

# Productivity and Openness in Indian Economy

Sanjoy Saha<sup>1</sup>

*Department of Economics, Debraj Roy College, Assam*

*The economic strategies of Indian economy have been very unique since independence. Using the conventional growth accounting method the study first attempts to estimate the aggregate TFP for the Indian economy and then examines the impact of trade openness on TFP growth. It has been observed that TFP growth in India has been erratic in nature. During 1960s average TFP growth in India was although positive but it was very low close to zero. Similarly, the economy experienced technological regress in the economy instead of technical progress during 1970s due to the average negative TFP growth. However, the economy's overall productivity has increased considerably after the initiation of internal economic reform measures during 1980s. The economy has been experiencing continuous rise in TFP growth since the introduction of external economic reforms. Granger Causality tests show that there is a one way relationship between trade openness and TFP growth for Indian economy. The econometric analysis reveals that trade openness in India has affected TFP growth positively and significantly. Therefore, the study suggests that formulation of more and more outward oriented policies would further in enhancing the productivity of the economy.*

Copyright © 2012 JAEBR

Keywords *Total Factor Productivity, Trade Openness, Granger Causality Test*

## 1. Introduction

The economic strategies of Indian economy have been very unique since independence. The policy makers started with inward-looking orientation mainly based on state interventionism and import substitution protectionist policies and then gradually moved toward an outward-looking orientation with increased reliance on market forces as resource allocation mechanisms and exports as the growth engine. These strategies also has resulted unique growth experience for the economy as well, for around three decades after independence Indian economy has grown at the so called 'Hindu Rate of Growth'. However, with the initiation of internal economic reforms during the mid-eighties there has been considerable step up in the growth rate of Indian economy and further after the introduction of broad based

---

<sup>1</sup> Correspondence to Sanjoy Saha, E-mail: sanjoy.saha10@gmail.com

economic reforms Indian economy has moved to the path of high growth trajectory where the economy has been growing at an impressive rate of around 7 to 9 percent per annum.

One can list several factors which have caused this high economic growth; trade liberalization undoubtedly could be one of them. However, the main motive of the study is not to examine the role of trade liberalization in achieving economic growth directly, rather it simply examines the impact of trade openness on aggregate productivity i.e. Total Factor Productivity<sup>2</sup> (TFP hereafter) growth for the Indian economy.

Muendler (2004) in his study has talked about three channels through which trade breeds productivity. Firstly, trade intensifies competition in the product market which compels the producers to innovate for surviving from which productivity gain is also expected. It is termed as 'competitive push'. Secondly, through trade an economy can avail cheap inputs and capital goods from foreign markets which allows it to adopt new methods of production and substitute the factors which relatively more expensive. It leads to the creation of capital, destruction of jobs and increase in productivity, known as 'foreign input push'. Thirdly, observed only at the industry and/or sector level, termed as 'competitive elimination' where increased foreign competition forces the least efficient firms to close down while the more efficient ones gain market share, hence raising average productivity.

Although, the proponents of liberalization always argue that opening up the domestic market will improve productivity of the economy diverting resources from less efficient sectors to more efficient ones. But, gain from openness may be different for different countries according to the status of the economy, human capital stock and many other things. Mere inflow of cheap inputs and better technology will not automatically lead to the corresponding increase in productivity. The technology has to be absorbed by the domestic labour force as well, if the domestic labour force does not have the skill to adapt the foreign technology then fruits of trade may not get translated into productivity rise; similarly, it may happen that given availability of other thing different sectors may not gain from the same due to insufficient credit facilities. Therefore, one needs to examine the relationship between the aggregate productivity and trade openness empirically for different countries.

---

<sup>2</sup> TFP refers to that part of the output which is generally not explained by the inputs used in the production process.

Existing studies throw mixed picture regarding the impact of openness on the TFP of different countries. Austria (1998) found that Export-GDP ratio affects TFP positively and significantly in Philippines, while, the import-GDP ratio found to exert a significant negative impact on the TFP. Miller and Upadhyay (2000) have observed that irrespective of the level of incomes openness as captured by Export-GDP ratio affect TFP positively for all countries. Khatiwada and Sharma (2004) found that trade openness affects the TFP of Nepal positively and significantly. Tsu-Tan Fu (2004) found that trade openness measured by ratio of import to GDP and exports to GDP are among the major determining factors in TFP growth in Taiwan. Similarly, Lee (2004) also has investigated performance of Export and Import-GDP ratio on TFP growth of Republic of Korea; found that both exert positive and significant impact on it. Akilno (2005) have found that export-GDP ratio as percentage of GDP has significant positive effect on TFP of Sub-Saharan African (SSA) Countries. Kim et al (2005) observed that one hand imports of capital goods and consumer goods have positive and significant effects on TFP while the import of raw material imports do not have any significant impact. Similarly, Export-GDP is found to exert negative but insignificant impact on Korean firms. Khan (2006) has found a significant negative relationship between TFP and trade openness arguing that the economy could not able to take the benefits that trickles through trade. Nachegea and Thomson (2006) observed that Openness to trade measured by export plus import to GDP ratio affect TFP positively and significantly. Njikam et al. (2006) found that on one hand trade openness without human capital affects TFP of some Sub-Saharan African countries negatively and significantly and some countries positively and significantly. Jajri (2007) have found that trade openness influences the TFP growth positively and significantly in Malaysia. Lee (2007) and Xu *et al.* (2008) observed positive and insignificant relationship between trade openness and TFP for Chinese economy. Mahmood and Afza (2008) found that trade openness impacted TFP growth of China, Indonesia, Malaysia, Thailand and South Korea negatively and significantly for two decades. Gonzalez and Constantin (2009) also found that openness is not a very relevant factor in explaining the role of technological status of the low income countries. On the contrary, openness affects TFP positively and significantly for middle and high income countries. Kumar et al. (2010) have examined impact of trade openness on TFP of South Africa and observed that it affects TFP positively and significantly.

The rest of the study is structured as follows. Section 2 describes the objectives, hypothesis, data and methodological issues. Section 3 and 4 throws light on the trends and

patterns of TFP growth and trade openness in Indian economy respectively. Section 5 discusses the results of the study and section 6 concludes the study.

## **2. Objectives, Hypothesis, Data and Methodology**

The study has twin objective. First objective is to estimate aggregate TFP for the economy as a whole using conventional growth accounting method. Second one is to see the impact of trade openness on TFP growth for the Indian economy. It is hypothesized that trade openness affects TFP growth positively.

One can estimate total factor productivity for the economy as a whole, across states, sector and sub-sector as well. The major problem of calculating total factor productivity at the aggregate level in India is the data constrains that is one require data on output and inputs on a time series basis. The data on output and capital stock is available but the data on total employment on a time series basis is not available because the major source of employment data in India are available mainly on a decadal and quinquennial basis i.e. the Census and NSSO respectively. Therefore, one needs to generate the time series data on total employment based on interpolation and extrapolation. We have used GDP and net fixed capital stock (NFCS) at constant prices as a measure of output and input respectively and following Veermani (2004) population of ages 15 to 64 has been used as the proxy for potential workers. The secondary data for the study has been used from the World Development Indicators, World Bank, National Accounts Statistics (NAS) various issues, Central Statistical Organization (CSO) and Handbook of Statistics on Indian Economy, Reserve Bank of India (RBI) respectively.

### **2.1 Growth Accounting and TFP Estimation**

There are large numbers of method through which TFP can be estimated. However, the literature is inconclusive about the best method to estimate. The present study has adopted growth accounting method for estimating TFP growth. It basically allows the breakdown output growth into components that can be attributed to the observable factors of the growth of the capital stock and of the labor force, and to a residual factor. Solow referred this residual as total factor productivity growth.

Most of the studies [Coronation (2002); Veermani (2004); Lee (2004); Akilno (2005); Khan (2006); Nachegea and Fontaine (2006); Gupta (2008); Loko and Diouf (2009) and Das

et al (2010)] on aggregate TFP have used standard growth accounting method. Following them, in this study conventional growth accounting in particular Translog-based growth accounting method has been used to estimate aggregate TFP for Indian economy.

$$Q_t^* = TFPG_t^* + V_K K_t^* + V_L L_t^* \quad (2.1)$$

$$TFPG_t^* = (\ln Q_t - \ln Q_{t-1}) - V_L^* (\ln L_t - \ln L_{t-1}) - V_K^* (\ln K_t - \ln K_{t-1}) \quad (2.2)$$

Where,  $V_L = \frac{1}{2}(V_{Lt} + V_{Lt-1})$  and  $V_K = \frac{1}{2}(V_{Kt} + V_{Kt-1})$ ; 'ln' is natural logarithm operator; Q is Output, L is labour input and K is capital input  $V_L$  and  $V_K$  are average factor shares.

For estimating TFP factor shares mainly labour share has been adjusted as the sum of compensation of employees and 50 percent of mixed income of the self employed to GDP with the assumption out of the total mixed income 50 percent is labour income and 50 percent is capital income. Similarly, assuming constant returns to scale 1 minus labour share gives capital share.

In order to examine the impact of trade openness on TFP growth simple regression analysis has been used. Trade openness can be captured by different indicators, but, there is no independent measure of openness which can give a full picture of the extent of openness of a country (Harrison, 1996). Survey of above studies show that the most popular and simple measures of openness are Export-GDP, Import-GDP and Trade-GDP ratio. We have also used these indicators for measuring openness in Indian economy.

### 3. Trends in Total Factor Productivity Growth

TFP is defined as increase in output growth which is not caused due to the factor accumulation. Thus, TFP may include all those factors which contribute to the generation of output other than labour and capital. This can happen because of several reasons such as, change in the quality of inputs, output, introduction of new techniques, inputs and outputs, better organization and so on.

We have observed that TFP growth in India has been fluctuating during the study period (see figure 1). On an average TFP has grown by 1.49 during the study period 1961-2008. Periodical averages show that, during 1961 to 1970 the average TFP growth in India was although positive but it was very low close to zero. Similarly, the economy experienced

on an average negative TFP growth during the period 1971 to 1980 implying that there had been technological regress in the economy instead of technical progress. Probable reasons for the low and negative TFP growth during the 1960s and 1970s could be assigned to mainly Indo-China, Indo-Pakistan war along external shocks like severe droughts and oil crisis and so on. Again, considerable inefficiency crept in the industrial sectors due to ‘Permit or License Raj’<sup>3</sup> causing TFP to fall. However, during 1980s when internal economic reforms were started in the economy along with the gradual withdrawal of several restrictive policies, the efficiency of the economy had gone up and there was sharp jump in the TFP growth from negative 0.14 percent to positive 2.18 percent. When the economy went for broad based external economic reforms from 1991, the average TFP growth still remains positive but declined slightly by 11 percentage points from 2.18 percent during 1980s to 2.07 percent in the 1990s. Then again, in between 2001 to 2008 there has been considerable increase in TFP growth by 1.18 percentage points from 2.18 percent to 3.36 percent.

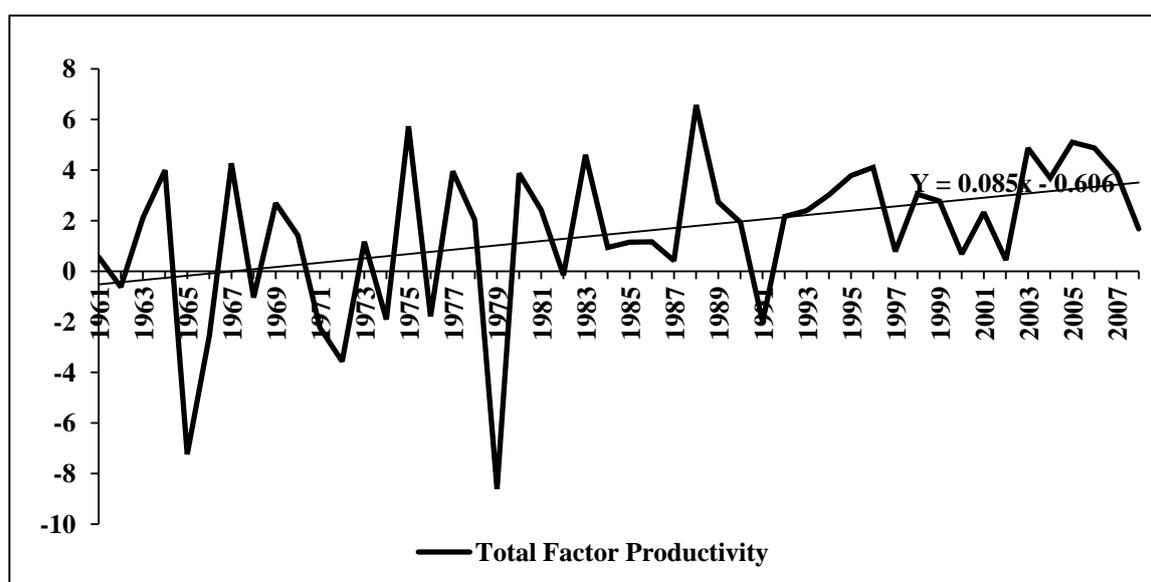


Figure 1: TFP Growth, 1961-2008

Source: Author's calculation

<sup>3</sup> **License or Permit Raj** refers to the elaborate licenses, regulations and accompanying red tape that were required to set up and run businesses in India. The large enterprises in seventeen industries were nationalized. Licenses were required not only for businesses for expanding productive capacity but also one had to have bureaucratic approval for laying off workers and for shutting down. When a business was losing money the Government would prevent them from shutting down and to keep the business going would provide assistance and subsidies. This gave rise to rampant corruption and inefficiency in the economy.

#### 4. Trade Openness in India, 1961-2008

The policy makers of Indian economy adopted inward-oriented very restrictive trade policies till 1960s. Since 1960's, India has adopted the import substitution<sup>4</sup> policy influenced both by a perception of export pessimism and adherence to the principle of infant-industry protection. The principal policy instruments used to achieve these goals have were mainly industrial licensing, reservation of certain goods which would be produced only by the small scale firms, import tariffs and quotas, restrictions on import of foreign technology and a virtual ban on direct foreign investment and so on. Therefore, India's economy remained largely closed until the 1980s, as a result of that India's foreign exchange reserves began to dwindle fast. To cope with these untoward effects of import substitution policies and trade protectionism, India introduced a set of partial liberalization policies in 1980s, and a set of more extensive liberalization policies in 1991 which has resulted substantial improvement in its Trade-GDP ratio (Raut, 2003 and Shinde, 2010). However, in spite of these measures still India remains one of the closed economies relatively in the recent past.

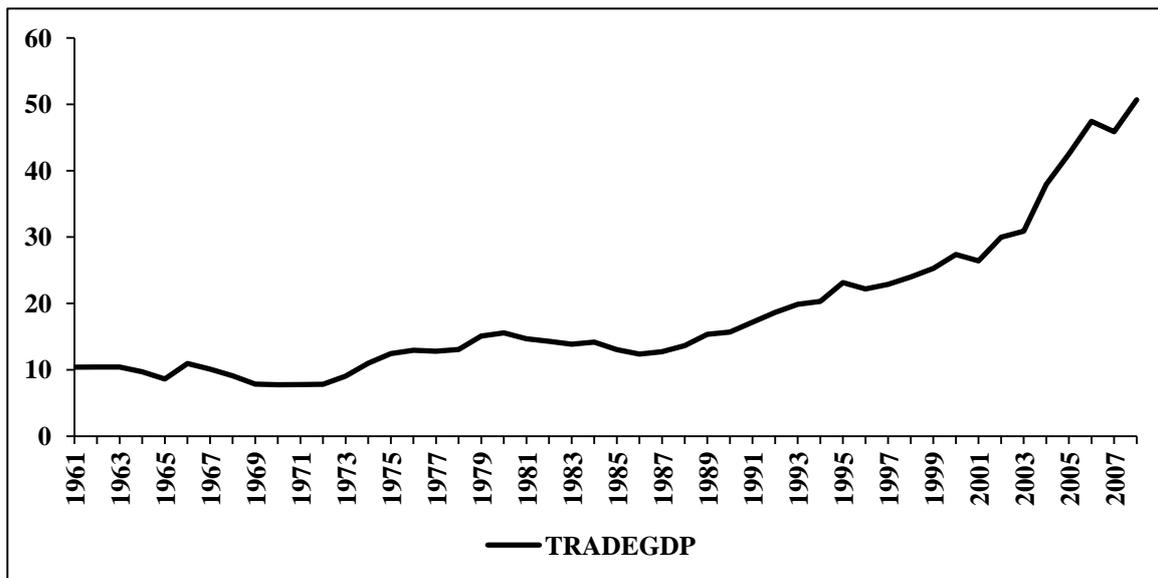


Figure 2: Trade-GDP Ratio, 1961-08  
Source: World Development Indicators, World Bank

Trade-GDP ratio in India was very low initially and it has grown very slowly (see figure 2) due to several restrictive policies followed by the policy makers. For almost two decades Trade-GDP ratio was more or less around 10 percent only after the initiation of internal economic reforms it has started rising with minor fluctuations. More specifically,

<sup>4</sup> A strategy for economic development which encourages industrial growth within a nation in order to reduce import of goods and to services, save foreign exchange, provides jobs and reduces dependency.

after the economic liberalization since 1991 the economy has experienced substantial jump in the Trade-GDP ratio and has not declined thereafter. However, it is true that although after the initiation broad based economic reforms the trade-GDP ratio of India has improved substantially but it is still very low in comparison to the some of the East Asian Tigers.

The table 1 clearly shows that during 1961-69 trade-GDP ratio of India was merely 9.72 percent, whereas the same was around 35 and 80 percent for Philippines and Malaysia respectively. Similarly, for the period 1990-99 trade-GDP ratios was around percent in comparison to the 178 percent of Malaysia. Again, the trade-GDP ratio of Thailand during 2000-08 was 100 times higher than the trade-GDP ratio of India reflecting less open nature of the economy.

Table 1. Comparison of Trade GDP Ratio with East Asian Countries

Period	1961-1969	1970-1979	1980-1989	1990-1999	2000-2008
India	9.72	10.97	13.96	20.91	37.68
Indonesia	22.17	41.39	47.81	57.55	60.84
Malaysia	79.66	84.09	112.00	178.13	206.38
Philippines	35.73	45.13	50.92	82.35	97.43
Thailand	34.67	41.62	54.68	87.06	134.78

Source: Author's calculation from World Bank data

## 5. Results and Discussion

### 5.1 Unit Root and Granger Causality Tests

The Augmented Dickey-Fuller (ADF) test has been applied to test the nature of stationarity of both dependent and independent variables. The results show that all the variables are in the level form that is integrated of order zero with different level of significance (Appendix 1). Granger causality tests reveal that there is one way relationship between trade openness as captured by Trade-GDP, Export-GDP and Import-GDP ratio (Appendix 2).

### 5.2 Determinants of TFP Growth

We have applied simple OLS technique to see the impact of trade openness on TFP growth in India for three alternative models (Appendix 3) taking TFP growth as a dependent variable and export-GDP, import-GDP and trade-GDP ratio respectively as explanatory variables. The econometric analysis shows that trade openness as captured by the three measures i.e. Trade-GDP, Export-GDP and Import-GDP ratio affects TFP growth positively and significantly. The findings of the study are in line with the findings of Austria (1998) for Philippines, Lee (2004) for Republic of Korea, Nachegea and Thomson (2006) for Niger, Jajri (2007) for Malaysia and so on. Thus, it could be argued that although Indian economy adopted very restrictive trade policies initially but with the gradual removal of tariff barriers and other

restrictions, fruits of trade have gradually percolated in different sectors of the economy which has helped in improving aggregate productivity positively and significantly.

## 6. Conclusion

Using the conventional growth accounting method the study first attempts to estimate the aggregate TFP for the Indian economy and then examines the impact of trade openness on TFP growth. It has been observed that on an average TFP has grown by 1.49 percent during study period but is erratic in nature. During 1960s average TFP growth in India was although positive but it was very low close to zero. Similarly, the economy experienced technological regress in the economy instead of technical progress during 1970s due to the average negative TFP growth. However, the economy's overall productivity has increased considerably after the initiation of internal economic reform measures during 1980s. The economy has been experiencing continuous rise in TFP growth since the introduction of external economic reforms. The econometric analysis reveals that trade openness in India has affected TFP growth positively and significantly. Therefore, the study suggests that formulation of more and more outward oriented policies would further in enhancing the productivity of the economy.

## References

- Akinlo, A.E. 2005. Impact of Macroeconomic Factors on Total Factor Productivity in Sub-Saharan African Countries. *WIDER Research Paper 39*.
- Austria, M.S. 1998. Productivity Growth in the Philippines after the Industrial Reforms. *Philippine Institute for Development Studies-Discussion Paper Series 98:26*.
- Boileau, L. Diouf, M.A. 2009. Revisiting the Determinants of Productivity Growth: What's New? *IMF Working Paper 09:225*.
- Cororaton, C.B. 2002. Total Factor Productivity in the Philippines. *Philippine Institute for Development Studies Discussion Paper Series 01*.
- Das, D. K., Erumban, A. A., Agarwal, S., Wadhwa, D. 2010. Total Factor Productivity Growth in the Reform Period: A Disaggregated Sectoral Analysis. *1<sup>st</sup> World KLEMS conference at Havard University*.

Edwards, S. 1998. Openness, Productivity and Growth: What do We Really Know? *The Economic Journal* 108447, 383-398.

Gonzalez, G., Constantin, S. 2009. Explaining TFP Growth Rates: Dissimilar Effect of Openness between Different Income Groups of Countries. *MPRA Paper* 17584.

Gupta, A. 2008. Indian Economy-TFP or Factor Accumulation: A Comprehensive Growth Accounting Exercise. *Working Paper Series*, University of British Columbia.

Harrison, A. 1996. Openness and growth: a time series, cross-country analysis for developing countries. *Journal of Development Economics* 48, 419-447.

Jajri, I. 2007. Determinants of Total Factor Productivity Growth in Malaysia. *Journal of Economic Cooperation* 283, 41-58.

Khan, S.U. 2006. Macro Determinants of Total Factor Productivity in Pakistan. *State Bank of Pakistan Research Bulletin* 22, 384-401.

Khatiwada, Y.R., Sharma, S.K. 2002. *Nepal: Country Study Report*. Institute for Integrated Development Studies, Nepal.

Kumar, S., Pacheco, G., Rossouw, S. 2010. How to Increase the Growth Rate in South Africa. *MPRA Paper* 26105.

Lee, B. 2004. *Measuring Total Factor Productivity: Survey Report*. Asian Productivity Organization, Tokyo.

Lee, D. 2007. *Determinants of Chinese TFP: National and Regional Level*. School of Economics, Yonsei University, Seoul, Korea.

Mahmood, A., Afza, T. 2008. Total Factor Productivity Growth in East Asia: A Two Pronged Approach. *European Journal of Economics, Finance and Administrative Sciences* 14, 93-111.

Miller, S. M., Upadhyay, M. P. 2000. The Effects of Openness, Trade Orientation, and Human Capital on Total Factor Productivity. *Journal of Development Economics* 632, 399-423.

Muendler, M. 2004. Trade, Technology and Productivity: A Study of Brazilian Manufacturers 1986-1998. *CESifo Working Paper* 1148.

Nachega, J.C., Thomson, F. 2006. Economic Growth and Total Factor Productivity in Niger. *IMF Working Paper* 06:208.

Njikam, O., Binam, J. N., Tachi, S. 2006. Understanding Total Factor Productivity Growth in Sub Saharan Africa Countries. *Working Paper Series*.

Raut, L. K. 2003. Competitiveness, Productivity And Export Performance Of Indian Private Firms. *Applied Econometrics and International Development* 33, 25-48.

Shinde, S.K. 2010. Trends in India's Foreign Trade Policy since Planning Period. *Shodh, Samiksha aur Mulyankan International Research Journal* 211:12, 61-63.

Solow, R. M. 1957. Technical Change and the Aggregate Production Function. *Review of Economics and Statistics* 393, 312–320.

Tsu-Tan, F. 2004. *Measuring Total Factor Productivity: Survey Report*. Asian Productivity Organization, Tokyo

Virmani, A. 2004. Sources of India's Economic Growth: Trends in Total Factor Productivity. *ICRIER Working Paper* 131.

Xu, H., Lai, M., Qi, P. 2008. Openness, Human Capital and Total Factor Productivity: Evidence from China. *Journal of Chinese Economic and Business Studies* 63, 279-289.

## Appendix

### Appendix 1. Results for Unit Root Tests

Variables	No constant	Constant	Constant & Trend	Test Statistic	Critical Values		
					1%	5%	10%
TFP	√			-5.725	-2.625	-1.950	-1.609
Trade-GDP	√			5.038	-2.625	-1.950	-1.609
Export-GDP	√			4.443	-2.625	-1.950	-1.609
Import-GDP	√			4.698	-2.625	-1.950	-1.609

Source: Author's calculation from World Bank data

### Appendix 2. Results for Granger Causality Tests

Null Hypothesis	Observation	F Statistics	Probability
Trade-GDP does not Granger Cause TFP	46	7.59424	0.00156
TFP does not Granger Cause Trade-GDP	46	0.18251	0.83385
Export-GDP does not Granger Cause TFP	46	8.83040	0.00065
TFP does not Granger Cause Export-GDP	46	0.64666	0.52905
Import-GDP does not Granger Cause TFP	46	6.21454	0.00439
TFP does not Granger Cause Import-GDP	46	0.86552	0.42838

### Appendix 3. Results of Regression Analysis

Models	Coefficients	t Statistics	P Value	R square	F	DW
Model I				0.1304	6.8983	2.3945
Intercepts	-0.0035	-0.4323	0.6674			
Trade GDP	0.0010	2.6264	0.0116			
Model II				0.1292	6.8262	2.4134
Intercepts	-0.0029	-0.3631	0.7181			
Trade GDP	0.0021	2.6127	0.0120			
Model III				0.1297	6.8558	2.3735
Intercepts	-0.0038	-0.4639	0.6448			
Trade GDP	0.0019	2.6183	0.0119			