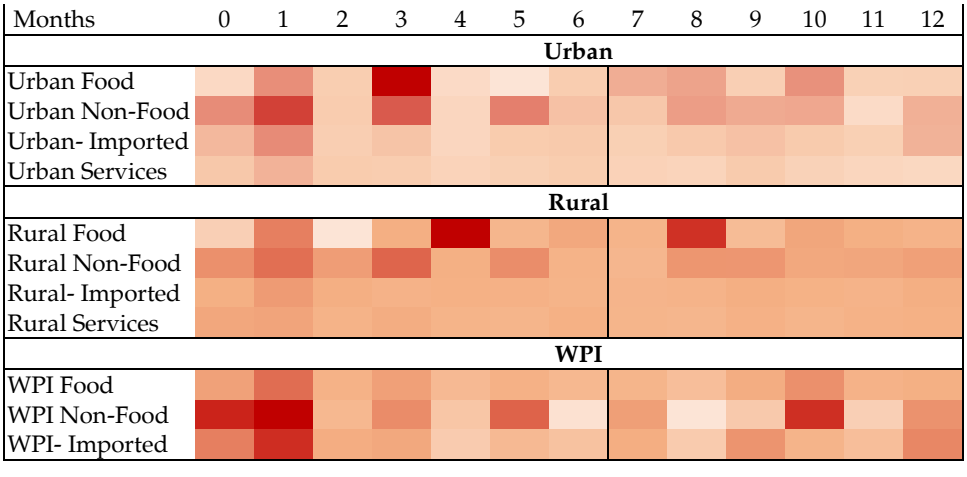
	CPI-Urban	CPI-Rural	NCPI	WPI
External Shocks				
Global Inflation	-0.22	-0.11	-0.18	-0.22
World Food Prices	0.37	0.29	0.33	0.49
US Industrial Production	-0.13	-0.08	-0.11	-0.13
Global Oil Prices	0.03	0.02	0.03	0.04
Domestic Shocks				
Exchange Rate	0.66	0.51	0.60	0.39
Expectations	0.18	0.21	0.19	0.03
Persistence	0.17	0.29	0.22	-0.23

Source: Authors' calculations

Besides the supply-side factors, global economic activity is also an important factor that can impact domestic inflation in a small-open economy like Pakistan. To proxy global economic activity or demand-side pressures, we used US Industrial Production. Figure 3 illustrates how global demand pressures affect retail and wholesale prices in Pakistan. The graph clearly shows that global economic activity had a little impact on Pakistan's inflation when other controls are included in the model. Our estimates indicate that a 100 bps shock to US industrial production results in an 11 bps decline in NCPI and a 13 bps decline in WPI of Pakistan over 12-month period. Moreover, compared to shocks from global inflation and global food inflation discussed earlier, global activity has the smallest effect on domestic inflation in Pakistan. The counterintuitive finding that rising US production reduces inflation in Pakistan can be explained by factors such as improved supply, lower import prices, currency appreciation, and enhanced competition and inflation expectations.

Finally, we have also incorporated global oil prices as one of the explanatory variables in the model. Figure 4 shows that the majority of the products are unaffected by global oil prices. This result holds true for both retail and wholesale prices in Pakistan. This aligns with the findings of Cunado and De Gracia (2005), Jongrim et al. (2023), and Choi et al. (2018). Our estimates suggest that a 100 bps shock in global oil prices leads to a 3 bps increase in Pakistan's NCPI and a 4 bps increase in its WPI.

Table 5 : Heat Map Showing the Impact of Exchange Rate Pass-Through on Inflation in Pakistan



Source: Authors' calculations.

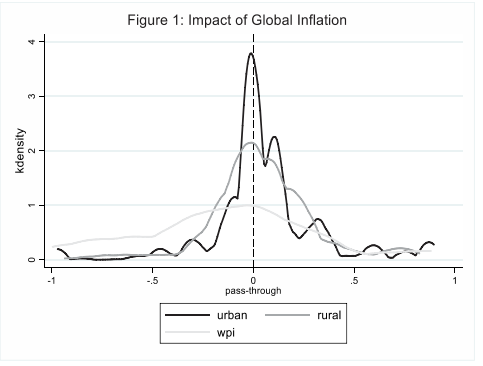


Figure 1: Impact of Global Inflation
kdensity
pass-through
urban
rural
wpi

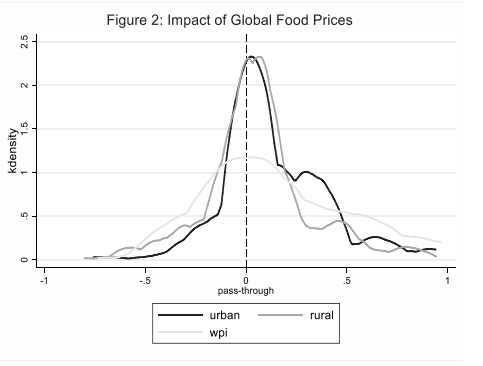


Figure 2: Impact of Global Food Prices
kdensity
pass-through
urban
rural
wpi

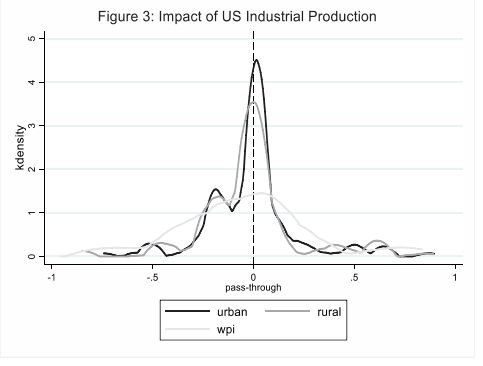


Figure 3: Impact of US Industrial Production
kdensity
pass-through
urban
rural
wpi

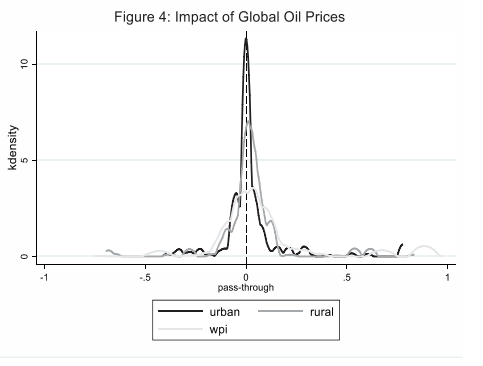


Figure 4: Impact of Global Oil Prices
kdensity
pass-through
urban
rural
wpi

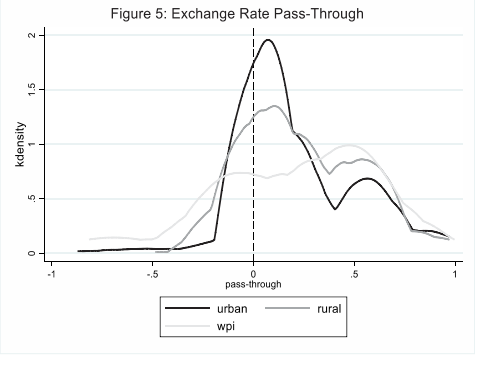


Figure 5: Exchange Rate Pass-Through
kdensity
pass-through
urban
rural
wpi

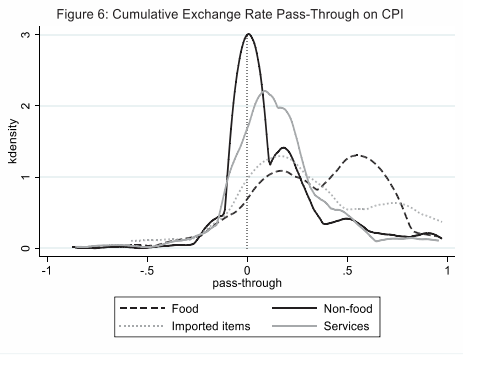


Figure 6: Cumulative Exchange Rate Pass-Through on CPI
kdensity
pass-through
Food
Non-food
Imported items
Services

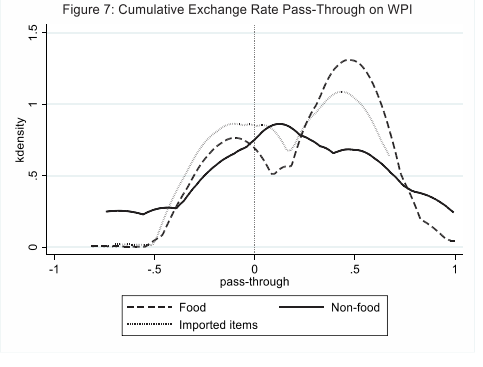


Figure 7: Cumulative Exchange Rate Pass-Through on WPI
kdensity
pass-through
Food
Non-food
Imported items

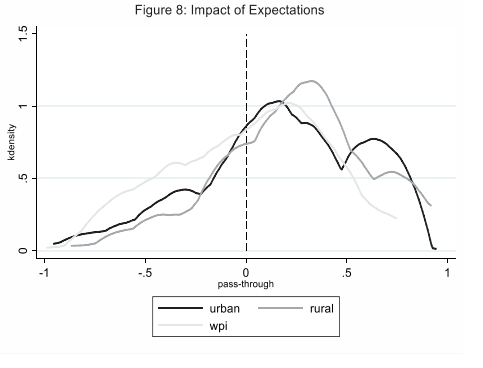
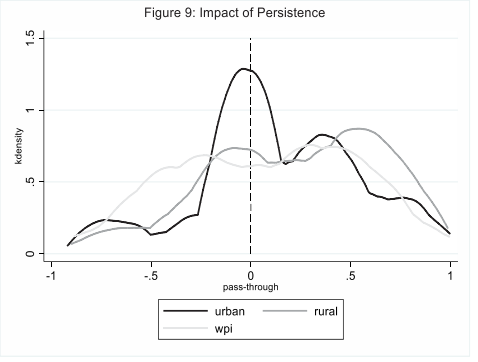


Figure 8: Impact of Expectations
kdensity
pass-through
urban
rural
wpi



Source: Authors' calculations

Though most of these external shocks seem to have a limited effect on domestic inflation in Pakistan, it is important to recognize the role of the exchange rate as a shock absorber in response to these external shocks. This, in turn, influences domestic inflation. Figure 5 illustrates the impact of the exchange rate on domestic prices. It is clear that both consumer and wholesale prices are affected by exchange rates. Within the CPI, the exchange rate pass-through appears to be stronger in rural areas compared to urban centers. For wholesale prices, the pass-through of the exchange rate shows higher variability. The distribution has a low peak and fat tails compared to those of urban and rural areas. The model estimates that a 100 basis point depreciation of the exchange rate results in a 60 basis point increase in NCPI and a 39 basis point increase in WPI over 12 months (Table 4).

Further disaggregation of NCPI reveals that around 67 percent of the urban items and 72 percent of the rural items have a positive exchange rate pass-through (Figure A2). Moreover, about 20 percent of urban CPI items exhibit a pass-through greater than one. This includes items like electricity charges, petrol, cigarettes, and some food products. Similarly, around 62 percent of WPI items show a positive pass-through. However, unlike CPI items, the cumulative distribution function is flatter on the left side of the y-axis, indicating a higher negative pass-through for 38 percent of WPI items compared to CPI. The category-wise analysis indicates that food prices in CPI are more affected by exchange rates than non-food prices, while imported items in CPI have a higher pass-through, and services (education, health, transport, personal grooming, accommodation, and household services) tend to have a relatively low pass-through due to their non-tradeable nature (Figure 6). Likewise, food products in WPI are more sensitive to exchange rate changes than non-food products (Figure 7).

Regarding the time dimension, the pass-through of exchange rates is greatest in the first 6 months, especially for the Urban-CPI, where prices tend to adjust quickly. In contrast to the urban CPI, prices in rural areas experience a delayed and more prolonged pass-through (Table 5). As for WPI, price adjustments are rapid, but second-round impacts occur after a longer lag compared to CPI.

Finally, we have analyzed the impact of domestic factors, i.e., inflation expectations and inflation persistence. Figures 8 and 9 show that inflation expectations and inflation persistence have a significant impact on consumer prices. CPI items are generally more affected by inflation expectations compared to WPI items. The role of expectations and persistence is also higher in rural areas compared to urban areas. Regarding persistence, rural items tend to have higher persistence than urban and WPI. The impact of persistence on WPI varies significantly. According to our model, a cumulative 12-month increase of 100 bps in inflation expectations and persistence results in a 19 bps and 22 bps increase in NCPI, respectively.

5. Conclusion

To summarize, the objective of this study was to examine the impact of external shocks and exchange rates on micro-level data in Pakistan. The main advantage of a micro-level analysis is to retain heterogeneous effects across products and regions, which was lacking in existing studies based on macro data.

For our model estimation, we considered four external shocks, i.e., global inflation, global food inflation, US industrial production as a proxy for global economic activity, and global oil prices. For domestic shocks, we used exchange rate, inflation expectations, and inflation persistence as explanatory variables. We based our independent variable on monthly prices data of Urban, Rural CPI items, and WPI items, totaling 710 products. Our results show that, among all external shocks, world food prices have the strongest impact on National CPI and WPI. Meanwhile, global oil prices have the lowest impact on consumer and wholesale inflation in Pakistan. Regarding domestic shocks, exchange rate has the highest pass-through to inflation, while expectations and persistence have a relatively lower impact. This finding contrasts with earlier studies on exchange rate pass-through in Pakistan (Choudhri and Khan, 2002; Choudhri and Hakura, 2006; Hyder and Shah, 2005; Jaffri, 2010; Siddiqui and Akhtar, 1999). One possible explanation for this difference is the

varying sample period used in our study. Our sample period (July 2016 – March 2024) coincides with a period of significant exchange rate adjustments, which makes the impact of exchange rate movements on inflation more pronounced in our results.

The central bank needs to be vigilant and proactive in monitoring changes in the exchange rate and global food prices, as these are key factors influencing domestic inflation. Additionally, inflation expectations are crucial, emphasizing the importance of monetary policy in anchoring them.

References

Ahmed, S., Ara, I., and Hyder, K. (2005). How external shocks and exchange rate depreciations affect Pakistan? Implications for choice of an exchange rate regime, *SBP-Research Bulletin, 2*(1), 661-88.

Batini, N., Jackson, B., & Nickell, S. (2005). An open-economy new Keynesian Phillips curve for the UK. *Journal of Monetary Economics, 52*(6), 1061-1071.

Betts, C., & Devereux, M. B. (1996). The exchange rate in a model of pricing-to-market. *European Economic Review, 40*(3-5), 1007-1021.

Burstein, A., & Gopinath, G. (2014). International prices and exchange rates. *In Handbook of International Economics* (Vol. 4, pp. 391-451). Elsevier.

Charnavoki, V. and Dolado, J.J., (2014). The effects of global shocks on small commodity-exporting economies: lessons from Canada. *American Economic Journal: Macroeconomics*, *6*(2), pp.207-237.

Choi, S., Furceri, D., Loungani, P., Mishra, S. and Poplawski-Ribeiro, M., (2018). Oil prices and inflation dynamics: Evidence from advanced and developing economies.*Journal of International Money and Finance*, *82*, pp.71-96.

Choudhri, E.U. and Hakura, D.S., (2006). Exchange rate pass-through to domestic prices: does the inflationary environment matter?. *Journal of International Money and Finance*, *25*(4), pp.614-639.

Choudhri, E.U. and Khan, M.S., (2002). The Exchange Rate and Consumer Prices in Pakistan: Is Rupee Devaluation Inflationary?. *The Pakistan Development Review*, pp.107-120.

Ciccarelli, M., & Mojon, B. (2010). Global inflation. *The Review of Economics and Statistics, 92*(3), 524-535.

Cunado, J. and De Gracia, F.P., (2005). Oil prices, economic activity and inflation: evidence for some Asian countries. *The Quarterly Review of Economics and Finance*, *45*(1), pp.65-83.

Devereux, M.B. and Engel, C., (2002). Exchange rate pass-through, exchange rate volatility, and exchange rate disconnect. *Journal of Monetary Economics*, *49*(5), pp. 913-940.

Dornbusch, R., (1987). Collapsing exchange rate regimes. *Journal of Development Economics*, *27*(1-2), pp. 71-83.

Dua, P., & Gaur, U. (2010). Determination of inflation in an open economy Phillips curve framework: The case of developed and developing Asian countries. *Macroeconomics and Finance in Emerging Market Economies*, *3*(1), 33-51.

Engel, C., (1993). Real exchange rates and relative prices: An empirical investigation. *Journal of Monetary Economics*, *32*(1), pp. 35-50.

Forbes, K. J. (2019). Has Globalization Changed the Inflation Process? *BIS Working Paper No. 791*, Bank for International Settlements.

Förster, M. and Tillmann, P., (2014). Reconsidering the international co-movement of inflation. *Open Economies Review*, *25*, pp. 841-863.

Gaulier, G., Lahrèche-Révil, A. and Méjean, I., (2008). Exchange-rate pass-through at the product level. *Canadian Journal of Economics/Revue Canadienne D'économique*, *41*(2), pp.425-449.

Goldberg, P. and Hellerstein, R., (2007). Sticky prices: Why firms hesitate to adjust the price of their goods. *Current Issues in Economics and Finance*, *13*(10).

Goldfajn, I. and Werlang, S.R.D.C., (2000). The pass-through from depreciation to inflation: A panel study. *Banco Central De Brasil* Working Paper, (5).

Ha, J., Kose, M. A., Ohnsorge, F., & Yilmazkuday, H. (2023). Understanding the global drivers of inflation: How important are oil prices? *Energy Economics*, *127*, 107096.

Hayashi, T., Wickremasinghe, N.H. and Jayakody, S., (2015). Application of the New Keynesian Phillips curve inflation model in Sri Lanka. *ADB South Asia Working Paper Series,* No. 36.

Hendry, D.F., (1995). Dynamic econometrics. Oxford University Press.

Hyder, K. and Hussain, S. Q. (2019). Asymmetric pass through of global oil prices to macroeconomic variables of Pakistan. *SBP Research Bulletin*, 15(1).

Hyder, K., & Hall, S. G. (2020). Estimates of the new Keynesian Phillips curve for Pakistan. *Empirical Economics*, 59(2), 871-886. https://doi.org/10.1007/s00181-019-01659-8

Hyder, K., Jafri, S.K., and Saqib, O.F., (2025). Post COVID-pandemic inflation persistence and inflationary expectations in Pakistan, conference paper in Eighteenth Annual Conference on The Management of The Pakistan Economy, Lahore School of Economics.

Hyder, Z. and Shah, S., 2005. Exchange rate pass-through to domestic prices in Pakistan (No. 0510020). *University Library of Munich*, Germany.

Jaffri, A.A., (2010). Exchange rate pass-through to consumer prices in Pakistan: Does misalignment matter?. *The Pakistan Development Review*, pp. 19-35.

Jiang, B., Yang, Y., Gao, J., & Hsiao, C. (2021). Recursive estimation in large panel data models: Theory and practice. *Journal of Econometrics*, *224*(2), 439-465.

Khan, Aleem, A., and Masood, A.Q., and Hyder, K., (2007). Determinants of Recent Inflation in Pakistan. *Social Policy and Development Centre,* Research Report.

Krugman, P. (1987). Pricing-to-Market When Exchange Rate Changes. In S.W. Arndt, and J.D. Richardson, eds. Real Financial Linkages in Open Economies. Cambridge, MA: MIT Press, pp. 49–70.

Menon, J., (1995). Exchange rate pass-through. *Journal of Economic Surveys*, *9*(2), pp. 197-231.

Mishkin, F.S., (2008). *Exchange rate pass-through and monetary policy* (No. w13889). *National Bureau of Economic Research*.

Mukhtar, T., & Yousaf, A. (2014). Inflation Dynamics and New Keynesian Phillips Curve: A Reassessment for Pakistan. *Journal of Business & Economics*, 6(2), 177.

Mumtaz, H. and Surico, P., (2012). Evolving international inflation dynamics: World and country-specific factors. *Journal of the European Economic Association*, *10*(4), pp. 716-734.

Mumtaz, H., Oomen, O. and Wang, J., (2006). Exchange rate pass-through into UK import prices.

Nakamura, E., & Steinsson, J. (2010). More facts about prices. *Columbia University*. https://eml. Berkeley. edu/jsteinsson/papers/fivefactssupplement. pdf. Accessed April, 30, 2020.

Nakamura, E., (2008). Pass-through in retail and wholesale. *American Economic Review*, *98*(2), pp. 430-437.

Neely, C.J. and Rapach, D.E., (2011). International co-movements in inflation rates and country characteristics. *Journal of International Money and Finance*, *30*(7), pp. 1471-1490.

Parker, M. (2018). How global is "global inflation"?. *Journal of Macroeconomics*, 58, 174-197.

Rao, N. H., & Bukhari, S. K. H. (2010). Asymmetric shocks and co-movement of price indices. *State Bank of Pakistan* Working Paper Series.

Riffat, F., Yousaf, A., & Mukhtar, T. (2016). Inflation dynamics and new Keynesian Phillips curve: An open economy perspective for Pakistan. *Journal of the Punjab University Historical Society*, 29(1), 172-183.

Saqib, M. (2024). Analyzing inflation dynamics in Pakistan: The new Keynesian Phillips curve perspective. *Journal of the Knowledge Economy*, 1-22.

Satti, A. H., Malik, W. S., & Saghir, G. (2007). New Keynesian Phillips curve for Pakistan. *The Pakistan Development Review*, 395–404. https://www.jstor.org/stable/41261172

Siddiqui, R. and Akhtar, N., (1999). The impact of changes in exchange rate on prices: A case study of Pakistan. *The Pakistan Development Review*, pp. 1059-1066.

Tauseef, T., Chaudhary, A. R., & Tauheed, T. (2024). A Revisit to Estimating Phillips Curve and NAIRU in Pakistan. *iRASD Journal of Economics*, 6(2), 10-52131.

Van Wincoop, E. and Bacchetta, P., (2003). Can information heterogeneity explain the exchange rate determination puzzle? National Bureau of Economic Research, Working Paper 9498.

Annexure

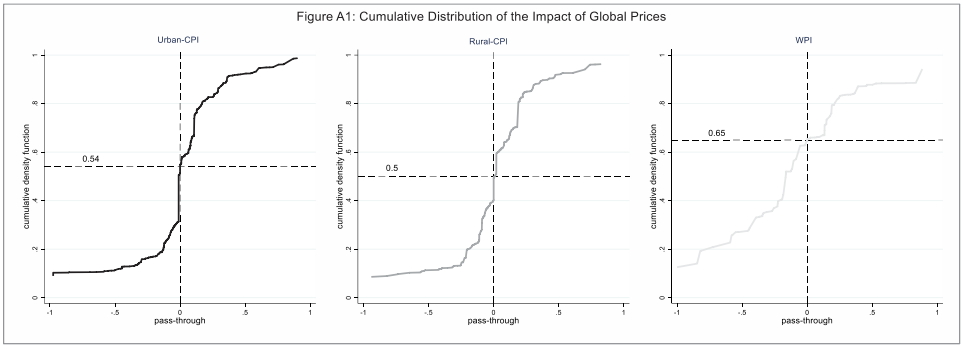


Figure A1: Cumulative Distribution of the Impact of Global Prices
Urban-CPI
Rural-CPI
WPI
cumulative density function
pass-through
0.54
0.5
0.65

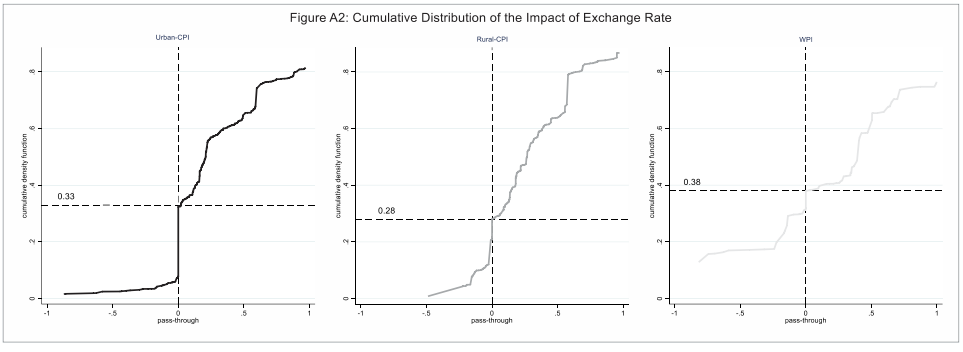


Figure A2: Cumulative Distribution of the Impact of Exchange Rate
Urban-CPI
Rural-CPI
WPI
cumulative density function
pass-through
0.33
0.28
0.38