The determinants of manufacturing sector growth in Sub-Saharan African countries

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ABSTRACT

A robust manufacturing sector is the engine of growth in both developed and developing economies. Research has provided opportunities to analyze how foreign direct inflows influence manufacturing sector and economic growth in many developing economies, but to date, there has been little attention given to how manufacturing sector growth relates to other equally important variables such as interest rates, inflation, labor costs and government incentives in sub-Sahara African countries. This study explored the explanatory power of the independent variables of FDI, interest rates, inflation, labor costs and government incentives relative to manufacturing sector growth in Sub-Saharan African countries from 2008 – 2010.

Keywords: Manufacturing Sector, African, FDI, Government Incentives, Growth
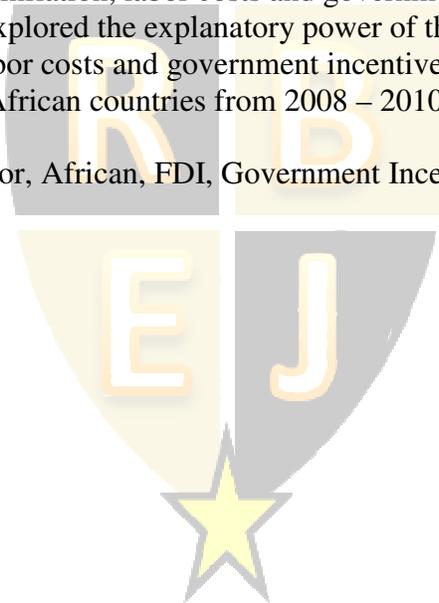
INTRODUCTION

The manufacturing sector contribution to GDP in sub-Saharan African (SSA) economies has remained stagnant over the years. The adjustment reforms instituted by SSA countries to address their low industrial growth mainly due to the decline in oil prices during the global economic recession of the 1980s were not completely successful. Although the debates over the relationship between the manufacturing sectors and economic growth in developing countries was decades old, there was no concrete evidence that showed how the manufacturing sector varied relative to the components of economic development such as foreign direct investments (FDI), interest rates, inflation, labor costs, and government incentives. The limited existing studies on the manufacturing sector and foreign direct investments have produced mixed and inconclusive results; thus, confirming the existence of knowledge gaps. It must be noted, however, that despite the important role the manufacturing sector plays in every economy and the sensitivity of the variables of interest rates, inflation, labor costs, and government incentives, there are no comparative studies on the relationship between manufacturing sector growth and FDI, interest rates, inflation, labor costs, and government incentives in SSA countries. While there are many empirical studies that suggest a significant relationship among the manufacturing sector, foreign direct investment, and GDP such as Quattara (2004) and Fredrick (2000), there are few studies that have examined the relationships between manufacturing sector growth and a range of explanatory variables such as interest rates, inflation, labor costs, foreign direct investments, and government initiatives in SSA countries.

The transformation from a traditional economy in SSA countries to a modern one where technology and modern production activities in manufacturing sector assume a significant role has remained a defining characteristic of economic growth and development (Naude & Szirmai,2012). The role of the manufacturing sector in the development of any economy cannot be over emphasized. Szirmai (2009) argued that there was an empirical correlation between the degree of industrialization and per capita income in developing countries. Tybout (2000) maintained that the manufacturing sector was perceived as an engine of growth, a key source of skilled job creation and an avenue for various spillovers to other sectors. The scarcity of resources in SSA countries, coupled with limited foreign inflows for developmental purposes has often limited manufacturing sector growth and hindered the capability of developing countries to invest in growth projects such as infrastructure, education, energy, communications, and roads (Mallik, 2008). Although some scholars had lauded foreign direct investments as a key tool for stimulating growth in the manufacturing sector and other vital sectors within an economy (Chudnovsky & Lopez, 2002; Dunning, 2002), there has been no evidence to indicate its relevance on the economies of SSA countries. Kosack and Tobin (2006) argued that empirical evidence did not confirm a significantly positive relationship between FDI, GDP and manufacturing sector. Rana and Dowling (1988) explained that the effects of foreign aid on domestic savings, domestic investment, and the manufacturing sector growth of developing countries had been controversial since the end of the World War II.

In view of the increasingly important role of the manufacturing sector in the country's economy, there has been little evidence to show how the manufacturing sector growth has varied in relation to other important financial and noneconomic variables. This study addressed how other variables relate to manufacturing sector growth in SSA countries. Exploring the explanatory power of these variables will fill the knowledge vacuum that currently exists in the study of manufacturing sector growth in SSA countries.

The rest of this paper is organized as follows. In section II, we provide a brief review of the literature and the theoretical framework. Section III discusses the data, methodology and hypotheses used in the paper. Section IV discusses the empirical results which is the followed by the conclusion in section V.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Naude and Szirmai (2009) noted that since the beginning of the industrial revolution in the early part of the nineteenth century, manufacturing sectors had been transformative for all economies through spillover effects to other sectors. Oyati (2010) claimed that the advanced countries, which could readily harness its power, had achieved great prosperity, profitability, and remarkable growth in their respective economies. The experiences of the developed nations and the emerging economies of China, India, North Korea, Malaysia, and Singapore indicated a positive correlation between manufacturing sector growth and national economic growth (Banjoko, Iwuji & Bagshaw, 2012). The developing economies with agrarian and services oriented in the past also evolved several initiatives to sustain the development of their manufacturing sectors.

The study of the relationship between manufacturing sector growth and FDI, interest rates, inflation, and government incentives within the SSA countries was guided through the theoretical frameworks of the accelerator and the neoclassical theories of investment and growth. The accelerator theory of investment states that investment varies with output. An increase in the demand for finished goods tends to increase inventories more than proportionally to increase in sales, except when the manufacturing firm is limited by inadequate funding due to high interest rates and limited inflow of direct investments(Clark 1917). In quantitative terms, the model is predicated on a normal link between the capital stock desired by the firm and the level of output of the firm.

Jorgensen (1967) and Hall and Jorgensen (1971) faulted the accelerator model in two respects. First, that the ratio of desired capital to the level of output was assumed to be constant, and this ratio could only hold if the cost of capital was fixed. Cost of capital was, however, subject to variations because of interest rate and government policies and could thus not be fixed. Second, the model assumed that investment was always enough to preserve the actual capital stock to be equal to the desired capital stock in every month.

The model was criticized for not taking cognizance of the cost of adjusting the capital stock and the unavoidable lags in the installation of capital (Clark, 1917). Despite the obvious limitations with this model, it provided a solid foundation on investment behavior.

The neoclassical approach to investment was formulated by Jorgensen (1967) and Hall and Jorgensen (1971) to address and close gaps associated with the accelerator theory. This model related the value of capital required by the firm as a function of its output level (Hall & Jorgensen, 1971). It indicated that the desired capital depended on the level of output and the cost of capital, the real interest rate, inflation, and depreciation.

Unlike the accelerator model, the neoclassical model essentially recognized the existence of lags in the real interest rate and government policies. According to this theory, interest rates, investments, and fluctuations in the private sector had a profound effect on manufacturing sector growth. Nevertheless, the neoclassical assumptions of perfection in market, output, and interest rates as well as static expectations about future prices were implausible given that the investment function was a future facing process that looked into the future (Serven & Solimano, 1992). To

understand adequately changes in manufacturing sector growth relative to variations in FDI, interest rates, inflation, labor costs, and government incentives, it is necessary to first understand the role of the manufacturing sector in SSA.

A review of the empirical literature has shown first, that the manufacturing sector in SSA countries declined following the global oil price decline and the global recession in the early 80s. The decline has been confirmed by studies undertaken by Jalilian and Weiss (2000), Ghura and Goodwin (2000), and Alli (2007). Secondly, the manufacturing sector in SSA and advanced countries exert a positive impact on the economy of a country as confirmed by Oyati (2010), Banjoko et al. (2012), and Naude and Szirmai (2009). Third, the relationship between FDI and economic growth had been found to be mixed among scholars. Additionally, Dunning (2002) and Hout (1996) argued that there was a significantly positive relationship between FDI and growth of the economies in SSA countries, while others, such as Tobin and Kosack (2006) have disputed the claim that FDI results in any growth within the economies of SSA countries.

Although studies on the relationship between manufacturing sector growth and other independent variables of interest rates, inflation, labor costs, and government incentives were not available, existing studies did confirm the impact of these variables on private investments. For example, some studies indicated that real interest rate had a negative effect on private investments (Greene &Villanueva, 1991; Musalem, 1989), while others such as McKinnon (1973) and Shawn's (1973) hypotheses reported that real interest has a positive impact on private investment. Fry (1988) argued that a rise in interest rate would have a significant negative effect on the volume and quality of investments in distressed or developing economies.

Existing literature supports the notion that inflation exerts a negative impact on private investment and manufacturing sector growth. Fisher (1991) and Smith (1994) provided evidence supporting the negative impact of high inflation rates on private investments. On the contrary, Dornbusch and Fischer (1993) argued that inflation was an integral part of a country's public finance and it is very hard to reduce the rate. Hence, high or moderate inflation could be attributed to external shocks, especially on the prices of goods and services (Dornbusch & Fischer, 1993).

As previously indicated, overall, the studies examining the relationship between manufacturing sector growth and the independent variables are mixed and sparse. Several patterns emerged identifying areas where further research is needed. Additionally, while extensive studies have been performed on the relationship between FDI and economic growth at the macro level, further research is required at the micro level between manufacturing sector growth and relationship to FDI, interest rates, inflation, and government incentives.

DATA, METHODOLOGY AND HYPOTHESES

Annual data for this study was collected from several databases from 2008 to 2010 and was comprised of 78 observations. Manufacturing sector, FDI, real interested rates, inflation and government incentives were retrieved from the World Bank Development Indicators, the International Monetary Fund and the African Development Bank Database. We operationalize the variables as follows:

Manufacturing sector growth is defined as a percentage of GDP from 2008 to 2010.
A FDI net inflow is defined as a percentage of GDP from 2008 to 2010.
Inflation is defined as the annual percent change in consumer prices from 2008 to 2010.
Real Interest rates adjusted for inflation from 2008 to 2010.

Government incentives: Tariff rates applied as percentage on manufactured products from 2008 to 2010.

We explored 26 Sub-Saharan African countries. Table 1 provides a list of the Sub-Saharan African countries examined in this study (Appendix)

To examine the theory underlying the field, we statistically tested the relationships between manufacturing sector growth and FDI, interest rates, inflation, and government incentives, employing a multiple regression model. The regression equation is comprised of the various variables:

$$Y = \alpha + B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + \varepsilon \tag{1}$$

Where α is the intercept, Y is the dependent variable, manufacturing growth sector which was being predicted or explained.

B_0, B_1 and Beta is the coefficient of X, which is the slope of the regression line, which measures how much of Y varies relative to changes in the independent variables. The X_1, X_2, X_3X series are the independent variables of FDI, inflation, interest rates, labor cost, and government incentives; these are values that predict or explain the value of Y, the manufacturing sector growth.

ε - Error term used for predicting the value of Y, with a given value of X.

We developed the following hypotheses for this study:

Hypothesis 1
H_01: The inflow of foreign direct investment does not account for a significant amount of variation in manufacturing sector growth.
H_a1: The inflow of foreign direct investments does account for a significant amount of variations in manufacturing sector growth.

Hypothesis 2
H_02: The rate of interest does not account for a significant amount of variation in manufacturing sector growth.
H_a2: The rate of interest does account for a significant amount of variation in manufacturing sector growth.

Hypothesis 3
H_03: The rate of inflation does not account for a significant amount of variation in manufacturing sector growth.
H_a3: The rate of inflation rate does account for a significant amount of variation in manufacturing sector growth.

Hypothesis 4
H_05: The use of government incentives does not account for a significant amount of variation in manufacturing sector growth.
H_a5: The use of government incentives does account for a significant amount of variation in the manufacturing sector.

Empirical Results

The 26 countries in this study had complete and consistent data for both the dependent variable and the independent variables. The descriptive statistics for the dependent and independent variable variables for the 26 SSA countries are listed in Table 2 and the results of the regression analysis are listed in table 3. (Appendix)

With 78 observations, the dependent variable had a mean average of 2.71 and SD = 6.91, and the independent variables of interest are the interest rate (M=9.27 SD 10.5519) and FDI (M= 5.97, SD= 6.79) and CPI (M=8.87, SD=6.12) and GI (M=11.79, SD=3.26).

Given the foregoing coefficients in table 3, the following are the reinstatements of the research questions for the study, together with the null and alternative hypotheses and the results of the research question. Next is the general form of the regression equation that explains how variations in the independent variables explain manufacturing sector growth in SSA countries. Manufacturing sector growth = 5.843 -.034*(interest rate) + 0.002*(FDI) - .166 *(CPI) - .115*(GI).

The *p*-value shows whether the variation in the dependent variable (manufacturing sector growth) explained by the independent variable is significant or not. If the p-value is greater than 0.05, the null hypothesis would not be rejected.

In Table 1, because the *p*-value of the data is greater than 0.05, for all the coefficients or the independent variables of FDI, interest rates, inflation and government incentives, the null hypotheses were not rejected. This implied that the variations in the independent variables (coefficients) were not statistically significant in explaining manufacturing sector growth (dependent variable).

CONCLUSION

This paper sought to address two fundamental questions in relation to the relationship between the manufacturing sector growth and FDI, interest rates, inflation and government incentives in SSA countries from 2008 -2010.

The first research question addressed the relationship between the manufacturing sector growth and FDI, interest rates, inflation and government incentives in SSA from 2008 - 2010. Multiple regression analyses were conducted. There was no significant relationship between manufacturing sector growth and any of the independent variables. The null hypotheses were not rejected in all cases and for all the independent variables.

The second question addressed the extent to which manufacturing sector growth varied relative to changes in FDI, interest rates, inflation, and government incentives. There was no statistically significant relationship between manufacturing sector growth and the independent variables. The outcome of the study showed that the independent variables of FDI, interest rate inflation and government incentives were not found to have any significant relationship with the manufacturing sector growth in SSA countries from 2008 - 2010. This implied that the independent variables of interest rates, inflation, government incentives and FDI should not be the only variables to be considered while examining manufacturing sector growth in SSA countries. More attention should be focused on the effects of corruption, political instabilities and lack of infrastructural amenities on manufacturing sector growth in SSA countries.

In SSA countries, the lack of infrastructural facilities such as good roads, electricity, and other amenities had been cited as the bane of industrial production in SSA countries.

Additionally, corruption and political instabilities in many African countries had been responsible for the stagnant position of the manufacturing sector growth in SSA countries. For instance, FDI would not have any meaningful impact if those foreign funds were constantly diverted to other less productive ventures due to the corrupt practices of leaders. In addition, infrastructural limitations such as a bad road network, communication issues, and lack of technical knowledge have been cited in literature as a hindrance to industrial production and manufacturing sector growth in SSA countries (Clarke, 2012; Goedhuys & Sleuwaegen, 2010).

This study clearly added value to the body of knowledge by looking at a diverse number of variables as opposed to previous studies that focused on the relationship between FDI and economic growth only. Although existing research findings were mixed, this study reinforced the view that FDI, interest rates, inflation, and government incentives were important variables. However, the explanatory power of these variables were not statistically significant in explaining changes in the dependent variable, implying that the fundamental problems of infrastructural issues, bad and inefficient communication networks, and acute corruption should be addressed by the leaders in SSA countries for the independent variables to have any meaningful or significant explanatory power on the manufacturing sector growth in SSA countries.

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Table 1: **List of Sub-Saharan African Countries**

Angola	Benin
Burkina – Faso	Burundi
Cote d'Ivore	Cape Verde
Congo Democratic	Ethiopia
Guinea	Guinea Bissau
Gambia	Kenya
Lesotho	Malawi
Mali	Mauritius
Namibia	Niger
Nigeria	Senegal
Sudan	Tanzania
Togo	South Africa
Uganda	Zambia

Table 2: Descriptive Statistics

	N	Range	Min	Max	Mean	Standard Deviation	Skewness	Standard Error	Kurtosis	Standard . Error
Interest	78	53.20	-16.90	36.30	9.2692	10.5519	. 416	. 272	. 452	. 538
Manu. Sector	78	37.10	-17.10	20.00	2.7141	6.9071	-.526	. 272	1.033	. 538
FDI	78	40.00	-5.00	35.00	5.9744	6.7899	2.129	. 272	6.184	. 538
CPI	78	43.00	1.00	44.00	8.8667	6.1204	2.468	. 272	12.895	. 538
GI	78	17.10	2.10	19.20	11.7859	3.2619	-.365	. 272	1.431	. 538
Valid N	78									

Table 3: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients			95. 0% Confidence Interval for B	
	B	Standard Error	Beta	*t*	Significant	Lower Bound	Upper Bound
(Constant)	5. 843	3. 421		1. 708	. 092	-. 974	12. 661
Interest	-. 034	. 076	-. 052	-. 444	. 658	-. 186	. 118
FDI	. 002	. 121	. 002	. 018	. 986	-. 239	. 243
CPI	-. 166	. 134	-. 147	-1. 244	. 217	-. 433	. 100
GI	-. 115	. 246	-. 054	-. 466	. 643	-. 606	. 376

a. Dependent Variable: Manufacturing Sector