

# Foreign Direct Investment and its Impact on Total Factor Productivity in Pakistan

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## **Abstract**

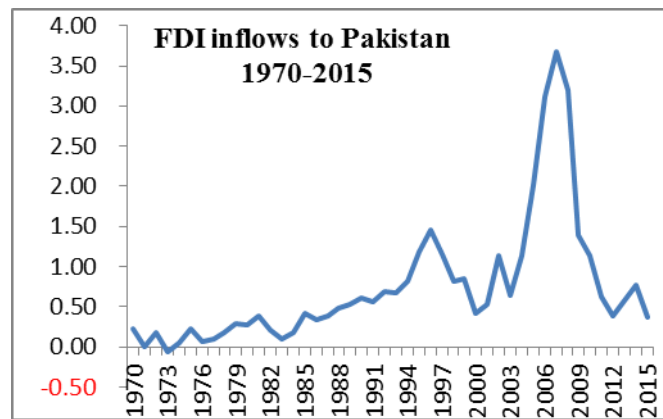
*This study examines the effect of foreign direct investment (FDI) on the total factor productivity (TFP) of Pakistan in presence of trade openness, human capital, government expenditure and inflation using annual data over the period of 1970 to 2015. Since the variables are co-integrated in the long run, the study uses Johansen co-integration technique and error correction method to examine the long run and short run relationship among the variables. The results suggest that there is a positive and significant impact of FDI on total factor productivity in Pakistan in the long run. FDI inflows bring in new ideas and technologies in the host country exposing the labor to better methods and skills. This causes an increase of the efficiency of the domestic factors of production and the results are consistent with this theory. The results also suggest that trade openness has a positive impact on productivity. Human capital represented by education expenditure is found to have a positive effect on TFP in Pakistan however; government expenditure has a negative effect. This suggests that government spending is not effectively allocated to create an efficient workforce that would result in an increase in factor productivity. Pakistan needs to improve the quality of human capital in order to fully utilize its economic resources. An increase in education expenditure, better healthcare facilities and improved school conditions is a prerequisite to increase the productive capabilities of people.*

**Keywords:** Total factor productivity, foreign direct investment, trade openness, human capital, Pakistan

## **1. INTRODUCTION**

With the rapid globalization, the importance of foreign direct investment (FDI) has been broadly recognized as a growth engine for a country. FDI inflows are particularly important for developing countries because they generate an increase in domestic investment compensating for the lack of national savings (Dhrifi, 2015). In a labor intensive country like Pakistan, the estimation of total factor productivity (TFP) indicates the overall efficiency of inputs and is an important measure to determine the effect of labor on the growth of GDP. A lot of literature focuses on the relationship between GDP and FDI but limited number of studies are conducted to analyse the productivity growth in developing economies especially Pakistan.

Pakistan is rich in natural resources but is struggling as a developing economy due to inefficient allocation of resources. Pakistan liberalized its economic policies in 1984 and since then it has experienced a growth in FDI inflows. For the past two decades, it has been receiving higher FDI but after 2007, the FDI inflows declined dramatically owing to the socio-political instability. Nevertheless, Pakistan steadily started receiving more investment from foreign countries; mainly from China followed by United States (US) and United Arab Emirates (UAE). As of 2015, FDI inflows make up 0.36% of total GDP.



**Figure 1** Pakistan's FDI inflows (% of GDP)

The figure shows the FDI in Pakistan as percentage of GDP from 1970 to 2015. Until now, Pakistan has received the highest level of FDI in 2007. As can be seen in the figure, there is a major structural break at 2008 which was caused by many sociopolitical factors. In 2008, after the death of Benazir Bhutto, a prominent political leader and ex prime minister of Pakistan, the increasing political instability and growing terrorism caused a massive downfall of foreign investment in Pakistan.

The evidence on the effect of FDI inflows to Pakistan's economic growth is mixed. Various studies show the effect to be positive (Shah et. al. 2011; Rahman, 2014; Rehman, 2015), while a few studies suggest the effect is negative or insignificant (Falki, 2009; Salman and Feng, 2010; Najia et.al; 2013). However, limited literature is available that examines the relationship between productivity growth and FDI. This study attempts to find the relationship between these two major factors relating to the overall growth of the country considering trade openness, government expenditure and consumer price index as crucial control variables.

The rest of the paper is organized as follows; section 2 explains the theoretical framework and empirical model followed by the data and methodology in section 3. Section 4 discusses the obtained results and the last section comprises of policy recommendations.

## 2. FRAMEWORK AND EMPIRICAL MODEL

Total factor productivity (TFP) of a country is defined as the output relative to the factors of production. Literature suggests that per capita income growth can only be sustained when it is generated by total factor productivity growth (Akinlo and Adejumo 2016).

Following the endogenous growth theory, this study analyses the relationship between total factor productivity and FDI in presence of trade openness and human capital. The model includes fiscal policy variables such as government expenditure and CPI. The impact of FDI is affected by other policy variables including trade policy regime, inflation and government expenditure. Human capital is particularly important for FDI to be able to positively affect the productivity of a country. Better quality of human capital implies better absorptive capabilities of the host country.

Hence, the empirical model is specified as

$$TFP_t = c_t + \alpha_1 FDI_t + \alpha_2 OPEN_t + \alpha_3 H_t + \alpha_4 G_t + \alpha_5 CPI_t + \varepsilon_t$$

Where  $TFP_t$  is the total factor productivity at time t.  $FDI_t$  is foreign direct investment at time t.  $OPEN_t$  is trade openness calculated as (Exports + Imports)/GDP.  $H_t$  is the human capital at time t, represented by education expenditure.  $G_t$  is the government expenditure and  $CPI_t$  is consumer price index at time t.

### 3. DATA AND METHODOLOGY

The study uses annual time series data of 46 years from 1970-2015 for Pakistan. All the data is obtained from Penn world table 9.0 and World development indicators (WDI). All the variables are expressed in natural logarithmic form.

The study employs Johansen co-integration technique and error correction method to estimate both long run and short run effects of FDI, trade openness, human capital and fiscal policy variables on TFP.

Table 1 shows the summary statistics of all the variables under study. The definition of variables is given in appendix 2.

To apply Johansen co-integration technique, all the variables need to be integrated of order 1. Unit root test is performed to test the order of integration of the variables using ADF, PP, DF-GLS and KPSS tests. The tests indicate that all the variables are integrated of order 1. The results of unit root tests are shown in table 2.

**Table 1 Summary Statistics**

Variable	Mean	Std. Dev.	Skewness	Kurtosis	JB normality test	No. of observations
lnTFP	2.99	0.047	-0.37	2.27	2.03	45
lnFDI	-0.76	1.148	-0.909	4.77	11.81	44
lnOPEN	2.96	0.43	-0.46	3.13	1.67	46
lnH	0.56	0.21	-0.65	3.15	3.23	45
lnG	2.4	0.17	0.244	3.23	0.55	45
lnCPI	3.09	1.09	-0.093	2.05	1.76	45

**Table 2 Unit Root Test**

Variables	ADF		PP		DF-GLS		KPSS	
	C	C & T	C	C & T	C	C & T	C	C & T
LnTFP	-2.2(3)	-2.8(1)	-1.17(2)	-0.8(1)	-1.4(1)	-1.5(1)	0.85(0)	0.77(0)
$\Delta$ lnTFP	-4.6(1)** *	-4.9(1)***	-5.5(2)***	-6.1(2)** *	-4.1(0)** *	-5.0(0)** *	0.31(2) ***	0.05(2) ***
lnFDI	-2.2(3)	-3.1(3)	-2.8(2)	-4.8(3)	-1.6(3)	-3.2(3)	0.71(5)	0.15(4)
$\Delta$ lnFDI	-3.3(3)**	-3.4(3)*	-12.4(0)** *	-11.5(2)* **	-2.2(0)**	-4.3(0)** *	0.08(3) ***	0.04(3) **
lnOPEN	-1.57(0)	-2.46(0)	-1.5(1)	-2.4(2)	-0.3(0)	-2.3(0)	1.01(3)	0.15(2)

$\Delta \ln \text{OP}$	-	-	-	-	-	-	0.09(1)	0.07(1)*
<b>EN</b>	8.34(0)* **	8.35(0)** *	8.3(1)***	8.31(1)* **	7.3(0)** *	8.1(0)** *	***	*
<b>lnH</b>	-2.5(2)	-2.35(2)	-2.7(3)	-2.27(4)	-0.95(2)	-1.8(2)	0.46(5)	0.19(5)
$\Delta \ln \text{H}$	-	-	-	5.58(3)* **	-5.4(0)	-5.6(0)	0.22(2) **	0.07(5) **
<b>lnG</b>	-1.73(0)	-1.89(0)	-1.8(2)	-1.96(2)	-1.7(0)	-1.85(0)	0.49(1)	0.28(1)
$\Delta \ln \text{G}$	-	-	-	5.87(0)* **	-	-	0.10(0) **	0.09(0)* **
<b>lnCPI</b>	-1.21(1)	-3.2(3)	-0.88(2)	-2.36(2)	1.1(3)	-2.1(3)	0.86(5)	0.16(1)
$\Delta \ln \text{CPI}$	-	-	-	-	-	-	0.16(1) ***	0.11(1)* *
	3.57(3)* *	3.35(3)**	3.46(2)**	3.48(1)*	3.55(3)* **	3.78(3)* **		

- \*, \*\* and \*\*\* implies level of significance at 1%, 5% and 10% level respectively.
- Numbers in parentheses represent lag length selected using AIC criterion.

#### 4. RESULTS AND CONCLUSION

In an attempt to examine the relationship between TFP and FDI in presence of other control variables, Johansen co-integration technique is applied. The tests results indicate the presence of at least one co-integrating vector for all equations at the 5% significance level. The results of Johansen co-integration test are shown in table 3. Since the variables are co-integrated in the long run, there exists a short run dynamic adjustment towards its long run equilibrium. To test the short run dynamics of the variables under study, vector error correction method is employed; the results of which are shown in table 4.

**Table 3**  
**Johansen's Co-integration Test**  
**Co-integration LR test based on maximum eigenvalue of the stochastic matrix**

Variables under study: lnTFP, lnFDI, lnOPEN, lnH, lnG and lnCPI					
	hypothesis	alternative	Eigen-value	$\lambda$ -value	$\lambda$ -trace
VAR	$r=0$	$r=1$	0.641600	41.04418***	113.5796**
	$r \leq 1$	$r=2$	0.520937	29.43690	72.53539
	$r \leq 2$	$r=3$	0.496228	27.42523	43.09849
	$r \leq 3$	$r=4$	0.208749	9.365577	15.67326
	$r \leq 4$	$r=5$	0.130425	5.590031	6.307685
	$r \leq 5$	$r=6$	0.017781	0.717653	0.717653

LR estimates

$$\ln TFP = 0.048 \ln FDI^{**} + 0.612 \ln OPEN^{***} + 0.001 \ln H - 0.063 \ln G - 0.006 \ln CPI^{**}$$

(3.2)                      (5.69)                      (0.06)                      (1.09)                      (3.7)

Eq.1.2 tests the short run relationship among the variables considering the structural break. A structural break can be seen in figure 1 at 2007 which is included in the model as a dummy variable  $\delta_1 D_{07}$  where  $D_{07} = 0$  before 2008 and  $D_{07} = 1$  otherwise. This would capture the effect of how the changes Pakistan's economy experienced as a result of global financial crisis, political instability and most importantly the sudden emergence of terrorist activities in the region.

With dummy included in the model, the results show a strong immediate effect of the socio-political shock at 2007 that dramatically affected Pakistan's economy.

**Table 4**  
**Vector error correction model for total factor productivity and FDI in Pakistan**

Variables	Eq.1.1	Eq.1.2	Eq.1.3	Eq.1.3
$ECM_{t-1}$	- 0.476166*** (-3.50332)	-0.166929 (-1.03546)	- 0.107771*** (-2.76706)	0.073205 (0.97556)
$\Delta \ln TFP_{t-1}$	0.057619 (0.33595)	0.110604 (0.49234)	-0.181702 (-1.07785)	-0.082474 (-0.41407)
$\Delta \ln TFP_{t-2}$	-0.030022 (-0.17310)	0.145847 (0.72188)	-0.140801 (-0.79081)	0.033384 (0.16265)
$\Delta \ln FDI_{t-1}$	-0.013435* (-1.98218)	-0.006708 (-0.78379)	0.004084 (0.56707)	-0.002842 (-0.38044)
$\Delta \ln FDI_{t-2}$	-0.003874 (-0.68130)	-0.006363 (-0.92612)	0.002757 (0.39666)	-0.012704* (-1.99256)
$\Delta \ln OPEN_{t-1}$	-0.011415 (-0.28043)	-0.025460 (-0.42592)	-0.019878 (-0.47532)	0.072791 (1.23431)
$\Delta \ln OPEN_{t-2}$	0.014285 (0.35866)	0.030393 (0.56637)	0.028029 (0.77378)	0.076950 (1.50806)
$\Delta \ln H_{t-1}$	0.049861* (1.66663)	0.031162 (0.84934)	0.011390 (0.38523)	0.021980 (0.62593)
$\Delta \ln H_{t-2}$	0.018813 (0.60531)	-0.014624 (-0.38413)	0.021018 (0.67291)	-0.011539 (-0.32840)
$\Delta \ln G_{t-1}$	-0.054490 (-1.44733)	-0.014831 (-0.33743)	-----	-----
$\Delta \ln G_{t-2}$	-0.035200 (-1.11689)	-0.052570 (-1.24803)	-----	-----
$\Delta \ln CPI_{t-1}$	-0.065240 (-0.63320)	-0.188584 (-1.35646)	0.076699 (0.64600)	-----

$\Delta \ln CPI_{t-2}$	- 0.295105*** (-2.93728)	-0.228324* (-1.79910)	-0.256120** (-2.57145)	-----
$D_{07}$	0.039471*** (4.32868)	----	0.021158*** (2.56258)	0.002636 (0.76265)
Constant	- 0.057784*** (-4.06090)	0.033506** (2.52693)	- 0.045151*** (-3.57872)	-0.019663* (-1.75788)
Adjusted $R^2$	0.416867	0.074450	0.369777	0.103085
F-stat	2.889312	1.228941	2.809115	1.425253
Akaike AIC	-5.409657	-4.952961	-5.353880	-5.029295
Schwarz SIC	-4.763241	-4.349640	-4.793653	-4.555257
LM test	33.75(0.58)	39.16(0.32)	34.01(0.11)	18.92(0.27)
HET	565.1(0.52)	559.27(0.34)	370.29(0.17)	167.52(0.88)
Normality test	7.58(0.81)	13.53(0.33)	3.27(0.97)	5.13(0.74)
Log likelihood	117.7835	108.1063	114.7237	106.5566

Figures in parenthesis represent the t-statistics.

\*\*\*Indicates significant at 1%.

\*\* Indicates significant at 5%.

\* Indicates significant at 10%.

The study suggests that there is a positive and significant effect of FDI on the total factor productivity in the long run. FDI inflow is an important stimulus for productivity gains through introduction of new processes, efficient managerial skills, technological know how and employee training in the host country (Jude and Leveuge, 2013) and the results of this study are consistent with this theory. The results also suggest that trade openness has a significant positive effect on TFP. Both trade and FDI are means to expose the local market to new ideas and innovation hence inclusion of both variables was critical to the study; omitting one variable might overstate the effect of other (Hejazi and Safarian, 1999). Human capital is represented by education expenditure and it has a positive effect on TFP though not significant. This might be because education expenditure as a percentage of GDP is very low in case of Pakistan which is not enough to influence the productivity. Moreover, education expenditure might not be able to fully capture the effect of human capital on TFP. These results validate the previous literature (Akinlo and Adejumo, 2016; Liu et, al. 2010; Sedhain, 2016; Ciruelos and Wang, 2005; Borensztein, 1998).The government expenditure however has a negative effect on total factor productivity suggesting that government spending is not allocated efficiently so as to be able to affect the productivity.

The results for VECM show that TFP converges at the rate of about 47% per annum towards its long run equilibrium. FDI affects TFP positively in the short run whereas trade openness and human capital have no significant effect. However, when the dummy variable is included to capture the short run effect of structural break at 2007; the VECM results show a significant impact of dummy variable indicating that the economy suffered an immediate setback.

## 5. POLICY RECOMMENDATIONS

Pakistan is a labor intensive developing economy. In order to fully utilize its economic resources it needs to improve the quality of human capital to be able to develop more efficient factors of production. Despite of a positive impact of human capital on TFP, the effect is insignificant. An increase in education expenditure, better health facilities and betterment of school conditions is a prerequisite to increase the productive capabilities of people. The negative effect of government expenditure suggests that the government needs to particularly focus on diverting its expenditure on education and health development. The amount of FDI received by Pakistan has been very minimal in recent years despite of significantly positive effect of FDI on productivity growth. Hence, it is imperative for policy makers in Pakistan to revise the policies in order to attract more FDI that would help increase employment and efficiency of labor and to expose its factors of production to state of the art technologies.

### Appendix:

- 1) This study follows the model by Xu (2000) and Ciruelos and Wang (2005) to calculate the total factor productivity TFP as  $Y_t / (K_t^\alpha L_t^{1-\alpha})$  where  $Y_t$  is the real GDP for Pakistan. The value of  $\alpha$  is calculated by normalizing  $Y_t / (K_t^\alpha L_t^{1-\alpha})$  with respect to labor. The value of  $\alpha$  for Pakistan comes out to be 0.55.  $K_t$  is the capital stock and  $L_t$  is the labor force at time t.

The capital stock  $K_t$  is measured following the models by Barro et al. (1995); Easterly and Levine (2001) and Ciruelos and Wang (2005). The capital stock  $K_t$  is calculated in a specific period t,  $I_t$  is the real investment in period t and the depreciation rate of capital is taken as  $\delta$ . The value of depreciation rate ( $\delta$ ) of capital stock for each year is obtained from Penn world table 9.0. Following Easterly and Levine (2001); Barro et al (1995), Let  $g$  be the growth rate of real output and  $I_0$  be the initial gross investment. The initial value of k can be computed following Solow growth model.

$$K_0 = I_0 / (g + \delta)$$

Following Easterly et al (2003), steady state growth rate  $g$  is computed as weighted average of the countries. The world growth rate is given a weight of 0.75 and the country's growth rate 0.25. These studies have computed the value of  $g$  to be 0.0423.

The above equation gives the initial value of investment  $K_0$  and the capital stock for following periods can be calculated from the capital accumulation equation

$$K_t = (1 - \delta)K_{t-1} + I_t$$

## 2) Variable definition

Variable	Definition
TFP	Total factor productivity defined as $Y_t/(K_t^{\alpha} L_t^{1-\alpha})$ calculated by using data for real GDP, capital stock and population.
FDI	Natural log of foreign direct investment, as a percentage of GDP (FDI/GDP)
OPEN	Trade openness calculated as the natural log of sum of total exports and imports as a percentage of GDP [(IMP+EX)/GDP]
H	Human capital, proxy used is log of education expenditure (USD) as a percentage of GDP (USD)
G	Government expenditure also calculated as the natural log of Government expenditure (in USD) as a percentage of GDP(USD)
CPI	The consumer price as a proxy for inflation.

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