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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 modeled as a function of production capacity, cost, and prices. However, 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 modeling 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 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 the 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 modeling export performance of Pakistan at both the aggregate and disaggregated levels.

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

I. Introduction

In today's globalized world, the economic performance of any economy, highly depends on performance of its trade. The standard economic theory about trade starting from Ricardo to new classical model is quite clear about 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 absence of trade. Exports are pivotal part of the international trade; therefore, export growth and economic growth are interconnected and have a very close relationship. If exports grow at a faster rate than the imports (generally called as trade surplus), it will lead to increase the economic size of a country.

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Several economists argued that export expansion improves the productive efficiency and management procedures in production of the domestic firms resulting from proper allocation of all types of resources, greater capacity utilization, accelerating the rate of investment, specialization 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 enhances the rate of capital formation and technological innovation [Grossman and Helpman (1993), and Esfahani (1991)]. An export expansion may also help to 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 to 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 in order 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 constraint 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 formulation of a comprehensive export policy. A relatively small number of empirical studies, like Anwar (1985), 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), Gul and Rehman (2014), etc., have identified the determinants of export performance for Pakistan. The conclusions reached by these studies in this area, especially for relative prices have however, varied widely. For example, Anwar (1985), Khan and Saqib (1993), Hasan and Khan (1994), Atique and Ahmad (2003) and Afzal (2005) argued that relative prices have not made any significant difference in export performance of Pakistan, whereas Gul and Rehman (2014) has 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 have exercised a significant impact on export behavior of Pakistan.

In case of Pakistan, the available literature using different methodologies and approaches has some common points and weakness. Secondly, almost all the existing empirical studies in Pakistan's case have utilized the neoclassical approach to model the export supply function in which the export supply is basically 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 assumption of the market-clearing prices and ignore the role of domestic-demand pressure. Here the important question can be posed as in Zilberfarb (1980) that omitting the domestic demand pressure from the export model may produce the upward bias in the price elasticity.

Second, several economists argue that variation in the domestic demand may have 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), Rahmaddi and Ichihashi (2012)]. Apart from this, it has been observed recently that traditional factors are far away to fully explain the export supply [Fagan, et al. (2005), Esteves and Rua (2015)]. These findings highlight the need to investigate for other factors that may affect the export supply of an economy.

Keeping into view the above discussion, the present 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 modeling the export supply for Pakistan. It is expected that domestic demand affects 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 fall in domestic demand, the firms will be able to devote more resources to the export sector. Early empirical studies on the role of domestic demand on exports, including Riedel, et al. (1984), Faini (1994), Rahmaddi and Ichihashi (2012) and Esteves and Rua (2015) have also documented a significant negative effect of domestic demand pressure on export growth.

To be more precised the study empirically estimate the export supply model for aggregate, primary and manufactured exports by including production capacity, relative prices, production cost and domestic demand as explanatory variables in the export supply model. The evidence gathered here suggests that changes in domestic demand have negatively and significantly affected the growth of export supply of aggregate as well as primary and manufactured goods in Pakistan. In conclusion, the empirical estimates verified that domestic demand pressure hypothesis is relevant for modeling export behavior in Pakistan.

The rest of the paper is organized as follows: In Section II, a brief elucidate of the existing empirical results on determinants of export supply is presented. Section III presents the specification of the export supply function and econometric technique used to evaluate the role of domestic demand on export performance for Pakistan. The empirical results are discussed in Section IV. Finally, Section V contains the concluding remarks. The data sourced are given in the Appendix, Table A-1.

II. Literature Review

A large number of empirical literature evaluates the determinants of export performance around the globe. In terms of literature, existing for export supply function, Kohli (1978), Goldstein and Khan (1978), (1985), Khan and Knight (1988), Arize (1990) and many others 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 imperfect substitution model framework. The

basic assumption of the model is that 'neither imports nor the exports are perfect substitutes for domestic goods. They postulate that producers in domestic economy are assumed to maximize 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 growth. On the other hand, some 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 utilization along with prices and production capacity variables in the export supply model in order to test its economic rationale and empirical importance for modeling export behavior; but all studies yielded mixed and conflicting conclusions on the role of domestic demand pressure on export performance. For instance, Artus (1973) for United States, United Kingdom and Germany, Zilberfarb (1980) for Israel, Riedel, et al. (1984) for India, and Faini (1994) for Turkey and Morocco, have documented a significant adverse impact of domestic demand pressure on export performance, while Dunlevy (1980) and, Haynes and Stone (1983) for the United States and the United Kingdom have reported a significant positive effect of domestic demand on export growth. These results imply that domestic demand also appears to be a significant variable for modeling 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 indicate that real appreciation of India's Rupee has adversely affected the export performance of India, while export supply is significantly and positively related to relative prices. Moreover, the study also clarifies that domestic demand pressure has a significant negative effect on India's export supply. Athukorala and Suphachalasai (2004) have analyzed the role of domestic demand pressure along with the traditional factors on export performance of manufactured and four sub-components; namely, chemical, basic manufactured, machinery and transport equipment, and the miscellaneous manufactured for Thailand. Their results show that domestic demand pressure (measured by capacity utilization) has significant negative effect on 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 are greater in short-run, implying that domestic demand has a larger effect on export performance of manufacturing goods in the short-run.

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

Recently, Rahmaddi and Ichihashi (2012) evaluated the role of domestic demand 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. Moreover, the results elucidate that export supply is also highly responsive to changes in production capacity and the domestic demand (measured by capacity utilization). However, the production capacity has positive effects on export performance, whereas the domestic demand has negatively affected the export growth in case of Indonesia. At the end, they concluded that along with traditional factors, the domestic demand is also relevant for modeling export supply for Indonesia. Other studies, Esteves and Rua (2015) for Portugal, Belke et al. (2015) for Euro region, modeled the export behavior 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 in the short-run. In addition, the results explicate that relationship between these two variables is asymmetric, implying that links between these two variables become much stronger when the domestic demand decreases. More recently, Bobeica, et al. (2016) argued the analyzed impact of domestic demand pressure on export growth for eleven Euro area countries by utilizing the error correction dynamic panel model. The empirical results indicate that domestic demand pressure has a significant negative effect on the export growth. However, in the boom period, this effect almost disappeared. In conclusion, the recent literature shows that along with the traditional determinants, changes in domestic demand are also a strong stimulus of export performance.

With respect to the literature available for Pakistan, Akhtar and Malik (2000), Atique and Ahmad (2003), Zada, et al. (2011) and Gul and Rehman (2014) have yielded the 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 case of relative prices, Atique and Ahmad (2003) has reported insignificant positive effect of relative prices on export growth; whereas, Gul and Rehman (2014) has documented a significant negative influence of relative prices on export performance. Moreover, other studies like Zada, et al. (2011) argued that export price has a significant influence whereas domestic prices have an insignificant impact on export supply. Other studies, like Anwar (1985), Khan and Saqib (1993), Hasan and Khan (1994) and Afzal (2005) have also proposed that domestic production capacity has significant influence on export performance of aggregate as well as manufactured and primary exports while for relative prices, all these studies reported insignificant effect on the growth of both the primary and manufactured exports in Pakistan's case. For individual export category in case of Pakistan, Haleem, et al. (2005) documented that domestic production of citrus fruits has a negative influence on export performance of citrus; whereas, export price and Pakistan's GDP have significant effect on the export supply of citrus fruits. Cameron and Zaman (2006) argued that real GDP of Pakistan has exercised an insignificant impact on the export

growth of carpets and rugs sector in the short-run while the relative price has significantly affected the export supply of carpets and rugs in both periods.

It is therefore concluded that in case of Pakistan, a look at empirical studies shows the wide disagreement on the role of various factors in determination of export supply. The most important point in the extant literature with respect to Pakistan is that all studies are implicitly based on the assumption of market-clearing prices and ignore the role of domestic demand pressure. Here, the important question can be posed [as in Zilberfarb (1980)] that omitting the domestic demand pressure from the export model may produce upward- bias in the price elasticity. Secondly, several economists argued that variation in domestic demand may have direct effects on export growth by affecting the availability of goods for export, and these effects are not fully captured by changes in the relative prices.

III. Methodological Frameworks

1. Specification of Export Supply Model

Specification of the export supply function is a complex issue and factors that influence its economy vary across sectors and countries due to domestic economic conditions and various governmental and industrial policies. However, there exist two main conceptual approaches to model the determinants of export supply; namely, the neoclassical and Keynesian approaches. The advocates of neoclassical approach postulate that export supply is basically determined by the relative prices and production capacity. On the other hand, the Keynesian economists claim that export supply is the function which depends largely on domestic demand pressure, with price relegated mostly to the backstage. Several studies integrate these two approaches to model the factors of export supply across the globe [Zilberfarb (1980), Haynes and Stone (1983), Arize (1987), Faini (1994), Rahmaddi and Ichihashi (2012), Basarac-Sertic, et al. (2015) and Bobeica, et al. (2016)]. To estimate the export supply function for Pakistan, the same formulation has also been taken in this study.

The basic assumption in 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 the export markets; therefore, this assumption allows an estimation of a single equation export supply function.[1] The general equation of the export supply function is specified as follows:

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

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

where, X_s is the quantity of 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), PC is a production capacity to reflect the domestic economic activities and DDP is the domestic demand pressure. This equation is used to estimate the export supply function for aggregate, primary and manufactured exports covered in this study. In the extant trade literature, there are still controversial views on selection of an appropriate functional form of export supply model. Generally, due to interpretation and its superior fit, a log-log model is preferred. Therefore, all variables are logarithmically transformed to Equation (1) and expressed econometrically for estimation purpose:

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

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 with mean zero 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 depended variable as an explanatory variable is that time lag is involved in adjustment of export supply to changes in independent variables.

2. Estimation Technique

Recently, the empirical studies emphasized the use of cointegration technique for estimation of export demand and supply functions in order to avoid the endogeneity and spurious regression problems. Keeping in view these problems, this study utilizes the autoregressive distributed lag (ARDL) model [Pesaran, et al. (2001)] to estimate the export supply function for Pakistan. The rationale for using the ARDL model instead of Engel-Granger (1987) and Johansen (1991) tests for cointegration is that ARDL has advantage over the other two techniques. First, ARDL is the most reliable and suitable model in the case of 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:

$$\begin{aligned}\Delta \ln X_{Si,t} = {} & \alpha_0 + \textstyle\sum_{i=0}^{a} \alpha_{1i} \Delta \ln \text{RP}_{t-i} + \sum_{i=0}^{b} \alpha_{2i} \Delta \ln \text{CoP}_{t-i} + \sum_{i=0}^{c} \alpha_{3i} \Delta \ln \text{PC}_{t-i} + \sum_{i=0}^{d} \alpha_{4i} \Delta \ln \text{DDP}_{t-i} \\ & + \textstyle\sum_{i=1}^{e} \alpha_{5i} \Delta \ln X_{Si,t-i} + \varphi_1 \ln \text{RP}_{t-1} + \varphi_2 \ln \text{CoP}_{t-1} + \varphi_3 \ln \text{PC}_{t-1} + \varphi_4 \ln \text{DDP}_{t-1} + \varphi_5 \ln X_{Si,t-1} + \varepsilon_t \end{aligned} \qquad (3)$$

where Equation (3), represents the first difference, I is the number of lag and t-1 is the level lag of variables. The study uses the bound test 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. In order 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 cointegrating relationship by utilizing the bound test. Under the Wald test, the null and alternative hypothesis are:

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

In case of evidence in favor 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 'normalized by the lagged exports from model (3) for relative price, cost of production, production capacity and the domestic demand pressure can be obtained as:

$$-\left(\frac{\varphi_1}{\varphi_5}\right), -\left(\frac{\varphi_2}{\varphi_5}\right), -\left(\frac{\varphi_3}{\varphi_5}\right), \text{ and } -\left(\frac{\varphi_4}{\varphi_5}\right), \text{ respectively.}$$

Lastly, the short-run dynamics are captured by estimating the restricted ECM-ARDL model derived from the conditional ARDL-ECM through a simple linear transformation. The restricted ARDL-ECM model consist of the difference of variables and error correction term. The error correction term (ECT) is obtained by estimating the long-run level model using OLS for each export categories. The restricted ECM-ARDL model is expressed as follows:

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

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 speed and direction of change toward equilibrium in the long-run. The expected value of adjustment coefficient should be negative and statistically significant. Finally, the verifying validity of classical assumption of residual analyzing the dynamic stability of the models, the study has utilized the normality test, serial correlation LM test, ARCH test for heteroscedasticity and Ramsay's Reset test are applied.

3. Data and Measurement of Variables

The annual time series data is used by this study, over the time period of 1971 to 2014. All variables are in Pak Rupee (PKR) with year 2000=100. Data for all variables is sourced from the International Financial Statistics yearbooks (various years), Federal Bureau of Statistic of Pakistan (various issues) and the Economic Survey of Pakistan. This data is further used for 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. However, the disaggregated exports including primary and manufactured were deflated in the same category of export unit value index of Pakistan. Relative price is obtained by dividing the export unit value index to the wholesale price index of Pakistan; whereas, the relative price for primary and manufactured export categories is calculated by dividing the export unit value index of a specific category to the same category of wholesale price index. 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, trend real GDP of Pakistan is used to represent the production capacity and changes in productivities. However, for disaggregated exports, production capacity is proxy 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 at a more practical level, 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 the domestic demand pressure by taking the ratio[2] of real GDP to trend the real GDP,[3] where the later captures the long-term performance of economy and former reflects the influence of short-term factors. For disaggregated export categories, domestic demand pressure is measured by the ratio of sector-wise value added to GDP trend value. However, measurement of the domestic demand pressure as deviation of the trend real GDP is questionable in the extant literature; therefore, it is important to identify the specific reasons for measuring domestic demand pressures as 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 as to 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 will not be able to allocate resources to the export sector. On the contrary, when the values of deviation from

[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.

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 reduce the chance of measurement error.

c) This 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 the subjective biases.

d) The measure is symmetric which means that it measures positive pressure with the same accuracy as the negative demand pressures.

e) This measure has acquired the wide currency in the profession. Thus, by using the same measure as used by a large number of previous studies, it allows ready comparability of findings with the previous studies.

IV. Results and Discussion

OLS regression is estimated with non-stationary data and residuals, which produced the spurious results. Apart from this, if time series of integrated order 2 or more, 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 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 sta-

TABLE 1

Results of ADF* and PP* Tests for Unit Root

Variables in Natural log	Level of Variable		First Difference		Inference
	ADF Test	PP Test	ADF Test	PP Test	
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	-10.310	-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	-15.000	-14.040	I(1)

Note: The Null hypothesis is that the variable has a unit root. The Critical values ADF and PP tests at 1% level of significance are -3.59. The superscript * represent the variables stationary in level. ADF (Augmented Dicky-Fuller) and PP (Phillips-Perron) tests. Both tests performed without included trend.
Source: Authors' calculation.

tistic values of both tests are also reported showing that all variables are non-stationary in level, except the relative price variables at 1 per cent level of significance. However, after taking the first difference of variables both 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 degree or integrated I (0), and other variables are stationary in the first difference or integrated I(1). This gives a good justification to apply the bound testing approach or unrestricted ARDL-ECM. 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 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 length for each variable and the ARDL in different specification was selected across various export categories in accordance with general-to-specific methodology [Hendry (1995)]. After selection of the best-fit model, Wald test has been applied for the identification of cointegrating relationship among the examined variables. The results of bound testing for cointegration of each estimated equation are reported in Table 2. In all three cases the computed F-statistic value of Wald test is greater than the upper bound critical value I(1) of Pesaran, et al. (2001)], at 1 per cent level of significance. These results confirm the existence of a cointegrating relationship among various factors of export supply across aggregated, as well as disaggregated export categories; namely the primary and manufactured goods. Moreover, the results of several diagnostic tests (reported in Tables 3 and 4) are also up to the mark and residual of each equation satisfy the classical assumption. Based on this finding, the next step is to proceed to determine the long- and short-run dynamics of export supply.

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: Asymptotic critical value [Pesaran, et al. (2001)]for the bound test" of upper bound and lower bound values at 1% and 5% significance level are (4.68, 3.41), (3.79, 2.62) respectively. The superscript * represent F-statistic value forthespecific equation is greater thantheupper critical value I(1) of [Pesaran, et al.(2001)] at 1% level of significance.
Source: Authors' calculation.

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, which is selected after ensuring that residual of each equation satisfies the classical assumptions. The long-run estimates shows that aggregate export supply is highly elastic to changes in price and production capacity; while; inelastic to changes in the cost of production and domestic demand as the long-run elasticities of the cost of production (-0.42) and domestic demand (-0.86) is significantly less than unity. Aggregate exports are disaggregated into primary and manufactured export categories, the long-run elasticity of various factors significantly be different in term of magnitude and signs. For primary export supply, using areas on able level of significance, the coefficients of all variables are statistically significant and have expected signs, except the cost of production. However, 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 pre-

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***	1.750
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)	

Note: The values in parentheses [ ] are F-statistics probability values andap-value of diagnostic tests respectively.
The superscript *, ** and *** represents1%, 5% and 10% significance level respectively.
Source: Authors' calculation.

vious studies, like Afzal (2005) for Pakistan, who obtained the relative price elasticity of primary export supply, less than unity and insignificant. In case of manufactured export supply, all coefficients have expected signs and statistically significant with magnitude greater than unity, implying that export supply of manufactured goods is highly elastic to changes in prices, cost, production capacity and the domestic demand pressure in the long-run. These results are generally consistent with the findings of previous studies. For example, Faini (1994) obtained the statistically significant effects of relative price, production capacity and capacity utilization on total manufactured exports for Morocco and Turkey. Afzal (2005) obtained domestic production elasticity of export supply of manufactured goods, more than unity for Pakistan. Finally, Basarac-Sertic, et al. (2015) obtained the production capacity and domestic demand 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 modeling export supply of aggregate, as well as the manufactured and primary goods in Pakistan's case.

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 which is corrected or it return to equilibrium in the upcoming period. However, the coefficient of adjustment for aggregate (-0.896) and primary (-0.804) export supply are very large, indicating that 89.6 and 80.4 per cents 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 the 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 are statistically significant for manufactured exports only. Moreover, the coefficient of the cost of production for aggregate export is positive with magnitude and less than the unity but statistically insignificant. These findings imply that the export supply of aggregate, as well as primary and manufactured goods, are inelastic with respect to relative price and cost of production in short-run in Pakistan.

Although, the coefficients of production capacity and domestic demand are found to be statistically significant and greater than unity in all the three cases, implying significant effects of production capacity and domestic demand on the export supply of aggregate, primary and manufactured export supply in the short-run. However, the domestic demand pressure has a negative effect on export performance in all the three cases. This validates that domestic demand development is relevant for modeling the

short-run dynamics of exports in Pakistan. In addition, the results also clarify that the short-run coefficients of domestic demand are much greater in magnitude as compared to long-run coefficients in all the three cases, implying that changes in domestic demand have larger effects on export supply in the short-run in Pakistan's case.

V. Conclusion

Traditionally, export supply is modeled as a function of production capacity, cost and prices; but however, these factors fail to explain fully, the export performance. In this context, 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 modeling export supply for Pakistan. In order to achieve the objective of this study, autoregressive distributed lag (ARDL) model (bound testing approach) has been employed on annual data for the period of 1971 to 2014. The empirical results based on bound testing approach showed a cointegrating relationship among various factors of export supply across the aggregate, as well as disaggregated export categories; namely the primary and manufactured goods.

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)	

Note: The values in parentheses [ ] are F-statistics probability values and ap-value of diagnostic tests respectively. The superscript *, ** and *** represents1%, 5% and 10% significance level respectively.
Source: Authors' calculation.

The findings of long-run estimates shows that aggregate export supply is highly elastic to change in relative prices and production capacity while inelastic to changes in cost of production and domestic demand 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 and production capacity in the long-run. Similarly, the export supplies of primary products are 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 the traditional factors, for modeling export supply of aggregate as well as the manufactured and primary goods in the long-run in Pakistan's case.

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 are found to be statistically significant (greater than unity) in all the three cases. These results signify that Pakistan's export performance rely heavily on production capacity and domestic demand development in the short-run. In addition, the estimates also clarify that the short-run coefficients of domestic demand are much greater in magnitude as compared to long-run coefficients in all the three cases; implying that domestic demand has a larger effect on export supply in the short-run in Pakistan's case.

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 should provide incentives to manufactured and goods exporters, in order to expand the export sector of Pakistan. Apart from this, the government should stabilize price ratio of inputs and industrial material around the level which would balance the production of value-added manufactured products. In addition, the statistical findings shows that the export supply of primary goods is chiefly determined by the domestic production and domestic demand. Therefore, it is strongly suggested that provincial governments should provide special incentives to farmers at the pre-production stage to increase the output of agricultural products and to generate the surplus for export. Finally, the study concludes that domestic demand pressure has a negative and significant effect on export supply of aggregate, primary and manufactured goods. This imply that along with production capacity the cost of production and relative prices, demand and domestic pressure is also relevant for modeling export supply at both the aggregate and disaggregated levels.

Further research should be extended in several dimensions. First, the number of time series observations in this study is not large. Second, the study did not cover, whether the relationship between domestic demand and export behavior is asymmetric or not. Therefore, future research can be benefitted by constructing a panel data using observations from all provinces of Pakistan and allow for an asymmetric impact of domestic demand on exports growth to overcome this issue.

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APPENDIX

TABLE A-1

Detail of Abbreviation and Data Source for each Variable

Variables	Abbreviation and Definition	Data Source
DP	Production Capacity Real GDP is used as proxy to measure production capacity	Economics Survey of Pakistan (Various Issues)
RP	Relative Price Ratio of Unit Value of Export to Wholesale Price Index	Pakistan Bureau of Statistics
CoP	Cost of Production Producer Price Index is used as proxy to measure cost of production	IMF (International Financial Statistics)
DDP	Domestic demand Pressure: Ratio of real GDP to Trend Real GDP is used as proxy to measure domestic demand pressure	-
X^s	Export Supply Total value of aggregate, primary and manufactured exports are used to measured export supply	Economic Survey of Pakistan (Various Issues)

Note: All variables (Constant price = 1999-2000).
Source: Authors' calculation.