INVESTIGATING THE NEXUS BETWEEN INWARD FOREIGN DIRECT INVESTMENT AND CAPITAL GOODS IMPORTS: EMPIRICAL EVIDENCE FROM PAKISTAN

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ABSTRACT

This research found the empirical analysis between capital goods imports and inward foreign direct investment (FDI) of Pakistan by applying the annual time series data from 1975 to 2020. The importance of this area of research arises from its role in the balance of payments by incorporating the foreign direct investment in the capital goods import demand model. The autoregressive distributed lag (ARDL) technique is used to estimate the long run relationship between dependent and independent variables. Furthermore, fully modified least square (FMOLS) and Dynamic ordinary least square (DOLS) techniques are also applied to check the robustness of the estimated long run results. The findings indicate that capital goods import is positively influenced by foreign direct in case of Pakistan. Moreover, domestic income, and relative price both have theoretically correct signs. On the other hand, the coefficient of export is negatively associated with import demand, which means that capital goods imports are not used in the promotion of export growth in Pakistan. We recommend that an import substitution policy should be encouraged and to divert FDI toward the promotion of export growth and hence reduce trade deficit in Pakistan.

Keywords: *foreign direct investment, capital goods imports, balance of payment, ARDL.*

JEL Classification: *F21, F10, F40, O40*

1. INTRODUCTION

Numerous economists have highlighted the importance of global trade in the growth of the economy. Imports are the key part of international trade which has drawn increased attention in developing nations, particularly since liberalization. Imports of capital goods are essential to boosting economic growth, especially in countries with low levels of productivity. On the

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other hand, this increasing trend of imports may create external imbalances in the trade sector. Because of this reason, a substantial research has been conducted to investigate the factors that influence import demand such as Ginman (1976) and Rehman (2007) and Alias and Cheong (2000), Giovannetti (1989), but these studies ignored the role of foreign direct investment and financial development in the formulation of import demand model.

Therefore, in recent years, the focus of research is the impact of FDI on host country's imports is important by Keho (2020). However, the FDI can also have a significant role in the balance of payments of the host country. The FDI companies require imports of capital goods and raw material for the production process which are not easily available in the host country. This may cause a balance of payment distortion. If foreign firms use local inputs in the production, they have not adversely affect on balance of trade of the host country, but if foreign firms highly dependent on imports they may create trade deficit. The contribution of FDI on imports is also depends on output type of FDI, if output is complementary to imported inputs, it may adversely affect on balance of payments. On the other hand, if FDI inflows promote import substitution industries it may reduce the import pressure because the imported items which were imported earlier would now be produced domestically. The empirical outcomes provided mixed argument regarding the foreign in flow role in import demand i.e. Brenton et al. (1999), Goh et al. (2013), Cushman (1988) and Liu et al. (2002).

The economy of Pakistan has been facing trade deficit from several decades due to high import content, as the share of capital goods imports is extremely high relative to the other classification in total imports. This research strengthens the existing body of research by evaluating the impact of foreign direct investment on Pakistan's capital goods imports. The objective of this study is to find the impact of FDI in the formulation of an import demand model which is based on capital goods import, instead of analyzing aggregate import. This model will be more helpful in formulating the trade policy in line with reducing trade deficit in Pakistan. To the best of our knowledge no empirical analysis has been done to identify the issue of balance of payment in respect of the role of foreign direct investment in capital goods imports in Pakistan. So this study fills the gap in the literature by incorporating the foreign direct investment as a potential variable to determine the capital goods imports in Pakistan.

This research enriches the existing of previous work by examining the impact of foreign direct investment (FDI) inflows on Pakistan's demand for capital goods imports. The remainder of the paper is structured as follows. We discuss the related literature in section 2, and the import demand model is

presented in section 3. We go over the methodology and findings in section 4 before providing our final conclusion in section 5.

2. LITERATURE REVIEW

Most of the empirical research is available in the context of positive contribution of foreign direct investment in import demand. The main reason of this relationship is that FDI often has high propensity of intermediate and capital goods imports which are not readily available in the host countries.

Pacheco-López (2005) examined the behavior of FDI on export and import since late 1980 in Maxico. The results indicate that multinational organization has significant impact on export. Furthermore, FDI also played a negative role in the balance of payment. The empirical results also confirm the causality between export, import and foreign direct investment. The study suggests that government should strengthen the local industries and develop integration between domestic industries and export oriented sectors.

Uzunoz and Akcay (2009) investigated the determinants of wheat import demand in Turkey over the period 1984-2006. The authors estimated the elasticities of wheat import (3.47), (3.98), (0.19),(20.2), (16.78) and (-1.186) with respect to domestic price of wheat import, gross national product of per capita, exchange rate, production of wheat, domestic demand and trend factor respectively. The results show that domestic wheat price is strongly associated with wheat import this indicates that consumer would move their consumption to purchase domestic wheat rather than imported wheat.

Yousaf et al. (2008) present the effect of FDI on Pakistan's import and export over the period 1973 to 2004. The results indicate that import demand is positively influenced by 1% change in FDI both in short run and long run (0.08 and 0.52) respectively. This study suggests the guideline to the policy makers to attract FDI by creating the friendly environment to foreign investors. As well as import substitution related FDI will be beneficial for Pakistan. Furthermore, FDI should include as an important indictor in formulating the outward looking development policies in Pakistan. Similarly, Ahmed et al. (2003) examine the effect of openness by considering the trade and FDI in Pakistan over the period 1972 to 2001.

Alguacil and Orts (2003) investigate the connection between FDI and imports in Spain by using the time series data from 1970 to 1992. For the estimation authors used FDI, relative price, domestic demand and inflation in the determination of import demand. The empirical results not only showed the significantly impact of domestic demand and relative price but FDI also play a significant and positive role in promoting import demand. Moreover, the dynamic behavior of the variable series confirms the existence of

unidirectional causality. However, the unexpected movement of FDI affects the sensitivity of the import demand specifically during the first year. Infect no results found in the support of reverse causation from imports to FDI.

Aqeel and Nishat (2004) found the effects of feasibility of the government in attracting FDI during the period from 1961 to 2003 in Pakistan. For the empirical analysis authors consider GDP, corporate tax, custom duties, average wage, private sector credit, exchange rate, general share price index and two dummy variables . The short run and long run results clearly identified that all variables in the estimated analysis have significant impact on FDI except wage rate and general share price index. They suggest that estimated results should be used in the policy making to attract the FDI in Pakistan.

Liu et al. (2002) used the quarterly data from 1981:1 to 1997:4 for estimating the empirical relationship between trade, economic growth and foreign direct investment in China. They used cointegration, causality analysis and VECM model for the estimation. The finding clearly justified the existence of substitution effect between FDI and imports. Moreover, causality running from FDI to imports in China.

Keho (2020) investigated the role of FDI in Import demand of Cote d'Ivoire. The author uses the time series data from 1980 to 2017 by using the bound testing approach of cointegration. The results indicate that all that national income, price of domestic goods and services, price of imported goods and services, and foreign direct investment inflows statistically significant with import demand in both short run and long run. The study suggests that policy makers should encourage FDI with low import content. Moreover, tax incentive should be given to import substitution industries.

Lin (1995) used FDI from Indonesia, Malaysia, Philippines and Thailand in the estimation of Taiwan import demand function during the period 1972 to 1992. The empirical results indicate that FDI from Indonesia, Malaysia, and Philippines has no significant impact on Taiwan's import demand function. Exception the FDI from Thailand has significant but negative impact on import demand which may be some degree of import displacement by FDI.

De Mello and Fukasaku (2000) captured the sensitively of trade through FDI during the period 1970 to 1994 in selected Latin American and South East Asian countries . The study used bi-vitiate vector error-correction and causality analysis. The results confirm the positive impact of FDI on import demand in all countries of Latin America except the Mexico, for which foreign direct investment seems to be displacing imports in the long run. The complementary hypothesis between FDI and import is confirmed in case of South East Asia except in Singapore and Philippine. This study concludes that FDI-Import nexus is less unambiguous.

Hailu (2010) estimated the linkages between trade (import and export) and FDI of Sub-Saharan African countries by using the panel data from the period 1980 to 2007. The study used least square dummy variable (LSDV) approach. The results indicate that one period lag of FDI has significant impact on import performance which indicates that Multi-National Enterprises enhance FDI to promote domestic production of goods and services instead of promotion of import substitutions. Moreover, export elasticity is positive and significant with respect to FDI which indicates that FDI has important contribution to the export subsector in African countries. This study suggests that policy makers should more emphasis in formatting investment policy related to MNEs specially those areas that promote export, import substitution.

3. MODEL, DATA AND METHODOLOGY

3.1 Model Specification

The purpose of this research is to look at the empirical relationship between FDI inflows and capital goods imports of Pakistan. This goal is met by expanding the import demand function to include FDI as an explanatory variable such as Brenton et al. (1999) and Goh et al. (2013). This research uses import demand theory, which makes the assumption that the import demand function is homogenous to degree zero in terms of prices and income. This suggests that real income and import relative prices can be used to represent the import demand function. The advantage of this formulation is that it mitigates the issue of problem of multicolinearity that may exist between the variables.

Therefore, our empirical model is specified as follows:

$$LnM_t = \beta_0 + \beta_1 LnY_t + \beta_2 LnRP_t + \beta_3 LnFDI_t + \beta_4 LnEXP_t + \beta_5 URB_t + \beta_6 TL_t + \mu_t \quad (1)$$

Where Mt is the real import demand of finished capital goods, Yt is real income represented by GDP and RPt denotes relative price of imports, which captures the trade-off between imported and domestic goods prices. Where FDIt is the foreign direct investment inflows in real terms, EXP is the real export of goods and services, URBt is the growth in urbanization and TLt is the dummy for trade liberalization. Additionally, ut is the error term which is normally distributed with mean zero and constant variance.

Imports are positively related to real income, which is consistent with demand theory argued by Tirmazee and Naveed, (2014). An increase in domestic income will increase demand for finished capital goods, while the

expected sign of relative price will be negative. The effect of FDI on imports is determined by the degree of substitutability or complementarily between imports and FDI (For review Helpman (1984), Markusen and Venables (1998) and Pacheco-López (2005). When the complementarily hypothesis holds, a positive effect is expected, whereas a negative effect is expected when substitutability holds. However, the impact of exports (positive or negative) on imports is far from clear, both theoretically and empirically argued by Bathalomew (2010). Similarly, the expected urbanization sign is positive, as increased urbanization leads to increased import demand in the country supported by Anaman and Buffong (2001).

3.2 Data Description

The data set is obtained from the World Development Indicators, (World Bank 2020), Handbook of Statistics (2020), State Bank of Pakistan and Economic Survey of Pakistan (2020). From 1975 to 2020, the sample period is covered. To convert nominal import data in constant local currency (2010=100), we used the import unit value index of capital goods imports. The GDP deflator (2010=100) was used to convert GDP, FDI, and EXP into constant local currency. The relative price of imports was calculated by dividing the import price index by the GDP deflator. After that, the data is expressed in natural logarithmic form. This functional form directly provides elasticity coefficients. Furthermore, log linear form reduces the problem of error term heteroscedasticity. Studies by Sinha (1997) and Raijal (2000) have shown that the log linear transformation of the variables is more effective compared to linear transformation.

4. EMPIRICAL ESTIMATION

4.1 Descriptive Analysis

To examine the distributional properties of imports of capital goods change along with foreign direct investment and other variables in Pakistan for the period 1975 to 2020, various descriptive statistics have been reported in Table 1.

Table 1: Summary Statistic of Data

	LnM	LnY	LnRP	LnFDI	LnEXP	URB
Mean	7.4673	10.4598	3.7004	5.2395	8.3995	3.4387
Median	7.5162	10.4839	3.8174	5.4911	8.6404	3.5605
Maximum	8.3681	11.4111	5.2107	7.6517	9.1241	4.5048
Minimum	6.3952	9.2685	2.0603	2.0976	6.9803	2.6499
Std. Dev.	0.5	0.6498	1.0305	1.439	0.6743	0.6374
Skewness	-0.0682	-0.2563	-0.1584	-0.4609	-0.7958	0.1615
Kurtosis	2.2821	1.884	1.7228	2.2852	2.251	1.5274
Jarque-Bera	1.0234	2.8904	3.3189	2.6083	5.9307	4.356
Probability	0.5994	0.2356	0.1902	0.2713	0.0515	0.1132

Note: M,Y, RP, FDI, EXP and URB denotes Real capital imports ,real income, relative prices, foreign investments inflows , exports and urbanization.

The average imports of capital goods are 7.467 and standard deviation is 0.5000 indicates small volatility in imports. The maximum to minimum yearly fluctuations in capital goods imports ranges 8.368131 to 6.395 whereas median is 7.516 indicate the distribution is symmetrical.

The average foreign direct investments in Pakistan were 5.239 and standard deviation of 1.439 indicates relative high volatility in the distribution. The median is 5.491 and the maximum to minimum fluctuations observed ranges 7.651 to 2.097. On average the gross domestic product recorded as 10.459 and standard deviation value 0.649 shows moderate volatility in GDP. However, the yearly fluctuations from maximum to minimum valued as 11.411 to 9.268.

The average value of relative price recorded as 3.7004 and has high volatility as standard deviation valued as 1.0305. The yearly fluctuations ranges from maximum to minimum valued as 5.210 to 2.060. Similarly, urban growth is recorded 3.438 on average and distribution is small volatile as 0.6374, whereas yearly changes in urban is valued as 4.504 to 2.649. The average exports value in Pakistan recorded as 8.399 having small volatility, however the yearly fluctuations in exports maximum to minimum recorded as 9.124 to 6.980. The jarquebera statistics indicates that all variables series are normally distributed at 5 percent significance level.

4.2 Unit Root Test

Data from time series show trends or the non-stationarity issue. In order to obtain reliable results, this stochastic behavior must be eliminated. Thus, testing time-series characteristics is necessary to determine whether the variables are stationary in the variables. This study performs the Augmented

Dickey Fuller (1979) and Phillips Perron (1988) tests for estimation of the integration order of variables. However, there are some structural breaks exist in the series therefore Zivot and Andrews (1992) structural break test is also performed.

Table 2: Result Of Unit Root And Zivot And Anfrews Test

VARIABLES	LEVEL		FIRST DIFFERENCE		LEVEL	
	ADF	PP	ADF	PP	t Statistics	TIME BREAK
LnM	-4.411*	-3.006	-5.069*	-4.916*	-5.506**	1998
LnY	-2.611	-2.611	-9.265*	-12.514*	-5.192*	1994
LnRP	-3.011	-3.258*	-7.215*	-7.816*	-4.625*	2008
LnLFDI	-2.391	-2.307	-7.832*	-7.832*	-4.294*	2010
LnEXP	-1.203	-1.011	-7.006*	-7.9868*	-4.392	1991
URB	-2.64	-2.37	-3.664*	-3.329**	-4.646*	1999

Note: LnM representing real imports of finished capital goods, LnY representing real GDP, LnRP representing relative prices, LnFDI representing real Foreign direct investment, LnEXP representing real exports and URB is urbanization. The unit root tests and structural break test have been performed under the model with constant and trend. * indicates 5% significance level and ** indicates 10% significance level.

The examination of order of integration is the starting point of our empirical results. Table 2 portrays the results of unit root test for the variables. The Augmented Dickey Fuller (ADF) test concludes that all variables except capital goods imports are integrated of order 1 with a 5% significance level. While, the Philips-Perron (PP) test results indicate that all variables, except relative prices, are integrated in order 1 at the 5% and 10% significance levels. As there are breaks in the series therefore we conduct Zivot and Andrews structural break test to examine the breaks, which identifies the structural break in the variables. It can be observed that all variables except exports are stationary at level having structural break. These structural breaks are the result of financial and trade liberalization policies in the late 1990s and early 2000s.

4.3 Auto-Regressive Distributive Lag (ARDL) Model

The relationship between the import demand for capital goods and foreign direct investment was examined in this study using the ARDL model. The ARDL model offers two critical value constraints, one for I(0) and the other for I(1), where I(0) denotes level 0 integration and I(1) denotes level 1 integration. As a result, the ARDL model avoids the deficiencies arising due to

the classification of the variables according to their integration order, whether I(0) or I (1). In another way, the ARDL model can be used whether the variable is entirely I(0), I(1), or a combination of both. The ARDL model has advantages over other cointegration tests i.e. the ARDL model is being appropriate even with the endogeneity issue of independent variables. Furthermore, the ARDL model can be helpful to explore short-run dynamics and long-run relationships. The unrestricted error correction representation of the ARDL general model is represented as follows:

$$\Delta Y_t = a_0 + \beta_0\ Y_{t-1} + \beta_1 X_{t-1} + \sum_{i=o}^{p} \vartheta_{1i} X_{t-i} + \sum_{i=0}^{p} \vartheta_{2i}\, \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

Here Δ is the difference operator, p is the lag period, εt is the random error term, and is the difference operator. The independent variables are denoted by xt, and the dependent variable is denoted by Yt. By placing limitations on the joint significance, the null hypothesis of "no cointegration" can be tested for across all variables. The null hypothesis can be tested by computing F-statistics and comparing it against the lower and upper bounds crucial values. H0 is rejected if F-statistics is higher than the critical value's upper bound at the 5% level, which suggests that there is a long-run association between the selected variables. The diagnostic tests of serial correlation, normality test, and heteroskedasticity test have been used to evaluate the model.

4.4 Fully Modified Ordinary Least Square (FMOLS)

Before concluding the findings, it is crucial to assess the sensitivity of the long-run parameters estimated from ARDL model. To test the accuracy of the estimations, this analysis re-estimates the model using FMOLS. To estimate the long-run parameters, FMOLS uses a semi-parametric technique. This technique delivers consistent parameters even with the small sample size and avoids the concerns of endogeneity, serial correlation, and omitted variable bias. In order to estimate the long-run parameters, FMOLS uses a semi-parametric technique. Moreover, it estimates a single cointegrating relationship, which is a mixture of I (1) variables.

4.5 Dynamic Ordinary Least Square (DOLS)

In order to estimate a long-run relationship, DOLS developed by Saikkonen (1991) & Stock and Watson (1993) uses a parametric technique. The endogeneity issue is controlled, and the autocorrelation and residual non-normality are adjusted to produce objective and effective DOLS results. Mathematically, it can be written as follows:

$$Y_t = \alpha + cx_t + \sum_{i=-k}^{i=k} \emptyset \Delta X_{t+i} + \varepsilon_t \quad (3)$$

Here, c shows the long-run elasticity, the coefficient of leads and lags differences of I (1) regressors is represented by ∅. These coefficients are called Nuisance parameters; they adjust to avoid endogeneity, autocorrelation, and non-normal residuals.

The findings of the F-statistic test, which investigates the null hypothesis that there is no cointegration among the variables, are presented in Table 3. By applying Akaike information criterion (AIC) the maximum lag is determined which is 3. The estimated finding confirm that there is a long-run relationship exist between foreign direct investment, income, relative prices, exports, and urbanization and capital goods imports in Pakistan. The value F statistic (13.65) is found to be greater than the lower and upper bounds at 5% and 10% significance levels, respectively.

Table 3: Cointegration Test

		Significance	***I0 Bound***	***I1 Bound***
Model Specification	F-statistic	10%	2.26	3.35
lnM f(lnY,lnRP,lnFDI, lnEXP,urban, dummy)	13.65479*(5)	5%	2.62	3.79

Note: LnM representing real imports of finished capital goods, LnY representing real GDP, LnRP representing relative prices, LnFDI representing real Foreign direct investment, LnEXP representing real exports and URB is urbanization. * indicates rejection of null hypothesis of no cointegration at 5% and 10 % level of significance.

We use the ARDL technique, Fully Modified Ordinary Least Square (FMOLS), and Dynamic Ordinary Least Square (DOLS) methods to estimate the long-term association. The results are reported in Table 4.

Table 4: Longrun Elasticities of Import Demand Function

Regressor	**Dependent variable: LnM**		
	ARDL	**FMOLS**	**DOLS**
	(4,4,4,3,2,3)[a]		
LnY	1.74747	1.90431	2.21303
	(12.564)*	(8.470)*	(6.742)*
LnRP	-0.49681	-0.5746	-0.8084
	(-5.097)*	(-4.331)*	(-3.431)*
LnFDI	0.18895	0.16398	0.18968
	(-10.609)*	(4.959)*	(3.330)*
LnEXP	-0.14947	-0.32491	-0.18941
	(-3.349)*	(-2.835)*	(-1.018)
URB	0.53136	0.37505	0.48476

	(8.661)*	(2.715)*	(2.331)*
DUMMY	0.0339	0.11176	0.08276
	-1.525	-1.404	-0.762
C	-10.565	-9.8125	-13.81
	(-8.746)*	(-4.727)*	(-4.707)*
Diagnostic Test			
A. Normality	0.754 , (-0.685)		
B. Functional Foam	0.0028, (-0.0028)		
C. Serial Correlation	2.2832, (-0.153)		
D. Heteroskedasticity	1.6582, (-0.1541)		

Note: the ARDL selected based on the Akaike Information Criterion. The figures in parenthesis are t−statistics. * indicates significance level at 5% and ** indicates significance level at 10%.

A. Normal Distribution Test.
B. Ramsey's Reset Test
C. Langrange multiplier Test
D. White Test.

With respect to the import demand model of capital goods, we find that foreign direct investment has a positive impact on capital goods imports, and this relationship is statistically significant. This is in line with the previous empirical findings by Waheed and Jawaid (2010) and Keho 2020). According to ARDL estimates, a 1% increase in foreign direct investment leads to rise in the demand of capital goods imports in Pakistan by 18%. It shows that foreign investment and demand of finished capital goods imports are complementary to each other. Meanwhile, FMOLS suggests the one percent increase in foreign investments will raise imports demand by 0.16 percent. Similarly, DOLS estimates show that one percent rise in foreign investment leads to an increase imports demand by 0.18 percent in Pakistan. Domestic Income on the other hand is significant and positively related to imports demand supported by Tirmazee, and Naveed, (2014) and Narayan et al. (2010). The coefficient of income elasticity found a one percent increase in domestic income leads to a 1.74 percent increase in import demand through ARDL, while FMOLS and DOLS estimates show that domestic income influences import demand positively by 1.90 percent and 2.20 percent, respectively.

Furthermore, the relative price elasticity is negatively related to imports demand and significant which is in line with the literature Hoque and Yusop (2010). The ARDL coefficients suggest that one percent increase in relative prices leads to fall import demand by 0.49 percent. However, FMOLS and DOLS estimate that relative price has negative influence on import

demand by 0.57 and 0.80 percent respectively. On the other hand, export is significant, but negatively influence on import demand of capital goods. According to ARDL estimates, the export coefficient suggests that one percent increase in total exports of a country reduces import demand by 0.14 percent, which shows that a country does not demand imported capital goods to boost its exporting industry. FMOLS and DOLS, on the other hand, have 0.32 and 0.18 percent impacts on import demand, respectively. However, Urbanization increases import demand of capital goods, as the coefficients of ARDL and FMOLS and DOLS suggest that one unit increase in urbanization leads to rise in demand by 0.53 percent, 0.18 and 0.38 percent respectively. As followed by Anaman and Buffong (2001). Dummy variable on the other hand incorporated for assessing the impact of trade labialization in the import demand model which is positive, but insignificant. The Short run results are also estimated for the model suggests that significant influence of variables on imports demand of capital goods. The error correction term which measures the speed at which capital goods import adjusts to changes in the explanatory variables before converging to their equilibrium levels, is negative and significant. The coefficient of -3.29 percent in the import demand model implies that a deviation from the long-run level of imports this period is corrected by about 3.29 percent in the next period. Having compared the ARDL results with FMOLS and DOLS, we conclude that FMOLS and DOLS estimates are reliable in the long run.

4.6 Stability Test of Model

The stability of the model has been examined by QUSUM and QUSUMSQ tests introduced by Brown, Dublin, and Evans (1975). The stability test of the model has also been undertaken by using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ. The estimated coefficients are said to be stable if the plot of the CUSUM statistic stays within a 5% level of significance. A same procedure is used to carry out the CUSUMSQ that is based on the squared recursive residuals. A graphical presentation of these two tests is provided in Figures 4.1 and 4.2. The plots of the CUSUM and CUSUMSQ statistics for import demand of capital finished goods marginally cross the critical value lines, at 5 percent, so we conclude that capital goods import demand is stable over time.

Figure: 4.1 Cumulative Sum of Recursive Residual

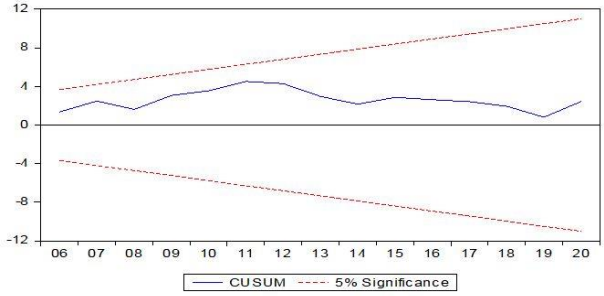
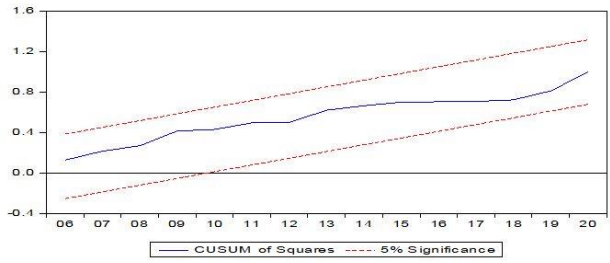


Figure: 4.2 Cumulative Sum of Recursive Residuals



4.7 Rolling Window Regression Technique

The study further estimates the coefficients of long run cointegrated equations by using the rolling window method. The main advantage of this is that it can estimate the coefficient of each observation.

A rolling analysis of a time series model is frequently used to assess the model's long-term stability. A key assumption when analyzing time series data with a statistical model is that the model's parameters remain constant over time. However, the economic environment frequently changes, and it may not be reasonable to assume that the parameters of a model are constant. A common technique for assessing the consistency of a model's parameters is to compute parameter estimates over a fixed-size rolling window through the sample. The rolling window regression is based on changing fixed-size subsamples that roll over the sample period sequentially by adding one observation at the end of the sample while dropping one at the beginning.

Figure: 4.3 Rolling Regression Estimates

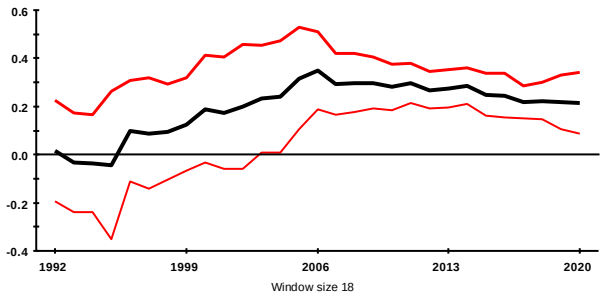


Figure 4.3 represents the result of rolling regression. The rolling window size is fixed at 18 observations. It clearly explains that foreign direct investment positively determines import demands in Pakistan over the sample period. The coefficients sharply rise from 1995 as a result of economic liberalization period in Pakistan. At that time foreign direct investments were greatly relaxed. However, it slightly declined in 2006 and then fluctuated onwards. The figure shows that from 1997 to 2005 the coefficient of foreign direct investment varied in the range of 0 to 0.4.

5. CONCLUSION AND POLICY IMPLICATIONS

This study captures the impact of the inflow of foreign direct investment on capital goods imports in Pakistan from the period 1985 to 2020. The autoregressive distributed lag (ARDL) technique is used to estimate the long run relationship between dependent and independent variables. Furthermore, fully modified least square (FMOLS) and dynamic least square (DOLS) techniques are also applied to check the robustness of the estimated long run results. For checking the stationary of the variables, the study used Augmented Dicky Fuller (ADF) and Phillips Peron (PP) unit root tets. The results indicate that by using the ARDL approach, FMOL, and DOLS all three confirm that foreign direct investment has positive impact on capital goods import in Pakistan. However, FDI has a positive and statistically significant impact on capital goods import in both the short run and the long run. These results indicate that the import bill is likely to increase by inflow of foreign direct investment in Pakistan and thereby cause the problem of a trade deficit. Moreover, urbanization has significant and positive impact on the demand for capital goods imports because an increase in urbanization leads to an increase in the demand for goods and services, and domestic production depends on capital goods. The relative price, on the other hand, is negative and significant when capital goods are imported. The coefficient of export is negatively associated with import demand, which means that capital goods import is not used in the promotion of export growth in Pakistan. Therefore, the policymakers should encourage foreign direct investment in export-based industries, which would reduce trade deficit in Pakistan. In addition, while

attracting FDI to Pakistan, policymakers should be concerned about the import content used in domestic production and support import substitution policies.

Appendix

Table 5: Short Run Elasticities

Variable	Coefficient	T values
D(LnM(-1))	2.07705	(6.108)*
D(LnM-2))	1.01870	(3.926)*
D(LnM(-3))	1.6717	(6.382)*
D(LnFDI)	0.09579	(1.940)**
D(LnFDI(-1))	-0.15767	(-3.409)*
D(LnFDI(-2))	-0.09915	(-2.1692)*
D(LnFDI(-3))	-0.18379	(-3.637)*
D(LnGDP)	1.91260	(3.840)*
D(LnGDP(-1))	0.61238	(1.431)
D(LnGDP(-2))	-1.41531	(-3.679)*
D(LnGDP(-3))	-1.21837	(-4.416)*
D(LnRP)	-0.31162	(-1.299)
D(LnRP(-1))	-0.13622	(-0.601)
D(LnRP(-2))	1.0391	(4.886)*
D(LnEXP)	-0.29726	(-1.631)
D(LnEXP(-1))	0.60229	(3.043)*
D(URB)	1.18046	(2.226)*
D(URB(-1))	1.46546	(1.915)**
D(URB(-2))	-0.64985	(-1.747)
D(DUMMY)	0.1118	(1.611)
ECT(-1)	-3.29694	(-7.708)*

Note: The figures in parenthesis are t−statistics. * indicates significance level at 5% and ** indicates significance level at 10%.

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