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Differential Impact of Commodity Price Shocks on Export of Textile Industrial Chain of Pakistan

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A B S T R A C T

Purpose - Pakistan, textiles account for 60% of total export earnings, fluctuations in textile prices have a significant impact on foreign earnings, national income, and country's terms of trade. This study attempts to highlight the fact that commodity price shocks have industrial differences and price shock is transmitted along with textile industries chain from upstream industries to downstream industries.

Design/methodology/approach - It uses monthly data over the period July 2008 to June 2020 and employs SVAR model.

Findings - The finding of the study provides the insight that downstream industries are the most affected industries to the commodity price shocks. Whereas the upstream industries do not respond significantly to these shocks. However, midstream industries are negatively affected by food and education price shocks. The results of our analysis provide a clear view to policymakers that which category of commodity price shocks can lead to a boom and which to busts.

Originality/value – This is our original work to the best of our knowledge, there is no well-known study that has been conducted to examine the commodity price transmission mechanism for the exports of the textile industry chain of Pakistan.

Limitations/Implications – Our results provide guidance to policymakers that one policy for all is not a good option as all industries of the textile industry chain are not affected by these shocks equally.

Keywords: Textile Industrial chain, Commodity price shocks, Energy prices, SVAR

1. INTRODUCTION

Commodity price fluctuations have always been of great significance to developing economies. Empirical literature shows that commodity price movements cause major turns in business cycles (Balashova & Serletis, 2020). However, most of the previous work on commodity prices centers on the analysis of energy price shocks, where crude oil prices gained prominent attention. There is a vast literature that investigates different aspects through which oil price may affect an economy (McLeod, 2018).

The shocks in food prices have a direct impact on the stability of food prices (Laha &

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Sinha, 2021). Moreover, according to the (Bank, 2018) annual report the sharp increase in food prices since 2008 becomes a matter of daily unrest, struggle and even sacrifice for more than 2 billion people. Furthermore, economies whose total export earnings depend on a small set of commodities are more vulnerable to commodity price shocks. For example, in Pakistan textile accounts for 60% of total export earnings, so fluctuations in textile prices have a significant impact on foreign earnings, national income, and terms of trade of Pakistan. On the other hand, some commodities like energy, transportation, education, and the health of labor are key inputs in the production process. Any shock in the prices of these basic inputs has a significant impact on the industrial production of an economy.

Pakistan's economy is facing many problems since its creation. The trade balance of the country mostly remains in deficit due to higher dependency on imports. Further, the deficit in trade balance adversely affects the foreign exchange reserves of the country and Pakistan's currency continued to devaluate due to these problems. However, the worst of all problems is the increasing public debt that reached 106% of GDP in the fiscal year 2020. Stability is the much-needed factor for Pakistan's economy. Stability and increase in export earnings are the much-needed factors for Pakistan's economy.

The textile industry is the mainstay of Pakistan's economy. Pakistan ranked at the fourth number in production of cotton in the world and third in its consumption. Further, the textile industry has a 46% share in total manufacturing and gives direct and indirect employment to 45% of the labor force. There are several studies that work on the textile industry of Pakistan through different aspects (ARSLAN et al., 2022; Hayat et al., 2020; Irshad et al., 2017; Memon et al., 2020). However, what has been lacking in the literature is the analysis of the differences in the impacts of commodity price shocks on industrial chains and transmission mechanisms. Commodity price shocks have industrial differences and price shock is transmitted along with industries chain from upstream industries to downstream industries. To the best of our knowledge, there is no well-known study that has been conducted to examine the commodity price transmission mechanism for the exports of the textile industry chain of Pakistan. Thus, this study is aimed to quantify the dynamic transmission effects of commodity price shocks on the exports of the textile industrial chain of Pakistan.

2. LITERATURE REVIEW

The textile industry chain broadly consists of three major sub-sectors, the spinning sector[1] , weaving sector[2] , and garments manufacturing[3.] However, all the sub-sectors are strongly linked together; the end product of the first sub-sector is an input for the next sub-sector. Figure 1 shows the textile industry chain of Pakistan.

The textile industry chain starts from cotton spinning that adds value to cotton by renovating cotton into cotton yarn. Spinning is the base process, and all the succeeding value additions depend upon it (Mubarik et al., 2019). Therefore, any discrepancy in the quality of yarn spinning straightly affects the entire textile industry chain. Moreover, most of the spinning upstream industries worked in an organized way and a total of 477 spinning units are working in Pakistan (Organization, 2019-2020).

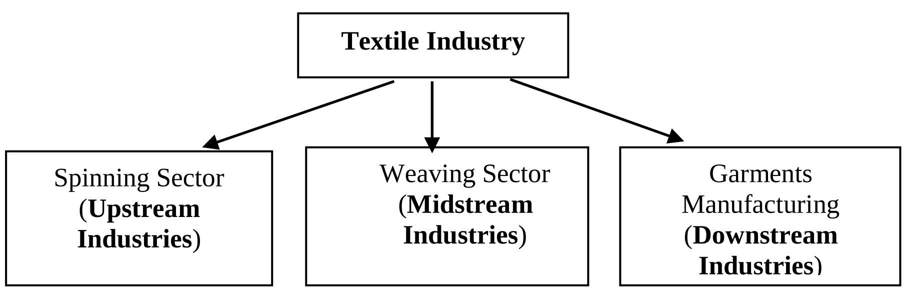

Figure 1. Textile Industry Chain

The weaving sector is consisting of midstream industries and is classified in to the second process of the textile industry chain in Figure 1. Weaving is defined as the process of transformation of cotton yarn into raw fabric and is broadly divided into two sub-sectors: unorganized non-mill sector and organized mill sector. In terms of usage of technology, the weaving sector can be divided into three sub-sectors hand-looms sector, power looms and high-speed mill looms. The hand-loom sector is the oldest sector and carries a long tradition and excellence of craftsmanship. However, the power looms and high-speed mill looms sectors dominates the midstream industry in term of investment,

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[1] Cotton spinning sector is treated as upstream industries (UPI) of textile sector.
[2] Weaving sector is treated as midstream industries (MDI) of textile sector.
[3] Garments manufacturing is treated as the downstream industries (DSI) of textile sector.

production, and share in export. According to the annual report of All Pakistan Textile Mills Association ((APTMA), 2015) the power looms and high-speed mill loom sector is fully responsible for fulfilment of domestic needs and export of cotton fabric. On the other hand, the hand-loom sector does not play any important role in export. However, the output of the midstream industry is mostly referred to as "raw" because it does not involve any printing and dying. Therefore, the midstream industries mostly produced raw cotton fabric (80% of total production).

Garments manufacturing includes downstream industries, and it is the third process of the textile industry chain. Downstream industries are commonly used to make ready-made garments, bed linen, hosiery, artificial silk and synthetic fabrics, canvas, and towels. Furthermore, downstream industries have the highest-value addition in the textile industry chain of Pakistan (Pandit et al., 2019). The hosiery industry provides direct employment to 210,000 skilled laborers and 490,000 unskilled labor. The hosiery export of Pakistan contains the export of socks, processed, and knitted fabrics, and knitted bed sheets. The ready-made cloth industry of Pakistan is also one big industry for providing jobs to millions of workers. It fully met the domestic demand and has a good share in total downstream industry export. The towel industry is an export-oriented industry and has both organized and unorganized sectors. There are 10,000 towel looms working in Pakistan both with shuttle and shuttle-less units. The canvas and tarpaulin industry has a capacity of 100 million sq. meter production. 60 percent of the total production of this industry has been exported and 40 percent has been consumed domestically. Artificial silk-like polyester, nylon, synthetic fabrics, and polyolefin dominate the artificial silk and synthetic fabrics industry. There are currently five major producers of these fabrics in Pakistan with 636,00 tons annual capacity of production. Moreover, there are 9000 looms of artificial silk production in Pakistan (Economic Survey of Pakistan 2020-2021).

Many of the scholars studied the commodity price shock transmission mechanism from the perspective of macroeconomy (Civcir & Varoglu, 2019; Khan, 2022; Qian & WU LB, 2014; Zhang et al., 2019). (However, commodity price shocks have industrial differences, and price shock is transmitted along industry chains from upstream industries to downstream industries.

(Chuan Gao et al., 2018) developed a new perspective of the industry chain to examine the internal relationship among the metal industry chain for China. Their study analyses the direct and indirect impact of international metal prices on the output of metal industry chains. The results of the study show that metal price shock has a significant impact on midstream and upstream industries, whereas the downstream industry is not directly affected. Moreover, the international metal price shocks have spill over effects, and their strength weakens, as transmitted on industries prices, along the industry chain from upstream to downstream industries.

The literature on the export of the textile industry of Pakistan is mainly focused on the determination of textile export. (Subhani et al., 2007) examine the determinants of the textile export performance of Pakistan. The study finds that an increase in export intensity, export market development, past export performance satisfaction, pricing strategy adaptation, export intensity, and firms’ commitment to exporting have a significant impact on expected short-run textile export performance. (Siddiqi et al., 2012) used co-integration analysis to find out the major determinants of the export demand of the textile sector of Pakistan. Results of the study suggest that income and trade openness are the major determinants of Pakistan. A further significant positive relationship has been found between exchange rate and textile export and between CPI and textile export.

Hussain et al.(2020) investigate the supply-side factors that can affect the export performance of Pakistan. The study used annual data over the period 1971 to 2014 with the ARDL model to find out short and long-run impacts. Results revealed that relative prices and cost of production have a significant and larger impact on the export of value-added manufacturing like textile. Moreover, the domestic demand and production capacity are the prominent determinants in LR whereas, the cost of production and production capacity and relative prices have a significant impact in the short run.

One stream of literature focused on comparative advantage (CA) and revealed comparative analysis (RCA) for the export. The study also found that the Pakistan textile industry did not get the benefits of the elimination of the quota regime. Irshad et al. (2017) employed CA analysis and found that although Pakistan’s export does not play much significant role in world trade. It had CA in the export of clothing and overall textile export. Maqbool et al. (2020) examine the competitiveness of textile export of Pakistan. It employs different measures of RCA and found that Pakistan has a comparative advantage in textile export and also in textile import textile industry of Pakistan. Ahmad et al. (2014) used annual data from 1980 to 2011 and employ the RCA method for overall textile export and clothing export of Pakistan. It noted that Pakistan has a high comparative advantage in textile export low comparative advantage in clothing.

The domestic and foreign shocks can affect the export performance of any industry. Iqbal et al. (2017) aimed to highlight the impact of the energy crisis on the Pakistan textile industry. It uses annual data over the period 2000 to 2015 and employed the OLS method. The study found that the energy crisis leads to a negative impact on the return on assets and return on equity of the textile industry of Pakistan. (Nizamani, 2017) examines the impact of domestic and foreign shocks on the textile export of Pakistan. The domestic shocks include interest rate, output and inflation, and exchange rate shocks. The foreign shocks include oil supply, financial and income shocks in the international market. The study employs the SVAR model for monthly data over the period 2003-2016. It found that positive shock in international output positively affects textile export. Whereas negative financial and oil supply shocks negatively affect the export of the textile industry of Pakistan. In the case of domestic shocks, inflation and output responded positively whereas, interest rate and exchange rate caused a negative response. The review of the literature advocates that the analysis of the impact of commodity price on the industrial chain and transmission mechanism needs to be explored.

3. RESEARCH METHODOLOGY

Following the ministry of textile industry of Pakistan upstream industries (UI) are made up of cotton spinning industries that include the export of raw cotton, cotton yarn, cotton carded and combed, and yarn other than cotton yarn. So, we will add these industries' export in million US dollars for UI. Midstream industries (MI) are made up of the weaving industries and include the export of cotton fabrics in million US dollars. Whereas the downstream industry (DI) is made up of the export of hosiery (knitwear), bed-wear, towels, canvas goods and tarpaulin, ready-made garments, artificial silk, and synthetic textile, and other textile made-up (excluding towels and bed-wears) in the US million dollar. Whereas the other macroeconomic variables used in our study are industrial production (Nizamani,2017) and monthly weighted average exchange rate (ER) and monthly real interest rate (rate).

3.1. Descriptive Statistics

To get a better understanding of the data, we have performed its descriptive and graphical analysis. Table 1 shows the descriptive statistics of export of the textile industrial chain.

Table 1. Descriptive Statistics of Textile Industrial Chain Industries

	UI	MI	DI
Mean	145.78	188.59	678.61
Median	133.88	186.40	694.45
Maximum	310.48	282.70	929.50
Minimum	39.89	54.05	287.90
Std. Dev.	54.16	35.04	114.92
Skewness	0.78	-0.18	-0.27
Kurtosis	3.08	4.00	3.08
Jarque-Bera	14.50	6.79	1.80
Probability	0.00	0.03	0.41
Observations	144	144	144

Note: *UI stands for upstream industries, MI for midstream and DI for downstream industries*

Table 1 shows the descriptive statistics of industries of the textile industry chain. The average value of downstream industries for the period of our analysis export is 678.61 million US dollars which are higher than the average value of midstream and upstream industries export value of 188.59 and 145.78 million US dollars. It revealed the fact that downstream industries export dominates the export of other two industries of the textile industry chain. The maximum value of export of downstream industries was 929.5 million US dollars which were recorded in February 2020 due to a massive increase in demand for textile manufacturing from American and European agencies as trade opened up slowly after the Covid-19 situation. Further, the government also contributes to this growth of export through duty drawbacks and refunds of taxes. The minimum value of export of downstream industries was recorded in April 2020 with 287.90 million US dollars. This reduction was mainly due to delays in shipments and cancellations of orders from European Union (EU) countries. The midstream industry's export reached the maximum value of 282.69 million US dollars in March 2011. This increase was mainly due to an increase in raw cotton prices in international markets that leads to an increase in the price of cotton cloth and an increase the export earnings. Further, international trade and demand for cotton cloths also increased significantly during this period. The minimum export of the midstream industry was also recorded in April 2020 due to the same reason of shipment delay and order cancellation.

3.2. Methodology

This study aims to employ the Structural VAR model to examine the relationship between commodity price shocks and the export of Pakistan's textile industry chain. The SVAR model can be expressed as in equation 1.

$$A_0 y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + u_t \quad (1)$$

Where y_t is a vector of economic variables and u_t is a vector of the structural economic shocks. The vector of the structural economic shocks has a property that u_t is white noise with zero mean and variance-covariance matrix Ω. Consistently, the model can be written more compactly as.

$$A(L) y_t = u_t \quad (2)$$

Where A (L) = $A_0 - A_1(L) - A_2 L^2 - \cdots - A_p L^p$ and A_i is a coefficient matrix ($i = 0 \ldots p$) and L is the lag operator. Moreover, for estimation of the structural model, we need to derive its reduced form and for that, we pre-multiply both sides of the SVAR model equation (1) by A_0^{-1}.

$$A_0^{-1} A_0 y_t = A_0^{-1} A_1 y_{t-1} + \cdots + A_0^{-1} A_p y_{t-p} + A_0^{-1} u_t \quad (3)$$

So, the same model can be represented as;

$$y_t = B_1 y_{t-1} + \cdots + B_p y_{t-p} + \varepsilon_t \quad (4)$$

Where, $B_i = A_0^{-1} A_i$ and ($i = 1 \ldots p$) and $\varepsilon_t = A_0^{-1} u_t$. Equivalently the model can be written more compactly as:

$$B(L) y_t = \varepsilon_t \quad (5)$$

Where B (L) = $I - B_1(L) - B_2L^2 - \cdots - B_pL^p$ and $B_i$is a coefficient matrix ($i = 1 \ldots p$) and L is the lag operator. Standard estimation methods like OLS permits us to attain consistent estimates of the reduced form parameters, the reduced form errors ε_t and their covariance matrix Σ. Moreover, as the Σ and the structural variance-covariance matrix Ω, are related, the structural shocks of any variable can be recovered by imposing appropriate identifying restrictions. This study will also use Augmented Dickey-Fuller (ADF) model for the unit root test to check the stationarity of data.

3.3. Identification of SVAR model

We are using data from large three different industries and seven groups of commodity prices so; it is not feasible to add all industries and commodity prices groups in one model. Thus, it will use a separate model for each industry and each group of commodity prices. Therefore, we need to impose separate restrictions for each commodity price. The identification of restriction of our SVAR model used an information-based approach. The maximum number of parameters is 254 and the maximum number of independent movements in the covariance matrix is 155. Thus, our model required at least 10 fully identified restrictions.

For energy prices

Commodity Price equation

$$cpe_t = \beta_1 cpe_{t-p} + \mu_e \quad (6)$$

Aggregate textile output equation

$$y\_tex_t = \beta_2 y\_tex_{t-p} + \beta_3 cpe_{t-p} + \beta_4 ui_{t-p} + \beta_5 rate_{t-p} + \mu_y \quad (7)$$

Upstream industries equation

$$Ui_t = \beta_6 ui_{t-p} + \beta_7 y\_tex_{t-p} + \beta_8 cpe_{t-p} + \beta_9 er_{t-p} + \mu_{inf} \quad (8)$$

Interest rate equation

$$rate_t = \beta_{10} rate_{t-p} + \beta_{11} cpe_{t-p} + \mu_{rate} \quad (9)$$

Exchange rate equation

$$er_t = \beta_{12} er_{t-p} + \beta_{13} cpe_{t-p} + \beta_{14} ui_{t-p} + \beta_{15} rate_{t-p} + \mu_{er} \quad (10)$$

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[4] : N^2=25

[5] $N(N+1)/2$

We imposed the assumption of exogeneity on our commodity price equation as it is commonly believed that energy prices are set by the energy demand and supply forces independent of the individual industry production and export (C. Gao et al., 2018; Jo et al., 2019). The aggregate textile equation includes energy prices as energy is the basic input in the production process (Lee & Ni, 2002). The textile industry of Pakistan is an export-orientated industry. Therefore, the export of the upstream industry affects the production decision of the textile industry, so we add the upstream industry export in the aggregate textile production equation (Maqbool et al., 2020). Pakistan's textile industry has the in-build potential for growth and performs well due to the easy and cheaper availability of raw cotton and labor. Further, the textile industry of Pakistan has massive demand domestically and internationally. Therefore, there is always a good opportunity for new investment. Thus, interest rate plays a significant role in the aggregate production of textile (Irshad et al., 2017). The export of upstream industry equation incorporates the impact of energy prices, aggregate textile output, and exchange rate (Nizamani,2017). Whereas, studies found that interest rate is affected by domestic aggregate output and inflation (Lee & Ni, 2002; Nizamani, 2017). However, it is not assumed to be affected by a single industry like textile production. Therefore, the interest rate equation incorporates the impact of energy prices only. The exchange rate is the most endogenous variable in our model, and it responds contemporaneously to energy prices, upstream industry export, and interest rate shocks. The above system of the equation can be expressed in matrix form as follows.

$$\begin{bmatrix} \mu cpe_t \\ \mu y\_tex_t \\ \mu ui_t \\ \mu rate_t \\ \mu er_t \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & a_{22} & a_{23} & 0 \\ a_{31} & a_{32} & 1 & 0 & a_{35} \\ a_{41} & 0 & 0 & 1 & 0 \\ a_{51} & 0 & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon cpe_t \\ \varepsilon y\_tex_t \\ \varepsilon ui_t \\ \varepsilon rate_t \\ \varepsilon er_t \end{bmatrix}$$

We have imposed a total of 10 zero restrictions to estimate our macro-economic SVAR model. Thus, a total of 15 parameters will be estimated with 15 independent movements of the covariance matrix and our model is just identified.

For food prices

Commodity Price equation

$$cpf_t = \beta_1 cpf_{t-p} + \mu_f \qquad (11)$$

Aggregate textile output equation

$$y\_tex_t = \beta_2 y\_tex_{t-p} + \beta_3 ui_{t-p} + \beta_4 rate_{t-p} + \mu_y \qquad (12)$$

Upstream industries equation

$$Ui_t = \beta_5 ui_{t-p} + \beta_6 y\_tex_{t-p} + \beta_7 cpf_{t-p} + \beta_8 er_{t-p} + \mu_{inf} \qquad (13)$$

Interest rate equation

$$rate_t = \beta_9 rate_{t-p} + \beta_{10} cpf_{t-p} + \mu_{rate} \qquad (14)$$

Exchange rate equation

$$er_t = \beta_{11} er_{t-p} + \beta_{12} cpf_{t-p} + \beta_{13} ui_{t-p} + \beta_{14} rate_{t-p} + \mu_{er} \qquad (15)$$

The above system of equations is similar to energy price with one change that our aggregate output equation does not include food price as it is not directly related to production. The above system of the equation can be written in matrix form as follows.

$$\begin{bmatrix} \mu cpf_t \\ \mu y\_tex_t \\ \mu ui_t \\ \mu rate_t \\ \mu er_t \end{bmatrix} = \begin{vmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & a_{22} & a_{23} & 0 \\ a_{31} & a_{32} & 1 & 0 & a_{35} \\ a_{41} & 0 & 0 & 1 & 0 \\ a_{51} & 0 & a_{53} & a_{54} & 1 \end{vmatrix} \begin{bmatrix} \varepsilon cpf_t \\ \varepsilon y\_tex_t \\ \varepsilon ui_t \\ \varepsilon rate_t \\ \varepsilon er_t \end{bmatrix}$$

We have imposed a total of 11 zero restrictions to estimate our macro-economic SVAR model. Thus, a total of 14 parameters will be estimated with 15 independent movements of the covariance matrix and our model has an over-identified restriction.

For housing prices

Commodity price equation

$$cph_t = \beta_1 cph_{t-p} + \beta_2 rate_{t-p} + \mu_h \qquad (16)$$

Aggregate textile output equation

$$y\_tex_t = \beta_3 y\_tex_{t-p} + \beta_4 ui_{t-p} + \beta_5 rate_{t-p} + \mu_y \qquad (17)$$

Upstream industries equation

$$Ui_t = \beta_6 ui_{t-p} + \beta_7 y\_tex_{t-p} + \beta_8 cph_{t-p} + \beta_9 er_{t-p} + \mu_{inf} \qquad (18)$$

Interest rate equation

$$rate_t = \beta_{10} rate_{t-p} + \beta_{11} cpf_{t-p} + \mu_{rate} \quad (19)$$

Exchange rate equation

$$er_t = \beta_{12} er_{t-p} + \beta_{13} cph_{t-p} + \beta_{14} ui_{t-p} + \beta_{15} rate_{t-p} + \mu_{er} \quad (20)$$

The housing assets are forward-looking, so they react instantly to the macroeconomic situation of an economy. Further, the interest rate has a positive impact on house prices so we add interest rate in the equation of commodity price for housing (Su et al., 2019). The rest of the restrictions are similar to the food price model. The above system of the equation can be written in matrix form as follows;

$$\begin{bmatrix} \mu cph_t \\ \mu y\_tex_t \\ \mu ui_t \\ \mu rate_t \\ \mu er_t \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & a_{13} & 0 \\ 0 & 1 & a_{22} & a_{23} & 0 \\ a_{31} & a_{32} & 1 & 0 & a_{35} \\ a_{41} & 0 & 0 & 1 & 0 \\ a_{51} & 0 & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon cph_t \\ \varepsilon y\_tex_t \\ \varepsilon ui_t \\ \varepsilon rate_t \\ \varepsilon er_t \end{bmatrix}$$

We have imposed a total of 10 zero restrictions to estimate our macro-economic SVAR model. Thus, a total of 15 parameters will be estimated with 15 independent movements of the covariance matrix and our model is just identified.

For transportation prices

Commodity Price equation

$$cpt_t = \beta_1 cpt_{t-p} + \mu_t \quad (21)$$

Aggregate textile output equation

$$y\_tex_t = \beta_2 y\_tex_{t-p} + \beta_3 cpt_{t-p} + \beta_4 ui_{t-p} + \beta_5 rate_{t-p} + \mu_y \quad (22)$$

Upstream industries equation

$$Ui_t = \beta_6 ui_{t-p} + \beta_7 y\_tex_{t-p} + \beta_8 cpt_{t-p} + \beta_9 er_{t-p} + \mu_{inf} \quad (23)$$

Interest rate equation

$$rate_t = \beta_{10} rate_{t-p} + \beta_{11} cpt_{t-p} + \mu_{rate} \quad (24)$$

Exchange rate equation

$$er_t = \beta_{12} er_{t-p} + \beta_{13} cpt_{t-p} + \beta_{14} ui_{t-p} + \beta_{15} rate_{t-p} + \mu_{er} \quad (25)$$

The transportation price is assumed to be exogenous in our model ad it determines by the demand and supply of transportation (Sahin et al., 2009). The aggregate output equation takes into account transportation cost as most of the industrial activities involve transportation (Redding et al., 2015). The rest of the restrictions are similar to energy prices. The above system of the equation can be expressed in matrix form as follows;

$$\begin{bmatrix} \mu cpt_t \\ \mu y\_tex_t \\ \mu ui_t \\ \mu rate_t \\ \mu er_t \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & a_{22} & a_{23} & 0 \\ a_{31} & a_{32} & 1 & 0 & a_{35} \\ a_{41} & 0 & 0 & 1 & 0 \\ a_{51} & 0 & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon cpt_t \\ \varepsilon y\_tex_t \\ \varepsilon ui_t \\ \varepsilon rate_t \\ \varepsilon er_t \end{bmatrix}$$

We have imposed a total of 10 zero restrictions to estimate our macro-economic SVAR model. Thus, a total of 15 parameters will be estimated with 15 independent movements of the covariance matrix and our model is just identified.

For education prices

Commodity Price equation

$$cpedu_t = \beta_1 cpedu_{t-p} + \mu_{edu} \tag{26}$$

Aggregate textile output equation

$$y\_tex_t = \beta_2 y\_tex_{t-p} + \beta_3 ui_{t-p} + \beta_4 rate_{t-p} + \mu_y \tag{27}$$

Upstream industries equation

$$Ui_t = \beta_5 ui_{t-p} + \beta_6 y\_tex_{t-p} + \beta_7 cpedu_{t-p} + \beta_8 er_{t-p} + \mu_{inf} \tag{28}$$

Interest rate equation

$$rate_t = \beta_9 rate_{t-p} + \beta_{10} cpedu_{t-p} + \mu_{rate} \tag{29}$$

Exchange rate equation

$$er_t = \beta_{11} er_{t-p} + \beta_{12} cpedu_{t-p} + \beta_{13} ui_{t-p} + \beta_{14} rate_{t-p} + \mu_{er} \tag{30}$$

The above system of equations is similar to food price. Thus, our aggregate output equation does not include education price as it is not directly related to individual industry production. The above system of the equation can be written in matrix form as follows;

$$\begin{bmatrix} \mu cpedu_t \\ \mu y\_tex_t \\ \mu ui_t \\ \mu rate_t \\ \mu er_t \end{bmatrix} = \begin{vmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & a_{22} & a_{23} & 0 \\ a_{31} & a_{32} & 1 & 0 & a_{35} \\ a_{41} & 0 & 0 & 1 & 0 \\ a_{51} & 0 & a_{53} & a_{54} & 1 \end{vmatrix} \begin{bmatrix} \varepsilon cpedu_t \\ \varepsilon y\_tex_t \\ \varepsilon ui_t \\ \varepsilon rate_t \\ \varepsilon er_t \end{bmatrix}$$

We have imposed a total of 11 zero restrictions to estimate our macro-economic SVAR model. Thus, a total of 14 parameters will be estimated with 15 independent movements of the covariance matrix and our model has an over-identified restriction.

For health prices

Commodity Price equation

$$cphel_t = \beta_1 cphel_{t-p} + \mu_{hel} \tag{31}$$

Aggregate textile output equation

$$y\_tex_t = \beta_2 y\_tex_{t-p} + \beta_3 ui_{t-p} + \beta_4 rate_{t-p} + \mu_y \tag{32}$$

Upstream industries equation

$$Ui_t = \beta_5 ui_{t-p} + \beta_6 y\_tex_{t-p} + \beta_7 cphel_{t-p} + \beta_8 er_{t-p} + \mu_{inf} \tag{33}$$

Interest rate equation

$$rate_t = \beta_9 rate_{t-p} + \beta_{10} cphel_{t-p} + \mu_{rate} \tag{34}$$

Exchange rate equation

$$er_t = \beta_{11} er_{t-p} + \beta_{12} cphel_{t-p} + \beta_{13} ui_{t-p} + \beta_{14} rate_{t-p} + \mu_{er} \tag{35}$$

Our SVAR model with health price does not include health price in the aggregate output equation as it is not directly related to production. The above system of the equation can be written in matrix form as follows;

$$\begin{bmatrix} \mu cphel_t \\ \mu y\_tex_t \\ \mu ui_t \\ \mu rate_t \\ \mu er_t \end{bmatrix} = \begin{vmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & a_{22} & a_{23} & 0 \\ a_{31} & a_{32} & 1 & 0 & a_{35} \\ a_{41} & 0 & 0 & 1 & 0 \\ a_{51} & 0 & a_{53} & a_{54} & 1 \end{vmatrix} \begin{bmatrix} \varepsilon cphel_t \\ \varepsilon y\_tex_t \\ \varepsilon ui_t \\ \varepsilon rate_t \\ \varepsilon er_t \end{bmatrix}$$

We have imposed a total of 11 zero restrictions to estimate our macro-economic SVAR model. Thus, a total of 14 parameters will be estimated with 15 independent movements of the covariance matrix and our model has an over-identified restriction.

For clothing and footwear prices

Commodity Price equation

$$cpcf_t = \beta_1 cpcf_{t-p} + \mu_{hel} \quad (36)$$

Aggregate textile output equation

$$y\_tex_t = \beta_2 y\_tex_{t-p} + \beta_3 ui_{t-p} + \beta_4 rate_{t-p} + \mu_y \quad (37)$$

Upstream industries equation

$$Ui_t = \beta_5 ui_{t-p} + \beta_6 y\_tex_{t-p} + \beta_7 cpcf_{t-p} + \beta_8 er_{t-p} + \mu_{inf} \quad (38)$$

Interest rate equation

$$rate_t = \beta_9 rate_{t-p} + \beta_{10} cpcf_{t-p} + \mu_{rate} \quad (39)$$

Exchange rate equation

$$er_t = \beta_{11} er_{t-p} + \beta_{12} cpcf_{t-p} + \beta_{13} ui_{t-p} + \beta_{14} rate_{t-p} + \mu_{er} \quad (40)$$

Our SVAR model with health price does not include health price in the aggregate output equation as it is not directly related to production. The above system of the equation can be written in matrix form as follows;

$$\begin{bmatrix} \mu cpcf_t \\ \mu y\_tex_t \\ \mu ui_t \\ \mu rate_t \\ \mu er_t \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & a_{22} & a_{23} & 0 \\ a_{31} & a_{32} & 1 & 0 & a_{35} \\ a_{41} & 0 & 0 & 1 & 0 \\ a_{51} & 0 & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon cpcf_t \\ \varepsilon y\_tex_t \\ \varepsilon ui_t \\ \varepsilon rate_t \\ \varepsilon er_t \end{bmatrix}$$

We have imposed a total of 11 zero restrictions to estimate our macro-economic SVAR model. Thus, a total of 14 parameters will be estimated with 15 independent movements of the covariance matrix and our model has an over-identified restriction. Further, the same restrictions will be used for midstream industries and downstream industries.

4. RESULTS AND ANALYSIS

To use the correct specification of the model, we perform an ADF test. Further, the lag numbers have been selected on basis of the Schwarz Info Criterion (SIC). Table 2 shows the results of the unit root test for commodity prices cpe is energy prices, cpf is food prices, cpedu is education prices, cphel is health prices, cph is housing prices, cpt is transportation prices, cpcf is clothing and footwear prices, the rate is the interest rate, y_tex is textile industry output and er is the exchange rate, u_i is upstream industry export, mi is midstream industry export, di is downstream industry export.

Table 2. Unit Root Test Results

Variables	ADF Test at Level		ADF Test at First Diff		Order of Integration
	t Statistics	P Values	t Statistics	P Values	
Cpe	0.11	0.966	-5.15**	0.000	I(1)
Cpf	-0.56	0.874	-11.51**	0.000	I(1)
Cpedu	-0.09	0.947	-11.55**	0.000	I(1)
Cphel	0.45	0.984	-10.83**	0.000	I(1)
Cph	0.36	0.981	-3.65**	0.000	I(1)
Cpt	-1.45	0.559	-8.10**	0.000	I(1)
Cpcf	1.84	0.999	-10.36**	0.000	I(1)
Y_tex	-9.27**	0.000	-	-	I(0)
Er	1.91	0.999	-8.45**	0.000	I(1)
Rate	-1.50	0.528	-7.69**	0.000	I(1)
Ui	-3.00*	0.03	-	-	I(0)
Mi	-3.25*	0.01	-	-	I(0)
Di	-3.37*	0.01	-	-	I(0)

Note: CV at 5% level with intercept=-2.88 and CV at 1% level with intercept=-3.48. ** shows significance at 1% * shows significance at 5% level.

Table 2 shows that most of the variables are stationary at first difference whereas, few are stationary at level. The standard textbooks support is with stationary data as it helps to meet the normality condition and inference can be done. Therefore, we have preferred to go with stationary data. Figure 2 shows the impulse responses with the energy price model.

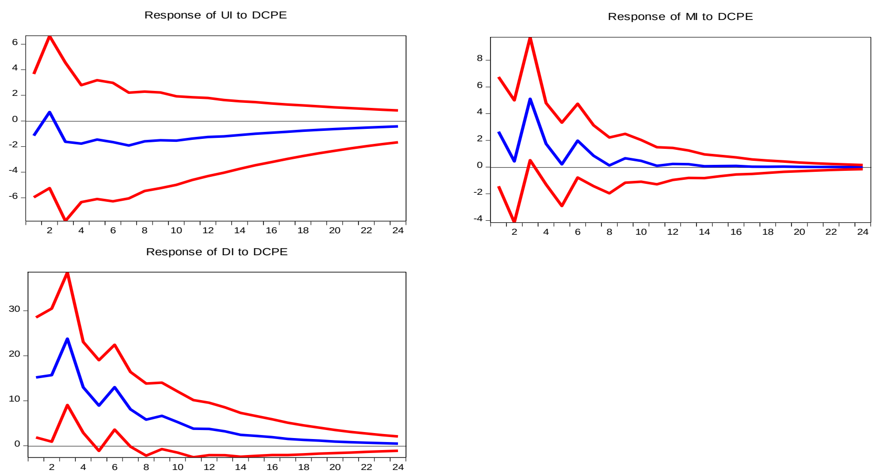

Figure 2. Impulse Response with Energy Price Model

In response to positive shocks in energy prices the export of upstream industries decreases. As upstream industries consist of the spinning sector of the textile industry chain the price of cotton yarn and other products of upstream industries depend on the supply of raw cotton. Thus, the increase in energy prices does not easily transmit to these industry's prices, and an increase in energy prices increases the cost of production and discourages production and export. However, this response is not significant for our analysis. The export of midstream industries shows a positive response with energy price shocks however, it is significant for the third month only. These results are consistent with the findings of (Nizamani,2017) that positive shocks in oil prices lead to a positive response in the textile export of Pakistan. In the case of downstream industry export, the energy price shocks lead to the massive expansion and this response is significant for the first seven months. The highest response is observed with a 25 percent increase in export in the third month of the shock. These results provide an interesting and unusual view, one possible justification for these results can be the capacity of downstream industries to increase the price with an increase in energy prices. It is widely believed that shocks in energy prices are transmitted to all other prices (Hanif et al., 2017). Further, oil has a dominant share in energy prices and Pakistan is a net importer of oil the increase in international oil prices also affects the international textile prices and encourages export.

Moreover, the downstream industries have the highest value addition and also have the advantage of product differentiation and subsidies from the government. Thus, if the increase in energy prices is less than the increase in international textile prices the export is expected to increase.

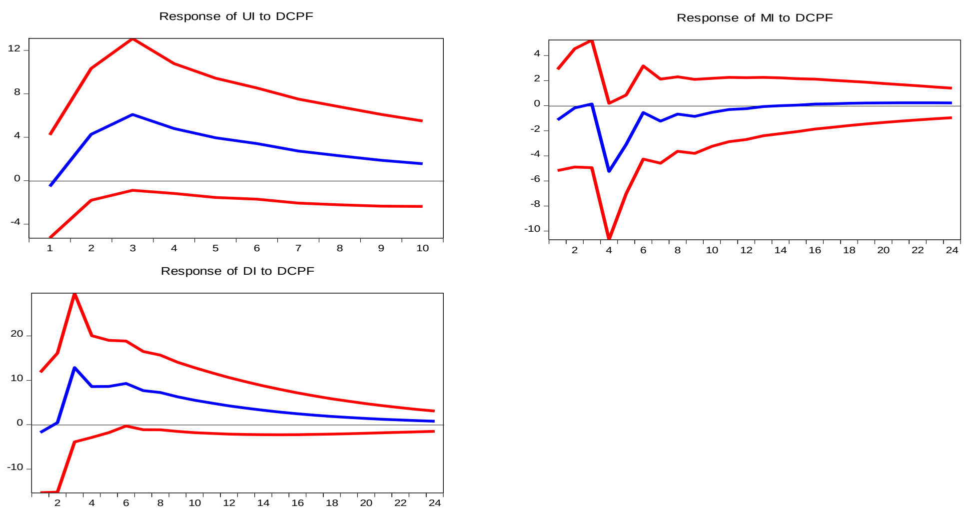

Figure 3. Impulse Response with Food Price Model

Figure 3 above shows that in response to food price shocks the export of upstream industries increases however, this response is insignificant. The export of midstream industries decreases with shocks in food prices and this response is significant in the fourth-month aftershock. Food is essential of life and consumers spend an ample share of their income on the consumption of food items and food prices have the highest share in the consumer price index (CPI). Thus, an increase in food prices creates inflationary pressure in the domestic economy. The midstream industries of Pakistan mostly export raw cotton thus it faces high competition from neighbouring countries. Domestic inflation reduces the competitiveness of midstream industries' export. Further, the shocks in food prices increase the export of downstream industries however this impact is significant for a fifth month only.

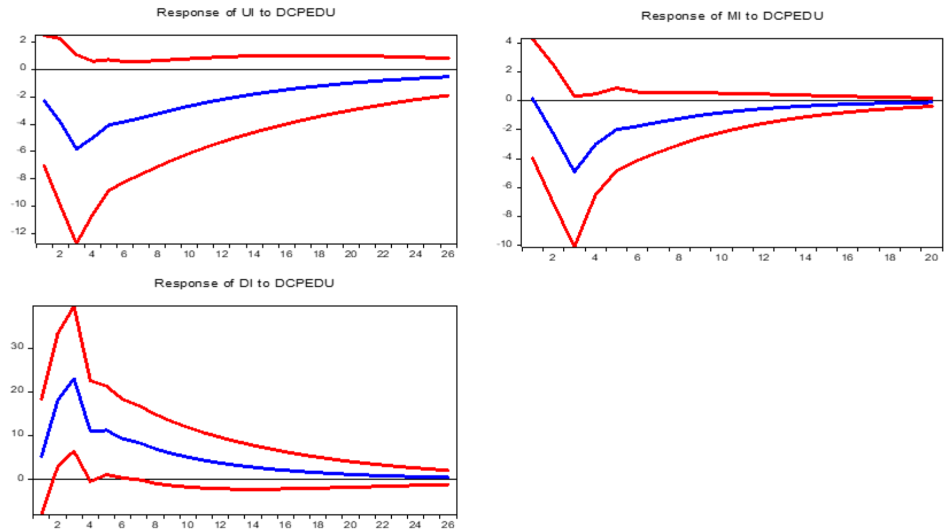

Figure 4. Impulse Responses with Education Price Shocks

Figure 4 shows that in response to education price shock the export of upstream and midstream industries decreases. However, it is significant for midstream industries export only. Whereas the export of downstream industries increases significantly from the second to seventh month of the shock. Education is the key to investment in human capital, the increase in the price of education leads to an increase in the investment cost of the human capital cost of living and production.

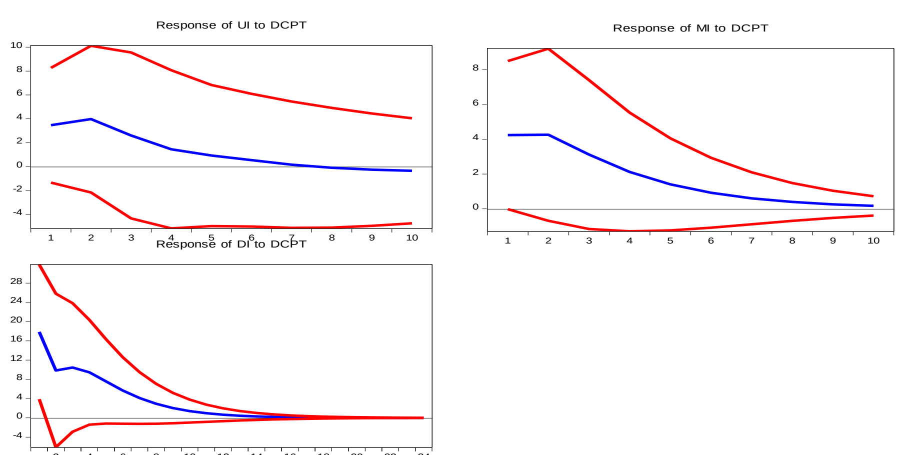

Figure 5. Impulse Response with Transportation Price Model

Figure 5 shows that transportation price shocks increase the export of all industries. However, the response is significant for midstream and downstream industries and only for the first month. An increase in transportation price increases the cost of production as most of the industrial activities involve the movements of labor, raw materials, and finished products from one place to another (Redding et al., 2015). Although the increase in transportation price increases the cost of production domestically it does not have much significant impact on export.

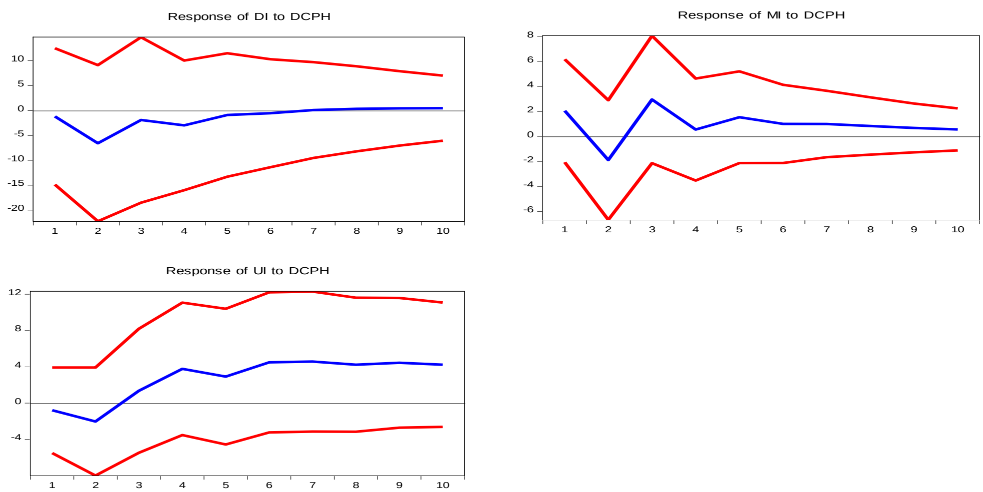

Figure 6. Impulse Responses with Housing Price Model

The housing assets are forward-looking, so they react instantly to the macroeconomic situation of an economy. The shocks in housing prices decrease the export of upstream industries. In the case of midstream industries, the shocks in housing prices increase the export for the first month, and then decreases for the second month and thereafter it increases. In response to housing, price shocks downstream industries export increases after the second month. However, this response is insignificant for all industries.

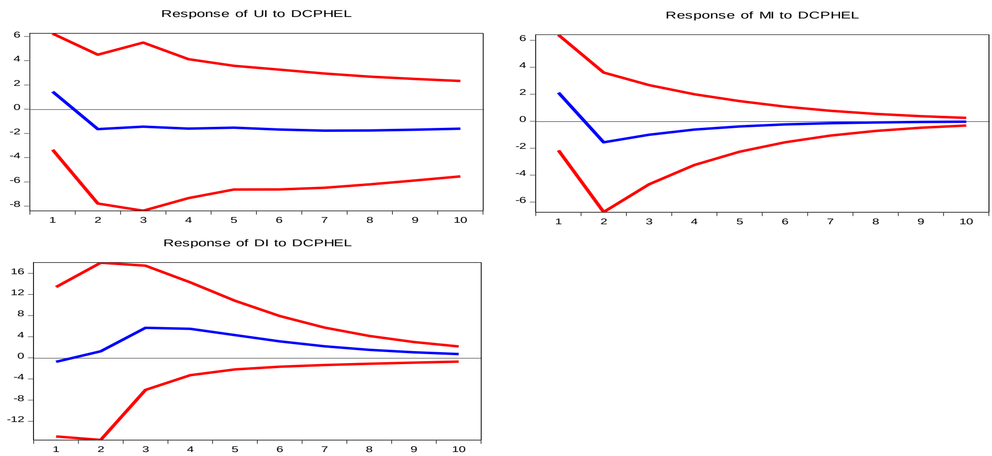

Figure 7. Impulse Response with Health Price Model

Figure 7 shows the impulse response with the health price model. Although health price shocks decrease the export for upstream and midstream industries and increases for downstream industries. Although, the results are not significant healthcare has always been considered as an economic activity, societies invest their time and resources in it, and they have traded for it.

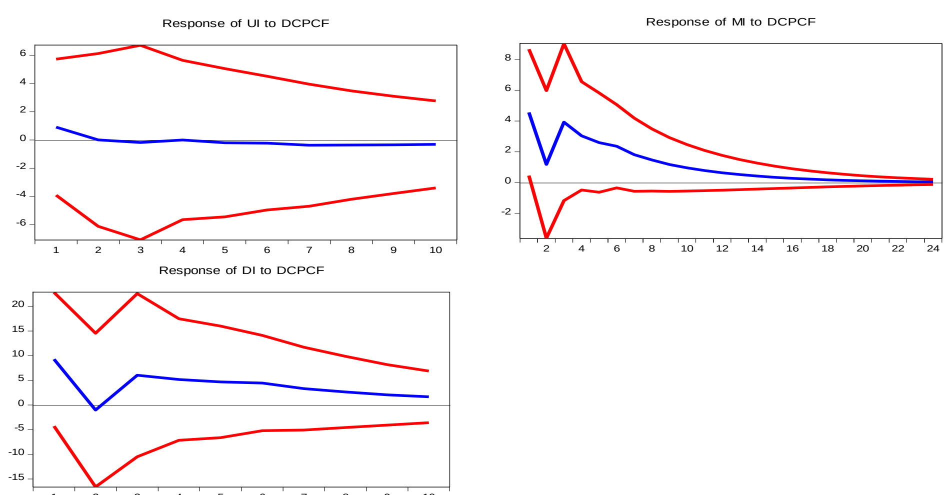

Figure 8. Impulse Responses with Clothing and Footwear

The above figure shows that in response to clothing and footwear price the upstream industries' export has no impact. Whereas midstream industries export that consists of export of “raw cloth” shows positive impact. The downstream industries export also has a positive impact. But this response is not significant. Being a small open economy that suffers severely from the balance of payment deficit the domestic price shocks have less impact on exports. However, the impact is expected to work through the channel of domestic production of exportable industries. And through the increase in the cost of production reduces the comparative advantage in trade. Further, the transmission of price shock to industrial prices affects the competitiveness of export.

5. CONCLUSION

The textile industry chain of Pakistan is made of three sub-industries. The export of midstream and downstream industries increases with energy price shocks. It may be through the channel of exchange rate depreciation. As Pakistan is a net importer of oil, the increase in energy prices resulting from the increase in oil prices (that has highest share in energy group) leads to an increment in payment to foreign countries and reduction in foreign reserves and exchange rate depreciation. The exchange rate depreciation makes the domestic commodities cheaper to foreign buyers as in result of the export increases. The food and education price shocks decrease the export of midstream industries as these shocks put inflationary pressure on the prices of final products of these industries and reduce, the export competitiveness. However, the same prices shocks increase the export of downstream industries. It might be since these industries have the highest value addition and have advantage of product differentiation. The finding of our study provides the insight that downstream industries are most affected industries with the commodity price shocks. However, the impact of these shocks is positive. Whereas midstream industries are adversely affected by food and education price shocks.

The results of the analysis provide useful information to the policymaker that will help them to achieve their goals more effectively. To improve the situation of the trade deficit of Pakistan, our results provide guidance to policymakers that one policy for all is not a good option as all industries of the textile industry chain are not affected by these shocks equally. Thus, subsidies should be provided to only those industries that are adversely affected by commodity price shocks. In the future, the dynamic transmission impact of commodity price shocks on the textile industry chain can be examined on export quantity and with export value to isolate the impact of exchange rate movements. Further, the studies can be done by including foreign variables like weighted aggregate consumption of major textile partners of Pakistan and weighted aggregate exports of major textile competitors of Pakistan to make the results more efficient.

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