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Yeboah Asuamah, Samuel and Broni Pinkrah, Samuel and Quansah Abbey, Paul

School of Business and Management Studies, Sunyani Polytechnic, Sunyani, Ghana, West Africa , P. O. Box 206,, School of Business and Management Studies, Sunyani Polytechnic, Sunyani, Ghana, West Africa , P. O. Box 206,, Business School, Catholic University College of Ghana, Fiapreh. P. O. Box 363, Sunyani, Ghana, West Africa,

17 May 2016

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Samuel Yeboah Asuamah (corresponding author)[1], Samuel Broni Pinkrah[2], Paul Quansah Abbey[3]

1. School of Business and Management Studies, Sunyani Polytechnic, Sunyani, Ghana, West Africa , P. O. Box 206, E-Mail: nelkonsegal@yahoo.com, Phone: +233244723071
2. School of Business and Management Studies, Sunyani Polytechnic, Sunyani, Ghana, West Africa, P. O. Box 206, E-Mail: bpinkrah@yahoo.co.uk, Phone: +233245004340
3. Business School, Catholic University College of Ghana, Fiapreh. P. O. Box 363, Sunyani, Ghana, West Africa, E-mail: abbeyquansah@gmail.com, Phone: +233207051855

Abstract

The research paper investigates the stable long run hypothesis between globalisation and manufacturing sector productivity for Ghana for the period 1961-2013 using annual time series data. The augmented Dickey Fuller (ADF, for unit root analysis) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS, unit root analysis), OLS (regression analysis), Johansen test (long run analysis), VECM (short run analysis), and the granger causality (causality analysis) tests were used. The findings suggest the data were integrated of order one. The findings of the study seem to indicate that the manufacturing sector has not benefited from globalisation. There is the need to introduce various policy measures such as improvement in security to reduce risk and uncertainty of foreign investment into the manufacturing sector; improvement in infrastructure to encourage domestic and foreign investment into the manufacturing sector; and strong political will to attract investors into the sector. Further studies should consider the effect of other factors (electricity) and other proxies of globalisation (foreign direct investment, financial liberalisation, investment liberalisation, and multinational firm activity) on the manufacturing sector performance to determine if the findings will be replicated. The issues of structural breaks should be investigated in future studies.

Keywords: Manufacturing Sector, Trade Openness, Globalisation, Long Run
Jet Classification: F14; L60

1.1 Introduction

The concept of globalisation and its influence on the manufacturing sector have been long examined in both theoretical and empirical literature with inconsistent findings in the literature (Yeboah, 2016; Akpan & Atan, 2015; Gatawa, Aliyu, & Musa, 2013; Tardanico & Rosenberg, 2000; Ninsin, 2000; Tybout, 2000). According to researches such as Kinoshita (1998); Dicken (1997); Greider (997); Boyer and Drache (1996); Castells (1996); Harrison (1994); Kokko (1994); and Stalk and Hout (1990), globalisation comes as a result of factors such as technology and innovation, nature of competition among firms, and the nature of the production process adopted for production by firms in the manufacturing sector.

The firms in the manufacturing sector benefit from globalisation in various ways such as increasing market potential for the firms, enhancing trade potentials of countries, enhancing investment potential of firms, and increasing resource accessibility to the firms (Corswant, 2002; Jones, 2002; Reyes, Raisinghani & Singh, 2002; Shocker, Srivastava & Ruekert, 1994).

Globalisation is believed to impact on the manufacturing sector and subsequently results in economic growth (Anand 2004; Micheal, 2004, Wikipedia 2004; UNDP 2003; World Bank 2002; Anyanwu, 2000; Clark, 2000; Cooper 1995; Jungnicke, 1993). Whereas Gatawa et al. (2013) and Umaru, Hamidu, and Musa (2013) studies identified significant negative effect of globalization on the manufacturing sector for Nigeria, Akpan and Atan (2015) reported of significant positive effect on the

Nigerian economy in a similar study. The negative effect is believed to results from the potential threats globalisation poses to the manufacturing sector as reported by researchers such as Ted (2003); Meredith (2003); Hafsi (2002); Jones (2002); Woo (2000); Eng (2001); and McLean (2001). Other researchers have also reported that globalisation has no impact on manufacturing sector productivity (Okpokpo, Ifelunini, & Osuyali, 2014; Ezike & Ogege, 2012; Mehrara, Ahrari, Farahani, Sadr, 2008; Okoh, 2004; & Obaseki, 2000)

The empirical and theoretical findings on the influence of globalisation on the manufacturing sector are mixed as indicated by the review of related literature. This calls for further empirical studies such as the current paper to add to the existing literature. Few empirical studies exist in the study area (Yeboah, 2016). The contribution of the manufacturing sector to the growth of the Ghanaian economy over the years have not been impressive and that the sector continues to shrink (Dasmani, 2015). Ghanaian economy is considered as 'small but open' economy and the current study examines whether the manufacturing sector has benefited from the open economy policy adopted over the years.

The current study contributes to the theories of globalisation by answering research questions underlying the study. The findings of the study provide policy directions to policy makers on how to influence the manufacturing sector, and in addition serve as reference material to researchers interested in the current topic.

The objective of the paper is to contribute to the body of knowledge in the area of globalisation by empirically investigating the effect of globalisation on the manufacturing sector. The paper specifically among other things assesses:

- The nature of shock to globalisation and the manufacturing sector to determine whether the effect of shock to the variables (globalisation and the manufacturing) are permanent or not.
- The nature of long run and short run link between globalisation and manufacturing sector.
- The nature of causality between globalisation and manufacturing sector performance.

The study is based on the following research questions: (a) What is the nature of external shock to the globalisation and the manufacturing sector and why? (b) How does globalisation affect the manufacturing sector in the long run?

The Kwiatkowski-Phillips-Schmidt-Shin (KPSS), augmented Dickey-Fuller test (ADF), Ordinary Least Squares (OLS) regression method, Johansen Model, and the Vector Error Correction Model (VECM) are used to provide answers to these questions.

Three main hypotheses are tested:

H1: The effect of external shock to globalisation and the manufacturing sector are not temporary.
H1: There is insignificant long run relationship between globalisation and the manufacturing sector.
H2: There is insignificant short run link globalisation and manufacturing sector.
H3: There is bidirectional link between globalisation and the manufacturing sector productivity.

Globalisation affects all sectors of the economy, however, the current study focuses on only the manufacturing sector, since the sector has not been performing well. The annual time series secondary data obtained from official sources may suffer from challenges such as data massage, and errors in variable. The issue of structural breaks that might affect the variables in the estimated model is not considered in the current paper. The rest of the sections of the paper deal with methodology, empirical results, discussions, and conclusions.

2. Research Methodology

2.1 The Research Design

The current study is a quantitative research and explanatory using time series data. The link between globalisation and manufacturing sector productivity is quantified and explained in the current paper.

2.2 Data

The study uses annual time series data for the period 1961-2013. This period is chosen to ensure the large use of large sample size. The sample size for the study is 52 which meets the standard for large sample size in regression analysis using time series data. Data was obtained from World Development Indicators (WDI-2012). Data used are reported in Table 1.

Table 1 Data Description, Proxies and Sources

Data Description	Proxy	Source
Globalisation (GB)	Trade Openness	World Bank World Development Indicator (WDI)
Manufacturing Sector Productivity (MSP)	Manufacturing Value Added	World Bank WDI

2.3 Conceptual Framework

The study investigates the influence of globalisation on the manufacturing sector productivity based on the theories and empirical works on globalisation by previous researchers (Armita & Paramita, 2010; Serpil, 2010; Kim et al., 2007; Mohamed et al., 2005; Alcal & Ciccone, 2004; Hwang & Wang, 2004; Gol dar & Anita, 2003; Mahadevan, 2002; Satish, 1999).

2.4 Econometric Model

The current research paper is based on a bivariate model which specified in equation (1). The dependent variable is manufacturing sector productivity (MSP) (proxied by manufacturing value added) whereas the explanatory variable is globalisation (GB) (proxied by trade openness).

$$\ln MSP_t = a + c \ln GB_t + e_t \quad \text{.....(1)}$$

2.5 Estimation Methods

The current paper employed estimation methods such as (a) Augmented Dickey-Fuller (1981) (ADF) (to investigate the effects of external shocks to globalisation, and manufacturing sector productivity). The test is based on the null hypothesis (H_0) that there is a unit root or the data are non-stationary in levels (shock is permanent). The alternative hypothesis (H_a) is that the data are stationary in the series (shocks are not permanent); (b) Kwiatkowski et al. (1992, KPSS) tests to investigate the effects of external shocks to globalisation, and manufacturing sector productivity.

The KPSS test is considered as a reverse test for to the ADF test, and as such it is used as a confirmatory test in examining the effect of shocks on variables. The KPSS test is based on the null hypothesis (Ho) that the data set are stationary (in levels) against the alternative hypothesis (Ha) that the data set are not stationary; (c) The Ordinary Least Square method (OLS) regression method (to estimate the log-linear relationship between globalisation, and manufacturing sector productivity.

For the OLS assumptions see Burke (2010); (d) The Johansen Method (used to examine the long run link between the globalisation, and manufacturing sector productivity). The Johansen method is based on the trace test and the eigenvalue test, which have identical conclusions on its assumptions. The null hypothesis for the trace test is that the number of cointegration vectors is r=r*<k, against the alternative hypothesis that r=k.

The null hypothesis for the "maximum eigenvalue" test is not different from that of the “trace” test but the alternative hypothesis is r=r*+1; (e) The vector error correction model (VECM) (to investigate the

short run link between globalisation, and manufacturing sector productivity); (f) The Granger-causality test (to examine the nature of causality between globalisation, and manufacturing sector productivity). The hypothesis underlying Granger-causality test is that, globalisation and manufacturing sector productivity are significantly related in the long run. Granger (1986) states that when variables are integrated of order 1 and are cointegrated there is at least one form of causality between the variables.

2.6 Diagnostic Methods

Various diagnostic tests were performed to examine the goodness of fit of the estimated model specified in equation (1). They are R-Square (R^2), the adjusted R^2, Joint significance test, J-B Normality test, Breusch-Godfred LM test, ARCH LM test, White Heteroskedasticity test, Ramsey RESET. The cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) were used to the stability of the model. The CUSUM and CUSUMSQ tests are based on the null hypothesis that all estimated coefficients in the given regression model are stable and that there is no change. The heteroskedasticity test is based on the null assumption of heteroskedasticity not present in the estimated mode; the reset test for model specification is based on the assumption that the model is adequately specified; The LM test for autocorrelation up to order 1 is based on the null assumption that there is no autocorrelation in the estimated model; the test for ARCH of order 1 is based on the null assumption that no ARCH effect is present in the model; the test for normality of residual is based on null assumption that the errors are normally distributed in the estimated model.

3 Empirical Results

3.1Time Series Plot

The results of the time series plots of the data are shown in figure 1 to figure 4. The figures show that the variables (GB, and MSP) are non-stationary in levels (figure 1 to figure 2). The variables achieved stationarity when they were first differenced (figure 3, and figure 4). The stationarity properties are scientifically investigated further using the ADF and the KPSS tests. The results are reported in Tables 2 to Table 4.

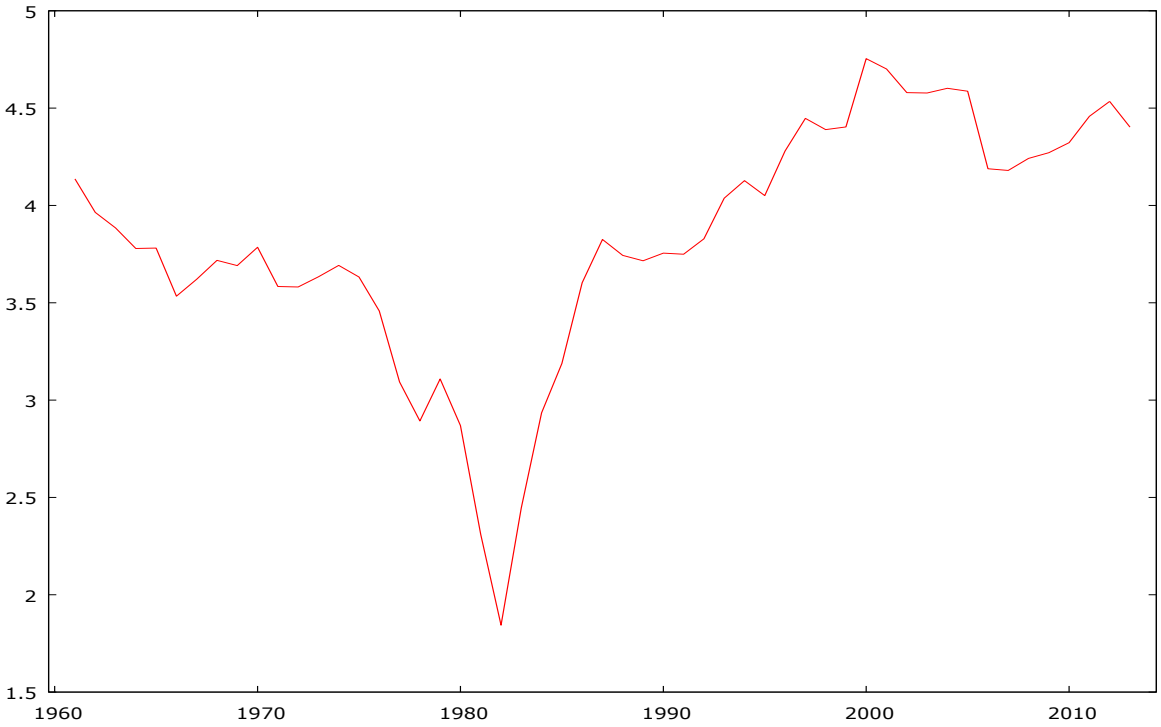

Figure 1. Time series Plot of lnGB in levels

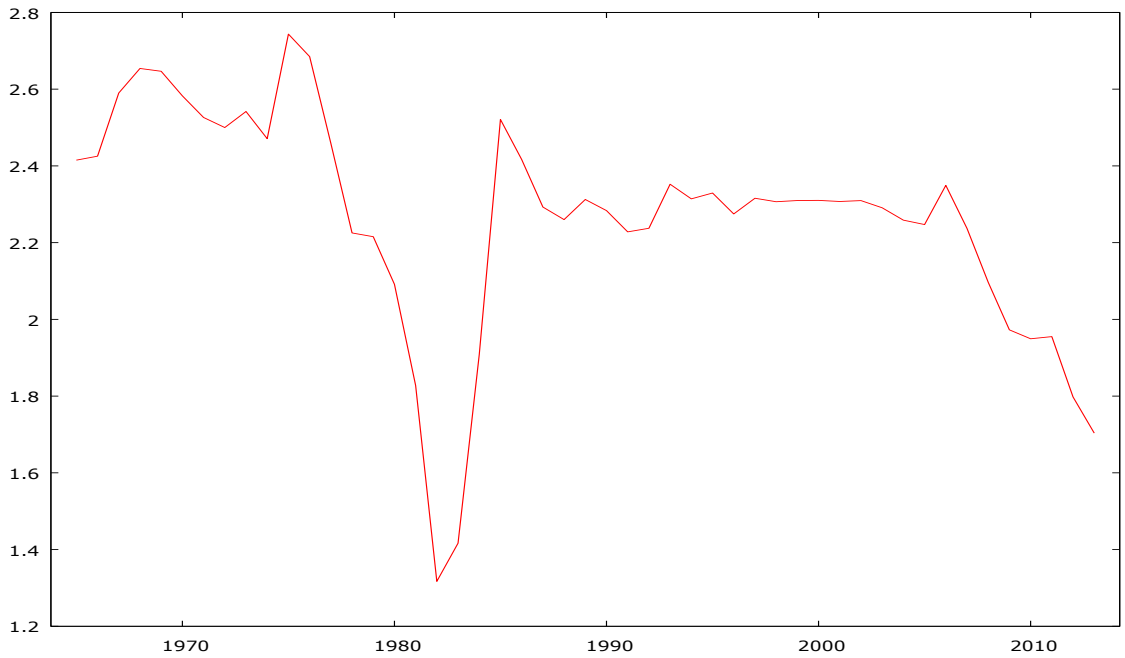

Figure 2. Time series Plot of MSP in levels

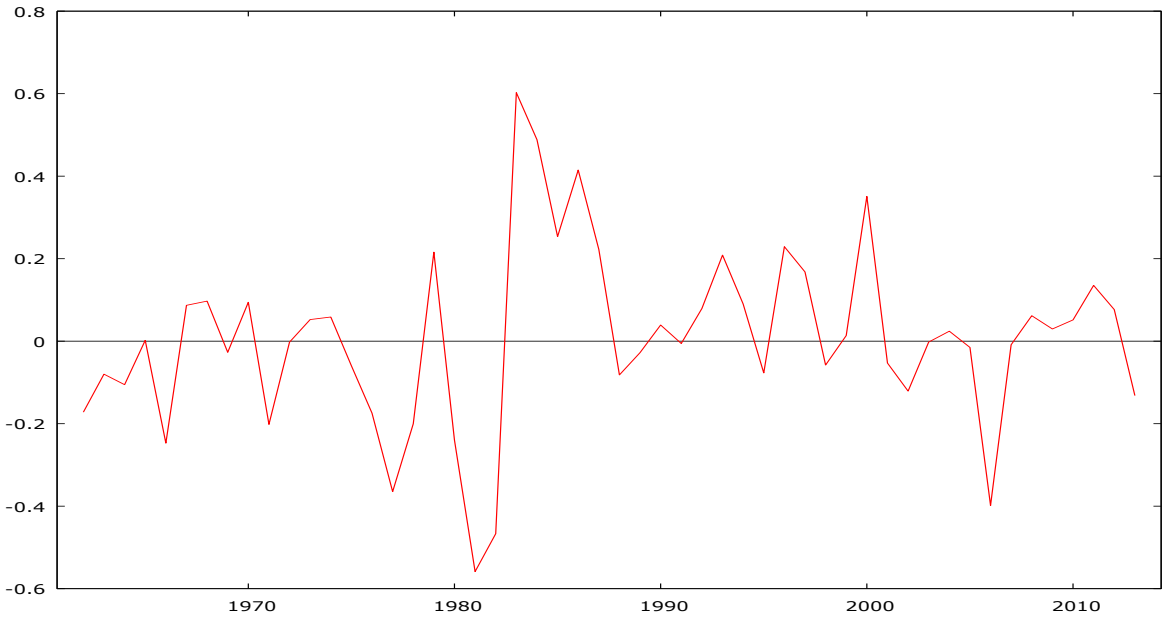

Figure 3. Time series Plot of lnGB in first difference

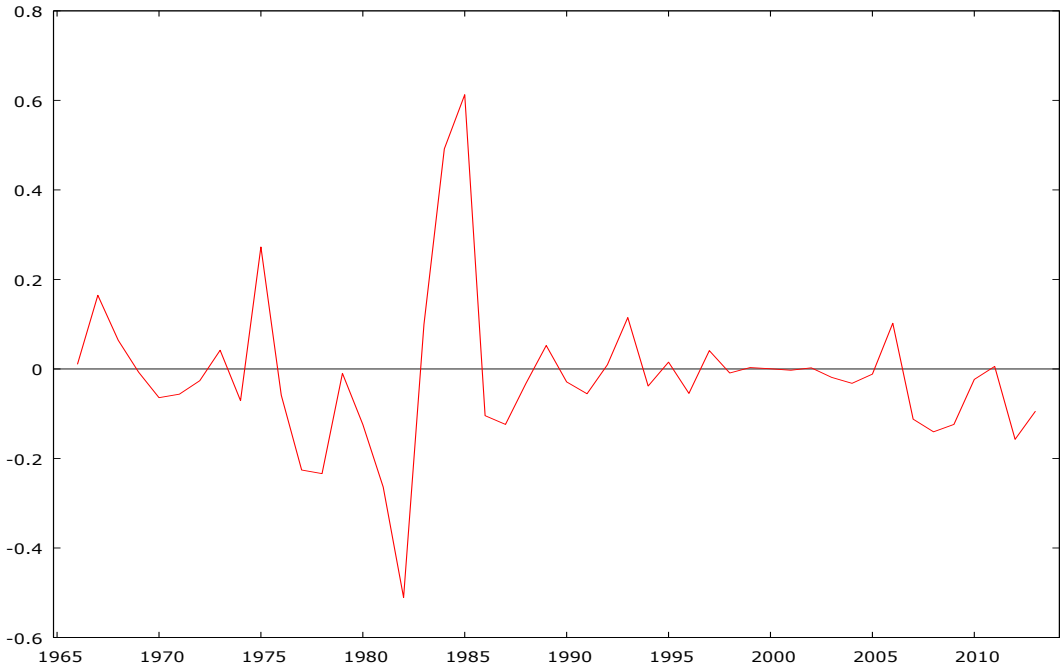

Figure 4. Time series Plot of lnMSP in first difference

3.2 The ADF/KPSS Test Results

Table 2 and Table 3 show the test results of the ADF. The results show that the data are not stationary in levels (Table 2). The data in Table 3 shows that the data attained stationarity after they were first differenced. Table 4 and Table 5 depict the test results of the KPSS test. The results reported in Table 4 indicate the data are not stationary in levels, however, the data attained stationarity after they were first differenced (Table 5). The findings suggest that shocks to globalisation, and manufacturing sector productivity are not temporary but permanent.

Table 2 ADF Stationarity Test Results with a Constant and Trend

Variables	Coefficients	T-statistics	ADF/P-Value	Results	Max Lag length
lnMSP	-0.325	-3.090	0.109	Not Stationary	9
lnGB	-0.131	-2.379	0.391	Not Stationary	9

Source: Author's computation, 2016

Table 3 ADF Stationarity Test Results with a Constant and a Time Trend

Variables (1^{st} dif.)	Coefficients	t-statistics	ADF/P-Value	Results	Max Lag length
ΔlnMSP	-1.019	-3.578	0.032	Stationary	9
ΔlnGB	-0.865	-5.203	7.127e-005	Stationary	9

Source: Author's computation, 2016: Note: *** denotes significance at 1% level

Table 4 KPSS Stationarity Test Results with a Constant and a Time Trend

Variables (levels)	T-statistics/P-value	Results	Max Lag length
lnMSP	0.098	Stationary	3
lnGB	0.213(0.010)	Not Stationary	3

(Source: Author's computation, 2016):
Critical values at 10% (0.122), 5% (0.149) and 1% (0.212) significant levels

Table 5 KPSS Stationarity Test Results with a Constant and a Time Trend

Variable (first diff.)	T-statistics	Results	Lag Length
ΔlnMSP	0.059	Stationary	3
ΔlnGB	0.088	Stationary	3

(Source: Author's computation, 2016):
Critical values at 10% (0.122), 5% (0.149) and 1% (0.212) significant levels

3.3 OLS Regression Results

3.3.1 Parameter Estimates

Table 6 indicates the OLS results of the specified model in equation (1). The results show significant positive effect of globalisation on the manufacturing sector of Ghana. The results indicate that at the 10% level of significance, 1% increase in globalisation leads to about 11.41% increase in the productivity of the manufacturing sector. The R^2 value of 0.0629 does not indicate that the estimated model performs well. The value indicates that globalisation explains only about 6.29% changes in the manufacturing sector productivity.

Table 6. OLS Regression Results

Model 4: OLS, using observations 1965-2011 (T = 47): Dependent variable: lnMSP				
Variables	Coefficient	Std. Error	t-ratio	p-value
Const.	1.8259	0.2481	7.3600	0.0000***

lnGB	0.1141	0.0642	1.7770	0.0820*
Mean dependent var	2.2608	S.D. dependent var	0.2951	
Sum squared resid	3.9164	S.E. of regression	0.2887	
R-squared	0.0629	Adjusted R-squared	0.0431	
F(1, 47)	3.1595	P-value(F)	0.0819	
Log-likelihood	-7.6252	Akaike criterion	19.2505	
Schwarz criterion	23.0341	Hannan-Quinn	20.6859	
rho	0.8853	Durbin-Watson	0.2998	

(Source: Author's Computation, April, 2016)
Note *** and * denotes significance at 1% and 10% levels

3.3.2 Diagnostic Test for OLS Test Results

The model estimated passed only the normality test (t=3.7209; p=0.1556). The model failed the rest of the test such as the Reset test for specification (t=23.5697; p=0.0000); heteroskedasticity (t=8.7577; p=0.0031); LM test for autocorrelation up to order (t=121.8930; p=0.0000); ARCH of order 1 (0.0006); CUSUM test for parameter stability (t= -7.0482; p=0.0000). Since the estimated model did not pass all the diagnostic tests and the variables are unit root, the OLS results are not robust and as such the Johansen and the vector error correction models were used to examine the long run and short links (section 3.4).

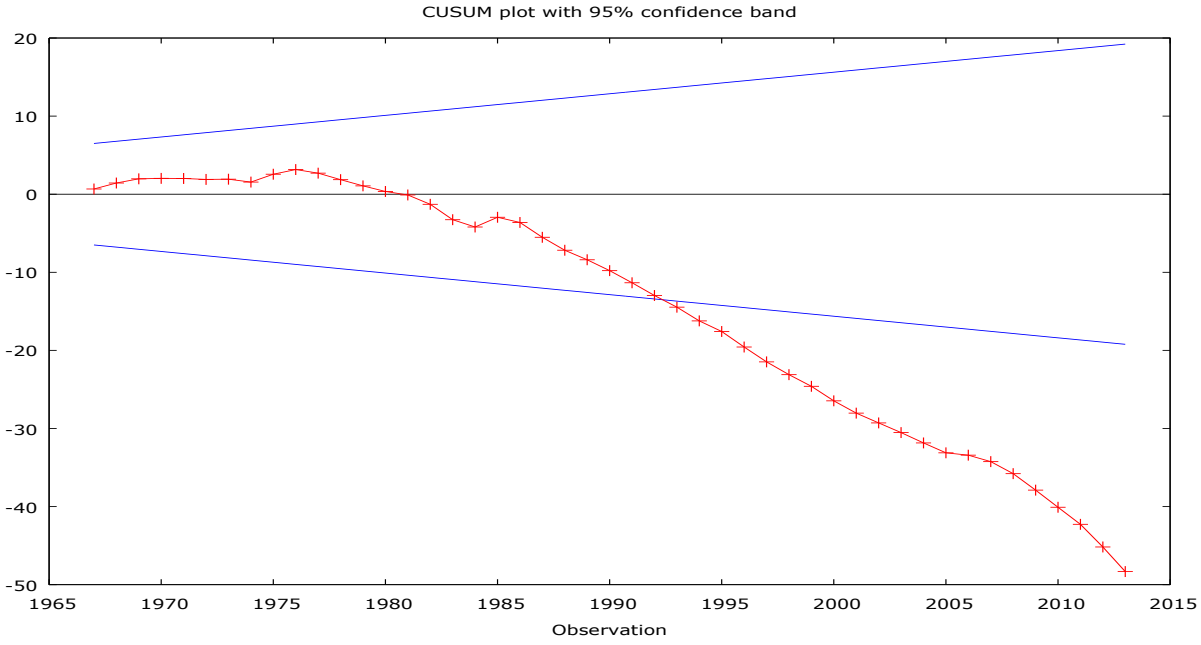

Figure 7. Plots of CUSUM

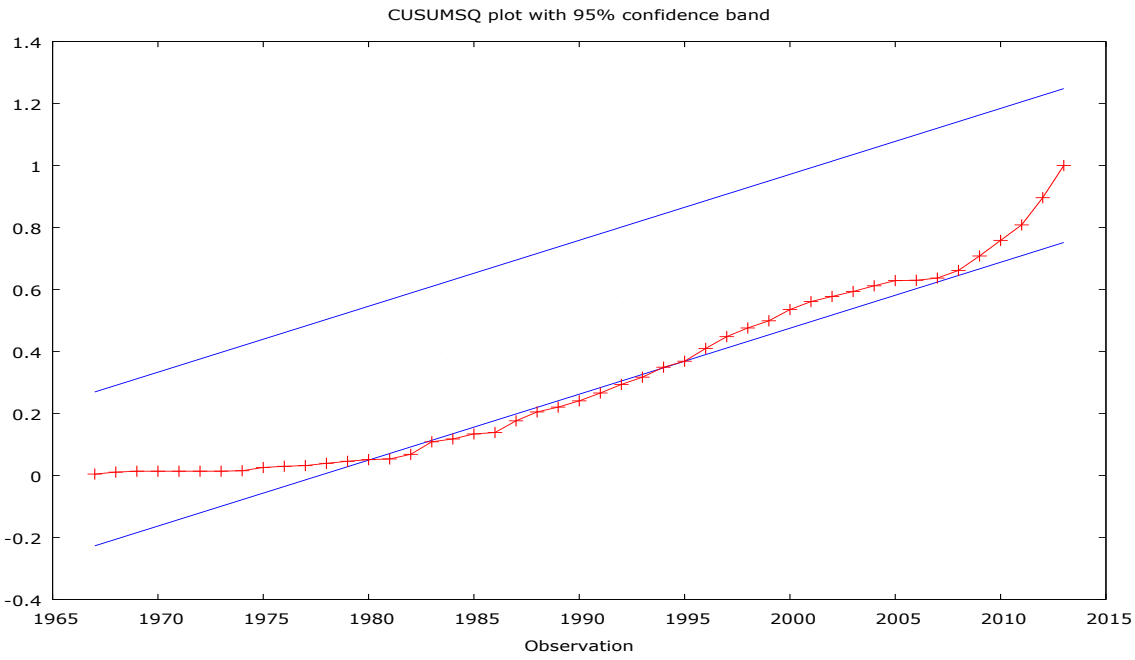

Figure 8. Plots of CUSUMSQ

3.4. Johansen Cointegration Test Results

3.4.1. Cointegration results with Manufacturing Sector Productivity as the Dependent Variable

The results of the long run cointegration relationship between globalisation, and manufacturing sector productivity with manufacturing sector productivity as the dependent variable are reported in Table 7. The results based on both the Trace test statistics and Maximum Eigenvalue Test values show the non-rejection of the null hypothesis of no cointegration. The results indicate that there is no cointegration rank. The conclusion is that there is no stable long run relationship between globalisation, and manufacturing sector productivity.

Table 7 Johansen Hypothesised Cointegration Results [Dependent variable= MSP]

Rank	Eigenvalue	Trace test P-value	Lmax test p-value
0	0.1035	5.3928 [0.7659]	5.2418 [0.7130]
1	0.0031	0.1509 [0.6976]	0.1509 [0.6976]
1. Null hypothesis		r=0	
2. Alternative hypothesis		r=1	
Johansen test:			
Number of equations = 2			
Lag order = 1			
Estimation period: 1966 - 2013 (T = 48)			

Author's computation, 2016: Note **denotes significance at 5% level

3.5 The Vector Error Correction Model for Short Run Parameter Estimates (VECM)

Table 8 shows the results of the estimated error correction model (Short run dynamics). The error correction term (ECM) is insignificant and but has the expected a priori theoretical sign of negative. The value of -0.1264 indicate a slower adjustment rate of about 12.64% from short run disequilibrium to long run equilibrium.

Table 8 Error Correction Results [Dependent var.=lnMSP]

Variable	Coefficient	Std Error	T-Ratio	P-Value
Cons	0.3048	0.2038	1.4950	0.1417
ECM_{-1}	-0.1264	0.0801	-1.579	0.1212

Mean dependent var	-0.0148	S.D. dependent var	0.1688
Sum squared resid	1.2705	S.E. of regression	0.1662
R-squared	0.0514	Adjusted R-squared	0.0308
rho	0.4042	Durbin-Watson	1.1875

Author's computation, April 2016

3.6 Results of Granger-Predictability Test

Granger causality test results are reported in Table 9. The test is based on the null assumption (Ho) that globalisation does not granger-predict manufacturing sector productivity and manufacturing sector productivity do not granger-predict globalisation. The alternative hypothesis (H1) are that globalisation granger-predict manufacturing sector productivity and manufacturing sector productivity granger-predict globalisation. The results show that globalisation granger-predict manufacturing sector productivity with feedback (that is bidirectional causality).

Table 9 Granger-Predictability Test Results

Variables	**Chi-square values**	**P-values**	**Decision**
lnMPS does not cause lnGB	20.509	0.000***	Reject Ho
lnGB does not cause lnMPS	3.1964	0.074*	Reject Ho

Authors computation, 2016: Note *** and * denote significance at 1% and 10% levels

3.7 Discussions

The findings of the study shows that shocks to globalisation is permanent and not transitory. This is consistent with that of earlier researchers such as Habibi (2015); Altaee, Saied and Adam (2014); Kar, Nazlioğlu, and Ağir (2014); Adhikary (2012); Arif and Ahmad (2012). Policies to attain globalisation are not achieving the intended target. The findings of the study suggest there is permanent shock to the manufacturing sector productivity. The findings are in agreement with that of previous studies such as Uddin (2015); Bhattacharya and Narayan (2013); Ilyas, Ahmad, Afzal and Mahmood (2010); Ajaga and Nunnenkamp (2008). The findings are however not in line with that of Guillaumont and Hua (2015), and Oyewale and Musiliu (2015) who reported of transitory effect of shock to the manufacturing sector productivity. The findings suggest that policies to improve productivity in the manufacturing sector are not yielding positive results as expected.

The findings of the study shows that globalisation has positive influence on manufacturing sector productivity that is consistent with the findings of earlier researchers such as Akpan and Atan (2015);

Corswant (2002); Reyes et al. (2002), whereas the findings are incongruent with that of other researchers such as Gatawa et al. (2013) and Umaru et al. (2013) whose studies suggested negative effect of globalisation on the manufacturing sector.

The findings of research suggest there is no stable long run and short run influence of globalisation on manufacturing sector productivity which is inconsistent with that of the findings of Shombe (2008) who reported of stable long run and short run link between globalisation and manufacturing sector productivity, and Gatawa et al. (2013) and Umaru et al. (2013) who reported of stable negative long run effect of globalisation on manufacturing sector productivity. However, the findings are consistent with that of Okpokpo et al. (2014); Ezike and Ogege (2012); Mehrara et al. (2008); Okoh (2004); and Obaseki (2000) who reported of insignificant long and short run link between globalisation and manufacturing sector productivity. The findings of the granger causality test suggest feedback effect between globalisation and manufacturing sector productivity which support the findings of Deme (2002).

The findings of the current study does not support the theories on the role of globalisation in the manufacturing sector performance and these theories must be revised. The findings do not support the policy directions (trade openness) of policy makers and such policies should be looked at again. The findings indicate that reducing globalisation will not have negative consequences on the growth of the manufacturing sector, since the sector has not benefited from economic globalisation.

4 Conclusions and Policy Implications

The research paper investigates the stable long run hypothesis between globalisation and manufacturing sector productivity for Ghana for the period 1961-2013 using annual time series data. The ADF (for unit root analysis) and the KPSS (for unit root analysis), OLS (regression analysis), Johansen test (long run analysis), VECM (short run analysis), and the granger causality (causality analysis) tests were used. The findings suggest the data were integrated of order one. The findings of the study seem to indicate that the manufacturing sector has not benefited from globalisation.

There is the need to introduce various policy measures such as improvement in security to reduce risk and uncertainty of foreign investment into the manufacturing sector; improvement in infrastructure to encourage domestic and foreign investment into the manufacturing sector; and strong political will to attract investors into the sector.

Further studies should consider the effect of other factors (electricity) and other proxies of globalisation (foreign direct investment, financial liberalisation, investment liberalisation, and multinational firm activity) on the manufacturing sector performance to determine if the findings will be corroborated. The issues of structural breaks should be investigated in future studies.

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