

## **FDI AND MANUFACTURING GROWTH: BOUND TEST AND ARDL APPROACH**

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### **Abstract:**

The objective of this study is to investigate the effect of foreign direct investment (FDI) toward manufacturing value added growth in the context of developing economies like Pakistan. The study used annual data for the period 1972-2017. By applying the cointegration method known as "bounds test" and the autoregressive distributed lag (ARDL) approach to find both long term and short-term effect of FDI on manufacturing value added growth. Meanwhile the foreign direct investment and exports has also shown a significant impact on MAU in long run and short run. In addition, long run estimates show that foreign direct investment, employment and exports positively influence the Pakistan's manufacturing value added growth, while market size also significantly affect with negative sign of coefficient value and the employment insignificantly affect with positive sign. Our results suggest that Pakistan should consider appropriate positive policies regarding foreign direct investment, employment and exports to achieve high and stable manufacturing sector growth in the future. This paper contributes to the area of FDI and manufacturing sector growth by critically analyzing and synthesizing existing theory and research on FDI and manufacturing sector growth and with the help of advance technology and knowledge transfer.

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## 1. Introduction

Foreign Direct Investment (FDI) refers to the cross-border investments by an enterprise with the purpose of obtaining long-term benefits in other countries (Wang, Hong, Kafouros, & Wright, 2018). The long-term benefits represent the influence of direct investors towards the enterprise management through the possession of a minimum 10 percent of voting power (OECD, 2013). It usually involves participating in joint-ventures, management, transfer of technology and expertise. Besides that, FDI is also known as the growth enhancing factor in developing countries as it has the potential to create employment, enhance foreign skills and technology, productivity and improve long term socio-economic development (khan, 1994; Kobrin, 2005). Thus, the most developed and least developed countries are equally involved in the FDI activities to accelerate economic growth in their respective countries. In developing countries, FDI has been considered as potential source of development for the novel and small domestic firms (Ahmad, 2012; Choong et al., 2004; Wang et al., 2018).

Developing countries adopt such economic policies which boost up foreign trade and investment on the one hand and act as investors, producers and consumers across borders on the other hand (Tong, 2001). Foreign direct investment (FDI) is a great source of expansion for small and inexpert local firms in many developing countries (Blomstrom & Kokko, 2003).

Manufacturing sector is playing a crucial role in the growth of the economy of Pakistan. The performance of Pakistan's manufacturing sector has followed a boom–bust growth cycle. At a time when the BRICS emerging economies have succeeded in establishing well diversified and internationally competitive manufacturing sectors, Pakistan's manufacturing sector has struggled to grow in a sustained manner and is still plagued by a host of structural problems, including low productivity and lack of innovation in product and process technologies. Manufacturing sector is the backbone of Pakistan's economy a constitutes the second largest sector of economy contributing 13.5 percent to Gross Domestic Product (GDP) and generating biggest number of industrial employment with technology transfer

The number of studies examining the relationship between FDI and economic growth, it is found that studies emphasizing the impact of FDI on manufacturing sector growth is rather lacking

specifically in the context of Pakistan. Furthermore, it is more lucid to examine the impact of FDI on manufacturing sectors since huge influx of FDI inflows in Pakistan are directed towards the manufacturing sectors.

This paper further contributes in the following ways. First, we used a more recent time series data to quantify the link between FDI and manufacturing growth by examining the short and long run the effect FDI on manufacturing sector. Second, we used a more robust method known as the “bounds test” to examine the cointegration between the dependent variable namely manufacturing value added output and its determinants. In addition, few of the model specification problems mentioned by Carkovic & Levine (2002), which would lead to inaccurate estimation, were solved by adapting the ARDL model. For instance, this method controls the deficiency of other studies by considering the inclusion of lagged dependent variables in examining the short run dynamics of FDI. Moreover, the analysis proposed in this paper also makes it possible to explain the long-term dynamics.

The next section 2 provides a brief overview of foreign direct investment and Pakistan’s manufacturing sector while section 3 reviews the relevant literature. In section 4, the study discusses the theoretical framework while in section 5 it discusses the data and methodology. The results of the study are discussed in section 6, and the last section gives conclusion and policy implications

## **2. FDI and Pakistan’s Manufacturing Sector (An Overview)**

In the recent years, many countries of the world particularly the developing economies want to get the attention of foreign investors to invest in their domestic firm particularly in the form of FDI( Ullah, Shah, Khan, 2014; Epaphra & Massawe, 2017) The increasing trend of foreign investment in an economy provides many benefits including capital inflow, increase employment opportunities, enhance employees ‘wages, technological development and spillover which increase the productivity of domestic firm finally enhances economic growth (Cipollina, Giovannetti, Pietrovito & Pozzolo, 2012; Eregha, 2012).

Figure 1 depicts the FDI net inflows measured in millions of dollars in Pakistan. It can be observed from the figure that FDI in Pakistan has been decreasing since 2007. The decreasing trend continues until 2012, when it gets little increasing trend and reaches to US\$1000 million in 2016.

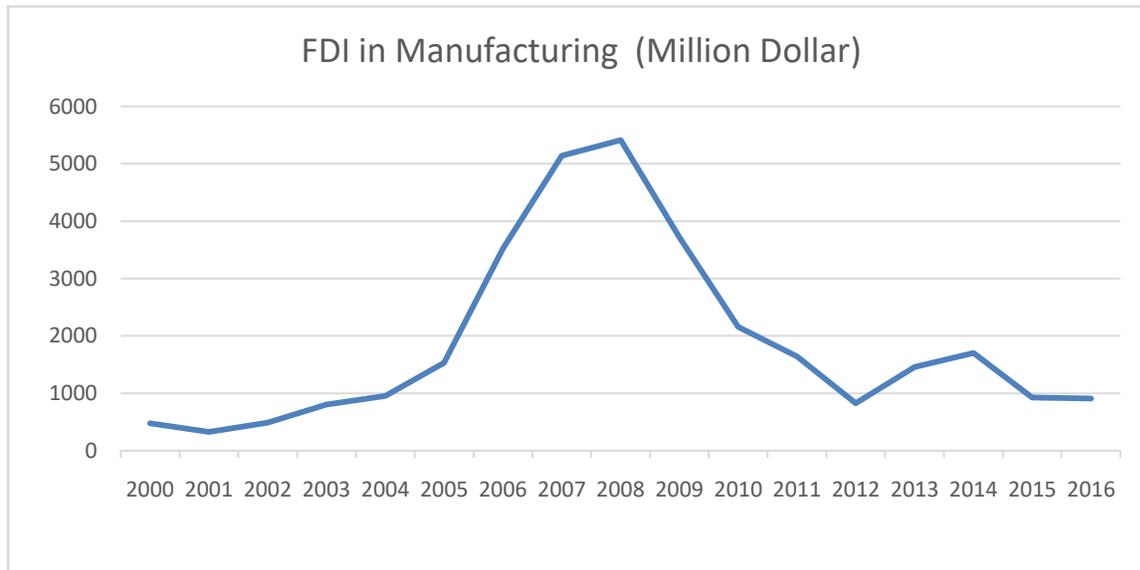


Figure 1

*Foreign Direct Investment (Millions of Dollars) in Manufacturing Sector of Pakistan, 2016*

Source: *Statistical Handbook of Pakistan, 2016-2017*

The doors of Pakistan are open to FDI like other developing economies in anticipation of inward economic benefits, though it has not been as successful as India and China, the neighboring countries, in attracting consistent and significant inflows of FDI. Also, the underutilization of inward FDI to enhance economic activities is another point to ponder in developing economies (Ataullah & Le, 2006; Escobari & Vacaflores, 2014). This might be due to inappropriate economic reforms that failed to attract sufficient amount and kinds of FDI in these countries because the structural composition and kind of FDI matters for desired economic outcomes (Chakraborty & Nunnenkamp, 2008; Tahir et al., 2015). The critical role of FDI in the growth phenomenon cannot be neglected. As argued by Trevino, Thomas, and Cullen (2008 a) that the development rate of novel technologies and products is higher in case of transnational

corporation (TNCs) as compared to domestic corporations, which in turn exert a competition pressure thereby enhancing the intimation and innovation process among domestic firms.

Pakistan heavily rely on foreign finance and technology since it is a capital-scarce country (Rehman, 2016). Many factors are responsible for this poor performance. Unfortunately, the economy of Pakistan has been suffering from higher inflation rates, increased population growth, political disruptions, internal and external disputes on the borders since last two decades. Inadequate levels of investments caused by poor savings give birth to poor socio-economic infrastructure which cause lower growth rates in most of macroeconomic indicators (Zaman, Shah, Mushtaq Khan, & Ahmad, 2012).

The importance of manufacturing sector cannot be neglected due to its significant share in Pakistan's exports and employment generation. FDI is significantly contributing to the growth of manufacturing sector (Haque , 2014; Kalim, 2001; Pasha, Pasha & Hyder, 2002). Among several other factors, it is the state of art technology, which enhances the growth of output in the manufacturing sector. FDI, through transfer of the state of art technology, can raise the productivity and growth of output of the FDI firms (foreign firms) in the manufacturing sector.

The Figure 2 shows that the decreasing trend of manufacturing value addition since 2012. It is clearly seen from graph that value addition as a percentage of GDP in Pakistan is not very encouraging. The decreasing trend from the last six years depicts that it should be checked that why it is not increasing.

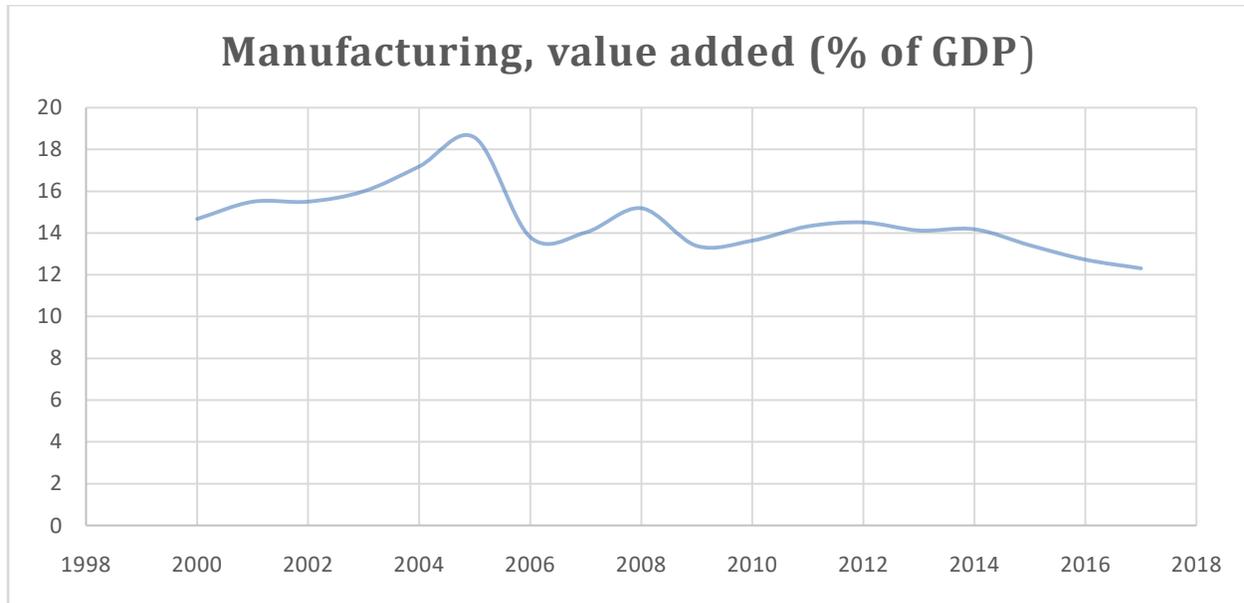


Figure 2

*Manufacturing value added (% of GDP) of Pakistan, 2017*

Source: *Statistical Handbook of Pakistan, -2017*

Furthermore, the relationship between growth of manufacturing and foreign direct investment (FDI) has extensive importance in the economic history. There are sound conceptual reasons for believing that FDI can ignite economic growth performance of manufacturing while the empirical evidence is divided, most of the studies show a strong complementary connection between manufacturing FDI and economic growth in both developed and developing countries. Although, manufacturing FDI contributes to economic growth only when a host country has sufficient absorptive capacity of the advanced technologies (Borensztein et al., 1998). But FDI is a remarkably important variable for growth in transition economies, as its effect on economic growth is positive and statistically significant in transition economies (Campos & Kinoshita, 2002). In the same way, manufacturing FDI is positively correlated with economic growth and accelerate country's growth with the condition of adequate human capital, trade liberalization and economic stability (Bengoa & Sanchez-Robles, 2003; Brännlund, Nordström, Stage & Svedin, 2016; Wang, 2009).

### **3.Literature Review**

#### **3.1 Impact of FDI on Manufacturing Sector Growth**

In various theoretical studies, FDI and relevant findings have been presented both from empirical and theoretical perspective. For instance, have considered the vital impact of FDI for the other selected indicators. He has found that FDI is very much significant in explaining the role in growth of the economy, for the employment creation, increasing level of productivity and causing a spillover effect for the technological development. besides, FDI has positive and consecutive effect of technological advancement with the economic growth. however, the impact of FDI on the growth of the economy regarding sector growth is very much important to address and discuss.

Another study has been conducted by while focusing on 69 developing regions with the focus on human capital for the absorbing capacity of foreign level of technology. With the higher HC, the level of FDI inflow is very much significant. They have concluded that impact of FDI differs from state to state with the human capital. Higher level of human capital will encourage the level of FDI in the state (Borensztein et al., 1998; Uwazie, 2015).

Under the title of FDI various factors like knowledge, capital stock and level of technology with the management practice are captured. In addition, skill and competencies, level of training and organizational development. besides, in the developing countries, level of FDI has significant and impact on the economic growth ((De Mello, 1999; Nambiar & Balasubramaniam, 2016; Ndiaye & Helian, 2017).

According to the prior study, there are many factors affecting FDI and each different country has their own major determinants of FDI depending on their level of income. As stated by Yasmin, Hussain and Chaudhary (2003), FDI for upper and lower middle-income countries and trade openness, external debt, labor force and domestic investment, whereas urbanization, market size, wages, current account and inflation are the determinants for lower income countries. Furthermore, FDI and trade are considered as catalysts for achieving desired rates of growth in developing economies. While the effect of total FDI on growth is ambiguous as a negative effect

of investments is evidenced in case of primary economic sectors, however, a positive FDI effect is found in case of manufacturing sector(Alfaro, Chanda, Kalemlı-Ozcan, & Sayek, 2004).

By using the data in the form of time series to examine the association between FDI and other determinants for the growth of Malaysian firms, Chang and Wong (2005) has selected the time of 1980 to 2002. He has found that with the good and significant rate, manufacturing sector has significantly attracted the FDI in Malaysia. Another study of Chang and Wong (2005) have explained that FDI has significant impact on the value of growth rate. Their study has used the time series data to examine the relationship between local investment and their impact on the long run growth along FDI. Conclusion of the study indicates that all investment types have significant and positive impact on Malaysian economy.

Chuang (2007) have scrutinized the impact of FDI and relevant decision on the level of investment at domestic glance. They have considered the manufacturing firms of Taiwan, while data is collected from Industrial Development Bureau from 1993 to 1999. They have also considered the deferral effect for the FDI on the size of the firm and endogenous switching model for the correct estimation. Their empirical findings explain that FDI has significant impact on the value of manufacturing firms and their decision making. In addition, when the business firms are engaged in defensive FDI, a crowding out effect is found. At the end, a positive effect of FDI has been found on the larger firms while for the smaller firms, this effect is positive as well.

By considering the both short term and long-term effect of FDI, Chandran et al. (2009) have considered the manufacturing growth for the Malaysian economy over 1970 to 2003. A latest co-integration approach is applied, while considering ARDL model. they have found that FDI in both long and short run has significant influence with 1 % increase, causing a positive change of 11.5 % in the growth of manufacturing value added outcome factor. The empirical findings explain that FDI has a major role to play for the stimulation of growth in the economy from the context of Malaysia. Besides the significant of FDI, they have suggested that focus is also needed for the human capital from the context of Malaysian.

In their study analyzed the effect of FDI along inflation over the growth of Pakistani economy from 1981 to 2010. By applying the multi regression approach it is found that FDI has a significant and positive influence on the economic growth from the context of Pakistan. While the impact of inflation on the economy is found to be significant and negative.

Wang (2009) have argued that diversified findings in the relationship between FDI and growth of the economy is because of taking FDI in aggregate format. For this purpose, he has taken the sector wise data for the FDI inflow in the economy for 12 Asian states. Time duration of the study was 1987 to 1997 and it is found that in manufacturing sector performance of FDI is very much significant and positive but not the same for the non-manufacturing firms. Research work of Wong et al. (2015) , have examined association for the FDI and growth of manufacturing sector from the context of Nigeria by using the OLS regression estimation technique. Findings of the study explain a significant and positive relationship between FDI and growth of manufacturing sector.

Various earlier studies have found insignificant impact of FDI on the economic growth in the developing and host countries. FDI negatively affect the growth of the economy, if foreign investors and their business firms will remittance huge amount of profit to their home country. Edison, Levine, Ricci, and Sløk (2002) have confirmed his findings in a sense that FDI has a negative impact on the growth of various states with the using of cross country analysis over 1960 to 1995. Meanwhile, FDI inflows does not have any effect on the growth of the economy (Carkovic & Levine, 2005).

Similarly, the impact of FDI on the growth of manufacturing sector is experienced with the negative impact both in the title of panel and time series econometric modelling as explained by (Mencinger, 2003). However, the flow of FDI is greatly depends on the absorption capacity of the technology. In the study of (Durham, 2004.), it is found that FDI has a negative but insignificant impact on the growth of the economy. In another study of (Falki, 2009), it is observed that the effect of FDI on the growth of Pakistan for the time duration of 1980-2006. The point of focus is based on the endogenous growth theory while taking both FDI and growth into final consideration with the factor of production. Other economic indicators like domestic

investment, trade, labor force is also used in the analysis. Findings of the study have explained a significant and negative relationship among FDI and GDP in the context of Pakistan.

Another study Liu, Daly, and Varua (2012) by has explored the idea that there exists a negative association between FDI and growth for the manufacturing sector. They have shown that with the expansion of manufacturing sector, the skill and abilities of labor force are very much significant. But at the same time, it is found that higher value of labor force causes higher cost of production when can negatively affect the value of FDI in the domestic market for the host countries.

As compare to total value of FDI, both type of investments has their relative impact. It is very much interesting to see both the investments are separately fill this gap in the literature. So, the effect of FDI on the growth is still under discussion and various studies have been conducted to check the impact of foreign investment on the overall economy. Some studies have observed a significant and positive, but some have examined negative and significant impact on the growth of the economy with the economic and technological situations of the countries.

### **3.2 FDI and Performance of Growth Manufacturing**

This section provides literature on the effect of Foreign investment on economic growth in general and manufacturing sector growth. In the study of Ullah et al. (2012) have also examined the role of FDI for the sectorial growth in Pakistan over the special reference with the agriculture and industrial sector from 1979 to 2009. Simultaneous equations are developed to capture the overall effect of FDI for both two selected sectors. Application of two stage least square or 2SLS method of estimation has explained the fact that there FDI has significant impact on the growth of agriculture sector. In addition. the effect of FDI is positive for the industry but this effect is not significant. Besides, many other factors like public sector investment, system of irrigation and level of technology are some other indicators having significant influence on the growth of agriculture sector in Pakistan.

Mwakanemela (2014) have conducted the research work to investigate the association between macroeconomic factors like FDI, openness of the trade and rate of inflation on the manufacturing

sector and export performance of Tanzania from 1980 to 2012. By applying the VECM and OLS regression models it is found that there is a negative and significant impact of inflation on the performance of manufacturing sector. In addition, Chaudhry, Ayyoub, and Imran (2013) have also examined the impact of inflation on manufacturing, service and agriculture sector of Pakistan. Time of the study was 1972 to 2010 and findings of the study suggest that inflation rate has negative impact on manufacturing sector of Pakistan. In the study of Hooda (2013), manufacturing sector is selected for the effect of FDI in the Indian economy. It is found that FDI has significant and negative impact along impost intensity, R&D and market power. The level of FDI is seemed to be higher in those countries where the value of market imperfection is more. The negative association between tariff and FDI has considered an efficiency seeking.

Wong et al. (2015) have examine the relationship between FDI and manufacturing sector of Nigeria through OLS regression model. their findings explain the idea that there exists a significant positive association between FDI and growth of manufacturing sector in the region of Nigeria which is currently known as developing economy. In addition. from the empirical findings, it is observed that effective macroeconomic policies like degree of trade openness and rate of exchange in the economy, the effect of FDI on the level of manufacturing sector growth is increased. In addition, the findings of their study also explain that it is very much significant to implement the growth enhancing policies for the host countries to promote more international investment in the local market.

In their research work, Brännlund, Nordström, Stage, and Svedin (2016) have explored the impact of FDI on the productivity over the time of 1980 to 2005 which consists of various manufacturing firms with at least 50 employees. They findings have explained that FDI has a significant positive influence on the value of productivity. It is also clear that FDI has also a positive impact on the transfer of technology, while its impact on the transfer of resources is less clear. In addition, the impact of FDI on the efficiency of Swedish manufacturing firms have found that foreign ownership has a significant positive impact on the level of efficiency and productivity.

There is an empirical level of association between the industrialization and level of per capita income in the developing states. This is due to the reason that such actor leads to the huge injection of capital in the economy and have multiple effect on the economy. With such significant effect, people have the job opportunity in the economy which also increase the per capita income and its growth (Kaldor, 1966b; Rodrik & Subramanian, 2009). Besides, it is also examined that the link and spillover effect between all these factors are under observation from the context of manufacturing and other sectors in the economy (Szirmai & Verspagen, 2015)). Like other sectors in the economy, the role of manufacturing is very much significant and over quarter to quarter its role is very much important to consider, while studying the overall economy.

Libanio and Moro (2006) have examined the link between manufacturing sector growth and performance of the economy for Kaldorian economy. For this purpose, first and second growth laws for the Latin American economies are considered over 1985 to 2001. They also have examined the relationship between industrial growth and level of GDP with the effect of manufacturing sector on productivity level for the overall economy. The findings of the study have confirmed the idea that manufacturing sector is known as the engine for the economy. Their findings also suggest that based on the industrial activities, it is found that growth cycle has a cumulative effect.

#### **4. Theoretical Framework**

Theoretically, neoclassical growth models (Solow, 1956, Swan. 1956) through the assumption of exogeneity in technical progress have limited space to understand the role of FDI on long run growth. In the neo-classical growth models of Solow type, the resultant growth is due to technological progress and labour force. The core concept of this model is that output can be produced by the major contribution of two factors of production named as capital and labour. The only channels via which FDI can affect growth in the host country are through infusion of technological and other knowledge specific shocks. All these factors of production like knowledge and technological advancement are known as the growth promoting indicators with their effect on the production and level of productivity. The present study has selected to

examine the effect of foreign direct investment on growth manufacturing value added in Pakistan.

Furthermore, the study starts with the decisive work, neo-classical growth model developed by Solow (1956). Then study takes Solow's aggregate production by incorporating both FDI and growth. This study employs the endogenous growth model as used in the recent study of Chandran et al.(2008) in order to examine the effect of foreign direct investment and growth of manufacturing value added.. We have added foreign direct investment and growth of manufacturing value added to the equation and employed the following augmented production function:

$$\Delta \ln MAU_t = \alpha_0 + \sum_{i=1}^p \beta_1 \Delta \ln MUA_{i-1} + \sum_{i=0}^p \beta_2 \Delta \ln FDI_{t-i} + \sum_{i=0}^p \beta_3 \Delta \ln EMPL_{t-i} + \sum_{i=0}^p \beta_4 \Delta \ln EXP_{t-i} + \sum_{i=0}^p \beta_5 \Delta \ln INF_{t-i} + \sum_{i=0}^p \beta_6 \Delta \ln MS_{t-i} + \Phi_1 \ln FDI_{t-1} + \Phi_2 \ln EMPL_{t-1} + \Phi_3 \ln EXP_{t-1} + \Phi_4 \ln INF_{t-1} + \Phi_5 \ln MS_{t-1} + \mu_t \alpha$$

Where:  $\beta_1, \beta_2, \beta_3, \beta_4$  and  $\beta_5$  are parameters to be estimated

MAU = Manufacturing value added

FDI = Foreign Direct Investment in Manufacturing

EMPL= Employment in manufacturing

EXP = Manufacturing Exports

INF = Inflation

MS = Market size

$\mu \alpha$  = Error Term

## 5. Data and Methodology

The data set was obtained from State Bank of Pakistan. To check for the stationarity series of all the variables in the model, the unit root test was performed. Augmented Dickey Fuller (ADF) was to identify whether all the variables were stationary and to determine the variables' orders of integration. The ARDL was then employed to see whether there exists a long run relationship among the variables.

## 5.1 Empirical Results

Descriptive statistics of data is used to define the basic features of dataset such as mean, median, and mode are the three measures of central tendency of a random variable (Gujarati, 2004). The key aspect of descriptive statistics is to present quantitative descriptions of the data in a manageable form like table. Thus, descriptive statistics are estimated for all the variables included in the model.

**Table 1: Descriptive Statistic**

	MAU_	FDIM_	EXP_	EMPL	MS	INF
Mean	26.89950	7.485918	13.29284	12.80983	9.908850	44.79607
Median	26.96629	7.606365	13.35924	13.21767	8.640765	28.66647
Maximum	28.08941	9.355852	17.35930	15.76167	25.43683	143.2020
Minimum	25.51868	4.247066	8.235441	8.270000	0.400237	3.185327
Std. Dev.	0.793728	0.997493	2.441779	1.687662	5.853793	43.59976
Skewness	-0.190552	-0.769838	-0.114363	-0.855857	1.156423	1.123422
Kurtosis	1.845207	3.636240	2.075842	3.015730	3.854801	2.954744

The variable having standard deviations, indicate that violence is highly volatile followed by FDI and MAU. The standard value for Kurtosis of normality is 3 whereas the value of Kurtosis of FDIM, EMPL and MSM are greater than 3 which is a sign that leptokurtic distribution is present in the data. While the values of MAU, EXP and INF are less than 3 which shows Platykurtic distribution.

**Table 2: Correlation matrix**

	MAU	FDIM_	EXP_	EMPL	MS	INF
MAU	1.000					
FDIM	0.073	1.000				
EXP	0.210	0.095	1.000			
EMPL	0.156	-0.065	-0.603	1.000		
MS	-0.172	-0.110	0.126	-0.132	1.000	
INF	0.871	-0.221	-0.145	0.340	-0.163	1.000

Results of the table 2, indicate the relationship between dependent variable and independent variables proved to be very useful in pre-estimation analysis especially as regards potential associations suggested by theories. Manufacturing value added events have positive relationship with the foreign direct investment, exports, employment and inflation. It implies that increase in manufacturing value added growth has positively influenced the FDI and exports. Furthermore, increase in manufacturing value added events has also negative influence over the inflation.

## 5.2 Units Root Tests (ADF Test)

In order to avoid spurious regression, we begin with an investigation of the properties of the time series data that we are dealing with to determine if the variables are stationary or nonstationary in nature. The procedure used here is the Augmented Dickey Fuller (ADF). Data in Table shows that dependent variable of manufacturing value added (MVA) and other variables of FDI, Labour, Export, Inflation rate, and Market Size.

**Table 3: Augmented Dickey Fuller Test ADF for unit root**

Variables	AT LEVAL		FIRST DIFFERENCE			CONCLUSION
	INTERCEPT	TREND & INTERCEPT	INTERCEPT	TREND & INTERCEPT		
<b>MUA</b>	2.456	0.456	-1.417	-3.681		1(1)**
<b>FDI</b>	-2.692	-3.194	-6.129	-6.200		1(0)**
<b>EMPL</b>	-1.805	-1.822	-6.882	-6.786		1(1)**
<b>EXP</b>	-1.104	-0.766	-6.071	-6.144		1(1)**
<b>INF</b>	1.66	-0.650	-3.627	-4.282		1(1)**
<b>MS</b>	-4.701	-4.837	-7.932	-7.807		1(0)*

From the results in Table 3, the ADF test results show that some variables are stationary in level while others are stationary in first difference. Therefore, based on the ADF tests results, we choose to use the ARDL method to conduct the long run and short run analysis. The ARDL

method is desirable when variables have mixture of orders of integration, that is,  $I(0)$  and  $I(1)$ . It is worth mentioning that among the variables tested, no one is integrated of order two, which may negate the use of ARDL approach. Thus, our study is free of spurious result.

### 5.3. Bound Test for Co-integration

We employ F-statistic to test the joint significance of the parameters. We then compare the computed value of F-statistic with the critical values of the two bounds, that is, upper bound,  $I(1)$  and lower bound,  $I(0)$ . We accept the existence of co-integration if the estimated F-statistic is more than the critical value for upper bound and conversely, we reject the existence of co-integration if F-statistic is below the critical value for lower bound. The finding will remain inconclusive when F-statistic is between the critical values for lower and upper bound. The null hypothesis of F-statistic test is that co-integration does not exist among variables. Table 4 shows the results of bound test for co-integration

**Table 4: Bound Test**

Test Statistic	Value	k	Significance	Critical Value Bounds	
				$I_0$ Bound	$I_1$ Bound
F-Statistic	3.80178	5	10%	2.26	3.35
			5%	2.62	3.79
			2.50%	2.96	4.18
			1%	3.41	4.68

In ARDL method, we have to check the bound test before conducting the co-integration relationship among the dependent and independent variables. The bound test shows the values of F-statistic of 3.80 are more than critical value for upper bound at the 5% significant level. This suggests the existence of co-integration among the variables for the Pakistan. That is, MUA has long run relationship with the explanatory variables (FDI, EMP, EXPL, MS and INF). On the basis of the bound test results, we move forward to conduct the long run estimates of the model.

#### 5.4. Estimation of Long Run Relationship

Table 5 shows the results of co-integration between Growth of manufacturing value added and each of the explanatory variables, foreign direct investment, exports and employment have significant and positive relations with the manufacturing value added growth of Pakistan. The results show that a 10% increase in foreign direct investment causes manufacturing value added growth to increase by 4.2% while a 10% increase in the employment results in 2.1% increase in growth of manufacturing value added. Exports is also significant in influencing manufacturing growth. Results show that a 10% increase in exports leads to about 2.0% increase in manufacturing value added growth.

**Table 5: ARDL Estimated Results of Long Run Relationship**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI	0.42651	0.112271	3.79894	0.002
EXP	0.206992	0.045775	4.521949	0.0005
EMPL	0.213987	0.095124	2.249569	0.0411
MS	-0.18829	0.037501	-5.02099	0.0002
INF	-0.01032	0.006988	-1.47693	0.1618
C	26.91653	1.877233	14.3384	0.0000

Three variables have positive influence on the growth of manufacturing sector value added of Pakistan. The coefficient of foreign direct investment indicates that a 10% increase in FDI leads the MUA to increase by 4.2%. The findings also support the Neoclassical growth theory in both countries, Under the model of neo-classical growth, the resulted output is because of progress in the technology and labour force and both are known as exogenous factors. Our results are in line with those obtained in other countries as pointed out in the literature (see Chandran and krishnan 2009; Fakhreddin, Nezakati, & Vaighan, 2011; de Mello and Sinclair (1995)., the findings for the foreign direct investment in the current study are in accordance with the previous results of studies in the context of Pakistan and India (see for example, Ali, Li and Kamran , 2015; Rehman, 2015; Ullah, Shan and Khan, 2014; Gul & Naseem, 2015).

Exports also has high positive impact on the manufacturing growth of Pakistan. It indicates that a 10% increase in exports makes the MUA of Pakistan to increase by 2.0%. Moreover, the results obtained for the impact of exports on growth of manufacturing value added are in line with the findings of some studies (of Nowjee, Poloodoo, Lamport, Padachi, and Ramdhony , 2012) cited earlier in the literature review. Specifically, the present results support the results obtained by the previous studies (Chaudhry, Ayub & Akhtar, 2016; Sohail, Rehman and Azeem, 2014) done in the context of Pakistan.

Lastly, employment is statistically significant, suggesting that a 10% increase in employment makes MUA to increase by 2.1%. Moreover, the results obtained for the impact of employment on growth of manufacturing value added are in line with the findings of some studies (Atlam, Soltan, Mohamed, 2017; Hamid & Pichler, 2009) cited earlier in the literature review. Specifically, the present results support the results obtained by the previous studies (Rizvi and Nishat, 2009; Khan, 1994) done in the context of Pakistan. It should be noted that in the long run, the estimated coefficients of foreign direct investment employment and exports are all significant and plays a very important role in manufacturing value added growth of economy in long run.

### **5.5. Estimation of Short Run Dynamics**

Table 6 displays the results obtained for short run dynamics. The coefficient of ECM results for the Pakistan is negatively significant. This, in addition to bound test results, confirms that MUA has long run relationship with other explanatory variables. The results reveal that foreign direct investment has positive and significant influence in its third lag on the growth of manufacturing value added of Pakistan, The results show that a 10% rise in foreign direct investment makes third lag MUA to increase 0.017187 % while first and second lag by 0.003988 and 0.014659 in the short run. Exports (EXP) is negatively significant in affecting the manufacturing value added growth of Pakistan in the short run. This implies that a 10% increase in exports makes the Pakistan's growth manufacturing value added to increase in its first and forth lags by -0.00905%. and -0.01731 have a significant and negative relationship in MAU, while second and third lags by -0.00564 and 0.003822 have a no significance in MAU. We also found that employment (EMPL) has positive insignificant impact on manufacturing value added growth. It shows that a

10% increase in employment makes MUA to increase by 0.001, while a 10% increase in second and third lag of employment leads to -0.00755 and -0.00878 respectively, negative and significant increase in MUA.

Market size(MS) is negatively significant in affecting the manufacturing value added growth of Pakistan in the short run. From the results of this MS, a 10% increase in MS first to third lag) lead to significant positive changes in MUA, while a 10% increase in first lag to four lags inflation leads to 0.005358, 0.002648, -0.00842, 0.011223 respectively, significant increase in MAU in short run.

**Table 6: ARDL Estimation Results of Short Run Relationship**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MAU(-1))	-0.23629	0.151721	-1.55737	0.1417
D(FDI)	0.003988	0.006989	0.570609	0.5773
D(FDI(-1))	-0.01227	0.009573	-1.28213	0.2206
D(FDI(-2))	0.014659	0.008635	1.697599	0.1117
D(FDI(-3))	0.017187	0.00687	2.501834	0.0254
D(EXP)	-0.00905	0.003545	-2.55235	0.023
D(EXP(-1))	-0.00564	0.003882	-1.45246	0.1684
D(EXP(-2))	0.003822	0.004407	0.867119	0.4005
D(EXP(-3))	-0.01731	0.003701	-4.67755	0.0004
D(EMP)	0.001282	0.003132	0.409445	0.6884
D(EMPL(-1))	-0.00468	0.003816	-1.22731	0.2399
D(EMPL(-2))	-0.00755	0.002796	-2.69943	0.0173
D(EMPL(-3))	-0.00878	0.00252	-3.48297	0.0037
D(MS)	-0.00465	0.000842	-5.51686	0.0001
D(MS(-1))	0.004144	0.000811	5.112442	0.0002
D(MS(-2))	0.005831	0.000944	6.1783	0.0000
D(MS(-3))	0.001684	0.000777	2.168451	0.0478
D(INF)	0.005358	0.0011	4.870504	0.0002

D(INF)	0.002648	0.001198	2.211365	0.0441
D(INF)	-0.00842	0.0035	-2.40642	0.0305
D(INF)	0.011223	0.003323	3.377783	0.0045
ECT	-0.10073	0.025004	-4.02876	0.0012

The adjustment mechanism in Model (*MUA*) turn out to be very slow with 11 per cent speed of adjustment within the current period. It means therefore that, 11 of the disequilibrium in the model will be corrected within a period of one year. It is thus confirmed that the Error correction term ( $ECT_{t-1}$ ) or adjustment mechanism is very slow in *MUA*.

## 6. Diagnostic tests

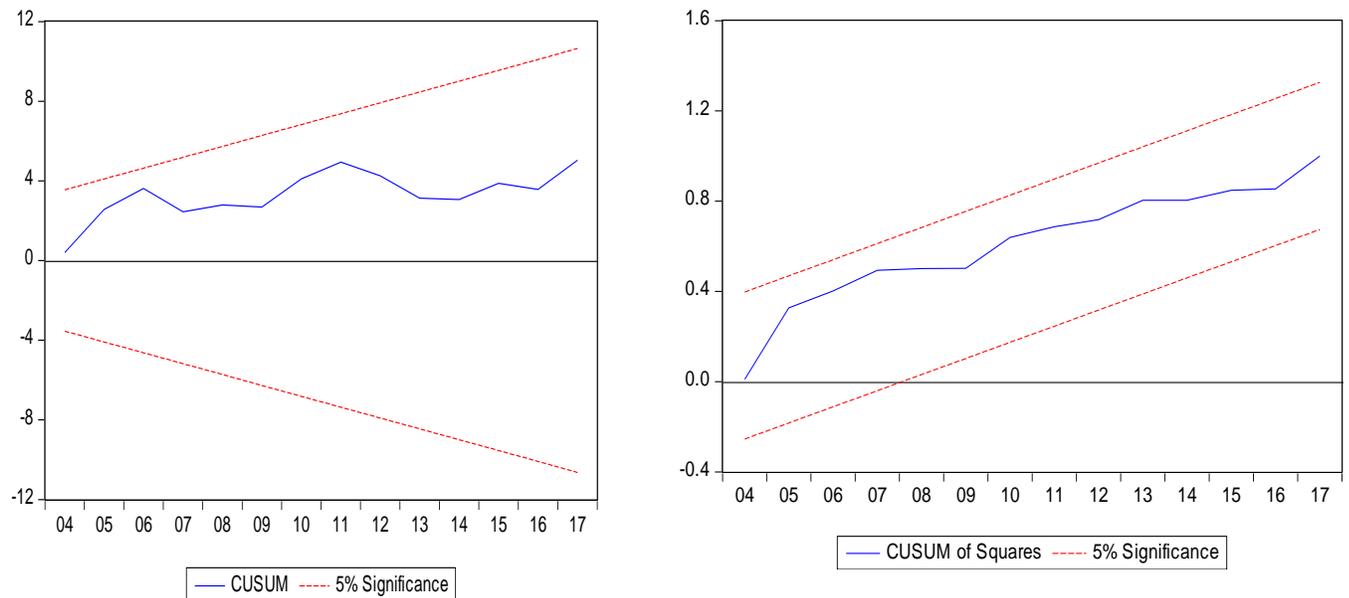
The study conducts some diagnostic tests to ensure model fit and stability. Table 7 indicates that the model passes all the diagnostic tests conducted. For example, the results of autocorrelation and heteroscedasticity tests are not significant at the 5% level. It means problems of serial correlation and heteroscedasticity do not exist. In addition, the results of Ramsey RESET stability tests are not significant at the 5% level, suggesting that the models are stable and fitted.

**Table 7: Diagnostic tests Results**

Model		Serial Correlation	Ramsey Reset Test	Hetroscedasticity
Manufacturing value added				
Model MAU				
	F - Statistics	1.6006	0.0313	1.0020
	p-value	0.2420	0.8623	0.5181

We further apply CUSUM and CUSUM of squares to test for the stability of our models. A Figure 3 plot CUSUM and CUSUM of squares for Pakistan respectively. The Figures indicate

that the models are stable since CUSUM and CUSUM of squares lines do not go beyond the 5% critical lines for the test



**Figure 3.**  
**Plots of CUSUM and CUSUM of Squares for Pakistan**

### 7. Conclusion and Policy Implications

The study attempts to analyze the effects of foreign direct investment on growth of manufacturing value added in Pakistan. Manufacturing sector of Pakistan has faced several potentially serious issues including too much concentration in industrial productions, inadequate foreign direct investment, and high inflation. Most of the studies focusing on the foreign direct investment, private investment and gross domestic product has analysed their relationship by ignoring the sectoral consequences of manufacturing sector. This study fills this gap by incorporating the role of foreign direct investment in the manufacturing on value added manufacturing growth of Pakistan.

The result in short and long run shows that foreign direct investment and exports significantly affect the manufacturing growth of Pakistan. In addition, long run estimates show that foreign direct investment, employment and exports positively influence the Pakistan's manufacturing value added growth, while market size also significantly affect with negative sign of coefficient

value and the employment insignificantly affect with positive sign. In the short run the *ECT* appeared with the appropriate sign and statistically significant while variables relations were confirmed in the short run for the long run analysis.

These results suggest that Pakistan should consider appropriate positive policies regarding foreign direct investment, employment and exports to achieve high and stable manufacturing sector growth in the future

In particular, Pakistan can boost up her manufacturing growth by embracing more employment and exports sector in order to integrate with the global market. For example, Pakistan should promote its foreign direct investment and exports, which are declining in recent years. In term of foreign direct investment, the Pakistan Bureau of statistics reported that foreign direct investment declined by 146.4 million US\$ between 2013 and by 922.7 million US\$ between 2015 and by 558.5 million US\$ between 2017(SBP, 2017).

According to the State Bank of Pakistan, exports declined by 12% between 2013 and 2015, and by 1.3% in 2017 (SBP, 2017) and employment in manufacturing are declined by 14.75% between 2013 and 14.44% by 2015, and by 14.12% in 2017 (SBP, 2017) .Hence, the Pakistan should encourage foreign direct investment and exports by improving security conditions, infrastructure and energy sector in the country.

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