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ROLE OF DOMESTIC DEMAND IN DEVELOPMENT OF EXPORT SUPPLY FROM PAKISTAN: An ARDL Approach

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Abstract

Traditionally, export supply is modelled as a function of production capacity, cost and prices. These factors are not able to fully explain the export performance. The present study includes the domestic demand pressure as an additional explanatory variable in the traditional export supply model to evaluate its empirical importance for modelling export supply for Pakistan. Using the Autoregressive Distributed Lag (ARDL) model (bound testing) on annual data over the period of 1971 to 2014; the results confirm that domestic demand pressure has a negative and significant effect on the supply of aggregate, primary and manufactured exports in both the long- and short-run periods. However, the short-run coefficients of domestic demand are much greater in magnitude in all three cases, implying that changes in domestic demand have a larger effect on export growth in the short-run. Finally, the study concludes that along with the traditional factors, domestic demand pressure is also relevant for modelling the export performance of Pakistan at both the aggregate and disaggregated levels.

Keywords: Export Supply, Domestic Demand Pressure, ARDL Model, Pakistan.
JEL Classification: F10, F14, C22.

I. Introduction

In today's globalised world, the economic performance of any economy highly depends on the performance of its trade. The standard economic theory about trade, starting from Ricardo to the new classical model, clarifies the role and benefits of trade between nations based on comparative advantage and relative factor endowments. In the traditional trade models, all countries gain from trade which increases the consumption possibilities of consumers in trading nations compared to what they could consume in the absence of trade. Export is a pivotal part of international trade; therefore, export growth and economic growth are interconnected and have a close relationship. If exports grow at a faster rate than imports (generally called trade surplus), it will lead to an increase in the economic size of a country.

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Several economists argued that export expansion improves the productive efficiency and management procedures in the production of the domestic firms resulting from the proper allocation of all types of resources, greater capacity utilisation, accelerating the rate of investment, specialisation in production, exploitation of scale economies and dissemination of technical knowledge stimulated by foreign competition [Grossman and Helpman (1993), Ram (1985) and Krueger (1978)]. Exports may help to increase the importation of technology, capital goods and intermediate inputs by relaxing foreign exchange constraints which enhance the rate of capital formation and technological innovation [Grossman and Helpman (1993) and Esfahani (1991)]. An export expansion may also help decrease the country's balance of payments problems [Thirlwall (2011)]. However, Pakistan's exports dropped by around US$ 3 billion from US$ 25,382.6 million in 2011 to US$ 22,089.1 in 2015 [IFS (2016)]. The trade deficit of a country reached 22,167 million dollars in 2015 from 15,266 million dollars in 2011. In such a situation, as exports are considered the engine of economic performance, a formulation of sound trade policy is required to improve the export performance as well as to reduce the trade deficit of the country.

The failure and success of any policy to boost the export performance are heavily dependent on a better understanding of factors constraints on export performance and responsiveness of exports to change in the traditional and non-traditional factors. Therefore, the direction and magnitude of relevant elasticities are essential for the formulation of a comprehensive export policy. A relatively small number of empirical studies, like Khan and Saqib (1993), Hasan and Khan (1994), Khan and Aftab (1995), Akhtar and Malik (2000), Atique and Ahmad (2003), Afzal (2005), Cameron and Zaman (2006), Zada, et al. (2011) and Gul and Rehman (2014), etc., have identified the determinants of export performance for Pakistan. However, the conclusions reached by these studies, especially regarding relative prices, have varied widely; for example, Anwar (1985), Hasan and Khan (1994), Atique and Ahmad (2003) and Afzal (2005) argued that relative prices had not made any significant difference in the export performance of Pakistan. In contrast, Gul and Rehman (2014) have documented a significant negative influence of relative prices on export performance. Other studies, like Cameron and Zaman (2006) and Zada et al., (2011), argued that relative prices had exercised a significant impact on the export behaviour of Pakistan.

The available literature using different methodologies and approaches has some common points and weaknesses. Firstly, almost all the existing empirical studies in Pakistan's case have utilised the neoclassical approach to model the export supply function. The export supply is determined by the domestic production capacity and relative profitability of producing export goods. All available studies in the case of Pakistan are implicitly based on the assumption of market-clearing prices and ignore the role of domestic demand pressure. Zilberfarb (1980) raised the important question that omitting the domestic demand pressure from the export model may produce an upward bias in the price elasticity. Secondly, several economists argue that variation

in the domestic demand may have a direct effect on export growth by affecting the availability of goods for exports, and these effects are not fully captured by changes in the relative prices [Artus (1973), Zilberfarb (1980), and Rahmaddi and Ichihashi (2012)]. Apart from this, it has been observed recently that traditional factors are far away from fully explaining the export supply [Fagan, et al. (2005), Esteves and Rua (2015)]. These findings highlight the need to investigate other factors that may affect the export supply of an economy.

The study intends to consider the domestic demand pressure as an additional explanatory variable along with traditional factors in order to evaluate its empirical importance for modelling the export supply for Pakistan. Domestic demand pressure is expected to affect the firm's willingness and ability to supply exports. When there is high domestic demand pressure, the firms will work at full capacity and will not be able to allocate resources to the export sector. Contrary, when there is a fall in domestic demand pressure, the firms will devote more resources to the export sector. Early empirical studies on the role of domestic demand pressure on exports, including Riedel, et al. (1984), Rahmaddi and Ichihashi (2012) and Esteves and Rua (2015), have also documented a significant negative effect of domestic demand pressure on export growth.

The study empirically estimates the export supply model for aggregate, primary and manufactured exports by including production capacity, relative prices, production cost and domestic demand pressure as explanatory variables in the export supply model. Evidence also suggests that changes in domestic demand have negatively and significantly impacted the growth of export supply of aggregate as well as primary and manufactured goods in Pakistan. In conclusion, the empirical estimates verified that the domestic demand pressure hypothesis is relevant to modelling export behaviour in Pakistan.

The paper is organised as follows: Section II presents a brief explanation of the existing empirical results on determinants of export supply. Section III presents the specification of the export supply function and econometric techniques used to evaluate the role of domestic demand pressure on export performance for Pakistan. The empirical results are discussed in Section IV. Finally, Section V contains the concluding remarks.

II. Literature Review

A large number of empirical literature evaluates the determinants of export performance around the globe. In terms of literature existing on export supply function, Kohli (1978), Goldstein and Khan (1978) (1985), Khan and Knight (1988), Arize (1990) have argued that export supply is largely determined by production capacity and relative profitability. However, Goldstein and Khan (1985) have derived the export supply equation in the imperfect substitution model framework. The basic assumption of the model is that 'neither imports nor the exports are the perfect substitutes for domestic goods. They postulate that producers in the domestic economy are assumed to maximise their

profits, subject to the cost constraint. They have included the variable cost of production in addition to relative prices and supply capability in the export supply equation and reported a statistically significant impact of variable cost on export performance.

The other studies, like Artus (1973), Zilberfarb (1980), Dunlevy (1980), Haynes and Stone (1983), Riedel et al. (1984), Arize (1987), Goldar (1989), Lawrence (1989) and Faini (1994) have included the domestic demand pressure or capacity utilisation along with prices and production capacity variables in the export supply model in order to test its economic rationale and empirical importance for modelling export behaviour. However, all studies yielded mixed and conflicting conclusions on the role of the domestic demand pressure on export performance. Artus (1973) for the United States, United Kingdom and Germany, Zilberfarb (1980) for Israel, Riedel, et al. (1984) for India, and Faini (1994) for Turkey and Morocco, these studies have documented a significant adverse impact of domestic demand pressure on export performance. Dunlevy (1980) and Haynes and Stone (1983) have reported a significant positive effect of domestic demand pressure on export growth for the United States and the United Kingdom. These results imply that domestic demand pressure also appears to be a substantial variable for modelling export supply for respective countries.

In the recent decade, Sharma (2003) has estimated the effects of various factors on export performance for India. The findings of the study indicate that real appreciation of India's Rupee has adversely affected the export performance of India. Moreover, the study also clarifies that domestic demand pressure has a significant negative effect on India's export supply. Athukorala and Suphachalasai (2004) have analysed for Thailand the role of domestic demand pressure and traditional factors on export performance of manufactured four sub-components; chemical, basic manufactured, machinery and transport equipment. Their results show that domestic demand pressure (measured by capacity utilisation) has a significant negative effect on the export performance of chemical, machinery and transport equipment and the total manufactured exports in the long-run. However, in all these cases, coefficients of domestic demand pressure are greater in the short-run, implying that domestic demand pressure has a larger effect on the export performance of manufacturing goods.

Edwards and Alves (2006) investigated South Africa's manufacturing export performance determinants. They reported that South Africa's total manufacturing and sub-categories, including natural resource-based manufactured and labour-intensive manufactured exports, are highly elastic to changes in the relative price in the long-run. In contrast, the export supply of metal products is relative price inelastic. The results also clarify that labour cost and capacity utilisation have negative effects on the supply of aggregate as well as the sub-categories of manufacturing exports, but the coefficient of labour cost is statistically insignificant in all sectors.

Rahmaddi and Ichihashi (2012) evaluated the role of domestic demand pressure along with the traditional factors on export supply for Indonesia. According to their estimates, export supply is highly elastic with respect to changes in relative price, as the

estimated elasticity of relative price (1.88) is greater than unity in the long-run. The results elucidate that export supply is also highly responsive to changes in production capacity and domestic demand pressure (measured by capacity utilisation). However, the production capacity has positive effects on export performance, whereas the domestic demand pressure has negatively affected the export growth in the case of Indonesia. They also concluded that the domestic demand pressure is also relevant for modelling export supply for Indonesia along with traditional factors. Other studies, Esteves and Rua (2015) for Portugal, and Belke, et al., (2015) for the Euro region, modeled the export behaviour by including domestic demand pressure as an additional variable along with traditional factors and documented a highly significant negative linkage between exports and domestic demand pressure in the short-run. In addition, the results explicate that the relationship between these two variables is asymmetric, implying that links between these two variables become much stronger when the domestic demand pressure decreases. Bobeica, et al., (2016) analysed the impact of domestic demand pressure on export growth for eleven Euro area countries by utilising the error correction dynamic panel model. The empirical results indicate that domestic demand pressure has a significant negative effect on export growth, but this effect almost disappeared in the boom period. The recent literature shows that along with the traditional factors, changes in domestic demand pressure are also a strong stimulus of export performance.

The literature available for Pakistan, Akhtar and Malik (2000), Atique and Ahmad (2003), Zada, et al. (2011) and Gul and Rehman (2014) have yielded conflicting conclusions on the effect of various factors on export growth. For example, all the mentioned studies have documented the significant positive effect of production capacity on export growth. In the case of relative prices, Atique and Ahmad (2003) have reported an insignificant positive effect of relative prices on export growth, whereas, Gul and Rehman (2014) have documented a significant negative influence of relative prices on export performance. Zada, et al. (2011) argued that export price has a significant influence, whereas domestic prices have an insignificant impact on export supply. Anwar (1985), Khan and Saqib (1993), Hasan and Khan (1994), and Afzal (2005) have also proposed that domestic production capacity has a significant influence on export performance of aggregate as well as manufactured and primary exports while for relative prices. All these studies reported insignificant effects on the growth of both the primary and manufactured exports in Pakistan's case. For individual export categories, Haleem, et al. (2005) documented that domestic production of citrus fruits has a negative influence on the export performance of citrus, whereas export price and Pakistan's GDP have a significant effect on the export supply of citrus fruits. Cameron and Zaman (2006) argued that the real GDP of Pakistan had exercised an insignificant impact on the export growth of the carpet and rugs sector in the short-run while the relative price has significantly affected the export supply of carpet and rugs in both periods.

Therefore, it is concluded that in the case of Pakistan, a look at empirical studies shows the wide disagreement on the role of various factors in the determination of

export supply. The most important point in the extant literature concerning Pakistan is that all studies are implicitly based on the assumption of market-clearing prices and ignore the role of the domestic demand pressure. Zilberfarb (1980) argued that omitting the domestic demand pressure from the export model may produce an upward- bias in the price elasticity. Several economists argued that variation in the domestic demand might have direct effects on export growth by affecting the availability of goods for exports, and changes in the relative prices do not fully capture these effects.

III. Methodological Frameworks

1. Specification of Export Supply Model

Specification of the export supply function is a complex issue. The factors that influence the export supply vary across sectors and countries due to domestic economic conditions and various governmental and industrial policies. There are two main conceptual approaches to model the determinants of export supply, the Neoclassical and Keynesian approaches. The advocates of the neoclassical approach postulate that export supply is basically determined by the relative prices and production capacity. On the other hand, Keynesian economists claim that export supply is the function which depends largely on domestic demand pressure, with price relegated mostly to the backstage. Some studies integrate these two approaches to model the factors of export supply across the globe [Zilberfarb (1980), Faini (1994), Rahmaddi and Ichihashi (2012), Basarac-Sertic, et al. (2015) and Bobeica, et al. (2016)]. The same formulation has also been taken in this study to estimate the export supply function for Pakistan.

The basic assumption in the specification of an export supply function for this study is that Pakistan is a small open economy and exporters are regarded as price takers in export markets; therefore, this assumption allows an estimation of a single equation export supply function.[1] The general Equation (1) of the export supply function is specified as follows:

$$X_S = f\,(RP, CoP, PC, DDP) \tag{1}$$

where, Xs is the quantity exported, RP is a relative price (the ratio of export price to domestic prices), CoP is the cost of production (represented by the producer price index), and PC is a production capacity to reflect the domestic economic activities, and DDP is the domestic demand pressure. Equation (1) is used to estimate the export supply function for aggregate, primary and manufactured exports covered in this study.

[1] A small country assumption is not unrealistic. A small country assumption holds in this case because, according to International Financial Statistics (IFS, 2016), Pakistan's exports constitute a small share that is less than 1 per cent of world exports for the period covered in this study, 1971-2014. In econometric terms, this signifies that the estimation of the export supply function is relatively free from the simultaneous-equation bias.

In the extant trade literature, there are still controversial views on the selection of an appropriate functional form of export supply model. Generally, a log-log model is preferred due to interpretation and its superior fit. Therefore, all variables in Equation (1) are logarithmically transformed and expressed econometrically for estimation purposes as follows in Equation (2):

$$\text{Ln } X_{Si,\,t} = \alpha_0 + \alpha_1 \text{LnRP}_t + \alpha_2 \text{LnCoP}_t + \alpha_3 \text{LnPC}_t + \alpha_4 \text{LnDDP}_t + \mu_t \qquad (2)$$

where *i* represents the export supply of aggregate, primary and manufactured goods, *t* is the time period, *Ln* is the natural log, μ is the error term which is independently and identically distributed zero-mean and constant variance; and α_0, α_1, α_2, α_3, α_4 are unknown parameters to be estimated. In Equation (2), each variable is expressed in logarithmic terms; therefore, the estimated coefficients are the relevant elasticities of export supply with respect to corresponding variables. The hypothesized signs of the elasticities are $\alpha_1 > 0$ and $\alpha_2 < 0$, $\alpha_3 > 0$, $\alpha_4 < 0$.

Finally, the disequilibrium model is estimated by including the lag dependent variable in the model. The rationale for including the lagged dependent variable as an explanatory variable is that time lag is involved in the adjustment of export supply to changes in independent variables.

2. Estimation Technique

The recent empirical studies emphasised the use of cointegration techniques for the estimation of export demand and supply functions in order to avoid endogeneity and spurious regression problems. This study utilises the autoregressive distributed lag (ARDL) model to estimate the export supply function for Pakistan [Pesaran, et al. (2001)]. The rationale for using the ARDL model instead of Engel-Granger (1987) and Johansen (1991) tests for cointegration is that ARDL has the advantage over the other two techniques. First, ARDL is the most reliable and suitable model in the case of a small sample size. Secondly, the ARDL can be employed, irrespective of the underlying series being I (1), I (0) or mixed order. The specification of an unrestricted ECM-ARDL model for the export supply function is obtained by transforming Equation (2) as follows in Equation (3).

$$\begin{aligned}\Delta \ln X_{Si,t} = {} & \alpha_0 + \Sigma_{i=0}^{a} \alpha_1 \Delta \ln \text{RP}_{t-i} + \Sigma_{i=0}^{b} \alpha_2 \Delta \ln \text{CoP}_{t-i} + \Sigma_{i=0}^{c} \alpha_3 \Delta \ln \text{PC}_{t-i} \\ & + \Sigma_{i=0}^{d} \alpha_4 \Delta \ln \text{DDP}_{t-i} + \Sigma_{i=1}^{e} \alpha_5 \Delta \ln X_{Si,t-i} + \varphi_1 \ln \text{RP}_{t-1} + \varphi_2 \ln \text{CoP}_{t-1} + \varphi_3 \ln \text{PC}_{t-1} \\ & + \varphi_4 \ln \text{DDP}_{t-1} + \varphi_5 \ln X_{Si,t-1} + \varepsilon_t \end{aligned} \qquad (3)$$

where, Δ represents the first difference, *i* is the number of lags and t is the time period. The study uses the bound testing approach in order to know the cointegration. Hence, α_1, α_2, α_3 α_4 and α_5 are coefficients of short-run estimation and φ_1, φ_2, φ_3 φ_4 and φ_5 are

coefficients of long-run estimation. The (a, b, c, d and e) are the number of lags used for each variable. To determine an appropriate lag length for each variable, Akaike's Information Criterion (AIC) and other diagnostic tests have been employed. After identifying the appropriate lag length, the specification is tested for the presence of a cointegrating relationship by utilising the Wald test. Under the Wald test, the null and alternative hypothesis is:

$$H_0 : \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0 \quad \text{(No Co-integration)}$$
$$H_a : \varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq 0 \quad \text{(Co-integration)}$$

In case of evidence in favour of cointegration, the next step is to estimate the long-run effects which can be extracted from the reduced form solution of the unrestricted ECM-ARDL model (3), when $\Delta X_{si,t} = \Delta RP_t = \Delta CoP_t = \Delta PC_t = \Delta DDP_t = 0$. The long-run coefficients "normalised by the lagged exports" from the model (3) for the relative price, cost of production, production capacity and domestic demand pressure can be obtained as $-\left(\frac{\varphi_1}{\varphi_5}\right)$, $-\left(\frac{\varphi_2}{\varphi_5}\right)$,$-\left(\frac{\varphi_3}{\varphi_5}\right)$ and $-\left(\frac{\varphi_4}{\varphi_5}\right)$ respectively.

Finally, the short-run dynamics are obtained by estimating the restricted ECM-ARDL model. The Error Correction Model (ECM) is derived from the conditional long-run ARDL model through a simple linear transformation. The ECM model consists of the difference of variables and error correction terms. The error correction term (ECT) is obtained by estimating the long-run level model using OLS for each export category. The ECM model is expressed as follows in Equation (4):

$$\begin{aligned}\Delta \ln X_{Si,t} = {} & \alpha_0 + \Sigma_{i=0}^{a} \alpha_{1i} \Delta \ln RP_{t-i} + \Sigma_{i=0}^{b} \alpha_{2i} \Delta \ln CoP_{t-i} + \Sigma_{i=0}^{c} \alpha_{3i} \Delta \ln PC_{t-i} \\ & + \Sigma_{i=0}^{d} \alpha_{4i} \Delta \ln DDP_{t-i} + \Sigma_{i=1}^{e} \alpha_{5i} \Delta \ln X_{Si,t-i} + \gamma ECT_{t-1} + \varepsilon_t \end{aligned} \quad (4)$$

where ECT_{t-1} is the lagged residual series from the long-run "level model" and Δ is the first difference operator. α_1, α_2, α_3, and α_4 are the short-term elasticities, and γ is an adjustment coefficient. The γ indicates the long-run speed and direction of change toward equilibrium. The expected value of the adjustment coefficient should be negative and statistically significant. Finally, to verify the verifying validity of the classical assumption of the residual and analyse the dynamic stability of the models, the study has utilised the normality test, serial correlation LM test, ARCH test and Ramsay's Reset test.

3. Data and Measurement of Variables

The annual time series data is used by this study over the period of 1971 to 2014. All variables are in Pak Rupee (PKR) with the year 2000=100. Data for all variables are sourced from the International Financial Statistics yearbooks (various years), Federal Bureau of Statistics of Pakistan (various issues) and Economic Survey of Pakistan.

This data is further used for the estimation of different variables.

Many studies have used the real value of exports as a quantity of export supply. Hence, following the extant literature, the present study also uses the current value of aggregate and disaggregated exports in PKR deflated by the export unit value index of Pakistan to measure the quantity of export supply. The disaggregated exports, including primary and manufactured, were deflated by using the same category of export unit value index of Pakistan. Relative price is obtained by dividing the export unit value index by the wholesale price index of Pakistan. In contrast, the relative price for primary and manufactured export categories is calculated by dividing the export unit value index of a specific category by the same category of the wholesale price index. The producer price index is used as a proxy for the cost of production. Pakistan is among countries which can not report the production capacity data directly. Therefore, the trend real GDP of Pakistan is used to represent the production capacity and changes in productivity. However, production capacity is a proxy for disaggregated exports by trend value of sector-wise GDP. A vast literature, including Zilberfarb (1980), Dunlevy (1980), Haynes and Stone (1983), Arize (1987), Goldar (1989), Edwards and Alves (2006), Rahmaddi and Ichihashi (2012), and Bobeica, et al. (2016) have used deviation from the trend income/GDP as a proxy to measure the domestic demand pressure. Following the extant literature, the present study measures domestic demand pressure by taking the ratio[2] of real GDP to trend real GDP.[3] The latter captures the long-term performance of the economy and the former reflects the influence of the short-term factors. Domestic demand pressure is measured for disaggregated export categories by the ratio of sector-wise value added to GDP trend value. The measurement of domestic demand pressure as a deviation of trend real GDP is questionable in the extant literature; therefore, it is important to identify the specific reasons for measuring domestic demand pressures as a deviation of the real GDP from its long-term trend. Some of them can be stated as follows:

(a) Deviation from the long-term trend value directly measures how many resources are unemployed in the economy. When values of deviation from the trend are negative, the firms will work at full capacity and not be able to allocate resources to the export sector. On the contrary, when the values of deviation from trend income are positive, the firms will work below the full capacity and will be able to devote more resources to the export sector.
(b) The measure is simple to calculate and reduces the chance of measurement error.
(c) It is a direct measure of domestic demand pressure calculated from the actual data. This fact makes it superior over alternative measures of domestic demand pressures that rely on expert opinion or qualitative data and are more susceptible to subjective biases.

[2] Dunlevy (1980), and Goldar (1989) have used the ratio of real income to trend real income to avoid the negative values in the case of taking the domestic demand pressure in logarithm.

[3] Trend Level of Real GDP is obtained by fitting the linear time trend to the real GDP of Pakistan.

(d) The measure is symmetric, which means it measures positive pressure with the same accuracy as the negative demand pressures.
(e) The measure has acquired wide currency in the profession. Thus, using the same measure as used by many previous studies allows ready comparability of findings with the previous studies.

IV. Results and Discussion

OLS regression is estimated with non-stationary data and residuals, which produces spurious results. Apart from this, if the data series of any variable is integrated of order two or more, then the ARDL cannot be used. To overcome this problem, the data series of each variable has been tested for determining the order of integration of the variables. For this purpose, ADF (Augmented Dickey-Fuller) test (1979) and PP (Phillips–Perron) test are used for the presence of a unit root in the individual time series. The results of each variable, whether it is integrated of order zero or one, are reported in Table 1. The test statistic values of both tests are reported in Table 1 showing that all variables are non-stationary in level, except the relative price variables at a one per cent level of significance. However, after taking the first difference of variables, the ADP and PP tests produced the test statistic values less than the critical values for all variables. These results signify that almost all relative price variables are stationary with zero degrees or integrated I (0), and other variables are stationary in the first difference or integrated I(1). It gives a good justification to apply the bound testing approach or unrestricted ARDL-ECM.

TABLE 1

Results of ADF* and PP* Tests for Unit Root

Variables in Natural Log	Level of Variable		First difference		
	ADF test	PP test	ADF test	PP test	Inference
Aggregate Exports	-1.600	-2.550	-9.521	-5.087	I(1)
Primary Exports	-0.958	-1.948	-6.648	-6.791	I(1)
Manufactured Exports	-2.164	-2.510	-10.31	-5.682	I(1)
Producer Price Index	2.933	6.057	-3.629	-4.415	I(1)
Relative price General	-9.268*	-5.562*			I(0)
Relative Price Food	-4.107*	-4.043*			I(0)
Relative Price Manufactured	-6.320*	-5.145*			I(0)
Real GDP	-2.092	-1.831	-4.407	-4.407	I(1)
Ratio of RGDP to Trend RGDP	-2.550	-1.566	-15	-14.04	I(1)

Note: The Null hypothesis is that the variable has a unit root. The Critical values of ADF and PP tests at a one per cent level of significance are -3.59. The superscript * represents that the variable is stationary at the level. ADF (Augmented Dicky-Fuller) and PP (Phillips- Perron) tests are performed without included trend.
Source: Authors' estimation.

Under such methodology, there is no restriction on the order of integration of regressors, as it should either be I (1) or I (0) or mixed order.

1. Cointegration Analysis

The calculation of the ARDL model is sensitive to the selection of lag length; therefore, the Akaike information criteria (AIC) and the other diagnostic tests have been employed to determine an appropriate lag length and accurate specification of the ARDL model. Different lags lengths for each variable and the ARDL in the different specifications were selected across various export categories according to general-to-specific methodology [Hendry (1995)]. After the selection of the best-fit model, the Wald test was applied the identification of cointegrating relationships among the examined variables. The results of the Wald test for cointegration of each estimated Equation are reported in Table 2. In all three cases, the computed F-statistic value of the Wald test is greater than the upper bound critical value I (1) of [Pesaran, et al. (2001)], at a 1 per cent level of significance. These results confirm the existence of a cointegrating relationship among various factors of export supply across aggregated and disaggregated export categories, namely the primary and manufactured goods. Moreover, the results of several diagnostics tests (reported in Tables 3 and 4) are also up to the mark and the residual of each Equation satisfies the classical assumption. Based on these findings, the next step is to proceed to determine the long- and short-run dynamics of export supply.

2. Long-Run Effects for Aggregate, Manufactured and Primary Export Supply

The results of long-run effects for aggregate, primary and manufactured exports are reported in Table 3, together with the lag structure of ARDL. This lag specification of ARDL is the same as used for the bound testing approach, which is selected after ensuring that the residual of each Equation satisfies the classical assumptions. The long-run estimates show that the aggregate export supply is highly elastic to changes in price and production capacity; while inelastic to changes in the cost of production

TABLE 2

Results of Bound Testing

Export Categories	F-Statistic	Upper Bound Critical Value (1%)	Conclusion
Aggregate Exports	13.43*	4.68	Cointegration
Primary Exports	8.904*	4.68	Cointegration
Total Manufactured	6.487*	4.68	Cointegration

Note: Upper bound I(1) and lower bound I(0) critical values of [Pesaran, et al. (2001)] at 1% and 5% significance levels are (4.68, 3.41), (3.79, 2.62) respectively. The superscript * represents that the F-statistic value for the specific Equation is greater than the upper bound value I(1) of [Pesaran, et al. (2001)] at 1% significance level.
Source: Authors' estimation.

and domestic demand pressure as the long-run elasticity of the cost of production (-0.422) and domestic demand pressure (-0.863) is significantly less than unity. When aggregate exports are divided into primary and manufactured export categories, however, the long-run elasticities of various factors are noticeably different in terms of magnitude and signs. For primary export supply, using a reasonable level of significance, the coefficients of all variables are statistically significant and have expected signs, except the cost of production. However, the export supply of primary goods is highly responsive to changes in relative price, production capacity and the domestic demand pressure, while it is inelastic with respect to changes in the cost of production. These results are generally in contradiction to the findings of previous studies, like Afzal (2005) for Pakistan, who obtained the relative price elasticity of primary export supply, as less than unity and insignificant. In the case of manufactured export supply, all coefficients have expected signs and are statistically significant with a magnitude greater than unity, implying that the export supply of manufactured goods is highly elastic to changes in prices, cost, production capacity and the domestic demand pressure the long-run. These results are generally consistent with the findings of previous studies. For example, Faini (1994) obtained the statistically significant effects of rel-

TABLE 3

Long-Run Estimates with Unrestricted ARDL

Regressors	Aggregate Exports		Primary Exports		Manufactured Exports	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Intercept	-14.89*	-4.112	-9.170**	-2.474	-11.132**	-2.501
RP	1.224*	4.063	1.113*	5.245	1.842***	1.75
CoP	-0.422**	-2.311	0.143*	2.048	-1.076**	-2.302
PC	2.184*	4.589	1.316*	4.576	3.053*	2.886
DDP	-0.863*	-3.156	-1.486***	-1.831	-1.644**	-2.207
R^2	0.867		0.656		0.704	
F-statistic	15.732 [0.000]		5.036 [0.000]		4.753 [0.000]	
DW	2.183		1.952		2.264	
Model Diagnostic						
Autocorrelation	F(1,28)	0.576 [0453]	F(2,27)	0.126 [0.851]	F(2,24)	0.766 [0.475]
Functional Form RESET	F(1,28)	0.140 [0.710]	F(1,28)	0.301 [0.584]	F(1,25)	0.220 [0.642]
Normality J-B (χ2)	1.561 [0.457]		1.970 [0.373]		0.705 [0.702]	
Heteroscedasticity	F(12,29)	1.443 [0.203]	F(11,29)	1.131 [0.373]	F(13,26)	1.743 [0.110]
Lag Specification	(ARDL: 1,1,1,1,1)		(ARDL: 2,1,1,1,1)		(ARDL: 2,1,3,1,2)	

Notes: The values in parentheses [ ] are F-statistics probability values and p-value of diagnostic tests, respectively. The superscript *, ** and *** represents 1 per cent, 5 per cent and 10 per cent significance levels, respectively.
Source: Authors' estimation.

ative price, production capacity and capacity utilisation on total manufactured exports for Morocco and Turkey. Afzal (2005) documented domestic production elasticity of export supply of manufactured goods, more than unity for Pakistan. Recently, Basarac-Sertic, et al. (2015) obtained the production capacity and domestic demand pressure elasticities of export supply of manufactured goods more than unity and statistically significant for 27 European Union member countries. In conclusion, the long-run dynamics clarify that domestic demand pressure is statistically relevant in the long-run along with traditional factors for the modelling export supply of aggregate and manufactured and primary goods in the case of Pakistan.

3. Short-Run Effects for Aggregate, Manufactured and Primary Export Supply

The short-run dynamics presented in Table 4 show that lagged error correction terms for aggregate, primary and manufactured export supply are negative and highly significant. This implies that disequilibrium arises from external shocks, corrected or returned to equilibrium in the upcoming period. However, the coefficient of adjustment for ag-

TABLE 4

Short-Run Estimates with Restricted ARDL

Regressors	Aggregate Exports		Primary Exports		Manufactured Exports	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Intercept	-0.055	-1.414	-0.103	-1.347	0.084	1.338
ΔRP	0.571*	4.476	0.409***	1.932	0.669*	3.675
ΔCoP	0.25	1.002	-0.054	1.472	-0.871*	-2.645
ΔPC	1.397***	1.894	2.489***	1.703	2.551***	1.705
ΔDDP	-1.701*	-4.447	2.227**	-2.897	-2.015***	-1.935
ECT(-1)	- 0.896*	-6.272	-0.804*	-5.649	- 0.257**	-2.075
R^2	0.827		0.6		0.724	
F-statistic	19.725 [0.00]		8.733 [0.00]		10.802 [0.00]	
DW	1.879		1.98		1.82	
Model Diagnostic						
Autocorrelation	F(1, 32)	0.227 [0.602]	F(1, 34)	0.041 [0.839]	F(1, 32)	0.619 [0.437]
Functional Form RESET	F(1, 32)	1.624 [0.211]	F(1, 34)	0.489 [0.585]	F(1, 32)	1.171 [0.250]
Normality J-B (χ2)	0.498 [0.779]		0.793 [0.672]		1.497 [0.472]	
Heteroscedasticity	F(8, 33)	0.681 [0.704]	F(6, 35)	1.888 [0.110]	F(8, 33)	0.690 [0.697]
Lag Order	(ARDL: 1, 0,0,1,1)		(ARDL: -,0,1,1,1)		(ARDL: 2,1,3,1,2)	

Notes: The values in parentheses [ ] are F-statistics probability values and p-value of diagnostic tests, respectively. The superscript *, ** and *** represents 1 per cent, 5 per cent and 10 per cent significance levels, respectively.
Source: Authors' estimation.

gregate (-0. 896) and primary (-0.804) export supply are huge, indicating that 89.6 per cent and 80.4 per cent of adjustment toward equilibrium will occur within one year in the export supply of aggregate and primary goods, respectively.

In addition, the short-run estimates explicate that coefficients of relative price are correctly signed and statistically significant in all three cases, but the magnitude of price elasticities is noticeably less than unity in all cases. Likewise, coefficients of the cost of production are negative and less than unity for primary and manufactured export supply but statistically significant only for manufactured exports. Moreover, the coefficient of the cost of production for aggregate exports is positive with a magnitude smaller than unity but statistically insignificant. These findings imply that the export supply of aggregate and primary and manufactured goods are inelastic with respect to relative price and cost of production in the short-run in the case of Pakistan.

Although, the coefficients of production capacity and domestic demand pressure are found to be statistically significant and greater than unity in all three cases, implying significant effects of production capacity and domestic demand pressure on aggregate, primary and manufactured export supply in the short-run. However, the domestic demand pressure has a negative effect on export performance in all three cases. This validates that domestic demand pressure is relevant for modelling the short-run dynamics of exports in Pakistan. In addition, the results also clarify that the short-run coefficients of domestic demand pressure are much greater in magnitude as compared to long-run coefficients in all three cases, implying that changes in domestic demand pressure have larger effects on export supply in the short-run in the case of Pakistan.

V. Conclusion

This study is an attempt to assess the impact of domestic demand pressure on the export performance of Pakistan. In order to achieve the objective of this study, the autoregressive distributed lag (ARDL) model has been employed on annual data for the period 1971 to 2014. The empirical results based on the bound testing approach showed a cointegrating relationship among various factors of export supply across the aggregate, as well as disaggregated export categories, namely primary and manufactured goods. Moreover, the findings of long-run estimates show that aggregate export supply is highly elastic to changes in relative prices and production capacity while inelastic to changes in the cost of production and domestic demand pressure in the long-run. On the contrary, the export supply of manufactured goods is highly responsive to changes in relative prices, cost of production, domestic demand pressure and production capacity in the long-run. Similarly, the export supply of primary products is highly elastic with respect to all factors except the cost of production in the long-run. These results imply that domestic demand pressure is statistically relevant along with traditional factors for modelling export supply of aggregate and manufactured and primary goods in the long-run in the case of Pakistan.

The results of short-run dynamics confirm that export supplies of aggregate, primary and manufactured goods are inelastic to changes in relative price and cost of production in the short-run. On the contrary, the coefficients of production capacity and domestic demand pressure are found to be statistically significant and greater than unity in all three cases. These results signify that Pakistan's export performance relies heavily on production capacity and domestic demand pressure in the short-run. In addition, the short-run estimates clarify that the short-run coefficients of domestic demand pressure are much greater in magnitude as compared to long-run coefficients in all three cases, implying that domestic demand pressure has a larger effect on export supply in the short-run in the case of Pakistan.

In conclusion, the empirical results confirm that prices and cost of production strongly affect the export supply of manufactured goods. Thus, it is recommended that the government provide incentives to manufactured goods exporters to expand Pakistan's export sector. Apart from this, the government should stabilise the price ratio of inputs and industrial materials around the level which would balance the production of value-added manufactured products. In addition, the statistical findings show that the export supply of primary goods is chiefly determined by the domestic production and domestic demand pressure. Therefore, it is strongly suggested that provincial governments should provide special incentives to farmers in the pre-production stage to increase the output of agricultural products and generate a surplus for exports. Finally, the study concludes that domestic demand pressure has a negative and significant effect on the export supply of aggregate, primary and manufactured goods, implying that along with traditional factors, demand domestic pressure is also relevant for modelling export supply at both aggregate and disaggregated levels in Pakistan.

Further research should be extended in several dimensions. First, the number of time-series observations in this study is not large. Second, the current study did not cover whether the relationship between domestic demand pressure and export behaviour is asymmetric. Future researchers can be benefited by constructing a panel-data set using observations from all provinces of Pakistan and allowing an asymmetric impact of domestic demand pressure on export growth to overcome this issue.

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