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Disaggregated Import Demand Function: A Case Study of Pakistan

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Abstract
This study investigates the income and price elasticities of disaggregated import demand function in case of Pakistan. This paper applies the ARDL bound testing approach to co-integration over the time span of 1972-2009. Our empirical findings show that there exists a long run relationship among the variables. The impact on real GDP on import demand of food items is positive. The impact on real GDP on import demand of raw material is positive. The effect of real GDP on import demand of fuel lightening and the lubricants items group is positive. The impact of relative price on import demand of fuel lightening and the lubricants items group is negative. The effect of real GDP on import demand of manufactured items group is positive, but the impact of relative price is negative. Fuel lightening and lubricants items and manufactured items are highly price elastic, while food items and raw material items are price inelastic. The overall results of all the four models indicate that fuel lightening and lubricants items group is more income elastic as compared to the other commodity groups, and the manufactured items group is more price elastic as compared to the other commodity groups. This study also confirms that import demand of all the commodity groups is highly sensitive to changes in real GDP. The government should try to invest in high-tech industry so that in long run imported goods demand may be controlled.
Keywords: Demand Function, ARDL bounds testing, Pakistan
JEL Classifications: F10, C51

I. Introduction

International trade plays a vital role in the economies of the world to grow and develop. Through international trade in goods and services and international flow of money the economies of the world are more closely linked to one another now than ever before. Keeping up with the shifting international environment, trade has become a central concern of both business and national economic policy. International trade permits each country to specialize in areas of relative efficiency and thus increases overall world output. For each country, the gains from trade are reflected in consumption possibilities that exceed production possibilities. The terms of trade, the rate at which goods are exchanged, is subject to the forces of international supply and demand, and lie somewhere between the opportunity costs of the trading partners. The terms of trade determine how the gains from trade are shared. But most of the time the trade policy deck seems stacked in favor of the special interests. Because the interests of import competing firms and workers are highly sensitive and they are quick to mobilize politically. By contrast, the benefits of freer trade are less direct and spread over millions of consumers. As a consequence, the beneficiaries of free trade are less likely to monitor trade policy and carry out much less lobby activities to influence it. For this purpose, the political odds favor trade barriers. Embargoes are outright prohibitions against import or export of particular goods. Quotas limit the quantity of a good imported or exported. Tariffs discourage imports by making them more expensive. The World Trade Organization (WTO) (2005) seeks to reduce world-wide trade barriers and enforce trade rules. Trade liberalization is one of the major policy issues all over the world, particularly in WTO member countries. Trade liberalization is advocated on account of efficient economic growth and human welfare. On the basis of comparative advantage under a free trade regime, the trade enables countries to specialize in the production of particular goods and services, enhances competition and promotes technological dissemination. In this way wide variety of better-quality products are available to consumers at cheaper prices (Balassa, 1963 and World Bank, 2002). International trade is known to have an influential effect on the growth and development of a country. The same is true in case of Pakistan. Generally, the studies on the topic of international trade can be divided into two categories. Ones that found the exports lead to growth and others concluded that imports are more helpful for achieving growth and development. However, these have remained a topic of debate so far and demand an empirical investigation in Pakistani scenario. Understanding how import flows react to changing economic conditions in a country is necessary for formulating trade and exchange rate policies. There is widespread agreement that imports generally react more swiftly than exports to substantive trade liberalization, resulting in short run current account imbalances. Estimation of import demand functions has always been an active area of research.

The reason is the concern of policy makers for the resolution of trade deficits and volatility in exchange rates and thereby to design effective trade policies. Import demand function investigation has implications for a wide range of important macro-economic policy issues. Among these issues are the impact of expenditure-switching through exchange rate management and commercial policy on a country's trade balance. The relative prices play a significant role in the determination of trade flows and policies of devaluation as a way to correct the trade imbalance (Reinhart, 1995). The role of income elasticities of imports is as important as their price elasticities. If in a two-country model, prices are constant and income growth is the same in both countries, then the trade

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balance between them can still change over time if their respective income elasticities of demand for import differ. It indicates that the income elasticity of import demand is also an important policy variable (Johnson, 1958). The estimation of import demand functions is usually based on a conventional demand theory which indicates that the quantity of imports demanded is a function of money income, the price of the imported commodity and the price of domestic substitutes. However, the estimated price and income elasticities appeared to be different from similar estimates of developed countries and for middle-income countries. Aggregate level studies cannot explain the true picture of the problem while the disaggregated studies can explain better the income and price elasticity of import demand of each commodity group. In this way difference may be calculated among high and low elastic commodity group which may help in better policy measures. In case of Pakistan most of the studies so far conducted, circle around the aggregate expenditure effect on aggregate import demand. But there is hardly any study which helps to find commodity group-wise (food items, raw material items, fuel lightening and lubricant items and manufactured items etc,) income and price elasticities of import demand for Pakistan. The lack of disaggregated estimation of import demand elasticities is a serious gap in the effort to quantify the effects of policy measures on the volume of imports and economic welfare in general. This study in hand tried to find some solution for trade imbalance and to examine the import demand functions of group-wise imported commodities using time series techniques. Import behavior of Pakistan shows that overall 50 to 55 percent imports of the country consisted of food items, raw material items, fuel lightening and lubricants items, and manufactured items. Fuel lightening and lubricants items had the highest share among the other imported commodity groups of Pakistan. In 1972, the imports of manufactured goods were high (21 percent) as compared to other three imported goods groups and gradually come down to around 9 percent. The overall share of food items was high at the start of 1970s, later on it decreased continuously, because of the agricultural development in the country. The share of imported raw material items increased, although gradually, during 1972 to 2010. One can see, the overall share of fuel lightening and lubricants items in the overall imports of Pakistan, which used to be small (around 8 percent) in 1972, however increased continuously and accounted for around 30 percent in 2010. Being a pioneer study of this nature in Pakistan, this research is a humble effort to contribute in existing economic literature.

II. Literature Review

Imports are widely discussed at aggregate and disaggregate levels. Houthakker and Magee (1969) studied aggregate import and export demand functions for a large number of countries on a comparable basis. They also presented import and export demand equations for the United States disaggregated by trading partners and by commodity groups. They found that the disaggregation by the trading partners was not better approach to generate information relevant to solve the problem of trade deficit. The prices for the bilateral trade flows were various combinations of aggregate price data (the export price index of the exporting country, the import price index of the importing country, and the importing country's wholesale price index). This device makes it possible to present disaggregated results without encountering the data handling problems of bilateral prices. Khan (1975) had explained estimation of disaggregated import demand elasticities for developing countries and presented a formidable data handling problem, because in developing countries data on the disaggregated level were not available. While in developed countries, the available studies on the subject were concerned mostly with the estimation of income and price elasticities of disaggregated imports corresponding to one-digit level of the Standard International Trade Classification (SITC). Halkie and Hooper (1988) recognized that half of the change in import trade volume was due to change in relative prices. It was interesting that much of the increase in imports, when calculated at the aggregate level appears to reflect the sensitivity of imports to total demand. However, when constructed at disaggregated level the increase simply highlights the overall rise in demand for goods in a specific sector.

Their analysis was consistent with the elasticity estimation and also provided the evidence that much of the jump in import trade was due to an ongoing upward trend in imports, unrelated to the traditional macro price and income elasticity explanations. Sarmad (1989) estimated the consumer goods import demand function for Pakistan for the period 1959-60 to 1985-86 at both aggregate and disaggregated levels. His results explained that there was strong evidence to support the use of log linear form as the appropriate functional form of import equation, both at the aggregate and disaggregate levels. The estimated price and income elasticities appeared to be different from similar estimates of developed countries and for middle-income countries. Khan and Aftab (1996) used quarterly series pertaining to the 1983-93 period to assess the impact of depreciation of real effective exchange rate on the trade balance of Pakistan. Using the instrumental variable estimation technique, they estimated aggregate as well as disaggregate export demand functions. They concluded that Marshall-Lerner condition was barely satisfied for Pakistan since the sum of import and export demand elasticities were only slightly greater than one. At the disaggregate level they found that only one third of Pakistan's major exports were likely to respond positively to devaluation. However, they ignored the aggregate and the disaggregate role of import demand in the trade balance of Pakistan.

Dutta and Ahmad (2000) estimated long run import demand function for Bangladesh using co-integration and error correction approaches to the period 1974-1994. They employed two types of import demand functions for estimation using the real import prices, real GDP, real imports and dummy variable. The dummy was used for the proxy of trade liberalization policies. They concluded that only one co-integration relationship prevails among import price, GDP and real foreign exchange reserves. The sign of the coefficient of the error correction term was negative as expected and statistically significant for the first model indicating the validity of a long run equilibrium relationship among variables. For the second model real import price, real GDP, real imports and the dummy variable were significant. The estimated error correction was statistically significant at the 5 percent level and had expected negative sign, which was the further proof of long run equilibrium relationship among the variables. The coefficients of the dummy variable were very low for both models, which explained that liberalization policies were not fully effective. Bahmani (2001) and Bahmani and Gelan (2007) investigated that nominal devaluation should improve the trade balance of an economy by making exports cheaper in international markets in terms of international market prices which increases the volume of exports. On the other hand, a nominal devaluation makes imports more expensive that leads to less import in terms of domestic currency. While inflationary pressures in the economy had always eaten up beneficial impacts of nominal devaluation.

Macro-analysis suggests that the nominal exchange rate needs to be adjusted for variations in local and international prices. After adjustment, nominal devaluation policy would be effective and improve the trade balance, if nominal devaluation leads to real devaluation. Bahamani and Kara (2003) investigated the import and export demand functions for nine industrialized countries like Australia, USA, and Canada etc. The data were used on a quarterly basis for the period 1973-98. For economic analysis they used ARDL bounds testing approach. Their results highlighted that long run income elasticities were greater in import demand function than in the export demand function. The price elasticities were smaller than unity, indicating that import and export demand functions were relatively inelastic. They failed to provide any specific answer to the policy question that which policy has quickest impact on trade. They found trade flows of different countries do react differently. Santos-Paulino and Thirlwall (2004) investigated the impact of trade liberalization on imports, exports and the balance of trade for 22 developing countries. They tested the impact and significance of liberalization using different estimation techniques such as the fixed effects and generalized method of moments (GMM) for panel data analysis. They found that the impact of trade liberalization on import growth was greater than on export growth for developing countries. Hussain (2004) estimated total and disaggregated import demand functions for Bangladesh during the period 1973-2000. Ordinary Least Squares (OLS) method was used for linear and log-linear import demand equations. He found income elasticity positive as expected for all commodities, except rice and wheat. The coefficients of relative prices ranged from -1.66 to -0.73 for all the commodities, but the coefficients of relative price for rice and soya bean oil were found to be negative even though they were not statistically significant.

Lopez (2005) estimated the effects of trade liberalization on import demand of Mexico for the period of 1973-2000. He used Autoregressive Distributed Lag (ARDL) estimation technique for the identification of the long run relationship between dependent and independent variables. The study found that the price and income elasticities of import demand and error correction of import demand coefficients were statistically significant. He concluded that trade liberalization positively affected import growth. Alam and Ahmad (2010) estimated import demand function for Pakistan by using quarterly data with the help of Autoregressive Distributed Lag Model (ARDL) analysis. They found that there existed a long run relationship between import demand, real economic growth, relative price, real effective exchange rate and volatility of real effective exchange rate. There was a positive relationship between aggregate import demand and income, and depreciation of local currency had no effect on import demand in Pakistan. By applying Granger causality, they found that fluctuations in the import demand was a short run phenomenon in Pakistan. Chani and Chaudhary (2010) investigated the impact of final expenditure components of aggregate import demand in Pakistan. Using ARDL co-integration approach, they analyzed the long run relationship of import demand, relative prices of imports and components of final expenditure (investment, exports and government consumption expenditures). They found a long run relationship between import demand and components of Gross Domestic Product (GDP) and relative prices. Their results explained that relative prices had negative, but significant relationship with import demand of Pakistan.

III. Theoretical Background and Data Collection

Economic theory aims at the construction of models which describe the economic behavior of individual units and their interactions, which create the economic system of a region, a country or the world as a whole. An economic model is a simple representation of a real economic situation. The model can include some real situations with implying some abstraction from reality which can be achieved by some assumptions. The degree of abstraction from reality depends on the purpose for which the model is constructed. The main purpose of the model is the analysis and prediction. The validity of the model depends on its predictive power, the realism of its assumptions,

the information it provides, its generality and its simplicity (Lange, 1946 and Nagel, 1963). For modeling the time series behavior of import demand, we should keep certain things in our mind. An appropriate model of international trade depends on, the types of goods being traded, the end use of the imported commodities, the purpose of the modeling and the availability of the required data (Chani and Chaudhary, 2010). Theoretical modeling of international trade flows is dominated by two types of general models; these are perfect substitute's models and imperfect substitute's models. The perfect substitute's models are criticized on the ground that at the most disaggregated level, for which comparable data can be gathered, there are significant and non-transitory price differences for the same product in different countries. The law of one price does not seem to hold true either across or within countries, except for standard goods such as wheat and copper that are sold through international commodity exchanges (Isard 1977, Kreinen and Officer 1978). On the basis of empirical literature, traded goods are imperfect substitutes if both exist in the same market. The increasing trend of intra-industry trade between the countries creates doubt on the hypothesis of the perfect substitutes. Following the imperfect substitute's model of Goldstein and Khan (1985), the model of this study could be defined as:

$$Md_t = f(Y_{it}, MP_t, DP_t) \quad (1)$$

Here t is time period, Md_t is the import demand in time period t , Y_{it} is the nominal GDP (Gross Domestic Product) of importing country, MP_t is price index of imported commodities in t time period and DP_t is domestic price level of import substitute in t time period. According to Goldstein and Khan (1985) imperfect substitute model of import demand function is based on conventional demand theory. In the light of conventional demand theory, demand function for imports represent the quantity demanded as a function of the level of income (GDP) in the importing country, imported goods own prices and the price of domestic substitutes. So in this way expected sign of f_1 and f_3 would be positive and the expected sign of f_2 would be negative. If we follow the assumption of no money illusion and double the money income and price level then the quantity demanded remains constant, i.e. $f_1 + f_2 + f_3 = 0$ (constant demand is because of the homogenous of degree zero). Such homogeneity of the demand function is expressed by dividing both sides of equation (4.1) by DP_t . In this way our equation becomes as:

$$Md_t = h(Y_t, RP_t,) \quad (2)$$

According to the literature, the relative price (the price of imports relative to the price of their domestically produced substitutes) would be inversely related to the import demand and real income would positively affect the import demand. Following Houthakker and Magee (1969), Kreinin (1973), Khan (1975) and Sarmad (1989) the model of disaggregated import demand function for Pakistan becomes as:

$$\ln Md_{it} = \alpha + \alpha_1 \ln Y_t + \alpha_2 \ln RP_{it} + \alpha_3 t + u_{it} \quad (4)$$

$$\ln MdF_t = \alpha + \alpha_1 \ln Y_t + \alpha_2 \ln RPF_t + \alpha_3 t + u_{it} \quad (5)$$

$$\ln MdRM_t = \alpha + \alpha_1 \ln Y_t + \alpha_2 \ln RPRM_t + \alpha_3 t + u_{it} \quad (6)$$

$$\ln MdFLL_t = \alpha + \alpha_1 \ln Y_t + \alpha_2 \ln RPFLL_t + \alpha_3 t + u_{it} \quad (7)$$

$$\ln MdMF_t = \alpha + \alpha_1 \ln Y_t + \alpha_2 \ln RPMF_t + \alpha_3 t + u_{it} \quad (8)$$

Where, food items (MdF), raw material items (MdRM), fuel lightening and lubricants items (MdFLL), manufactured items (MdMF). The present study uses the variables of import demand of different commodity groups (food items, raw Material items, fuel lighting and lubricants items, manufactured items) of Pakistan as dependent variables. Relative Prices of each commodity group in Pakistan and Real GDP of Pakistan are as independent variables for the period from 1972 to 2010. The unit value of imports is used as a proxy of the import price index. The data for the imports of different commodity groups are taken from various issues of Year Book of Federal Bureau of Statistics (FBS) of Pakistan; the wholesale price index is taken from various issues of Economic Survey of Pakistan; the relative price variable is the natural log of the ratio of the import price index of domestic wholesale price index. The year 2000 is used as a base year. Wholesale price index and the unit value indices of imports are taken from FBS. Data for the real GDP is taken from International Financial Statistics (IFS) online database by the International Monetary Fund (IMF) (2010).

IV. The ARDL Bounds Testing Approach to Cointegration

In economic literature, many methods are available to examine cointegration among the variables. The most widely have used methods are the residual based Engle-Granger (1987) test, maximum likelihood based on Johansen (1991/1992) and Johansen-Juselius (1990) tests. All these require that the variables in the system have same order of integration. These cointegration tests are inefficient and can lead to contradictory results, generally when the order of integration is dissimilar among the variables. To overcome this issue, Pesaran et al. (2001) has introduced an alternative cointegration technique known as the Autoregressive Distributive Lag (ARDL) bound

testing. It is argued that ARDL has a number of advantages over conventional techniques like Engle-Granger (1987) and Johansen (1992) cointegration approaches. The first main advantage of ARDL is that it can be applied irrespective of whether underlying regressors are stationary purely I(0), purely I(1) or mutually co-integrated (Pesaran and Pesaran, 1997). The second advantage of using the ARDL approach to cointegration is that it is better to use for small size of sample (Mah, 2000) than Engle and Granger (1987), Johansen (1991) and Philips and Hansen (1990) cointegration tests. The third advantage of this approach is that it takes sufficient number of lags to capture the data generating process in a general to specific modeling framework (Laurenceson and Chai, 2003). Moreover, the ARDL gives valid information about the structural break in time series data. However, Pesaran and Shin (1999) contended that "appropriate modification of the orders of the ARDL model is sufficient to simultaneously correct for residual serial correlation and the problem of endogenous variables". This approach is based on the estimates of an Unrestricted Vector Error Correction Model (UECM) and it has better statistical properties for short run dynamics and long run equilibrium as compared to the residual based Engle-Granger technique (Pattichis, 1999). Moreover, ARDL remains valid irrespective of the order of integration of the explanatory variables. But ARDL will fail if any variable is I(2). For applying the bounds testing procedure, it is necessary to represent equation in a conditional autoregressive distributed lag model as following:

$$\Delta \ln Md_{it} = \beta_1 + \beta_2 t + \beta_3 \ln Md_{it-1} + \beta_4 \ln Y_{t-1} + \beta_5 \ln RP_{it-1} + \sum_{h=1}^{p} \beta_h \Delta \ln Md_{it-h} + \sum_{j=0}^{p} \gamma_j \Delta \ln Y_{t-j} + \sum_{k=0}^{p} \phi_k \Delta \ln RP_{it-k} + u_{it} \quad (9)$$

All the variables have already been explained above and symbol Δ represents the change in variables. First the study will find the direction of relationship among the variables in case of Pakistan by applying the bounds test using Wald test. The Wald test for the bounds testing depends on some of the following factors: The order of integration I(d) of variables in the ARDL model, either the intercept or trend or both are included in the ARDL model and the number of regressors in the ARDL model. The calculated F-statistic is compared with the critical value tabulated by Pesaran and Pesaran (1997) or Pesaran et al. (2001) which is further developed by Narayan (2005). If the F-test statistic exceeds the upper critical value, the null hypothesis of no long run relationship can be rejected regardless of whether the underlying order of integration of the variables are I(0) or I(1). If the F-test statistic falls below the lower critical value the null hypothesis is not rejected. However, if the sample F-test statistic falls between these two bounds, the conclusive decision is not made. When the order of integration of the variables is known and all the variables are I(1), the decision is made based on the upper bounds. If all the variables are I(0) then the decision is made based on the lower bounds. On the basis of above equation our null and alternative hypothesis for cointegration test are as given: $H_0 : \beta_3 = \beta_4 = \beta_5 = 0$ (there is no co-integration among the variables) against alternative hypothesis: $H_A : \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$ (there is co-integration among variables). If there is long run co-integration relationship among the variables, for finding short run relationship we use the Vector Error Correction Model (VECM). The VECM is explained as under:

$$\Delta \ln Md_{it} = \beta_1 + \beta_2 t + \sum_{h=1}^{p} \beta_h \Delta \ln Md_{it-h} + \sum_{j=0}^{p} \gamma_j \Delta \ln Y_{t-j} + \sum_{k=0}^{p} \phi_k \Delta \ln RP_{it-k} + \omega ECT_{t-1} + u_t \quad (10)$$

As we have explained all the variables above except $ECT_{t-1,}$ which is one time period lagged error correction term. The error correction model results indicate the speed of adjustment back to the long run equilibrium after a short run shock. To determine the goodness of fit of the ARDL model, the diagnostic tests are conducted. The diagnostic or sensitivity tests examine the serial correlation, autoregressive conditional heteroscedisticity, normality and heteroscedisticity associated with the model.

V. Empirical Results and their Discussions

For cointegration if the variables become stationary then we will be able to move towards further process. In doing so, we have applied Augmented Dickey-Fuller (ADF) (1979, 1981) test to check the stationarity of time series data in logarithmic form. Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC) have been used for optimum lag selection. The results of the Augmented Dickey-Fuller (ADF) test are reported in Table-1. According to the results given in Table-1, variables of real GDP, imports of food items, imports of raw material items, imports of fuel lightening and lubricants items, imports of manufactured items and relative price of manufactured items is not stationary at level I(0). Only the variables of relative price of food items, relative price of fuel lightening and lubricants items and relative price of raw Material items are stationary at level I(0). This

implies that null hypothesis of unit root at level I(0) cannot be rejected for all variables except relative price of food, relative price of fuel lightening and lubricants and relative price of raw material. However, all the variables are stationary at first difference I(1). This shows that the null hypothesis of unit root for all variables is rejected when we use the first difference I(1) of the variables. Thus the variables have mix order of integration. Some of them are stationary at level I(0) and others at 1st difference I(1), which is suitable condition for applying the ARDL bounds testing approach to cointegration. In Table-2, the criteria for variables lag order selection are presented. On the basis of these criteria, an optimal lag length has been selected. In view of the number of variables to be studied, the number of observations and lags requirement of the cointegration test, the maximum two lags, are allowed to select the optimum lag length in Vector Auto-Regressive (VAR) process. Lag selection Criteria like Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Final Prediction Error (FPE), Sequential Modified Likelihood Ratio (LR) and Hannan-Quinn Information Criterion (HQ) suggest an optimal lag length of 1 in Table-2. Thus the lag length 1 has been used in our analysis. The results of the ARDL cointegration test for the import demand of food items, are presented in Table-3.

Table-1: ADF Unit Root Test Analysis

Variable	At Level I(0)		At 1st difference I(1)	
	T-Statistic	P-value	T-Statistic	P-value
$LnGDP_t$	-2.0045	0.2837	-4.7900	0.0004
$LnMdF_t$	-1.5683	0.4884	-5.8650	0.0000
$LnMdFLL_t$	-2.4092	0.1462	-4.5789	0.0008
$LnMdMF_t$	-1.7708	0.3886	-5.6157	0.0000
$LnMdRM_t$	0.3664	0.9785	-5.9444	0.0000
$LnRPF_t$	-3.9639	0.0041	-6.6238	0.0000
$LnRPFLL_t$	-4.5644	0.0008	-7.8118	0.0000
$LnRPMF_t$	-0.3026	0.9145	-6.7115	0.0000
$LnRPRM_t$	-3.2360	0.0257	-7.3591	0.0000

Table-2: Lag Length Selection

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SBC	HQ
0	88.2578	NA	9.9e-14	-4.4032	-4.0073	-4.2650
1	327.6042	345.7225*	1.71e17*	-13.2002*	-9.2414*	-11.8185*
2	405.1033	73.1935	5.28e-17	13.0057	-5.4840	-10.3804

Indicates lag order selected by the criterion
LR(Likelihood Ratio): sequential modified LR test statistic (each test at 5 percent level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Food Items Import Demand Function

Table-3: Bound Testing Analysis

F-Statistic (Wald-Test) = 9.7180		
Level of Significance	Lower Bound Value	Upper Bound Value
5%	4.1958	5.3343
10%	3.3543	4.4242

Table-4: Long Run Results

Dependent Variable = $LnMdF_t$			
Variable	Coefficient	t-Statistic	p-value
$LnGDP_t$	2.1759	18.6909	[0.000]
$LnRPF_t$	-0.3808	-1.1521	[0.258]
Constant	-43.4337	-13.3171	[0.000]

Wald statistic is used to test the null hypothesis of no cointegration ($H_0 : \beta_3 = \beta_4 = \beta_5 = 0$) among the variables. The Wald statistic is 9.718 which is greater than upper bound value 5.334 at 5 percent significance level. Hence the null hypothesis of no co-integration ($H_0 : \beta_3 = \beta_4 = \beta_5 = 0$) is rejected and the alternative hypothesis ($H_A : \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$) is accepted which states that there is cointegrating relationship among the variables. Thus, the analysis of data confirms the presence of long run relationship among import demand of food items, real GDP and relative price of

food items. As cointegration exists among the variables used in the model, therefore, the results presented for the long run are reliable. These results represent long run elasticities of import demand of food items with respect to real GDP and relative price. The long run results are reported in Table-4. The results reported in Table-4 show that real GDP has statistically significant impact on import demand of food items. But the impact of relative prices on import demand of food items is negative and insignificant. The results show that real GDP has high (2.1759) elasticity of import demand for food items while relative prices have insignificant and negative elasticity (-0.3808) for the import demand for food items. The results show that long run coefficient of independent variables have theoretically correct signs. The elasticity of import demand for food items with respect to relative prices reveals that a large proportion of imported food items has inelastic demand and has negative relationship with price. But in case of real GDP, import demand of food items have highly elastic demand and have positive relationship. This shows that in long run import demand of food items are highly income elastic but are inelastic with respect to price. It is because when income of a country increases, people of the country tend to use high quality imported food items. In this way demand for imported food items increases in the long run. When the long run cointegration among the variables is proved, we can use ECM to test the short run relationship of the variables. Table-5 shows short run results. Table-5 reports that real GDP and relative prices of food items have insignificant effect on import demand of food items. Coefficient of real GDP is positive but insignificant while the coefficient of relative price has theoretically correct sign negative but is also insignificant. The results show that real GDP has high coefficient (3.7642) for the import demand of food items and is highly elastic. The low and negative coefficient of relative price (-0.2928) in short run shows inelastic demand for Imported food items in Pakistan.

Table-5: Short Run Results

Dependent Variable = Δ LnMdF$_t$			
Variable	Coefficient	t-Statistic	p-Value
Δ LnGDP$_t$	3.7642	-1.5409	[0.133]
Δ LnRPF$_t$	-0.2928	-1.1837	[0.245]
Ecm$_{t-1}$	-0.7690	-5.4298	[0.000]
R-Squared: 0.50, F-Statistic: 10.57, D-W: 1.54			

Raw Material Items Import Demand Function

Table-6: Bound Testing Analysis

F-Statistic (Wald-Test) = 4.6527		
Level of Significance	Lower Bound Value	Upper Bound Value
5%	4.1958	5.3343
10%	3.3543	4.4242

The Wald statistic is used to test the null hypothesis of no cointegration ($H_0 : \beta_3 = \beta_4 = \beta_5 = 0$) among the variables. The Wald Statistic is (4.652) which is in between the lower bound value and upper bound value, it is inconclusive at 5 percent level and we cannot reject the H_0. But the Wald Statistic (4.652) is greater than upper bound value (4.424) at 10 percent significance level. Hence we reject the null hypothesis of no cointegration ($H_0 : \beta_3 = \beta_4 = \beta_5 = 0$) and accept the alternative hypothesis ($H_A : \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$) which states that there is cointegrating relationship among the variables used in the model for the study. Thus, the analysis of data confirms the presence of long run relationship among import demand of raw material items of Pakistan, real GDP of Pakistan and relative price of raw material items. As we have proved that there is cointegration among the variables of the model therefore the results for the long run are reliable. These results represent long run elasticities of import demand of raw material items with respect to real GDP and relative price of Raw Material items. The long run results are reported in Table-7.

Table-7: Long Run Analysis

Dependent Variable = LnMdRM$_t$			
Variable	Coefficient	t-Statistic	p-Value
LnGDP$_t$	2.9697	22.3170	[0.000]
LnRPRM$_t$	-0.57385	-1.5477	[0.131]
Constant	-65.7405	-18.1132	[0.000]

The results reported in Table-7 show that real GDP has positive and statistically significant impact on import demand of raw material items. But the impact of relative price of raw material items on import demand of raw material items is negative and insignificant. The results show that the real GDP has high (2.9697) elasticity of import demand of raw material items but relative price of raw material items has insignificant and inelastic (-0.5738) import demand of raw material items. The results also show that long run coefficient of independent variables have theoretically correct sign. The elasticity of import demand of raw material items with respect to real

GDP reveals that a large proportion of raw material items is highly elastic in long run and has positive relationship. The elasticity of import demand of raw material items with respect to relative price of raw material items reveals that a large proportion of raw material items have inelastic demand and negative relationship. This shows that the import demand of raw material items in Pakistan is price inelastic and highly income elastic in long run. This happened because of the fact that the price of a commodity is generally negatively related to its quantity demanded. Whenever income of a country increases (or growth takes place), generally its industrial production also increases that is why the demand for Raw Material items also increases. Results of short run analysis are presented in Table-8.

Table-8: Short Run Analysis

Dependent Variable = Δ LnMdRM$_t$			
Variable	Coefficient	t-Statistic	p-Value
Δ LnGDP$_t$	1.4803	3.7056	[0.001]
Δ LnRPRM$_t$	-0.2860	-1.4228	[0.156]
Ecm(t-1)	-0.4984	-3.9326	[0.000]
R-Squared: 0.34, F-Statistic: 5.65, D-W: 1.72			

Table:8 shows short run dynamics of the variables. We find that real GDP has significant effect on import demand of raw material items in short run and relative price of raw material items has insignificant effect on import demand of raw material items in short run. The error correction term of the model is statistically significant and has negative sign. The results, reported in Table-8 further show that coefficient of real GDP is positive and significant in short run. The coefficient of relative price of raw material items has theoretically correct sign but is insignificant in short run. It is pointed out that real GDP has high coefficient (1.4803) for import demand of raw material items. This indicates that import demand for raw material items in short run is highly income elastic and it has positive relationship. The low and negative coefficient of relative price of raw material items (-0.49847) in short run shows inelastic demand for imported raw material items of Pakistan.

Fuel Lightening and Lubricants Items Import Demand Function

The results of ARDL cointegration test for the import demand of fuel lightening and lubricants items, are presented in Table-9.

Table-9: The ARDL Bounds Testing Analysis

F-Statistic (Wald-Test) = 4.8258		
Level of Significance	Lower Bound Value	Upper Bound Value
5%	4.1958	5.3343
10%	3.3543	4.4242

Wald statistic is used to test the null hypothesis of no co-integration ($H_0 : \beta_3 = \beta_4 = \beta_5 = 0$) among the variables. The Wald Statistic is (4.825) which is between the upper and lower bounds value at 5 percent significance level. So, it is inconclusive at 5 percent level and we cannot reject H_0. But the Wald Statistic (4.825) is greater than upper bound value 4.424 at 10 percent significance level. Hence we reject the null hypothesis of no co-integration ($H_0 : \beta_3 = \beta_4 = \beta_5 = 0$) and accept the alternative hypothesis ($H_A : \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$) which states that there is cointegrating relationship among the variables used in the model of this study. Thus, the analysis of data confirms the presence of long run relationship among import demand of fuel lightening and lubricants items, real GDP and relative price of fuel lightening and lubricants items in Pakistan. As cointegration exists among the variables used in the model therefore, the results presented for long run are reliable. These results represent long run elasticities of import demand for fuel lightening and lubricants items with respect to real GDP and relative price of fuel lightening and lubricants items. The long run results are reported in Table-10.

The results reported in Table-10 show that real GDP and the relative price of fuel lightening and lubricants items have statistically significant impact on import demand of fuel lightening and lubricants items. But the impact of relative price of fuel lightening and lubricants items is negative with respect to import demand of fuel lightening and lubricants items. The results further show that the real GDP has high (3.1088) elasticity of import demand of fuel lightening and lubricants items while the relative price of fuel lightening and lubricants items has significant and negative elasticity (-1.1082) for the import demand of fuel lightening and lubricants items. However, the coefficient of relative price shows that the import demand for fuel lightening and lubricants items group is elastic and that the long run coefficients of independent variables have theoretically correct signs. The elasticity of import demand for fuel lightening and lubricants items with respect to real GDP reveals that fuel lightening and lubricants items are highly elastic and have positive relationship. The elasticity of import demand for fuel lightening and lubricants items with respect to relative price of fuel lightening and lubricants items shows that fuel lightening and lubricants items are highly price elastic, although the price elasticity is lower than the income elasticity of fuel lightening and lubricant items. The short run results are shown in Table-11.

Table-10: Long Run Analysis

Dependent Variable = $LnMdFLL_t$			
Variable	Coefficient	t-Statistic	p-Value
$LnGDP_t$	3.1088	28.3775	[0.000]
$LnRPFLL_t$	-1.1082	-6.5519	[0.000]
Constant	-66.1164	-21.3151	[0.000]

Table-11: Short Run Analysis

Dependent Variable = Δ $LnMdFLL_t$			
Variable	Coefficient	t-Statistic	p-Value
Δ $LnGDP_t$	1.8240	5.6617	[0.000]
Δ $LnRPFLL_t$	-0.6501	-4.6147	[0.000]
Ecm(t-1)	-0.5867	-6.1787	[0.000]
R-Squared: 0.57, F-Statistic: 14.49, D-W: 1.06			

Table-11 reports that real GDP and relative price of fuel lightening and lubricants items have significant effect on import demand for fuel lightening and lubricants items in short run. This shows that 1 percent change in income creates 1.82 percent change in import demand of fuel lightening and lubricant items. The error correction term is statistically significant and has a negative sign. The results, reported in Table-11 further show that coefficient of real GDP is positive and significant in short run. The coefficient of relative price of fuel lightening and lubricants items has theoretically correct sign and is significant in short run. While, the real GDP has high coefficient (1.8240) for the import demand of fuel lightening and lubricants items which shows that the import demand is highly elastic with respect to real GDP. The low and negative coefficient of relative price of fuel lightening and lubricants items (-0.65018) in short run shows that the demand for imported fuel lightening and lubricants items is inelastic in Pakistan.

Manufactured Items Import Demand Function

The results of ARDL cointegration test for the import demand for manufactured items, are presented in Table-12.

Table-12: The ARDL Bound Testing Analysis

F-Statistic (Wald-Test) = 4.5548		
Level of Significance	Lower Bound Value	Upper Bound Value
5%	4.1958	5.3343
10%	3.3543	4.4242

Wald statistic is used to test the null hypothesis of no co-integration ($H_0 : \beta_3 = \beta_4 = \beta_5 = 0$) among the variables. The Wald Statistic is (4.554) which is in between the lower bound and upper bound values at 5 percent significance level. This shows that at 5 percent significance level we cannot reject H_0. But the Wald Statistic (4.5548) is greater than upper bound value 4.4242 at 10 percent significance level. Hence we reject the null hypothesis of no cointegration ($H_0 : \beta_3 = \beta_4 = \beta_5 = 0$) and accept the alternative hypothesis ($H_A : \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$) which states that there is cointegrating relationship among the variables. Thus, the analysis of data confirms the presence of long run relationship among import demand of manufactured items, real GDP and relative price of manufactured items in Pakistan. These results represent long run elasticities of import demand of manufactured items with respect to real GDP and relative price of manufactured items. The long run results are reported in Table-13.

Table-13: Long Run Analysis

Dependent Variable = $LnMdMF_t$			
Variable	Coefficient	t-Statistic	p-Value
$LnGDP_t$	1.7219	5.4325	[0.000]
$LnRPMF_t$	-1.4114	0.60857	[0.027]
Constant	-25.5100	-2.1840	[0.037]

The results reported in Table-13 show that real GDP has positive and statistically significant impact on import demand for manufactured items. Similarly, the impact of relative price of manufactured items on the import demand of manufactured items is negative and significant at 5 percent level. The results show that the real GDP has high (1.7219) elasticity of import demand for manufactured items and relative price also has significant and high elasticity (-1.4114) for the import demand for manufactured items. The long run coefficients of independent variables have theoretically correct signs. The import demand of manufactured items is elastic with respect to real GDP. Similarly, the import demand of manufactured items has elastic demand with respect to relative price. This shows that real GDP has positive relationship with import demand of manufactured items but relative price has negative relationship with import demand of manufactured items. Generally, the manufactured items fall in

category of luxurious items. Therefore, theoretically, their elasticity should be high because a little change in income as well as price results in a larger change in the quantity demanded. However, this change is opposite in case of price but to the same direction in case of income. The short run results are reported in Table-14.

Table-14: Short run Analysis

Dependent Variable Δ LnMdMF$_t$			
Variable	Coefficient	t-Statistic	p-Value
Δ LnGDP$_t$	3.1814	2.2128	[0.034]
Δ LnRPMF$_t$	-0.57385	-1.7205	[0.095]
Ecm(t-1)	-0.32390	-3.3803	[0.002]
R-Squared: 0.35, F-Statistic: 5.56, D-W: 1.69			

Table-14 shows that real GDP and relative price of manufactured items have significant effect on their import demand in short run. The error correction term of the model is statistically significant and has negative sign. The results reported in Table-14 show that coefficient of real GDP is positive and significant at 5 percent in short run. The coefficient of relative price of manufactured items has theoretically correct sign and is although significant but at 10 percent significance level in short run. The results show that real GDP has high coefficient (3.1814) for import demand of manufactured items and is highly elastic. The low and negative coefficient of relative price of manufactured items (-0.57385) in short run show that the demand for imported manufactured items is inelastic. It is further added that import demand of manufactured items is highly income elastic while inelastic with respect to price in the short run and are respectively significant at 5 percent and 10 percent levels. To analyze the stability of the long run and short run coefficients of the model of all import demand functions The graphs of cumulative sum (CUSUM) and the cumulative sum of the squares (CUSUM sq) show that the null hypothesis of the regression equation in analysis is correctly specified and cannot be rejected as the plot of these statistics remains with the critical boundary of 5 percent significance level[2].

VI. Concluding Remarks and Policy Recommendations

The aim of this study was to find the income and price elasticities of disaggregated import demand functions for Pakistan. The ARDL bounds testing approach to cointegration was used for analysis of the long run relationship of disaggregated import demand for food items, raw material items, fuel lightening and lubricants items and manufactured items with respect to relative price of all the four commodity groups and real GDP. Our empirical findings show that there exists a long run relationship between import demand of all the four commodity groups, real GDP and their relative prices. Long-and-short run elasticities of food items conclude that the import demand of food items group is highly income elastic as compared to relative price. In the long run, the impact of real GDP on import demand of food items is positive. Short run elasticities of food items indicate that import demand of food items is highly income elastic while inelastic with respect to relative price. Long-and-short run coefficients of raw material items indicate that the import demand of raw material items group is highly income elastic while inelastic with respect to relative prices. In the long run, the impact of real GDP on import demand of raw material items is positive. Short run coefficients of raw material items indicate that import demand of raw Material items is highly income elastic and inelastic in case of relative prices. Long-and- short run results of fuel lightening and lubricants items indicate that the import demand of fuel lightening and the lubricants items group is highly income as well as price elastic. In the long run, the impact of real GDP on import demand of fuel lightening and the lubricants items group is positive. The impact of relative price on import demand of fuel lightening and the lubricants items group is negative. Short run elasticities of fuel lightening and lubricants items indicate that import demand of fuel lightening and lubricants items is highly income elastic while inelastic in case of relative prices. Long-and-short run elasticities of manufactured items indicate that the import demand of manufactured items group is highly income elastic as well as highly price elastic. The Long run impact on real GDP on import demand of manufactured items group is positive. Similarly, the impact of relative price is negative. Short run coefficients of manufactured items indicate that import demand of manufactured items is highly income. In short, the analysis shows that imports of all the categories are highly income elastic. However, fuel lightening and lubricants items and manufactured items are highly price elastic, while food items and raw material items are price inelastic. The overall results of all the four models indicate that fuel lightening and lubricants items group is more income elastic as compared to the other commodity groups, and the manufactured items group is more price elastic as compared to the other commodity groups. The results of study also confirm the reality that our import demand of all the commodity groups is highly sensitive to changes in real GDP. If we see the overall results of the four models, all of the models are highly income elastic. It means that the higher the income, Pakistan will shift to higher import demand. It is exactly according to the Keynesian absorption theory which states that the increase in income increases the demand of imported goods. In such situation, monetary policy will help to reduce the demand of imported commodities. The monetary policy should be improved in such a way that it increases the domestic

[2] The graphs of CUSUM and CUSUMsq are available upon request from authors.

savings and promotes domestic investment. With the help of the fiscal policy, incentives should be given to domestic investors and exports-oriented industries should be established. Exports of finished goods should be promoted instead of primary or semi-manufactured goods. In this way, we may improve the trade balance. Secondly, since imports increase with the income, emphasis should be given on imports of technology and producers goods items rather than importing consumers' items. It will help boost domestic production as well as exports. Import demand of fuel lightening and lubricants items and manufactured items are highly price elastic among the four models. This shows that for reducing the import demand of these groups, improved exchange rate policies should be adopted. The exchange rate policies directly affect the relative prices and in this way imports of the country will decrease in the long run. Because exchange rates between foreign currency and local currency directly affects the imports and exports of a country. Therefore, the focus should be on such policies that can increase the supply of foreign currency into the country, for example, improving the infrastructure and conditions for foreign direct investment. Moreover, such measures should be adopted that can increase the foreign remittances into the country. If we look at the trade liberalization process in Pakistan, it may be safely concluded that it is increasing the gap of imports and exports. Trade liberalization in Pakistan is increasing the amount of imported goods at a faster pace. Therefore, the trade liberalization should be rationalized in favor of Pakistan such that the trade balance of the country may become favorable. For reducing the import demand of Fuel Lightening and Lubricants, the alternative energy sources should be developed. Import substitution policy of the government should be rationalized such that the imports may be reduced in the long run. The government should try to invest in high-tech industry so that in long run imported goods demand may be controlled.

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