Testing the Productivity Growth Effects of Financial Liberalisation on the Economic Sectors of Ghana in the Precence of Structural Breaks

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Abstract

The study examined the relationship between financial liberalization and productivity growth of the three economic sectors in Ghana by using the yearly data over the period 1970-2013. In the analysis; the credits provided to private sector, investment, trade liberalization and capital account openness are considered as indicators of financial liberalization while sector level value added as a percentage of GDP represents productivity growth. The stationarity of the series and the long run relationship are analyzed by means of Zivot-Andrews (1992) and Clemente, Montanes and Reyes (1998) tests and Gregory Hansen tests in which structural breaks are considered. The findings of the study revealed that increasing spending on the productive sectors of the economy will yield a positive result of sustainable productivity growth at sector levels. However, government initiated structural reform that is not accompanied by sound macroeconomic policies may not have a lasting effect, since the effect of such reform in the long run growth path could be thrown out of gear by other external shocks. The positive effect of financial liberalization on productivity growth can be broadly confirmed in all the three economic sectors. Future studies could be focused on whether financial liberalization will make anticipated impact on sector level productivity growth using primary data from the various sectors of the economy in a survey study using structural modeling.

Keywords: financial liberalization, productivity growth, trade liberalization capital account openness, market capitalization, structural breaks

1. Introduction

1.1 Background

Mounting empirical and theoretical evidence demonstrates that cross-country differences in income disparity and economic development can be explained by differences in the productive capacity of firms and economic sectors of the countries in the global economy and particularly differences in productivity between developed and developing countries. Standard economic theories on the issue from various authors have made attempt to offer insight on income disparities employing factor accumulation and total factor productivity (TFP). Both Single-country and cross-country studies in development accounting has also demonstrated how TFP explains income per capita. Available literature shows that TFP accounts for 50% - 70% of per capita income differences across countries (Hsieh & Klenow, 2010). Foster et al. (2001) also contend that reallocation among firms contributes immensely to aggregate productivity growth. As a result the low productivity observed in developing countries could be explained from the point of view of developing countries inability to allocate production factors from less productive to more productive firms and sectors (Bartelsman et al., 2013). Economic literature provides fresh insight into how cross-country capital flow and progressive development of domestic financial activities influences generation of savings for investment activities (McKinnon, 1973; Shaw, 1973) which in turn contribute to more efficient allocation of scarce economic resources (Bencivenga & Smith, 1991; De Gregorio & Guidotti, 1995; Goldsmith, 1969). In addition to this, well developed financial market transactions promote efficient risk diversification between alternatives economic purposes.

The argument presented here has in most cases formed the basis for politically-driven interventions to embark on financial liberalization process worldwide, both involving developed and developing countries. Empirical and theoretical literature on the nexus between financial liberalization and growth indicates that financial liberalization on average stimulates productivity growth. Bekaert et al. (2005) in their study provided evidence to

confirm this positive link   both when treating the growth process in general terms (Bekaert et al., 2005) and also in the case concerning decomposition of the impact on the two main sources, productivity and capital accumulation (Gehringer, 2013).

In the 1970s, the phenomenon of financial repression, a major economic policy that was adopted by many governments especially in developing economies for the purpose of generating growth and revenue by means of artificially low interest rates and inflationary monetary policies attracted stronger discussion on the issue. The argument had its foundation from the theoretical works of Keynes (1936) and Tobin (1965), who proposed the need for government interference in the credit market. However, evidence from both single-country and cross-country studies reveals that a range of different financial frictions retard productivity growth by obstructing optimal allocation of economic resources. Empirical evidence from other studies (Levine &Warusawtharana, 2017; Buera et al., 2011; Hall & Jones, 1999) also suggests that financial frictions can explain a sizeable portion of the differences in productivity between developed and developing countries. Therefore, the argument that follows is that, the opening of financial services coupled with structural reforms of domestic financial sector constitutes the essential processes intended at developing an efficient and competitive financial system towards enhanced productivity growth. Thus a good financial system running hand in hand with well-functioning competitive market together with a well-supporting financial institution provides an enabling environment for sustainable productivity growth. Schumpeter (1911), buttressing this point contended that the services provided by financial intermediaries are among the essential ingredients required by both developed and developing countries for driving innovation and growth. This argument was formalized by Mckinnon (1973) and Shaw (1973), and supported by their contemporaries Fry (1988) and Pagano (1993). It was   Mckinnon (1973) and Shaw (1973) who posited that government restrictions on the operation of the financial system in terms of interest rate ceiling, direct programs and high reserve requirements has the tendency to impede financial deepening. This they contend may negatively influence the quality and quantity of investments activities and hence retard productivity growth. With regard to literature on the nexus between financial liberalization and growth, some authors believe that the relationship has been "badly over-stressed" (Lucas, 1988, p. 6). Arestis and Dematriades, (1999), considering the analysis of the issue with regard to developing countries argue that unrealistic assumption of perfect information and perfect competition could be the main cause of the discrepancy between financial liberalization theory and evidence.

Ghana, as in the case of several other developing countries has implemented various structural and economic reforms programmes aimed at reaping the benefit associated with well-developed, effective and efficient financial system. These structural reform programmes were introduced at the time when the country's   financial sector was faced with financial repression leading to the abysmal performance of the sector as an   intermediary with the role to facilitate the attainment of growth levels in real sectors (manufacturing and agriculture) of the economy (Adu et al., 2013). The Financial Sector Adjustment Program (FINSAP) was then introduced in 1988 to help liberalize the financial sector which was facing several challenges in the early 1980s. The results were significant and positive effect on various financial systems which lead to the growth of the economy over the years of implementation. This study is intended to investigate the influence of financial liberalization on sectoral growth performance of the main economic sectors of the economy. Specifically, the study will distinguish between the productivity growths as measured by TFP of the three main economic sectors of the country. It further examined the nature of structural breaks and external shocks to financial liberalization and productivity growth of the three economic sectors.

1.2 Problem Statement

The Ghanian economy, like all the Sub-Saharan African (SSA) countries was adversely affected by the international recessions, debt crises and political instability that severely hit the sub region in the 1970s. The economic condition at the time which was occasioned by a reduction in the domestic resource mobilization and weak tax base, further depressed investment and economic growth leading to a deterioration in economic performance in the presence of financial repression during the period which gave rise to the adoption of structural adjustment programme. In Ghana, the economic conditions resulted to financial sector reforms as part of the Structural Adjustment Programme which was embarked upon in 1983 and 1996. Successive governments in Ghana over the years saw it as a matter of urgency to initiate and implement series of financial reform measures in an attempt to stimulate sustainable growth and economic development. The motivation for the implementation of these reform programmes was on the basis of a plethora of worldwide studies showing evidence of the dynamics of international financial liberalization giving impetus to rapid aggregate growth in support of the debate which favors a positive relationship between financial liberalisation and improved economic performance (Gehringe, 2013). Depending on the theoretical approach that one applies, financial

liberalization is deemed to have positive or negative effects on the growth process. This assertion is confirmed both when analyzing the growth process in general terms as in Bekaert et al. (2005) and when the intention is to investigate the impact on its main sources, productivity and capital accumulation (Bonfiglioli, 2008; Gehringer, 2013).

Contrasting the view expressed above with available literature (Demirguc- Kunt & Detragiache, 1998; Kaminsky & Reinhardt, 1999; Stiglitz, 2000; Glick & Hutchinson, 2001) which concerns more specifically with the economics of financial crises provides ample reasons to believe that financial liberalization might be the main cause of increased frequency of crisis and of induced macroeconomic volatility. The aforementioned analyses emphasized exclusively an aggregate perspective, putting together a wide range of economic sectors, industries and firms in various developed and developing economies. Moreover, macro data used in the empirical investigations were considered adequate to grasp an average effect of the phenomenon. Only a few studies recognized the need to make use of more disaggregated view: either by applying sector-level data (Levchenko, 2009; Becker et al., 2011) or by investigating a particular country, like Ghana being the case in Djokoto (2013), Karikari (1992), Gyapong and Karikari (1999), Frimpong and Oteng-Abayie (2008), and Sakyi (2011) who documented empirical evidence for the whole economy of Ghana on the relationship between financial liberalisation and economic performance, and Adenutsi (2008) for industrial performance also in Ghana. Yet there is still an unexploited area of the story that needs to be addressed.

In Ghana, studies that attempt to investigate the impact of financial liberalization on productivity growth which is considered as one of the main source of economic growth are not readily available (Djokoto, 2013). More precisely, studies that make effort to investigate and quantify the effect of financial liberalisation on the productivity growth distinguishing between manufacturing, service and agriculture sectors are completely absent from Ghana, making this research the first of its kind in Ghana. Furthermore, Gehringer (2014) found that due to the diversity in the intrinsic characteristics of manufacturing, service and agriculture sectors, their individual sector responses to the liberalisation processes are also expected to differ. This is because the impact of financial liberalisation is found to be sector-specific or at least differ in its effects on manufacturing, service and agriculture sectors (Gehringer, 2014).

This study is intended to investigate the effects of financial liberalisationon on productivity growth measured by total factor productivity (TFP). The study, analyses manufacturing, service and agriculture sectors in separate with the aim of preventing any sector-specific characteristics from influencing the determination of the more general relationship between financial liberalisation and productivity growth. Moreover, the study investigate the influence of financial liberalisation on the sectoral productivity growth particularly, distinguishing between the effects of financial liberalization on the productivity growth of the three main economic sectors (manufacturing, service and agriculture) of Ghana.

1.3 Research Questions

The research design adopted for this study is quantitative and therefore the research Questions are as follows:

1.   Is there a short-run effect of financial liberalization on the productivity growth of the Economic Sectors of Ghana?

2.   Is there a long-run effect of financial liberalization on the productivity growth of the Economic Sectors of Ghana?

3.   Is there a permanent effect of shock and Structural breaks to financial liberalization and productivity growth of the Service, Manufacturing and Agriculture Sectors in Ghana?

2. Literature Review

2.1 Endogenous Growth Theory

The theoretical approach to studying productivity growth is the Endogenous Growth Theory (Kaldor, 1957) which emerged as an improvement upon the Neoclassical Growth and the Harrod– Domar Growth Models. Endogenous growth theory came out as an attempt to embrace the sources of technological progress leading to sustained productivity growth. The theory expresses productivity growth as a function of growth in inputs together with growth in the efficiency in the transformation process (Kaldor, 1957; Koushik, 2017).

Endogenous growth theory emphasizes much on how economic activities that lead to the creation of new technological knowledge enhance long-run growth. The theory makes long-run economic growth dependent on the growth of total factor productivity (TFP), which is also determined by the rate of technological progress. The theory emerged subsequent to some of the short comings of the neoclassical growth theory introduced by Solow

(1956) and Swan (1956). According to the neoclassical theory, technological progress is determined by scientific processes that are exogenous to economic forces that bring about economic growth. This assertion is challenged by the endogenous growth theory which specifies the channels through long-run economic growth fueled by technological progress that can be influenced by economic factors (Kaldor, 1957; Koushik, 2017).

2.2 Financial Liberalisation Theory

The seminal work on finance-growth nexus presented by Schumpeter (1911) was subsequently followed by several other studies such as that of goldsmith (1969), McKinnon (1973) and Shaw (1973). These studies have formed the bedrock of the theory analyzing the effects of financial liberalization on productivity growth both in developed and developing economies. The studies by Schumpeter (1911) which is generally referred to as the initial framework leading to the analysis of the link between finance and growth hypothesis maintained that having a well-functioning financial system in place is an important first step in stimulating technological innovation (growth) through efficient allocation of economic resources flowing from unproductive to productive sectors within an economy. Schumpeter's argument is supported by Patrick (1966) supply-leading hypothesis which also maintained that when well-functioning financial market and associated services are created well in advance of the time they are needed, they draw along with it the real sectors on the path of growth, by means of transferring scarce resources from surplus spending units to deficit spending units in accordance with the highest rates of return on investment.

2.3 Measurement of Productivity

Productivity can broadly be described as the efficiency with which inputs are turned into output (Hulten, 2001). Productivity has been considered as a derived measure, and therefore not a straightforward concept that can directly be observed. Owing to this reasons, its calculation can be approached from different angles. The method of calculation chosen much depends on the purpose for which it is measured, the unit of measurement applied and availability of data (OECD, 2001).

Productivity can be measured using single factor productivity measure; example is labour productivity (OECD, 2001). With this approach output measurement is usually related to a single measure of input. Alternatively, productivity can also be measured using multifactor productivity measure as with Total Factor Productivity (TFP). Here a measure of output is related to observable group of input. In each of the two measures outlined above, there is also an issue of the choice of inputs and outputs; where an output is measured by means of gross measure or value added approach (OECD, 2001).

2.3.1 Total Factor Productivity (TFP)

Total factor productivity (TFP) is acclaimed to be the measure that presents comprehensive measurement of productivity. TFP, according to Kathuria et al. (2011) is defined as the ratio of output (or value added) to a weighted sum of the inputs used in the production process. Due to the nature of its inclusiveness, it is not confronted with the problem of changing factor intensities in production. TFP measurement takes into account both intermediate inputs and capital intensity.

Even though TFP has been subjected to criticism as a concept for measuring firm or industry level productivity, literature abound with several authors who employed it as a measure of firm level or industry level productivity (Gatti & Love, 2008; Grilli & Murtinu, 2011; Colombo et al., 2011; Harris &Li, 2012; Ackah et al., 2012; Levine & Warusawitharana, 2014).

2.3.2 Measurement of Production Function

The issue regarding the estimation of production function and productivity is the question of how input and output should be measured. There are however, several alternatives available. Authours such as (Saliola & Seker, 2011; Ahiakpor & Dasmani, 2012) approached the issue from gross output measures using revenue or sales. Value added approach was employed by others (Ospina & Schiffbauer, 2010; Levine & Warusawitharana, 2014). Besides these, (Biatour et al., 2011; Ackah et al., 2012) chose both gross output and value added approaches.

None of the three approaches described have been rated superior or preferred to the other. Whichever approach is used will depend on the availability of data. The value added approach can be conveniently used if data on intermediate inputs is available. To be able to use sales or revenues approach what one requires is to deflate their values using price deflator series where a given year is considered as the base year (Ackah et al., 2012).

2.4 Financial Liberalisation and Productivity Growth

The functions performed by financial system in any economy in developed or developing countries cannot be overemphasized. A hand full of the important functions performed by financial system are given below: Among

the basic functions are mobilization of financial resources for productive activities, financial system facilitate risk management, resource allocation from less productive to the most productive activities in any economy is imperative in enhancing productivity growth. This is an aspect of intermediation process that is facilitated by financial system (Levine, 1997).

The theoretical foundation of the argument supporting the assertion that well developed financial system has a greater tendency to enhance productivity growth in both developed and developing countries was laid by Schumpeter (1912). The views expressed by Schumpeter (1912) have been confirmed and enhanced by subsequent studies (Greenwood & Jovanovic, 1990; King & Levine, 1993). The import of the argument developed by Schumpeter (1912) is that, significant among the beneficial consequences of financial liberalization is its ability to spur allocative efficiency of savings which eventually lead to productivity growth. This is generally achieved through information channel, whereby well-developed financial intermediation process minimises the cost of information to the extent that savings are brought to where they are mostly needed for competitive productive activities (Beck et al., 2000). It is argued that where better information are made available to the financial intermediaries concerning the destination of productive and potential innovators, credit constraint may not hinder production activities which are even classified as high risk investment. This eventually will lead to advancement in technological progress (Acemoglu et al., 2006; Acemoglu & Zilibotti, 1997) and eventually productivity growth.

Apart from economic policies that deal with the elimination of financial distortions, other studies (Dabla-Norris et al., 2013; Aghion et al., 2005) have revealed that capital market development has a closer link with higher productivity growth. Reforms that encourage the formation and development of equity, bonds and securities markets can be effective in increasing productivity by means of bringing down cost of capital and making funds available for new capital and innovation. In other related studies, it was discovered that availability of financial instruments towards financing innovation process are mostly beneficial to countries closer to the technology frontier (Aghion et al., 2005).

Evidence found by Dabla-Norris et al. (2013) demonstrates that structural reforms enhance resource allocation leading to a boost in productive capacity. They discovered that productivity growth in EMDEs is dependent on catch-up growth by absorbing technology and ideas from technology leaders, structural reforms toward higher-productivity sectors and efficient resource allocation within sectors. A large body of other empirical evidence in a related study abound in literature on how trade openness, efficient and well-developed financial systems, and economic institutions with the capacity to promote competition and facilitate entry and exit, increase productivity growth at the cross-country, sector, and firm levels (Christiansen et al., 2013; OECD, 2013; Prati et al., 2013; Restuccia & Rogerson, 2013; Bourles et al., 2013).

2.5 Emperical Literature

Empirical studies on the effects of financial liberalization on productivity growth have yielded different results; various factors have accounted for this result. Among other factors, the following can be considered: estimation methodology (Krishnan et al., 2014, Nandy & Puri, 2014), stage of development of the economy (Chauvet & Jacolin, 2015; Gatti & Love, 2008), data used and sample size (Ali & Najman, 2015).

Empirically, the nexus between financial liberalization and productivity growth has been confirmed by several researchers on the subject. Beck, et al., (2000) examined the nexus between financial intermediary development and sources of growth. They used private credit and liquid liabilities as proxies for measuring financial intermediary development for 63 countries for the period 1960-1995; they discovered a strong positive link between financial intermediary development and real per capita GDP growth and total factor productivity growth.

Evidences drawn from both theoretical and empirical studies reveals that efficient financial systems cause increase in investment and promote innovation (Levine, 2005). In this sense, countries running efficient financial systems are therefore able to take advantage of technology transfer. Efficient capital allocation across firms and industries follow well developed financial systems (Rajan & Zingales, 2001; Tressel, 2008). In countries where financial repression and restriction on price or quantity of credit have been suppressed, it is known that resources move freely from across and within productive sectors. Larrain and Stumpner (2013) identified this evidence in 10 Eastern European countries that reforms directed at reducing financial repression have been found to increase manufacturing productivity by 17% resulting from enhanced allocation of resources across firms and within-industries.

Cross-country analysis offers more insight into the extent to which productivity payoffs of financial liberalization may vary across countries at different developmental stages (Chipeta, 2012). However, access to credit and its effects on productivity growth was not found to differ across countries at different

development levels. Specific reference was made to some industrialized countries such as Bulgaria, China and other developing countries in Africa such as Tanzanian. Evidence provided by Krishnan, Nandy and Puri (2014) shows that where smaller and financially constrained firms are given access to bank financing, their productivity is affected positively. Contrary to other studies (Krishnan et al., 2014; Chauvert & Jacolin, 2015), theirs was based on natural experiment of US private and public manufacturing firms, subsequent to the interstate banking deregulation which immensely opened bank financing to firms. Their findings was not different from that of Robb and Robinson (2014) who also found increased access to bank finance as a very critical factor in firms' productivity, most especially with regard to small and startup firms. It is also discovered that line of credit and savings has a strong positive link with productivity growth measured by Total factor Productivity (TFP) (Ali & Najman, 2015).

Studies in African and other developing countries have not yielded contrary evidence. Ali and Najman (2015) observed in a large survey of 33 African and other developing countries and discovered that where the perceived access to finance remains an obstacle for firms in those countries the less productive they become. On the other hand the same firms when given more access to external finance become better off in terms of their productivity. This view has been supported by International Finance Corporation(IFC) (2013) which also identified financial constrain as a major obstacle to enterprise growth and productivity among small and medium sized firms. Osei-Assibey (2013) also found that in Ghana, Medium and small enterprise having increased access to debt finance or loan achieve higher productivity in their operation. His study was based on data sourced from the Ghana Living Standards Survey (GLSS 5)..Chauvet and Jacolin (2015) rather distinguished between firm level and country level determinants in assessing the factors that influence both firm level and country level determinants of productivity. They identified that statistically, foreign ownership, size, export and overdraft facility significantly serve as a strong firm-level determinants of productivity, however GDP growth, income per capita, population and corruption ware considered as country level determinants.

In a related study by Andrews and Cingano (2014) it was found that well developed financial system moving hand in hand with lesser stringency in banking regulation leads to higher productivity. According to the authors, this is achieved by means of net firm entry mechanism. The implication is that availability of finance enhances productivity growth through the elimination of lower productivity firms in the economy. Their results agree with findings of similar study by Midrigan and Xu (2014). Bravo-Biosca et al. (2013) also found an indirect evidence of link between firm-dynamic-related productivity and greater financial development in a study carried on in 10 OECD countries using firm level data covering a period of 2002 to 2005. The conclusion drawn was that in the case where industries depend much on external finance, well developed financial institutions within an economy yields a more dynamic growth distribution of firms, a condition that promotes reallocation of capital through the firm churning process.

In a study conducted by Cole et al. (2016) in which firm technology adoption decisions for three countries including India, Mexico and the United States were modeled using external financing as a critical determinant, it was revealed that a financial system that engages in long-term contracts and efficient performance monitoring is a key driver for the adoption of advanced technologies that promotes higher productivity. Advanced production technologies require higher initial capital outlay with the payoff late in the firm development cycle. Countries such as US having efficient financing institutions and mechanisms are able to take advantage of adopting such advanced technologies. In the case of India and Mexico running flexible systems which permit adoption of entry-level and intermediate-level technologies, their financing needs are lower with shorter pay-off horizons as compared to advanced technology. The basis of differences in TFP between countries can therefore be highlighted by the kind of technology choice adopted. They further hinted that TFP for India and Mexico have the potential to rise by 46% and 43% respectively if their financial system were as well-developed as that of the United States (Cole et al., 2016; Ali & Najman, 2015).

Adusei (2013) on the other hand applied annual time series data from 1971 to 2010 in carrying out a related study in Ghana. Unlike the previous study, he used The Fully Modified Ordinary Least Square (FM-OLS), Error Correction Model (ECM) and Generalized Method of Moments (GMM) for estimations. The study found that finance impedes economic growth in Ghana. His conclusion was that financial liberalization undermines growth and therefore not beneficial to the economy. The study further revealed that FM-OLS and ECM results confirms that money supply to GDP ratio and domestic credit to GDP ratio hinder growth in both the long-and short-run (Adusei, (2013)

3. Methodology

31 Research Design

The research design for this study is quantitative design. The study is intended to conduct a systematic and objective examination of the variables involved in the study in order to establish and measure the relationship between financial liberalization and productivity growth, using sector-level data. The study used multivariate analysis model.

3.2 Statistical Data Analysis/Procedures

The analysis of data is based on econometric models such as Error correction model to examine the short run and long run relationship among the variables; Multivariate regression analysis, which involves the study of the relationship among the variables in the model, will be applied (Lancaster, 2005).

3.3 Econometric Estimation Techniques

The investigation and examination of the long run relationship is based on testing for unit root; performance of cointegration test (Gregory and Hansen model).

3.4 Nature and Sources of Data

The data used in this study are secondary data. The study employed annual time series data from 1970 to 2013. The sources of the data are various issues of World Bank's, World Development Indicators, IMF's International Financial Statistics, Bank of Ghana, Ghana Statistical Services and Ghana Financial Market Department Report. Only quantitative data was used in this study

3.5 Measurement of Productivity

Several forms of Production function are available for estimating Total Factor Productivity (TFP). Among others, the following can be considered: Transcendental Logarithmic (Translog) Production Function, Constant Elasticity of Substitution (CES) and Cobb- Douglas production function. Following other authors such as (Chen & Guariglia, 2011; Osei-Assibey, 2013; Gatti & Love, 2008; Arnold et al., 2008). This study employs the Cobb-Douglas Production Function in Estimating Total Factor Productivity (TFP).

3.5.1 Estimating Total Factor Productivity (TFP)

This study used the Value-Added-Based Total Factor Productivity measure.

Estimation of total factor productivity measure begins with the standard Cobb-Douglas production function given as equation (1):

$$Y_{it} = TFP_{it} L_{it}^{\beta_L} K_{it}^{\beta_k} \sum_{m=1}^{M} X_{imt}^{\beta} \quad \ldots\ldots\ldots\ldots\ldots\ldots \ \ldots\ldots\ldots\ldots \ (1)$$

Where TFP$_{it}$ denotes technology contribution to output (Y) in sector i at time t, β coefficients refer to each factor's (X) estimated output elasticity and m= (1, 2…m)

Equation (1) is then transformed into a log-log model as in equation (2)

$$\ln Y_{it} = \ln TFP_{it} + \beta_L \ln L_{it} + \beta_k \ln K_{it} + \beta_1 \ln X_{i2t} + \beta_2 \ln X_{i2t} + \ldots + \beta_m \ln X_{imt} \ldots \quad (2)$$

The productivity level is obtained as the residual of the (lnTFP$_{it}$) by subtracting from output the observable inputs contributions weighted by their corresponding output elasticities

$$\ln TFP_{it} = \ln Y_{it} - \beta_L \ln L_{it} - \beta_k \ln K_{it} - \beta_1 \ln X_{i2t} - \beta_2 \ln X_{i2t} - \ldots - \beta_m \ln X_{imt} .. \quad (3)$$

Going by the value added approach and given that value added is defined as the difference between the value of gross output and the value generated by intermediates (X$_1$…X$_M$):

$$\ln VA_{st} = \ln Y_{st} - \beta_1 \ln X_1 + \beta_2 \ln X_2 + \ldots + \beta_m \ln X_m \quad \ldots\ldots\ldots\ldots\ldots\ldots \ (4)$$

The log productivity measure for each Sector-year observation, TFP$_{st}$ is taken as the residual from analogous log-log model as in equation (3):

$$\ln TFP_{st} = \ln VA_{st} - \beta_L \ln L_{st} - \beta_k \ln K_{st} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \ (5)$$

In this sense, TFP growth ($\ln TFP_{it} - \ln TFP_{it-1}$) is defined as the value added not influenced by an increase in input (labour and capital)

The regression estimation below is therefore based on equation (4)

$$\ln Y_{st} = c + \alpha \ln K_{st} + \beta \ln L_{st} + \varepsilon_{st} \dots\dots\dots\dots\dots\dots(6)$$

With Y_{st} denoting value-added by sector (s) in year (t), and K_{st} and L_{st} denoting capital and labor inputs respectively. The log specification given in equation (3.1) assumes a Cobb-Douglas model for value-added by economic sectors (Manufacturing, service and Agriculture). The intention here is not to impose a constant returns-to-scale restriction in the above model, however, both the capital and labor elasticities will be estimated.

The log productivity measure for each Sector-year observation, TFP_{st} is taken as the residual from equation (3).

The Log growth rate of Productivity which will be employed as the dependent variable for the subsequent models is derived by taking differences of this residual. This is expressed as:

$$TFP_{st+1} = TFP_{st-1} - TFP_{st} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(7)$$

In the model, capital is measured using the replacement value of capital while labor measured as the staff cost of employees. The replacement value of capital is computed based on double declining balance method used by Summers and Salinger (1983). This approach (replacement value of capital) allows the incorporation of potential differences in the quality of the capital stock. Using staff cost of labour in the measurement of labour input also permits the author to capture potential differences in the skill level of employees

The TFP measure that is estimated indicates the amount of value-added by various sectors beyond what can be attributed to its capital and labor inputs. Therefore, an increase in TFP will mean that where input factors are held constant, the economic sector involved generates a higher amount of value-added to productivity.

3.5.2 Model Specificatio

The next step after estimating productivity (TFP) is to regress on its policy variables. The main policy variables to be considered in this study are financial liberalisation proxied by Credit to Private-Sector, Sector-Level Investment (FDI) and Trade openness. There are other potential determinants of sector level productivity growth identified in literature such as Capital Account openness, Market Capitalization and Credit Control Relaxation). That notwithstanding, empirical theory does not indicate any particular determinant which must be used in an empirical model. The study will therefore follow the stepwise approach whereby as many significant variables as the data may provide can be included in the model.

The baseline model for this study is based on the endogenous growth model. Following Adusei (2013) and also on the basis of the theoretical literature, the model for the study is specified as:

$$TFP_{st+1} = \alpha_1 TFP_{st} + \alpha_2 TFP_{st-1} + \gamma Finlib_t + \beta X_{st} + v_s + \varepsilon_{st+1} \dots\dots(8)$$

With TFPit+1 denoting real productivity growth from year t to t + 1; $Finlib_{st}$ is the financial liberalization index, X_{st} denotes a set of additional controls; and v_s denotes a sector fixed effect. The coefficient of interest, γ, is interpreted as an elasticity term. The lagged productivity growth terms are included for the purpose of accounting for the mean reversion in productivity observed in the data. ε is the idiosyncratic error term. A positive coefficient for γ signifies that financial liberalization promotes productivity growth within the sectors. The control variables used comprise sector's size, physical investment during year t, government expenditure, market capitalization and credit control relaxation. Considering the significance of these control variables, a positive relationship with productivity is expected. Government expenditure in percentage of GDP included as part of the control variables measures the contribution of the government involvement to economic growth. This influence even though, is expected to be positive; it might also be negative due to the crowding out effect regarding private investment (Adusei, 2013).

A sector's size variable is also included for the purpose of soaking up some sector-specific characteristics in relation with a sector in an economic system (Maskus et al., 2012; Friedrich et al., 2012).

3.6 Estimation Strategy

For most time series regression analysis, consistency in the data and parameter estimates is very relevant. Therefore, the study follows three major steps to estimate the parameters included in the estimable model. Firstly, the study examines the stationarity properties of the variables included in the model. Secondly, the study tests for the presence or otherwise of cointegration (long-run relationship) amongst the variables. Finally, the study estimates the long-and short-run parameter estimates.

3.6.1 Unit Root Test without Structural Break

Unit root test is relevant in time series model in order to investigate the stationarity properties of the variables. Time series variables that are non-stationary leads to estimations which produce spurious results. It is also important to test for the stationarity properties for the purpose of determining the order of integration so that an appropriate econometric technique can be chosen. Where the series are non-stationery, there is the need to make them stationery through differencing. Augmented Dickey-Fuller (1981) (ADF) and the Kwiatkowski et al. (1992, KPSS) were used for the unit root test which does not involve structural break.

Generally, as specified by Nanthakumar and Subramaniam (2010), the ADF test is specified as:

$$\Delta Y_t = \alpha_t + \beta_t \gamma_t + \rho Y_{t-1} + \sum_{i=1}^{q} \partial \Delta Y_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (9)$$

Where γ is time trend, Y is time series variable in the model, ε_t is the error term or stochastic error term. Given that Y_t is the level of the series variable, μ is the drift term, T is the time trend, P is the number of lags, Δ indicates that the series are in their first difference. The ε_t is the error term/ white noise having the features of normal distribution. The error term (ε_t) has an expected mean value of zero (0) and a constant variance. None of the errors is dependent on each other. The constant term and time trend are not present in the equation (2), equation (3) rather has a constant term while; equation (4) has both the constant term and time trend.

The null hypothesis (H_0) states that the series are non-stationary in levels; while the alternative hypothesis (H_1) states that the series are stationary. The critical values are compared with the computed values at 5%, 1% and 10% levels of significant.

The ADF Test is governed by the decision rule which states that if the computed ADF value in absolute term is less than the ADF critical value in absolute term, the series in the model are said to be non-stationary or has unit roots, which therefore requires differencing until they become stationery.

3.6.2 The KPSS Test

The KPSS test is normally performed for the purpose of confirming the ADF test. The main null assumption underlying the KPSS test is that the series variables being tested are stationary as against the alternative assumption which states that the series are non-stationary (Kwiatkowski et al., 1992).

The KPSS Test is expressed in an equation form given in equation (10)

$$X_t = \xi t + r_t + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (10)$$

Where X_t is the series variable being tested; t is the deterministic trend, r_t is the random walk, and ε_t is the stationary error.

The random walk can also be expressed in an equation form as:

$$r_t = r_{t-1} + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (11)$$

Given that μ_t is equal to IID (0, $\sigma2_\mu$). r_t has an initial value of zero (0) given by r_0 and also considered as fixed. It functions as the intercept in the model. The stationarity assumption governing this test is given as $\sigma2_\mu = 0$. The series variable (X_t) which is being tested assumes trend stationary properties on the basis that the error term is stationary.

5.6.3 Unit Root Test with Structural Breaks

The analysis of time series variables with structural breaks are based on several tests including Zivot-Andrews (1992) and Clemente, Montanes and Reyes (1998) tests. The examination and investigation of unit root with one endogenously determined structural break is examined with the use of The Zivot-Andrews (ZA) unit root test. This test estimates the break date but does not consider it as fixed. The ZA test allows only a single break in the intercept and the trend of the series variable being examined.

The equations below give the expression of the ZA tests.

$$y_t = \alpha_0 + \alpha_1 DU_t + d(DTB)_t + \beta_t + py_{t-1} + \sum_{i=1}^{p} \emptyset_i \, \Delta y_{t-1} + e_t \dots\dots\dots (15a)$$

$$y_t = \alpha_0 + \gamma DT_t^* + \beta_t + py_{t-1} + \sum_{i=1}^{p} \emptyset_i \, \Delta y_{t-1} + e_t \dots\dots\dots\dots\dots\dots\dots (15b)$$

$$y_t = \alpha_0 + \alpha_1 DU_t + d(DTB)_t + \gamma DT_t + \beta_t + py_{t-1} + \sum_{i=1}^{p} \emptyset_i \, \Delta y_{t-1} + e_t \; \ldots\ldots (15c)$$

Given that DUt (λ) =1 if t>Tλ, 0 otherwise; DT*$_t$ (λ) = t-Tλ if t>Tλ, 0 otherwise. Lamda hat in the equations (15a), (15b), and (15c) are the estimated values of the break fraction.

The null assumption specified in equation (15b) states that the time series variable being examined is integrated without an exogenous structural break while the alternative hypothesis states that the series is trend-stationary with a break point occurring in the trend at an unknown point. In this sense break point can be estimated at a point that favours the alternative hypothesis.

$$y_t = \beta + y_{t-1} + e_t, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (16)$$

Various information criteria are employed in selecting the lag length. These include: Schwartz Information Criterion (SIC) Hannan-Quinn Information Criterion (HQI), Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). The t-test is also used in addition to the selection processes outlined above. In the case where the series variables exhibit multiple breaks, the ZA test becomes limited in dealing with it. An appropriate test was developed by Clemente, Montanes, and Reyes (1998) which permits multiple structural breaks to be examined.

The assumptions (Null assumption and the alternative assumption) underlying the test are specified in the equations (17) and (18).

$$H_0; x_t = x_{t-1} + \delta_1 DTB_{1t} + \delta_2 DTB_{2t} + \mu_t, \ldots\ldots\ldots\ldots\ldots (17)$$

$$H_1; x_t = \mu + \theta_1 DU_{1t} + \theta_2 DTB_{2t} + \varepsilon_t, \ldots\ldots\ldots\ldots\ldots\ldots (18)$$

Given that DTBit is the dummy variable. DTB$_{it}$ is equal to 1 if t= TB$_i$+1, 0 otherwise. DU$_{it}$ = 1 if t>TB$_i$ (for i=1, 2), 0 otherwise. TB1 and TB2 represent the period for the break point. Clemente et al. (1998) specified that TBi = λiT (for i=1, 2) for the range 0<λ_i<1 and λ_2>λ_1.

The estimation of the break points is made dependent on innovative and additive outliers.

Equation (19) presents the model for the innovative outlier

$$x_t = \mu + \rho x_{t-1} + \delta_1 DTB_{1t} + \delta_2 DTB_{2t} + \theta_1 DU_{1t} + \theta_2 DU_{2t} + \sum_{i=1}^{k} c_j \Delta x_{t-i} + \varepsilon_t, \ldots\ldots (19)$$

The assumption for the asymptotic distribution of the test statistic for the above model is given in a model (20) below.

$$0 \prec \lambda_0 \prec \lambda_1, \lambda_2 \prec 1 - \lambda_0 \prec 1 \;, \ldots\ldots (20)$$

Where λ_1 and λ_2 take the values of [(t+2)/T, (T-1/T)]

Based on the assumption that λ_2>λ_1+1, the issue regarding the case where the breaks occur at conservative period can be eliminated.

Structural break involving additive outliers can be examined using the models specified in equations (21) and (22).

$$x_t = \mu + \theta_1 DU_{1t} + \theta_2 DU_{2t} + \tilde{x} \ldots\ldots\ldots\ldots\ldots (21)$$

The deterministic aspect of the model is ignored when estimating equation (16) Clemente et al. (1998). Equation (22) is then estimated on an assumption that ρ =1. The minimum value of t-ratio is employed in testing for the null assumption that ρ =1.

$$\tilde{x}_t = \sum_{i=0}^{k} \omega_{1i} DTB_{1t-i} + \sum_{i=0}^{k} \omega_{2i} DTB_{2t-i} + \rho \tilde{x}_{t-1} + \sum_{i=1}^{k} c_i \Delta \tilde{x}_{t-i} + \ell_t \ldots\ldots\ldots (22)$$

Where DTB$_{it}$ is the dummy variable included in the model to ensure that min tA0$_{\rho^{\wedge}}$ (λ_1, λ_2) converges to the distribution.

$$\min t_{\rho^{\wedge}}^{A0} (\lambda_1, \lambda_2) \rightarrow \inf \lambda = \wedge \frac{H}{[\lambda_1 (\lambda_2 - \lambda_1)(1 - \lambda_2)]^{0.5} k^{0.5}} \ldots\ldots\ldots (23)$$

3.6.4 Cointegration Analysis Base on the Gregory and Hansen Methodology with Structural Breaks

The Gregory and Hansen Methodology of cointegration permit the investigation of long run and short run relationship with endogenous structural breaks. The four models specified in equations (24, 25, 26 and 27) are specifically developed for this purpose. The investigation is based on the following assumptions: null assumption that there is no cointegration with structural break against the alternative assumption that there is cointegration with structural break.

The variables defined in the equations: M and N are the two series variables with M denoting the dependent variable and N denoting the independent variable. e is the error term t is time subscript; and k is the break date.

$$M_t = \theta_1 + \theta_2 f_{tk} + a_1 N_t + e_t, \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (24)$$

Model A: Level Shift

$$M_t = \theta_1 + \theta_2 f_{tk} + \delta_1 t + a_1 N_t + e_t, \dots\dots\dots\dots\dots\dots (25)$$

Model B: Level Shift with Trend

Model C: Regime Shift with change in Intercept and Slope coefficients

$$M_t = \theta_1 + \theta_2 f_{tk} + \delta_1 t + a_1 N_t + a_2 N_t f_{tk} + e_t, \dots\dots\dots\dots\dots (26)$$

Model D: Regime Shift with change Intercept, Slope coefficients and Trend

$$M_t = \theta_1 + \theta_2 f_{tk} + \delta_1 t + \delta_2 t f_{tk} + a_1 N_t + a_2 N_t f_{tk} + e_t, \dots\dots\dots\dots (27)$$

Estimation of dummy variables in equations (24) to (27), require an additional equation (28) as specified below.

$$f_{tk} = 0 \text{ if } t \leq k \text{ and } f_{tk} = 1 \text{ if } t > k \quad \dots\dots\dots\dots \quad \dots\dots (28)$$

The determination of the break date depends on the estimation of the cointegration equations for all possible break dates in the series under investigation. The minimum t-statistics is used in selecting the break date or ADF test statistic is maximum in absolute term. Critical values in Engle-Granger model developed by Gregory and Hansen (1996) is employed in investigating cointegration in the presences of unknown structural breaks.

4. Results and Discussions

4.1 Time Series Plot of the Variables in Levels without Breaks

The Time Series plot results shown in Figure 1 (Appendix A) indicate that, all the series are not stationary in levels, and might achieve stationarity by differencing (Figure 2) (Appendix B). This implies that there is the need for further scientific investigation of the nature of unit root using the KPSS model of unit root.

4.2 The Unit Root Tests without Structural Breaks

The series were examined in levels in linear form, and in first difference. The results in Table 2 indicate mixed results. Some series are unit root in levels but become stationary in first difference as indicated in Table 3, with the implication that they are integrated of order one, I (1). Series variables that are stationary at levels are integrated of other zero, I (0). The levels of significance are 1%; 5% and 10%. Some series are stationary at 10% but not at 1% and 5%. The results indicate that all the series are stationary in first difference. The KPSS is a reversed test for unit root. It is used for confirmation of the stationarity properties of the series.

Table 2. ADF AND KPSS tests without structural breaks

	ADF Test without Structural Breaks				KPSS Test without Structural Breaks			
Variable (Level)	t-statistics	ADF/P-Value	Results	Lag length	t-statistics	P-Value	Results	Lag length
TL	-1.149	0.698	Not stationary	1	0.132	0.082	stationary	3
BSL	-0.522	0.885	Not stationary	1	0.252	n.a	Not stationary	3
INV	-1.696	0.098	Not stationary	1	0.140	n.a	Not stationary	3
CAOP	-3.149	0.003	Not stationary	1	0.174	n.a	Not stationary	3
ASP	-1.784	0.389	Not stationary	1	0.055	n.a	stationary	3
MSP	-3.033	0.032 **	stationary	1	0.098	n.a	stationary	3
SSP	-1.746	0.408	Not stationary	1	0.108	n.a	stationary	3

Source: (Author's computation): Critical values at 10%, 5% and 1% significant levels are 0.119, 0.146, 0.216 respectively

Table 3. The ADF AND KPSS tests without structural breaks

	ADF Tests without Structural Breaks				KPSS Tests without Structural Breaks			
Variable (1st dif.)	t-statistics	ADF/P-Value	Results	Lag length	t-statistics	P-Value	Results	Lag length
TL-1st dif.	-5.398	2.92e-06 ***	Stationary	1	0.120	n.a	Stationary	3
BSL-1st dif.	-5.591	1.08e-06 ***	Stationary	1	0.092	n.a	Stationary	3
CAOP-1st dif.	-3.557	0.001***	Stationary	1	0.099	n.a	Stationary	3
INV-1st dif.	-6.378	0.000 ***	Stationary	1	0.144	n.a	Stationary	3
ASP-1st dif.	-7.099	1.78e-010 ***	Stationary	1	0.041	n.a	Stationary	3
MSP-1st dif.	-5.921	1.85e-07 ***	Stationary	1	0.066	n.a	Stationary	3
SSP-1st dif.	-7.250	6.85e-011 ***	Stationary	1	0.051	n.a	Stationary	3

Source: (Author's computation): Critical values at 10%, 5% and 1% significant levels are 0.119   0.146   0.216 respectively.

4.3 Testing Unit Root Allowing for Endogenous Structural Breaks

The Zivot-Andrews test was used to test for unit root allowing for endogenously determined structural break. The results are reported in Table 4. The test is based on the null hypothesis of unit root against the alternative hypothesis of no unit root. The null hypothesis of unit root cannot be rejected excerpts Agriculture Sector Value Added (ASP) and Service sector value added (SSP). The series variables are unit root with structural breaks. The break dates coincides with known national dates in the Ghanaian economy.

Table 4. Zivot-Andrews unit root tests with structural break

Series (Level)	t-statistic	Optimal Breakpoints	Decisions
ASP	-6.417	1978	Stationary
MSP	-3.840	1981	Unit root
SSP	-5.918	2004	Stationary
BSL	-3.132	1981	Unit root
TL	-2.560	2002	Unit root
CAOP	-2.659	1979	Unit root
INV	-2.128	1979	Unit root

Source: (Author's computation):   Critical values are 1% (-4.93); 5% (--4.42) and 10% (--4.11): Note: ***, ** and * denotes statistical significance at the 10%, 5% and 1% levels respectively.

Table 5. Zivot-Andrews unit root tests with structural break

Series (First Diff)	t-statistic	Optimal Breakpoints	Decisions
ΔASP	-7.081	1984	Stationary
ΔMSP	-5.956	1987	Stationary
ΔSSP	-5.936	1981	Stationary
ΔBSL	-8.747	1999	Stationary
ΔTL	-3.461	1987	Unit root
ΔCAOP	-6.610	1990	Stationary
ΔINV	-7.100	1996	Stationary

Source: (Author's computation): Critical values are 1% (-4.93); 5% (--4.42) and 10% (--4.11): Note: ***, ** and * denotes statistical significance at the 10%, 5% and 1% levels respectively.

4.4 Testing for Unit Root Allowing for Two Structural Breaks

The Clemente-Montanes-Reyes test (1998) was used to test for unit root allowing for two structural breaks. The Clemente-Montanes-Reyes test has two models, which are the innovational outlier (IO) and Additive Outlier (AO). The results for IO model are reported in Table 8 and that for AO model are reported in Table 7. According

to the IO model, structural changes take place gradually and allows for a break in both the slope and the intercept of the model. In the AO model, the assumption is that structural changes is rapid and allow for a break in only the slope. The test is based on the null hypothesis that the series are not stationary with structural breaks (there is unit root) and the alternative hypothesis that the series are stationary with break (there is no unit root). Despite the structural break in the series using the innovative outlier, Manufacturing Sector Value Added (MSP) and Service sector value added (SSP), we are unable to reject the null hypothesis of a unit root in the series variables in levels, as shown in Table 7.

Table 7. Clemente et al., (1998) structural break with double mean shifts

IO mode: IO model, structural changes take place gradually and allows for a break in both the slope and the intercept of the model				
Series (Levels)	t-statistics	5% Critical Value	Optimal break Points	Decisions
TL	-3.238	-5.490	1984&1994	Unit root
BSL	-3.800	-5.490	1995&2006	Unit root
CAOP	-3.401	-5.490	1977&1992	Unit root
INV	-4.646	-5.490	1987&1991	Unit root
ASP	-0.407	-5.490	1982&2004	Unit root
MSP	-6.425	-5.490	1979&1982	Stationary
SSP	-8.775	-5.490	1982&2004	Stationary

Source: (Author's computation).

In Table 9 we are able to reject the null hypothesis of unit root in the series variables in first difference.

Table 8. Clemente et al., (1998) structural break with double mean shifts

IO model: In the AO model the assumption is that structural changes is rapid and allow for a break in only the slope.				
Series (Levels)	t-statistics	5% Critical Value	Optimal break Points	Decisions
ΔTL	-6.222	-5.490	1981&1999	Stationary
ΔBSL	-7.988	-5.490	1982&1998	Stationary
ΔCAOP	-9.607	-5.490	1977&1993	Stationary
ΔINV	-7.210	-5.490	1982&1992	Stationary
ΔASP	-14.618	-5.490	1981&1985	Stationary
ΔMSP	-8.120	-5.490	1981&1985	Stationary
ΔSSP	-8728	-5.490	1981&1985	Stationary

Source: (Author's computation).

Considering the case of additive outliers, in the face of structural break in the series variables in levels, the null hypothesis of a unit root in the series could not be rejected, in Table 10. The results in Table 11 indicate mixed results. Some series are unit root in levels but become stationary in first difference (BSL, INV and ASP).

Table 9. Clemente et al., (1998) structural break with double mean shifts

AO model: In the AO model the assumption is that structural changes is rapid and allow for a break in only the slope.				
Series (Levels)	t-statistics	5% Critical Value	Optimal break Points	Decisions
TL	-1.317	-5.490	1988&1998	Unit root
BSL	-0.236	-5.490	1974&1996	Unit root
CAOP	-2.057	-5.490	1977&1995	Unit root
INV	-4.718	-5.490	1975&1990	Unit root
ASP	-1.162	-5.490	1980&2003	Unit root
MSP	-0.641	-5.490	1979&1981	Unit root
SSP	-3.141	-5.490	1981&2005	Unit root

Source: (Author's computation).

Table 10. Clemente et al., (1998) structural break with double mean shifts

AO model: In the AO model the assumption is that structural changes is rapid and allow for a break in only the slope.				
Series (Levels)	t-statistics	5% Critical Value	Optimal break Points	Decisions
ΔTL	-1.973	-5.490	1982&2004	Unit root
ΔBSL	-6.940	-5.490	1981&1997	Stationary
ΔCAOP	-5.478	-5.490	1976&1992	Unit root
ΔINV	-7.513	-5.490	1981&1991	Stationary
ΔASP	-6.418	-5.490	1981&1984	Stationary
ΔMSP	0.993	-5.490	1973&1982	Unit root
ΔSSP	-2.124	-5.490	1978&1981	Unit root

Source: (Author's computation).

*4.5 Gregory-Hansen Structural Break Cointegration Test (*Service, Agriculture and Manufacturing Sectors *Value Added Model)-Model C; Model C/T; Model C/S and Model C/S/T)*

Determinants of Service, Agriculture and Manufacturing sectors productivity growth are modeled using Gregory-Hansen (G-H) Co-integration approach in the presence of structural breaks

The results on the estimated models revealed evidence of cointegration considering the various assumptions (a level shift; a level shift with a trend; a regime shift which allows the slope vector to shift as well and a regime shift which allows the slope vector to shift with a trend) using the ADF/Zt values. The models are estimated for the long run parameters for four explanatory variables due to the fact that Gregory-Hansen model takes a maximum of four variables.

The results on the estimated models [model C; model C/T; model C/S and model C/S/T] are reported in Table 11. The results revealed evidence of no significant cointegration in models C, C/T and C/S/T for service and manufacturing sectors but significant cointegration in model C/S. Models C/S/T and C/S are estimated for the service and manufacturing sectors. In the case or Agriculture sector, the results indicate that there is no significant cointegration in models C, and C/S and model C/S/T but significant cointegration in model C/T. Models C/S/T and C/T are therefore estimated for that sector.

The long run parameters of the two models selected for each of the three sectors are estimated using OLS. The results are presented in Table 19. The estimates of the models presents Model C/S as the only plausible model for service and manufacturing sectors and model C/T for Agriculture sector since some of the estimated coefficients of the explanatory variables are significant. The residuals from Model C/S and C/T are used to estimate the short run dynamic equation for the determinants of service, manufacturing and agriculture sectors, productivity growth with the error-correction adjustment model (ECM).

In model C/S, service sector productivity grows by about 33.3%, 35.9%, 13.9% and about 0.06% (though insignificant) when Banking sector Liberalisation, Investment, Capital account openness and Trade liberalization) increase by 1% respectively in the long run.

Manufacturing sector productivity increases by 33.3%, 35.9%, 13.9% and 0.06% when Banking sector Liberalisation, Investment, Capital account openness and Trade liberalization increase by 1% respectively in the long run. Model C/T also revealed that Agriculture sector productivity grows by about 23.6%, when investment increases by 1%, it however decreased by 2.2%, about 41.2% and about 48.96% (though insignificant) when Banking sector Liberalisation, Capital account openness and Trade liberalization) increase by 1% respectively in the long run.

Table 11. Gregory-Hansen structural break cointegration test (service, agriculture and manufacturing sectors value added model)-model c; model c/t; model c/s and model c/s/t)

Variables	Model	ADF	BP	Zt	BP	Zα	BP
SSP, TL BSL, CAOP, INV	C	-8.260	1984	-8.320	1984	-54.220	1984
	C/T	-8.290	1984	-8.390	1984	-54.530	1984
	C/S	-2.930	1983	-8.620	1984	-55.500	1984
	C/T/S	-8.890	1984	-8.780	1984	-56.170	1984
ASP, TL BSL, CAOP, INV	C	-8.530	1981	-8.630	1981	-56.070	1981
	C/T	-8.330	1981	-8.420	1981	-55.000	1981
	C/S	-3.740	1979	-8.990	1981	-57.610	1981
	C/T/S	-8.780	1981	-8.880	1981	-57.030	1981
MSP, TL BSL, CAOP, INV	C	-5.87	1993	-5.04	1992	-31.81	1992
	C/T	-5.73	1993	-5.06	1985	-31.52	1985
	C/S	-3.72	1999	-5.34	1987	-34.05	1987
	C/T/S	-6.41	1988	-5.42	1987	-34.54	1987

Table 12. Estimated Long Run Coefficients of Models C/S; Model C/T; and Model C/S/T)

Cointegration equations 1970-2013 (Service, Agriculture and Manufacturing Sectors Value Added)						
	Service Sector		Agriculture Sector		Manufacturing Sector	
Variables	Model C/S (DUM1983)	Model-C/S/T (DUM1984)	Model C/T (DUM1981)	Model-C/S/T (DUM1981)	Model C/S (DUM1999)	Model-C/S/T (DUM1988)
Constant	5.776 (0.000)	8.108 (0.252)	-1.134 (0.894)	-1.138 (0.894)	6.637 (0.378)	2.760 (0.720)
Dum X Constant	-12.312 (0.000)	1.728 (0.367)	4.503 (0.045**)	4.503 (0.046**)	-1.329 (0.291)	N.A
Trend	N.A	-0.057 (0.126)	-0.112 (0.009***)	-0.112 (0.009***)	N.A	-0.077 (0.099)
lnTL	-0.202 (0.151)	-.818 (0.559)	(4.920 (0.003***)	4.920 (0.0034***)	-0.589 (0.683)	1.354 (0.249)
lnBSL	0.264 (0.005)	1.207 (0.198)	-0.623 (0.565)	-0.62 (0.565)	1.328 (0.199)	1.030 (0.299)
lnCAOP	-1.224 (0.000)	-4.082 (0.327)	-3.438 (0.407)	-3.438 (0.407)	-4.404 (0.231)	-2.783 (0.444)
lnINV	.279 (0.073)	2.412 (0.142)	-1.128 (0.527)	-1.128 (0.527)	2.818 (0.095)	0.003 (0.977)
R-squared	0.992	0.235	0.394	0.394	0.371	0.214
Adj R-squared	0.991	0.111	0.292	0.292	0.128	0.087

4.6 OLS: Using Observations 1970-2013 (T = 44) Dependent Variables: lnSSP, lnMSP and lnASP

The results of short-run dynamic equilibrium relationship coefficients estimated for the three sectors are reported in Table 13. All the explanatory variables in the models in respect of service and manufacturing sectors, with the exception of trade liberalisation are insignificant. The coefficients (5.97543) for SSP and (3.92482) for MSP of trade liberalisation have the expected priori theoretical sign. The error correction term (ECM) 0.877 for service sector is statistically significant; however it does not have the expected theoretical sign of negative. However, with MSP the error correction term (ECM) -0.475062 is statistically significant with the expected theoretical sign of negative. The results indicate that in the short-run financial liberalization influences the productivity growth of the manufacturing sector in Ghana.

In the case of agriculture sector, all the explanatory variables in the model are significant with the exception of Capital account openness. The error correction term (ECM) -0.957667 is statistically significant and has the

expected theoretical sign of negative. The implication is that in the short-run financial liberalization influences the productivity growth of the agriculture sector in Ghana.

Table 13. Short run coefficients estimates

Cointegration Equations 1970-2013 (Service Sector Value Added)				
Model C/S		Regresands = (lnSSP. LnASP, lnMSP)		
Regressors	Elasticities	Std Error	T-ratio	P-value
ΔlnSSP_1	8.283	3.788	2.187	0.036 **
ΔlnBSL	-0.415	1.512	-0.275	0.785
ΔlnTL	5.975	2.156	2.771	0.009 ***
ΔlnCAOP	-4.085	5.754	-0.710	0.483
ΔlnINV1	0.9106	1.481	0.615	0.543
DUMCON83	110.851	48.263	2.297	0.028 **
Constant	-8.272	13.248	-0.624	0.536
EC1	0.8766	1.445	0.607	0.548
ΔlnASP_1	-0.022	0.0085	-2.822	0.008 ***
Constant	1.854	0.0303	61.49	1.92e-036 ***
lnBSL	-0.022	0.089	2.766	0.009 ***
lnTL	-0.412	0.136	-3.025	0.005 ***
lnCAOP	-0.489	0.308	-1.586	0.122
lnINV	0.236	0.091	126.7	4.57e-047 ***
DUMCON81	15.848	0.125	126.7	4.57e-047 ***
Constant	7.26289	2.86789	-2.532	0.0161 **
EC1	-0.958	0.0114	-87.32	1.38e-041 ***
ΔlnMSP_1	-0.203393	0.148888	-1.366	0.1809
Δ lnBSL _1	-0.415641	1.56936	-0.265	0.7927
ΔlnTL _1	3.92482	2.05845	1.907	0.0650 *
ΔlnCAOP _1	-3.32931	5.55092	-0.599	0.8056
ΔlnINV_1	-0.391146	1.57669	-0.248	0.8056
DUMCON99	2.09854	1.19226	1.760	0.0874 *
Constant	7.26289	2.86789	-2.532	0.0161 **
EC1	-0.475062	0.189386	-2.508	0.0171 **

	SSP	ASP	MSP
Mean dependent variable	0.012	-0.019	-0.0196
Sum squared residuals	137.561	0.523	133.5347
R-squared	0.573	0.999	0.5698
rho	-0.092	0.288	-0.1348
S.D. dependent variable	2.803	3.431	2.751
S.E. of regression	2.011	0.124	1.982
Adjusted R-squared	0.485	0.999	0.481
Durbin-Watson	2.168	1.289	2.202

4.7 Stability Tests

The results of the parameter stability tests are shown in Figures 3 4, 5, 6, 7, and 8. Figures 3 and 4 indicate that the estimated coefficients are stable for SSP per both the CUSUM and CUSUMSQ tests. The estimated coefficients are unstable per the CUSUMSQ test for ASP. However, the estimated coefficients according to the CUSUM showed stability as the residuals fall within the 5% critical boundaries as indicated in figure 5 and 6. Figures 7 and Figure 8 indicate that the estimated coefficients are unstable per the CUSUM test. However, the estimated coefficients according to the CUSUMSQ showed stability as the squared residuals fall within the 5% critical boundaries.
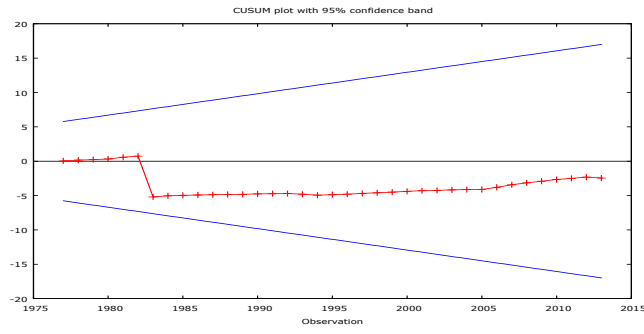
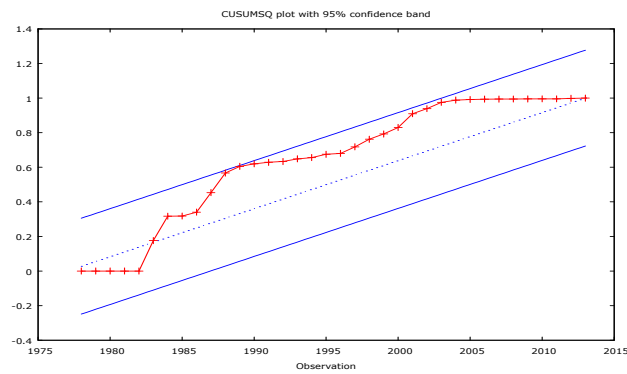Figure 3. Plot of CUSUM (SSP)

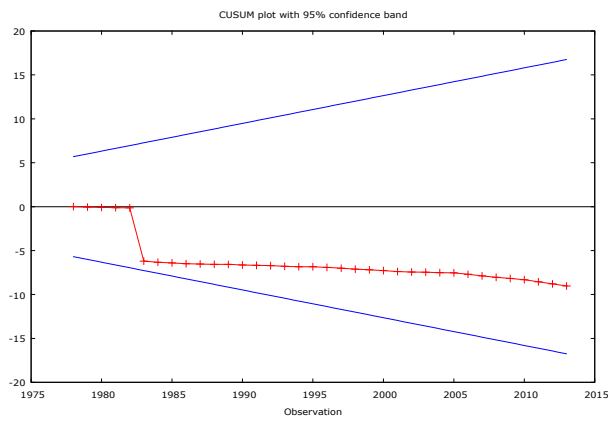Figure 4. Plot of CUSUMSQ (SSP)
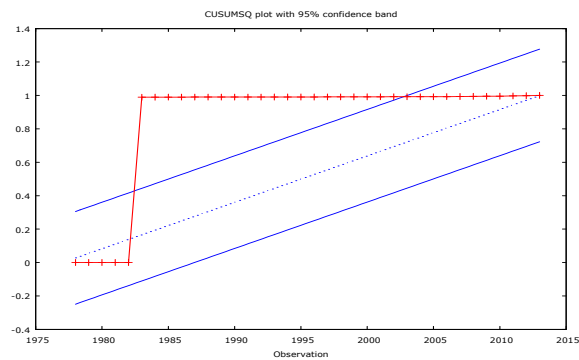

Figure 5. Plot of CUSUM (ASP)
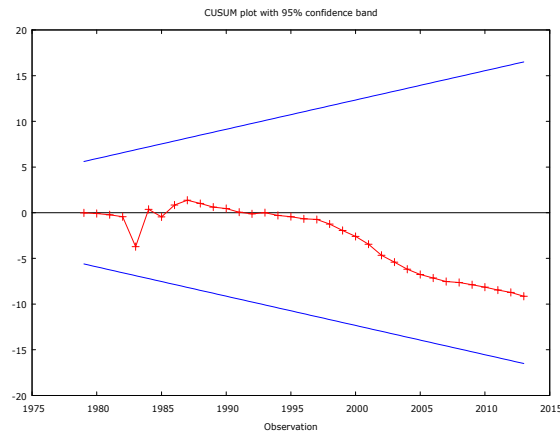

Figure 6. Plot of CUSUMSQ (ASP)
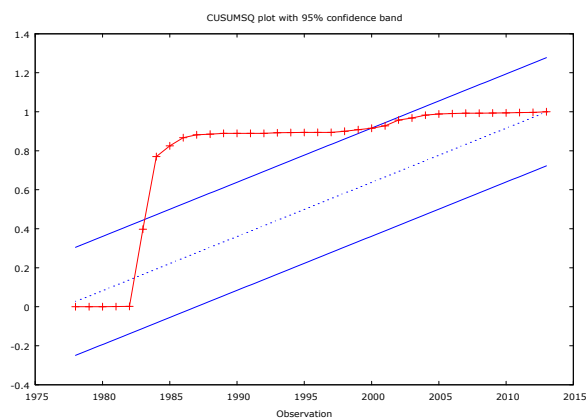
Figure 7. Plot of CUSUM (MSP)

Figure 8. Plot of CUSUMSQ (MSP)

The results of the study in many respects confirm previous evidence (Didier & Schmukler, 2014, Larrain & Stumpner, 2013; Dabla-Norris, Ho, & Kyobe; 2013; Schumpeter, 1911; McKinnon, 1973; Shaw, 1973; Goldsmith, 1969; Fry 1988; & Pagano, 1993). In the long-run, financial liberalization exercised a clearly positive impact on productivity growth of the economic sectors of Ghana, with a much stronger effect observed for service sector productivity growth than for manufacturing and agriculture sectors confirming the evidence found in Ghana by Jedwab and Osei (2012). The theoretical proposition that developing economies are closed economies with limited access to external finance and self-finance investments is confirmed Didier & Schmukler, 2014, Larrain & Stumpner, 2013; Dabla-Norris, Ho, & Kyobe; 2013; Schumpeter, 1911; McKinnon, 1973; Shaw, 1973; Goldsmith, 1969); therefore alleviating financial restrictions in developing economies, is a means of exerting positive effect on growth in the sense that rising interest rates will lead to competitive market equilibrium, which will eventually promote efficient allocation of resources to productive sectors and industries for the purpose of enhancing productivity growth in Ghana.

The results obtained have empirical significance. There is a strong positive effect of trade openness on agriculture sector productivity growth and negative but insignificant effect on manufacturing and service sectors in the long-run. This result seems to reflect the relatively stronger involvement of agriculture activities in international trade relations that contributed to positive productivity-driven growth impulses. However, in the short-run there is a strong positive effect of trade openness on Service sector followed by manufacturing sector and significantly negative growth effect of Trade openness on agriculture sector productivity.

In the long-run Banking sector liberalization contributes to positive productivity-driven growth effects in service sector than manufacturing sector and significantly negative growth effect on agriculture sector productivity growth. In the short-run Banking sector liberalization exerts significantly negative growth effect on agriculture productivity growth and again negative but insignificant growth effect on manufacturing and service sector productivity growth. Capital account openness on the other hand contribute negatively to productivity growth in

all the three sectors both in the long-run and short-run with the negative growth effects being significant for service sector and insignificant for manufacturing and agriculture sectors. There is also a strong positive effect of investment for manufacturing and service sectors productivity growth, however, the intensity of the respective influence differs, being stronger for manufacturing sector and weaker for service, and negative but insignificant effect on agriculture sector productivity growth in the long-run. Investment exerts positive growth effect on agriculture productivity growth in the short-run but insignificant growth effect on manufacturing and service sectors.

In the short-run however, the results of the study revealed mixed results because there is evidence from the study indicating both positive and negative growth effect of financial liberalization on the productivity growth of the three economic sectors in Ghana. A key reason that could explain the mixed results is that the effects of financial liberalization are time-varying (Schmukler & Kaminsky, 2007). The results of the study indicate that agriculture sector productivity growth is negatively influenced by trade liberalization in the short-run, on the contrary, trade liberalization exerts positive growth effects on both manufacturing and service sector productivity. However, in the long run, trade liberalization leads to a significantly positive impact on agriculture sector productivity growth as confirmed by Djokoto (2013). This result also support the evidence found by Schmukler and Kaminsky (2007) that financial liberalization is followed by large booms and busts during the short run period whiles in the long run, institutions improve and financial markets tend to stabilize. This means that reforms payoffs evolve over time and that productivity gains from reforms takes time to materialize (Dabla-Norris and others, 2015). The implication is that gains associated with financial reform programmes could be consolidated by avoiding drastic policy reversal, but rather concentrate on fine-tuning the existing policy measures and continued implementation of the financial sector reforms programmes

5. Conclusion

There is permanent effect of shock and structural breaks to financial liberalization and productivity growth of the service, manufacturing and agriculture sectors in Ghana. The theories of unit root in time series data are confirmed. The structural breaks coincide with identified climatic, economic, and political shocks in Ghana. The theoretical implications are that, the theories of structural breaks are supported, and that anticipated values of productivity growth that do not take into consideration the effects of structural breaks and external shocks might be affected by errors, and therefore exaggerated. Therefore, with regard to policy implication, government initiated structural reform that is not accompanied by sound macroeconomic policies may not have a lasting effect, since the effect of such reform in the long run growth path could be thrown out of gear by other external shocks.

The theoretical preposition that developing economies are closed economies with limited access to external finance and self-finance investments is confirmed; the implication is that alleviating financial restrictions in developing economies will lead to competitive market equilibrium, which will eventually promote efficient allocation of resources to productive sectors for promoting productivity growth in Ghana.

Theoretically, productivity growth model is confirmed. Wagner's hypothesis is also supported that government expenditure (investment in agriculture and manufacturing sector) affect productivity growth which in turn leads to economic growth. Expansionary fiscal policy is therefore supported as against contractionary policy. In Practice, increasing government spending (Investment), opening up trade, improving the financial sector will improve productivity growth of the economic sectors of Ghana. Considering the fact that financial liberalization exerts uneven effects on the productivity growth of the respective economic sectors of the economy, it is strongly recommended that policy makers should exercise caution in their choice of financial liberalisation indicators as a policy instrument for the purpose of realizing the intended productivity growth in the various sectors of the economy.

Financial liberalization exercises an uneven effect on the productivity growth of the various economic sectors of Ghana. The positive effect of financial liberalization on productivity growth can be broadly confirmed in all the three economic sectors (Agriculture, Manufacturing and Service Sectors). The results as revealed by the study are important in so far as they provide insights on the linkages between financial liberalization and productivity growth. To be precise, the results does not only confirm that financial liberalization might be growth-enhancing across the economic sectors, but they emphasize the evidence that such positive effects emanate from productivity improvements, which constitute an important channel through which developing countries could achieve economic growth.

Future studies could be focused on whether financial liberalization will make anticipated impact on sector level productivity growth using primary data from the various sectors of the economy in a survey study using structural modeling.

References

Abiad, A., Oomes, N., & Ueda, K. (2008). The quality effect: Does financial liberalization improve the allocation of capital? *Journal of Development Economics, 87*(2).

Acemoglu, D., Aghion, P., & Zilibotti, F. (2006). Distance to Frontier, Selection, and Economic Growth. *Journal of the European Economic Association, 4*(1), 37-74. https://doi.org/10.1162/jeea.2006.4.1.37

Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a Fundamental Cause of Long-Run Growth. *Handbook of Economic Growth, MIT, 1*(1), 385-472. https://doi.org/10.3386/w10481

Ackah, C., Aryeetey, E., & Morrissey, O. (2012). Tariffs and Total Factor Productivity: The Case of Ghanaian Manufacturing Firms. *Modern Economy, 3*(3), 275-283.

Ackerberg, D., Benkard, C. L., Berry, S., & Pakes, A. (2007). Econometric tools for analyzing market outcomes. In J. Heckman and E. Leamer (Eds.), *Handbook of Econometrics, 6*(1), 4171-4276. Amsterdam: North-Holland.

Agbaeze, E. K., & Onwuka, I. O. (2014). Financial liberalization and investments–the Nigeria Experience. *Journal of Research in Economics and International Finance (JREIF)*, *3*(1), 12-24.

Ahiakpor, F., & Dasmani, I. (2012). Access to Finance and Efficiency of Firms in Ghana. Draft report, University of Cape Coast.

Akinlo, A. E. (2005). Impact of Macroeconomic Factors on Total Factor Productivity in Sub-Saharan African Countries. World Institute for Development Economics Research. Research Paper No. 2005/09.

Akpaeti, A. J. (2015). Impact of Financial Sector Reforms on Agricultural Growth in Nigeria: A Vector Autoregressive (Var) Approach. *American Journal of Experimental Agriculture, 7*(1), 17-35. https://doi.org/10.9734/AJEA/2015/11423

Ali, N., & Najman, B. (2015). Informal Competition and Productivity in Sub-Saharan Africa. Draft of University of Paris, France.

Andersen, L., & Babula, R. (2008). The link between openness and long-run economic growth. Retrieved from http://www.usitc.gov/publications/332/journals/openness_growth_link.pdf

Arnold, J., Javorcik, B., Lipscomb, M., & Mattoo, A. (2012). Services Reform and Manufacturing Performance: Evidence from India. *WB Policy Research Working Paper 5948*, World Bank, Washington.

Baumann, S., Hermes, N., & Lensink, R. (2013). Financial liberalization and economic growth: A meta-analysis. *Journal of International Money and Finance, 33*(3), 255-281. https://doi.org/10.4324/9780203714287

Beck, T., Levine, R., & Loayza, N. (2000). Finance and the sources of growth. *Journal of Financial conomics, 58*(2), 261-300. https://doi.org/10.1596/1813-9450-2057

Bekaert, G., Harvey, C. R., & Lundblad, C. (2011). Financial openness and productivity. *World Development, 39*(1), 1-19. https://doi.org/10.2139/ssrn.1358574

Bencivenga, V., & Smith, B. (1991). Financial intermediation and endogenous growth. *Review of Economic Studies, 58*(2), 195-209.

Benhabib, J., & Spiegel, M. M. (2000). The role of financial development in growth. *Journal of Economic Growth, 5*(4), 341-360.

Biatour, B., Dumont, M., & Kegels, C. (2011). The determinants of industry-level total factor productivity in Belgium. *Federal Planning Bureau working paper*, 7-11.

Borchert, I., Gootiiz, B., & Mattoo, A. (2010). Restrictions on Services Trade and FDI in Developing Countries. World Bank, mimeo.

Borensztein, E., De Gregorio, J., & Lee, J.W. (1998). How does foreign direct investment affect economic growth? *Journal of International Economics, 45*(1), 115-135.

Chauvet, L., & Jacolin, L. (2015). Financial Inclusion and Firms Performance. Seminar paper.

Chen, M., & Guariglia, A. (2011). Financial Constraints and firm productivity in China: Do liquidity and export behaviour make a difference? Research paper series, China and the World Economy, University of Nottingham.

Chipeta, C. (2012). Financial Liberalisation and the Capital Structure of Firms Listed on the Johannesburg Stock Exchange. Retrieved from http://www.repository.up.ac.za/bitstream/handle/2263/23951

Christiansen, L., Schindler, M., & Tressel, T. (2013). Growth and Structural Reforms: A New Assessment. *Journal of International Economics*, *89*(2), 347-356. https://doi.org/10.1016/j.jinteco.2012.07.008

Clemente, J., Montañés, A., & Reyes, M. (1998). Testing for a unit root in variables with a double change in the mean. *Economics Letters*, *59*(2), 175-182. https://doi.org/10.1016/j.econlet.2019.06.003

Cobb,C. W., & Douglas, P. H. (1928). A Theory of Production. *American Economic Review, 18*(1), 139-165. Retrieved from http://w*ww.econ.iastate.edu/classes/econ521/Orazem/Papers/cobb-douglas*

Dabla-Norris, E., Giang, H., & Kobe, A. (2013). Reforms and Distance to Frontier. IMF Technical Note to Staff Discussion Note 13/08. Washington: International Monetary Fund.

Dabla-Norris, E., Giang, H., Kalpana, K., Annette, K., & Robert, T. (2013). Anchoring Growth: The Importance of Productivity-Enhancing Reforms in Emerging Market and Developing Economies. IMF Staff Discussion Note 13/08, Washington: International Monetary Fund. https://doi.org/10.5089/9781498334181.006

Dabla-Norris, E. S., Guo, V., Haksar, M., Kim, K., Kochhar, K. W., & Zdzienicka. A. (2015). The New Normal: A Sector-Level Perspective on Growth and Productivity Trends in Advanced Economies. IMF Staff Discussion Note 15/03 International Monetary Fund, Washington.

Didier, T., & Schmukler, S. L. (2014). Financial Development in Asia: Beyond Aggregate Indicators. https://doi.org/10.1596/1813-9450-6761

Djokoto, J. G. (2013). Openness and Agricultural Performance in Ghana: *Journal of Science and Technology, 33*(2), 24-36. https://doi.org/10.4314/just.v33i2.3

Dramani, J. B., Tandoh, F., & Tewari, D. D. (2012). Structural breaks, electricity consumption and economic growth: Evidence from Ghana. *African Journal of Business Management, 6*(22), 6709-6720.

Du, J., & Girma, S. (2012). Firm Size, Source of Finance, and Growth - Evidence from China, *International Journal of the Economics of Business*, *19*(3), 397-419. https://doi.org/10.1080/13571516.2012.715272

Effiong, E. (2015). Financial Development, Institutions and Economic Growth: Evidence from Sub-Saharan Africa.

ESSO, L. J. (2009). Cointegration and causality between financial development and economic growth: Evidence from ECOWAS countries. *European Journal of Economics, Finance and Administrative Sciences*, *16*(1), 112-122.

Fernandez-Arias, E., & Montiel, P. J. (1996). The surge in capital inflows to developing countries: An analytical overview. *World Bank Economic Review, 10*(1), 51-77.

Fischer, M. (2010). Generalized tukey-type distributions with application to financial and teletraffic data. *Stat Papers*, *51*(1), 41-56.

Fons-Rosen, C., Kalemli-Ozcan, S., Sørensen, B. E., Villegas-Sanchez, C., & Volosovych, V. (2013). Quantifying Productivity Gains from Foreign Investment. *NBER Working Paper* no. 18920. https://doi.org/10.3386/w18920

Fowowe, B. (2004). Financial Liberalization Policies and Economic Growth: Panel Data Evidence from Sub-Saharan Africa. *Paper presented at the CSAE conference* (pp. 21-22).

Gatti, R., & Love, I. (2008). Does access to credit improve productivity? Evidence from Bulgaria. *Economics of transition, 16*(3), 445-465. https://doi.org/10.1111/j.1468-0351.2008.00328.x

Gehringer, A. (2013b). Growth, Productivity and Capital Accumulation: The Effects of Financial Liberalization in the Case Of European Integration. *Int. Rev. Econ. Finance, 25*(3), 291-309. https://doi.org/10.2139/ssrn.2024887

Gehringer, A. (2013c). *Financial liberalization and productivity growth in manufacturing and service sectors: evidence from panel investigation on sector-level data.* Retrieved from http://www.economics-ejournal.org/economics/discussionpapers
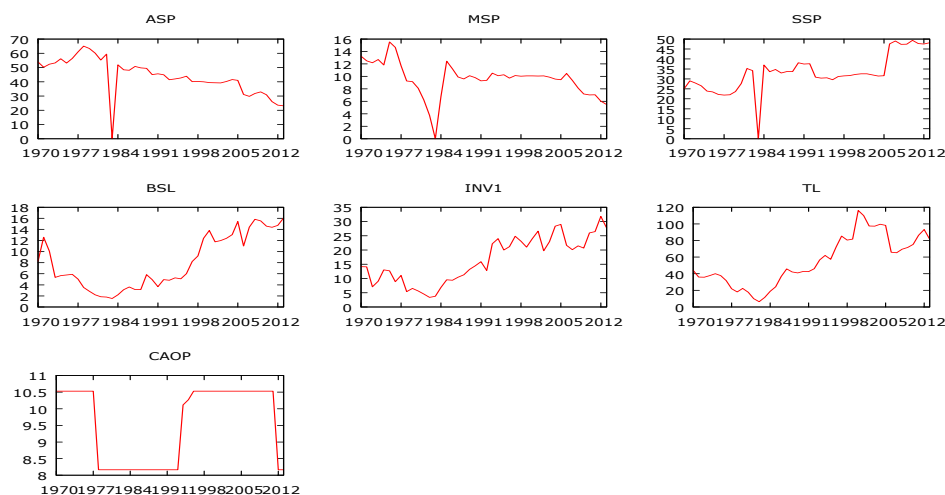
Gehringer, A. (2014a). Uneven Effects of Financial Liberalization on Productivity Growth in the EU: Evidence from a dynamic panel investigation. *International Journal of Production Economics, 159*(3), 334-346. https://doi.org/10.1016/j.ijpe.2014.05.003

Goedhuys, H., Janz, N., & Mohnen, P. (2006). What drives Productivity in Tanzanian Manufacturing Firms: Technology or Institutions? Working Paper.

Goldsmith, R. W. (1969). *Financial Structure and Development*. New Haven, CT: Yale University Press.

Granger, C. J. (1969). Investigating Causal Relationships by Econometrics Models and Cross Spectral Methods, *Econometrica, 34*(3), 424-438. https://doi.org/10.2307/1912791

Greenwood, J., & Jovanovic, B. (1990). Financial development, growth, and the distribution of income. *Journal of Political Economy, 98*(5), 1076-1107. https://doi.org/10.21034/wp.446

Greenwood, R., & Scharfstrein, D. (2013). The Growth of Finance. *Journal of Economic Perspectives, 27*(2), 3-28.

Gregory, A. W., & Hansen, B. E. (1996). Tests for cointegration in models with regime and trend shifts. Oxford Bulletin of Economics and Statistics, *58*(3), 555-559. https://doi.org/10.1111/j.1468-0084.1996.mp58003008.x

Gregory, A. W., & Hansen, B. E. (1996a).Residual-based tests for cointegration in models with regime shifts. *Journal of Econometrics*, *70*(1), 99-126. https://doi.org/10.1016/0304-4076(69)41685-7

Grilli, V., & Milesi-Ferretti, G. M. (1995). Structural Determinants and Economic Effects of Capital Controls. *International Monetary Fund Staff Papers*.

Gujarati, D. N. (2004). Basic Econometrics, Fourth Edition, McGraw-Hill Companies.

Hall, R. E., & Jones, C. I. (1999). Why do some countries produce so much more output per worker than others? *Quarterly Journal of Economics*, *114*(1), 83-116. https://doi.org/10.1162/003355399555954

Henry, P. B. (2000). Stock market liberalization, economic reform, and emerging market equity prices. *Journal of Finance, 55*(2), 529-564. https://doi.org/10.1111/0022-1082.00219

Hoskins, C. N., & Mariano, C. (2004). *Research in Nursing and Health*: Understanding and Using Quantitative and Qualitative Methods (2nd ed.). New York, CA: Springer Publishing Company.

IFC. (2013). World Bank Group. Retrieved from https://openknowledge.worldbank.org/handle/10986/15772

Jedwab, R., & Osei, D. R. (2012). Structural change in Ghana 1960-2010. Retrieved from https://www2.gwu.edu/~iiep/assets/docs/papers/Jedwab_IIEPWP2012-12.pd

Karikari, J. A. (1992). Causality between Direct Foreign Investment and Economic Output in Ghana. *Journal of Economic Development*, *17*(1), 7-17.

King, R. G., & Levine, R. (1993a). Finance and growth: Schumpeter might be right. *Quarterly Journal of Economics, 108*(3), 717-737. https://doi.org/10.2307/2118406

King, R. G., & Levine, R. (1993b). Finance, entrepreneurship, and growth: theory and evidence. *Journal of Monetary Economics, 32*(3), 513-542.

Kose, A. M., Prasad, E. S., & Terrones, M. E. (2009). Does openness to international financial flows raise productivity growth? *Journal of International Money and Finance, 28*(4), 554-580.

Krishnan, K., Nandy, D. K., & Puri, M. (2014). Does Financing Spur Small Business Productivity? Evidence from a Natural Experiment. *The Review of Financial Studies, 28*(6).

Lane, P. R., & Milesi-Feretti, G. M. (2001). The external wealth of nations: measures of foreign assets and liabilities for industrial and developing countries. *Journal of International Economics, 55*(2), 263-294.

Lane, P. R., & Milesi-Feretti, G. M. (2007). The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970-2004. *Journal of International Economics, 73*(2), 223-250. https://doi.org/10.1016/j.jinteco.2007.02.003

Larrain, M., & Stumpner, S. (2013). Financial Reforms and Aggregate Productivity: The Microeconomic Channel. Working Paper.

Levine, O., & Warusawitharana, M. (2014). Finance and productivity growth: Firm-level evidence. Finance and Economics discussion series. Division of research & Statistics and Monetary affairs Federal Reserve Board, Washington, D.C. https://doi.org/10.17016/FEDS.2014.17

Levine, R. (1996b). Foreign banks, financial development, and economic growth. In: Barfield, C. E. (ed.). *International financial markets*. Washington DC. CA: Enterprise Institute Press:

Levine, R. (1997c). Financial development and economic growth: views and agenda. *Journal of Economic Literature, 35*(2), 688-726.

Levine, R. (2005a). Finance and Growth: Theory and Evidence. In Philippe Aghion and Steven N. Durlauf (Eds.), *Handbook of Economic Growth.*

Maurel, M., & Seghir, M. (2014). The main obstacles to firm's growth in Senegal, implications for the long run. *African Development Bank Group Working Paper Series, 208.* https://doi.org/10.35188/UNU-WIDER/2014/880-3

Midrigan, V., & Xu, D. Y. (2014). Finance and Misallocation: Evidence from Plant-Level Data. *American Economic Review, 104*(2), 422-458. https://doi.org/10.1257/aer.104.2.422

Nicoletti, G., & Scarpetta, S. (2003). Regulation, Productivity and Growth: OECD Evidence. *Economic Policy, 18*(36), 9-72. https://doi.org/10.1596/1813-9450-2944

Nirodha, D. S., Jaime, M. J., & Johnson, J. (2013). Trade Liberalization Effects on Agricultural Production Growth: The Case of Sri Lanka.Selected Paper Prepared For Presentation at the Southern Agricultural Economics Association Annual (Saea) Meeting, Orlando, Florida, 2-5 February 2013.

OECD (Organization for Economic Cooperation and Development). (2013). The Missing Entrepreneurs. In *Policies for Financing.* Paris.

Ogunsakin, S. (2014). Nigerian Financial Sector and Manufacturing. *IOSR Journal of Applied Chemistry (IOSR-JAC), 7*(3), 41-46.

Olanrewaju, H. M. (2016). Implications of Commercial Bank Loans on Economic Growth in Nigeria (1986-2014). *Journal of Emerging Trends in Economics and Management Sciences (JETEMS), 7*(3), 124-136.

Orji, A., Orji, I. A., & Nwachukwu, P. (2015). Financial Liberalization and Output Growth in Nigeria: Empirical Evidence from Credit Channel. *International Journal of Economics and Financial Issues, 5*(1), 297-311

Osei-Assibey, E. (2013). Source of finance and small enterprise's productivity growth in Ghana, *African Journal of Economic and Management Studies, 4*(3), 372-386. https://doi.org/10.1108/AJEMS-03-2012-0017

Ospina, S., & Schiffbauer, M. (2010). Competition and firm productivity: Evidence from firm-level data. IMF Working Paper. WP/10/67. https://doi.org/10.5089/9781451982114.001

Patrick, H. T. (1996). Financial development and economic growth in underdeveloped countries. *Economic Development and Cultural Change, 14*(2), 174-189.

Perron, P. (1989).The great crash, the oil Price shock and the unit root hypothesis. *Econometrica, 57*(6), 1361-1401. https://doi.org/10.2307/1913712

Pesaran M. H., & Shin, Y. (1999). *Econometrics and Economic Theory in the 20th Century: An Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis*. Cambridge, UK: Cambridge University Press.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326.

Pesaran, M..H., & Pesaran, B. (1997). *Working with Microfit 4.0: Interactive Econometric Analysis.* Oxford, UK: Oxford University Press. https://doi.org/10.1002/jae.616

Polat, A., Muhammad, S., Ijaz, U. R., & Saqlain, L. S. (2013). Revisiting Linkages between Financial Development, Trade Openness and Economic Growth in South Africa: Fresh Evidence from Combined Cointegration Test. *MPRA* Paper No. 51724, http://mpra.ub.uni-muenchen.de/51724/

Prati, A., Onorato, G. M., & Papageorgiou, C. (2013). Which Reforms Work and under What Institutional Environment? Evidence from a New Data Set on Structural Reforms. *Review of Economics and Statistics, 95*(3), 946-968.

Rajan, R., & Zingales, L. (2001). Financial Systems, Industrial Structure, and Growth. *Oxford Review of Economic Policy, 17*(4), 467-482. https://doi.org/10.1093/oxrep/17.4.467

Rajan, R., & Zingales, L. (2003). The great reversals: the politics of financial development in the twentieth century. *Journal of Financial Economics, 69*(1), 5-50. https://doi.org/10.1016/S0304-405X(03)00125-9

Richardson, K. E., & Tamarauntari, M. K. (2014). Economic Liberalization and Industrial Sector Performance in Nigeria- A Marginal Impact Analysis. *Industries International Journal of Development and Emerging Economics*, *2*(4), 43-59,

Saint-Paul, G. (1992). Technological choice, financial markets and economic development. *European Economic Review, 36*(4), 763-781. https://doi.org/10.1016/0014-2921(92)90056-3

Saliola, F., & Seker, M. (2011). Total Factor Productivity across the developing world. World Bank Group, Enterprise Note Series No. 23.

Schmukler, S. L. (2003). *Financial globalization: gains and pain for developing countries.* Word Bank, Washington, DC.

Schumpeter, J. A. (1911). *The Theory of Economic Development.* Cambridge, MA: Harvard University Press.

Schumpeter, J. A. (1912). *Theorie der wirtschaftlichen Entwicklung*. Leipzig: Duncker & Humblot.

Shaw, E.S., (1973). *Financial Deepening in Economic Development*. London, UK: Oxford University Press,

Solow, R. M. (1956a). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, *70*(1), 65-94. https://doi.org/10.2307/1884513

Solow, R. M. (1963b). *Capital Theory and the Rate of Return*. Amsterdam: North-Holland.

Takii, S. (2005). Productivity Spillovers and Characteristics of Foreign Multinational Plants in Indonesian Manufacturing 1990-1995. *Journal of Development Economics, 75*(2), 521-542.

Tombe, T. (2012). The Missing Good Problem: How Low Agricultural Imports Contribute to International Income and Productivity Differences. Manuscript, University of Calgary.

Udoh, E., & Ogbuagu, U. R. (2012). Financial Sector Development and Industrial Production in Nigeria (1970-2009): An ARDL Cointegration Approach. *Journal of Applied Finance & Banking*, *2*(4), 49-68.

World Bank. (2017). Uganda moving beyond recovery: investment and behavior change, for growth country economic memorandum. Report No, 39221-UG.
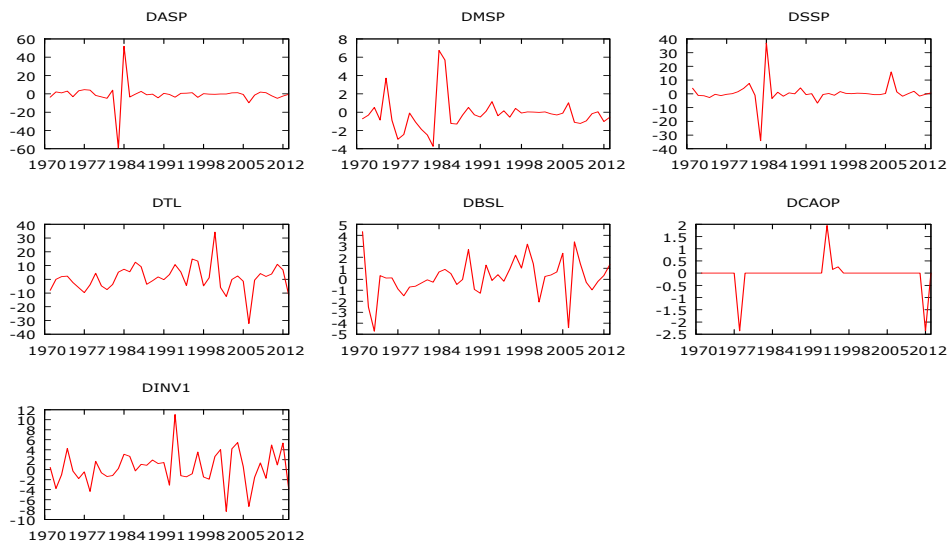
Appendix A

Time Series Plot of the Variables in Levels without Breaks

Time Series Plot of the Variables in Levels without Breaks