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DETERMINANTS OF THE OUTPUT OF THE MANUFACTURING INDUSTRY IN GHANA FROM 1974 TO 2006*

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ABSTRACT

In this paper, we sought to ascertain the determinants of manufacturing output in Ghana based on available data from 1974 to 2006 using cointegration and error correction model analysis. Our measure of the output of the manufacturing industry was the share of the total economy attributed to the manufacturing industry based on the value added to the gross domestic product. We showed that the level of output of manufacturing industry was driven in the long-run period by the level of per capita real gross domestic produce (GDP), the export-import ratio and political stability. In the short-run period, the level of output of manufacturing was driven by export-import ratio and political stability. The importance of the export-import ratio variable in affecting both long-run and short-run manufacturing output suggested that increasing level of manufacturing in Ghana would partly depend on the growth of export-based manufacturing firms.

Keywords: agriculture, economic growth, export-based industrialisation, Ghana, industrialisation, manufacturing industry.

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1. INTRODUCTION AND PROBLEM STATEMENT

Industrialisation, focussing on manufacturing, has become a major focus of African countries including Ghana. In 2008, a special session of the continental political grouping, the African Union, was devoted to the issue of industrialisation by African countries. Specific to Ghana in recent times, manufacturing was a major issue of discussion during the campaign period leading to the December 2008 General Election. All the four major political parties in Ghana, the National Democratic Congress (NDC), the New Patriotic Party (NPP), the Convention People's Party (CPP) and the People's National Convention outlined ambitious programmes for the expansion of the manufacturing industry that they would pursue if elected to form government. Further, the Growth and Poverty Reduction Strategy 2 (2006-2009) (GPRS 2) of the previous NPP government in Ghana stressed the linkage of manufacturing to agro-industry as an important part of the government agenda. The renewed focus on manufacturing in Africa is the result of the persistent weakness of African economies characterised mainly by production and export of raw materials and large balance of trade deficits in many African countries including Ghana.

The performance of the economy of Ghana since independence in 1957 can be divided into three period phases. These are (1) the 1957 to 1966 period, (2) 1966 to 1983 period and (3) 1984 to the present (2008). The first period was marked by the rule of Dr. Kwame Nkrumah and the CPP. This period was marked by moderate economic growth averaging around 4.5 per cent per annum and relatively low levels of inflation. This was also the period when considerable initial attempts were made to industrialise the country with the establishment of selected industries located around the country, the development of the Akosombo Hydroelectric Dam, the new Township and Industrial City anchored around the Port of Tema and the setting up of the Ghana Industrial Holding Corporation (GIHOC).

The second period is the period of political instability starting from the first military coup in February 1966 to 1983. This period was characterised by low economic growth and stagnation, considerable depreciation of capital stock and two of the worst recorded droughts in the history of the country in 1977 and 1983. The earlier attempts at manufacturing in the First Republic (1960-1966) were largely abandoned

during this period. The period from 1984 to 2008 marked the new period of political stability characterised by moderate economic growth averaging around 4.8 per cent per year and moderate levels of inflation. This period witnessed no successful military coups and generally good climate with occasional moderate droughts (for example in 1998/99 and 2006/2007). The moderate growth was also anchored around extensive economic liberalisation based on programmes enacted by the government with extensive support from the World Bank and the International Monetary Fund. While this period saw sustained moderate economic growth, it was marked by the relative decline of the manufacturing industry and the extensive sale and/or privatisation of stated-owned industries including the near-dissolution of GIHOC.

Average annual economic growth, measured as the change in real gross domestic product (RGDP), was 4.8 per cent from 1984 to 2008 (the new period of political stability). This annual economic growth varied from a low of 3.2 per cent in 1984 to a high of 6.4 per cent in 2007. The provisional economic growth rate for 2008 was 6.2 per cent. The recent over six per cent annual economic growth rates (from 2006 to 2008) have also been linked to very high levels of government budget deficits which are unsustainable, averaging 10 per cent of GDP. Despite the continuous annual economic growth and political stability over the last 25 years, unemployment has continued to be a major socio-economic problem. Further, the growth of the last 25 years has not led to a similar appreciable growth in formal employment outside of the government work force. This has led to increased poverty in urban areas such as in the capital city, Accra, even though overall people classified as poor in Ghana declined from about 51 per cent of the population in 1991/92 to about 28.5 per cent in 2005/2006. High levels of unemployment especially among the youth have attracted the attention of policymakers who have formulated several strategies to deal with this problem. New initiatives include the National Youth Employment Scheme which is similar to the Workers' Brigade Movement of the First Republic.

High economic growth rates are important to reduce poverty and unemployment levels among the population. However significant reductions in poverty are also associated with pro-poor growth policies that allow the employment of large numbers of the population in meaningful employment. This is often achieved

through accelerated expansion of the manufacturing industry and labour-intensive construction work programmes. Over the last 25 years, strategies to accelerate economic growth and overall socio-economic development of Ghana have focused on using the private sector as the main engine of growth. Recent government strategy, as outlined in the GPRS 2 document, favours the use of agriculture, information and communication technology and tourism as the main growth drivers.

It is generally acknowledged from empirical evidence that countries that have moved quickly from a low income status to a middle-income status have used their industrial sector, especially the construction and manufacturing industries, as the major driving forces of economic growth. Specific to Ghana, Anaman and Osei-Amponsah (2007) for instance, have established strong causality links between the growth of the construction industry and the growth of the overall macro-economy based on the 32-year period from 1974 to 2005 for Ghana. They conclude that the construction industry has been a major driver of growth in Ghana and moves the entire economy along as the industry expands. The linkage between the growth of the manufacturing industry and the growth of the macro-economy is also analysed by Osei-Amponsah and Anaman (2008). They show that the growth of the macro economy precedes or Granger-causes the growth of the manufacturing industry with a one-year lag. However, the growth of the manufacturing industry does not precede or Granger-cause the growth of the macro-economy.

The Government of Ghana considers private sector development, which includes the improvement of investment and the enhancement of basic service delivery, as one of the necessary factors for sustaining and expanding businesses, stimulating growth and reducing poverty. Despite the 25 years of continuous political stability and economic liberalisation from 1984 to 2008, the performance of the private sector has not been impressive. A major characteristic of the unimpressive performance of the private sector has been the weak performance of the industrial sector. Ghana's industrial sector is made up of four sub-sectors or industries. These industries are (1) mining and quarrying (2) manufacturing (3) electricity and water and (4) construction. Overall, the industrial sector performed marginally well against the projected targets set in the Government's Ghana Poverty Reduction Strategy (GPRS 1). However, the contribution of manufacturing industry to GDP continues to

decline due to a number of factors such as the high costs of production and the influx of cheaper imports from Asia and other parts of the world. For example, the growth rate of the manufacturing industry fell from 5.5 per cent in 2005 to 4.2 per cent in 2006 and further deteriorated to -2.3 per cent in 2007 (Institute of Economic Affairs, 2008).

Industrialisation linked to manufacturing is normally associated with the decline of agriculture's share of the GDP and the corresponding rise of the output of the manufacturing industry. The rise of industrialisation, based on increasing the output of the manufacturing industry, is viewed as an essential part of a successful economic development strategy. This strategy is also often accompanied by strong rises in per capita income levels and the accumulation of factors of production. However, the factors that determine the pace of manufacturing are the subject of debate in the economic development literature and appear to vary from country to country. Given the importance of the manufacturing industry in the drive of Ghana to achieve a middle-income status in the shortest possible time, it is important to ascertain the determinants of the output of the manufacturing industry in this country. We have therefore undertaken this econometric study to estimate the determinants of manufacturing output in the country to provide some policy recommendations that will promote a vibrant industrial era in Ghana. The rest of this paper is organised as follows: the next section provides a summary of the literature reviewed. This is followed by a discussion of the methodology used for the study. The subsequent section discusses the results of the study. The conclusions and policy recommendations follow.

2. LITERATURE REVIEW

Industrialisation is the development of a modern manufacturing sector which involves the organisation of enterprises, specialisation and the application of improved technology. The promotion of industries is necessary for rapid and sustained development of developing countries such as Ghana. Not surprisingly, in the period after independence, many African governments pushed for industrialisation based on manufacturing as a means of rapid socio-economic

development. Given the limited experience and the weak capacity of the private sector in manufacturing at the time, the push for manufacturing was often done through public investment in small, medium and large scale industries (Steel and Webster, 1992). Manufacturing involves social change. While its narrow outcome is an increase in industrial production from existing or new factories, a broader set of societal changes have also generally accompanied, if not preceded, the development of manufacturing. According to Gerschenkron (1962), these changes include a situation of political stability, the availability of experienced entrepreneurs, a capable urban work force and capital, the emergence of a market for industrial goods, and the presence of a growing body of technical knowledge.

During the 1970s, the newly industrialising countries of East Asia started to emerge as economic power houses on the back of increasing share of the manufacturing industry as a proportion of GDP. A study by the World Bank (1993) suggested the rapid growth of East Asia during the second half of the 20th Century was underpinned by spetacular growth in the manufacturing industries. This is supported by more recent studies such as those by Drysdale and Huang (1997), Jacob (2005), Sun (2006) and Kim and Park (2006). Storm and Naastepad (2005, pp. 1079-1084) argued that the extraordinary growth of the manufacturing industries in East Asia was the outcome of a virtuous cycle initiated by government-led increases in investment which led to higher growth and productivity and drove an accelerated expansion in exports.

The theoretical literature on the determinants of industrialisation, based on manufacturing, has several variants. There are theories that stress the role of local demand in generating sufficient expenditure on manufacturing goods (Murphy *et al.*, 1989). Other theories emphasise the importance of comparative advantage and doubt the pro-industrialising effects of high agricultural productivity (Matsuyama, 1992. A study by Breinch (2005) nests several theories in a unifying framework and introduces features of economic geography. The study uses a multi-location model with transport costs in which industrialisation is driven by access to markets and comparative advantage patterns. The model is used to indicate how costly international trade and relative geographical position are important determinants of

the level of industrialisation especially that dealing with the size of the manufacturing sector in developing countries.

Breinch (2005) asserts that in a world where neighboring countries show similar specialisation patterns, comparative advantage effects are less significant, in particular if agricultural reforms are coordinated across countries in a geographical region. Raising income above subsistence levels does not only alleviate rural poverty but it generates demand for manufactured goods necessary for successful industrialisation. Hansen and Prescott (2002) and Gollin *et al.* (2002, 2007) highlight the role of agricultural productivity in the process of industrialisation. The former authors have developed a model in which the transition from agriculture to industry is brought about by faster technological progress in the industrial sector and is slowed by higher productivity in the agricultural sector. They suggest that most of the late industrialised countries began the process of industrialisation late because of low agricultural productivity. Further, once a society produces the basic nutritional requirement of food, labour starts moving from agriculture to industry. Indeed, virtually every country that has experienced sharp increases in living standards over the last 200 years has done so through some of industrialisation that involves manufacturing.

Zhang *et al.* (2000) developed a framework to model the determinants of land use based on policy and historical experiences in China. A long period panel data set at the provincial level was constructed from various governmental sources to conduct the empirical analysis and hypothesis tests. Their results provide a better understanding of the driving forces behind the changes in China's agricultural land use. The empirical evidence showed that industrialisation and urbanisation are important factors influencing the conversion of farmland. Hence industrialisation and grain self-sufficiency policies are inherently in conflict with each other. Further, the relationship between land use intensity and industrialisation appears to be one of an inverse U-shape relationship. Industrialisation brings down non-labour input costs of agricultural production, promoting the practice of multiple cropping. On the other hand, industrialisation, especially the rapid development of rural enterprises, offers more non-farm job opportunities, raising wages and making intensive farming unattractive as surplus labour is exhausted.

Basu and Guariglia (2008) investigate whether, in addition to differences in agricultural productivity, differences in initial years of schooling can explain why some countries industrialise later than others. They use a neoclassical growth model, which predicts that countries with a greater initial knowledge gap industrialise later. They then use this model as a baseline and calibrate it to historical data of the United Kingdom (UK). It is established that their baseline model performs well in replicating actual historical UK real GDP per capita series during the era following the Second Industrial Revolution. The widespread adoption of increasing-returns-to-scale, industrial, technologies as a key aspect of industrialisation has been emphasised in both the theoretical and empirical literature. The empirical evidence suggests that industrial technologies are adopted throughout input chains in the economy. Ciccone (2000) derives two main results from his analysis of implications of available technologies for effective industrialisation. First, industrialisation's effect on aggregate income and productivity may be large even if increasing returns at the firm level are small. Second, minor improvements in the productivity of technologies may lead to higher level of industrialisation and increases in aggregate income and productivity. This will be the case especially if firms coordinate their decisions to adopt industrial technologies. Hence the coordination of activities of industrial firms by government may be useful to accelerate industrialisation.

Miguel *et al.* (2002) examined the effect of industrialisation on social capital in Indonesia from 1985 to 1997 using nationally representative surveys. They analysed a set of social capital measures including multiple measures of activities related to voluntary association, levels of trust and informal cooperation, and family outcomes. There were three main findings. First, districts that experienced rapid industrialisation showed significant increases in most social capital measures. Second, districts that were close to rapidly industrialising areas exhibited high rates of out-migration, significantly fewer community credit cooperatives, and a reduction in mutual cooperation as assessed by village elders. Finally, initial social capital in a district did not predict subsequent industrial development.

Louri and Minoglou (2001) analysed the determinants of de-industrialisation of Greece, based on the manufacturing share of the real GDP, using time-series

econometric analysis. They concluded that the relatively weak performance of the manufacturing industry in Greece was determined by the low GDP per capita, the long economic recession and unfavourable manufacturing trade conditions. The literature summarised above suggests that there are several factors that determine the level of industrialisation as measured by the output of the manufacturing industry. Some of these factors are related to government policy such as the coordination of activities of industrial firms by government. Coherent government policy to assist industry implies at the minimum some degree of political stability and governance institutions. Other factors are related to the size of the local economy as measured by the real GDP or per capita real GDP, trade conditions in manufacturing and other sectors of the economy and shocks such as the tripling of world oil prices in the 1970s, droughts and severe energy shortages.

3. METHODOLOGY

3.1. Specification of the Econometric Models

Following the approach used by Louri and Minoglou (2001), we use time-series econometric approach to ascertain the determinants of the level of industrialisation, as measured by the relative share of the manufacturing industry of the GDP of Ghana using data from 1974 to 2006. Based on the literature review summarised in the earlier section and specific conditions of Ghana including historical realities, the general model of the level of manufacturing output is specified below in Equation 1.

$$\mathbf{MSHARE} = A_0 + A_1\,\mathbf{EIRATIO}_t + A_2\,\mathbf{PCRGDP}_t + A_3\,\mathbf{ROILPRI}_t + A_4\,\mathbf{STABLEP}_t + A_5\mathbf{WEATHER}_t + V_t \qquad \textbf{Equation 1}$$

where $MSHARE_t$ is the share of the manufacturing industry as percentage of the gross domestic product in time t;
$EIRATIO_t$ is the ratio of total exports to total imports in time t;
$PCRGDP_t$ is the per capita real gross domestic product in time t in Ghana cedis;
$ROILPRI_t$ is the real oil price based on crude prices in the international market in time t;

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 1977, 1979, 1981 to 1983. These were years characterised by military coups or unsettled governments with many attempted coups such as in 1983;

WEATHER is a dummy variable for years of very low rainfall or droughts. A value of 1 denotes 1977, 1983, 1998 and 2006 and zero for all other years;
Ai (i = 0,1,2,3,4,5) are the parameters to be estimated and
V_t is the error term.

The empirical model is based on a log-linear model based on its superiority to the linear model derived from a specification test (Ramsey Reset model test). The empirical model used in this study is described as follows in Equation 2.

$$\mathbf{LMSHARE = B_0 + B_1\ LEIRATIO_t + B_2\ LPCRGDP_t + B_3 LROILPRI_t + B_4\ STABLEP_t + B_5\ WEATHER_t + U_t} \qquad \textbf{Equation 2}$$

where LMSHARE, LEIRATIO, LPCRGDP, LR OILPRI are the natural logarithms of MSHARE, EIRATIO, PCRGDP and ROILPRI respectively;
Bi (i = 0,1,2,3,4,5) are the parameters to be estimated and
U_t is the error term.
A long-run growth function, as depicted in Equation 2, 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 3 as follows:

$$\mathbf{\Delta LMSHARE_t = C_0 + C_1 \Delta LEIRATIO_t + C_2 \Delta LPCRGDP_t + C_3\ \Delta LROILPRI_t + C_4 \Delta STABLEP_t + C_5 \Delta WEATHER_t + C_6\ U_{t-1} + W_t} \qquad \textbf{Equation 3}$$

where U_{t-1} is the lagged error term from the cointegration equation depicted in Equation 2, W_t is a normal random error term, Δ is the first difference operator and Ci (i = 0,1,2,3,4,5) are the parameters to be estimated.

3.2. Estimation of Models

It is now well established in economic literature that time-series econometric modelling must test for stationarity and cointegration of the economic variables. Thus, the models were estimated using time-series methodology that allowed for the testing of stationarity of the variables and long-run relationships based on cointegration analysis. Stationarity of the variables in the growth models was estimated based on the Phillips-Perron (PP) test (Phillips and Perron, 1988) and the Augmented Dickey Fuller (ADF) test (Dickey and Fuller, 1981). The first differences of the variables were also subjected to the test for stationarity using the PP and ADF tests. The tests were undertaken using the Time-Series Processor (TSP) package Version 4.5 (Hall and Cummins, 2001). The null hypothesis for both tests was that there was a unit root in the time series. The optimal number of lagged first differences in the ADF test was chosen automatically by TSP. Cointegration analysis was undertaken to determine whether the variables had valid cointegration relationships among themselves. This analysis 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)). As shown by the results of this study, the economic variables were a mixture of stationary and non-stationary variables which make the ARDL method clearly suitable. The ARDL method involves 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 to 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 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 International Financial Statistics Yearbook Issues from 1985 to 2007 published by the International Monetary Fund. Data for the most recent issues were used for the economic variables superseding values found in earlier editions. Data on GDP and market share attributed to the manufacturing industry were obtained from the Ghana Statistical Service. The data used for the analysis were those available from 1974 to 2006. Data for 2007 and 2008 available from the Ghana Statistical Service were considered too provisional to be useful for our analysis.

4. RESULTS

The results of the econometric analysis are summarised in Tables 1 to 4. Table 1 reports the summary results of the unit root tests of the variables both at the levels and first differences based on the ADF and PP tests. Based on the ADF test, the results show that while the variables are non-stationary at the levels, there are stationary based on their first differences. However, for one variable, $\Delta LEIRATIO_t$, stationarity is confirmed by the PP test and not the ADF test. The mixed results from the stationarity tests support the use of the ARDL method since this method is not conditional on the order of integration of the variable. The results of the estimated optimal ARDL manufacturing share of the economy model are reported in Table 2. As indicated earlier, the ARDL methodology is actually well suited for variables which are both stationary and non-stationary. The results from Table 2 confirm that the model is correctly specified based on the Ramsey Reset test. There is also no significant autocorrelation as measured by the Langrange Multiplier (LM) test for autocorrelation. Further, there was no significant heteroscedasticity as measured by the LM heteroscedasticity test. The high adjusted R^2 of the model suggests its strong power of the independent variables in explaining the variation in the dependent variable.

Table 1: Summary of ADF and PP Unit Root Tests of Variables at the Levelsand First Differences.

Variable	ADF Statistic	P Value	PP Statistic	P Value
$LMSHARE_t$	-10.613	0.000**	-3.470	0.915
$LEIRATIO_t$	-3.014	0.128	-15.822	0.159
$LPCRGDP_t$	-1.057	0.936	-4.639	0.846
$LROILPRI_t$	-3.598	0.030**	-16.134	0.150
$\Delta LMSHARE_t$	-4.064	0.007**	-10.906	0.378
$\Delta LEIRATIO_t$	-2.825	0.188	-22.132	0.046**
$\Delta LPCRGDP_t$	-3.857	0.014**	-12.677	0.282
$\Delta LROILPRI_t$	-5.449	0.000**	-23.103	0.038**

Notes

** denotes statistical significance at the 5% level.

Δ denotes first difference operator.

Table 2: Results of Estimated Optimal ARDL Manufacturing Share of the Economy Model of Ghana Based on Data from 1974 to 2006 with variables measured in Constant 2006 Values.

Explanatory Variable	Parameter Estimate	T-Statistic	P Value
INTERCEPT	-0.687	-4.174	0.000**
$LMSHARE_t$	0.322	1.866	0.075*
$LEIRATIO_t$	0.304	1.909	0.069*
$LPCRGDP_t$	0.419	1.433	0.165
$LROILPRI_t$	0.133	1.541	0.137
$LROILPRI_{t-1}$	-0.220	-2.486	0.021**
$STABLEP_t$	0.168	3.518	0.002**
$STABLEP_{t-1}$	0.153	2.671	0.014**
$WEATHER_t$	-0.21	-0.629	0.535

R^2 0.826**
Adjusted R^2 0.765**
Probability level of significance of model specification based on the Ramsey Reset test of correct model specification 0.336
Probability level of significance level for autocorrelation based on the Langrange Multiplier (LM) test 0.597
Probability level of significance for heteroscedasticity based on the LM heteroscedasticity test 0.110

Notes

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

* denotes statistical significance at the 10% level

The estimated long run relationship derived from the estimated optimal ARDL model are presented in Table 3. These results show that the variables, LEIRATIO, LPCRGDP and STABLEP, are statistically significant determinants of the dependent variable in the long run. This implies that the level of manufacturing output is influenced in the long-run period by the level of per capita real GDP, the export-import ratio and political stability. The results of the estimated short-run parsimonious error correction model derived from the long-run model are presented in Table 4. The power of the model is considered moderately strong given its adjusted R^2. The results indicate that in the short-run period, the deviations in the level of manufacturing output are significantly driven by changes in the export-import ratio and political stability.

The error correction term in the short-run ECM model is statistically significant indicating that the independent variables in the long-run model Granger-cause or precede manufacturing output. The proof of Granger causality based on the statistically significant error correction term also justifies the use of the single-equation model for the study. The value of -0.678 as the coefficient estimate of the error correction term (refer to Table 4) means the correction of the dependent variable from its long run value is undertaken in about one-and-half years (1/0.678). Given the fact that both in the short-run and long-run periods, the export-import ratio variable significantly influences the dependent variable, this raises the importance of this variable as a pivotal factor in policy analysis dealing with increasing the level of the output of the manufacturing industry in Ghana.

Table 3: Results of Estimated Long Run Relationship Derived From the Optimal ARDL Manufacturing Share of the Economy Model of Ghana Using Data from 1974 to 2006.

Explanatory Variable	Parameter Estimate	T-Statistic	P Value
INTERCEPT	-1.013	-4.878	0.000**
LEIRATIO $_t$	0.449	1.799	0.085*
LPCRGDP$_t$	0.618	1.802	0.085*
LROILPRI$_t$	-0.129	-1.143	0.265
STABLEP$_t$	0.474	5.865	0.000**
WEATHER$_t$	-0.032	-0.655	0.519

Table 4: Results of Estimated Shortrun Parsimonious Error Correction Model Derived from the Long-Run Manufacturing Model of Ghana Using Data from 1974 to 2006.

Explanatory Variable	Parameter Estimate	T-Statistic	P Value
INTERCEPT	-687	-4.174	0.000**
ΔLEIRATIO$_t$	0.304	1.909	0.068*
ΔLPCRGDP$_t$	0.419	1.433	0.164
ΔLROILPRI$_t$	-0.133	-1.541	0.136
ΔSTABLEP$_t$	0.168	3.518	0.002**
ΔWEATHER$_t$	-0.021	-0.629	0.535
U$_{t-1}$	-0.678	-3.928	0.001*

R^2 0.645**

Adjusted R^2 0.522**

Notes

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

* denotes statistical significance at the 10% level.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

The determinants of the level of manufacturing output in Ghana, based on the share of manufacturing industry of the gross domestic product, were established using secondary data from 1974 to 2006. We used cointegration and error correction model analysis to establish the determinants. We showed that the level of output of the manufacturing industry was driven in the long-run period by the level of per capita real GDP, the export-import ratio and political stability. In the short-run period, the level of output of the manufacturing industry was influenced by the export-import ratio and political stability. Because exports and imports were measured in monetary terms, our results implied that the level of manufacturing output would increase with increased export earnings either because of price or quantity changes.

With the political stability over the last quarter of century in Ghana (1984 to 2008) coinciding with moderate continuous economic growth averaging 4.8 per cent per annum, but continuously shrinking share of the manufacturing industry, increased level of industrialisation would have to be linked to rapid growth in the level of exports vis a vis imports especially in the area of manufactured exports which have been shown in other empirical works to be linked to improvement in total factor productivity (refer to, for example, the recent work by Siliverstovs and Herzer for Chile). This increased level of exports would require a sustained push by the government to assist manufacturers in reducing the constraints of energy and infrastructure in the country and in accessing export markets especially those in West and Central Africa. The government should consider the provision of enhanced tax incentives and targeted subsidies to promote the expansion of manufactured exports. Public intervention through the mobilisation of finance for manufacturing firms needs to be improved.

As argued by Storm and Naastepad (2005, pp. 1084-1085), an important lesson to be drawn from the rapid growth of the manufacturing industries in East Asia during the second half of the 20thCentury is that the sole reliance on market forces or market-friendly policies cannot explain the structural change of East Asian economies towards manufacturing production especially export-oriented manufacturing production. Market imperfections and market failure characterise industrial production and the fact that the rate of individual industrial investments is often low

requires coordinated industrial investments. We share the view of Storm and Naastepad that industrialisation requires a "Big Push" in the coordination and financing of complementary investments, the responsibility of such coordination falls with the government.

The narrow focus of the government of Ghana on industrialisation mainly linked to agro-industry (as contained in the GPRS 2 document) needs to be broadened to include emphasis on the development of industries other than agro-based industries. This is necessary to improve access to markets in the West Africa and African Regions given that agro-based industries are common in these two regions. Other export-oriented industries that need strong support from the new NDC government include book publishing, computer assembly plants, garments and textiles, pharmaceuticals and new industries related to the emerging oil and gas industry given the recent discovery of commercial quantities of oil and gas in Ghana. The new government may also consider the setting up of a revived GIHOC to facilitate speedy public-private development of new firms in the manufacturing industry and related sectors such and the gas industry, information and communication technology and integrated rural development sectors.

Finally, our study suggests that since the export-import ratio is an important determinant of manufacturing industry in Ghana, further research work is needed on the analysis of export and import trade as it relates to both the growth of manufacturing industry and the entire economy. This topic is part of our on-going research agenda.

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