

An Estimation of Relationship between Foreign Direct Investment and Industrial Structure Upgrading in Pakistan: Decomposition

Analysis

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Abstract

FDI plays an important role in the industrial structure transformation in Pakistan over the years. However, due to the turbulent international financial markets, political instability, frequent strike processions, deteriorating law and order situation, energy crisis and so on, have resulted in FDI fluctuations which seriously impacts the normal operation of the national economy in general and have severe implications for industrial structure improvement in particular. As a result, FDI in Pakistan declined sharply. Many foreign enterprises withdraw their business from Pakistan. There is an urgent need for industrial structure upgrading in Pakistan so as to regain the considerable market potential and attract more FDI in the country. This paper uses co integration analysis and dynamic variance decomposition, to present the relationship between FDI and Pakistan's industrial structure upgrading. The result shows that there is a stable relationship between FDI and industrial structure upgrading especially in the long-term. Moreover to successfully achieve the task of dual transformation of stabilizing economy for attracting more FDI and upgrading industrial structure government have to follow a viable policy option culminating the hindrances in the process of sustainable development.

Keywords: Foreign Direct Investment, Industrial Structure, Political Stability, Decomposition analysis

1. Introduction

Foreign direct investment (FDI) happens when a home country wants to invest capital or other production factors in other countries and obtain or control the relevant enterprise management in order to get profit or scarce factors of production. It is for those countries who want to conduct profitable business projects while lacking enough capital. With its large domestic market and open foreign trade policy, Pakistan has attracted many foreign countries to invest directly in the country. Many years ago, more countries were attracted to invest directly in Pakistan than its neighboring countries, Premila et al (2010).

FDI in Pakistan began to increase in the financial year of 2000, till the financial year of 2010, inward FDI in Pakistan reached around US\$3.5 billion and declined to US\$ 1.57 billion currently, Sana et al (2012). This steep decline has aggravated the growth trends and it shows that FDI has great importance for the country's economic growth. Especially developing countries like Pakistan should pay more attention on FDI inflow. There are many reasons of the deterioration of FDI such as global financial crisis, war on terror, unstable law and order situation, low technology and so on.

Table 1. FDI inflows in Pakistan

Years	FDI Inflows Averages				
	1970s	1980s	1990s	2000	2010
FDI Inflows in Million US\$	18	84	500	305	3500

Source: UNCTAD Data online.

This relatively good performance till year 2010 is predominately driven by policy liberalization and investment promotion, and is comparable to that of other developing countries that have opened up in an expansive period of worldwide FDI growth. Pakistan's economy has lost significant growth momentum. There are many possible reasons for the deceleration of growth momentum, such as the terms of trade shock of 2008, global financial crises, and acceleration of war on terror, security hazards and high profile killings. Even comparative performance of Pakistan's economy in terms of growth of real GDP remained poor compared to the same income group countries. Investment is the key to reviving economic growth but both total investment and fixed investment have shown a dismal picture. The total investment has declined from 22.5% of GDP in 2011, to 13.4% of GDP in 2012 and gross fixed investment has decreased to 18.1% of GDP from 20.4% of GDP last year, (Ministry of Finance, 2012-2013). This fall in total investment and gross fixed investment can be viewed as downward acceleration of inflow of foreign direct investment in Pakistan. According to Xu (2000), Alfaro et al. (2004), Lee et al. (1998), Blomstorm and Kokko (2003), FDI has great impact on economy progress and growth. They believe that magnificent transformation can be done with FDI inflows resulting in more sophisticated and better products for the domestic markets. This research mainly talks about the relationship between FDI and industrial structure upgrading in Pakistan, by considering the related aspects of inward investment leading to industrial structure transformation. The degree to which industrial structure upgrading in Pakistan is related with FDI and policies implemented by the government will be discussed in this paper. After these introductory notes Section 2 reviews the related literature. Section 3 provides the data information. Section 4 introduces the methodology and analysis. The final part concludes the paper.

2. Literature Review

Many scholars have had researched on the influence of FDI in the economic development of the countries and the industrial structure. In addition, there are many domestic and foreign scholars who have studied and explored the adjustment and upgrading of industrial structure especially in the developing countries. When the developed countries in the west have entered into the industrial era, industrial structure and economic growth have drawn the attention of a growing number of economists and scholars. In Kuznets (1949) study of economic growth, he states that across different stages of economic development, industrial structure is in dynamic evolution. Clark (1951) also points out that the order of the shift of the key point of the employment structure and industrial structure is usually from primary industry to secondary industry and then to the tertiary industry.

Borensztein, Gregorio and Lee (1995) found FDI is an important mean for technology transfer in the purpose of contributing economic growth by using data of 69 developing countries from 1970 to 1989. Shen Kunrong et al (2001) found that FDI can promote the level of technology and efficiency of organization so that to improve the productivity of economy for the country. Findlay (1978) believed that FDI has a positive impact on economic growth by the spillovers of technology, and he also suggested that FDI has the ability to improve economic growth of the host country. Salman and Feng (2009) observed FDI inflow have positive effects on sectoral growth such as agriculture, industry and service of economy in Pakistan by using vector autoregressive estimates for the year 2000 to 2009. He concluded that FDI plays a positive relationship with the agricultural, industrial and service growth.

Khalil Hamdani (2011) points out that FDI in Pakistan declined due to terrorist violence and natural disasters such as floods and earthquake. On the other hand, the share of FDI to GDP was less than 1% but it does not mean that the economy development has no reliance on FDI. Since Pakistan's independence in 1947, the country attracted huge sums of foreign direct investments which now become an important source of economic development in Pakistan and the share of FDI to GDP have increased a lot.

Fu Lifan (2009) found that a country's industrial evolution and upgrading can be promoted by FDI and through some beneficiary effects, like structural change, gathering of capital, progress of technology, systematic change and foreign trade development.

3. Data Composition and Measurement

Liu, 2005, has described the Industrial structure in three aspects. This historical and pattern oriented development of industry is seen as; Movement in industrial structure from Primary to Secondary and Tertiary industry resulting in reducing the share of Primary industry.

Above mentioned stages of development and evolution of industrial base in the country usually follows a trajectory. The use of primitive resource especially the labor force leads to labor intensive primary industry development. This is followed by capital intensive industrial growth involving more specialized skills and more sophistication in the production process which is seen as secondary industry development. With the advent of more educated workforce and technology based research and development setups we witness innovation drive or technology intensive industrial development. This pattern is depicted as:

$$\text{Labor-Intensive Development} \rightarrow \text{Capital Intensive Development} \rightarrow \text{Technology Intensive Development}$$

The above features of industrial upgrading when put together will help in pile up of the proportion of tertiary industry. So we have taken the proportion of tertiary industry as a threshold for industrial upgrading. Because the industrial structure is a difficult concept to quantify, different scholars have disputed. The increase in the proportion of tertiary industry is significant, so this proportion as a approximately index presents for industrial upgrading denoted by LTI.

FDI stock is accumulated of total FDI inflows, and then considering depreciation of assets, divestments and other factors, adjusted according to comparable prices. In order to make estimations more meaningful, the data logarithm as LFDI and LTI are taken. We used annual data which involve the period of 1980 to 2010. These data sources are Ministry of Finance and Annual Statistical Yearbook available on Government of Pakistan website.

4. The Model and Empirical Estimates

4.1 Co-integration Test

The main idea of co integration test contains: if a linear combination of two or more same order time series vector can be combined in a sequence, their non-stationary time series has stable long-term equilibrium relationship. Only two variables integrated of same order may witness the existence of co integration relationship. Therefore, we have to test order integrated of variables before the co integration test. We use the Augmented Dickey – Fuller Test (ADF) to test unit root sequence.

Following is the ADF test equation:

$$dx_t = \alpha_0 + \alpha_1 t + (\lambda - 1)x_{t-1} + \sum \beta_i dx_{t-i} + \varepsilon_t \quad (1)$$

Null hypothesis $H_0: \lambda = 1$

And the

Alternative hypothesis $H_1: \lambda < 1$

Accepting the null hypothesis means that the time series contains a unit root.

Table 2. Unit Root Test (1980—2010)

Variables	Intercept (C)	Time trend	Lag phases	ADF statistic	Critical Value (1%)	Critical Value (5%)
LTI	Yes	Yes	3	-3.1598	-4.3541	-3.4572
1st Difference	Yes	None	1	-2.6524	-3.1786	-2.9512
LFDI	Yes	Yes	2	-4.2330	-5.2581	-4.6875
1st Difference	Yes	None	1	-3.8547	-3.6543	-3.2451

Unit Root Test results

In all the variables we can see there exists unit root, and their first differences are significant at the 5% level reject the unit root hypothesis. The variables are thus Integrated of Order One (I (1)); therefore, we can use it to do long-term co integration. Two-step method has been proposed by Engle and Granger to estimate the co integration vector. In order to overcome the defect of EG two-step estimation in small sample situation, Johansen presented a

dynamic distributed lag model (VAR) model to estimate the long-term equilibrium relationship, which available to get valid unbiased estimates Bo Sjö (2008).

Initially, we base on the AIC, SIC information criteria to determine the final lag periods. In Table 3, we give the Log likelihood, AIC, SC values based on several lag intervals. Ultimately, we select the lag 2-order of VAR model, and the basic form is:

$$Y_t = c_0 + c_1 Y_{t-1} + c_2 Y_{t-2} + \varepsilon_t$$

Where $Y_t = f(\text{LTI, LFDI})$ (2)

Table 3. Vector Auto Regression Estimates

Lag Intervals	Sample (adjusted)	Included observations	Log likelihood	Akaike information criterion	Schwarz information criterion
1	1980-2010	27 after adjustments	27.8072	-1.1598	-1.0841
2*	1981-2010	26 after adjustments	27.8921	-1.6524	-1.1786
3	1982-2010	25 after adjustments	27.9079	-1.2330	-0.2581

Note: The smaller the values of AIC and SIC the better is the estimation.

After we estimate the proper Lag Interval, we shall do the VAR (2) model related tests to confirm the suitability for further integration and estimations. Table 4 shows the Autocorrelation LM Test and Residual Heteroskedasticity Test results. It conveys that: order-1, order-2, order-4, order-6 autocorrelation test and the heteroscedasticity test relatively fit the model, which makes suitable for further integration and estimations.

Table 4. VAR (2) Model Evaluation Diagnostics

	LM(1)	LM(2)	LM(4)	LM(6)
Autocorrelation LM Test	2.1393	4.3216	8.3216	11.8824
(P values are in brackets)	(0.1905)	(0.1809)	(0.0805)	(0.0615)
VAR Residual Heteroskedasticity Tests	12.4320 (0.3297)			

Notes: The autocorrelation LM test and null hypothesis has no autocorrelation; heteroscedasticity test and the null hypothesis have no heteroskedasticity.

Then, we use co integration tests to VAR (2) model by Johansen maximum likelihood estimation to confirm the variables equilibrium relationship in the long term. In the comparison of several results, we finally confirmed the test form: co integration variables with a linear trend and intercept limited in the co integration space. Johansen maximum likelihood estimate results have shown in Table 5.

Table 5. Johansen Maximum Likelihood Estimate Results

Eigen value	Likelihood Ratio	Critical Value (1%)	Critical Value (5%)	Hypothesized No. of CE(s)
0.5672	28.99	25.63	32.33	None*
0.3909	8.83	12.38	16.43	At most 1

Note: * indicates on 5% significance level reject the null hypothesis, the null hypothesis of Johansen test has no co integration.

The table shows that: Johansen maximum likelihood estimate statistics is greater than the critical level of 5%, reject the null hypothesis, it reveals the co integration. There exists long-term co integration relationship between FDI and industrial upgrading.

4.2 Decomposition Analysis of Variance

The error variance of time series forecast is the interaction of noise of itself and the other factors within the system. The purpose of breaking down the impact of the mean squared error of the system is to decompose the contribution of each variance component. We consider the existence of co integration, decompose the LTI and LFDI based on VECM. Results are shown below:

Table 6. The impact decomposition of dLTI and dLFDI

		Variance decomposition of dLTI			Variance decomposition of dLFDI		
Period	Variables	S.E	LTI	LFDI	S.E	LTI	LFDI
1		0.25323	100.0000	0.00000	0.11619	11.53543	87.25684
2		0.37811	99.84515	0.43820	0.18695	10.29517	90.12864
3		0.38689	98.85431	1.32958	0.21235	8.37789	92.55613
4		0.38804	97.83543	2.44664	0.23765	6.27621	92.65898
5		0.39705	96.89517	3.59721	0.25852	5.23873	94.15983
6		0.40402	94.87789	4.58756	0.26975	14.16037	85.32456
7		0.41222	93.87621	5.55175	0.28901	18.28877	81.35742
8		0.42746	92.83873	6.63053	0.29002	22.20323	76.24159
9		0.42171	91.86037	7.66243	0.29008	30.13811	70.02574
10		0.43558	90.88877	8.61968	0.30354	35.13689	63.92105

The forecasting variance decomposition of LTI, can be exclusively explained by its own. LFDI has relatively limited explanatory power to LTI; however, the explanatory power of LFDI gradually increases over forecast period. In contrast, it can conclude from the variance decomposition of dLFDI. In the first six periods, most of the LFDI growth can be explained by itself, dLTI have some weaker explanatory power to dLFDI. After the 6th period, the explanatory power gradually increases. In the 10th period even increases to around 35%, and its explanatory power of LFDI increases weaken.

5. Conclusion

5.1 The Interaction between FDI and Industrial Upgrading

As more foreign direct investment will be attracted in Pakistan in the future, the industrial structure will be promoted by the foreign enterprises. For example, the new technology, new management skills will be introduced to Pakistan, which will result in dual transformation in the economy. The high economy growth along with stability will attract more foreign investment and industrial efficiency will increase with the mutual interactions of the two forces in a coherent environment. It will ultimately result in the mutual benefit of our interest variables industrial structure upgrading and FDI.

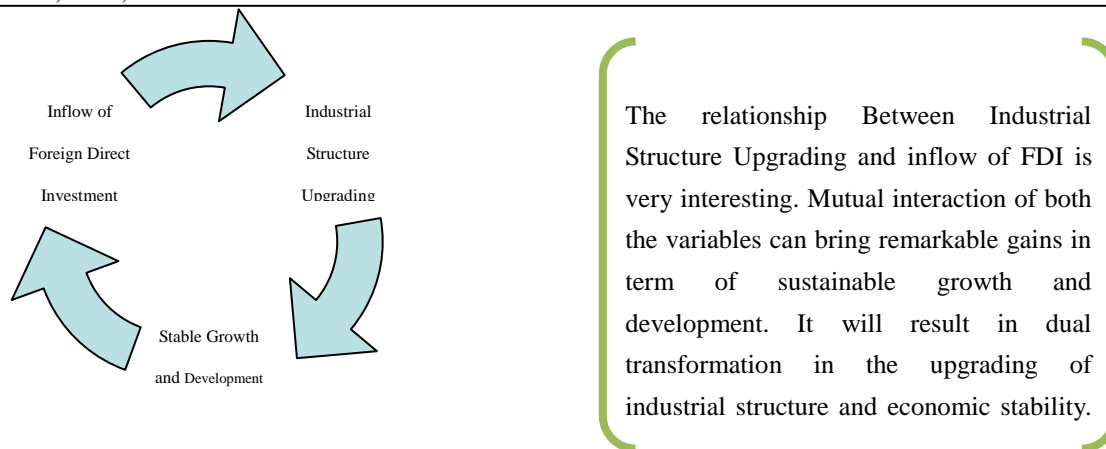


Figure 1. Circular effect and relationship

The long-term relationship between FDI and industry structural upgrade is confirmed by subsequent tests. The entry of foreign capital make up for domestic fund shortage, improve Pakistan's efficiency of resources allocation, promote comparative advantage and induce the enhancement of total economic output. In other words, FDI does drive industrial evolving and optimizing directly and through a bundle of beneficiary effects, such as the change of demand structure, capital accumulation, technological progress, institutional change and export trade development. In addition, FDI play an important role in the upgrading of industry. The Government should chalk out a more prudent policy for attracting foreign investments to those industries with comparative advantage. Government has implemented some policies to improve the situation and made Pakistan a better place for foreign investors. The Government should lead more foreign investors to high-tech industries and value added productions. In addition, the country needs to take the strategic measures for encouraging foreign investment in the central regions of Pakistan. Therefore, we should fully use FDI as the way to improve the development of the country's entire economy and upgrading our industry structure.

5.2 Long-Term Stable Co integration Relationship

The empirical results reveal the industrial upgrading and FDI variables are integrated of order one (1 (1)) process, that is first-order stationary. There exists long-term stable cooperative relationship. It also reveals from the variance decomposition of dLTI and dLFDI within which exist an evident interaction of long-term. Especially, the impact of dLTI to dLFDI becomes increasingly significant. In recent years, FDI's rapid growth rate is combined with high efficiency of industrial structure. It can be seen from the dLTI forecast variance decomposition: the dLTI alters from 100% (in the 1st period) to around 91%, can be fully explained by the changes on its own. Industrial structure changes are the results of government industrial policy, more obvious in short-term. But the dLFDI explanatory power gradually increases over time. In the long run, the contribution of foreign investments in industrial upgrading will be growing. With a large number of investments and technology spillovers effect, associated effect of host country enterprises, demonstration effect of production and management and the competitive effects. In addition, the forecast variance decomposition of the dLFDI can be interpreted that industrial structure upgrading to promote the growth of foreign investment.

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