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Journal of International Economics is devoted to the publication of professional and academic research in all the areas of international economics. It is published in the months of January and July. The journal broadly covers areas such as cross country growth models, population and migration patterns, international trade, trade policy and relations, trade organizations and bodies, foreign investment flows, balance of payments and exchange rate mechanism, multinational corporations and cross border manufacturing, etc.

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From the Editor's Desk...

The issue of trade war between China and US, still continues to occupy space in the domain of international economics. The impasse seems to threaten the very existence of globalization. Everyone concerned, hopes that the issue will be solved sooner than later, as it has wider ramifications for the world economy. Resignation of British PM Theresa May and the Brexit issue is also in limelight. As far as India is concerned, the general elections and its result, engaged practically every country's attention. For the first time in the history, election results were screened in theatres in the world's largest economy, USA. The jaw dropping majority secured by BJP stunned the world.

For the new government, there are challenges galore. The data released by the department for promotion of industry and internal trade in the last week of May, mentions that, FDI equity inflows have fallen by one percent to $ 44.4 billion. Reforms in banking sector, ultimately leading to fall in NPAs, increase in credit to private sector Is another significant policy change. A slow down in global growth to 3.2 percent, as predicted by OECD, may have an adverse impact on India's exports, in turn widening the trade deficit. The issue of US sanctions on Iran and the problem of Oil is another issue that will engage the attention of policy makers. The new Finance and Commerce minsters will have their plate full of challenges.

In this issue of the journal, we have as usual made an attempt to select those articles that would be a value addition to all those who want to read good literature on issues pertaining to international economics. The papers in this issue discuss topics such as, impact of trade openness on economic growth in SAARC countries, effect of bilateral trade on business cycles in India, determinants of South Africa's military expenditure. We are sure the topics in this issue are of immense value for our readers once again.

We request our regular contributors to continue to show the same enthusiasm in contributing articles. We further request to keep sending review of books that talk about issues pertaining to international economics.

Dr G Rajesh

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Journal of International Economics invites original contributions in the form of articles and case studies in the area of international economics.

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The following types of articles and case studies will be considered for publication in the Journal:

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- Research Papers
- Case Studies
- Book Reviews

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Tables and illustrations complete with titles, labels and artwork should be placed in the text at the appropriate locations. Diagrams, graphs, etc., should be sent in original.

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The Impact of Trade Openness on Economic Growth in SAARC Countries: A Panel Data Analysis

Ganapati Mendali*

Abstract

It is widely investigated whether trade openness leads to economic growth and the findings of the past studies are inconclusive. The study investigates this linkages of the South Asian Association for Regional Cooperation (SAARC) countries from 2004 to 2016 by employing panel data. Using panel-cointegration and fully modified ordinary least squares (FMOLS) techniques, it found that openness has a negative effect on economic growth in SAARC countries except Pakistan.

Keywords: Economic Growth, FMOLS, Panel Co-integration, SAARC, Trade Openness

Introduction

International trade is considered as an engine of growth of an economy. The outcome of trade could be seen in the form of employment creation, capital formation, soaring GDP and GDP per capita. Trade openness promotes economic growth in various ways. It increases foreign investments, expand markets and help attaining economies of scale which further enhance sharing of information, technology and knowledge spillovers. It also creates large foreign exchange reserves which could be used to develop the less developed sectors of the economy. Trade helps to push economic growth of advanced and developing economies during the later part of the 20th century. Contrary to this, in the early 2000's, a slowdown in the process of trade reform, a post-crisis scenario of protectionism, give a question mark on trade; whether it leads to increase in productivity and income growth. It is highly a controversial and a debated topic among economist about the nature of the link between trade openness and growth. If one follows the standard neoclassical exogenous growth model, a change in trade policy would influence only the pattern of product specialization, it does not affect the growth of an economy in the long run. However, according to the new growth theory, any modifications in the trade policy affect the economic growth rates in the long run.

But the effect of trade openness on economic growth in long run is uncertain if trading partners are structurally different in terms of innovation capabilities. The disagreement plays out at the theoretical as well as empirical levels.

Edward (1983) examined the panel data set for 93 advanced and developing

* Guest Faculty in Economics, P.G.Department of Economics, Panchayat Degree College, Bargarh, Odisha and can be reached at ganapatimendali@gmail.com

countries. The time period of the study is from 1960 to 1990. It found that the total factor productivity (TFP) growth is very high in open economies. Harrison (1996) employed various measures of openness to study the association between openness and economic growth. It established a positive association between growth and different measures of openness. Yanikkaya (2003) confirmed that restrictions on trade could promote growth in developing countries under certain conditions. It further established the fact that restrictions on trade can benefit a country depending on the types of the country i.e. a developed or developing country; a small or big country, and whether a country is comparatively advantageous in its protected sectors. Rodríguez (2007) reviewed some of the cross-country empirical association between openness and economic growth and found no significant correlation between trade openness and growth during the period 1990-2003. Andersen and Babula (2008) also reviewed some of the empirical analysis of the relationship between international trade and economic growth and found that the relationship is positive. Bajwa and Siddiqi (2011) examined the causal association between trade openness and economic growth for four South Asian countries (Bangladesh, India, Pakistan and Sri Lanka) from 1972 to 2007 by using panel cointegration and fully modified ordinary least squares (FMOLS) techniques. It divides the whole study period by two sub periods viz. 1972-1985 and 1986-2007 to examine the scenario before and after the implementation of SAARC. It found that there exists long run negative relationship between GDP and openness in 1972-85 and a positive causation between GDP and openness in time period 1986-2007. Zeren and Ari (2013) examined the association between trade openness and economic growth for the G7 countries between 1970 and 2011 by employing Granger non-causality test with respect to heterogeneous panel data developed by Dumitrescu and Hurlin (2012). It showed a bidirectional causality relationship between openness and economic growth which also makes a case for endogenous growth theory. Musila and Yiheyis (2015) investigated the effects of trade openness on the level of investment as well as the rate of economic growth in Kenya using annual time series data from 1982-2009 by using the OLS regression model and Granger causality tests. It found that aggregate trade openness have affected the level of investment and the tempo of economic growth positively, where as the effect on the latter is statistically insignificant. Ulaşan (2015) found that lower trade barriers are not linked with higher growth. Kim et al.(2016) studied the relationships of trade with economic growth and growth volatility using the Chudik and Pesaran (2013) cross-sectionally augmented autoregressive distributed lag (CS-ARDL) panel data approach. Using a panel of 73 developed and developing countries from 1970-2011, it found that trade augments economic growth in the short and long run while larger impacts are observed in the short run than in the long run. It again states that more trade improves economic growth in the long-run at the cost of more volatility in the growth rate which is apparently relevant for non-OECD countries or countries with underdeveloped financial systems, higher inflation, lower human capital, larger corruption and less rigid labor regulation. Keho (2017) studied the effect of trade openness on economic growth of Cote d'Ivoire. The period of the study is from 1965 to 2014. It utilized a multivariate framework which contained labor, capital stock and trade openness as explanatory variables. By employing the Autoregressive Distributed Lag (ARDL) model and the Toda and Yamamoto Granger causality tests, it illustrated that there

is a positive effect of trade openness on economic growth both in the short and long run. It also divulged a positive relationship between trade openness and capital formation which helps in achieving the desired economic growth. Sakyi et al. (2015) examined the impact of trade openness on the levels of income and rates of growth of 115 developing countries from 1970 to 2009. It stated that trade openness is the reason as well as outcome of the income level in the long run. A positive relationship between openness and economic growth is seen in the short run. Ramanayake and Lee (2015) established that trade openness does not warranty continuous economic growth for developing countries. Inspite of the huge available literature on the openness-growth relation, the nature of the correlation between trade openness and growth remains controversial, requiring further detailed empirical analysis.

The structure of the rest of the paper is as follows. The next section presents an outline of SAARC region. In the succeeding section, the data and methodology issues are explained. The subsequent section discussed the empirical results. The summing up and conclusions of the study are presented in last section.

Overview of SAARC Region

The SAARC[1] constitutes around 2.0 per cent of world goods trade (Jain and Singh, 2009). This region is unusually different in accordance with country size, geography, economic and social development, political systems, languages, and culture. Especially these three countries viz., Afghanistan, Nepal, and Bhutan, are landlocked and mountainous; Sri Lanka is an island and the Maldives is an archipelago. Despite of forming a regional cooperation, the members of SAARC countries have many unresolved issues related to territory, water sharing, ethnic and religious etc. Most of the countries have economic problems like poverty, unemployment, income inequality and regional imbalances etc. and they depend on external aid/assistance. According to Asian Development Bank (ADB) Report, (2012), apart from Maldives, in all other SAARC countries, over 10% of the population lives on less than US$2 (PPP) a day. They too have no access to improved sanitation. In terms of population, India has more than 74 percent of the population of SAARC countries. Almost 96 percent of population lives in the three countries, i.e., India, Pakistan and Bangladesh. There is a negligible population exist in Bhutan and Maldives of the total population in the SAARC countries. Intra-regional trade in SAARC countries is low. However, it gained momentum after the initiation of SAARC Preferential Trading Agreement (SAPTA) in the mid-1990s. The South Asian economies mainly went after protectionist trade policies to shield the domestic industries from foreign competition during their initial phases of development. South Asia region is less integrated region of the world in terms of the trade of commodities, capital and ideas (Ahmed and Ghani, 2007). The intraregional trade is very low for South Asia i.e. it is less than 2 percent of GDP, compared to more than 20 percent for East Asia.

1 The South Asian Association for Regional Cooperation (SAARC) is a regional intergovernmental organization in South Asia region. It is also a geopolitical union of nations. Its member states comprise Afghanistan, Bangladesh, Bhutan, India, Nepal, the Maldives, Pakistan and Sri Lanka.

Data and Methodology

The study uses annual data for seven SAARC countries[2] (Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka.) from 2004 to 2016.

Here N=7 and T=13. In the study, the variables used are Y, (Gross domestic product, GDP) (current US $), opn (openness), gfcf (gross fixed capital formation) (current US $) and lf (labour force). The openness is represented by the ratio of exports plus imports to GDP. The data is extracted from the World Development Indicators.

Model Specification

The following neoclassical production function is used to analyze the effect of trade openness on economic growth:

$$Y = f(opn, gfcf, lf) \quad (1)$$

The equation (1) is written in the panel model type as follows:

$$\ln Y_{i,t} = \beta_{0\,i,t} + \gamma_{1\,i} \ln opn_{i,t} + \gamma_{2\,i} \ln gfcf_{i,t} + \gamma_{3\,i} \ln lf_{i,t} + \varepsilon_{i,t} \quad (2)$$

where i= 1 to 7 stands for the countries

t stands for the time period from 2004 to 2016

β and γ are co-efficients

$\varepsilon_{i,t}$ is the error term.

Empirical Results

Panel Unit Root Results

Before employing panel cointegration tests, the data are examined whether unit root is present or not, by employing panel unit root tests. Table-1 displays the results of three panel unit root test as LLC, IPS and ADF-FC tests, where LLC is common and IPS ADF-FC are individual unit root test, respectively. All tests results do not reject the null hypothesis (i.e. non-stationary at level) with individual effect except opn. Yet, all tests reject the null hypothesis of non-stationarity at first difference. This shows that all the variables Y, opn, gfcf and lf are integrated of order one, i.e., an I(1) process. Hence, the series can be cointegrated.

Table-1: Panel Unit Root Tests

	LLC	IPS	ADF-FC	LLC	IPS	ADF-FC
Variable		level			First difference	
Y	-2.59(0.005)	-0.43(0.33)	18.48(0.1859)	-5.79(0.0000)	-2.46(0.0009)	28.79(0.0111)
opn	-3.67(0.0001)	-1.95(0.0255)	26.7486(0.0208)	-5.51(0.0000)	-3.68(0.0001)	38.82(0.0004)
gfcf	-1.32(0.0942)	-0.79(0.2147)	24.62(0.0385)	-5.78(0.000)	-3.49(0.0002)	35.01(0.0015)
lf	1.04(0.8517)	3.26(0.99)	14.58(0.4076)	-4.08(0.000)	-3.32(0.0005)	36.82(0.0008)

Source: Author's own calculation using data from World Development Indicators, World Bank.

Notes: LLC, IPS, ADF-FC indicates the Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003), and ADF-Fisher Chi-square respectively. All tests study the null hypothesis of non-stationary (unit root). The four variables were grouped into one panel with sample N= 7, T=13. The parenthesized values are the probability of rejection.

2 Maldives is excluded for non-availability of data.

Cointegration

The results of Pedroni Cointegration test is given in Table-2. Pedroni presents seven statistics for tests of the null hypothesis of no cointegration in heterogeneous panels. With this technique two models are developed i.e. (1) with no deterministic trend and (2) with deterministic trend. The results of the test illustrate that null hypothesis of no-cointegration is rejected for four tests out of seven tests for both models at 5 percent level. This shows the evidence of cointegration for the group as a whole and individual country of the panel.

Table-2: Pedroni Panel Cointegration Tests

Test Statistics	No Deterministic Trend				Deterministic trend			
	Statistics	Probability	Weighted Statistics	Probability	Statistics	Probability	Weighted Statistics	Probability
Panel Cointegration Statistics ((Within-Dimension)								
Panel v-statistics	-0.13	0.55	-0.97	0.83	-1.08	0.86	-2.18	0.98
Panel rho-statistics	1.11	0.87	1.47	0.93	2.77	0.99	2.84	0.99
Panel pp-statistics	-2.14*	0.17	-1.91*	0.03	-0.01*	0.50	-2.05*	0.02
Panel ADF-statistics	-3.46*	0.03	-4.32*	0.00	-2.11*	0.02	-3.78*	0.00
Group Mean Panel Cointegration Statistics(Between-Dimension)								
Group rho-statistics	2.53	0.99			3.83	0.99		
Group pp-statistics	-1.74*	0.04			-2.07*	0.02		
Group ADF-statistics	-4.39*	0.00			-2.50*	0.01		

Source: Author's own calculation using data from World Development Indicators, World Bank.

Note: This table reports Pedroni (2004) residual cointegration tests. The number of lag truncations used in the computation of statistics is 1. All reported values are distributed N(0, 1) under null of no cointegration.

* Significance at 5% level.

Therefore, using Pedroni cointegration test, it is asserted that there is a dynamic relationship among openness, economic growth, gross fixed capital formation and labour force in the long run as more of the tests result in the rejection of no cointegration. To support and make a strong point of the existence of cointegration, Kao residual cointegration test are also applied. The result of the test is reported in the Table-3.

Table-3: Kao Residual Cointegration Test

Model Specification:	ADF t-statistics	Prob.
No Deterministic Trend	- 4.10	0.00

Source: Author's own calculation using data from World Development Indicators, World Bank.

Note: This table reports Kao (1999) residual cointegration test. The number of lag truncations used in the calculation of statistics is 1. The null hypothesis is no cointegration. Probability values are computed using asymptotic Chi-square distribution.

The results show that null hypothesis of no cointegration is strongly rejected at 5 percent level of significance. So there exists a long-run relationship among openness, economic growth, gross fixed capital formation and labour force for the panel of selected SAARC countries.

FMOLS Estimates

Pedroni (2001) panel Fully Modified Ordinary Least Squares (FMOLS) method

is employed to examine the individual coefficients on a bilateral basis and for the whole group. The estimated FMOLS coefficients are shown in Table-4.

Table-4: FMOLS Estimates

	Independent Variables					
Countries	**opn**	**prob.**	**gfcf**	**prob.**	**lf**	**prob.**
Afghanistan	-0.69*	0.01	0.58*	0.01	0.38	0.24
Bangladesh	-0.09*	0.00	1.03*	0.00	-1.20*	0.00
Bhutan	-0.03	0.87	0.33*	0.01	2.84*	0.00
India	-0.17	0.25	0.97*	0.00	2.05*	0.01
Nepal	-0.81*	0.00	0.94*	0.00	-1.07	0.72
Pakistan	0.28*	0.00	0.34*	0.01	2.51*	0.00
Sri Lanka	-0.35*	0.02	0.78*	0.00	-0.29	0.78
Panel Group	-0.26*	0.00	0.71*	0.00	0.86*	0.00

Source: Author's own calculation using data from World Development Indicators, World Bank.

Notes: The number of lag truncations used in calculation is 1.

* Significance at 5% level.

Table-4 presents the result of long-run elasticities for each country and a panel of these countries which is based on Pedroni's group mean FMOLS estimator. It is seen that in country level, trade openness played negative role that is coefficient of openness is negative for six out of seven countries during the study period. However, for Bhutan and India it is not significant. In contrast openness played a positive role only for Pakistan, which is significant.

The sign of the coefficients of gross fixed capital formation is positive and significant for all the countries and of the labour force it gives the mixed results. From the group panel estimation results, it is seen that the coefficient of openness is -0.26 and it is significant. This implies that one percent increase in openness leads to 0.26 percent decrease in GDP for the SAARC countries. The co-efficient of gross fixed capital formation, 0.71 indicates that one percent rise in gfcf result in 0.71percent increase in GDP. With respect to labour force, it could be revealed that one percent rise in labour force result in 0.86 increase in GDP.

Summary and Conclusion

The aim of this study is to determine of causal relationship between openness and economic growth in seven SAARC countries from 2004 to 2016. The panel cointegration technique and fully modified ordinary least squares (FMOLS) technique is used to determine the long-run responsiveness relationship. It is found that openness has a negative impact on economic growth on SAARC countries except Pakistan. The result of the study is in line with the studies by Musila & Yiheyis, 2015; Ulaşan, 2015. The FMOLS results showed a negative sign which show that there exists a long-run negative causation between these two variables. This would be due to the fact that SAARC countries are not at the frontier of technological progress which might not gain more in terms of productivity growth from international transfer of technology. Another convincing justification is that the standard (traditional) measures of openness may not be a true indicator. A comprehensive measure of openness which could consist of some other principal

determinants such as outward foreign direct investments (FDI), mobility of human capital, patenting, scientific publications etc. could identify growth impact of SAARC countries.

References

Ahmed, S. & Ghani, E. (2007). *South Asia Growth and Regional Integration*, World Bank Publication.

Andersen, L. & Babula, R. (2008). The Link between Openness and Long-Run Economic Growth, *Journal of International Commerce and Economics,* United States International trade Commission.

Asian Development Bank (ADB) Report, (2012).

Bajwa, S. & Siddiqi, M. W. (2001). Trade Openness and its Effects on Economic Growth in Selected South Asian Countries: A Panel Data Study, *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering,* 5 (2), pp: 212-217.

Chudik, A. & Pesaran, A. M. (2013). Common Correlated Effects Estimation of Heterogeneous Dynamic Panel Data Models with Weakly Exogenous Regressors, *Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute Working Paper No. 146*.

Dumitrescu, E-I & Hurlin, C. (2012). Testing for Granger Non-Causality in Heterogeneous Panels, *Economic Modelling,* 29 (4), pp:1450-1460.

Edwards, S. (1998). Openness, Productivity and Growth: What Do We Really Know?, *Economic Journal*, 108 (447) , pp: 383-398.

Harrison, A. (1996). Openness and Growth: A Time Series, Cross-Country Analysis for Developing Countries, *Journal of Development Economics*, 48(2), pp:419-447.

Im, K., Pesaran, H. & Shin, Y. (2003). Testing for Unit Roots in Heterogeneous Panels, *Journal of Econometrics*, 115(1), pp: 53-74.

Jain, R. & Singh, J. B. (2009). Trade Pattern in SAARC Countries: Emerging Trends and Issues, *RBI Occasional Papers*, 30(3), pp: 73-117.

Keho, Y. (2017). The Impact of Trade Openness On Economic Growth: The Case of Cote D'Ivoire, *Cogent Economics & Finance*, 5(1).

Kim, D. H., Lin, S. C& Suen, Y. B. (2016). Trade, Growth and Growth Volatility: New Panel Evidence, *International Review of Economics and Finance*, 45, pp: 384-399.

Levin, A., Lin, C. F. & Chu, C. S. (2002). Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties, *Journal of Econometrics*, 108(1), pp: 1- 24.

Musila, J. W. & Yiheyis, Z. (2015). The Impact of Trade Openness on Growth: The case of Kenya, *Journal of Policy Modeling*, 37(2), pp:342-354.

Pedroni, P. (2001). Fully Modified OLS for Heterogeneous Cointegrated Panels. In: Badi H. Baltagi, Thomas B. Fomby & R. Carter Hill (ed.), *Nonstationary Panels, Panel Cointegration, and Dynamic Panels* (Advances in Econometrics, Volume 15) Emerald Group Publishing Limited, pp: 93-130.

Pedroni, P. (2004). Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests With an Application to PPP Hypothesis: New Results, *Econometric Theory*, 20(3), pp:597-627.

Ramanayake, S. S. & Lee, K. (2015). Does Openness Lead to Sustained Economic Growth? Export Growth versus Other Variables as Determinants of Economic Growth, *Journal of the Asia Pacific Economy*, 20(3), pp: 345-368.

Rodríguez, F. (2007). Openness and Growth: What Have We Learned?, *DESA Working Paper No. 51*.

Sakyi, D., Villaverde, J. & Maza, A. (2015). Trade Openness, Income Levels, and Economic Growth: The Case of Developing Countries, 1970-2009, *The Journal of International Trade and Economic Development*, 24(6), pp:860-882.

Ulaşan, B. (2015). Trade Openness and Economic Growth: Panel Evidence, *Applied Economics Letters*, 22(2), pp:163-167.

Yanikkaya, H. (2003). Trade Openness and Economic Growth: A Cross-Country Empirical Investigation, *Journal of Development Economics*, 72(1), pp: 57- 89.

Zeren, F. & Ari, A. (2013). Trade Openness and Economic Growth: A Panel Causality Test, *International Journal of Business and Social Science*, 4(9), pp: 317-324.

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Skilled Workers as the Backbone of an Efficient Economy: A Study of National Project for Continuous Industrial Development in Sudan

Yagoub Elryah[1]
Zeinab Kamal[2]

Abstract

This paper analyses different aspects of skilled labor and it is contribution to economic growth in Sudan over the years from 1980-2016. The paper focusses on two questions. First, to what extent do Sudan has achieved a higher levels of school enrolments, but this is not resulting in higher economic growth? Second, how the investment in knowledge and higher education could transfer the Sudan's economy into higher income? The results show that the human capital was not significant with most variables, while the physical capital was correlated with human capital and the value added of manufacturing to the GDP. Similarly, the physical capital was not significant with population growth and the interaction of physical and human capital and lower investments in physical and human capital decreases total factor productivity. The cointegration and causality tests suggest that there was cointegration between economic growth and value added of manufacturing sector. Similar cointegration exists between economic growth and physical capital and between human capital and population growth. These findings do not support the interaction among physical and human capital and economic growth, where the granger causality results does not confirm causality.

Keywords: Economic Growth, Labor Productivity, Skilled Workers

Introduction

Even though skilled labor is essential for improving productivity, labor productivity in developing countries including Sudan is often not willing to contribute to economic growth. In Sudan, economic development has been facing enormous challenges; with the core challenges being how to recover from the current economic shock by utilizing available skilled labor to stimulate economic growth, immediate attention is the skill gap and mismatch in labor market needs.

1 Industrial Economies Research Institute (IERI), Industrial Research and Consultancy Center (IRCC), Ministry of Industry and Trade, Khartoum, Sudan, and can be reached at yagelryah@gmail.com

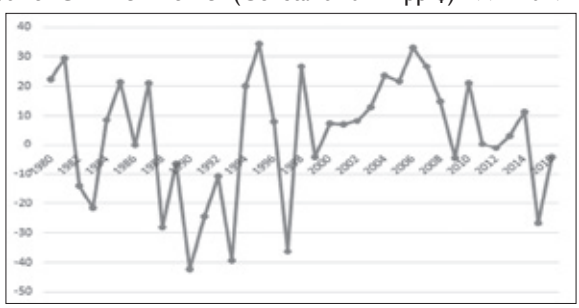
2 Research Assistant, Industrial Research and Consultancy Center, Shambat Extension, Khartoum, Sudan and can be reached at zeinabkamal555@gmail.com

As illustrated in a survey on employer skills needs, Sudan has been facing big challenges how to increase labor productivity and stimulate private sector to lead economic development. There are numerous causes associated with this problem, but the main causes in this study are academic degree, qualifications, specific skills, work experiences required by the employer as well as experience the company demand.

As much as Sudan's economy has struggled to create more jobs for skilled labor; the country still facing problems with its economic policies. On one hand, many workers particularly new graduates from universities and vocational training institutes are trying to acquire skills that could help them get employed; whereas firms are seeking for specific cognitive skills that workers do not have. On the other hand, the training programs and knowledge offered by universities and training institutions are often mismatching the labor market needs, where Sudan's labor market is characterized by rising internal and external migration of skilled and unskilled labor to the major cities; which increases the unemployment rates and brings about imbalance and oversupply of labor in industrial, manufacturing and service sectors. As a consequence, policy intervention is required to stimulate the economic growth through better use of human capital.

The skilled workers for the industrial and manufacturing sectors have widely been considered one of the successful education policies of the modern times. Therefore, the understanding of the change of technological progress provides an important insight into the performance of the industrial sector. Our argument is that Sudan continues to develop and build labor and upgrading skills, but this has not contributed to the economic growth. The question is how the investment in knowledge and higher education could transfer the economy into higher income growth. However, over the years the productivity of labor in Sudan has decreased. However, since the early 1980s, East Asian countries successfully adopted industrial policies that transferred these countries into more industrialization nations. Sudan is still lagging behind, unable to benefit from the availability of land, labor, climate, and location. The economic reform policy provided the framework to concentrate on agro-based industries, which becomes one of the alternatives to diversify Sudan's economy. Figure-1 displays the evidence that growth of labor productivity has been fluctuating over the years from 1980-2016.

Figure-1: Growth of GDP Per Worker (Constant 2011 Ppp $) 1991-2017



Source: The World Bank Group, 2018

Figure-1 shows how the labor productivity growth was fluctuating during the past years. It witnessed substantially declining the years 1994 (-21%), and it sharply declined over the period from 1988 to 1998 by -28% in average. However,

from 2000 until 2007, the productivity growth was improved and it reached the highest level of 34%. However, the productivity growth was declining in the years followed the independent of South Sudan in 2011. This can be justify to the fact that Sudan has lost 75% of oil revenues, also during the period many people are moved to major cities, thereby decreasing labor in agricultural sector. As a result, productivity per worker is increased only in agricultural sector. However, there is a need to upgrade skills among workers in industrial and manufacturing sectors, which need first adequately to develop the manufacturing sector and educational system.

There is now a very large literature assessing and evaluating the contribution of labor productivity in economic growth (Tamkin, et al., 2004; Hansson, et al., 2003; Dearden, et al., 2000). There is a vast literature on productivity and training programs and manufacturing as an engine for economic growth (Bartel, 1994; Kathuria & Raj 2009). Labor productivity and structural change have also attracted a large literature with evaluations including (Duarte, 2006; Lin, 2011; Rodrik, 2017; Fagerberg & Verspagen, 2002). There is also a rapidly growing literature on innovation and productivity (Masso & Vahter, 2012; Ratnasingam et al., 2017; and Alani, 2012).

This research aims to investigate key factors that contribute to successful linking between education output and productive sectors. We examine how skilled workers could contribute to the Gross Domestic Product (GDP) and offer "conditional" human capital and brain drain theories in three steps. Frist, we argue that although Sudan has achieved higher levels of school enrolments, but this has not resulted into higher growth. Second, we show that demand for skilled labor was stagnated where the marginal returns to education fell especially after the expansion and revaluation of education system in early 1990s. However, the educational outputs in the early period were poor especially among engineers and science graduates due to the lack of educational environment, study materials, laboratories and the absence of linkage with productive sectors. Finally, Sudan has been suffering from drain effect due to the emigration of skilled labor, which becomes one of the major challenges that decreases the productivity and efficiency of the economy.

There are several reasons why we chose to focus on the skilled labor for this study. Sudan is one of the countries that have made efforts to upgrade its labor skills and knowledge in order to provide labor market with skills that matched it needs. We believe this study is an important contribution to declining labor productivity in Sudan. There is a need for academicians and practitioners to pay attention to the contributions of human capital in enhancing productive sectors particularly industrial and manufacturing sectors, as it has received little or no academic attention (El-Tom, 2013).

This study covers a period of thirty seven years from 1980-2016. The rationale for choosing this period is that, it is intended to examine the contributions of skilled labor in Sudan in this period, going back from the successful the revolution of higher education revolution in the early 1990s, where many universities and vocational institutions were established. In Sudan, this period has underscored substantial changes in the labor market as a response of economic shock, which erupted after the secession of South Sudan in 2011.

This study sets out to increase our understanding of skilled workers as a backbone for efficient economy by examining the contribution of labor productivity in

economic growth in Sudan. All in all, two main research questions lie behind this paper: (1) to what extent do Sudan has achieved a higher levels of school enrolments, a higher index of human development but this are not resulted in higher economic growth? And (2) how the investment in knowledge and higher education could transfer the Sudan's economy into higher income? The paper is structured into this introductory and four additional sections, together aiming to give a comprehensive and complete picture of the skilled workers in Sudan's. In section two, we review related literature and presents the research methods and hypotheses. Section three presents overview of Sudan's economic obstacles the needs for developing the skills and innovation, and it gives analyses the linking of education and labor market. It tries to shed some lights on the role of National Project for Continuous Industrial Development (for now known, NPCID) in providing the industrial sector with the skilled labor is need. We present our empirical models and discuss the estimated results in section four. The final section, section five gives the conclusion of the study followed by the main findings and policy implications.

Literature Review and Research Methodology

In relation to the previous section, this section consists of two sub-sections. Firstly, a discussion is held to convey the conceptual framework, theoretical and empirical literatures on the skilled labor, education, labor productivity, and economic growth. We present our main hypotheses and contributions. The final section illustrates the research methodology.

Theoretical and Empirical Literature

Before proceeding further, it is necessary to define clearly the key terminology referred to in this study. In particular, it is imperative to clarify what we mean when we talk about "National Project for Continuous Industrial Development" (NPCID). The NPCID is a project initiated by Sudanese Ministry of Industry in 2015 to mobilize the industrial sector to bring about a sustainable industrial renaissance based on Research, development, innovation, technology and its mechanisms, capacity building guidance, and assurance of perfecting them.

What are the effects of training programs on labor productivity growth? The human capital theory classifies training into general and special training, where the individual labor and firm would have incentives on training investment. The theory emphasizes that the government interventions to training provision undesirable and unnecessary, as it can be undertaken by the market economy. It gives exception for government intervention so as to make the market competitive, which will provide a proper acquisition of developing skills.

In the literature on human capital the starting point is generally the characteristics the worker has to contribute to productivity. This theory argues that the skilled labor would be valued in the market because it increases firms' profits. Recently, the World Bank demonstrates that the capital accumulation in East Asian countries has been transforming these countries to high economic growth. The education attainments in science and technology and innovation policy are the main engines for manufacturing. Barrett, and O'Connell (1994) argue that the enrolment boosts economic growth. Freeman & Kleiner (2000) pointed out that education has a significant impact on economic growth. There has been linking between skills

and productivity has be discussed in a large body of literature, which involves the comparisons of labor skills and productivity. The findings from these literature were emphasized that there was huge productivity gaps between the developing and developing countries.

In Sudan context, however, Nour (2011) argues that the Sudanese industrial firms are characterized by lower levels of skilled workers. We argue that skilled workers development has been targeted by the Sudanese government as the main mechanism for enhancing the labor productivity. Besides the vocational training institutes, Sudan's Ministry of Industry has lunched "National Project for Continuous Industrial Development" (NPCID), which focuses on enhance the skills for new graduates. However, although the human capital was improved, but this have not translated into higher productivity, which cannot be achieved only by improving the skills of the workforce, other factors should be considered to drive productivity, the enterprise, innovation, investment, competition.

How the labor productivity, skills, human and physical capital affect GDP? Many scholars have continued to argue that private training enhances the labor productivity and obviously firms, where training qualifies labor with skills the market needs and become productive workers (Spence, 1973). Similarly, Barrett, and O'Connell (1994) argue that the firms invest in its workers by providing them with training that could sufficiently help these firms in gaining higher productivity. Acemoglu (1994) argue that the wages cannot explain the productivity especially when the productivity arises from private training provided by firms and not the labor itself. However, the educational outputs have a significant impacts on labor productivity have been focused on skilled workers, where the productivity is considerably measured through wages. Barron, et al., (1998) used micro-data to demonstrate impacts of vocational graduates on enhancing the productivity in developing countries. The study found that workers with technology background are likely to get the practical skills and have significant impacts on increasing productivity, this finding confirms the results found by Barrett, and O'Connell (1994).

There are many theories explaining how productivity could be enhanced through the quality of education outputs in enhancing the productivity and economic growth. For instance, theory of classical growth illustrates that the labor, capital, technology. In contrast, endogenous growth theory Barron, et al., (1998) argue that increasing quality of labor will drive the economic growth. However, brain drain theory demonstrates that the prospects of migration could foster investments in education due to higher returns abroad (Rapoport and Docquier, 2012). In sum, from the above discussion we formulate our first hypothesis for the output per worker, i.e. the stimulate growth:

Hypothesis 1: the labor productivity, human and physical capital positively affect the Gross Domestic Product (GDP)

Identifying the direct effect of the population growth and the structural change and the value added of industry on GDP has attracted a considerable attention. However, the impacts of human capital on the performance of firms are gaining a lot of attention in the literature. Using a firm-level data, Groot (2009) identifies the effects of training on firms in Turkey over the period 1980-2000. They conclude that training generates substantial gain for firms. They also found a direct connection between investment in training and changes in stock market performance, productivity, and profitability. In contrast Tamkin, et al., (2004) summarizes the benefits that firms could attain through providing private training to its workers.

The higher performance of a firm explained by educated labor, whose productivity is higher especially if the trainers are consistent with returns.

In Sudan context, few studies are focused on developing the labor skills and technology (Nour, 2011) and misallocation of human capital (Elryah, 2016). It seems reasonable to argue that Sudan is continuously struggling with lower sciences and technology input-output indicators; there are mess connection between industrial sector and research and development and technology transfer agencies. Ibrahim et al., (2014) argue that the formal and the informal reality of skills development in Sudan remain the main derivers of labor's productivity. Elryah (2016) argues that despite the availability of skilled and highly professional workers in Sudan, the majority of them are working either in service sector or are unemployed. Furthermore, the study found that skilled workers are associated with unproductive activities, while the labor in industrial sector is associated with lower productivity. Hansson (2001) claims that higher economic growth could be achieved by learning new skills through technical education that provides the industrial sector with skilled labor needs, while a better health care system was a positively enhance economic growth.

There is now growing literature has been carried out to estimate the influence of structural transformation on economic growth. The outcomes from these studies are focused on manufacturing and industrialization as an engine of economic growth (Ratnasingam, 2011; Duarte, & Restuccia, 2006). These studies have demonstrated that countries that experienced faster economic growth (such as China, four tigers and NIEs) followed industrialization to increase the manufacturing output (Holzer, H., et al.,1993). Similarly, Kathuria & Raj (2009) found that the high economic growth that India achieved was through manufacturing and services sectors.

It generally believed that the statistical association among the investments in human capital, innovation and upgrading skills increase productivity and higher incomes and stimulate economic growth. We argue that as advanced economies adapt labor-intensive and high spending on research and development (R&D), however, developing countries including Sudan are expected to adapt the same policies that could help in transforming their economies into high efficient. Most of the literature found that economic development increases likelihood of skilled workers, innovation, technology and productivity (Acemoglu, 1998; Barrett, and O'Connell, 1994; Barron & et., el., 1989). An important paper by Rodrik (2017), who claims how structural change increases labor productivity, the study found that the structural change was associated with labor productivity. However, according to Bassi & et al. (2004) argue structural change plays a substantial role for less developed countries to catch up with the developed world through productivity levels in the manufacturing sector. Based on the above literature, our second hypothesis can be formulated as follows.

Hypothesis 2: population growth and the structural change have a direct relationship with Gross Domestic product (GDP).

Methodology

Data Collection

This study uses macroeconomic data to estimate relationship among the variables. Our main dependent variable is the real gross domestic product. The explanatory variables are the value added of industry (% of GDP), human capital can be

estimated by the taken the median of years of schooling, output or productivity per worker (we divide the GDP data by employment). Data was collected from the following sources. The World Bank, Sudan national statistics bureau, and UNDP Human Development Reports.

Model

In this paper, we derive the econometric model to test the relationship among human capital, the real GDP; the output per worker, the physical capital is estimated by the monetary stock; the interaction between productive structure and education output; the rate of population growth; and the value added of industry to GDP.

Following the previous scholars, in this study we consider Solow model developed by Mankiw & et al. (1992), is adopted as the baseline model for this study. Mankiw & et al. (1992) construct their model from the function of "Cobb-Douglas production", while adding the human capital index as an additional variable. We first consider the factor of production function (the Cobb-Douglas production) to show the association of the total output with total productivity, the human and physical capital. The modified Cobb-Douglas production function is of the form:

$$Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta} \quad (1)$$

We can rewrite the above function as follows.

$$Y/L = A(K/L)^{\alpha} (H/L)^{\beta} \quad (2)$$

Where: Y: the total output K: physical capital H: human capital L: labor A: the total productivity Y/L: output per worker K/L: capital per worker H/L: the average human capital.

From the functions above and because we need to consider other variables that might have cause and effect on the total output, human capital and productivity of labor, we consider the following equation.

$$\log GDP_i = a_1 Y_i + b_1 HC_i + b_2 K_i + b_3 (K \times HC)_i + b_4 \ln POP_i + b_5 G_i + IND\_GDP_i + \varepsilon_i \quad (3)$$

Where, GDP represents the GDP growth; i is a year; Y represents the output per worker, HC is a human capital measure; K represents the monetary stock of machineries and equipment; POP represents population growth; K×HC represent total capital in the economy; IND_GDP represents the value added of industry (% of GDP); ε is an error.

An Overview of Sudan's Economic Policy and the Need for Developing Skilled Workers

Brief Overview of Economic Development in Sudan

Historically, Sudan is considered as an agricultural country "bread-basket" for Arabic countries [26]. And further, Sudan has been taught from other developing countries, especially after get its independence that exporting agricultural commodities as raw materials are not beneficial for Sudanese economy. Agricultural commodities such as Cotton, Gum Arabic, and livestock continue enhancing the national economy through the allocation of financial resources for the development. For decades, Sudan starts exporting primary agricultural

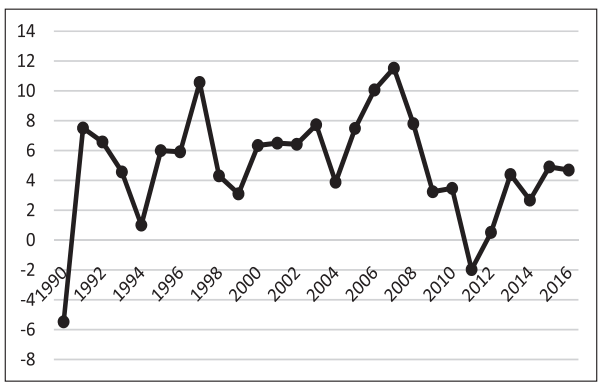
commodities as raw materials and is still lagging behind, unable to benefit from the availability of resources including human and natural, besides the good climate, and location. The economic reform policy provided the framework to concentrate on agro-based industries, which becomes one of the alternatives to diversify the Sudan's economy.

In the early 1960s, Sudanese government began a series of ten-year plans to develop the productive sectors. One of the major programs was the establishing textiles factories, edible oil processing industries, flour Industry, and other food-processing industries. As part of broader structural adjustment programs in the late 1970s, Sudan has attracted the Arabic financial resources and mobilized domestic savings to build the national economy, many sugar companies were established. However, in early 2000, the Sudanese government has attracted China's Foreign Direct Investment (FDI) to discover and produce oil products.

Since the early 2000s until 2011, the economic policies have focused on producing and exporting crude oil and ignored the other productive sectors such as agriculture and manufacturing. However, these policies have longer support the process of economic development, especially after Sudan lost 75% of its oil revenues due to the secession of South Sudan. Sudan has rich with other natural resources and considered as bread basket for the Arab world where the agricultural holds reserves of fishing, forestry and some of the underexploited sectors that have huge economic development potential.

Sudan is one of the most fasted growing during the years of 2005-2010, due to producing and exporting oil. However, the years followed the secession of South Sudan in 2011 were accelerated all these trends. Sudan has been facing an economic shock, a negative economic growth, lower production of both agricultural and industrial outputs. As a result, two economic reform plans were successfully implemented to return the economy to the normal. In recent years, the economic shock created by the secession of South Sudan and losing nearly 75% of oil revenues have decreased the Sudan's growth. Therefore, as a result economic growth was declined causing an economic shock which has been a common phenomenon in recent years.

Figure-2: Sudan's Real Economic Growth 1990-2016



Source: World Bank, 2018

Figure-2 displays the evidence that the negative and fluctuation of Sudan's economic growth, for instance in 1991 and 2011, where the growth was negative

-6% and -3% respectively. At the end of 2016, the real growth was 2.8% supported by oil-transit fees, agriculture, and minerals, and is projected to reach 7.2% by the end of the five-year economic reforms program. However, in the coming years, economic growth and development are expected to grow, especially after the government initiated economic policies that allow the industrial and manufacturing sector leads the growth.

Linking Education and Industry: some evidence from the NPCID

The universities and vocational institutes in Sudan have failed to produce high quality of labor that have job-relevant skills, which has become a constraint in the ability of Sudan to innovate. However, Sudan has established many technical, collages, universities and vocational institutes; more recently, the government has established the NPCID to provide industrial and manufacturing sector with skilled labor, but these efforts have not increased the skills for most participants and the majority of them are not fully employed.

Another challenges is that the private sector is unable to grow to meet the oversupply of labors among college and university students, which estimated to reach 2.5 million unemployment by 2020. However, in 2015 the industrial and manufacturing sector employs nearly 14% of the labor force and the output per labor was dropped by 30% from SDG18,804 in an early 1980s to 5833.4 in 2016. This can be justify to the absence of industrial strategies and lower investments in infrastructure, science and technology that would raises the skills and knowledge among workers. However, the establishment of the NPCID had in view, in the first place, to provide industrial and manufacturing sector with skilled workers that would contribute and sustain economic growth. One of the key pillars that the NPCID targets is enhancing the labor skills that would create the knowledge society. The program is designed to mobilize the industrial and manufacturing sectors and provides them with the capacity building that matches the labor market. The NPCID recently organized many training programs and provided over 1200 trainees with required skills that may qualify them to the labor market. We argues that the project, which initiated in 2015 has not achieved some progress, where majority of the trainees are not fully employed, and it fails to establish partnerships and channels among businesses, manufacturing sector and stakeholders.

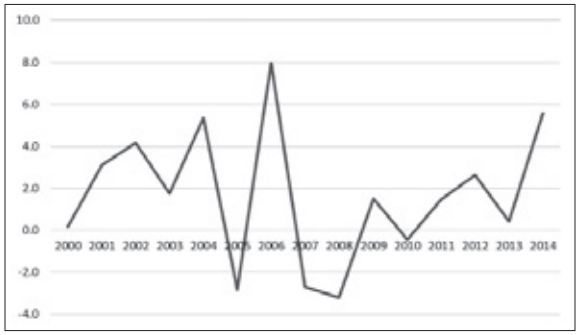
Because the universities fail to provide workforce with high skills that match the labor market, the intervention by government is considered a corrective measure. However, due to a decline in demand for skilled workers, the government has not been able to fulfill its role. However, with the shortage of skilled labor, the government can provide the industrial and manufacturing sector with incentives and subsidies that would help them secure the required technologies to increase productivity. In addition, the NPCID formulates a plan to increasing the number of technical and vocational institutions to train new college and postgraduate students every year in collaboration with private training institutions and Industrial Research and Consultancy Center. However, the current unemployment rate among skilled workers is high due to the lack of private sector and labor market conditions, which are changed drastically.

The Expansion of Higher Education

In early 1990s higher education in Sudan had witnessed considerable attention. Now there are 135 universities, university colleges, and colleges in Sudan, which

annually admit over 166 thousand Science and Technology and Innovation (STI) students to various levels of education. As a result, many Sudanese were able to get their higher degree and vocational diploma. Figure-3 presents the enrollments growth in primary schools between 2000 and 2014.

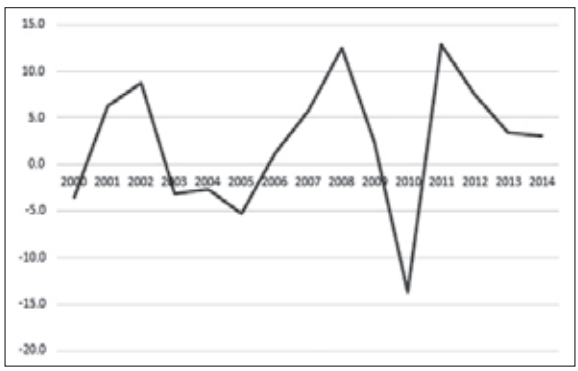
Figure-3: Growth of the Enrollment in Primary School (% gross)



Source: UNESCO, Institute for Statistics**,** 2017

Figure-3 illustrates the growth of the enrollments in primary school from 2000 to 2014, where the enrolment rates in primary education were grew from 0.2% in 2000 to 5.6% in 2014. Consequently, public and private higher education institutions have rapidly increased, and the number of students enrolled has increased and become accessible for all. The figure also shows that there was a negative growth in the 2005 and 2007 (-2.7%), and 2008 (-3.2%). This can be justified to the fact that during these years Sudan has faced conflicts in some regions that contributes to lower growth of enrollment of students in primary schools. However, the educational revaluation was faced with many challenges, the lack of qualified teaching staff and educational infrastructure coupled with the mass waves of students has led to low quality of education outputs (El-Tom, 2003). However, the gross school enrollment in tertiary colleges has witnessed rapid increases over the years from 1999 to 2012 (UNIDO, 2014), which indicates that it needs more efforts to overcome challenges such as high skilled labor to meet target 4 of the Sustainable Development Goals (SDGs) on high quality primary and secondary free education by 2030. To show this more clearly, Figure-4 presents the growth of enrollment in secondary schools over the years from 2000 to 2014.

Figure-4: Growth of Enrollment In Secondary School (% Gross)



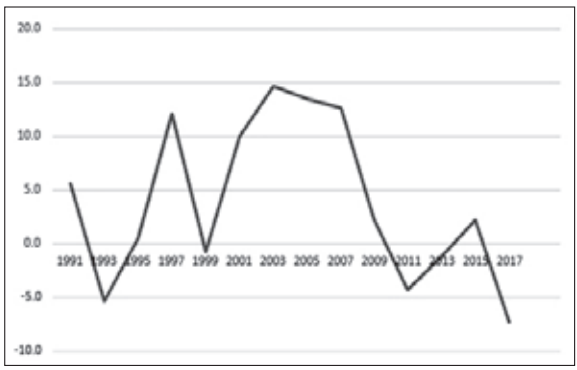
Source: UNESCO, Institute for Statistics, 2017

Figure-4 shows the fluctuation in the growth rates of enrollment in the secondary schools. For instance, in 2000 the growth of enrollment was (-3.9%), in 2002 it was (8.7%), and in the years from 2003 until 2005 was negative ranging from -3.1% to -5.2%. however, in 2010 the growth of enrollment in secondary schools was reached its slowed peak -13.8%. This fluctuation is caused by the conflicts in some regions in Darfur, South Kurdufan, and southern states, where nearly 40% of students enrolled in previous years have faced displacement besides the secession of South Sudan.

Labor Productivity and the Need for Developing Skills Capabilities

According to Sudan's Labor Force Survey in 2011, the private sector is unable to grow to meet the oversupply of labor among college and university students, which estimated to reach 2.5 million by 2020. It believed that the industrial sector is characteristic with lower capital per worker, which has been declining total factor productivity, as a result, labor productivity decreases. Figure-5 presents the growth of the output per worker, which calculated by dividing the share of industry in the GDP to the share of employment in industrial sector.

Figure-5: Output Per Worker (1991-2017)



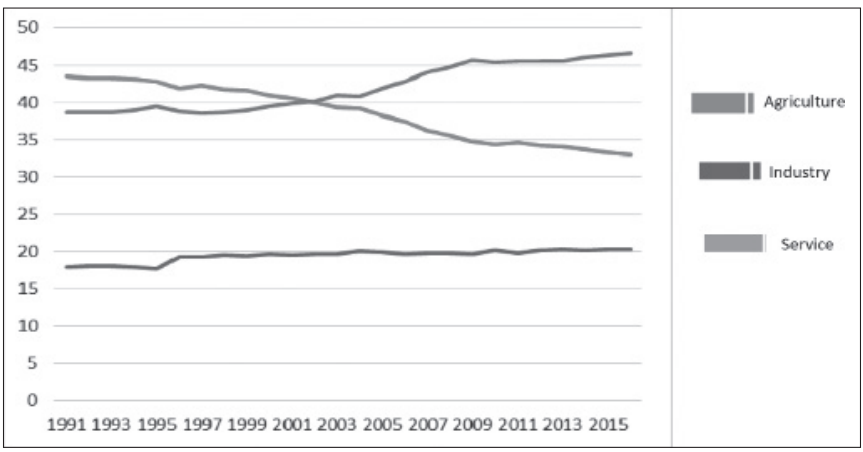
Source: World Bank, 2018

Figure-5 presents the growth of GDP per worker of industrial and manufacturing sector in Sudan, which shows fluctuation over years, but it has substantially declined in the last five years following the independence of South Sudan in 2011. Sudan has lost 75% of oil revenues; many people moved to major cities decreasing the labor force particularly in agriculture. As a result, productivity per worker is decreased in industrial sector. However, there is need to upgrade skills among workers in industrial and manufacturing sectors to adequately develop the manufacturing sector and educational system. However, in 2015 the industrial and manufacturing sector employed nearly 14% of the labor force and output per worker dropped by -7.3% in 2017, the lowest during the last three decades. This can be explained by the absence of industrial strategies and lower investments in infrastructure, science, technology and innovation that would raise the skills and knowledge among workers.

It is often argued that Sudan has been affected by brain drain, where there are many talented students who graduate from overseas recognized universities

working abroad and it difficult to find a convenient infrastructure and suitable environment to support their professional activities. We argue that most of skilled workers are working in non-productive sectors such as military, police and national servants. However, the NPCID offers a proper paradigm of the active role played by the government in training skilled workers. The main purpose of establishing the NPCID was to provide industrial and manufacturing sector with the skilled workforce. Other purposes could be the structural change especially after the revolution in the early 1990s, where massive unskilled labor immigrated to the urban areas. To show some facts, Figure-6 presents the share of employment by sector during the years from 1991-2015.

Figure-6: Employment by Sector (% of Total Employment)



Source: World Bank, 2018

Figure-6 illustrates the share of employment by sector over the period from 1990 to 2015, where the share of employment in agricultural sector dropped from 45% to 33% in the early 1990s and during the years Sudan experienced high oil boom in 2010. This can be explained by the education revaluation in early 1990s where the number of enrolled of students rapidly increased. There is witnessed a massive increase the employment rates in services, it increases from 37 percent in 1990 to 47 percent in 2015. The Industrial sector has however kept the same pattern from mid 1990s.

While Sudan has considered as a country abundant with workforce, but has been facing a big challenge as unemployment rates rose to higher levels. Until the early 2000s, the agricultural sector absorbed most of the workforce (70%), but after the secession of South Sudan and the immigration of unskilled labor to the urban areas, they got involved in non-productive sectors due to the declining agricultural output, resulting in high rates of unemployment.

Discussion and Results

Related to the previous sections, we presents our time series data results from 1980 to 2016. At first, we present the estimation results, followed by unit root results to measure the stationary of the variables using the ADF. Then, we present the results on Granger Causality Correlation matrix. Finally, results on causation is reported.

Estimation Results

Table-1: Statistical Results

Dependent variable: GDPG				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
GDPG	47,508.61	41,805.37	4.587461	0.1328**
Y	12,491.08	15,458.45	0.808042	0.4210**
POP	1,229295	0.071098	- 1.584433	0.0000*
HC	- 54,215,954	37,775,503	- 1.761979	0.0744**
K	-21,764,836	15,574392	-3.869041	0.4831**
K_HC	17,630,921	7,846,028	2,982,746	0.0856*
IND_GDP	-28,846,011	16,847,623	5,836,927	0.0003*
R-squared		0.954962	Mean of dependent var	1.51E + 08
Adjusted R-squared		0.938585	S.D. of dependent var	2.62E + 08
S.E. of regression		64,943,858	F-statistic	58.30979
Sum squared residuals		4.18E + 17	Prob. (F-statistic)	0.000000

Table-1 illustrates that the population growth and the contribution of manufacturing to the GDPG had a significant effect on GDPG, this due to immigration of labor from primary sector to modern sector specifically oil industry, which improves the productivity. The output per labor and the interaction between human and physical capital were not significant effect on GDPG, this implies there was a lack of spending in both skills and physical stock. Our first null hypothesis was accepted that labor productivity, human and physical capital positively has no effect on GDPG.

Unit Root Test

The table below shows the unit root and the stationarity by considering ADF tests to identify the integration among the variables. Our null hypothesis is that the variable is been stationary.

Table-2: ADF Test Results

Variable	GDPG	Y	IND_GDP	HC	G	POP	K
C.V for ADF	-4.24	-4.24	-4.24	-4.25	-4.3	-2	-3.55
Evidence of Unit Root at Level	1%	1%	1%	1%	1%	1%	1%
Evidence of Unit Root at First Difference	-5.4	-4.7	-6	-5.12	-6.2	-2.05	-4.243
level	1	level	1	1	1	1	

Table-2 shows the correlation among dependent variables, the physical capital was correlated with human capital and the contribution of manufacturing to the GDP, which become an engine source of labor productivity and may encourage many workers to move towards higher productivity sectors. The table also shows that the physical capital was not significant with POP, and the interaction of human and physical capital, this can be justified to that the fact that as population keeps growing, this will force many workers to move toward non-agricultural activities, and lack of human and physical capital decreases the total factor productivity.

Table-3: Correlation Matrix

	K	Y	POP	HC	K_HC	IND_GDP
K	1.00					
Y	-0.2770 (0.000) *	1.00				
POP	-0.4584 (0.1192)**	1.0486 (0.0682)**	1.00			
HC	0.3654 (0.000)*	-0.2998 (0.000)***	0.0257 (0.0012)*	1.00		
K_HC	-0.2581 (0.0802)**	0.1793 (0.0601)**	0.0271 (0.5771) **	0.0359 (0.452)	1.00	
IND_GDP	-0.4209 (0.0352)*	-0.3370 (0.000)*	0.5865 (0.0802)	0.6248 (0.000)*	0.2413 (0.000)*	1.00

*0.01 and **0.05

Physical capital (K), labor productivity (Y), population size (POP), Human capital (HC) and contribution of manufacturing to the GDP (IND_GDP).

It can be noticed that POP was not significantly correlated with K, IND_GDP, and K_HC. The results also show that the POP was positively enhanced the HC, this can be justifies to the fact that the increasing in population would push people move to the urban areas and look for a job at industrial and service sector, this would help the country to achieve the economies of scale and stimulate the economic growth.

As shown in Table-4, the human capital was significantly correlated with K, POP, and IND_GDP. The can be explain by the lack of industrial structure, where the physical capital needs high skilled labors to enhance productivity through innovating new technologies. Productivity of labor, human and physical capital were not significant, this implies to lower skills and depreciation of the physical capital.

The empirical results show that the interaction between physical and human capital was significantly correlated with the contribution of manufacturing to the GDP, this because the industrial and manufacturing sector associated with human and physical capital accumulation, while their interaction was positively correlated with all variable except population growth, this associated with the lower productivity per labor and lack of firms' efficiency, which make its commodities lower competitive in the foreign markets.

The Granger Causality tests that the cointegration and causality testing suggest that there is cointegration between GDPG and value added of manufacturing sector. Additionally, cointegration exists between GDPG and physical capital and between human capital and population growth. Causality tests show unidirectional causation from GDP to human capital but not vice versa i.e. GDP growth causes human capital but human capital does not cause GDP growth. The relationship between GDPG and interaction between physical and capital stock i.e. GDP causes capital stock, and capital stock does not cause GDP growth. It can be noticed that the relationship between capital stock and skilled labor i.e. capital stock does not enhance the human capital and human capital causes capital stock. Therefore, the null hypotheses were accepted confirming there was enough evidences of the population growth enhance the human capital accumulation.

Results on Granger Causality

It appears that education output does not contribute to economic growth in industrial and manufacturing sector. While the education outcomes took long time to impact on economic growth, this fact explains Sudan's position as there is a focus on quantity rather than quality of education.

The results above show that there is a causal relationship between GDP and average capital stock, when GDP was dependent variable and average capital stock was the independent variable, and also when average capital stock is dependent and GDP is independent. There was also a causal relationship between average human capital and GDP when average human capital is dependent and GDP is independent, and also between average human capital and average capital stock when average human capital is dependent and average capital stock is independent.

Table-4: Results on Granger Causality

Null Hypothesis	F-Statistic	Prob.
SHR_IND does not Granger Cause HC	0.137343	0.872216
HC does not Granger Cause SHR _IND	1.437611	0.253389
K does not Granger Cause HC	2.980562	0.065966
HC does not Granger Cause K	0.550761	0.58223
Y does not Granger Cause HC	2.63042	0.088599
HC does not Granger Cause Y	0.251585	0.779192
K does not Granger Cause SHR_IND	2.231554	0.124883
SHR_IND does not Granger Cause K	0.89128	0.420713
Y does not Granger Cause SHR_IND	1.241862	0.303272
SHR_IND_GDP does not Granger Cause Y	0.061773	0.940215
Y does not Granger Cause K	0.697767	0.505593
K does not Granger Cause Y	2.983509	0.065 804
HC does not Granger Cause POP	1.38473	0.025937
GDPG does not Granger Cause K_HC	1.716463	0.196881
SHR_IND does not Granger Cause GDPG	0.098344	0.046628
K_HC does not Granger Cause SHR_IND	0.35607	0.703344
GDPG does not Granger Cause K	1.719308	0.016379
Y does not Granger Cause K_HC	0.299957	0.743046
K_HC does not Granger Cause Y	3.554468	0.041176

A causal relationship also exists when average capital stock is dependent and average human capital is independent. There is no causal relationship when GDP is dependent and average human capital is independent.

Results on Test Results and Causation. From Table-4, it can be noticed that no relationship if found between GDP growth and human capital, the industrial output, and labor productivity when GDP growth was the dependent and independent variable and these variables were both independent and dependent variables. A causal relationship exists when the physical capital is dependent and GDP growth independent variable.

The causal relationship also exists between population growth and human capital when the population growth was the dependent variable and human capital was independent variables.

Table-5: Results on Test Results and Causation

Variable 1	GDPG	Y	IND_GDP	HC	POP	K	K × HC
Variable 2	HC	IND_GDP	GDPG	GDPG	HC	GDPG	IND_GDP
Causality	0.0879	0.3768	0.7038	0.1661	0.0452	0.0312	0.3564

From the above, we do accept the null hypothesis that no direct cointegration between the population rates that associated with industrial sector and the GDP growth. This does not allow us to reject assumption that there was no cointegration among GDP growth and population growth and contribution of industry to GDP, which means there was no relationship among these independent variables. This implies that the moving of lower skilled labor to modern sectors has no effect on the economic growth

Conclusion

The paper has sought to provide an overview of role of skilled workers in contributing in economic growth in Sudan. It has attempted to investigate the key factors that contribute to successful linking between education output and productive sectors. We analyzed the different aspects of skilled labor and it is contribution to economic growth in Sudan over the years from 1980-2016. The paper focused on two questions. First, to what extent do Sudan has achieved a higher levels of school enrolments, a higher index of human development but this is not resulting in higher economic growth? Second, how the investment in knowledge and higher education could transfer the Sudan's economy into higher income? The empirical results show that the population growth and the contribution of manufacturing to the GDP had a significant effect on GDP, this due to imaigration of labor from primary sector to modern sector espesificlly oil industry, which improves the productivity. The output per labor and the interaction between human and physical capital were not significant effect on GDP, this emplies the lack of spending in both skills, education and physical capital. Our first null hypothesis was accepted that labor productivity, human and physical capital positively has no effect on the GDP.

We found that human capital was not significant with most variables, this mean it does not match the labor market needs. We also found that the physical capital was correlated with human capital and the contribution of manufacturing to the GDP, which become an engine source of labor productivity and may encourage many workers to move towards higher productivity sectors. Similarly, the physical capital was not significant with POP, and the interaction of human and physical capital, this can be justified to that the fact that as population keeps growing, this will force many workers to move toward non-agricultural activities, and the lack of spending on education and skills and physical capital decreases the total factor productivity.

The results above suggest that there is cointegration between GDPG and value added of manufacturing sector. Similar cointegration exists between GDPG and physical capital and between human capital and population growth. Causality tests show an-unidirectional causation from GDP to human capital but not vice versa i.e. GDP growth causes human capital but human capital does not cause GDP growth. The relationship between GDPG and the interaction between physical and capital stock i.e. GDP causes capital stock, and capital stock does not cause GDP growth.

There was a relationship between the human capital between and capital stock i.e. human capital causes capital stock. These findings do not support the interaction between the GDP growth and capital accumulation, where the granger causality results fail to confirm causality. Compared to previous findings, suggesting no enough evidence is found to influence the GDP growth. While many scholars did not found a correlation between the two variables.

To achieve the expected development there is a need to increase the productivity and enhance the labors' skills, which may captured well by high education quality and training that match the labor market requirements. The implication is that, Sudan have successfully established the NPCID to provide the industrial sector with the skilled labors, it should ensure that these training institutes are high quality and match the students' qualifications.

Moreover, improvement over time in training institutes quality can be justify by provide them with incentives and link them with factories and research institutes. Successful policies are likely to depend on matching the education outcomes with the labor market needs. Nevertheless, from a policy viewpoint, enhancing skilled labors and improving training institutes' quality is a clear avenue to raise the labor's productivity and thereby higher sustainable growth.

Even though, the National Project for Continuous Industrial Development (NPCID) is devoted to upgrading worker's skills, most of the training programs were conducted for unemployment people and these programs were introduced in the times of most difficulties for Sudan between 2015 and 2017. But the NPCID is still at early stage and needs further development to function at a full capacity to enhance human capital. The institution infrastructure for this project needs development and sufficient fund to play its role in providing labor market with skilled labor need.

As illustrated above, the major reason resulting in poor productivity and missed the opportunity to develop both the agricultural and industrial sectors lie in the fact human capital has a lack of incentives to learn modern technologies. When analyzing implications of policy for economic development, it is worthwhile to learn from the experience of successful economic development. South Korea and New Industrialization Countries (NICs), among others, are proper examples. Among these countries, we are familiar with the fact that South Korea has expanded its economy from poor to more modern industrialized country.

Based on the above, we suggest a further reform to training programs by targeting those who are fully employed in factories and industrial clusters, where the migrant workers could play a major contribution to Sudan's urban economic development. Therefore, the capital of Sudan and other major cities could specialize in high value-added production to demand these skilled workers.

References

Acemoglu, D. (1998). *Pattern of skill Premia* , *Review of Economic Studies*, 70, pp:199-230.

Alani, J. (2012). Effects of Productivity Growth on Employment Generation, Capital Accumulation and Economic Growth in Uganda*, International Journal of Trade, Economics and Finance*, 3(3), pp:170-175.

Bartel, A. (1994). Productivity Gains from the Implementation of Employee Training Programs , *Industrial Relations,* 33(4).

Barrett & and O'Connell (1994). *Does Training Generally Work? The returns to In-Company Training,* Bonn: IZA – Institute for the Study of Labor. Discussion paper 51.

Barron, J., D. Black & M. Loewenstein (1989). Job matching and on-the-job training*, Journal of Labor Economics,* Vol. 7, pp:1-19.

Dearden, L., H. Reed & J. van Reenen (2000). Who Gains When Workers Train? Training and Corporate Productivity in a Panel of British Industries, *Working Paper w00/04*, London: Institute for Fiscal Studies.

Duarte, M. & Restuccia, D. (2006). The role of the structural transformation in aggregate productivity*, The Quarterly Journal of Economics*, 125(1), pp:129-173.

Elryah, Y. (2016). Misallocations of Human Capital in the Context of New Structural Economics Framework: Evidence from Sudan, *Bus Eco J*, 7, pp: 258.

El-Tom, M. E. (2013). *In African higher education: an international reference handbook, Bloomington and Indianapolis,* Indiana: Indiana University Press.

Fagerberg, J, & B. Verspagen (2002). *Technology-Gaps, Innovation-Diffusion and Transformation: an Evolutionary Interpretation*, *Research Policy*, 31, pp:1291-1304.

Freeman, R. & M. Kleiner (2000). Who Benefits from Employee Involvement: Firms or Workers?*, American Economic Review*, 90(2).

Groot, W. (2009). Productivity Effects of Enterprise-Related Training*, Applied Economic Letters*, 6(6).

Hansson, B. (2001). *Marketable Human Capital Investments: An Empirical Study of Employer Sponsored Training*, *Working Paper*, Stockholm: School of Business.

Hansson, B., U. Johanson & K. Leitner (2003). *The impact of human capital and human capital investments on company performance: Evidence from literature and European survey results, Background Report*, Luxembourg: Office for Official Publications of the European Communities , pp:264-315.

Holzer, H., et al. (1993). *Are Training Subsidies for Firms Effective? The Michigan Experience, Industrial and Labor Relations Review*, 46(4).

Ibrahim K. Ibrahim., et al. (2014). *Skills Development in Sudan: The Formal and the Informal Reality,* International Labor Organization.

Laurie Bassi., et al.(2004). *The Impact of U.S. Firms' Investments in Human Capital on Stock Prices,* Washington DC: Lucas,

R. E. (1988). On the machanics of Economic Development, *Jornal of Monetary Economics*, 22, pp:3-42.

Jaan Masso & Priit Vahter (2012). The Role Of Product Level Entry And Exit In Export And Productivity Growth: Evidence From Estonia, *University of Tartu - Faculty of Economics and Business Administration Working Paper Series 86*, Faculty of Economics and Business Administration, University of Tartu (Estonia).

Kathuria V. & Raj (2009). Is Manufacturing an Engine of Growth in India?, Analyis in the Post Nineties, Paper for the UNU-WIDER/UNU-MERIT/UNIDO

Workshop, Pathways to Industrialisation in the 21st Century. New Challenges and Emerging Paradigms.

Lin J. Y. (2011). New structural economics: A framework for rethinking development, *The World Bank Research Observer,* 26(2), pp:193-221.

Mankiw., David Romer. & Weil (1992). A Contribution of the Emporics of Economic Growth*, Quarterly Journal of Economics*, pp:407-437.

Nour, S. (2011). *Assessment of industrial performance and the relationship between skill, technology and input–output indicators in Sudan,* Springer Series Contributions to Economics, AG, Cham, Switzerland: Springer International Publishing.

Rapoport & Docquier (2012). Globalization, Brain Drain, and Development*, Journal of Economic Literature,* 50(3), pp: 681-730.

Ratnasingam et al. (2017). Productivity in wood*, BioResources*, 12(1), pp:1430-1446.

Rodrik (2017). *Structural Change, Fundamentals, and Growth: An Overview*

Spence, M. (1973*)*. Job Market Signaling*, Quarterly Journal of Economics*, 87(3).

Tamkin, P., et al. (2004). *Skills Pay: The contribution of skills to business success,* Institute for Employment Studies.

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The Effect of Low and Negative Interest Rates: Evidences from India and Bangladesh

Moid U. Ahmad[1]
Md. Mahabbat Hossain[2]

Abstract

Interest rates have a significant effect on any economy. As a policy, the central bank of any country adopts of interest policies of different types as a monetary strategy to influence various macroeconomic parameters such as FDI, inflation, exchange rate, and economic growth. The local and global economic scenario influence the decision to adopt Ultra Low Interest Rate Policy (ULIRP) or Negative Interest Rate Policy (NIRP) or a high rate policy. In global economy it is very common that the interest rate structure of a one country may affect the interest rates and other economic parameters of a co-integrated economy. This premise is the very basis of this study. The US and UK economies have recently witnessed a very low and negative interest rates. Indian and Bangladesh economies are integrated with US and UK economies and thus may be affected by their prevailing interest rates. The objective of this research is to study the integration of Indian and Bangladesh economies with western economies in context to interest rates particularly negative interest rates and ultra-low interest rates. One of the key findings of the research is that the transmission of UK and US interest rates have a same lag effect on Indian and Bangladesh economies.

Keywords: Bangladesh, India, Low Interest Rate, Macro Economy, Negative Interest Rate

Introduction

> *'RBI ready to tackle any impact of Fed rate hike'*, Raghuram Rajan, Governor, Reserve Bank of India (Source: Business Standard, December 12, 2015).

Repo rate is one of the main monetary policies tools that affects the liquidity of banking system, and influence the different macroeconomic variables such as economic growth, inflation, foreign direct investments, and foreign exchange rate,(Ahmad and Nasrin, 2017). When Fisher describes the relation between inflation and both real and nominal interest rates, where the real interest rate equals to the difference between nominal interest and inflation rates, he argues that monetary policy must focus mainly to manage the excepted inflation in order

1 Assistant Professor, Jaipuria Institute of Management, Noida and can be reached at professor.moid@gmail.com

2 Assistant Professor, Bangladesh Institute of Bank Management (BIBM), Mirpur-2, Dhaka,Bangladesh and can be reached at mahabbat@bibm.org.bd

to keep real interest rate at stable level which promotes saving and investment (Tymoigne, 2006: 2-4). Hicks (1937) develops a model as a way to understand the Keynes' general theory. He state that '*interest rates have a natural zero lower bound, implying that they could never by negative'*, and if we neglect the costs of holding money, it will always be profitable to hold money rather than to lend it. Later on, the economist Milton Friedman formalizes a variant of Hicks assumption known as the Friedman rule. He argues that the optimal level of nominal interest rates is zero, which means that there is neither a tax nor a subsidy on cash,(Friedman,1969).

"*Negative interest rates are not only here to stay for the future, but until inflation targets are achieved, more central banks are expected to adopt them to remain competitive",* (Twomey, 2016).

"Nominal interest rates cannot be negative although real interest can be", (Fischer, 1995).

As in 2015, many countries across the globe maintained, negative/low interest rates, (Table-1).

The near-zero rates or ultra-low interest rates is meant to aid an ailing economy but it poses serious challenges for banks, insurers, pension funds, and savers. The policy rationale is that by making mortgages and other loans cheaper, the economy growth can be revived but this policy has repercussions as profits go down, investment strategies are ignored, cost cuts and banking/ insurance services become more expensive.

"A fall in interest rates have implications on bond prices also" (www.businessweek.com).

Countries follow a ULIRP to discourage deposits by making it chargeable with an objective all money should be there in the market and nothing should be kept in the banks to revive the economy and counter deflation. Another consequence of ULIRP is that Investment funds in a country may look forward for investing in economies such as India and China to invest and earn better returns.

Ilgmann and Menner (2011) in their research review the historical aspect of negative rates starting from the 'taxing money' proposal of *'Silvio Gesell'* up to the researches and concepts discussed till the financial crisis of 2008. They found that 'taxing money' proposals highlight a serious policy issue and if this goes on much longer, we'll be living in the world of "free money". Ilgmann and Menner (2011) also found that the financial crises of 2008 has influenced various authors to suggest negative nominal interest rates as a way for stimulating consumption and investment in a demand-driven recession and that real interest rates on money should be lowered further to counter a deflationary economic environment.

The ULIRPs and NIRPs are becoming more common in recent times. Natwest Bank and Royal Bank of Scotland have should intent to charge customers to hold deposits. This policy is one of the foremost initiatives as a result of globally low and negative interest rates, (Brodbeck, 2016). Joshua and Delano (1990) conducted a study on determinants of private investment in 23 Less Developing Countries (LDCs) for the time period 1975-1985 and they found that the real interest rate is inversely related to investments, which is logical also.

As a policy, the central bank of any country may adopt interest rate policies of different types as a monetary strategy to influence various macroeconomic parameters such as FDI, inflation, exchange rate, and economic growth. The

local and global economic scenario influence the decision to adopt Ultra Low Interest Rate Policy (ULIRP) or Negative Interest Rate Policy (NIRP) or a high rate policy. In global economy it is very common that the interest rate structure of a one country may affect the interest rates and other economic parameters of a co-integrated economy. The economies of United States of America (USA) and United Kingdom (UK) have seen a very low and negative interest rates historically (Table-4). Indian and Bangladesh economies are integrated with US and UK economies and thus are affected by their prevailing interest rates (Table-2). Thus, it becomes imperative to study that effect and influence of interest rates in USA and UK on the economies of India and Bangladesh.

India, USA and Bangladesh are major trade partners (Table-2). The ULIRPs in USA is expected to boost its local economy and also some capital will flow out of the economy (probably to India and Bangladesh). As a consequence, local USA, Indian and Bangladesh economy, together, is expected to get a boost of money supply. Subsequently, USA will encourage imports from India and Bangladesh, enhancing their exports and vice versa. Another consequence of this dynamics is that because of differential interest rate policies by different countries, funds flowing to other economies may affect the local economy through their influence on inflation, interest rates, exchange rates and GDP growth. This forms the basic research premise of this research which becomes very imperative in current economic scenario.

Review of Literature

While Ahmad and Premaratne (2018) study the effect of negative and low interest rates between US, UK and Indian, Sri Lankan economies and they find out that interest rates affect both economies and that the effect has a lag of eight years. During the global financial crisis in 2008 that caused by the burst of the housing bubble and led to contract the US economy for 18 months, and consequently affected both developed and developing economies, for example, Economic activity in the G7 countries dropped by more than 5% and EU economies spiraled into a debt crisis. (Wang, 2017: 7). Central banks in several economies respond by declining interest rates sharply, till it hits to zero boundary, and they believe to be the lowest boundary, however these economies remained stagnant and needed stimulus, (Dougherty, 2009). In 2009, for the first time a Central Bank goes to NIR territory, where the Swedish Riksbank announced a -0.25% deposit rate.

From the middle of the year 2014, the EU Central Bank applied a series of schemes to relax its monetary policy against declining inflation, to support economic growth and to reduce the pressure on exchange rate appreciation. These measure included the gradual lowering of the interest rate facility of deposit, making it negative. As per this policy, the key interest rate that had stood at 0% in July 2012, declined to negative 0.1% in the mid of 2014, reduced subsequently and reached a low of negative 0.4% in March 2016 (Pereo and Kashama, 2017: 43).

Mwabutwa et al. (2016) found that inflation and real output responses to monetary policy shocks changed over the period and was found to be more consistent under stable macroeconomic conditions. The noted economist Irving Fisher supports the hypothesis that there is a positive relationship between inflation and interest

rates. Berumnet et al. (2007) tried to validate this hypothesis in developing and developed countries and found that the Fisher hypothesis holds in all Group 7 countries but fails to hold in more than 50% of the 23 developing economies. Fisher and Terrell (2000) in their research found that an increase in the global interest rate will deteriorate trade as local interest rates may rise and domestic demand may reduce. This deterioration in terms of trade is eventually reversed in the long-run.

Teodora (2009) holds that Vector Auto Regression (VAR) approach endogenously determines all the variables which make up the system and using Vector Error Correction Model (VECM) he validated that the basic transmission mechanism runs from base money (via interest rates) to the exchange rate and subsequently to prices. Working on equilibrium rationing hypothesis, King (1986), concluded that loan supply is responsive to the loan rate, in contradiction to the hypothesis. If interest rate changes, loan rates would change and effect the liquidity in the market which will affect the economic output. If interest rates fall below zero, people will prefer to hold money rather than deposit in the banks, in this case spending of government can raise GDP but increasing the supply of money will do nothing. However, there is a way to achieve NIR and that is to enhance inflation. Thus in the current model, the only way to escape from liquidity trap is either increasing government spending or reducing inflation (Parkin & King, 1995). Arteta et al. (2016) study the NIR policy sources and implications in both developing countries and emerging markets in order to investigate the immediate and long-term impact of this monetary policy. They find that the NIR policy spillover implications for emerging markets and developing economies are similar to those of other unconventional monetary policy measures. Moreover, NIR policy could introduce risks to financial stability, in case if the policy, rates are substantially below zero or if it is adopted for long period. Finally, they conclude that NIR policy has no significant effect to change the inflation rate expectations. Ball et al. (2016), aim to identify if central banks have effective instruments that stimulate the economy when nominal interest rates reach zero. The main conclusion of the study is that central banks can make nominal interest rates as negative as needed to spur recoveries from recessions. Gylych (2016) examines the effect of interest rate on Nigerian's economy growth rate of over the period 1990 to 2013. The study finds that interest rate has negative significant impact on economic growth, and therefore the lower interest rate will increase investment and rapid economic growth. Heider et al. (2016) found that when the interest rate is positive, the rates of deposits are closely linked to policy rates, while, if the interest rates become negative, banks, which depend on deposit funding, are fearing to reduce rates fearing which will lead to losing funding base. In cases of sticky deposit, interest rates reduce lending margins, and banks tend to move its activities to fee based services.

Molyneux et al., (2017), employ a bank level dataset for more than sixteen thousand bank working in thirty three OECD countries during the period 2012 to 2016. They aim at comparing among the NIR adopted countries and that did not apply the policy in terms of changing in bank lending. The study concludes that bank lending was weaker in NIR adopted countries than other countries.

The literature review shows that, there many economists argue about general monetary policies and interest rate, but few of them have written about NIR and LIR in particular, this is may be due to they are still experiencing and observing

its effects. Our paper is focused on negative and low interest rates and does a comparative study for India and Bangladesh and thus is a unique study of its kind.

Data Analysis and Discussion

Table-1: Countries and Interest Rates (2015)

Country Name	Rate of Interest
Ukraine	-13.12
Sierra Leone	-5.74
United Kingdom	-1.31 (for 2014)
Egypt, Arab Rep.	0.62
Israel	0.76
Macao, China	0.83
Mexico	0.89
Hong Kong, China	1.02
Hungary	1.11
Chile	1.14
Republic of Korea	1.29
Myanmar	1.52
The Bahamas	1.57
Iceland	1.63
United States	2.24
Swaziland	2.48

Source: data.worldbank.org

Table-2: Largest Exporter and Importer for Respective Countries (2015)

	Imports (percentage of total)
Bangladesh	China 22.4%, India 14.1%, Singapore 5.2%
India	China 15.4%, UAE 5.5%, Saudi Arabia 5.4%, Switzerland 5.3%, US 5.1%
	Exports (percentage of total)
Bangladesh	US 13.9%, Germany 12.9%, UK 8.9%, France 5%, Spain 4.7%
India	US 15.2%, UAE 11.4%, Hong Kong 4.6%

Source: www.cia.gov

Objective and Methodology

The objective of this study is to understand the dynamics of ULIPs and NIRPs on the economies of India and Bangladesh. To achieve the objective, relevant time series data has been extracted from the website of World Bank (data.worldbank.org) which sources its data from different organizations such as International Monetary Fund (IMF), United Nations Conference on Trade and Development (UNCTD) and official national sources. The time period of data used is 1960-2015, annual data, as available with the source.

Gretl software and SPSS 16 software were used for econometrics based analysis. List of variables used, including their explanations, is given in the study is given in Table-3.

Mwabutwa et al. (2016) investigated the evolution of monetary transmission mechanism in Malawi region by using a time varying vector autoregressive (VAR) model to evaluate the interrelationship between output and prices to bank rate, exchange rate and credit. Teodora (2009) is of the opinion that Vector Auto Regression approach endogenously determines all the variables which make up the system. A similar methodology was used by Ahmad (2015). The current research also used VAR based analysis as lag effect becomes very imperative in

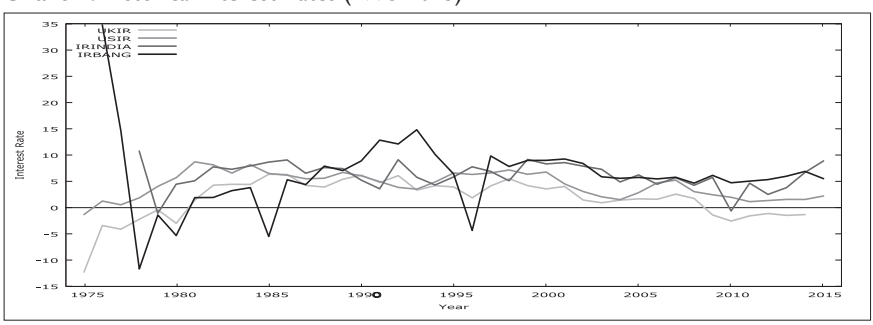
such analysis. This study considers all relevant variables as endogenous variables in the VAR system. Correlation coefficients and basic statistics have been also analyzed.

Table-3: List of Variables Used in the Research and Respective Explanations

Variable	Unit	Gretl Code
Interest rates for United Kingdom	%	UKIR
Interest rates for United States of America	%	USIR
Inflation rate for India	%	INFLATIONINDIA
GDP growth rate for India	%	GDPINDI
Foreign Exchange Rate for India	Amount	ERINDIA
Inflation rate for Bangladesh	%	INFLATIONBANG
GDP growth rate for Bangladesh	%	GDPBANG
Foreign Exchange Rate for Bangladesh	Amount	ERBANG
Interest Rates for India	%	IRINDIA
Interest Rates for Bangladesh	%	IRBANG
Foreign Direct Investment for India	Amount	FDIINDI
Foreign Direct Investment for Bangladesh	Amount	FDIBANG
Explanation of Variables		
Inflation	This is the annual growth rate of the GDP deflator showing the rate of price change in the economy as a whole.	
GDP growth rate	This is the annual growth rate of GDP at market prices based on constant local currency (U.S. dollars).	
Foreign exchange rate	This refers to the official exchange rate determined. Annual average, local currency units relative to the U.S. dollar.	
Foreign direct investment (net inflows)	This refers to direct investment equity flows in the reporting economy. It is the sum of equity capital, reinvestment of earnings, and other capital.	
Real interest rate	This is the lending interest rate adjusted for inflation as measured by the GDP deflator.	

The below given Chart-1 compares the historical interest rates for UK, USA, India and Bangladesh economies for the period 1975-2015. The graph suggests that USA, UK and Indian rates have moved in the same direction whereas Bangladesh rates have shown more extreme fluctuation over the time period and falling below zero at two significant historical junctures, once after gaining independence and once during the Asian crisis. Every time the rates have declined, they have recovered within 2-3 years. Also, post 1996, the rates in Bangladesh have stabilized and were found to be above Indian, UK and USA rates. It is observed that the movement of rates during the period 2008-2011 (Subprime crisis period) where all the rates (except Bangladesh) have either become negative or very low.

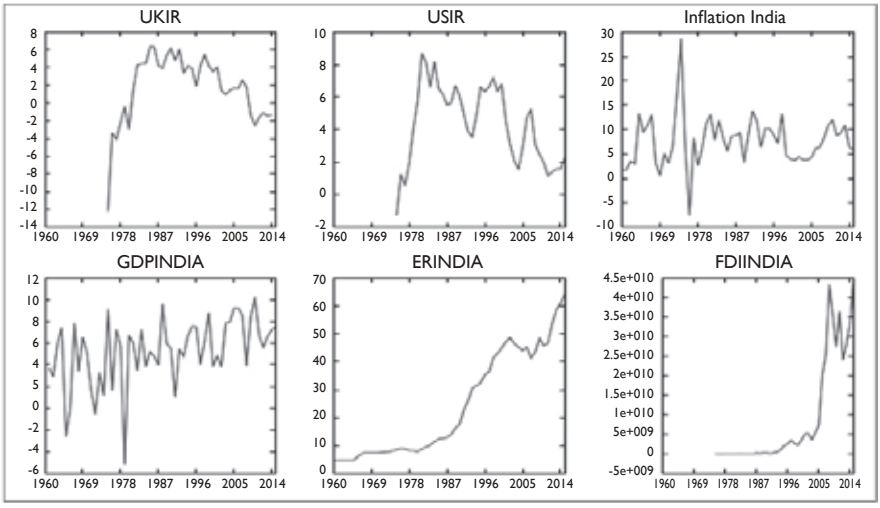
Chart-1: Historical Interest Rates (1975-2015)



Source: Authors' own calculation

It is observed in Chart-2 that in the later part of 70s, inflation in India was on a higher side and FDI was very low. At the same time, interest rates in India, UK (Chart-1) were negative and in USA (Chart-1) it was very low. Indian Rupee exchange rate is observed to be constantly becoming weak against US Dollar, occasionally becoming strong for very short periods. The FDI flow dropped twice after the subprime crisis but picked up in the later part of the time period for India.

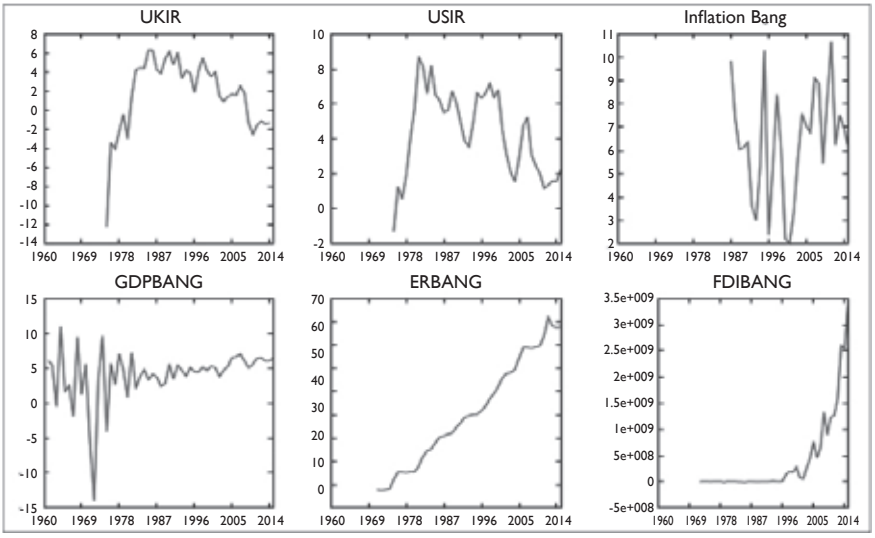
Chart-2: Graphical Representation of Economic Parameters for India



Source: Authors' own calculation

By analyzing Chart-3 for Bangladesh, it can be said that inflation is indicating extreme volatility, GDP growth has stabilized after independence in 1971, foreign exchange rate is constantly becoming weak against US dollar and FDI flow has improved significantly post 1996. Overall, it seems that's post 1996, Bangladesh economy has been doing good.

Chart-3: Economic Parameters for Bangladesh



Source: Authors' own calculation

The Coefficient of Variation is found to be high for FDI in India and Bangladesh and highest for UK interest rates making them few of the most volatile variable. Negative correlation is found between real interest rates and investments in other studies like Hyder and Ahmed (2003), Joshua and Delano (1990). Here a negative but low correlation is found between interest rate and FDI for Bangladesh and moderately negative for India.

Table-4: Descriptive Statistics (1960 – 2015)

Variable	Mean	Median	Minimum	Maximum
UK.IR	1.74	2.22	-12.24	6.35
US.IR	4.33	4.74	-1.28	8.72
INFLATION.INDIA	7.65	7.53	-7.63	28.60
GDP.INDI	5.29	5.71	-5.24	10.26
ER.INDIA	24.20	13.44	4.76	64.15
INFLATION.BANG	6.35	6.22	2.01	10.70
GDP.BANG	4.10	4.80	-13.97	10.95
ER.BANG	41.30	39.57	7.70	81.86
FDI.INDI	8.90E+09	2.14E+09	-3.61E+07	4.42E+10
FDI.BANG	4.19E+08	9.83E+06	-8.01E+06	3.38E+09

	Standard Deviation	Coefficient of Variation	Skewness	Kurtosis
UK.IR	3.75	2.16	-1.38	2.83
US.IR	2.44	0.56	-0.18	-0.91
INFLATION.INDIA	5.07	0.66	0.85	4.57
GDP.INDI	3.09	0.59	-1.06	1.46
ER.INDIA	18.76	0.78	0.52	-1.26
INFLATION.BANG	2.37	0.37	-0.16	-0.58
GDP.BANG	3.81	0.93	-2.33	8.32
ER.BANG	22.96	0.56	0.18	-1.21
FDI.INDI	1.39E+10	1.55	1.40	0.44
FDI.BANG	7.89E+08	1.88	2.27	4.61

Source: Authors' own calculation

The below given Table-5 presents a summary of correlation analysis amongst explanatory variables. Analyzing the correlation coefficients, it is observed that UK and USA interest rates are high, positively correlated (0.76) amongst themselves and have equal and negative relationship with GDP of India (-0.18), negative with Indian currency exchange rates and FDI. A similar type of relationship is observed between UK and USA interest rates and Bangladeshi variables of FDI (negative), interest rates (negative) and inflation (negative). USA interest rates are low but positively correlated (0.03) with Bangladeshi GDP with a bias (0.3) towards UK interest rates. Just like any macroeconomic variable, the transmission of interest rate effect may also have a lag effect which is further analyzed in a Vector Auto Regression (VAR) system (Table-7).

The correlation of UK and USA interest rates with inflation of India is positive and with Bangladesh, it is negative. This indicates a contrary economic effect of the UK and USA interest on Inflation in India and Bangladesh.

Table-5: Correlation Coefficients for All Variables

	UK.IR	US.IR	Inflation India	GDP India	ER India	IR India	FDI India	Inflation Bang	GDP Bang	ER Bang	IR Bang
UK.IR	1.00	0.76	0.20	-0.18	-0.02	0.45	-0.29	-0.22	0.30	0.01	-0.01
US.IR	0.76	1.00	0.30	-0.18	-0.34	0.27	-0.44	-0.15	0.03	-0.34	-0.23
Inflation India	0.20	0.30	1.00	-0.01	-0.02	-0.41	0.10	0.31	0.14	-0.12	-0.34
GDP India	-0.18	-0.18	-0.01	1.00	0.44	0.20	0.27	0.28	0.21	0.49	-0.11
ER India	-0.02	-0.34	-0.02	0.44	1.00	-0.12	0.71	-0.04	0.32	0.96	0.09
IR India	0.45	0.27	-0.41	0.20	-0.12	1.00	-0.27	-0.47	-0.12	-0.21	-0.06
FDI India	-0.29	-0.44	0.10	0.27	0.71	-0.27	1.00	0.36	0.44	0.81	-0.05
Inflation Bang	-0.22	-0.15	0.31	0.28	-0.04	-0.47	0.36	1.00	0.24	0.21	-0.26
GDP Bang	0.30	0.03	0.14	0.21	0.32	-0.12	0.44	0.24	1.00	0.47	0.03
ER Bang	0.01	-0.34	-0.12	0.49	0.96	-0.21	0.81	0.21	0.47	1.00	0.05
IR Bang	-0.01	-0.23	-0.34	-0.11	0.09	-0.06	-0.05	-0.26	0.03	0.05	1.00
FDI Bang	-0.31	-0.46	-0.03	0.28	0.72	-0.18	0.87	0.26	0.27	0.74	-0.03

Source: Authors' own calculation

The results from co-integration and regression analysis are indicated in Table-6. Interest rates of India and Bangladesh are regressed over UK and USA interest by running the Ordinary Least Square method (OLS). Here, Durbin-Watson (D-W) statistic is used to understand autocorrelations in the regression. The D-W statistic is a number that tests for autocorrelation and should be between 0 and 4 where a D-W value 2 means that there is no autocorrelation in the sample. It was found (Table-6) that USA and UK rates are integrated with Indian interest rates rather than Bangladesh rates but this relationship could be better explained for India (R-squared of 20% and 7%) rather than Bangladesh ((R-squared of 0% and 5%). Also, the regression coefficients were found to be positive for India and negative for Bangladesh.

Table-6: Results of Co-Integration Analysis

Sl. No	Dependent variable	Independent variable	Co-integration and level	R-squared at level 0 (%)	DW-statistic at level 0	Regression coefficient at level 0
1	IRINDIA	UKIR	Yes, Level 0	20	2.15	0.4
2	IRINDIA	USIR	Yes, Level 1	7	1.77	0.3
3	IRBANG	UKIR	Yes, Level 1	0	0.9	-0.02
4	IRBANG	USIR	Yes, Level 1	5	1	-0.7

Source: Authors' own calculation

To understand the lag effect of interest rates, Vector Auto Regression (VAR) methodology is followed based on Sims (1980). The results of VAR analysis are depicted in Table-7. This analysis is done on interest rates for Indian and Bangladeshi economies, separately. VAR systems are generated at various lags and the optimum regression equation was selected based on Akaike Information Criterion (AIC) and R-squared values. Lag 9 onwards VAR could not be generated for both countries because of lack of sufficient degrees of freedom. Apart from D-W statistic, heteroskedasticity (ARCH) is also analyzed for respective VAR systems. All the three variables were considered as endogenous variables in the VAR system. The best regression of the two VAR systems was found for Bangladesh

interest rates at lag 8 with high R-squared value (96%) and no autocorrelation (D-W of 2.1) or ARCH effect. A similar lag was also found for India and Sri Lanka (Ahmad & Premaratne, 2018).

Analyzing the output illustrated in Table-7, the Indian and Bangladeshi interest rates are influenced by UK and USA interest rates with variance explained at 95% and 96%, respectively. This effect is best measured at a lag of 8 years for both the countries.

Table-7: Summary of VAR Systems

Sl. No.	Dependent variable	Independent variable	R-squared	D-W statistic	Optimum lag	ARCH effect present
1	IR.INDIA	UKIR, USIR	95%	3.3	8	No
2	IR.Bang	UKIR, USIR	96%	2.1	8	No

Source: Authors' own calculation

Conclusion

The research had an objective to understand the dynamics of Ultra Low Interest Rate Policies (ULIRPs) and Negative Interest Rate Policies (NIRPs) on the interest rates and economies of India and Bangladesh. It was found that the two developed economies (USA and UK) are co-integrated with the two developing economies (India and Bangladesh) and surely the interest rates have a pass through effect on local macroeconomic variables such as interest rates, GDP growth, inflation, foreign exchange rates and FDI flows. The transmission of interest rates has a lag effect, which is found to be same (lag 8) for both Bangladesh and India. An almost zero R-squared value of Bangladesh interest rates with UK rates and very low R-squared value (5%) with US rates hints at other factors influencing interest rates in Bangladesh other than interest rates of UK and USA. This is a further area of research which can be explored by researchers.

It is observed that UK and USA interest rates are high, positively correlated amongst themselves indicating a double effect on economies which are trading partners for both the countries, like India and Bangladesh. This gives a hint to policy makers that they may think of a 'portfolio' of major trading partners and investment partners where diversification should be done based on correlation and co-integration amongst the portfolio countries. The correlation of UK and USA interest rates with inflation in India is positive and with Bangladesh, it is negative. This indicates a contrary economic effect comparing India and Bangladesh, which is validated through VAR results also. A contrary effect was observed for correlation between UK and US interest rates and FDI flows for India and Bangladesh where negative correlation is found for Bangladesh (-0.31, -0.46) and moderately negative (-0.29,-0.44) for India. A similar effect of UK and USA interest rates is found on FDI and exchange rates for both India and Bangladesh but different effect for GDP is found where Indian GDP is negatively and equally correlated (-0.18) with UK and USA interest rates whereas Bangladesh GDP is positively correlated with UK interest rates (0.3) and very low (0.03) correlated with USA rates. If US and UK follow a policy of reduced interest rates, India will benefit with increased FDI and improved GDP which may be attributed to NIRP and ULIRP of US and UK. Policymakers in India are expected to keep a tab on US and UK interest rates while deciding a monetary policy for India.

References

Ahmad, M. U. & Nasrin, S. (2017). An analysis of the effect of monetary policy changes on macroeconomic factors, *Theoretical and Applied Economics*, 24(2), pp:303-318.

Ahmad, M. U. (2015). An Analysis of market P/E using Auto Regression and Vector Auto Regression Models, *Samvad: SIBM Pune Research Journal*, 10, pp: 116-120.

Ahmad, M.U. & Premaratne, H.A.G.(2018). Effect of Low and Negative Interest Rates: Evidence from Indian and Sri Lankan Economies, *Business Perspective and Research*, 6(2),pp:90-99.

Arteta, Carlos et al.(2016) Negative Interest Rate Policies: Sources and Implications, *Centre for Economic Policy Research Discussion paper 11433*.

Ball L., et al. (2016), What Else Can Central Bank Do? *Geneva Reports on the World Economy 18*, ICMB and ECPR.

Bangladesh Bank. (2016). *Financial Stability Report 2015,* Issue 6.

Berument, H. et al.(2007). Inflation uncertainty and interest rates: is the Fisher relation universal?, *Applied Economics*, 39(1), pp: 53-68.

Black, F. (1995). Interest Rates as Options, *Journal of Finance,* 50(5), pp:1371-1376.

Brodbeck, S. (2016). Banks warn businesses to prepare for negative interest rates, *Money Marketing (Online)*.

Fisher, W.H. & Terrell, D. (2000), World Interest Shocks, Capital, and the Current Account,, Review of International Economics, 8(2), pp:261-274.

Friedman M. (1969). *The Optimum Quantity of Money and Other Essays*, IL: Aldine, Chicago.

Gesell, S. (1934). The Natural Economic Order, Money Part.

Greene, J. & Villanueva, D. (1990). Determinants of Private Investment in LDCs, *Finance and Development*, December 1990.

Gylych J. (2016).The Impact Of Interest Rate On Economic Growth Example Of Nigeria, *African Journal of Social Sciences*, 8(2), pp:51-64**.**

Heider F., Saidi F. & Schepens G. (2016). Life below zero: Bank Lending Under Negative Policy Rates, *Europe Central Bank and Stockholm School of Economics Working paper*.

Hicks J. (1937). Mr. Keynes and the "Classics": A Suggested Interpretation, *Econometrica,* 5(2),pp: 147-159.

Hyder, K. & Ahmad, G.M. (2003). Why Private Investment in Pakistan has Collapsed and How Can it be Restored?

Ilgmann, C. & Menner, M. (2011). Negative nominal interest rates: history and current proposals, *International Economics & Economic Policy*, 8(4), pp: 383-405.

Keynes, J. (1936). *General Theory of Employment, Interest and Money*.

King, S. R. (1986). Monetary Transmission, *Journal of Money, Credit & Banking*, 18(3), pp: 290-303.

Molyneux P. et al. (2017). Did Negative Interest Rates Impact Bank Lending?, *Bangor Business School, Working paper BBSWP/17/02.*

Mwabutwa, C. N., Viegi, N. & Bittencourt, M. (2016). Evolution of Monetary Policy Transmission, Mechanism In Malawi: A TVP-VAR Approach, *Journal of Economic Development*, 41(1), pp:33-55.

Parkin M. & King, D. (1995). *Economics,* 2nd edition, Addison-Wesley Publishers Limited.
Philips, M. & Campbell, D. (2012).The Hidden Burden of Ultra-Low Interest Rates.
Sims, C.A. (1980).Macroeconomics and reality, *Econometrica*, 48(1),pp: 1-48.
Twomey, B.(2016). The New Negative Normal, *Modern Trader*, June, pp:60-62.
Tymoigne, É. (2006). Fisher's Theory of Interest Rates and the Notion of "Real": A Critique, *The Levy Economics Institute Working Paper series*, 483,pp: 2-4
Warwick, B.(2016), Going Negative, *Investment Advisor*, 36(4), pp:22-26.
www.bloomberg.com
www.business-standard.com
www.businessweek.com
www.cia.gov
www.data.worldbank.org

Appendix I

Banking Sector Month-Wise Deposit & Advance Rate in Bangladesh

Month	Deposit Rate	Advance Rate	Spread
January 2015	7.26	12.32	5.06
February 2015	7.19	12.23	5.04
March 2015	7.06	11.93	4.87
April 2015	7.04	11.88	4.84
May 2015	6.99	11.82	4.83
June 2015	6.80	11.67	4.87
July 2015	6.78	11.57	4.79
August 2015	6.74	11.51	4.77
September 2015	6.66	11.48	4.82
October 2015	6.58	11.35	4.77
November 2015	6.46	11.27	4.81
December 2015	6.34	11.18	4.84

Source: Bangladesh Bank (2016)

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Does Growth Affect Environment? Evidence from the World

Surender Mor[1]
Geeta Singh[2]

Abstract

The study tests the Environmental Kuznets Curve (EKC) hypothesis on GNI per capita and CO2 emission for 39 economies of the world using panel data for the period 1990-2015. The findings confirm the existence of EKC hypothesis with inverted 'U' shape relationship between income and environmental degradation with turning point occurring at the US $ 40617 per capita and US $ 42468 per capita respectively for the world economy (WE) and lower-middle-income economies (LMIE). On the other hand, the study refutes the existence of inverted U shape EKC for high-income economies (HIE) and upper-middle-income economies (UMIE) and support a 'U' shape EKC relationship for the same. The acceptance of inverted 'U' shape EKC implies that there is inevitable damage to environmental resources in the early phase of economic development of an economy and the environmental quality tends to improve in the later stages of development. On the other hand, the establishment of 'U' shape EKC reflects increasing degradation of environment even at the higher level of income. Hence, countries can decide on the present value of higher future growth and the better quality environment in future at the cost of the current rate of degradation of environmental resources.

Keywords: Environment Degradation, EKC, Emission, Income, 'U' Shape

Introduction

Climate change refers to the long-term variation in the weather as a consequence of the atmosphere being altered by humankind's activity. The 20th century witnessed phenomena of first-time increase in the earth's temperature giving way to many global bads like GHGs, ozone layer depletion, pollution, waste problems, deforestation, desertification, depletion of exhaustible resources, destruction of ecosystems, loss of biodiversity, acid rain etc. Human activities like rapid industrialisation, urbanisation, modernisation etc. cause fast degradation of environmental resources. The galloping population of the world (1.6-7.6 billion from 1900-2018), besides human activities, has considerably strained the global resources especially environmental resources. Besides, transportation and construction sectors, the agriculture sector is likely to be worst affected by

1 Professor, Dept. of Economics, Bhagat Phool Singh Women University, Khanpur Kalan, Sonipat, Haryana and can be reached at surendermor71@gmail.com

2 Director, UGC-HRDC, Centre for Professional Development in Higher Education, University of Delhi and can be reached at geetanjali1908@gmail.com

the climate change as crop production is expected to increase in temperate areas and decline in the tropics with moderate warming giving way to severe regional disparities in African & Asian continent. Research indicates that in 1^{o}C increase in temperature (without an increase in rainfall) is more adverse than the increase in 2^{o}C temperature when accompanied by a 10 mm increase in rainfall in the production of food crops (Mor, 2011; Singh, 2017; Mor & Madan, 2018).

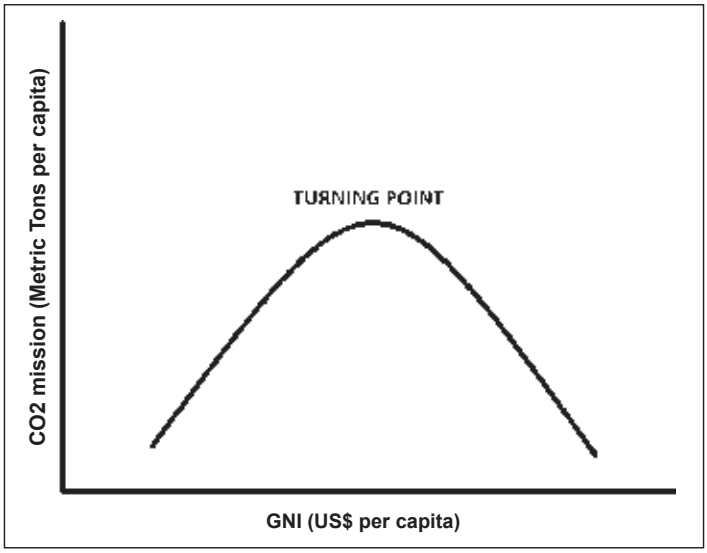
The international concern over the environment has grown in an unprecedented way at economic, political, social and scientific levels, which forced nations to commit a reduction in the concentration of greenhouse gases (GHGs) in the atmosphere. Resultantly, countries all over the world agreed to reduce GHGs to 1990s level during the Earth Summit (1992) at Rio-De Janeiro. The long-term objective of the Rio summit is to stabilise the concentrations of GHGs in the atmosphere at a level that would prevent dangerous anthropogenic interaction with the climate system. Keeping the spirit alive, the Kyoto protocol (1997) was signed in Kyoto, where industrialized nations committed themselves to mitigate overall GHG's emission by 5.2 per cent in 2008-2012 compared to 1990 base year (Singh, 2006). The momentum continues in the 21st century too as the Paris agreement, under the United Nations Framework Convention on Climate Change (UNFCCC) was approved by consensus on 12th December 2015, which will deal with emission of GHGs, adaptation and finance for environmental management for keeping the global mean temperature well below 2 degrees Celsius by 2100 AD.

The Environmental Kuznets Curve is named after Noble Laureates Simon Kuznets (1955), who hypothesized an inverted 'U' income-inequality relationship. Grossman and Krueger (1991), Shafik & Bandyopadhyay (1992) and Panayotou (1993) were pioneers to introduce and expand the applications of EKC. These studies support the existence Environmental Kuznets Curve hypothesis and further established the inverted U-shaped relationship between several pollutants and per capita income. The Environmental Kuznets Curve (EKC) describes a relationship between economic growth (income) and environmental degradation such that in the early phases of economic growth, the rate of environmental degradation would rise with an increase in income. However, above some threshold level of income, the level of environmental damage due to economic activity would begin to fall. The EKC hypothesis assumes that environmental degradation is something unavoidable in the early stage of economic growth. Consequently, a developing country is forced to accept some degradation in their environment in the process of development. In other words, the opportunity cost of economic development is a loss of environmental resources in the initial phase of growth.

Holtz-Eakin and Selden (1995) conducted the study on EKC for CO_2 for a panel of 108 countries for the period from 1951-1986 and found support for an EKC with estimated turning point occurs at the US $35,428 per capita. Moomaw and Unruch (1997) confirmed the existence of EKC hypothesis with V shape relationship using a data of 16 developed OECD countries for the period 1950-1992 with turning points ranges the US $ 8,884 to $ 15,425. Schmalensee et al. (1998) used carbon dioxide emission for 141 countries for the period 1950-2050 and found an inverted 'U' shaped EKC. Agras and Chapman (1999) found the turning point of CO_2 for the US $13630 per capita a surprisingly low amount of income. Heil and Selden (2001) used a second order polynomial in income per capita with several specification tests to study a panel data from 135 countries over

the period 1951-1992 and reported a monotonous increasing relationship between CO_2 emissions and income per capita.

Figure-1: EKC – Visualization of Income Environmental Trade Off



Martinez-Zarzoso and Bengochea-Morancho (2004) observed the inverted U shape relationships between CO_2 and GDP using panel data for 22 OECD countries for the period from 1975 to 1998. Olusegun (2009) found a 'U' shaped relationship meaning with the increase in GDP, CO_2 first declines then begin rising again for Nigeria. Lee et al. (2009) examined the Environmental Kuznets Curve hypothesis for CO_2 emission and found the evidence of the EKC hypothesis for middle income American and European countries. Mor and Jindal (2012) investigated the relationship between economic growth and environmental quality using panel data on 39 countries and found inverted 'U' shape relationship between income and environment with turning point at the level US $ 30088 PPP per capita. Singh (2014) confirmed the existence of EKC hypothesis and found an inverted 'U' shape relationship between income and environment. Kilic and Balan (2016) examined the EKC relationship in 151 countries for the period 1996-2010 and found an inverted U-shaped relationship between income and environmental degradation.

The perusal of literature related to the existence of the EKC relationship is marked a high degree with confusion with different shapes of EKC like U shape, V shape, Monotonous decreasing, inverted U shape etc. Hence, it is highly instructive to measure income and environment relationship for world economies at different income levels**.** In this backdrop, the present study investigates the relationship between GNI and CO_2 emission in 39 economies of the world, i.e., high-income economies (HIE), upper-middle-income economies (UMIE), low middle-income economies (LMIE) and low-income economies (LIE).

The paper continues as follows. Section 2 highlights the data and methodology employed in the course of the study while Section 3 devoted to the results and discussion. Section 4 reveals the conclusions and suggestions.

Data and Methodology

The present study attempts to investigate the relationship between economic growth (per capita income) and CO_2 emission – a proxy for the environmental quality, for the world using the method of least squares for the unbalanced panel data of the period of 1990-2015. It is pertinent to mention here that the world bank in World Development Indicators (2017) has categorised world economies on the basis of per capita as high-income economies (US $12,476 and above), upper middle income (US $4,036 to US $12,475), lower middle income (US $1,026 to US $4,035) and low income (US $1,025 or less). In all, a sample of 39 economies has been selected from the whole world giving a due representation of 20 per cent of each of four categories has been sampled as detailed below:

Table-1: List of Sample Countries by GNI (Nominal, Atlas Method, 2017)

Description	Selected Economies	Name of Sampled Economies
High Income Economies (HIE)	12 (out of 59)	Australia, Denmark, Iceland, Ireland, Luxembourg, Netherland, Norway, Qatar, Singapore, Sweden, Switzerland, United States
Upper Middle Income Economies (UMIE)	11 (out of 55)	Brazil, Costa Rica, Kazakhstan, Malaysia, Mauritius, Mexico, Palau, Panama, Russia, Turkey, Venezuela
Lower middle Economies LMIE)	10 (out of 52)	Armenia, Egypt, El-Salvador, Guatemala, Indonesia, Kiribati, Magnolia, Philippines, Samoa, Srilanka, Tunisia
Low-Income Economies (LIE)	6 (out of 29)	Benin, Chad, Haiti, Mali, Tanzania, Zimbabwe
World Economies (WE)	39 (out of 195)	All Above

Source: World Development Indicators, 2017.

The Database: The study uses data on Gross National Income (GNI) per capita (US $ atlas method), and CO_2 emission per capita (metric tons, per capita) and has been compiled from World Development Indicators (2017)**.** The parameters of the OLS model have been estimated by using computer EViews 10.

Estimation of Environmental Kuznets Curve

Model Specification

The study employed the ordinary least square method (OLS) to investigate the relationship between environmental degradation and economic growth on panel data related to 39 economies for the period 1990-2015. The EKC model considers CO_2 as a dependent variable representing the environment quality and income (a proxy for growth) as the independent variable. The following emission model has been employed during the course of the study:

$$E_{it} = \beta_0 + \beta_1 Y_{it} + \beta_2 Y^2_{it} + U_{it} \quad (1)$$

E = CO_2 emission (metric ton, per capita)

Y = GNI (US $ per capita)

Y^2 = Square of GNI (US $ per capita)

U = Stochastic term

i =Country

t = Time

β's= parameters to estimated

In Equation (1) if $\beta_1 > 1$ and $\beta_2 < 1$ then the estimated curve has a first turning point per capita income level calculated as

$$¥ = \text{Exp.}\ (-\beta_1 / 2\ \beta_2) \quad (2)$$

Results and Discussion

The basic statistics of the sampled economies is presented in Table-2 which revealed that the CO_2 Emission per capita is 22 times (6.56/0.29) lower in LIE, 4.5 times (6.56/1.44) in LMIE and 1.13times (6.56/5.85) in UMIE when compared to mean emission of CO_2 per capita. On the contrary, the mean per capita emission in HIE is 2.26 times (14.89/6.56) higher in HIE. The Table-2 further points out a similar trend in case of GNI per capita which shows a widening inequality in the per capita income of the sampled economy. The mean income per capita in the world economy is 51.60 times (25907/502), 13.52 times (25907/1915) & 4.45 times (25907/5828) higher compared to LIE, LMIE & UMIE respectively. Whereas the mean income of HIE is 1.70 times (44010/25907) more than the income of the global economy. Interestingly, the inequality in emission is more pronounced in HIE when compared to the global average (2.26 times higher) whereas in the case of GNI it is 1.70 times of world economy. The same is vice-versa in case of LIE, LMIE & UMIE, i.e., less inequality in CO_2 emission per capita compared to world average and more inequality in income when compared to the global average.

Table-2: Sample Statistics of CO_2 Emission and GNI for the World Economies

Variables		WE	HIE	UMIE	LMIE	LIE
CO_2 Emission (Metric tons per capita)	Mean	6.56	14.89	5.82	1.44	0.29
	Maximum	70.13	70.14	15.94	2.60	1.6
	Minimum	1.91	3.92	0.95	0.22	0.01
	Standard Deviation	9.6	12.91	4.37	0.61	0.39
GNI (US $ Per capita)	Mean	25907	44010	5828	1915	502
	Minimum	146010	146010	15200	4150	980
	Maximum	491	8010	241	170	130
	Standard Deviation	41211	41530	2282	1075	231

Source: Derived from the application of EViews10 on data on sampled economies.

Table-3 presents the parameter the test of causality between CO_2 emission and GNI per capita. The Granger causality test indicates that GNI is the cause of CO_2 emission for the sampled economies for the period from 1990 to 2015 at 10 per cent level of significance. On the contrary, the Granger test did not confirm the causality between CO_2 and GNI for the sampled countries of the period studied.

Table-3: Granger Causality Test Between GNI and CO_2 Emission

Description	Observations	F-Statistics	Probability
GNI does Granger cause CO_2	1012	1.62	0.903**
CO_2 does not Granger-cause GNI	1012	0.597	0.551

Note: * Statistically significant at 10 per cent level of significance.

Table-4 presents the parameter estimates of least squares for world economies including HIE, UMIE, LMIE & LIE using panel data for the period from 1990-2015. The parameter estimates for GNI per capita and GNI per capita square for world economies (WE) & lower-middle-income economies (LMIE) have been found statistically significant and are of expected sign. The findings indicate the existence of an Environmental Kuznets Curve when describing the relationship between CO_2 emissions per capita and GNI per capita that allows for a turning point (cut-off level) which corresponds to the US $ 40617 per capita & US $ 42468 per capita, respectively for world economies and lower-middle-income economies. The findings are in line with similar studies supporting the existence of EKC (Cialoni, 2007; Mor, 2012). The findings as evident from the Table-4 are very optimistic for world economies (WE) as well as lower-middle-income economies.

Table-4: Parameter Estimates Emission Model of Selected World Economies

Estimators	Parameter estimates				
	WE	HIE	UMIE	LMIE	LIE
β_0	1.7138	15.251	14.5911	0.641575	-0.05455
β_1	0.000316*	-0.000304*	-0.00512*	0.000327*	-0.000282
	(7.90)	-(1.98)	(7.41)	(2.12)	-(0.13)
β_2	-3.89E-09*	7.24E-09*	7.38E-07*	-3.85E-09*	4.21E-06
	(2.61)	(2.37)	(6.95)	-(3.87)	(0.97)
R^2	0.37	0.26	0.29	0.28	0.19
F Statistics	60.85	6.79	21.96	19.26	11.92
Turning point (US $ per capita)	40617	20995	34683	42468	33491
EKC Shape	Inverted 'U'	'U'	'U'	Inverted 'U'	'U'

Note: * Statistically Significant at 5 per cent level of significance.

Table-4 further highlights the parameter estimates of OLS for high-income economies (HIE), upper-middle-income economies (UMIE) and Lower income economies (LIE) using panel data for the period from 1990-2015. The parameter estimates for GNI per capita and GNI per capita square for high-income economies (HIE) & upper middle-income economies (UMIE) have been found statistically significant but attached with unexpected signs. The results refute the existence of an Environmental Kuznets Curve of 'inverted U' shape rather they point out the existence of a 'U' shape relationship between CO_2 emission per capita & GNI per capita for high-income economies (HIE) & upper middle-income economies (UMIE). In other words, GNI per capita is negatively related to CO_2 emission per capita which allows for a turning point or cut-off point which corresponds to the US $ 20995 and the US $ 34683 per capita respectively for high-income economies (HIE) & upper middle-income economies further indicating that environmental degradation set to increase with further increase in income in these economies. The findings are in line with similar studies supporting the existence of EKC (Lantz & Feng, 2006; Olusegun, 2009).

Conclusions and Suggestions

The study examined the Environmental Kuznets Curve (EKC) hypothesis using unbalanced panel data for 39 economies of the world for the period 1990-2015. The empirical findings of the study point out mixed results as for the world

economy (WE) it supports the existence of EKC hypothesis and inverted 'U' shape relationship between income and environmental degradation with turning point at the US $ 40617 per capita & US $ 42468 per capita for world economies (WE) and lower-middle-income economies (LMIE) respectively. On the other hand, the findings refutes the existence of inverted U shape relationship for high income economies (HIE), upper middle income economies (UMIE) and low income economies (LIE) rather it confirms the existence of 'U' shape relationship between income and environment thereby indicating that at a broad level of income growth, per capita emission of CO_2 begin to increase in high-income economies (HIE) and upper middle income economies (UMIE). The existence of inverted 'U' shape EKC is very optimistic for world and world should do best to speed-up the growth process. Further, there is enough potential for speeding up the growth process to achieve the desired level of GNI per capita. At the same time, the world needs to reduce the rate of increase in pollution. Therefore, a sort of double-pronged strategy, with one prong aimed at raising the per capita income level in economics and the other at emission mitigation strategies with strict environmental regulations would be cumulatively valuable.

References

Agras, J. & Chapman, D. (1999). A dynamic approach to the Environmental Kuznets Curve hypothesis, *Ecological Economics*, Vol. 28, pp. 267-277.

Cialoni, C. (2007). Economic growth and environmental quality. An econometric and a decomposition analysis, *Management of Environmental Quality - An International Journal*, 18(5), pp: 568-577.

Grossman, Gene M. & Krueger, Alan B. (1991). Environmental impact of the North American Free Trade Agreement, *Working paper 3914,* Cambridge, MA: The National Bureau of Economic Research.

Heil, Mark T. & Selden, Thomas M. (2001). Carbon emissions and economic development, future trajectories based on historical experience, *Environment and Development Economics*, 6(1), pp: 63-83.

Holtz-Eakin, D. & Selden, T.M. (1995). Stoking and fires? CO_2 emissions and economic growth, *Journal of Public Economics*, 57(1), pp: 85-101.

Kilic C. & Balan F. (2016). Is There an Environmental Kuznets Inverted-U Shaped Curve?, *Panoeconomicus*, Vol. 65, pp: 1-17.

Kuznets, S. (1955). Economic Growth and income inequality, *American Economic Review*, Vol. 45, pp: 1-28.

Lantz, Van & Feng, Q. (2006). Assessing income, population, and technology impacts on CO_2 emissions in Canada: Where's the EKC?, *Ecological Economics*, 57(2), pp: 229-238.

Lee C. C., Chiu Y.B. & Sun C. H. (2009). Does One Size Fit All? A Re-examination of the Environmental Kuznets Curve Using the Dynamic Panel Data Approach, *Review of Agricultural Economics*, 31(4), pp: 751-778.

Martinez-Zarzoso & Bengochea-Morancho, Aurelia. (2004). Pooled mean group estimation of an Environmental Kuznets curve for CO_2, *Economics Letters*, 82(1), pp: 121-126.

Moomaw, W.R. & Unruh, G.C. (1997). An Alternative analysis of apparent EKC-type transitions, *Ecological Economics*, Vol. 25, pp: 221-229.

Mor, S. (2011). Impact of global warming on food production, In: S. Anand (ed.) *ECODEVELOPMENT:Glocal Perspectives*, pp:111-123, New Delhi: Research India Press.

Mor, S. (2012). Globalization and Environment. An Empirical Study of Kyoto Parties, In: V. K. Kaushal, K. Rana, K. Attri & A. Rana (ed.) *Economic Liberalization. Effect and Challenges,* pp: 175-183, New Delhi: Kanishka Publishers.

Mor, S. & Jindal S. (2012). Estimation of Environmental Kuznets Curve and Kyoto Parties: A Panel Data Analysis, *International Journal of Computational Engineering and Management*, Vol.15, pp: 5-9.

Mor, S. & Madan, S. (2018). Climate Change and Food Production: A Case of Four North Indian States, In: N. Mehta & A. Arya (ed.) *Role of Public Policy in Development Process*, pp: 77-90, New Delhi: Academic Foundation.

Olusegun, O. A. (2009). Economic Growth and Environmental Quality in Nigeria: Does Environmental Kuznets Curve Hypothesis Hold?, *Environment Research Journal*, 3(1), pp: 14-18.

Panaytou, T. (1993). Empirical tests and policy analysis of environmental degradation at different stages of economic development, *Working Paper 238, Technology and Employment Programme*, Geneva: International Labour Office.

Schmalensee, R., Stoker, T.M. & Judson, R.A. (1998). World Carbon Dioxide Emissions, 1950-2050, *Review of Economics and Statistics*, 80(1), pp:15-27.

Shafik, N. & Bandyopadhyay, S. (1992). Economic Growth and Environmental Quality, Time Series and Cross-Country Evidence, *Background Paper for the World Development Report 1992*, Washington, DC:World Bank.

Singh S. (2006). The Kyoto Protocol, Toothless and Obsolete, *PURJA, Punjab University Chandigarh*, 38(2), pp: 33-42.

Singh, S. (2017). Climate Change and Indian Agriculture: An Assessment of Principal Food Crops, *Interdisciplinary Journal of Economics and Business Law*, 6(2), pp: 32-48.

Singh S. (2014). Estimation of Environmental Kuznets for India, *EPRA International Journal of Environmental Economics, Commerce and Educational Management*, Vol. 1, pp: 10-16.

World Bank. (2017). *World Development Indicators,* New York: Oxford University Press.

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Pattern of Trade and Trade Advantage in Pharmaceutical Industry in India

N.M. Varshini[1]
M. Manonmani[2]

Abstract

This paper analyses the pattern of trade and trade advantage in pharmaceutical industry during 2000-2014 in India. Indices such as Static Index, Marginal Intra-Industry Trade (MIIT) Index or Dynamic Index, Horizontal and Vertical Intra-industry Index are used to measure pattern of trade. Balassa Revealed Comparative Advantage (BRCA) Index, Theoretical Range of the BRCA value, Revealed Symmetric Comparative Advantage (RSCA) Index or Product Mapping, Normalized Revealed Comparative Advantage (NRCA) indices, Vollrath Trade Advantage Indices are used to analyse comparative and competitive advantage. It is found that the intra- industry trade was taking place at high level based on both static and dynamic indices. Pharmaceutical industry has comparative disadvantage throughout the reference period. The competitive strength is only in marginal.

Keywords: Comparative Advantage, Competitive Advantage, Pattern of Trade

Introduction

Trade is essentially an international transformation of commodities, inputs and technology which promotes welfare in two ways. It extends the market of a country's output beyond national frontiers and may ensure better prices through exports. Through imports, it makes available commodities, inputs and technology which are either not available or available only at higher prices, thus taking consumers to a higher level of satisfaction. The foremost principle of foreign trade, viz., "The law of comparative costs", signifies that what a country exports and imports is determined not by its character in isolation but only in relation to those of its trading partners. According to Samuelson "Foreign trade offers a consumption possibility frontier that can give us more of all goods than can own domestic production possibility frontier. The extension of foreign trade, according to Ricardo "will very powerfully contribute to increase the mass of commodities, and therefore, the sum of enjoyments". This will be true for each trading nation. In modern terminology, "trade is a positive sum game". Under developed countries are concerned with their international trade position, because for all of them,

1 Ph.D Research Scholar, Department of Economics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore and can be reached at varshini.nm.adu@gmail.com

2 Professor and Head, Department of Economics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore and can be reached at manomyil@yahoo.com

international trade-flow, skills, capital, machinery and implements which are essential for their economic development.

The Indian drugs and pharmaceutical industry, over the years, has shown tremendous progress in terms of infrastructure development, technology based creation as well as product usage. On the global platform, India holds fourth position in terms of volume and thirteenth position in terms of value of production in pharmaceuticals. The pharmaceutical industry has been producing bulk drugs belonging to all major therapeutic groups requiring complicated manufacturing processes as well as a wide range of pharma machinery and equipments. It has also developed excellent 'Good Manufacturing Practices' (GMP) facilities for the production of different dosage forms. Besides, the amendment to the Patents Act, 1970 and enactment of Patents Amendment Act, 2005, has opened up new avenues for the sector. The new patent regime has ushered in the era of product patents for the pharmaceutical sector, in line with the obligations under the World Trade Organisation (WTO) and Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement**.** As a result, the Indian pharmaceutical industry has become self-reliant in several areas and has developed a more sound and technologically advanced R&D segment. According to India Brand Equity Foundation, the Indian pharmaceutical market is likely to grow at a Compound Annual Growth Rate (CAGR) of 14-17 per cent in between 2012-2016. India is now among the top five pharmaceutical emerging markets of the world.

Intra-industry trade represents international trade within industries rather than between industries. Such trade is more beneficial than inter-industry trade because it stimulates innovation and exploits economies of scale. Intra-industry trade refers to the exchange of similar products belonging to the same industry. Intra-industry trade enhances the gains from trade through better exploitation of economies of scale, rather than through comparative advantage as trade leads countries to concentrate on a limited number of products within any particular industry. This leads to an expansion of world output because of the saving of fixed costs. Specialization within industrial categories may also stimulate innovation. Producing a greater variety and number of goods increases the general knowledge about technology and greater knowledge implies smaller costs of knowledge accumulation. Finally, intra-industry trade reduces the demands for protection because in any industry there are both exports and imports, making it difficult to achieve unanimity among those demanding protection.

The nature of an economy's comparative advantage has utility as it can help to identify the implications for an economy for a shift in a policy regime and to determine the influence on economic welfare both in the long run and in the short run. An understanding of comparative advantage provide clearer directives regarding the direction that an economy's trade and investment regime should adhere to in order to benefit from explicit differences in international factor endowments and relative demand. Gains from international trade are realized due to an improvement in the allocation of scarce resources when an economy produces its comparative advantage.

In this Study it was proposed that the Normalized Revealed Comparative Advantage (NRCA) index as an alternative measure of comparative advantage. The NRCA index is capable of revealing the extent of comparative advantage that a country has in a commodity more precisely and consistently than other alternative

RCA indices in the literature. As a result, the NRCA index is comparable across commodity, country, and time. Therefore, the NRCA index provides a useful tool for quantitative regional research, especially for studies on regional comparative advantage.

Measures of Revealed Comparative Advantage (RCA) have been used to help assess a country's export potential. The RCA indicates whether a country is in the process of extending the products in which it has a trade potential, as opposed to situations in which the number of products that can be competitively exported is static. It can also provide useful information about potential trade prospects with new partners. Countries with similar RCA profiles are unlikely to have high bilateral trade intensities unless intra-industry trade is involved. RCA measures, if estimated at high levels of product disaggregation, can focus attention on other non-traditional products that might be successfully exported.

Hence the study computed Normalized Revealed Comparative Advantage (NRCA) index, Balassa Revealed Comparative Advantage (BRCA), White's Revealed Competitive Advantage (WRCA) and Vollrath's indices followed by an examination of trade pattern in a longitudinal perspective. The BRCA, WRCA and Vollrath's indices has been computed in absolute terms across time. The revealed competitive advantage (Net Comparative Advantage) was calculated which gives importance to import performance of a country also. Changing patterns of comparative advantage in pharmaceutical industry has been compared across time by computing the G-L (Grubel-Lloyd) static indices, Brulhast's dynamic indices and Horizontal intra industry and Vertical Intra Industry Trade of Greenaway, Hine and Milner.

Methodology

This study is based on secondary data for the period spanning between 2000-2014. Data relating to export, import and total trade for pharmaceutical industry at world and at all India level are drawn from WTO statistical data base. Data on GDP is taken from Economic Survey and Hand Book of Statistics on Indian Economy published by Reserve Bank of India. The variables namely export and import are converted in to real terms by dividing them by GDP. Base shifting in GDP is done to bring about uniformity in values to a single base. The following statistical tools are used to analyze the data.

Tools of Analysis

Grubel – Lloyd (G-L) Index or Static Index

The G-L index created by Grubel and Lloyd in 1975 is one of the most popular Static Index measures. This index is used to measure the share of intra-industry in the trade. For an individual product group or industry i the share of IIT is formulated as:

$$GL_i = 1 - \frac{|X_i - M_i|}{(X_i + M_i)}$$

Where, Xi and Mi stand, respectively, for the exports and imports of industry i. If all trade was balanced GL_i would equal 1. On the other hand, if all trade was one-way, GL_i would equal zero. Thus, the closer GL_i is to 1 (that is, $X_i = M_i$), the more

trade in industry i is intra-industry trade. The closer GL_i is to zero (that is, either $X_i = 0$ or $M_i = 0$), the more trade in industry i is inter-industry trade. Therefore, the index of intra-industry trade takes values from 0 to 1 as the extent of intra-industry trade increases, that is, $0 \leq GL_i \leq 1$. If $GL_i = 1$, there is only intra-industry trade, no inter-industry trade. Conversely, if $GL_i = 0$, there is no intra-industry trade, only inter-industry trade. when G-L index less than 0.25 intra-industry trade level is low; when G-L index greater than or less than 0.25 or equal to 0.5, intra-industry trade is in a lower level; when G-L index greater than 0.5 and less than or equal to 0.5, intra-industry trade at a higher level; When the G-L index greater than 0.75 and less than or equal to 1, shows that intra-industry trade at a high level.

Dynamic Index

Owing to the G-L index is a static index to measure the intra-industry trade, it can't reflect the change in intra- industry trade level in different period. If the import and export increase proportion are the same in a nation, the G-L index would lapsed. Therefore, simply use G-L index to measure the level of intra-industry trade is not comprehensive. Hence the dynamic index known as Marginal Intra-Industry Trade (MIIT) index was introduced. The MIIT index first proposed by Brulhart (1994), the formula is:

$$MIIT_i = \frac{\Delta X_i - |\Delta M_i|}{|\Delta X_i| + |\Delta M_i|}$$

Brulhart points out that it is intra-industry trade, if an industry's absolute value of MIIT is less than 0.5. If the absolute value of MIIT is closer to zero, the higher level of intra-industry trade.

Horizontal and Vertical Intra-Industry Trade

Horizontal and vertical intra-industry trade was measured by using the Greenaway, Hine and Milner (1994; 1995) methodology. Nielsen and Luthje (2002) also showed that the methodology introduced by Greenaway, Hine and Milner is more appropriate for the measurement of horizontal and vertical intra-industry trade. The method introduced by Greenaway, Hine and Milner also supposes the separation of total IIT or, better said, disentangling of Bi on the belonging shares of horizontal IIT (HB_i) and vertical IIT (VB_i):

$$B_i = HB_i + VB_i$$

Following this methodology, the unit value index (UV) was calculated for exports and imports of pharmaceutical industry. Horizontal IIT is defined as a ratio between the unit value of exports UV_{xi} and the unit value of imports UV_{mi} for a particular industry i or, to put it differently, UV_{xi} / UV_{mi}. More specifically, horizontal IIT is defined (HB_i) when the unit value index (UV) was inside the range of ± 15 percent:

$$0.85 \leq UV_{xi} / UV_{mi} \leq 1.15$$

When the unit value index (UV) was outside the ±15 percent range, vertical IIT (VB_i) is defined for the particular industry. The share of vertical IIT (VB_i) is separated on the dependent share of V1 and V2 using the following condition:

$$V1: \frac{UV_{xi}}{UV_{mi}} > 1.15 \text{ and } V2: \frac{UV_{xi}}{UV_{mi}} < 0.85$$

Where V1 represents the share of vertical IIT when the ratio between the unit value of exports UV_{xi} and the unit value of imports (UV_{mi}) is greater than 1.15, and V2 represents the share of vertical IIT when the ratio between the unit value of exports UV_{xi} and the unit value of imports V_{mi} is smaller than 0.85. It is assumed that the relative quality of each product is best defined by the achieved relative price for the same product and that the relative share of V1 represents trade in vertically differentiated products of higher quality, which are sold at a higher average price, and that V2 represents trade in vertically differentiated products of lower quality, which are sold at a lower average price. In short, since the Greenaway, Hine and Milner methodology for measurement of horizontal and vertical intra-industry trade is grounded on unit value index (UV), it is able to capture adjustment costs.

Balassa's Revealed Comparative Advantage (BRCA) Index

This section is classified into two sub-sections. The former subsections analyses the BRCA in exports, while the latter focuses on the import scene which is termed as Revealed Import Dependence Index (RIDI). This will thus enable a complete picture of the BRCA scene over a period of time. An analysis of BRCA in imports gains importance due to the policies of liberalization adopted worldwide which will have an impact on the pattern of imports of the country. The study utilizes the Balassa and Bela (1965) measure of computing the RCA index as per the measure comparative advantage is 'revealed' by the relative export/import performance of individual product categories. Thus, the study is based on export and import data covering 15-years period from 2000 to 2014. The index for country i commodity j is calculated as follows:

$$BRCA_{ij} = \frac{X_{ij}/X_{wj}}{X_i/X_w}$$

Where, $BRCA_{ij}$ = Revealed comparative advantage of the i^{th} country's j^{th} industry,

X_{ij} = Merchandise exports of the j^{th} industry by the i^{th} country,

X_{wj} = World merchandise exports of the j^{th} industry

X_i = Total merchandise exports of the i^{th} country,

X_w = Total merchandise exports of the world.

If the BRCA index for a particular industry is greater than 1, it implies that the country has a revealed comparative advantage in the exports/imports of that industry and vice-versa. A positive value of BRCA might be interpreted as an indication of comparative advantage. The advantage of using the comparative advantage index is that it considers the intrinsic advantage of a particular export/import commodity and is consistent with changes in an economy's relative factor endowment and productivity.

Theoretical Range of the Balassa RCA Values

Values to provide a more even distribution of the BRCA scores, Hinloopen and

Van Marrewijk (2001) have divided the theoretical range of the Balassa Indices.

The BRCA values into four classes are as follows:

BRCA Classifications		
Class 'a'	0 <BRCA < 1	Comparative disadvantage
Class 'b'	1<BRCA < 2	Weak comparative disadvantage
Class 'c'	2 <BRCA < 4	Medium comparative advantage
Class 'd'	4 <BRCA	Strong comparative advantage

Revealed Symmetric Comparative Advantage (RSCA) or Product Mapping

RCA suffers from the problem of asymmetry as 'pure' RCA is basically not comparable on both sides of unity, as the index ranges from zero to one, if a country is said not to be specialized in a given sector, while the value of the index ranges from one to infinity, if a country is said to be specialized. The index is made symmetric, following the methodology suggested by Dalum et al. (1998) and the new index is called 'revealed symmetric comparative advantage' (RSCA). Mathematically, it can be expressed by as RSCA = (RCA-1)/ (RCA+1). This measure ranges between -1 and +1 and is free from the problem of skewness. A commodity is said to have comparative advantage in its exports if the corresponding RSCA value is positive and vice versa. In the present study, the RSCA was used to look into the comparative advantage of the selected commodities.

In a next step, the comparative advantages, i.e. competitiveness on international markets, are directly compared with the degree of export specialisation for these products. A few changes are made to RCA 1, and TBI is introduced to develop a product map. First of all, RCA 1 is modified so as to obtain a symmetric index with values from -1 to +1. This RSCA index is neutral at zero and takes the form

$$RSCA_i = \frac{RCA\ 1_i - 1}{RCA\ 1_i + 1}$$

White's Revealed Competitive Advantage (WRCA) Index

This method is an extension of Balassa's method. It takes into account import demand of a specific commodity for a country. Its advantage is that it uses both export and import data and competitive advantage is determined by both supply and demand. The revealed competitive advantage is calculated as the difference between revealed comparative export share for commodity j and revealed comparative import share for commodity j. Therefore the White's index provides the results of net comparative advantage (unlike Balassa's approach which only takes into the account of exports). The index is calculated as:

$WRCA_{ij}$= RCS_{ij} - RCD_{ij}

$$WRCA_{ij} = \frac{RX_{ij}/XW_j}{X_i/M_w} - \frac{M_{ij}/MW_j}{M_i/M_w}$$

Where,

$WRCA_{ij}$ is revealed competitive advantage of country i for commodity j, RCS_{ij} is the ratio of country i's share of commodity j to its share in total world exports,

RCD_{ij} is the ratio of country i's share of commodity j to its share in total world imports, M_{ij} is import of commodity j by country i, Mw_j is total world imports of commodity j, M_i is total world imports of country i, M_w is total world imports. If $WRCA_{ij} > 0$ and $BRCA_{ij} > 1$, then the results of both the models are identical and will show that the country has an advantage in exports of commodity j and vice versa.

The Relative Trade Advantage Index (RTA)

The Relative Trade Advantage Index (RTA), which was first used by Scott and Vollrath (1991), shows the net trade advantage/ disadvantage. This index is computed as the difference between the Relative Export Advantage (REA) and the Relative Import Penetration Index (RMP). Considering both exports and imports, the RTA is a more comprehensive measure of competitiveness, and expressed as:

$RTA_{ij} = RXA_{ij} - RMP_{ij}$

The competitive advantage revealed by this indicator is implicitly weighted by the importance of the relative export and the relative import advantages. It can be greater or less than zero. A positive value expresses a situation of net competitive advantage, and a negative one shows a competitive disadvantage. It is further elaborated as follows:

$$RXA_{ij} = \frac{\left(X_{ij}/X_{it}\right)}{\left(X_{nj}/X_{nt}\right)}$$

$$RMA_{ij} = \frac{\left(M_{ij}/M_{it}\right)}{\left(M_{nj}/M_{nt}\right)}$$

$RTA_{ij} = RXA_{ij} - RMA_{ij}$

$RC_{ij} = \ln (RXA_{ij}) - \ln (RMA_{ij})$

Results and Discussion

Pattern of Trade

Pattern of trade in pharmaceutical industry of India during the reference period under study is discussed based on static indices (G-L Indices) and Dynamic Index (Marginal Intra Industry Trade (MIIT) suggested by Brulhast (1994). As per the methodology of Greenaway, Hine and Milner (1994; 1995), separating the total IIT or, better said, disentangling of Bi on the belonging shares of horizontal IIT (HBi) and vertical IIT (VBi) were done.

Table-1 below presents the calculated static indices and dynamic indices taking in to account each reference period of the present study.

Table-1: Static and Dynamic Indices

Year	Static indices	Dynamic indices	Horizontal IIT
2000	0.4918	0.5082	3.7286
2001	0.4655	0.5345	3.8313
2002	0.5067	0.4933	3.3817
2003	0.4725	0.5275	3.9782
2004	0.4607	0.5393	4.3493
2005	0.5070	0.4930	4.2231
2006	0.5141	0.4859	4.2330
2007	0.5304	0.4696	4.2319
2008	0.4862	0.5138	5.1310
2009	0.5139	0.4861	4.5099
2010	0.5093	0.4907	4.5287
2011	0.4470	0.5530	5.3278
2012	0.4386	0.5614	5.8728
2013	0.3984	0.6016	5.9421
2014	0.3916	0.6084	5.8915

Footnote: Calculations are based on WTO statistical data base.

The G-L indices calculated to measure the static level of intra–industry trade in pharmaceutical industry of India showed that it is greater than 0.3 for all the years explaining the fact that the intra- industry trade is taking place at high level.

The above Marginal Intra Industry Trade (MIIT) indices for the trade of pharmaceutical industry proposed by Brulhast (1994) made very clear that the absolute value of MIIT is greater than 0.4, explaining higher level of intra–industry trade over the reference period from 2000 to 2014.

Details on Horizontal intra industry (HII) and the split of HII into vertical V1 (>1.15) and vertical V2 (<0.85) based on the unit value index of the pharmaceuticals trade of India for the reference period from 2000 to 2014, the following points were observed i) out of total IIT (Intra Industry Trade) only during 2001 and between 2009 and 2014 there was presence of HII during 2000,2003,2005,2007 and 2008 ($0.85 \leq HII \geq 1.15$). ii) Splitting the HII into V1 (>1.15) and V2 (<0.85), it is found that trade of all the products is taken place with higher quality. On the other hand the index of V2 showed that there is no low quality of pharmaceutical products which are exported from India.

Revealed Comparative Advantage

Balassa Revealed Comparative Advantage (BRCA) indices is calculated by for the reference period and is analyzed based on the theoretical range suggested by Hinloopen and Van Marrewik and Revealed Symmetric Comparative Advantage (RSCA) methodology given by Dalum, B.K Lauvrsen K and Villumsen for the Indian pharmaceutical industry. It is shown in Table-2.

Table-2: Indices Revealed Comparative Advantage

Year	BRCA	RSCA(Product Mapping)	NRCA
2000	1.6098	-0.3965	0.0001
2001	1.4242	-0.4566	0.0001
2002	1.2728	-0.4577	0.0002
2003	1.2381	-0.5312	0.0002
2004	1.1027	-0.5972	0.0002
2005	1.0588	-0.5999	0.0002

Year	BRCA	RSCA(Product Mapping)	NRCA
2006	1.0863	-0.5902	0.0003
2007	1.1213	-0.5780	0.0003
2008	1.1481	-0.6339	0.0003
2009	1.0291	-0.6279	0.0005
2010	1.0394	-0.6284	0.0005
2011	1.1393	-0.6539	0.0006
2012	1.3358	-0.6349	0.0004
2013	1.4207	-0.6220	0.0005
2014	1.3990	-0.6235	0.0005

Footnote: Calculations are based on WTO statistical data base.

It is evident that pharmaceutical industry has comparative disadvantage on account of both the indices since the indices under Class 'a'(0 <BRCA < 1) which is indicative of the fact that there is Comparative disadvantage throughout the reference period based on the theoretical range suggested by Hinloopen and Van Marrewik and also based on Symmetric methodology given by Dalum, B.K Lauvrsen K and Villumsen which stated that there will be Comparative disadvantage when negative values occur.

Based on Normalized Revealed Comparative Advantage (NRCA) indices it is understood that the comparative advantage from pharmaceutical industry is not having stronger comparative advantage. In other words, there was stronger disadvantage throughout the reference period under study since it is equal to zero (or less than 0.25).

White's Revealed Competitive Advantage (WRCA)

The indices calculated based on White's methodology for the reference period under study based on BRCA in export and BRCA in import is discussed based on Table-3.

Table-3: Indices of White's Revealed Competitive Advantage (WRCA)

Year	BRCA (Export) (A)	BRCA (Import) (B)	WRCA (A)-(B)
2000	1.6098	0.4321	1.1776
2001	1.4242	0.3731	1.0511
2002	1.2728	0.3720	0.9008
2003	1.2381	0.3062	0.9318
2004	1.1027	0.2522	0.8505
2005	1.0588	0.2501	0.8087
2006	1.0863	0.2577	0.8285
2007	1.1213	0.2674	0.8539
2008	1.1481	0.2241	0.9241
2009	1.0291	0.2286	0.8006
2010	1.0394	0.2282	0.8112
2011	1.1393	0.2093	0.9301
2012	1.3358	0.2233	1.1125
2013	1.4207	0.2331	1.1877
2014	1.3990	0.2319	1.1671

Footnote: Calculations are based on WTO statistical data base.

Across the years it is surprising to observe that out of 15 years, the indices of Whites Revealed Competitive Advantage (WRCA) are positive. In other words positive WRCA showed that India has an advantage in exporting pharmaceuticals since WRCA > 0 implying competitive strength with marginal record of WRCA index increasing more than 0.

Vollrath's Measures of Trade Advantage / Competitiveness

Vollrath's measures is used to examine revealed competitive advantage in the pharmaceutical industry for India from 2000 to 2014 based on three measurements namely Relative Trade Advantage (RTA), Relative Export Advantage (REA) and Revealed Competitiveness (RC). The summary of the results are presented in Table-4.

Table-4: Indices of RTA, REA and RC

Year	RTA	REA	RC
2000	4.2948	0.6330	0.6329
2001	4.5589	0.6589	0.6589
2002	4.4727	0.6506	0.6506
2003	4.4632	0.6497	0.6496
2004	3.7023	0.5685	0.5685
2005	3.0253	0.4808	0.4808
2006	2.8688	0.4577	0.4577
2007	2.8451	0.4541	0.4541
2008	2.5421	0.4052	0.4052
2009	2.7831	0.4446	0.4445
2010	2.1565	0.3338	0.3338
2011	1.9163	0.2825	0.2825
2012	2.3192	0.3654	0.3653
2013	2.3597	0.3729	0.3729
2014	2.4018	0.3806	0.3805

Foot Note: Calculations are based on WTO statistical data base.

Based on the calculations, it is noticed that all three indexes of RTA, REA and RC is positive, indicating that India has a competitive advantage in pharmaceutical products. Also, the positive values of RTA and RC indexes show that trade surplus exists in the industry. The positive value of REA indicated the high export share of India's pharmaceutical industry than the total world exports.

Conclusion

It is found based on the results that there is no low quality of pharmaceutical products which are exported from India. Intra-industry trade is taking place at high level. Based on the Comparative advantage index, advantage from pharmaceutical trade is not strong. But India has a competitive advantage in pharmaceutical products. Trade surplus exists in the industry.

References

Balassa & Bela (1965). Trade Liberalization and Revealed Comparative Advantage, *The Manchester School of Economic and Social Studies*, 33(2), pp: 99-123.

Brulhart, M. (1994). Marginal Intra-Industry Trade: Measurement and Relevance for the Pattern of Industrial Adjustment, *Weltwirtschaftliches Archive*, 30(3), pp: 600-613.

Dalum, B., Laursen, K. & Villumsen, G. (1998). Structural change in OECD Export Specialisation Patterns: De-Specialisation and Stickiness, *International Review of Applied Economics*, No.12, pp:447-467.

Greenway, D., Hine, R. & C. Milner (1994). Country-Specific factors and the Pattern of Horizontal and Vertical Intra-Industry Trade in the UK, *Weltwirtschaftliches Archiv*, 130(1), pp: 77-100.

Greenway, D., Hine, R. &nd C. Milner (1995). Vertical and Horizontal Intra-Industry Trade: A Cross Industry Analysis for the United Kingdom, *Economic Journal*, 105(433), pp: 1505-1518.

Nielsen, J.U. & T. Luthje (2002). Tests of the Empirical Classification of Horizontal and Vertical Intra-Industry Trade, *Weltwirtschaftliches Archiv*, 138(4), pp: 587-604.

Vollrath, T.L. (1991). A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage, *Weltwirtschaftliches Archive*, 127(2), pp: 265-280.

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Effects of Bilateral Trade on Business Cycles in India

Sumanpreet Kaur*

Abstract

Keeping in mind, India's faster growth and trade integration in the world economy, this study attempts to examine the effects of bilateral trade between India and China, U.S., U.K., Japan, Germany, Singapore, and U.A.E. respectively, on business cycle co-movements through the channel of trade integration over the period 1988 to 2016. Detrended Real GDP has been used as business cycle indicator for all countries and two variants of trade intensity measure are constructed to obtain two variants of interaction variable for studying the effects of bilateral trade. The empirical evidence suggests that Indian business cycles exhibit significant co-movement with those of China, U.S., and Japan for the time period under consideration. And trade integration channel further confirms that effects of China and U.S. business cycles on Indian business cycles gets transmitted through bilateral trade.

Keywords: Bilateral Trade, Business Cycles, Trade Integration

Introduction

Business cycles are a common phenomenon to all the economies worldwide and with a greater degree of globalization and integration, the business cycles tend to transmit from one economy to another. As has been aptly said in the literature that trade has been the engine of globalization and growth, but it is worth mentioning here that trade also serves as a mode for the transmission of macro-economic effects around the globe. The ever-increasing economic integration of the world economies also facilitates the spread of macro-economic fluctuations across borders. Imbs (2003) has rightly quoted that trade in goods and financial assets affect the cross-country synchronization of business cycles. Therefore, the impact of important trading associates is essential to comprehend the business cycle fluctuations of Indian economy as well. Keeping in mind the opening up of Indian economy, in the context of structural adjustment program introduced in the wake of economic reforms in 1991, its mandatory to know the business cycles of its trading partners and to check if such anomalies, if any, are getting transmitted to India through the channel of trade integration, financial integration, specialization or similarity in structures etc. Countries with stronger and closer trade links tend

* Ph.D. Research Scholar, Department of Economics, Panjab University, Sector-14, Chandigarh, India and can be reached at preet.suman912@gmail.com

to be more closely linked in macro-economic performance and consequently, to have highly correlated business cycles. However, the role of trade integration in synchronizing the business cycles is quite ambivalent. If one goes by the Ricardian or Heckscher-Ohlin theory of trade, then international trade between two countries will lead to a greater degree of specialization which will cause lesser output correlations and thus no synchronization between the paired countries. But if the countries are engaging in intra-industry trade, then larger quantum of trade may lead to higher output correlations and therefore, business cycle synchronizations as well. The role of international trade in transmitting business cycle fluctuations across countries has been widely documented and investigated. Accordingly, trade linkages have important implications for the formation of optimum currency areas as well. The potency of such a proposal lies in the fact that economies are more likely to benefit from a currency union if they have higher trade integration and more harmonized business cycles (Frankel and Rose, 1998). It can be seen from the available literature that for industrial economies, the stronger trade linkages pave way for highly correlated business cycles (Clark and van Wincoop, 2001). However, the linkages are seen in developing nations as well, though of a weaker magnitude (Calderon, Chong and Stein, 2007)

The present study aims at analyzing the Indian business cycles for some of its major trading partners to look for significant co-movements if any. It further identifies the role of bilateral trade in the transmission of such fluctuations across countries. Therefore, the channel of trade integration is considered for checking the propagation of business cycles from the partner nations to India. Henceforth, the paper is organized into successive sections. Section 2 sums up the existing literature and empirical evidence on business cycle co-movements across different nations. Section 3 deals with data and methods employed for the fulfillment of the set objective for this paper. Section 4 reports and discusses the empirical findings for India and Section 5 concludes the paper and suggests areas for further research.

Review of Literature

Few empirical studies which have analyzed the synchronization and correlation amongst trading nations through any of the channels like inter-industry trade, intra-industry trade, financial integration, specialization, the similarity of structures etc. are summed up below:

Frankel and Rose (1997) studied the suitability of a country's membership to European Monetary Union on the basis of trade intensity and Frankel and Rose (1998) investigated the entry of a country into a currency area on the basis of trade linkages by using a general equilibrium model of international trade for twenty-one countries over the period of thirty years and concluded that counties with closer trade links tend to have more tightly correlated business cycles. Clark and Wincoop (1999) examined and compared the extent of business cycle synchronization amongst fourteen European countries and nine U.S. regions with a dataset on employment and GDP from 1961 to 1997. The study concluded that business cycle correlations are significantly higher U.S. regions than the European nations. Imbs (2003) estimated a system of simultaneous equations for examining for examining the determinants of business cycle synchronization for eighteen countries over the time period from 1983 to 1998. The results indicated that nations with similar specialization patterns and financial integration have more

synchronized business cycles. Shin and Wang (2003) studied the relationship between trade integration and business cycles for twelve east Asian economies for 1976 to 1997 by analyzing data on real GDP and trade volume. The findings disclosed that the business cycles become correlated through the intra-industry trade channel. Calderon (2008) enquired if higher trade between Latin American economies and India and China is causing larger output correlations among them by taking a sample of 147 countries for the time period 1965 to 2004. Jayaram et. Al. (2009) analysing the business cycle synchronization between India and a set of industrial economies in general and U.S. in particular, for the period 1992 to 2008 by employing Harding-Pagan's concordance index and the results suggested that the linkages of Indian business cycle are stronger when measured against a group of industrial nations as opposed to only against U.S. Bhattacharya et. al. (2013) examined the role of degree of financial openness on the propagation of an exogenous terms of trade shock on business cycle volatility in India by developing a small open economy real business cycle model for the time period 1992-2010. On comparison with other emerging economies, the results suggested varied analyzing.

Research Methodology

Data Sources

For analyzing the transmission of cyclical fluctuations from rest of the world into the Indian economy through the channel of trade, data on aggregate economic activity and trade variables is required for India and its seven trading partners, namely, China, United States, United Kingdom, Japan, Germany, Singapore and the United Arab Emirates. The trading nations have been chosen keeping in mind the strong trade relations with Indian economy and the statistics as revealed by World Bank's World Integrated Trade Solution (WITS) on India and its major trade partners. Real GDP, with the base year 2010, has been taken up for calculating the business cycles and measures of nominal exports and imports and nominal GDP are considered for estimating the trade intensity between India and the respectively paired trade partners. The data has been sourced from WITS database from 1988 to 2016.

Model Specifications

The business cycles are estimated on the basis of the cyclical component of real GDP, isolated by applying Hodrick-Prescott filter (HP filter). For instance, a time can be defined as $Y_t - T_t - C_t + I_t$ The HP filter decomposes a time series into these respective, cyclical, trend and irregular component. The detrended time series are employed for the analysis of business cycles which are deviations from a long-term growth. The impact of business cycles of commercial partners of India on its own business cycles are calculated by fitting the following equation:

$$Y_{i,t} = \alpha + \beta IV^{i}_{t,j} + \varepsilon_{j,t} \quad (1)$$

where, i: India, j: Trading Partner, $Y_{i,t}$: Business Cycle of India, $X_{j,t}$: a row vector comprising the business cycles of trading partners.

In order to confirm if business cycle effects are transmitted to India through its trade with other countries, an interaction variable is built by multiplying the

trade intensity between India and the paired nation with the business cycle of that nation. In the first place, the bilateral trade intensity is measured by constructing two variants of trade intensity measures between two countries I and j at a point in time t. The first variant is calculated by following a formula suggested by Frankel and Rose (1998) which normalizes the trade intensity by nominal GDP of partner nations and therefore it is dependent on size.

$$T^1_{i,j} = \frac{1}{T}\sum_{t=1}^{T}\frac{X_{i,j,t} + M_{i,j,t}}{Y_{i,t} + Y_{j,t}} \tag{2}$$

where $X_{i,j,t}$ denotes total merchandise exports from the country I to j, $M_{i,j,t}$ represents imports to the country I from j, $Y_{i,t}$ denotes nominal GDP in the country I and $Y_{j,t}$ denotes nominal GDP in country j at time t.

The second variant is estimated by following Clark and van Wincoop (2001) based on Deardorff (1998) model, which is independent of size.

$$T^2_{i,j} = \frac{1}{2}\frac{1}{T}\sum_{t=1}^{T}\frac{(X_{i,j,t} + M_{i,j,t})Y^W_t}{Y_{i,t} * Y_{j,t}} \tag{3}$$

where, Y^W_t is world GDP.

T^2 differs from T^1 in that it depends only on trade barriers, and not on country size. Therefore, the second variant is a more accurate measure of the extent of integration amongst partner nations. In particular, Deardor (1998) shows that T^2 equals 1 if preferences are homothetic and there are no trade barriers.

Accordingly, the two variants of interaction variable can be defined as:

$$IV^1_{i,j} = \sum_{t=1}^{T} X_{j,t} * T^1_{i,j} \tag{4}$$

$$IV^2_{i,j} = \sum_{t=1}^{T} X_{j,t} * T^2_{i,j} \tag{5}$$

So, now the effect of bilateral trade between India and its commercial partners can be analyzed by estimating the following model:

$$Y_{i,t} = \alpha + \beta IV^k_{i,j} + \varepsilon_{j,t} \tag{6}$$

where, $IV^k_{i,j}$ is a row vector comprising interaction variable of trading partners.

Results and Findings

The unit root-testing is a pre-requisite to know the order of integration before carrying out analysis on time-series data. The order of integrations aids in finalizing the econometric estimating techniques to be employed for getting the results. Therefore, all the data series are subject to unit root analysis. The stationarity of the candidate series is tested using Augmented Dickey-Fuller (ADF) test, Philips Perron Unit Root test (PP), Dickey-Fuller Generalized Least Square test (DF-GLS) and Kwiatkowski, Phillips, Schmidt and Shin test (KPSS)[1]. Table-1 sums up the results of respective tests regarding the order of integration of the cyclical component of real GDP of India and its trading partners. Since all the variables come out to be level stationary as per all the tests so the model for testing business cycle inter-connections can be estimated by applying Ordinary Least Squares (OLS) method to fit the regression.

1 Interested readers may contact the author for detailed results on Unit Root Analysis.

Table-1: Unit-Root Test Results

COUNTRY	ADF	PP	DF-GLS	KPSS
INDIA	I(0)	I(0)	I(0)	I(0)
CHINA	I(0)	I(0)	I(0)	I(0)
U.S.	I(0)	I(0)	I(0)	I(0)
U.K.	I(0)	I(0)	I(0)	I(0)
JAPAN	I(0)	I(0)	I(0)	I(0)
GERMANY	I(0)	I(0)	I(0)	I(0)
SINGAPORE	I(0)	I(0)	I(0)	I(0)
U.A.E.	I(0)	I(0)	I(0)	I(0)

Note: I(0) represents the order of integration at the level.
Source: Author's Calculations.

Table-2 reports the results for OLS estimates for testing co-movements between India and its trading partners' business cycles. The results suggest that business cycles of China, U.S., and Japan are positively and significantly correlated at 5 per cent and 10 per cent with India's business cycles. However, the results are not significant for other countries. It can be inferred from these empirics that international trade has embedded synchronous movement in business cycles of India with China, U.S., and Japan. Though, U.S. and China both lie on completely opposite ends of a spectrum, with the U.S. being the super power from the developed nations and China being the fastest growing emerging nation from developing economies. The macro-economic fluctuations in these nations affect the performance of Indian economy.

Table-2: Effects Between India and its Trading Partners' Business Cycles

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHINA	0.197799	0.025201	7.848910	0.0000*
U.S.	0.069604	0.029461	2.362579	0.0279*
U.K.	-0.164243	0.168419	-0.975205	0.3406
JAPAN	0.104127	0.052906	1.968156	0.0624**
GERMANY	-0.068039	0.064053	-1.062227	0.3002
SINGAPORE	-0.650044	0.724246	-0.897545	0.3796
U.A.E.	-0.971858	0.623956	-1.557575	0.1343
C	6.96E-09	2536.814	2.74E-12	1.0000
R-squared	0.808803	**F-statistic**	2504.087 (0.0000)*	
Durbin-Watson stat	1.614052			

Notes: i) Figures in the parenthesis of type ( ) are p-values; ii) ** denotes significance at the 5 percent level and * denotes significance at the 10 percent level of significance.
Source: Author's Elaborations.

Table-3 reports the results for effects of bilateral trade between India and other nations by employing two different interaction variables, IV1 and IV2, depending on the two variants of trade intensity, T1, and T2 respectively as outlined in Section III. It can be concluded that both the interaction variables have a positive and significant impact in case of China and U.S. So, it can be inferred that impact of China and U.S. business cycles on India is through bilateral trade. Moreover, as per the latest facts and figures disclosed by WITS, China is the number one exporter to Indian economy with 16.96 per cent partner share followed by the U.S. with 5.72 per cent partner share. However, U.S. tops the list in total market

partner share with 16.13 per cent followed by U.A.E. and China. India and China are two of the greatest emerging powers of the world and both of them have been sharing cultural, political and trade relations since 1950. However, the India-China border conflict in 1962 was a major impediment to the bilateral trade ties between the two but the momentous visit of the then prime minister, Rajiv Gandhi in 1988 activated a phase of improvement in bilateral trade relations. As per the ministry of external affairs, India-China bilateral trade which was as low as US$ 2.92 billion in 2000, reached US$ 71.18 billion by 2016. The bilateral trade of India with China comprised of trade in electrical machinery and equipment, nuclear reactors, boilers, machinery, plastic and articles, mineral fuels, organic chemicals, fertilizers, pearls, stones, jewelry, iron and steel etc. As far as the U.S. is concerned, India's merchandise trade with the U.S. increased to $ 66.9 billion in 2014 from modest $ 5.6 billion in 1990. The trade between the two is composed of consumer goods, intermediate goods, chemical, textiles and clothing, raw materials, metal, fuels, machinery and equipment, minerals, food products etc. Therefore, the presence of strong trade ties between India and China on one hand and India and the U.S. on the other make these results quite plausible and desirable.

Table-3: Transmission of Cyclical Fluctuations to India through Bilateral Trade

	Interaction Variable1		Interaction Variable2	
Variable	**Coefficient**	**t-Statistic (P-Value)**	**Coefficient**	**t-Statistic (P-Value)**
CHINA	18.37335	1.768298 (0.0923)**	0.081702	2.098334 (0.0488)*
U.S.	37.69737	1.874199 (0.0756)**	0.133940	2.112419 (0.0474)*
U.K.	-17.94614	-0.970855 (0.3432)	-0.068671	-1.012835 (0.3232)
JAPAN	0.439058	0.021137 (0.9833)	0.033250	0.461879 (0.6492)
GERMANY	-7.978545	-0.776843 (0.4463)	-0.036448	-1.000563 (0.3290)
SINGAPORE	3.940139	0.462503 (0.6487)	0.010032	0.233033 (0.8181)
U.A.E.	0.587677	0.087561 (0.9311)	-0.016032	-0.453627 (0.6550)
C	-0.000526	-0.191896 (0.8498)	-0.000588	-0.220390 (0.8278)

Notes: i) Figures in the parenthesis of type ( ) are p-values; ii) ** denotes significance at the 5 percent level and * denotes significance at the 10 percent level of significance.
Source: Author's Elaborations.

Summary and Conclusions

The present study attempts to determine if Indian business cycles are getting affected by fluctuations originating in its trade partners economies through the channel of bilateral trade for the time period 1988 to 2016. The data on variables of interest like real GDP, nominal GDP, exports, and imports have been sourced from World Bank's World Integrated Trade Solution (WITS) for India and its major trade partners. The business cycles are obtained by isolating the cyclical component in Real GDP series with the help of Hodrick-Prescott filter. The empirical findings

indicated that Indian business cycles have a positive and significant relationship with business cycles in China, U.S., and Japan. While examining the significance of bilateral trade in transmitting these effects from trade partners to India, only China and U.S. interaction variables came out to be positive and significant. Thus, it can be inferred that Indian business cycles are closely moving with fluctuations originating in China and U.S. through the passage of bilateral trade. However, this is just one channel of transmission which has been investigated in the present endeavor, there are many other channels like financial integration, monetary dependence, fiscal closeness, specialization, similar structures etc. which shall be considered to get a universal view of co-movements in business cycles across nations. Accordingly, this present research can be extended further for investigating all other possible channels for propagating the business cycle fluctuations from one economy to another, leading to higher magnitudes of correlations and business cycle synchronization across borders.

References

Bhattacharya, R., Patnaik, M. I., & Pundit, M. (2013). Emerging economy business cycles: Financial integration and terms of trade shocks. *IMF Working Paper WP/13/119*. International Monetary Fund.

Calderon, C., Chong, A., & Stein, E. (2007). Trade intensity and business cycle synchronization: Are developing countries any different?. *Journal of international Economics*, 71(1), pp: 2-21.

Calderón, C. (2008). Trade, specialization, and cycle synchronization: explaining output comovement between Latin America, China, and India. In: M. Olarreaga, G. Perry, and D. Lederman (eds.) "China's and India's challenge to latin america: Opportunity or Threat", pp: 39-100. The World Bank Press, Washington D.C.

Clark, T. E., & Van Wincoop, E. (2001). Borders and business cycles. *Journal of international Economics*, 55(1), pp: 59-85.

Deardorff, A. V. (1998). Determinants of bilateral trade: does gravity work in a neoclassical world?. In: Frankel J. (ed.) "The Regionalization of the World Economy", The University of Chicago Press, Chicago.

Frankel, J. A., & Rose, A. K. (1997). Is EMU more justifiable ex post than ex ante?. *European Economic Review*, 41(3-5), pp: 753-760.

Frankel, J. A., & Rose, A. K. (1998). The endogenity of the optimum currency area criteria. *The Economic Journal*, 108(449), pp: 1009-1025.

Hodrick, R. J., & Prescott, E. C. (1997). Postwar US business cycles: an empirical investigation. *Journal of Money, credit, and Banking*, 29, pp: 1-16.

Imbs, J. (2004). Trade, finance, specialization, and synchronization. *Review of Economics and Statistics*, 86(3), pp: 723-734.

Jayaram, S., Patnaik, I., & Shah, A. (2009). Examining the decoupling hypothesis for India. *Economic and Political Weekly*, 44(44), pp: 109-116.

Shin, K., & Wang, Y. (2003). Trade integration and business cycle synchronization in East Asia. *Asian Economic Papers*, 2(3), pp: 1-20.

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Determinant of South Africa's Military Expenditure

Anifowose Oladotun[1]
Mabuyi Gumede[2]

Abstract

The study examines the determinants of South Africa's military expenditure from 1970 to 2017. The study is based on the neoclassical theory to estimate the determinants of military expenditure for South Africa. The Autoregressive Distributed Lag (ARDL) estimation technique was employed.

In conclusion, the result reported, revealed that four out of nine variables considered in this study were positive and significant to determine South Africa's military expenditure from 1970 to 2017. The positive and significant variables are trade balance, democracy index, inflation and external threats.

Keywords: GDP, Military Expenditure, South Africa

Introduction

Empirical studies on determinants of military expenditure in individual countries and cross-national countries abound, however, there are few studies for South Africa covering the period of 1970 to 2017. The rationale for investigating South Africa for this study are as follows, one, South Africa accounts for about 26.11% of total Sub-Sahara military expenditure and devotes a huge percentage of their total government expenditure to military expenditure has experienced a high level of both internal security challenges. The second reason is that of South Africa's involvement in regional peacekeeping missionaries in regional-conflicts makes this empirical investigation an interesting one to explore. For example, South Africa's involvement in regional and global peace keeping forces mission. Finally, on a general note, World's military expenditure has declined due to the peace dividend however; South Africa still assign a high percentage of their central government budgetary allocation to the military sector and industries despite witnessing harsh socio-economic inclusive growth challenges. For instance, South Africa is experiencing a downturn in GDP growth rates coupled with high unemployment rates, crime rates, high poverty rates, high-income disparity, climate change and a host of others. Barro (1990) and Aizenman and Glick (2006) affirmed that military

1 Ph.D. Scholar, University of Kwazulu-Natal, South Africa and can be reached at:anifowosedotun@yahoo.com.

2 Lecturer, University of Kwazulu-Natal, South Africa and can be reached at:gumeden1@ukzn.ac.za.

expenditure is not affected only by security threats, but by other socio-economic variables.

The structure of this paper is as follows: Section 2 presents South Africa military expenditure and its ranking from 1970 to 2018, Section 3 presents theoretical models for the determinant for military expenditure, Section 1.3.covers the empirical literatures, and Section 4 present the model specification and data description. In section 5, the econometric model and estimation technique will be presented,. In section 6 the empirical results and interpretation will be presented.

South Africa Military Expenditure and its Ranking from 1970 to 2017

According to SIPRI 2018, affirm that South Africa accounts for about 26.11 percent of total sub-Sahara military expenditure and with a total military expenditure of US$ 3913 million in constant 2017 price which is among the top five in the world. Table-1 present a snapshot key numbers of South Africa's socio-economic statistics.

Table-1: Key Numbers for South Africa

2016	South Africa
Population, total	55,908,865
Population growth	1,62
Military expenditure (% of GDP)	1,07
Corruption Perception score[1]	43 / 100
Unemployment, youth%	53,30
Inflation %	6
GDP growth%	0,28
Global Peace Index[2] (GPI)	126/ 163

Sources: World Bank Database Indicator (2017), Global Peace Index (GPI) (2017), Stockholm International Peace Research Institute SIPRI (2016) and Corruption Perception Index ranking (2017).[12]

South Africa is one of the most powerful countries in Sub-Saharan Africa (SSA) as well as ranked within the first 50 strongest countries in the World by military expenditure has presented in Table-2. Though, in recent times South Africa military expenditure has been reducing has presented in Figure-1. Notwithstanding, still have 2.48 percent of its military expenditure average for the periods of 1970 to 2017. This outweigh the average military expenditure of majority of North Atlantic Treaty Organisation (NATO) members' military expenditure to Gross Domestic Product (GDP) benchmark, except for France, Germany and some Former Soviet Union's Countries.

Table-2: South Africa Military Expenditure and Ranking 2017

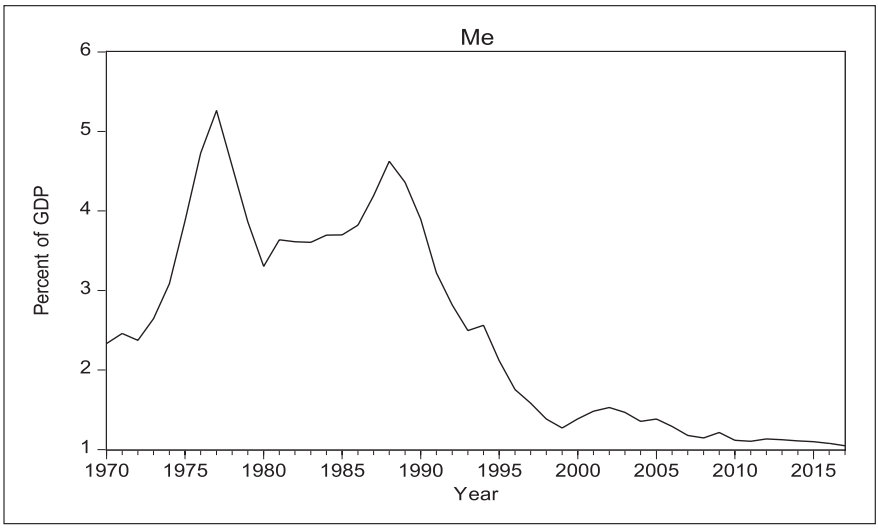
Country	World Country Ranking by Military Expenditure	Military Expenditure by Constant Million USD
South Africa	43rd	3110.20

Source: SIPRI new extended database 2017

1 A country or territory's score indicates the perceived level of public sector corruption on a scale of 0(highly corrupt) to 100(very clean)

2 GPI measures the relative position of nation's and regions peacefulness

Figure-1: South Africa Military Expenditure Trends from 1970 to 2017



Source: SIPRI new extended database 1970-2017

Theoretical Model of the Determinants for Military Expenditure

Empirical studies on determinants for military expenditure has been explored by utilizing diverse econometric estimation techniques. Furthermore, empirical studies also explored the possibility of political, geographical and socio-economic influence on military expenditure composition and trends. The determinants of military expenditure employed for this analysis is the neoclassical model.

Neoclassical Model

The military neoclassical model is chiefly centred on Smith (1980) and Smith (1995) work. It encompasses how political and economic factors influence military expenditure. The neoclassical model assumes optimization of welfare. The military neoclassical model can be written as:

$$W_1 = W(S, C, N, Zw) - - - 1$$

W-Welfare of the country; S- Security of lives and property from attacks; C-Consumption and Zw- Other factors.

Since, S cannot be measured but can be measured by using a proxy of military expenditure and other countries (this can be allies and rivals) denoted as $M_1, M_2, \ldots, M_n$. Thus, this can be substituted and incorporated into equation 1.

$$W_1 = W(M_1, M_2, \ldots, M_n, C, N, Zw) - - - 2$$

N.B. Allies military expenditure arise the country security whereas rivals military expenditure pose a threat. The military budget constraint can be written as

$$Y = P_C C + P_m M - - - 3$$

Y-nominal aggregate income; P_mPrices of military expenditure; P_c Prices of consumption and M- real military expenditure

$$M_1 = M\left(P_m/P_c, Y, N, M_1, \ldots, M_n, Z_w, Z_s\right) - - - 4$$

Welfare function is given as

$$W = \propto \log(C) + (1 - \propto)\log(S) - - - 5$$

The above is premised on the country has a rival neighbouring country M_1 and absence of allies. The security function is assumed as

$$S = M - M^* = M - (\beta_0 + \beta_1 M_1) - - - 6$$

Where

M^* - Military expenditure a country to resist its rival neighbour attack

β_0 - Fixed element not linked to rival military expenditure, it is negative if neighbouring security are natural and negative if vice versa.

β_1 - Relative effectiveness of military

Empirical Literature Review

Diverse researchers have examined the determinants for military expenditure across the globe, both in developed and developing countries and their empirical results have been mixed, thus it cannot be generalized for all countries. The determinant for military expenditure in emerging countries ranges from economic factors, socio-political factors and security to mention a few. This section provides the relevant empirical literatures on determinants of military expenditure following the above categories.

Security Threats

Provision of security for lives and properties of their citizens has been affirmed to be one the cardinal functions of the central government military and paramilitary agencies. The scope of the military and paramilitary agencies includes but not only limited to: intervening in communal clashes, inter-state boundaries disputes, national and international conflicts; Civil wars, and also participating in both regional and international peace keeping missions and ad-hoc joint task forces operations.

One of the key determinants for military expenditure identified by security / defence experts such as Dunne and Perlo-Freeman (2003)consented that external wars is one of the major determinants if not the major driver for the rise in military expenditure in developing countries. They further explained that the rise in military expenditure is triggered and evident during wartime or crisis period via the procurement of arms ammunition and rise in voluntary enrolment / conscription of young youths during such periods.

Hewitt (1991, 1992 and 1993) employing public-choice framework analysing the association between military expenditure and threats for 125 Less Developed Countries (LDCs) over the period 1972-1990 indicated that international wars positively does matter in increased military expenditure levels. (Batchelor et al. 2000), using South Africa as a case study, explored the determinants for military expenditure. They incorporated Angolan war (1977-1993) in their estimation. The empirical result indicate a significant and positive effect of war on South Africa's increased military expenditure for the period considered.

Dunne and Perlo-Freeman (2003) presented a comparative analysis of a cold war (1981-1989) and post-cold war period (1990-1997) for developing countries. The result confirmed a positive impact from external wars on military expenditure. Tambudzai (2011) and Tambudzai and Harris (2016) examined Zimbabwe's military expenditure determinants. The external wars variable clearly indicate a positive impact on Zimbabwe military expenditure on a long run basis.

Ball (1983)asserted that internal threats (civil wars) is more severe and detrimental than external threats for developing countries. Dunne and Mohammed (1995), also examined 13 sub-Saharan countries determinants for military expenditure for the period 1967-1985. The empirical result show a significant and positive impact of civil war on military expenditure. Collier and Hoeffler (2002) carried out a comparative econometric analysis between civil war(internal threats) and international wars(external threats) on military expenditure. The result indicate that civil war (internal threats) is significant and has positive impact on military expenditure than international threats (External threats).

Collier (2003) asserts that developing countries allocates 2.8 percent of its GDP to military expenditure during peacetime whereas during wartime assigns about 5 percent of national Gross Domestic Product to military expenditure and allied industries.

Security Web

The concept of security web was a product of Rosh (1988) work. The concept refers to nation's X security web as all other countries capable of influencing country X's security both at national and regional level. Rosh (1988) further explained that country X's threats levels can be ascertained by average military expenditure of Gross Domestic Product of countries in the security web. Rosh (1988) work affirmed that security web plays significant role and positively stimulate the increased military expenditure of 63 LDCs over the period 1969-1978. Dunne and Perlo-Freeman (2003) further explore the security web dynamics, by categorizing the countries in the security web into three distinct groups of Allies, neutral and rivalry/ enemies. Their empirical result were mixed for all the three distinct groups. However, Sun and Yu (1999) depicts that China's military expenditure was significantly and positively influenced by Japanese military expenditure for the period of 1965-1993. Likewise, Tambudzai (2011) affirmed that Zimbabwe military expenditure was significantly and positively influenced by growth in South Africa military arsenal for the period of 1980-2003.

Economic Factors

BARRO and SALA-I-MARTIN (1992) asserted that determinants of military expenditure is not affected by threat only but by host of economic, political and environmental factors. This section focus on empirically identified economic determinants of military expenditure.

Looney (1989) highlights that at aggregate level, economic variables such as income inequality disparity level, growth rate of GDP, budget size and Milex Industrial Complex (MIC). On a general note, GDP has been singled out as an important economic determinant of military expenditure. Other empirical studies have also used per capita GNP to examine the relationship between incomes for military expenditure.

Other identified internal economic determinants include the presence of arms industries, Central Government Expenditure (CGE) and non-military government expenditure. For instance, Hewitt and Van Rijckeghem (1995) work on military expenditure-growth nexus suggest that GDP level clearly depicts real impacts of military expenditure. The empirical result indicate the existence of convex relationship. Tambudzai (2011) and Tambudzai and Harris (2016) examined 12 Southern African countries determinant for military expenditure for the period 1997-2004. The empirical result indicate the significance of GDP per capita as military expenditure determinants.

Conversely, in individual country studies, Gross national income variables has been suggested to have positive effect as a determinant of military expenditure. For instance, Sun and Yu (1999) examines the determinant of military expenditure for China. The result reveal military expenditure is significantly and positively related to its Gross National Product. In examining an African context, Batchelor, Dunne et al. (2000) find that South Africa military expenditure is related to its income level.

Central Government expenditure is the reported final budget details stated in the accounts. Dommen and Maizels (1988) work on military burden on developing countries use central government of GDP as one of the determinants for military expenditure. The empirical result show that Central government Expenditure is significant and positive. Likewise, Dommen and Maizels (1988) result was collaborated by Hewitt (1991) further reinforce that central government expenditure is significant and positive in determining military expenditure.

Yildirim et al. (2005) investigate government consumption effect on military expenditure for 92 countries for 1987-1997. The result found that central government expenditure is significant and positive on military expenditure. In summary, above empirical results affirmed that central government expenditure is significant and positive by related to military expenditure.

Deger and Sen (1990) included arms production as a variable to examine military expenditure on the Indian economy for the period of 1960-1985. However, the result show that arms production is insignificant in the estimation.

Maizels and Nissanke (1986) identified foreign exchange and major aid to stimulate military expenditure. In addition, foreign arms producing is does have positive impacts in military expenditure demand. Arms producing countries can influence non-arms producing nation to buy military weapons exceeding their request.

Rosh (1988) also opined that countries infused with international countries politics does have the privilege to access funds to procure arms. He also asserted that trade is a key and does have a significant and positive effect on military expenditure for emerging countries.

Dunne and Perlo-Freeman (2003) included trade variable in their demand for military expenditure estimation. The empirical result show that trade does matter with a significant and positive impact on military expenditure whereas Dunne and Mohammed (1995) work indicate that trade is not significant in Sub Saharan Africa This may be due to low intra sub-Saharan trade activities.

Political Factors

In determining the factors that influence military expenditure, it has been suggested

by (Hou 2010), That, the political institution regimes does affect a nation's quest for military effort. For instance, (Dommen and Maizels (1988) has affirmed that democratic regimes tends to spend less whereas authoritarian regimes tends to invest more in military sector and allied industries to be full control of the nation. However, this above assertion cannot be generalized for all nations.

Dommen and Maizels (1988) Milex demand work use political regimes (from military to democratic) for 72 countries for the period of 1978-1980. Their result revealed that two fifth of military regimes make use of military force against the public.

On the other hand, Dunne and Perlo-Freeman (2003) and Dunne et al. (2008) incorporated democracy index from POLITY 1998 in estimating determinant for developing countries covering 1981 to 1997. Their result indicates that democracy does have significant and negative impact on military expenditure on developing countries. Hou (2010) identified the relevance of political regimes investigating India's demand for military expenditure discuss. Sun and Yu (1999) examined the change of China's leadership from war oriented to economic development after 1979. Their result indicate an inverse change on Chinese military expenditure level for 1965-1993.

(Batchelor et al. 2000) empirical work on South Africa military demand incorporated a political dummy to capture change of leadership administration. The empirical result indicate an inverse relationship with military expenditure.

Yu (2002) use US-China conflict and major political shock as an independent variable for determinant for Taiwan's military expenditure for 1966 to 1992. The empirical result indicate a significant and positive impact as a determinant for military expenditure.

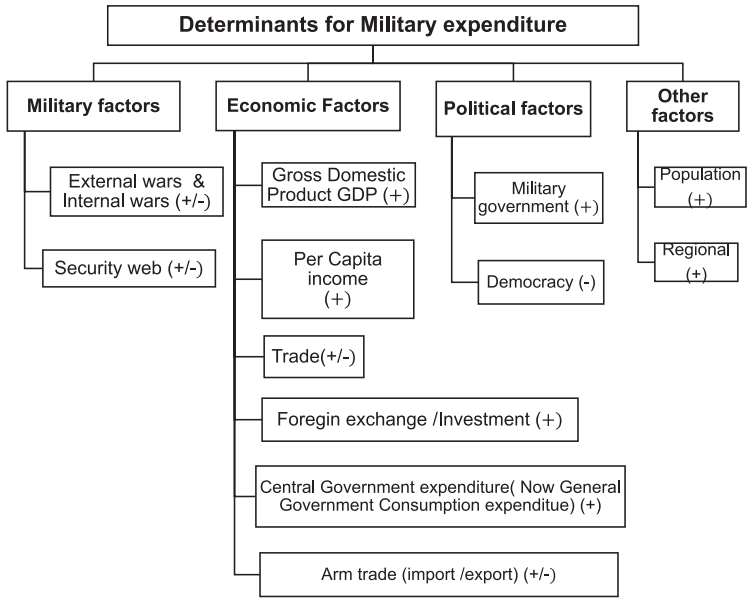
Other Factors

Dunne and Perlo-Freeman (2003) identified population as a significant determinant for military expenditure based on "Public good "theory. They opined that a large population does make military expenditure more effective. Also, Hewitt and Van Rijckeghem (1995) found that population is significant and positive for developing countries. However, (Dunne et al. (2008)found that there exist an inverse relationship between population and military expenditure for countries with large population whereas countries with small population invest more on military hi technologies. They suggest that countries with large population tends to focus more on consumption demand than security matters.

Other notable variables identified by empirical studies on determinant for military expenditure includes external threats. Dunne and Mohammed (1995) explores military participation-military expenditure nexus for 13 sub-Saharan countries. They use proportion of armed forces. The empirical result show that proportion of armed forces significantly and positively affect military expenditure level. (Yildirim et al. (2005) use ratio of armed forces per 1000 population to estimate determinant for military expenditure for 92 countries for 1987 to 1997. Their panel analysis result indicate that higher ratio of armed forces per 1000 population is linked to an increased military expenditure levels.

Dommen and Maizels (1988) identified geographical factor as a possible contagion effect especially in Middle East countries embodied in conflicts. Their empirical analyses attest the presence of regional factor as a significant and positive determinant for military expenditure for all Middle East countries.

Figure-2: Determinant of Military Expenditure



Model Specification

Empirical studies on determinants of military expenditure in emerging countries have been carried out employing diverse econometric estimation techniques. The formal models have developed from Smith (1980) neoclassical approach of. The general functional form can be written in a single regression equation as

$$E = m\left(^{P_m}/_{P_c}, Y, N, M_1, \ldots\ldots, M_n, Z_w, Z_s\right)$$

As a result, of non-availability of data on price deflators is dropped. Therefore, the determinants for South Africa for military expenditure, to capture the particularities of South Africa and data available. Determinant for military expenditure for South Africa is determined by economic, political and security factors. It can be written in the log form as follows:

Model I

Determinant for South Africa as follows:

$$Me(\%\ of\ GDP) = m\left(GDPc, Pop, Tb, Demo\ Index, Sw, Ext_w, Int_s\right)$$

Me- military expenditure (Percentage of GDP)
GDP- GDP per capita of South Africa
Pop-Population growth rate
Tb- Trade balance of GDP
Demo Index-Democracy Index
SW- averaging military expenditure of South Africa neighbouring countries
Ext - External threats
Int - Internal threats

Tambudzai (2011) and Tambudzai and Harris (2016) affirmed the relevance of GDP per capita as a determinant for military expenditure in emerging countries. Population variable is introduced to forecast public good effect. Trade in GDP- capture the degree of openness of South Africa. Political variable reflect the

political status and military in South Africa security web is incorporate into the determinant equation. The external war reflects the external wars involving South Africa. The expected sign to be positive. Internal conflicts such as civil wars and insurgency South Africa can affect the military expenditure and it is expected to have the positive impact. The ICRG database was used in computing both external and internal crisis.

Data Sources

Empirical literature on military expenditure recognized the issue of consistency and reliability of data collected from diverse sources (SIPRI, IMF, US department of Defence). More so, researchers also differ on whether or not to use military expenditure in levels or a percentage share of GDP. Sandler and Hartley (1995), Tambudzai (2011) and Brauner (2014) contend that the result of empirical research depend on whether level or share data is used and concluded that share data produce better results. The issue of conversion is encountered if military expenditure in level is used.

The study covers the period 1970 to 2017. Data source for military expenditure at levels and share of GDP were obtained from SIPRI database because it has more complete data series.

Table-3: Description of Variables and Data Source

Variables	Definition	Sources
Key variables		
ME	Military expenditure (Share of GDP)	World Bank and Stockholm International Peace Research Institute new extended database 1946-2017
Ext.	External threats are classified as wars involving two independent countries	International Country Risk Guide (ICRG) database 1984 -2017
Inter threats	Internal threats include Civil war[3], insurgency crisis and communal clashes	
POP	Population growth rate	World Bank Development Database 2018 (**WDI**)
Security Web	Security Web measured by averaging of the ratio of military expenditure to GDP of South Africa neighboring countries	
GDP	GDP per capita	
TB	Trade Balance	
Pol.	Political factor proxy was Democracy Index[4]	Polity IV database

Source – Author's Computation

Data Analysis and Interpretation[34]

The summary of statistics is important to explore the time series distribution of the data collected on each of the variables. Table-4 indicate that all the variables used as determinants for military expenditure are positive. This reveals that on the average all the determinants are positive. This is a pointer to the fact that South Africa countries determinants are positive during this periods. The mean of military

3 An International war is differentiated from civil war, if it involve more than one country. To be called a war it must include 1,000 battle causalities in both cases.

4 Democracy Index is an **index** compiled by the UK-based company the Economist Intelligence Unit (EIU) that intends to measure the state of **democracy** in 167 countries, of which 166 are sovereign states and 165 are UN member states

expenditure from the table is 2.480996 while the standard deviation is 1.279133. The mean distribution value is an indication that across the South Africa military expenditure is still relatively on the average because the mean distribution values for in between the upper and the lower limit. Again, the variance of 1.279133 is closer to the minimum limit than the maximum limit thus showing the data on military expenditure is not widely dispersed.

Table-4: Summary of Descriptive Statistics of Military expenditure in South Africa

	ME	POP	SECWEB	TB	DEMO	EXCH	EXTE	GDP	INFL	INT
Mean	2.4809	1.952	4.05508	-1.29E+0	2.708333	3.608405	7.008681	6362.582	9.182796	5.6920
Median	2.3532	2.1029	3.22290	-4E+07	7.000000	2.604999	9.875000	6146.071	8.809485	8.0000
Max	5.2633	2.7938	7.8824	94000000	9.000000	10.54075	12.00000	7582.553	18.65493	11.000
Min	1.0474	1.0467	2.18282	-8.28E+0	-88.0000	0.000000	0.000000	5423.588	-0.6920	0.0000
Std. Dev.	1.279	0.5972	1.72860	2.00E+08	19.26849	3.112151	4.734320	656.3770	4.3557	4.1095
Obs	48	48	48	48	48	48	48	48	48	48

Source – Author's Computation

Table-5 presents the correlation matrix of the variables used in the study. Correlation matrix shows the degree of association and direction of relationship among the variables. Results in Table-5 show that the degree of association that exists among the independent variables reveals that all can be included in the same model without the fear of multicollinearity.

Table-5: Correlation Matrix

	ME	POP	SECWEB	TB	DEMO	EXCH	EXT	GDP	INFL	INT
ME	1.0000									
POP	0.7898	1.0000								
SECWEB	0.7282	0.4128	1.000000							
TB	-0.2203	-0.2399	0.1369	1.0000						
DEMO	-0.1409	-0.2567	-0.1783	0.1471	1.0000					
EXCH	-0.6020	-0.7236	-0.2994	0.1377	0.1249	1.0000				
EXT	-0.6708	-0.7889	-0.2238	0.3611	-0.0481	0.6216	1.0000			
GDP	-0.4542	-0.5486	-0.4001	0.0373	0.3328	0.1447	0.1657	1.0000		
INFL	0.7997	0.6340	0.7516	-0.0232	-0.2171	-0.4570	-0.4208	-0.37596	1.00000	
INT	-0.7642	-0.8546	-0.3776	0.3441	0.0121	0.6683	0.9686	0.246280	-0.5562	1.0000

Source – Author's Computation

ARDL Bound Testing

After the confirmation of time series properties of the variables the next is the cointegration test before the estimation of the ARDL regression for both long and short run periods. The result of the ARDL bound test for cointegration is presented in Table-6.

Table-6: ARDL Bounds Test for South Africa Military Expenditure

ARDL Bounds Test		
Included observations: 46		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	5.393715	9
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	1.88	2.99
5%	2.14	3.3
2.5%	2.37	3.6
1%	2.65	3.97

Source – Author's Computation

The ARDL bound test results indicate that there is long run relationship between military expenditure and its determinants for South Africa since the calculated value of the F statistics is greater than 5% critical values at both lower and upper bounds. This shows that there is co-movement among determinant for military expenditure in South Africa.

ARDL Cointegrating and Long Run

After the confirmation of a cointegration among variables, the next line of action is to estimate the short run and long run form of the coefficients. The results is presented in Table-6.

Table-7: ARDL Cointegrating and Long Run form Result for Determinant of Military Expenditure in South Africa

ARDL Cointegrating And Long Run Form
Dependent Variable: ME
Selected Model: ARDL(2, 0, 2, 1, 0, 1, 1, 2, 2, 1)
Sample: 1 49
Included observations: 46

Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(ME(-1))	0.583451	0.112598	5.181719	0.0000
D(POP)	-0.118983	0.229878	-0.517590	0.6095
D(SECURITYWEB)	0.004767	0.045210	0.105443	0.9169
D(SECURITYWEB(-1))	0.122381	0.042778	2.860851	0.0086
D(TB)	-0.000000	0.000000	-2.041154	0.0524
D(DEMO_INDEX)	0.000526	0.002108	0.249531	0.8051
D(EXCH)	0.021254	0.021066	1.008945	0.3231
D(EXTERNAL)	0.037486	0.051891	0.722400	0.4770
D(GDP)	0.000365	0.000284	1.285558	0.2109
D(GDP(-1))	0.000738	0.000308	2.395026	0.0248
D(INFLATION)	0.031083	0.020015	1.552981	0.1335
D(INFLATION(-1))	-0.061126	0.019351	-3.158818	0.0042
D(INTERNAL)	-0.024776	0.066518	-0.372476	0.7128
CointEq(-1)	-0.319577	0.085346	-3.744484	0.0010
Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
POP	-0.372313	0.753686	-0.493989	0.0258
SECWEB	-0.424915	0.310868	-1.366869	0.1843
TB	0.000000	0.000000	0.401062	0.0319
DEMO	0.001646	0.006589	0.249815	0.0490
EXCH	-0.020297	0.051310	-0.395578	0.6959
EXT	0.343534	0.220992	1.554507	0.0332
GDP	-0.000103	0.000253	-0.407136	0.6875
INFL	0.344969	0.114295	3.018223	0.0059
INT.	-0.563548	0.315075	-1.788620	0.0463
C	3.174289	3.435933	0.923850	0.3648

Source – Author's Computation

Interpretation of ARDL Cointegrating and Long Run

Considering the individual variable long run relationship and impact on military expenditure as shown in Table-7, the result is an indication that population indicate a negative long run relationship with military expenditure. The long run coefficient of population is -0.3723 and significant. The implication of this is that as population rises it significantly reduces military expenditure. Therefore, according to the result, a unit rise in population will significantly retard inclusive growth by 37%.

Another variable included in the model is security web. The long run coefficient of security web is -0.4249 and it is statistically insignificant. The implication of this is that security web reduces military expenditure. Therefore, according to the result, a unit rise in security web will retards military expenditure by about 42 %.

Trade balance and democracy index another variables included in the model. The long run coefficient of trade balance and democracy index are 0.0000 and 0.001646 were statistically significant. The implication of this is that trade balance and democracy index positive will significantly stimulate military expenditure. Therefore, according to the result, a unit rise in trade balance and democracy index will increase military expenditure by about 0.0 % and 0.0% respectively.

Also, exchange rate, Gross Domestic Product (GDP) and internal threats variables are used in the model. The long run coefficient of exchange rate, Gross Domestic Product (GDP) and internal threats were -0.0202, -0.0001 and -0.5635 respectively. The result is an indication that exchange rate and GDP exhibits an adverse long run relationship with military expenditure and it statistically insignificant. The implication of this is that a rise exchange rate and GDP will not necessary stimulate inclusive growth. However, internal threat does significantly have an inverse relationship with military expenditure in South Africa.

In conclusion, external threats and inflation long run coefficient were 0.3435 and 0.3449 and statistically significant at 5% level. The implication of this is that external threats and inflation does significantly stimulate military expenditure.

Under the short run aspect of the cointegration regression, the result show that all the variables used as independent variable of military expenditure in South Africa have significant impact during the under review. The result show that the lagged values of all independent variables have short run insignificant impact on South Africa military expenditure.

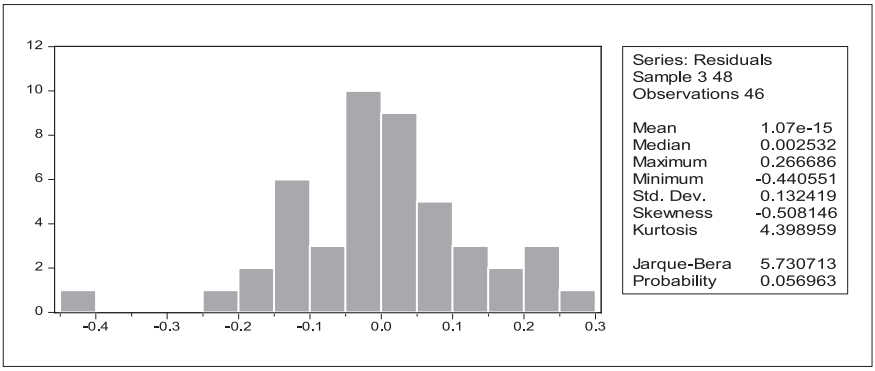
Diagnostic Tests (Post Estimation)

The section present the post estimation diagnostic tests ranging from, normality test, heteroscedasticity, serial correlations and stability test. The rationale of the post estimation tests is to ascertain the how robustness the previous estimations results.

Normality Test for South Africa

The result of the normality test shows that the probability value of the Jarque-Bera statistics is less than 5%, indicating that the residuals from the estimates are normally distributed.

Figure-3: Normality Test for South Africa



Source: Author's Computation

Test for Heteroskedaticity for South Africa

Heteroskedaticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.842197	Prob. F(21,24)	0.6523
Obs*R-squared	19.51638	Prob. Chi-Square(21)	0.5521
Scaled explained SS	9.028633	Prob. Chi-Square(21)	0.9890

Source: Author's Computation

The result of the heteroscedasticity test for South Africa is shown. The null hypothesis is that there is no heteroscedasticity. Using the F statistics, it is discovered that the probability of F shows that the null hypothesis is to be accepted. Therefore, it is concluded that the model is not having the problem of heteroscedasticity which may affect the validity of the result.

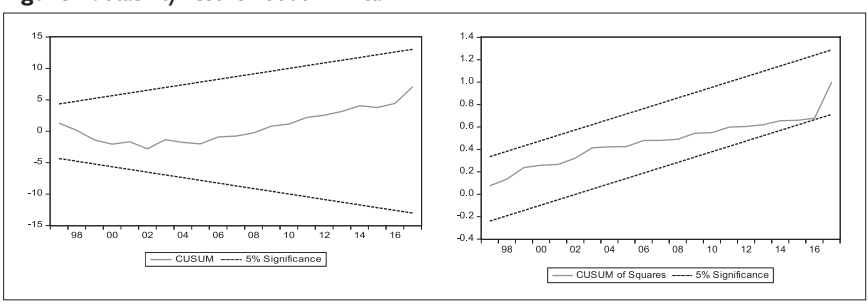
Test for Serial Correlation for South Africa

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	4.502080	Prob. F(2,22)	0.0230
Obs*R-squared	13.35922	Prob. Chi-Square(2)	0.0013

Source: Author's Computation

The null hypothesis for South Africa indicates that there is no serial correlation. Since the F-statistic and the probability, it is obvious that the null hypothesis is to accepted while we rejected the alternative hypothesis that there is serial correlation. Consequently, the estimates from our model are valid and can be used for forecasting.

Figure-4: Stability Test for South Africa



Source: Author's Computation

In conclusion, the stability test indicates that the model is reliable (that is, the model does fall within the red lines) and does not suffer from any structural break. This is an indication that the estimated exhibit the stability require for a model that will be useful for forecasting.

Conclusion

The results obtained and reported herein show that South Africa military expenditure is significantly determined by trade balance, democracy index, external threats and inflation rate from 1970 to 2017. The findings are consistent with quantitative findings on determinant of military expenditure and also in line with both theoretical and findings of other studies.

References

Aizenman, J. & R. Glick (2006). Military expenditure, threats, and growth, *Journal of International Trade & Economic Development***,** 15(2),pp: 129-155.

Ball, N. (1983). Defense and development: A critique of the Benoit study, *Economic Development and Cultural Change*, 31(3),pp: 507-524.

Barro, R. J. (1990). Government spending in a simple model of endogeneous growth, *Journal of political economy,* 98(5, Part 2),pp: S103-S125.

BARRO, R. J. & X. SALA-I-MARTIN (1992). Public Finance in Models of Economic Growth, *The Review of Economic Studies*, 59(4),pp: 645-661.

Batchelor, P. et al. (2000). Military spending and economic growth in South Africa, *Defence and Peace Economics,* 11(4), pp: 553-571.

Brauner, J. L. N. (2014). Military Expenditure and Regime Type: An Empirical Investigation into Civil Military Relations.

Collier, P. (2003). *Breaking the conflict trap: Civil war and development policy,* World Bank Publications.

Collier, P. & A. Hoeffler (2002). *Military expenditure: Threats, aid, and arms races,* The World Bank.

Deger, S. & S. Sen (1990). Military security and the economy: defence expenditure in India and Pakistan, T*he economics of defence spending,* pp: 189-227.

Dommen, E. & A. Maizels (1988). The military burden in developing countries, *The Journal of Modern African Studies*, **26**(3), pp: 377-401.

Dunne, J. P. & N. A. Mohammed (1995). Military spending in sub-saharan africa: Some evidence for 1967-85, *Journal of Peace research*, **32**(3), pp: 331-343.

Dunne, J. P., et al. (2008). The demand for military expenditure in developing countries: hostility versus capability, *Defence and Peace Economics,* 19(4), pp: 293-302.

Dunne, P. & S. Perlo-Freeman (2003). The demand for military spending in developing countries,*International Review of Applied Economics*, 17(1), pp: 23-48.

Hewitt, D. & C. Van Rijckeghem (1995). Wage expenditures of central governments

Hewitt, M. D. P. (1991). *Military expenditure: econometric testing of economic and political influences*, International Monetary Fund.

Hou, N. (2010). Arms race, military expenditure and economic growth in India, University of Birmingham.

Looney, R. E. (1989). Internal and external factors in effecting Third World military expenditures, *Journal of Peace Research,* 26(1), pp: 33-46.

Maizels, A. & M. K. Nissanke (1986). The determinants of military expenditures in developing countries, *World Development*, 14(9), pp: 1125-1140.

Rosh, R. M. (1988). Third world militarization: Security webs and the states they ensnare, *Journal of Conflict Resolution*, 32(4), pp: 671-698.

Sandler, T. & K. Hartley (1995). *The economics of defense*, Cambridge University Press.

Smith, R. (1995). The demand for military expenditure, *Handbook of defense economics,* 1, pp: 69-87.

Smith, R. P. (1980). Military expenditure and investment in OECD countries, 1954–1973, *Journal of comparative economics,* 4(1), pp: 19-32.

Sun, Q. & Q. Yu (1999). Determinants of China's military expenditures: 1965-93, *Journal of Peace Research*, 36(1), pp: 23-33.

Tambudzai, Z. (2011). Determinants of military expenditure in Zimbabwe, *The Economics of Peace and Security Journal*, 6(2).

Tambudzai, Z. & G. Harris (2016). What drives milex in Zimbabwe? A comparative study: Paper presented at 'The Fourteenth Annual International Conference on Economics and Security at Izmir University of Economics, Turkey, on June 17-18, 2010."

Yildirim, J., et al. (2005). Military expenditure and economic growth in Middle Eastern countries: a dynamic panel data analysis, *Defence and Peace Economics*, 16(4), pp: 283-295.

Yu, M. (2002). The Impact of US-China Relations on Taiwan's Military Spending: An analytical Model of error Correction Mechanism (1966-1992). CGOTS, APSA's annual meeting in Boston.

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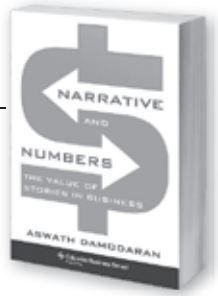
Book Review

Narrative and Numbers – The Value of Stories in Business



Author

Aswath Damodaran

Reviewer

Prashant Raman
Assistant Professor
Institute of Public Enterprise,
Hyderabad

In Narrative and Numbers: The Value of Stories in Business (Columbia University Press, 2017) Aswath Damodaran, professor of finance at New York University Stern School of Business and a self-acclaimed numbers man, explores the importance of storytelling in the framework of valuating companies and making investments. Damodaran, a well-known instructor of valuation, has emphasized that only quantitative valuation techniques are not enough for a company to attract investments but a qualitative narrative about the business is equally essential. However, he also observes that qualitative analysis alone had some shortcomings because while narrating a story about one's business he/she tends to get biased. Damodaran tries to present how a perfectly knitted story along with conventional quantitative analysis can result in a more assured valuation for a company. In his book he explains, valuation to be a link between the numbers and stories as he writes "In effect, valuation allows each side to draw on the other, forcing storytellers to see the parts of their stories that are improbable or implausible, and to fix them, and number crunchers to recognize when their numbers generate a story line that does not make sense or is not credible."

In the initial chapters, Damodaran focusses on how storytelling can be useful in the context of business. He discusses whether a story narrated by a business or an investor, is possible, plausible, or probable. Damodaran confesses that "the lines between the possible, plausible, and probable are not always easy to draw." He goes on to suggest that "Impossible and improbable are quantifiable, the first because you are assigning a zero probability to an event happening and the latter because you are attaching a probability (albeit a low one) that an event will happen. Implausible lies in the muddled middle, since proving that it cannot happen is not feasible and attaching a probability judgment to it is just as difficult."

Damodaran uses an array of case studies to project the effectiveness of combining numbers and stories for both the audiences – storytellers and number crunchers. The book discusses cases of Uber, Ferrari, Alibaba, Amazon etc. and help develop newer inventive models that can survive any kind of investigation.

The main target audiences for this book are entrepreneurs and investors. The core objective of both these groups is to avert delusion and mistaken belief in turning into expectation. It will not be an exaggeration to say that Damodaran has mastered the art of integrating storytelling with conventional financial analysis. The book can play an important role in valuation of a business in this new age. The author emphasizes that valuation entails both the right and the left side of one's brain – the number cruncher and the storyteller. Damodaran takes the reader on a journey where he makes everyone believe that numbers need a story to make them more genuine and compelling.

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