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DETERMINANTS OF ECONOMIC GROWTH IN GHANA

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Preface

The factors that have been responsible for long-run economic growth in Ghana are analysed using econometric methods based on available data from 1966 to 2000. The author identifies political stability as one of the major factors influencing long-run economic growth. World oil price shocks also influence economic growth by causing its decline. Government size (measured as government expenditures divided by the gross domestic product) influences economic growth in a quadratic equation manner. Increasing government size results in increasing growth until a point is reached beyond which growth actually falls with increasing government size. Growth of exports strongly affects economic growth as expected. However an increase in total investment-GDP ratio does not significantly affect long-run economic growth though the expected positive relationship is identified in this study. Likewise the growth of labour does not significantly influence economic growth suggesting insignificant marginal labour productivity at the aggregate level. The author makes several useful suggestions for policymakers to act upon to ensure sustainable economic development in Ghana so that the country can reach middle-income status more quickly.

We do hope you find this publication useful.

Mrs. Jean Mensa
Administrator
IEA

ABSTRACT

An econometric analysis of the factors influencing long-run economic growth in Ghana since independence was undertaken using a variant of neo-classical growth model based on available data from 1966 to 2000. The dependent variable of this long-run growth model was the annual growth of real gross domestic product (GDP). Annual growth of total exports, annual growth of total labour, total investment-GDP ratio, government size, measured as the ratio of total government expenditures to GDP, and the square of government size, were the independent variables. The other independent variables were a dummy variable for world oil market price shock of the mid-1970s and early 1980s and a dummy variable for political instability, defined as years when there was a military coup or extreme political upheaval sometimes related to major droughts. The short run error correction model, based on the long-run cointegration function, was also estimated.

The results showed that long run economic growth was positively influenced by political stability. The world oil price shocks of the mid-1970s and early 1980s led to reduced economic growth. Government size influenced economic growth in quadratic equation fashion with increasing government size resulting in increasing growth until a point is reached beyond which growth would actually fall with increasing government size. Growth of exports strongly affected economic growth. However increase in total investment-GDP ratio did not significantly affect long-run economic growth though the expected positive

relationship between the two variables was captured by the analysis. Growth of labour did not influence economic growth suggesting insignificant marginal labour productivity at the aggregate level. Short-run economic growth was mainly influenced by political stability. The error correction term in the shortrun ECM was statistically significant indicating that the independent variables in the long-run model cause or precede economic growth in the Granger sense.

Overall, the results indicated that political stability was a major catalyst for achieving long-run economic growth in Ghana, rather than structural adjustment programmes of international lending organizations per se as asserted by some researchers. The latter sometimes contributed to political instability in Ghana in the past, by creating conditions conducive to military coups. Moderate annual economic growth (3 to 4%) has always been achieved in Ghana in years of political stability with or without structural adjustment programmes, and regardless of the type of government, civilian or military. The challenge now is for Ghana to accelerate its economic growth in order to reach middle-income status without creating conditions for high inflation.

1. INTRODUCTION

I.1. Brief Historical Overview of Ghana

Ghana was the first country in Sub-Saharan Africa to gain political independence from European colonial powers in the 20th Century. Political independence was achieved on the 6th of March 1957. However self-government with a local Ghanaian Prime Minister was installed by the British Colonial Government in February 1951 after a period of agitation by local leaders after the Second World War. The period from 1951 to 1956 and from 1957 to February 1966 was under the leadership of Dr. Kwame Nkrumah and the Convention People's Party (CPP). CPP swept to power in three national elections organised by the British Colonial Government in 1951, 1954 and 1956 and two subsequent elections after independence in 1960 and 1964.

Ghana, was earlier called Gold Coast, because of the extensive deposits of gold found by European colonialists and explorers from the 15th to 19th Centuries AD. These large gold deposits and other mineral riches of the country led to intense interest and competition by European powers for the coastal trade which also included extensive trade in slaves. The coastal area of Ghana has the highest number of forts and castles built by European political authorities and traders in West and Central Africa from the 15th to 19th Centuries AD suggesting the intense nature of the competition for resources including slaves by European powers in Ghana during the colonial era. The Portuguese were the first Europeans to arrive on the shores of present day Ghana in the 15th Century, followed by the Danes, Dutch, French and finally the British who assumed colonial power in the 19th Century.

On the 6th of March 1844, the British signed a pact of cooperation with a number of Kings or Paramount Chiefs of coastal states of present-day Ghana. The local

signatories were the Kings of Abora, Ajumako, Anomabu, Asikuma, Assin Attandasu, Assin Apemanim, Cape Coast, Denkyira, Dixcove, Dominase, Ekumfi, Gomoa, Jamestown (Accra), Agona Nsaba, Twifu, Wassa Amenfi and Wassa Fiasi. The 1844 Treaty allowed the British limited judicial powers in the coastal states mainly in murder and robbery cases. However these powers held by the British were arbitrarily expanded from the 1850s until the proclamation of a Crown Colony in 1874 that brought these coastal states and other states south of the Pra River under formal British rule (Ward, 1958). The Asante Kingdom became a British colony following its final defeat by the British in 1901 and was incorporated into the Crown Colony. In 1902, the Northern Territories (comprising of present-day three northern regions) were proclaimed a British protectorate in 1902 to forestall advancing French and German advances. The fourth component of modern Ghana, the British Trans-Volta Togoland, was incorporated into Ghana following the United Nations referendum of 1956.

The modern name of Ghana, adopted at the time of independence in 1957, came from the Ancient Ghana Empire. This empire was located in the savannah region of West Africa and lasted for about 1,000 years from The Third Century AD to the 13th Century AD. The Ancient Empire of Ghana was a kingdom based on matrilineal clan lineage and its rulers practised African traditional religions. It was thought by some historians that the matrilineal Akan people of Ghana, who currently constitute about half of the current population of Ghana, migrated from the ancient Ghana Empire into the present state of Ghana after the collapse of the old Ghana Empire in the 13th Century when that empire was subjugated by the then rising State of Mali, which was ruled by African rulers who had converted to Islam.

From 1951 to 1966, Ghana underwent major economic transformation and development with the setting up of numerous schools and rapid improvement of

transport infrastructure and the establishment of the port city of Tema, 15 kilometres outside Accra, the capital city of Ghana. The development of the Akosombo hydroelectric dam, which was to be cornerstone of the country's industrialisation, was completed in January 1966. Modest industrialisation based on import substitution was the core government economic strategy. Over this period, Ghana became the leader in the drive for political independence in Africa and the beacon of pride in Africa and the Black and African Diaspora. In 1964 and 1965, the economy suffered moderately high inflation and very low world market prices of its main export commodity, cocoa. These together with the installation of a one-party state in 1964 and external pressures led to the first military coup in February 1966. The establishment of a one-party state in 1964, based on a nation-wide referendum, was partly the result of significant opposition violence including six major failed attempts to assassinate Dr. Nkrumah from 1958 to 1964 organised by the political opposition and external associates. The highly-intense two-party political rivalry, sometimes characterized by violence, that encompassed the pre-independence period and the 1957 to 1964 period in Ghana, appears to be re-emerging in present day Ghana.

From February 1966 to December 1981, the country underwent continuous periods of political instability. A succession of three military coups overthrew two elected civilian governments and one military government. The two elected civilian governments both had exactly 27 months of tenure, from October 1969 to January 1972 and from September 1979 to December 1981, respectively. The military coup on the 31st of December 1981 ended the third experiment with multi-party elected civilian governments. The coup established the Provisional National Defence Council (PNDC) under Flight Lieutenant Jerry Rawlings to oversee the administration of the country. The years, 1982 and 1983, were largely politically unstable with many attempted coups. The year, 1984 marked

the beginning of a 23-year period of new political stability up to the current year (2006). The military government that came to power at the end of 1981 effectively consolidated power starting in 1984 which also saw the country recover from the major drought of 1983.

From mid-1983 to 1991, the new military government sought assistance from the IMF and the World Bank for a major structural adjustment programme which sought to liberalise the economy and increase investment. The structural adjustment programme was modestly successful with increase in growth rates due to increases in total investment even though it led to increased poverty especially among the lower and middle classes. In the political arena, a constitutional government was installed in January 1993, after elections in December 1992. Flight Lieutenant Rawlings, who had then retired from the military, to contest the elections as a civilian, was elected President. His party, the National Democratic Congress (NDC) controlled Parliament. Mr. Rawlings was re-elected for a second final four-year term in December 1996.

In December 2000, the NDC was defeated in both Presidential and Parliamentary elections by the main opposition party, the New Patriotic Party (NPP), an offshoot of the United Party, which was the main opposition party in the earlier Nkrumah/CPP 1951 to 1966 era. This party briefly held power as the re-named Progress Party from October 1969 to January 1972. The Progress Party won elections contested in 1969 that banned parties that followed the traditions of the CPP. The first transition of power from one elected civilian government to another from a different party in Ghana since independence occurred in January 2001 when the NDC handed over power to the NPP. The re-election of the NPP Government in December 2004 completed a 21-year period of political stability, characterised by moderate economic growth but persistent poverty.

Currently the economy is growing between 5 to 6%. Due to power rationing and energy shortages resulting from the low water level of the Akosombo Dam, which supplies 60% of the energy requirements of the country, since September 2006, it is likely that economic growth will be significantly affected in the short-term period. The current government aims to raise annual economic growth rate to 8% and higher in the medium-term period based on its new strategy called the Growth and Poverty Reduction Strategy, 2006-2009 (Government of Ghana, 2006). It also aims to lift Ghana to a middle-income country by 2015 based on the achievement of a per capita income of US$1,000 from the low level of US$380 per capita in 2005 (Government of Ghana, 2005). An increase of per capita income by 163% is expected to be achieved in just nine years.

In the light of the above discussion, it is important to identify the major factors that have significantly influenced long-run economic growth. This effort can be useful to policy makers on the choice of strategies to accelerate economic growth given the unique historical and economic conditions of Ghana. The main objective of this study was to determine the factors influencing the long-run economic growth rate in Ghana using a neo-classical economic growth model. The rest of the paper is organized as follows: in the next section, a summary description of the economic structure of Ghana, as it has evolved since independence, is provided. This section is followed by literature review on economic growth, the methodology including the theoretical formulation of neoclassical growth models and empirical estimation of the model used for this study. The results, conclusions and policy recommendations, references follow.

1.2. Overview of Economic Structure of Ghana Since Independence

Table 1 shows the average sizes of selected macroeconomic indicators for Ghana over the 1957 to 2005 period. The economy of Ghana could be described as

largely mixed with relatively modest government size as measured by total government expenditures to GDP ratio. The need to maintain the mixed nature of the economy of Ghana, with a modestly strong State and vibrant private sector, was explicitly recognised as far back as 1963 with the introduction of the Seven-Year Development Plan (1963-70) of the Government of Ghana in the CPP era (refer to the foreword of the 1963-70 Seven-Year Plan document; also see Green (1965)). The average government size from 1965 to 2005 was 18.1%. Even under the socialist-oriented government of the CPP and Dr. Nkrumah, government size was just 25%. This was much lower than the 30% recorded for the United States and over 50% for Sweden and other Scandinavian (welfare state) countries over the last 30 years. During the 1990s, government size in Ghana averaged only 19.8% compared to government sizes of 50.0% for Brunei, 28.6% for Bahrain, 23.8% for Malaysia, 36.0% for Oman, 19.0% for the Phillipines and 17.6% for Singapore as reported by Anaman (2004).

An important characteristic of the economy of Ghana since independence has been the generally declining per capita GDP. With a fast increasing population, the growth of GDP has not been enough to meet the needs of the population. The population of Ghana was reckoned to be about 21 million in 2006. The per capita GDP of Ghana in 1960 was higher than the newly industrialised country of South Korea. In 1960, the per capita GDP of Ghana was 198.6 United States dollars (US$) as compared to US$151.4 for South Korea. These estimates are based on data from International Financial Statistics Yearbook issues from 1989 to 2005. During the 1957-1965 period, the average growth rate of real GDP of Ghana was about 4.62% (refer to Table 1). The average growth rate of real GDP of South Korea during 1960 to 1965 period was modestly higher at 6.1%. However the real GDP of South Korea grew throughout the 1960s to the present date at the fast pace of 6% or more, while Ghana entered into the period of political instability from 1966 to 1983 until the emergence of the new period of political stability

starting in 1984 when average growth rates began to stay around 4% over five-year periods.

Economic growth was moderate in the first post-independence period under Dr. Nkrumah and the CPP. Average annual growth rate was 4.62% during this period. This average rate dropped to 0.33% during the instability period from 1966 to 1983. The major structural adjustment programme contributed to reversing the growth rate. Average growth rate during the 1984 to 2000 period was 4.44% (refer to Table 1). During this period, economic growth returned to the rates observed during Nkrumah and CPP era. As can be observed in Table 2, the overall economic growth rate since independence calculated from 1958 to 2005, (3.0%) had been just about the size of population growth rate (2.8%) suggesting a per capita economic growth rate of about 0.2%. The low per capita economic growth rate could be attributed to low labour productivity, low level of government investment and relatively low total investment/GDP ratio. The politically unstable period from 1966 to 1983 was especially marked by low levels of investment.

Since 1990, capital inflows have gradually increased partly due to remittances from about two million expatriate Ghanaians. In 2005, according to the Bank of Ghana, Ghana's Central Bank, remittances sent through banks and finance companies totaled 4.76 billion US dollars. Of this amount, 1.39 billion dollars were private individual remittances. The remaining 3.37 billion dollars were sent to non-governmental organizations and religious bodies based in Ghana (Business and Financial Times, March 2006). The remittances from expatriate Ghanaians have led to a housing boom in the major cities and towns of Ghana and increased investment in rural housing. The increased rural housing may not be fully captured by the national income accounting procedures used by the Central Government as such investment are sometimes carried out by

individuals and organizations which do not use formal banking and financial systems. There is also the difficulty in accounting for renovation of nuclear family and extended family houses.

Over the 1957 to 2004 period, inflation averaged 28.5% in Ghana. However it was relatively low during the Nkrumah/CPP 1957 to 1965 era with annual inflation of only 7.8% compared to 39.9%, 27.8% and 21.8% for the 1966 to 1983, 1984 to 2000 and 2001 to 2004 periods respectively. Nevertheless, the inflation rate was modestly high at 13.6% and 26.3% in 1964 and 1965 respectively, during the last two years of Nkrumah/CPP rule. The inflation rate was highest for the years, 1977 and 1983, the rate was 111.1% and 121.7% for those two years respectively. Those two years were also the worst in terms of drought. Agricultural production was at its lowest in the annals of the country's history leading to political unrest and several attempted coups.

The economy of Ghana has traditionally been dependent on the export of cocoa and minerals especially gold. Export of cocoa beans has accounted for about 54.5% of total exports over the 1957 to 1997 period (refer to Table 1). This proportion had declined in recent years with cocoa only accounting for about 38.6% of total exports during the 1984 to 2000 period. The decline in the contribution of cocoa has been due to the increased prominence of gold and other minerals as export items. However the export sector is still largely dependent on cocoa, gold and timber. The growth rates of several major macroeconomic indicators are summarized over the 1957 to 2005 period in Table 2. Exports grew at a constant annual rate of only 0.36% during the 1957 to 1997 period; however over the 1984 to 1997 period, exports grew at annual rate of 10.71%.

Table 1: Average Sizes of Selected Macroeconomic Indicators for Ghana Over the 1957 to 2005 Period.

Item/Period	1957-2005	1957-1965 Nkrumah and CPP Era	1966-1983 Period of Political Instability	1984-2000 New Period of Political Stability - Rawlings Era	2001-2005 Rule of the Current Government Kuffour Era
Relative Government Size Measured as Government Spending Divided by GDP	18.13%	25.31%**	17.22%	18.01%	20.43%
Total Investment-GDP Ratio	14.01%	18.61%	9.27%	16.59%	NA
Private Investment-GDP Ratio	6.41%*	7.29%**	3.48%	10.11%*	NA
Government Investment-GDP Ratio	5.41%*	10.85%**	5.42%	5.00%*	NA
Annual Growth Rate of Real GDP	3.0%	4.62%	0.33%	4.41%	5.2%
Size of Real GDP in Constant 2000 Million US Dollars	6734.0	4285.6	5740.9	7410.0	11752.5
Size of Population in Millions	12.4	6.9	9.7	15.4	21.0
Real GDP Per Capita in 2000 Constant US Dollars	543.06	621.1	591.8	481.2	559.6
Annual Inflation Rate	28.5%	7.84%	39.88%	27.78%	21.75%
Cocoa Beans Exports as Proportion of Total Exports of Goods	54.5%	58.9%	67.3%	38.6%	NA

Notes
* Data available from 1965 to 1997
** denotes data available for only 1965.
NA denotes not available

Source: Statistical **analysis conducted with data from the International Financial Statistics Yearbook issues from 1986 to 2005 published by the International Monetary Fund, Washington, D.C., United States. Data from most recent issues were used for the economic variables.**

Table 2: Estimated Annual Constant Compound Growth Rates of 12 Selected Macroeconomic Variables for Ghana Since Political Independence, From 1957 to 2005, Expressed in Percentages Based on Real Values and Estimated Using the Semi-logarithmic Function.

Item/Period	1957-2005	1957-1965 Nkrumah and CPP Era	1966-1983 Period of Instability	1984-2000 New Period of Stability – Rawlings Era	2001-2005 Rule of the Current Government – Kuffour Era
Real GDP	2.08	4.46	0.82	4.46	5.46
Inflation	3.39	0.50	19.57	-0.97	-20.44
Population	2.77	2.49	2.38	3.12	2.17
Labour Productivity	-0.85	-1.03	-1.61	1.35	NA
Private Consumption	1.71	3.85	1.96	3.76	NA
Government Consumption	1.45	10.01	-3.23	8.16	NA
Exports	2.45	-3.07	-10.22	12.13	1.91
Imports	3.60	1.24	-9.66	14.96	0.51
Total Investment	2.59	6.52	-5.95	12.79	NA
Private Investment	5.28	-	-3.99	13.70	NA
Government Investment	0.03	-	-3.96	15.53	NA
Government Revenues	1.72	-	-6.80	10.02	NA
Government Expenditures	2.29	-	-3.68	10.42	-8.17

NA denotes not available

Source: Statistical analysis conducted with data from the International Financial Statistics Yearbook issues from 1986 to 2005 published by the International Monetary Fund, Washington, D.C., United States. Data from most recent issues were used for the economic variables

2. LITERATURE REVIEW

The traditional growth accounting approach based on aggregate function originally developed by Solow (1956) is a common method for analysisng factors that determine economic growth of countries. The historical development of economic growth models has been reported by Barro (1997) and also reviewed by Rogers (2003). This analysis has encompassed both neoclassical growth models initially developed by Solow (1956) and endogenous growth models originally developed by Romer (1986) and Rebelo (1991). Endogenous models have been expanded to incorporate human capital and schooling, knowledge spillovers and the quality of institutions. These extensions are discussed by Rogers (2003). The evidence generally suggests that for a given initial level of real per capita GDP, factors such as lower government consumption, higher levels of human capital, lower inflation, better law enforcement and improvements lead to higher economic growth (Oosterbann *et al.* (2002)).

A major finding of the report by the World Bank (1993) was that most of the growth in East Asia was due to the accumulation of human capital suggesting the importance of productivity growth in increasing economic growth. The study by the World Bank indicates rapid economic growth rates of several East Asian countries. The evidence of rapid growth rates for East Asia is supported by findings from other research studies (see for example Drysdale and Huang, 1997). However there has been considerable debate as to whether the high growth rates of East Asian countries has been due to productivity growth or due to the accumulation of physical capital. Krugman (1994) suggests that the rapid growth rates of East Asian economies was largely driven by capital accumulation and not productivity growth as indicated by World Bank (1993) and Drysdale and Huang (1997).

The relationship between government size and economic growth has been extensively studied. Karras (2001) suggests that government activities may accelerate or hinder economic growth. This depends on the net impact of the activities. The negative impact of government size on economic growth is due to the inefficieny of government, excess tax burden and the distortions of market-based incentive system as goverment becomes relatively larger. The positive impact of government is largely due to the correction of various forms of market failures, the development of physical infrastructure and the establishment of a legal administrative system necessary for the economy to function (Ghali, 1998). Some literature suggest that increasing government size often negatively affects economic growth especially for developing countries (Barro, 1991; Guseh, 1997) but may also increase economic growth. Recent literature indicates that government size may affect economic growth in a cubic fashion. As shown empirically by Anaman (2004) for Brunei, relatively small sizes of government hamper economic growth, moderate government sizes enhance economic growth and very large government sizes stifle economic growth. The evidence of Anaman (2004) for Brunei has been corroborated by new findings for 14 countries in Eastern Europe based on panel data analysis covering the period, 1994 to 2001 (refer to Kustepeli, 2005). The relationship between government size and economic growth is also investigated in this study for Ghana.

In a developing country context, the effectiveness of foreign aid to increase economic growth and development has been researched (see for example, the analysis for Ghana as reported by Lloyd et al., 2001). Foreign aid is supposed to enhance economic growth partly through increased government financing that allows the expansion of government investment (Hansen and Tarp, 2000). Foreign aid has been justified because the recipient countries have insufficient savings and/or inadequate export earnings. The foreign aid effectiveness debate

has revolved around the argument that foreign aid is only effective given the establishment of good government policies (World Bank, 1998). A contrasting view has been advanced by other researchers that good policies are not necessary for effectiveness of foreign aid. Another view is that it is actually political stability that is the key catalyst for advancing economic growth (Gounder, 1999). Political stability is essential for the formulation and implementation of any policy and is therefore the basic underlying driver of economic growth. Thus in the presence of political stability, economic growth may be enhanced regardless of the actual source of additional investment generated by the country (either domestic savings or foreign aid).

This brings to light another view of economic growth that emphasises the "luck" element or random factors in the advancement of growth. It is asserted by some authors that random factors (luck) are important determinants of economic growth as indicated by large intertemporal variation in growth rates among many developing countries (Easterly *et al.*, 1993; Rogers, 2003). Expounding from this view, it can be argued that some developing countries might have good economic policies but might have been unlucky to have been caught up by external pressures such as the Cold War rivalry of super powers as happened to several African countries during the Cold War era from 1950 to 1990.

Further some countries simply registered negative or low economic growth rates because they were invaded by stronger neighbours such as Kuwait being invaded by Iraq in 1990. Kuwait had negative or low economic growth rates throughout the 1990s. While East Asian countries have exhibited strong economic growth rates over the last 30 years, a major element has been the luck or random factor due to the alignment of these countries with the major Western countries during the Cold War era and the geographical closeness of these countries to Japan which invested heavily in those countries. The evidence from

East Asia suggests that most of these high-growth countries were not necessarily democratic but essentially one party states (for example, Indonesia under Suharto where over one and half million alleged communist activists were killed in the mid-1960s with little complaint from Western countries). Countries such as Malaysia, Singapore, Taiwan, and South Korea have been or were essentially one-party states or guided democracies, for most part of the period that their economies exhibited strong economic growth rates.

3. METHODOLOGY

3.1. Theoretical Formulation of the Neoclassical Model of Economic Growth

Since endogenous growth models and their variants are all essentially extensions of the neoclassical growth model, the latter model is used in this study. However the neoclassical model used in the study allows for the incorporation of political stability, temporary shocks such as very high energy prices and impact of government size on growth. The neoclassical growth model is based on the concept of an aggregate production function of the whole economy. Output of the economy is measured by real GDP at a point in time t ($RGDP_t$). This output is a function of total capital inputs (K_t) and labor (L_t) at time t. The aggregate production function is denoted below in Equation 1.

$$RGDP_t = A_t\, F(K_t, L_t) \qquad\qquad \textbf{Equation 1}$$

where A_t is a technology coefficient measuring total factor productivity for each year, t.

The aggregate production depicted in Equation 1 can be formulated using growth rates given the assumption of profit maximisation of firms. This is shown

in Equation 2 based on percentage terms.

$$rgdp_t = a_t + S_K k_t + S_L l_t \qquad \text{Equation 2}$$

where $S_K + L_t = 1$ **assuming constant returns to scale**

S_K **and** S_L **are the shares of capital and labor inputs of total inputs respectively.**

$rgdp_t$, a_t, k_t **and** l_t **are the percentage changes of** $RGDP_t$, A_t, K_t **and** L_t **respectively.**

The percentage change in output of the economy is equal to the percentage change in technology (or total factor productivity), the share of weighted percentage change in capital inputs and the share weighted percentage change in labor inputs. Adapting the neoclassical growth model to Ghana, political stability and world energy price shocks need to be incorporated into this model since it is clear from anedoctal evidence that these two factors have influenced economic growth in Ghana. Exports from Ghana are essentially primary products (agricultural products and minerals). Exports are incorporated into the growth model as they represent the conversion of natural capital to human-made capital. Given the earlier literature review the impact of government size on economic growth, government size variable is an integral part of the growth model. Assuming a Cobb-Douglas functional form, the economy-wide production function is stated as in Equation 3 as follows:

$$RGDP = B_0 \cdot EXP\ (B_1 * (GOVSIZ)^2/2 + B_2 * (GOVSIZ)^3/3) * (EXPORT)^{B3} * (TLABOUR)^{B4} * (TCAPITAL)^{B5} * EXP(B_6 * STABLEP) * EXP(B_7 * ENERGYS) \qquad \text{Equation 3}$$

Where EXP denotes the exponential operator;

GOVSIZ refers to government size (total government expenditures divided by GDP);

TEXPORT is the total annual level of exports of goods and services;

TLABOUR is the total annual level of labor inputs;

TCAPITAL is the total annual stock of human-made capital inputs;

STABLEP is a dummy variable denoting political stability with a value of 1 for the years of political stability and zero for years of instability. The years of political instability, denoted with a value of zero, are 1966, 1967, 1972, 1977, 1979, 1981 to 1983. These are years characterized by military coups or unsettled governments with many attempted coups sometimes associated with prolonged periods of drought such as in 1977 and 1983.

ENERGYS is a dummy variable for very high world oil market prices (energy price shock) A value of 1 denotes 1974, 1975, 1979 and 1980 and zero for all other years, and

B_i (i = 0,1,2,3,4,5,6,7) are the parameters to be estimated.

Taking natural logarithm of Equation 3 and then differentiating the derived equation, an economic growth (GROWTH) equation can be derived as shown in Equation 4 below.

$$GROWTH = B_0 + B_1 GOVSIZ_t + B_2 GOVSIZ2_t + B_3 GTEXPORT_t +$$
$$B_4 GTLABOUR_t + B_5 GTCAPITAL_t + B_6 STABLEP_t + B_7 ENERGYS_t + U_t$$
Equation 4

where $GROWTH_t$ is the annual growth of RGDP in time t;

$GOVSIZ_t$ is government size in time t;

GOVSIZ2 is the square of GOVSIZ;

GTEXPORT is the annual growth rate of the real value of total exports;

GTLABOUR is the annual growth rate of total labor force;

GTCAPITAL is the annual growth rate of total human-made capital stocks and Ut is the error term.

The empirical model used in this study is described as follows in Equation 5.

$$GROWTH_t = B_0 + B_1 GOVSIZ_t + B_2 GOVSIZ2_t + B_3 GTEXPORT_t + B_4 GTLABOUR_t + B_5 INVGDP_t + B_6 STABLEP_t + B_7 ENERGYS_t + U \quad \textbf{Equation 5}$$

where INVGDP is the ratio of total investment to GDP.

Total investment is the change in total stock of human-made capital. Total investment should be divided by total human-made capital stock to derive the growth rate of total capital stock. Due to the absence of data on total capital stock, total investment is divided by GDP. This implies that the total capital stock is directly related to the GDP, a reasonable assumption. U is the equation error term. The lagged ratio of total investment to GDP is also tested. A long-run growth function, as depicted in Equation 5, if it is a valid cointegration function, will also have an equivalent short-run error correction model (ECM). The short run ECM is shown in Equation 6 as follows:

$$\Delta GROWTH = C_0 + C_1\Delta GOVSIZ_t + C_2\Delta GOVSIZ2_t + C_3\Delta GTEXPORT$$
$$C_4\Delta GTLABOUR_t + C_5\Delta INVGDP_t + C_6\Delta STABLEP_t + C_7\Delta ENERGYS_t + $$
$$U_{t-1} + V_t \qquad\qquad\qquad\qquad \textbf{Equation 6}$$

where U_{t-1} is the lagged error term from the cointegration equation depicted
Equation 5, V_t is a normal random error term and Δ is the first differen
operator.

3.2. Estimation of Models

The growth models were estimated using time-series methodology that allowe
for the testing of stationarity of the variables and long-run relationships base
on cointegration analysis. Stationarity of the variables in the growth models w
estimated based on the Phillips-Perron (PP) test (Phillips and Perron, 1988) ar
the Augmented Dickey Fuller (ADF) test (Dickey and Fuller, 1981). The fir
differences of the variables were also subjected to test for stationarity using tl
PP and ADF tests. The tests were undertaken using the Time-Series Process
(TSP) package Version 4.5 (Hall and Cummins, 2001). The null hypothesis fe
both tests was that there was a unit root in the time series. The optimal number
lagged first differences in the ADF test was chosen automatically by TSP. In tl
economic literature, the PP test of stationarity is generally preferred to the AL
test because the latter test does not discriminate efficiently between nor
stationary and stationary time-series with high degree of autocorrelation and
also sensitive to time-series with structural breaks (West, 1988; Culvell ar
Papell, 1997). Cointegration analysis was undertaken to determine whether tl
variables had valid cointegration relationships among themselves. This analys
is discussed next.

3.3. Cointegration Analysis

The autoregressive distributed lag (ARDL) method developed by Pesaran *et al*. (2001) was used to establish cointegration relationships among the variables using the Microfit 4.0 for Windows software (Pesaran and Pesaran, 1997). The advantage of the ARDL method is that it can be applied to the model whether the variables are stationary (i.e. I(0)) or integrated of the first order I(1)). The ARDL method involved two steps. First, the existence of a long run relationship among the variables in the model is determined. The existence of a long run relationship is established by the bounds test based on a correctly specified and appropriate ARDL model and an associated unrestricted error correction model (Pesaran *et al*., 2001).

The determination of an appropriate and correctly specified ARDL model is based on test criteria such as the Schwarz-Bayesian Information Criterion and Adjusted R^2 and various diagnostic tests for econometric problems. The unrestricted error correction model is directly derived from the ARDL model. The ARDL model is a vector autoregressive (VAR) model. Hence the unrestricted error correction model is a re-parameterisation of the VAR model (Pesaran *et al*., 2001). The bounds test determines whether the coefficients of the lagged terms of the unrestricted error correction model are jointly equal zero. This is the null hypothesis. If the test statistic lies above the upper bound then the existence of a long run relationship among the variables is proven. The second step then involves derivation of the long-run relationship from the unrestricted error correction model once the existence of a long run relationship among the variables has been confirmed.

3.4. Data and Data Sources

Data used in the study were obtained from the various issues of the Internatic Financial Statistics Yearbook Issues from 1985 to 2005 published by International Monetary Fund. Data for the most recent issues were used for economic variables superseding values found in earlier editions of the Yearbo Data on government expenditures were not available before 1965. Data on tc labour were derived from World Bank Development Reports. Data on to investment from 1998 onwards were not available from the IMF sources. T data on investment covering the period from 1998 to 2000 were obtained frc the Ghana Statistical Service and the United Nations National Accounts Offic Data on investment from 2001 to 2005 were not available from the Ghar Statistical Service and such data obtained from the United Nations Nation Accounts Office were unreliable. Hence the economic growth regressio analysis was performed with data from only 1966 to 2000.

4. RESULTS

The results of the unit root tests are reported in Table 3. The results of the preferred PP test indicated that GROWTH and GTEXPORT were both stationary because the null hypothesis of unit root in these variables was rejected. However, based on the PP test, the other variables were not stationary at the levels but were all stationary based on their first differences, except for GTLABOUR, which was stationary based on second differences. Given this mixture of stationary and non-stationary variables at their levels, the ARDL method of cointegration analysis was an appropriate tool since it did not require all the variables to be integrated of the same order like some of the earlier cointegration methods such as those developed by Johansen (1988) and Johansen and Juselius (1990).

The results of estimated optimal ARDL growth model are shown in Table 4. The optimality of the model is determined using the Schwarz-Bayesian Criterion. Based on the various diagnostic tests, this model was good. The model was deemed to be correctly specified based on the Ramsey Reset test results. There was also absence of significant autocorrelation. However significant mild heteroscedasticity existed in the estimated model as indicated by the LM test of heteroscedasticity (refer to Table 4)[1]. The power of the model was moderately strong given the levels of 89.2% for R^2 and 82.1% for adjusted R^2. The estimated long-run relationships derived from the optimal ARDL model are reported in Table 5. All the seven independent variables were statistically significant except for INVGDP and GTLABOUR.

These results indicated that political stability and growth of exports were major factors influencing long-run economic growth over the 1966 to 2000 period. These results could be contrasted to those of Lloyd *et al.* (2001) who indicated that the structural adjustment from 1984 to 1991 had strong influence on economic growth. While this assertion is valid, the influence on economic growth induced by the structural adjustment for the 1984 to 1991 period was largely the result of political stability in that period. It must be remembered that an earlier structural adjustment programme of the IMF in 1971 led to the second coup of January 1972 which was in response partly to public reaction against the 1971 devaluation of the Ghanaian currency, the cedi, and worsening inflation induced by the IMF structural adjustment programme. In addition, the evidence of this study indicates that sustained moderate economic growth rates were achieved during the 1957 to 1965 Nkrumah/CPP era (refer to Table 1) and in earlier period from 1951 to 1956 without any major IMF structural adjustment programme. The key catalyst to economic growth in Ghana had been political stability. Structural adjustment programmes helped to raise funds to increase government investment spending but could only result in long-run economic

growth in an atmosphere of political stability. There had been mode
economic growth rate of at least 3.2% in any year that there was political stab
(refer to Appendix).

Growth of exports strongly affected economic growth as shown by the leve
significance of its parameter estimate. However increase in total investm
GDP ratio did not significantly affect long-run economic growth though
expected positive relationship between the two variables was captured by
analysis. This finding on investment is similar to those found for other Afri
countries as indicated by Rogers (2003). A possible reason for lack
significance might be related to the fact that a lot of new investment was usec
create conditions for expanding exports. Another possible reason might be t
the expansion of physical infrastructure such as roads, electricity and water v
not sufficiently coordinated with the productive sectors to allow for ra
growth. For example, during the 1993-2000 period under the civilian rule of N
Rawlings, about 23% of GDP was designated for investment. Yet the avera
annual growth was just about 4.3%. High levels of total investment in rural roa
and electricity and water supply were not fully co-ordinated with t
development of general purpose rural or farmers' markets that could have turn
the investments into higher farm and rural production of goods and services.

Growth of labour did not influence economic growth suggesting insignifica
marginal labour productivity at the aggregate level. This result was n
surprising given the general lax work attitudes of the public work forc
characterised by absenteeism and low productivity. The low aggregat
productivity of labour might also be due to the deterioration in the educationa
system from 1990 onwards as a result of the educational reforms introduced b
the Rawlings government under the direction of the World Bank. There i
widespread consensus that the once enviable educational system in Ghan

deteriorated as a result of this reform. New educational reforms are being introduced in 2007 to remedy the problems. Government size influenced economic growth in quadratic equation fashion with growth initially increasing as government size expanded until a maximum point was reached beyond which growth declined.

The results of the short-run ECM are reported in Table 6. They show that short-run deviations of economic growth were mainly influenced by political stability. The error correction term in the short-run ECM was statistically significant indicating that the independent variables in the long-run model cause or precede economic growth in the Granger sense. The value of -1.266 as the coefficient estimate of the correction term (refer to Table 6) could be interpreted as the error being overcorrected. This was due to the fact that political stability, arising after a period of instability, gave some immediate urgency at least in the short-term period, to the implementation of new rules and modalities, designed to correct quickly critical growth-constraining problems.

Table 3: Summary of ADF and PP Unit Root Tests of Variables at the Levels and First Differences

Variable	ADF Statistic	P Value	PP Statistic	P Value
GROWTH$_t$	-2.906	0.160	-25.510	0.023*
GOVSIZ$_t$	-0.580	0.980	-2.879	0.980
GOVSIZ2$_t$	-0.883	1.000	-1.311	0.984
GTEXPORT$_t$	-3.548	0.035*	-28.677	0.012*
GTLABOUR$_t$	-0.147	0.992	-1.115	0.987
INVGDP$_t$	-1.109	0.928	-6.015	0.744
ΔGROWTH$_t$	-2.186	0.498	-36.702	0.002*
ΔGOVSIZ$_t$	-2.054	0.572	-24.887	0.026*
ΔGOVSIZ2$_t$	-1.873	0.669	-25.673	0.022*
ΔGTEXPORT$_t$	-4.718	0.001*	-42.451	0.001*
ΔGTLABOUR$_t$	-2.639	0.262	-9.312	0.484
ΔINVGDP$_t$	-4.438	0.002*	-28.905	0.011*

Notes

*   denotes statistical significance at the 5% level.

     denotes first difference operator.

Table 4: Results of Estimated Optimal ARDL Growth Model of Ghana Based on Data from 1966 to 2000 with Variables Measured in Constant 2000 Values.

Explanatory Variable	Parameter Estimate	T-Statistic	P Value
INTERCEPT	-0.438	-3.582	0.002*
GROWTH$_{t-1}$	-0.266	-2.294	0.033*
GOVSIZ$_t$	1.130	0.999	0.330
GOVSIZ$_{t-1}$	4.366	3.291	0.004*
GOVSIZ2$_t$	-6.110	-1.924	0.069
GOVSIZ2$_{t-1}$	-10.178	-2.830	0.010*
GTEXPORT$_t$	0.020	1.540	0.139
GTEXPORT$_{t-1}$	0.031	2.764	0.012*
GTLABOUR$_t$	1.547	1.013	0.323
GTLABOUR$_{t-1}$	-2.694	-1.903	0.072
INVGDP$_t$	0.129	0.813	0.426
STABLEP$_t$	0.074	4.822	0.000*
ENERGYS$_t$	-0.026	-1.400	0.177
ENERGYS$_{t-1}$	-0.066	-3.270	0.004*

R^2	0.892*
Adjusted R^2	0.821*
Probability level of significance of model specification based on the Ramsey Reset test of correct model specification	0.392
Probability level of significance level for autocorrelation based on the Langrange Multiplier (LM) test	0.491
Probability level of significance for heteroscedasticity based on the LM heteroscedasticity test	0.041*

Note

* denotes that parameter is statistically different from zero at 5% level.

Table 5: Results of Estimated Long Run Relationship Derived From the Optimal ARDL Growth Model of Ghana Using Data from 1966 to 2000.

Explanatory Variable	Parameter Estimate	T-Statistic	P Value
INTERCEPT	-0.345	-3.783	0.001*
$GOVSIZ_t$	4.342	4.007	0.001*
$GOVSIZ2_t$	-12.868	-4.023	0.001*
$GTEXPORT_t$	0.040	2.570	0.018*
$GTLABOUR_t$	-0.907	-1.229	0.233
$INVGDP_t$	0.102	0.837	0.412
$STABLEP_t$	0.059	4.275	0.000*
$ENERGYS_t$	-0.072	-4.475	0.000*

Note

* denotes that parameter is statistically different from zero at 5% level.

Table 6: Results of Estimated Short-run Parsimonious Error Correction Model Derived from the Long-Run Growth Model of Ghana Using Data from 1966 to 2000.

Explanatory Variable	Parameter Estimate	T-Statistic	P Value
INTERCEPT	-0.438	-3.582	0.001*
Δ GOVSIZ$_t$	1.130	0.999	0.328
Δ GOVSIZ2$_t$	-6.110	-1.924	0.066
Δ GTEXPORT$_t$	0.020	1.540	0.136
Δ GTLABOUR$_t$	1.547	1.013	0.321
Δ INVGDP$_t$	0.129	0.813	0.424
Δ STABLEP$_t$	0.074	4.822	0.000*
Δ ENERGYS$_t$	-0.026	-1.400	0.174
U$_{t-1}$	-1.266	-10.928	0.000*

Note

* denotes that parameter is statistically different from zero at 5% level.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

The main factors that influenced long-run economic growth in Ghana wer
established using a neoclassical growth model based on data from 1966 to 200(
Long-run economic growth was strongly positively influenced by both politica
stability and growth of exports. Political stability leads to some mode$
economic growth partly through the stability of institutions such as thos(
responsible for law and order. However more than political stability is requirec
for sustained high growth rates. The world oil price shocks of the 1970s and earl}
1980s led to reduced growth. Government size influenced economic growth ir
quadratic equation fashion with increasing government size increasing growth
until a point is reached beyond which growth would actually fall. Growth of
labour and total investment to GDP ratio did not have statistically significant
influence on economic growth. However total investment was shown to be
positively linked to economic growth though the link was not statistically
significant. Apparently growth of aggregate labour did not influence economic
growth. This probably indicated insignificant marginal labour productivity at
the aggregate level.

Short-run economic growth was mainly influenced by political stability. The
error correction term in the short-run ECM was statistically significant
indicating that the independent variables cause or precede long-run economic
growth in the Granger sense. The model used in this study has provided some
useful results. However future studies on economic growth in Ghana to be
undertaken at the IEA will attempt to incorporate additional variables such as
quality of human capital, environmental capital and quality of institutions to
improve the quality of the analysis.

Economic growth rate over the last five years, from 2001 to 2005, (beyond the

years used for the econometric analysis of this study) has averaged about 5.2%. This moderately high growth rate has been driven by a number of factors. These include prudent macroeconomic management partly the result of the establishment of the law that gives the Central Bank (Bank of Ghana) independence from the Executive Branch in 2002. Prudent macroeconomic management has led to substantial reduction in the inflation rate. Average annual inflation rate fell from 32.9% in 2001 to 11.0% in 2006. Other factors that have influenced growth rates for the 2001 to 2005 period are relatively high export commodity prices, good weather and high amounts of donor funds that the country has attracted including monies available to the government through the total cancellation of all Ghana's multilateral debts owed to World Bank, IMF and African Development Bank. Several of these factors such as high international commodity prices and good weather are positive random shocks modestly offset by high world oil prices (negative random shock).

Another major factor that appears to have contributed to the current moderately high growth rates is the high investment-GDP ratios from 1993 to 2000. The average total investment-GDP ratio was 22.7% over the 1993-2000 period. This high level of investment increased substantially the total capital stock of the economy from 1992 to 2000. Thus the new civilian government which took power in January 2001 inherited from its civilian predecessor, political stability and an economy that has been revamped with high levels of investments. However this government also inherited an economy with moderately high average annual inflation rate of about 25% in 2000 which it has gradually lowered to the current rate of 11% in 2006. Overall the short to medium-term economic growth prospect of Ghana depends critically on the resolution of the current energy rationing, due to the low water at the Akosombo Dam, which has significantly reduced the production capacity of industries such as cement production, mining and aluminium smelting.

Several policy recommendations can be derived from this study. First, poli
stability is clearly shown to be a key factor influencing long-run econd
growth. Therefore the new political stability currently being enjoyed in Gl
with the maturing and development of democratic institutions through elect
should be protected and enhanced. The intervention by the military in
government business as happened four times during the 1966 to 1983 pei
should be a thing of the past. Successful multi-party democracy in Ghana
elsewhere around the world, for example in India, implies   extens
decentralisation and effective local government, and the emergence of via
parties other than the two main parties. The continuous rift between the two mi
parties in Ghana (NPP and NDC) resembles situations in parts of Asia such
Bangladesh, Pakistan, Philippines and Thailand. These latter countries ha
similar chequered political history such as Ghana. Over the last five years, the
four countries have all experienced various forms of military intervention aft
initial smooth transition to multi-party democratic rule mainly due to bitter an
intense rivarly between the two main political parties/groups in those countrie;
The entrenchment of political stability in Ghana requires the deepening an
broadening of multi-party democratic governance based on the emergence o
viable third political parties through political reform such as financing o
political parties to break the quasi two-party political system with its underlying
tensions, stresses and proneness to violence. Both major political parties
acquired their current status partly through the use of the power of political
incumbency.

The ruling NPP, in its 2000 Election Manifesto enshrined deeper and extensive
decentralisation, the direct election of District Chief Executives and State
financing of registered political parties as some of the core activities that it
would implement if it were elected by the people of Ghana. Since December
2000, the Ghanaian voting public has twice elected the NPP in both Presidential

and Parliamentary Elections. With exactly two years left for new national elections to be held in December 2008, the coming year (2007) should be the start of an intensive programme by the NPP for the effective implementation of extensive decentralisation and financing of political parties outlined in its 2000 Election Manifesto. Efforts also need to be made by civil society groups in Ghana to improve the working relationship between leaders of the NPP and NDC.

Second, growth of exports is clearly linked to long-run economic growth. The composition of exports in Ghana has largely been made up of primary products whose prices are under the vagaries of international commodity markets characterised by unstable and declining real prices. While export of primary products in Ghana has diversified with the production of more mineral products to reduce the dependence on cocoa, it is imperative that the export base be expanded to include more manufacturing and services. The current high international prices of Ghana's primary products may wrongly discourage policymakers from pursuing concerted actions aimed at diversifying the export base of the country to include more manufacturing and services.

Third, while the macroeconomic stability of recent years is commendable, it is apparent that macroeconomic stability is not adequate for economic development if it does not translate into the pockets of people especially through increased employment. There is a need for more government investment in the establishment of labour-intensive public works to accelerate economic growth and reduce unemployment. Possible candidates for such public works include the development of a rail network to serve the Accra-Tema area and adjoining towns of 60 kilometres radius such as Aburi, Winneba and Dodowa. Such an investment is likely to reduce the perennial congestion in Accra, allow many students attending schools and universities in the Accra-Tema area to live further

away from their schools and travel by train to school each day as is done routine in many countries around the world. An intra city rail network will also crea many jobs especially around the nodal points and reduce the pollution resultii from the use of an increasing number of cars. It is important to emphasise that suc public projects must be assessed as economically viable before the implementation in order to achieve sustainable growth.

Fourth, the government strategy of using agriculture, tourism and informatio and communication technology as the main drivers of growth to allow Ghana t reach middle-income status by 2015 as outlined in its Growth and Povert Reduction Strategy document (Government of Ghana, 2006) may not be pruden It is important to look for other growth drivers such as the construction industry As shown by Anaman and Osei-Amponsah (2006), the growth of the constructioi industry precedes the growth of gross domestic product in Ghana suggesting th possibility of using the construction industry as a major driver of growth.

The study reported in this paper provides evidence that the positive link between investment-GDP ratio and economic growth, while captured in the analysis, is not statistically significant. As indicated by Rogers (2003) this phenomenon is a common trend in African countries. The desire to make investment to have more significant impact on economic growth may need to involve the coordination of productive sectors of the economy with programmes that expand physical infrastructure such as roads, electricity and water. For example, in the rural areas that account for about half of Ghana's GDP, the development of rural roads, electricity and water supply should be linked with the development of modern multi-purpose farmers' and village market centres with modern amenities such as pipe borne water, water closet toilet facilities, electricity and cold stores, that together can act as a driver that accelerates the production of rural goods and services and creates increased employment for the youth.

Fifth, the problem of low labour productivity needs to be addressed. The government needs to devote more resources to enhance non-formal education with strong emphasis on basic literacy and skills training. The reform of the pre-university educational system scheduled to start in 2007 is in the right direction. However more resources need to be devoted to expanding technical and vocational education. The improvement of low labour productivity, especially in the public sector, can be achieved through some modest cultural reform. Reform is part and parcel of every human being and every society. Just like the evolutionary processes of biological organisms (including human beings), reforms are a permanent feature of human societies. A major area of current concern in Ghana is the large amounts of money spent on funerals which are disproportional compared to the low per capita GDP of the country. Related to expensive funerals is the large amounts of lost labour time due to absenteeism, early departures from offices and late arrivals to work due to attendance of funerals. These clearly affect labour productivity. Labour productivity, in both the private and public sectors, is also affected by the severe road congestion in the major cities of the country. This congestion also leads to considerable lost labour time due to late arrivals to work. This problem needs to be effectively tackled.

Sixth, the very high income inequality between the three northern regions (Northern, Upper East and Upper West Regions) and the rest of the country needs to be urgently addressed by the government. For all the major indicators of human welfare enshrined in the Millenium Development Goals of the United Nations set to be achieved by 2015, the three northern regions fare badly. Annual economic growth in the three northern regions is thought to be less than one percent. If growth in these regions were to increase modestly, it would enhance the chance of Ghana becoming a middle-income country.

ACKNOWLEDGMENTS

ENDNOTE

The alternative model, with lagged investment to GDP ratio, instead of curre investment to GDP ratio had no significant heteroscedasticity problem. The resu from both alternative models were essentially similar. The latter model was chos because of its lower scores for both Schwarz- Bayesian and Akaike Informatic Criteria.

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APPENDIX: DATA USED FOR ECONOMETRIC ANALYSIS OF GROWTH

YEAR	GROWTH	GOVSIZ	GTLABOUR	INVGDP	GEXPORT	STABLEP	ENERGYS
1966	-0.0077	0.1798	0.0142	0.1291	-0.1637	0	0
1967	-0.0294	0.2133	0.0145	0.1031	0.2170	0	0
1968	0.0651	0.2354	0.0157	0.1112	0.1833	1	0
1969	0.0542	0.1977	0.0176	0.1181	0.0161	1	0
1970	0.0745	0.2071	0.0198	0.1417	0.1768	1	0
1971	0.0552	0.2094	0.0309	0.1411	-0.2458	1	0
1972	-0.0266	0.1929	0.0303	0.0710	0.2826	0	0
1973	0.1507	0.1566	0.0288	0.0899	0.2387	1	0
1974	0.0335	0.1618	0.0268	0.1305	-0.1139	1	1
1975	-0.1286	0.2170	0.0247	0.1274	-0.0932	1	1
1976	-0.0320	0.2274	0.0222	0.0887	-0.2379	1	0
1977	0.0227	0.1914	0.0189	0.1106	-0.3172	0	0
1978	0.0840	0.1508	0.0184	0.0677	-0.1144	1	0
1979	-0.0361	0.1522	0.0220	0.0654	0.3368	0	1
1980	0.0508	0.1089	0.0278	0.0562	-0.2834	1	1
1981	-0.1181	0.1064	0.0321	0.0458	-0.6644	0	0
1982	-0.0509	0.1102	0.0353	0.0338	-0.3199	0	0
1983	-0.1029	0.0802	0.0376	0.0375	-0.0212	0	0
1984	0.0317	0.0987	0.0390	0.0688	2.6862	1	0
1985	0.0474	0.1334	0.0391	0.0957	0.3946	1	0
1986	0.0488	0.1384	0.0358	0.0939	0.3686	1	0
1987	0.0520	0.1369	0.0326	0.1046	0.3703	1	0
1988	0.0528	0.1369	0.0294	0.1094	0.0481	1	0
1989	0.0531	0.1387	0.0262	0.1355	-0.0439	1	0
1990	0.0344	0.1252	0.0231	0.1225	-0.0326	1	0
1991	0.0514	0.1402	0.0289	0.1351	0.1036	1	0
1992	0.0386	0.1780	0.0305	0.1384	0.0567	1	0
1993	0.0497	0.2101	0.0320	0.2222	0.2167	1	0
1994	0.0341	0.2193	0.0335	0.2395	0.3196	1	0
1995	0.0396	0.2191	0.0351	0.2002	0.0127	1	0
1996	0.0462	0.2218	0.0350	0.2147	0.0702	1	0
1997	0.0413	0.2061	0.0323	0.2455	-0.0058	1	0
1998	0.0476	0.2169	0.0296	0.2342	0.3541	1	0
1999	0.0443	0.2453	0.0268	0.2178	-0.0290	1	0
2000	0.0374	0.2964	0.0241	0.2429	0.5514	1	0

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Since PhD graduation in 1985, Dr. Anaman has worked in both academia and government in four other countries: United States, Australia, Papua New Guinea and Brunei Darussalam. In Papua New Guinea, he served as the Chief Project Economist in the Department of Agriculture and Livestock, Government of Papua New Guinea involved with appraisal and monitoring of integrated development projects from 1990 to 1992. Dr. Anaman has been involved with several international consultancies. These included duties as a short-term economic consultant for the World Meteorological Organisation on drought monitoring in Eastern Europe (Hungary, Bulgaria, Romania and Moldova) in 1996. He was also was a member of the six-member international working group on agrometerorology related to extreme events from 1995 to 1999.

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Dr. Anaman has published three books and co-authored 73 other papers including 35 refereed articles in 22 academic journals. He has published in a variety of areas in economic science including economics of agriculture, environmental and resource economics, health economics, construction economics, macroeconomics and economic growth, international trade and the economics of the family and marriage.