

## **Foreign direct investment and total factor productivity in South Asia**

**Zaira ADNAN**

Western Sydney University, Australia  
zaira\_aman@hotmail.com

**Mamta CHOWDHURY**

Western Sydney University, Australia  
mamta.chowdhury@westernsydney.edu.au

**Girijasankar MALLIK**

Western Sydney University, Australia  
g.mallik@westernsydney.edu.au

**Abstract.** *This study attempts to find the effect of foreign direct investment on total factor productivity (TFP) for the four major South Asian economies namely Bangladesh, Pakistan, India and Sri Lanka considering other variables such as human capital, trade openness, government expenditure and CPI as significant determining factors for TFP. The results suggest that FDI is an important determinant of TFP in South Asian region and has a significant positive impact. FDI, trade openness, government expenditure and inflation all affect TFP in the long run for all the countries under study. However, the effect of human capital on TFP in case of Bangladesh's and Sri Lankan economy is negative. South Asia needs to promote intra-regional trade and economic policies to increase foreign investment. The countries under study are labor intensive economies and labor productivity in the region can be improved through specialized skill development programs.*

**Keywords:** total factor productivity, foreign direct investment, education expenditure, trade openness, South Asia.

**JEL Classification:** E62, J24, O40, F43.

## 1. Introduction

Rapid globalization has led to recognition of the importance of foreign direct investment (FDI) 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). The business employs its management techniques, economic concepts and technology in the host country hence exposing it to new technologies and methods which is beneficial for the economy.

Foreign direct investment refers to any investment made by investors of a foreign country in the host country including both green field investment (establishing new production facilities) and brownfield investment (acquiring already existing facilities). FDI is mostly carried out by Multinational Enterprises (MNEs) of developed countries in developing countries where the labor is cheaper and regulations are relaxed. Hence, for the investors, FDI reduces cost of production because investors have to pay low corporate taxes in the host country and it is an effective way to enter foreign markets. The biggest advantage of FDI to the host country is that it creates employment opportunities for the domestic labor force hence increasing welfare of the society.

Neo classical theories consider technical progress as an exogenous process however these theories have been challenged by endogenous growth theorists who challenge that technical progress is endogenous and can be quantified as TFP. TFP accounts for the changes in output relative to the changes in factor of production i.e. labor and capital and is an important measure of the efficiency of the traditional factors of production. As discussed, FDI inflows affect growth through various channels; one of those channels is that FDI introduces new technologies and economic methods that positively affect the local factors of production hence increasing the factor productivity. FDI inflows increase input efficiency through this channel resulting in economic growth. This study uses total factor productivity (TFP) as a measure of growth and aims to find out the growth effect of FDI through this channel for five major South Asian economies. Literature suggests that FDI inflows are more beneficial to developing economies as compared to developed ones (Zhu and Chiang, 2005; Woo, 2008). South Asia comprises 21% of world's population and the region is geographically vital and is one of the fastest growing regions in the world. However, South Asian countries are developing lower middle income economies. A positive impact of FDI on total factor productivity in South Asian region would justify the theoretical significance of FDI inflows in case of developing economies. The following section gives an overview of the economies under study.

## 2. South Asian Economies

**India:** Indian Economy is 7<sup>th</sup> largest in the world in terms of nominal GDP is rich in natural resources such as coal, natural gas and forestry. Despite of being an emerging major economy in the world, India faces a few challenges such as enormous population growth (almost 20% per decade), environmental pollution, corruption, shaky infrastructure and rigid labor laws. In terms of economic freedom, India ranks 128<sup>th</sup> freest economy in the world.

**Pakistan:** Pakistan is 43<sup>rd</sup> largest economy in the world and is rich in diverse natural resources such as natural gas in Sui, coal mines and large gold/copper ore deposits. The main issue suffered by Pakistan in present era is that the resources are not fully utilized to flourish the country's economic growth. Despite of plenty available energy sources, Pakistan is unable to generate enough electricity to fulfil the country's energy requirement. The industries in Pakistan have suffered immensely over the past few years because of energy shortage issues. Moreover, corruption and terrorism have caused severe hindrance in Pakistan's economic path.

**Bangladesh:** Bangladesh is 56<sup>th</sup> largest economy in the world. As of 2016, Bangladesh is 2<sup>nd</sup> fastest growing economy in the world. Bangladesh is a major exporter of ready-made garments worldwide hence increasing its GDP growth rate. It also excels in ship building, jute and sugar industry. The manufacturing sector of Bangladesh is second largest in sub-continent. Bangladesh faces some economic challenges in its growth in form of inflation, low per capita income and unstable infrastructure.

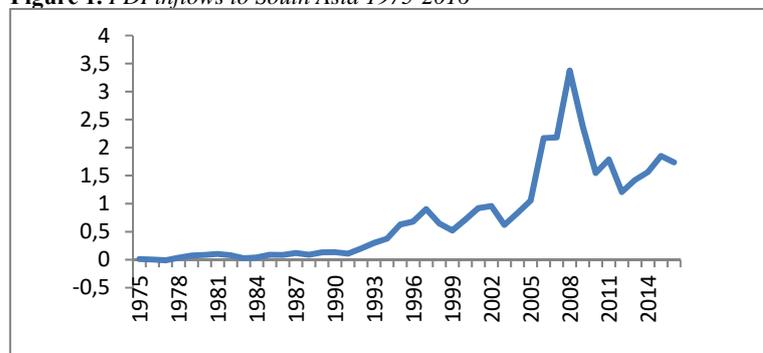
**Sri Lanka:** Sri Lanka stands 70<sup>th</sup> in the world in terms of PPP. Sri Lanka is one of the two South Asian countries that are rated high in terms of human development as evaluated by Human Development Index as of 2016. Sri Lanka's main industries are tea, rubber, sugar, textiles and tourism. Sri Lanka is ahead of other South Asian countries in terms of GDP per capita. The economic challenges faced by Sri Lanka are corruption, fiscal deficit and less economic freedom. It's the only South Asian country to have fulfilled the economic development goals. Despite of being a smaller economy as compared to other South Asian countries included in the study, Sri Lankan economy has the highest per capita income among the countries under study.

**Table 1.** Socio-economic indicators for South Asia (2016)

Indicators	India	Pakistan	Bangladesh	Sri Lanka
Population	1,311,050,527	188,924,874	160,995,642	20,966,000
RGDP (in millions USD)	2,466,177	227,866.8	167,771	79,907
Life expectancy at birth (years)	68	66	72	75
Gross enrolment ratio (Primary)	110.59	93.6	111.87	101.27
Gross enrolment ratio (Secondary)	68.9	41.6	58.3	99.7
Gross enrolment ratio (Tertiary)	23.8	10.4	13.4	20.7

## 2.1. FDI in South Asia

**Figure 1.** FDI inflows to South Asia 1975-2016



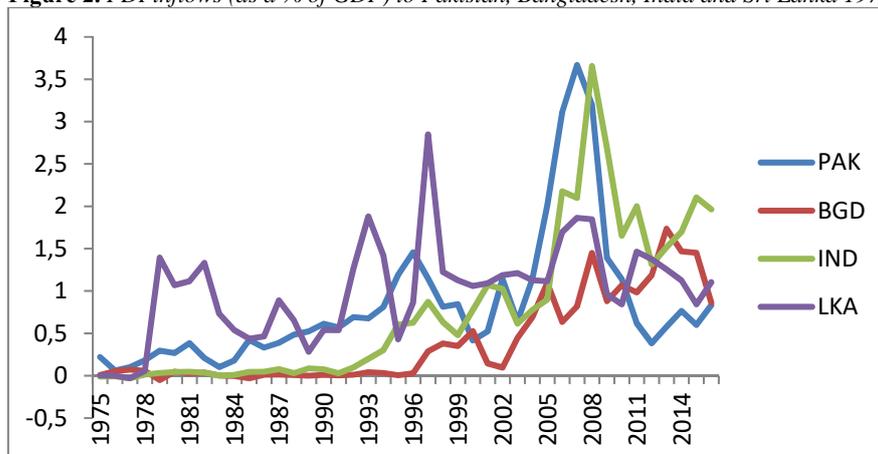
Source: World development indicators.

All the four South Asian economies have been implementing economic reform policies aiming to integrate their economies with rest of the world (Sahoo, 2006). South Asian region has seen an increase in FDI in 1990s with economic liberalization and improvement in FDI policy framework. An analysis of FDI inflows to different sectors shows that FDI is largely domestic market oriented in India and Pakistan, whereas it is concentrated in a few export-oriented industries in Sri Lanka and Bangladesh.

According to UNCTAD 2015 report, FDI inflows to South Asia were only 3.4 per cent of the global FDI inflows in 2014. This percentage is very diminutive as compared to the figures of Europe (23.5%) and Latin America and the Caribbean (13%). There are number of factors that hinder in the FDI inflow to the region namely strict regulations, lack of institutional framework and the quality of FDI received (Nawaz and Iqbal, 2015).

However, South Asian countries also have various advantages to offer to foreign investors including steady economic growth, comparatively lower level of inflation and availability of large number of skilled personnel because all these economies are labor intensive economies. The countries in South Asian region experienced slow economic growth until 1970s. In 1980s, all these countries liberalized their economies by introducing various economic reforms to keep up with the increasing globalization.

**Figure 2.** FDI inflows (as a % of GDP) to Pakistan, Bangladesh, India and Sri Lanka 1975-2016



Source: World development indicators.

India mainly liberalized its economy after July 1991 after foreign exchange liquidity crisis. New economic reform policies included reducing fiscal deficit, changes in labor laws and increasing FDI limits. As the Figure 2 shows, India received very minimal FDI until early 1990s and the FDI inflows have been increasing ever since. The structural break at 2008 is due to the global financial crisis (GFC) that affected almost every economy in the world. India introduced multi brand retail in 2012 expecting a high increase in FDI inflows however; it did not generate expected results. India's FDI inflows were about \$28 billion in 2013 but foreign investment is still hindered by macroeconomic instability.

Pakistan liberalized its economy in 1984 with the industrial policy introduced giving an equal weight to public and private sector but it mainly opened its economy in late 1980s when a new industrial policy package was introduced in 1989 recognizing the role and importance of the private sector, and a number of regulatory measures were taken to improve the business environment in general and attract FDI in particular. By the end of 1990s, a policy regime framework was designed to attract more foreign investment. Pakistan attracted increasing volume of FDI in early 2000's when there was a boom in the telecommunication industry. As can be seen in the figure, there is a major structural break at 2008 which was caused by many sociopolitical factors and not just due to GFC. In 2008, the increasing political instability and alarming rate of terrorism caused a massive downfall of foreign investment in Pakistan. In 2013, Pakistan's FDI inflows rose to \$1.3 billion due to major breakthrough in telecommunication industry (UNCTAD, 2014).

In Bangladesh, major economic reforms were introduced in 1980 with World Bank structural and sectoral adjustment loans. Many reform initiatives were taken in areas such as agricultural, trade and industrial policies. These policies were implemented in 1990s after which Bangladesh started receiving FDI at a steady rate until now as can be seen the Figure 2. The garment industry has been a blooming industry in Bangladesh for past few decades and FDI inflows has been benefiting the manufacturing industry however the labor standards and skill development have been a major challenge for the economy.

Sri Lanka was the first country in South Asian region to open its economy to outside world in 1977. It is the most outward oriented economy in the region. Sri Lanka liberalised its trade policies very early in the region by offering investment incentives, export promotion and rationalisation of public expenditure (Sahoo, 2006).

## 1. Literature review

Many recent studies have discussed the role of foreign direct investment (FDI) on economic growth and factor productivity and in most cases the positive impact of FDI has been identified (Ciruelos and Wang, 2005; Borensztein, 1998; Liu et al., 2010; Sedhain, 2016; Seyoum et al., 2014). However, there has been very little study conducted for South Asian region to analyse total factor productivity and its determinants specifically the effect of FDI on TFP. While many studies concluded that FDI has a positive impact on a country's growth and productivity (Ciruelos and Wang, 2005; Hejazi and Safarian, 1999; Woo, 2009; Loto and Ojapinwa, 2014), many other studies have not found any direct impact of FDI on growth (Falki, 2009) and a few even found the effect to be negative (Filiz, 2014). There are various reasons that the positive effect of FDI on host country is ambiguous. Generally, the data for FDI is less reliable than trade data which understates the effect of FDI (Xu and Wang, 2000). Another possible reason is the fact that collecting FDI data at firm level for each country is difficult and the obtained information might not cover the complete effect of FDI. Moreover, FDI can either crowd in or crowd out the local investment. The FDI inflows can crowd in investment by raising competition among local competitors or crowd out domestic investment by making local

competitors exit the market that can negatively affect the growth. Wang (2009) attempted to find the reason behind ambiguous results of FDI's effect on growth and found that the growth effect of manufacturing FDI is more than that of total FDI. FDI in different sectors of host economy has different effects on growth.

Literature indicates similar outcomes regarding FDI significance in various regions of the world. Iamsiraroj (2016) suggested a bidirectional relationship between FDI and economic growth for 124 countries of the world. Seyoum et al. (2014) found the same result for African region. Sakyi et al. (2015) investigated the impact of foreign direct investment and trade openness on economic growth in Ghana and found that FDI and its interaction with export led trade are crucial factors in economic growth. Yusoff and Nuh (2015) also suggested positive effect of FDI and trade for Thailand's economy. Behname (2012) found a positive relationship between FDI and economic growth for South Asia. Sedhain (2016) also found a positive effect of FDI on economic growth for SAARC countries. The study emphasized on the role of schooling and health expenditure on economic growth.

Recent literature has focused on understanding the relative importance of total factor productivity as compared to factor accumulation in a country's output growth. Easterly and Levine (2001) argued that TFP accounts for almost half of output growth in OECD countries. Their finding was that instead of factor accumulation, it is mostly TFP that accounts for growth in output per worker. The scope of this study is therefore threefold; firstly it analyses the TFP in South Asian economies on which there is not much literature available, secondly it discusses the role of FDI in economic growth of the region and thirdly it aims to identify the effect of human capital on TFP in presence of FDI.

Nachegea and Fontaine (2006) analysed the sources of growth and determinants of TFP growth in Niger the determinants of TFP to be fiscal and monetary policies, trade openness and terms of trade. Woo (2008), Baltabaev (2015) analysed the impact of FDI on TFP and found the impact to be positive. Malikain and Chitmabara (2017) analysed the relationship between FDI and TFP for African region and found a weak but positive relationship. Turkcan and Yetniker (2008) also found a positive relationship between FDI and TFP for OECD countries.

A study by Akinlo and Adejumo (2016) suggested FDI is the main positive factor in TFP growth in long run; whereas the impact is negative in short run. However, human capital has a positive effect in short run but negative impact in long run on growth of TFP; inflation and unemployment however, have a negative effect on TFPG.

Most of the literature suggests the positive effect of FDI on TFP nevertheless; there is very little literature available for South Asian countries that considers TFP as a crucial growth determining factor. This study will consider TFP as the channel through which FDI affects economic growth for all the countries under study and compare the results for policy recommendations.

## 2. Empirical model

Following Cobb-Douglas production function, this study carries out a time series analysis of FDI and its effect on TFP for each of the four countries under study. Other variable to be affecting TFP is considered to be human capital. Literature has used various measures to measure human capital. Most of the literature suggests that education (Lucas, 1988) and health facilities are an investment in human capital resulting in its betterment and increase in efficiency (Schultz, 2007). For South Asian region, data is not available for enough years to be used in the analysis. Hence, the study uses education expenditure as a proxy of human capital. The model includes trade openness and fiscal policy variables such as government expenditure and inflation as independent control variables. The proxy used for inflation is consumer price index. The model can be specified as

$$\ln TFP_t = c_t + \alpha^{fdi} \ln FDI_t + \alpha^h \ln H_t + \alpha^{open} \ln OPEN_t + \alpha^g \ln G_t + \alpha^c \ln CPI_t + \varepsilon_t \quad (i)$$

Where  $TFP$  is the total factor productivity,  $FDI$  is FDI inflows as percentage of GDP,  $H$  is human capital,  $OPEN$  is trade openness and  $G$  is Government expenditure as percentage of GDP, where  $t$  is the time subscript.

## 3. Data and methodology

In order to test the relationship among the TFP and the explanatory variables, this study employs Johansen co-integration and Vector error correction model (VECM). With the help of this procedure it is possible to examine the short-run and long-run relationship among the variables. The variables included in the model possibly have time trend hence they are most likely to be non-stationary. The study employs co-integration technique because it has stronger ability to incorporate the potential long run dynamic relation and better forecasting power. This analysis gives us normalized long run relationship in level form (Malik and Haldar, 2010).

Hence, first all the variables under study are tested for the order of integration. The ADF test (Dickey and Fuller, 1981) test is used with and without a time trend. The regression equation is specified as

$$y_t = \alpha + \beta y_{t-1} + \varepsilon_t \quad (ii)$$

Where

$$H_0: \beta = 1$$

If there is a unit root the

$$H_0: \beta < 1$$

However, the ADF tests are unable to discriminate well between non-stationary and stationary series with a high degree of auto-regression. The ADF tests may also incorrectly indicate that the series contain a unit root when there is a structural break in the series. Hence, the Phillips-Perron (PP) test (Phillips and Perron, 1988) is applied. The

PP test has an advantage over the ADF test as it gives robust estimates when the series has serial correlation and time-dependent heteroscedasticity. The PP test regression is given as

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + \varepsilon_t \quad (\text{iii})$$

If all the variables under study are proved to be integrated of I (1), the study is carried on to proceed to the co-integration procedure. The Johansen method provides two likelihood ratio tests, namely the trace and Maximum Eigen Value statistic tests, which are used to determine the number of co-integrating equations given by the co-integration rank  $r$ . A co-integration equation is the long run equation of co-integrated series. The Trace statistic tests the null hypothesis of  $r$  co-integrating relations against the alternative of  $k$  co-integrating relations, where  $k$  is the number of endogenous variables for  $r = 0, 1, \dots, k - 1$ . The maximum eigen value statistic tests the null hypothesis of  $r$  co-integrating vectors against the alternative of  $r + 1$  cointegrating vectors (Golinelli, 2003). However, when there is more than one co-integration equation the Johansen approach to co-integration analysis is preferred to the Engle-Granger approach (Thiele, 2003).

The study uses annual time series data from 1975-2016 for Bangladesh, Pakistan, India and Sri Lanka and analyses the determinants of TFP for all the countries. All the data is obtained from World development indicators and Penn world Table 9.

#### 4. Econometric results

Table 2. Summary statistics of time series variables

		lnTFP	lnFDI	lnOPEN	lnEDU	lnG	lnCPI
Bangladesh	Mean	3.64	-2.44	3.22	0.16	1.56	3.95
	StDev	0.06	2.21	0.36	0.37	0.20	0.62
India	Mean	2.59	-1.27	3.06	1.11	2.37	3.36
	StDev	0.06	1.89	0.59	0.14	0.09	1.04
Pakistan	Mean	3.31	-0.74	3.48	0.57	2.39	3.16
	StDev	0.05	1.13	0.13	0.21	0.16	1.14
SriLanka	Mean	3.27	-0.78	4.18	0.77	2.33	2.88
	StDev	0.04	2.11	0.19	0.23	0.20	1.37

Table 3. Unit Root Test results

Table 3.1. Unit root tests for Bangladesh

Variables	ADF		PP	
	C	C & T	C	C & T
lnTFP	0.12(5)	0.22(5)	-0.16(3)	-1.11(2)
$\Delta$ lnTFP	-2.38(4)*	-7.01(2)***	-8.63(4)***	-11.36(3)***
lnFDI	-1.45(0)	-3.01(0)	-1.32(1)	-3.01(0)
$\Delta$ lnFDI	-2.68(4)*	-3.98(5)**	-8.08(3)***	-7.99(3)***
lnOPEN	-1.67(0)	-2.63(1)	-1.53(3)	-3.1(2)
$\Delta$ lnOPEN	-8.61(0)***	-8.49(0)***	-7.35(2)***	-7.22(2)***
lnEDU	-0.85(1)	-3.09(0)	-0.82(3)	-3.14(1)
$\Delta$ lnEDU	-8.88(0)***	-8.70(0)***	-8.97(1)***	8.78(1)***
lnG	-2.22(1)	-3.04(1)	-2.59(6)	-3.06(11)
$\Delta$ lnG	-6.58(1)***	-6.51(1)***	-8.36(3)***	-8.25(3)***
lnCPI	-2.43(9)	-1.91(9)	3.3(0)	-2.70(1)
$\Delta$ lnCPI	-6.31(0)***	-7.42(0)***	-6.04(3)***	-6.25(0)***

Table 3.2. Unit root tests for India

Variables	ADF		PP	
	C	C & T	C	C & T
LnTFP	-2.38(1)	-1.03(0)	-1.74(2)	-1.03(0)
$\Delta$ LnTFP	-5.79(1)***	-6.22(0)***	-5.81(2)***	-6.22(1)***
lnFDI	-2.27(3)	-2.81(3)	-2.94(2)	-4.5(1)
$\Delta$ lnFDI	-3.29(3)**	-3.37(3)*	-11.7(1)***	-11.86(2)***
lnOPEN	-2.18(3)	-2.01(0)	-3.2(2)	-2.67(2)
$\Delta$ lnOPEN	-5.04(3)***	-5.52(3)***	-7.4(2)***	-8.1(2)***
lnEDU	-2.8(2)	-2.35(0)	-2.7(1)	-2.4(1)
$\Delta$ lnEDU	-5.4(0)***	-5.57(0)***	-5.4(1)***	5.58(1)***
lnG	-1.77(0)	-1.89(0)	-1.89(3)	-2.00(3)
$\Delta$ lnG	-6.08(0)***	-6.00(0)***	-6.05(3)***	-5.97(3)***
lnCPI	-1.58(1)	-2.16(0)	-1.28(2)	-2.44(2)
$\Delta$ lnCPI	-3.22(0)**	-3.85(1)**	-3.4(2)**	-3.52(1)**

Table 3.3. Unit root tests for Pakistan

Variables	ADF		PP	
	C	C & T	C	C & T
LnTFP	-2.38(1)	-1.03(0)	-1.74(2)	-1.03(0)
$\Delta$ LnTFP	-5.79(1)***	-6.22(0)***	-5.81(2)***	-6.22(1)***
lnFDI	-2.27(3)	-2.81(3)	-2.94(2)	-4.5(1)
$\Delta$ lnFDI	-3.29(3)**	-3.37(3)*	-11.7(1)***	-11.86(2)***
lnOPEN	-2.18(3)	-2.01(0)	-3.2(2)	-2.67(2)
$\Delta$ lnOPEN	-5.04(3)***	-5.52(3)***	-7.4(2)***	-8.1(2)***
lnEDU	-2.8(2)	-2.35(0)	-2.7(1)	-2.4(1)
$\Delta$ lnEDU	-5.4(0)***	-5.57(0)***	-5.4(1)***	5.58(1)***
lnG	-1.77(0)	-1.89(0)	-1.89(3)	-2.00(3)
$\Delta$ lnG	-6.08(0)***	-6.00(0)***	-6.05(3)***	-5.97(3)***
lnCPI	-1.58(1)	-2.16(0)	-1.28(2)	-2.44(2)
$\Delta$ lnCPI	-3.22(0)**	-3.85(1)**	-3.4(2)**	-3.52(1)**

Table 3.4. Unit root tests for Sri Lanka

Variables	ADF		PP	
	C	C & T	C	C & T
LnTFP	-2.38(1)	-1.03(0)	-1.74(2)	-1.03(0)
$\Delta$ LnTFP	-5.79(1)***	-6.22(0)***	-5.81(2)***	-6.22(1)***
lnFDI	-2.27(3)	-2.81(3)	-2.94(2)	-4.5(1)
$\Delta$ lnFDI	-3.29(3)**	-3.37(3)*	-11.7(1)***	-11.86(2)***
lnOPEN	-2.18(3)	-2.01(0)	-3.2(2)	-2.67(2)
$\Delta$ lnOPEN	-5.04(3)***	-5.52(3)***	-7.4(2)***	-8.1(2)***
lnEDU	-2.8(2)	-2.35(0)	-2.7(1)	-2.4(1)
$\Delta$ lnEDU	-5.4(0)***	-5.57(0)***	-5.4(1)***	5.58(1)***
lnG	-1.77(0)	-1.89(0)	-1.89(3)	-2.00(3)
$\Delta$ lnG	-6.08(0)***	-6.00(0)***	-6.05(3)***	-5.97(3)***
lnCPI	-1.58(1)	-2.16(0)	-1.28(2)	-2.44(2)
$\Delta$ lnCPI	-3.22(0)**	-3.85(1)**	-3.4(2)**	-3.52(1)**

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

Table 4. Johansen co-integration test for Bangladesh, India, Pakistan and Sri Lanka

Bangladesh					
	hypothesis	alternative	Eigen-value	$\lambda$ -value	$\lambda$ -trace
VAR	$r=0$	$r=1$	0.8155	57.4647**	172.2264***
	$r \leq 1$	$r=2$	0.7559	47.9525	114.7616
	$r \leq 2$	$r=3$	0.6578	36.4616	66.8090
	$r \leq 3$	$r=4$	0.4377	19.5756	30.3474
	$r \leq 4$	$r=5$	0.2688	10.6444	10.7717
	$r \leq 5$	$r=6$	0.0037	0.1272	0.1272
LR estimates					
$\ln TFP = 0.104^{***} \ln FDI - 0.892^{***} \ln EDU + 0.292 \ln OPEN - 3.49 \ln G + 1.372^{***} \ln CPI$					
$(4.08) \quad (-4.54) \quad (1.35) \quad (1.09) \quad (6.29)$					
India					
	hypothesis	alternative	Eigen-value	$\lambda$ -value	$\lambda$ -trace
VAR	$r=0$	$r=1$	0.6723	40.1682***	110.5892**
	$r \leq 1$	$r=2$	0.5510	28.8325	70.4209*
	$r \leq 2$	$r=3$	0.4117	19.0988	41.5884
	$r \leq 3$	$r=4$	0.2994	12.8142	22.4895
	$r \leq 4$	$r=5$	0.1733	6.8513	9.6753
	$r \leq 5$	$r=6$	0.0754	2.8240	2.8240
LR estimates					
$\ln TFP = 0.031^{***} \ln FDI + 0.011 \ln EDU + 0.150^{***} \ln OPEN - 0.038 \ln G - 0.1^{***} \ln CPI$					
$(6.28) \quad (0.25) \quad (4.04) \quad (0.38) \quad (4.29)$					
Pakistan					
	hypothesis	alternative	Eigen-value	$\lambda$ -value	$\lambda$ -trace
VAR	$r=0$	$r=1$	0.6056	37.2245	107.8988
	$r \leq 1$	$r=2$	0.5735	34.0869	70.6741
	$r \leq 2$	$r=3$	0.3496	17.2092	36.5872
	$r \leq 3$	$r=4$	0.2796	13.1203	19.3779
	$r \leq 4$	$r=5$	0.1441	6.2240	6.2575
	$r \leq 5$	$r=6$	0.0008	0.0335	0.0335
LR estimates					
$\ln TFP = 0.265^{***} \ln FDI + 0.443^{*} \ln EDU - 0.540 \ln OPEN - 0.159 \ln G - 0.293^{***} \ln CPI$					
$(5.78) \quad (2.29) \quad (-1.17) \quad (-0.78) \quad (-4.31)$					
Sri Lanka					
	hypothesis	alternative	Eigen-value	$\lambda$ -value	$\lambda$ -trace
VAR	$r=0$	$r=1$	0.6239	38.1455	97.6128
	$r \leq 1$	$r=2$	0.5694	32.8621	59.4673
	$r \leq 2$	$r=3$	0.2630	11.9029	26.6051
	$r \leq 3$	$r=4$	0.1859	8.0254	14.7022
	$r \leq 4$	$r=5$	0.1168	4.8475	6.6768
	$r \leq 5$	$r=6$	0.0458	1.8292	1.8292
LR estimates					
$\ln TFP = 0.050^{*} \ln FDI - 0.623^{***} \ln EDU + 0.685^{***} \ln OPEN + 0.638^{***} \ln G - 0.142^{***} \ln CPI$					
$(2.04) \quad (-4.54) \quad (4.75) \quad (6.55) \quad (-5.74)$					
Figures in parenthesis represent the t-statistics. *** Indicates significant at 10%. ** Indicates significant at 5%. * Indicates significant at 1%.					

**Table 5.** Vector error correction model for TFP, FDI and Trade openness in Bangladesh, Pakistan, India and Sri Lanka

Variables	BGD	IND	PAK	LKA
$ECM_{t-1}$	-0.033* [-2.35]	-0.243* [-2.48]	-0.348* [-1.62]	-0.066* [-1.70]
$\Delta \ln TFP_{t-1}$	-0.123 [-0.59]	0.253 [1.06]	0.216 [0.85]	-0.015 [-0.07]
$\Delta \ln TFP_{t-2}$		-0.189 [-1.09]	0.208 [0.93]	0.244 [1.23]
$\Delta \ln FDI_{t-1}$	-0.001 [-0.39]	-0.007 [-1.13]	-0.004 [-0.47]	-0.001 [-0.15]
$\Delta \ln FDI_{t-2}$		-0.008 [-1.50]	-0.004 [-0.46]	-0.004 [-0.87]
$\Delta \ln EDU_{t-1}$	-0.007 [-0.23]	-0.021 [-0.45]	0.043 [0.97]	0.028 [1.02]
$\Delta \ln EDU_{t-2}$		-0.058 [-1.16]	-0.021 [-0.47]	0.024 [0.85]
$\Delta \ln OPEN_{t-1}$	0.015 [0.55]	0.095 [1.84]	-0.052 [-0.77]	0.061 [0.98]
$\Delta \ln OPEN_{t-2}$		-0.020 [-0.36]	0.019 [0.32]	-0.045 [-1.08]
$\Delta \ln G_{t-1}$	0.060 [1.56]	0.255 [2.16]	-0.022 [-0.47]	0.032 [1.44]
$\Delta \ln G_{t-2}$		0.148 [0.98]	-0.058 [-1.37]	0.034 [1.26]
$\Delta \ln CPI_{t-1}$	0.089 [1.58]	-0.168 [-0.89]	-0.184 [-1.31]	0.106 [1.33]
$\Delta \ln CPI_{t-2}$		-0.060 [-0.39]	-0.222* [-1.90]	-0.261 [-1.23]
Constant	-0.001 [-0.08]	0.020 [1.20]	0.036** [2.92]	-0.021* [-2.01]
Adjusted $R^2$	0.201	0.052	0.050	-0.056
LM test	56.59 (0.02)	31.26 (0.69)	30.49 (0.73)	31.36 (0.69)
HET	306.15 (0.31)	561.67 (0.31)	571.33 (0.22)	563.07 (0.29)
Normality test	12.28 (0.42)	25.95** (0.01)	16.94 (0.15)	31.03** (0.01)
Log likelihood	268.49	100.1318	96.68497	111.1623

• Figures in [ ] represent t-statistic  
• Figures in ( ) represent p-values

## 5. Results and conclusion

There is limited empirical literature that explores the determinants of TFP especially for developing Asian economies. This study attempts to establish the determinants of total factor productivity for the developing South Asian economies and compare the results. The results suggest a positive significant effect of FDI inflows on TFP for all the economies under study. 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 education expenditure has a significant positive effect on TFP for Pakistan and India however the education expenditure has negative effect in case of Bangladesh and Sri Lanka. The unexpected results might be due the fact that education expenditure is not the best measure of human capital and omission

of other measures of human capital such as health expenditure and enrolment due to data unavailability might have led to misleading results. Although education is always considered to be an important factor in economic growth but education expenditure has to be allocated effectively to target the specific sectors in education that has the capacity to cause an improvement in factor productivity. 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). However, in case of Pakistan, trade openness has negative although insignificant effect on TFP. Trade openness in particular imports can cause the local producers to exit the market due to a more demanded imported alternative hence negatively affecting the domestic factor productivity. Government expenditure has insignificant negative effect in case of all economies except Sri Lanka where government expenditure has a positive and significant impact on TFP. Inflation has a negative effect on TFP as expected however; for Bangladesh, the inflation has a positive significant effect on TFP.

The VECM results show that TFP converges to its long run equilibrium level for all the countries under study. FDI has a positive effect in short run however, the effect is insignificant. The effect of all the variables under study is insignificant in short run. Hence, FDI, trade openness, human capital and fiscal policies are able to influence the TFP in long run for developing South Asian economies.

## 6. Policy recommendations

As suggested by the results, FDI inflows are significant determinant of TFP in the host country. South Asian region needs to develop effective foreign investment policies to attract more FDI. South Asia has restricted regulations for business start-ups making it less attractive for foreign investment. According to World Bank's indicator of "ease of doing business", South Asia ranks 128 of 189. Moreover, lack of institutional framework, lack of transparency, unruly law and order situation also hinder in the FDI inflow process. Pakistan has recently started to develop an economic corridor with China where China is investing a heavy amount in Pakistan's production sector. However, Pakistan needs to broaden its horizon and should not stick to foreign investment from only one country. The amount of FDI received by South Asia has been very minimal in recent years despite of significantly positive effect of FDI on productivity. Hence, it is imperative for policy makers in South Asian region to revise their policies in order to attract more FDI that would help increase employment and efficiency of labor and to expose the factors of production to state of the art technologies.

This study also established that trade is an important conduit to transfer skills to a country and a positive influence to TFP. Nonetheless, there is little to no trade among the South Asian countries due to political differences and intra-regional trade accounts up to only 5% of the total trade of South Asia.

In order to fully utilize its economic resource South Asian countries, need 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 almost insignificant. An increase in education expenditure, better health facilities and betterment of school conditions is a prerequisite to increase the productive capabilities of people. Specialized skill programs subsidized by government are needed to ensure increase in productive capabilities of domestic labor. The negative effect of government expenditure suggests that the government needs to particularly focus on diverting its expenditure on education and health development. Results show that TFP in Sri Lanka is positively affected by government expenditure so Sri Lanka government can effectively use the public spending to improve factor productivity.

---

## References

---

- Akinlo, A.E. and Adejumo, O.O., 2016. Determinants of Total Factor Productivity Growth in Nigeria, 1970-2009, *Global Business Review* 17(2) pp. 257-270.
- Asghar, A., 2016. Foreign Direct Investment and trade Openness: The case of South Asian Economies, *International Journal of Innovation and Applied studies*; Vol. 17, No. 2 pp. 513-521.
- Baltabaev, B., 2014. Foreign direct investment and total factor productivity growth: New macro-evidence, *The World Economy*, doi: 10.1111/twec.12115.
- Behname, M., 2012. Foreign direct investment and economic growth: Evidence from South Asia, *Atlantic review of economics*, 2<sup>nd</sup> volume.
- Borensztein, E., Gregorio, J.D. and Lee, J.W., 1998. How does foreign direct investment affect economic growth? *Journal of International Economics* 45, pp. 115-135.
- Ciruelos, A. and Wang, M., 2005. International technology diffusion, effects of trade and FDI. *Atlantic Economic Journal* 33, pp. 437-449.
- Coe, D.T. and Helpman, E., 1995. International R & D spillovers. *European Economic Review* 39, pp. 859-887.
- Dhrifi, A., 2015. Foreign Direct Investment, technological innovation and economic growth: empirical evidence using simultaneous equations model, *International Review of Economics*, Vol. 62, pp. 381-400.
- Easterly, W. and Levine, R., 2001. It's Not Factor Accumulation: Stylized Facts and Growth Models, *World Bank Economic Review*, 15:2, pp. 177-219.
- Falki, N., 2009. Impact of FDI on economic growth of Pakistan, *International Review of Business Research Papers*, Vol. 5, No. 5, pp. 110-120.
- Filiz, K., 2014. FDI and Total Factor Productivity relations: An empirical analysis for BRIC and Turkey, *Advances in management*, Vol. 7(3).
- Haldar, S.K. and Mallik, G., 2010. Does Human Capital Cause Economic Growth? A Case Study of India, *International Journal of Economic Sciences and Applied Research* 3 (1), pp. 7-25.
- Hejazi, W. and Safarian, A.E., 1999. Trade, Foreign Direct Investment and R&D spillovers. *Journal of International Business Studies* Vol. 3, No. 3, pp. 491-511.
- Iamsiraroj, S., 2016. The foreign direct investment-economic growth nexus *International Review of economics and finance*, 42, pp. 116-133.

- Loto, M.A. and Ojapinwa, T.V., 2014. Capital formation, technological diffusion and economic growth in Nigeria: An ARDL Bound Testing Analysis, *Journal of Economics and Sustainable development* Vol.5, No. 19, pp. 37-44.
- Malikane, C. and Chitambara, P., 2017. FDI, productivity and the technology gap in African countries, *Journal of African Trade*. Vol. 4, Issues 1-2, pp. 61-74
- Nachega, J.C. and Fontaine, T., 2006. Economic Growth and Total Factor Productivity in Niger, International Monetary Fund.
- Sahoo, P., 2012. Determinants of FDI in South Asia: Role of infrastructure, Trade openness and Reforms, *The Journal of World investment and Trade*, Vol. 13, Issue 2, pp. 256-278.
- Sakyi, D., Commodore, R. and Opoku, E.E.O., 2015. Foreign Direct Investment, Trade openness and economic growth in Ghana: An empirical investigation, *Journal of African Business*, 16: 1-2, pp. 1-15.
- Sedhain, R., 2016. Role of Foreign Direct Investment on Economic Growth: A Case of SAARC Countries, SSRN. 2780359.
- Seyoum, M., Wu, R. and Lin, J., 2014. Foreign direct investment and economic growth: The case of developing African economies, *Soc Ind Res*, 122, pp. 45-64.
- Türkcan, B. and Yetkiner, I.H., 2008. Endogenous determination of FDI growth and economic growth: The OECD case, St. Louis: Federal Reserve Bank of St Louis.
- Wang, M., 2009. Manufacturing FDI and economic growth: evidence from Asian economies, *Applied Economics*, 41:8, pp. 991-1002.
- Woo, J., 2008. Productivity Growth and Technological Diffusion through Foreign Direct Investment, *Economic Inquiry*, Vol. 47, pp. 226-248.
- Xu, B., 2000. Multinational enterprises, technology diffusion and host country productivity growth. *Journal of development economics* Vol. 62, pp. 477-493.
- Xu, B. and Chiang, E.P., 2006. Trade, Patents and International Technology Diffusion. *Journal of International Trade and Economic Development*, 14:1, pp. 115-135.
- Yusoff, M.B. and Nuh, R., 2015. Trade openness and economic growth: Empirical evidence from Thailand, *Foreign trade review*, 50(2), pp. 73-84
- Zhu, L. and Jeon, BN., 2007. International R & D Spillovers: Trade, FDI and Information technology as spillover channels. *Review of International Economics*, 15(5), pp. 955-976.
- Drakos, K. and Konstantinou, 2014. Terrorism, crime and public spending: Panel VAR evidence from Europe, *Defence and Peace economics*, 25:4, pp. 349-361.

## Appendix 1

This study uses data for Pakistan, India, Bangladesh and Sri Lanka from 1975-2016. All the data was obtained from World development indicators and Penn world table 9.0.

This study follows the model by Xu (2000); 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 country under study. GDP data in constant \$US is available where base year varies for each country. The value of  $\alpha$  is calculated by normalizing  $Y_t/(K_t^\alpha L_t^{1-\alpha})$  with respect to labor.  $K_t$  is the capital stock and  $L_t$  is the labor force for the country under study at time t.

The value of  $\alpha$  for Pakistan comes out to be 0.54 and the values were different for each country under study. The values of  $\alpha$  for each country is given in the table below

Country	Value of $\alpha$	TFP calculation
Bangladesh	0.42	$Y_t/(K_t^{0.42} L_t^{0.58})$
Pakistan	0.54	$Y_t/(K_t^{0.54} L_t^{0.46})$
India	0.57	$Y_t/(K_t^{0.57} L_t^{0.43})$
Sri Lanka	0.55	$Y_t/(K_t^{0.55} L_t^{0.45})$

The capital stock  $K_t$  is measured following the models by Barro et al. (1995); Easterly and Levine (2001) and Ciruelos and Wang (2005). For a country  $i$ , the capital stock  $K_{it}$  is calculated in a specific period t,  $I_{it}$  is the real investment in period t and the depreciation rate of capital is taken as  $\delta$ . Several studies have assumed the value of  $\delta$  to be to be 0.07 (Ciruelos and Wang, 2005; Easterly and Levine 2001; Barro et al., 1995). Coe and Helpman (1995) and Zhu and Jeon (2007) assumed  $\delta$  to be 0.05. This study takes the data for depreciation rate for each year from Penn World Table 9.0. The capital stock is then calculated accordingly for each year for all the countries under study.

Following Easterly and Levine (2001); Barro et al. (1995), Let  $g$  be the growth rate of real output and  $I_{i0}$  be the initial gross investment for a country  $i$ . The initial value of K can be computed following Solow growth model.

$$K_{i0} = I_{i0}/(g + \delta)$$

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 us the initial value of investment  $K_{0i}$  for a country  $i$  and the capital stock for following periods can be calculated from the capital accumulation equation

$$K_{it} = (1 - \delta)K_{t-1} + I_{it}$$

**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 (in USD) as a percentage of GDP (in USD)
G	Government expenditure also calculated as the natural log of Government expenditure (in USD) as a percentage of GDP (in USD)
CPI	The consumer price index