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Statistical Analysis of Factors Influencing Economic Growth in Zambia

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Abstract: ***The focus of this research is to investigate the factors influencing the economic growth in Zambia. The motivation of this research is due to the unsustainable growth trends that Zambia has been experiencing in recent years. There is an assessment on whether it's a Least Developed Country status is beared on the vulnerability to a Mid Income Trap therefore by using adapted unit root model, Granger causality tests were conducted to establish which variables affect Zambia's Gross Domestic Product (GDP) per capita income level and predispose it to the Middle Income Trap (MIT). Thus, per capita income, labor productivity, agriculture share to GDP, and manufacturing industry share to GDP were investigated. The results have shown that agriculture share of GDP strongly affects GDP per capita income while manufacturing share of GDP has a weaker effect on GDP per capita. The results obtained further indicate that a change in agriculture share of GDP strongly affects the manufacturing output. Therefore, Zambia should increase investment in agriculture and manufacturing to maintain a positive GDP per capita income growth and to catalyze growth in the secondary sectors.***
Keywords: Copper; Agriculture; Manufacturing Industry; Test; Economic Performance; Middle Income Trap

I. INTRODUCTION

The original inhabitants of Zambia were the Khoisan people. The region was eventually colonized during a Bantu expansion in the 13th century. There are now 72 ethnic groups in Zambia, most of which speak Bantu. Nearly 90% of Zambians belong to 1 of 9 ethnolinguistic groups: Nyanja-Chewa, Bemba, Tonga, Tumbuka, Lunda, Luvale, Kaonde, Lozi, and Nkoya. The ethnic composition of Zambia in 2003 was: Bemba (22%), Tonga (11%), Lozi (5.2%), Nsenga (5.1%), Tumbuka (4.3%), Ngoni (3.8%), Chewa (3%), white (1%), and others (45%).Expatriates, most of which are from South Africa and the United Kingdom, are mostly in Lusaka and the Copperbelt. While there were 70,000 Europeans in the country in 1964, most have left. There is also a small population of Indians and Chinese. It is estimated that 80,000 Chinese live in Zambia, with 13,000 Indians.

There are about 89,000 asylum seekers and refugees in Zambia, most of which came from the Democratic Republic of Congo (47000), Angola(27000) , Zimbabwe(5000) and Rwanda(5000).

With very large reserves of copper and cobalt, Zambia was one of the most prosperous countries in Sub-Saharan Africa until its economy foundered with the slump in world copper prices in the mid-1970s. This landlocked country's transport network was also crucially disrupted by civil unrest or liberation wars in the surrounding countries of Angola, Congo, Mozambique, Namibia, South Africa and Zimbabwe. The economy remains vulnerable to fluctuations in copper prices, and to drought.

The early 1990s was a difficult period, with the impact of a two-year drought being exacerbated by weak copper prices. In 1992, the government launched an economic reform programme with substantial divestment of state enterprises. By 2004, 259 state enterprises had been sold off. In 2006, 75 per cent of the shares in Zambia National Commercial Bank (one of the few remaining major state-owned enterprises) was sold to Rabobank (of the Netherlands) and to the Zambian public. The reform programme encouraged a more diversified economy and development of exports such as flowers, fruit and vegetables, gemstones, cotton lint and sugar. It was continued, with the support of the IMF, into the 2000s, when the emphasis was on poverty reduction.Zambia qualified in 2005 for debt relief under the IMF/World Bank Heavily Indebted Poor Countries Initiative, deriving US$224 million in debt relief, which released it from 80 per cent of its annual debt-service commitments.

This development reflected macroeconomic stability and sound fiscal policies, which had resulted in good growth in the 2000s. From 2005 growth strengthened to more than ten per cent in 2010 and then continued at six or seven per cent p.a. during 2011–15, despite an adverse international economic climate.In the 1960s, the Zambian economy was characterized as a dual economy that was highly capital intensive mainly driven by the mining and agricultural sectors. However, the dual economy could not absorb the needed employment that the economy desperately needed to improve the distribution of wealth among Zambians.

Smallholder agriculture, which was expected to be the solution, was underdeveloped due to the agricultural policies that the colonial Government had introduced to promote commercial agriculture.

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The major problems that the Government of Zambia faced at independence, therefore, revolved around the shortage of manpower and a segregated education system that did not favour the provision of high quality education to the local populace.

A. Background of Study

Since independence, Zambia has heavily relied on copper mining; and this has been the bedrock of the economy. However, the mining sector has gone through mineral booms and recessions because of fluctuations in the international copper prices, rendering the Zambian economy susceptible to external shocks. Furthermore, other equally important sectors, such as agriculture and manufacturing, have not been developed to their full potential; and these sectors become affected whenever there is a mineral recession. In order to circumvent these problems, the Zambian authorities implemented a number of medium-term national development plans, and these were supported by reforms in the form of short-term or transitional national development plans.

In 2006, the Zambian authorities developed a long-term development strategy that aimed to transform Zambia from a low-income to a middle-income economy by the year 2030. For Zambia to achieve this goal, the economy was expected to grow at an average rate of 6% p.a. during 2006-2010; 8% p.a. during 2011-2015; 9% p.a. during 2016-2020; and 10% p.a. (Republic of Zambia, 2006). The success of the Vision 2030 development strategy could be well on track. The performance recorded by the medium-term strategies implemented after 2006 recorded considerable success. The economy grew at an average rate of 8.7% p.a. during the period of the Fifth National Development Plan (2006-2010) and at an average of 6.4% p.a. during the first four years of the Sixth National Development Plan (2011-2015). Overall, the Zambian economy has grown at an average rate of 7.7% p.a. during the period 2006-2014, which is in excess of the average growth rate forecast in the Vision 2030 strategy of an average of 7% p.a. for the period 2006-2015 (World Bank, 2015). However, in order to sustain such high growth rates, it is important for the Zambian authorities to understand the key macroeconomic determinants that have driven the Zambian economy, as well as those that hinder growth.

B. Problem Statement

Zambia had one of the world's fastest growing economies for the ten years up to 2014, with real GDP growth averaging roughly 6.7% per annum, though growth slowed during the period 2015 to 2017, due to falling copper prices, reduced power generation, and depreciation of the kwacha. Zambia's lack of economic diversification and dependency on copper as its sole major export makes it vulnerable to fluctuations in the world commodities market and prices turned downward in 2015 due to declining demand from China; Zambia was overtaken by the Democratic Republic of Congo as Africa's largest copper producer. GDP growth picked up in 2017 as mineral prices rose.

The early 1990s was a difficult period, with the impact of a two-year drought being exacerbated by weak copper prices. In 1992, the government launched an economic reform programme with substantial divestment of state enterprises. By 2004, 259 state enterprises had been sold off. In 2006, 75 per cent of the shares in Zambia National Commercial Bank (one of the few remaining major state-owned enterprises) was sold to Rabobank (of the Netherlands) and to the Zambian public. The reform programme encouraged a more diversified economy and development of exports such as flowers, fruit and vegetables, gemstones, cotton lint and sugar. It was continued, with the support of the IMF, into the 2000s, when the emphasis was on poverty reduction.

C. Significance of Study

Zambia has been successful in navigating several economic challenges over recent years, ranging from drought which took a heavy toll on agricultural production, slower than expected recovery of mineral prices, as well as uncertainty related to the trade war unleashed between the US and China. But Zambia is again proving resilient, with most projections showing Zambia outperforming the broader region.

This research will help get a better understanding of these economic challenges there by finding solutions for continuing expansion of its economy, steadily reducing its debt, and, most importantly, delivery of development to the most vulnerable of our communities. There is a need to look closely at ways to improve public spending in agriculture to ensure the promotion of a non-copper economy and improved rural livelihoods. Low agriculture productivity is a key impediment to poverty reduction and has knock on effects in terms of gender disparities, land degradation and rapid deforestation.

D. Objectives

The objective of this research from a theoretical point of view is to get a better understanding of the factors that are influencing the country's economic growth. By going through past records of the economic performance of Zambia and carefully looking at the stage when it was at its best state economically. We can begin to trace the factors that directly influence its economic growth.

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After establishing these problems the research aims to find sustainable solutions that can be used to solve these problems and achieve a positive economic growth.

E. Limitations

Government policies with respect to business and trade change often without prior consultation, such as agricultural crop export bans. Similarly, market-distorting subsidies in the agriculture sector inhibit greater involvement by and the growth of private enterprises in the sector.

Although hourly wages are low, actual labor costs are considered high for the region, driven up by low labor productivity, stringent labor laws, and a shortage of skilled labor.

Though the monetary policy has eased and there has been an increase in commercial bank liquidity, the private sector is crowed out by increased government borrowing at attractive rates to financing institutions.

Although improvements have been made at key border crossings, including the opening of integrated customs services at the Zambia-Zimbabwe border at Chirundu, the DRC-Zambia border at Kasumbalesa, and the Zambia-Tanzania border at Nakonde, the cross-border movement of goods remains slow. This, combined with high fuel prices and some poor highway segments, translates to steep transportation costs.

Other limitations include overreliance on rain-fed agriculture compounded by low levels of irrigation, low levels of agricultural mechanization among smallholder farmers, low private sector participation in agricultural development, and limited access and availability to agricultural finance and credit facilities. Furthermore include the de-escalation in the investment towards agricultural research and development, the unsustainable use of natural resources, and lower resilience to the effects of climate change.

F. Research Plan

This research will contain of 6 chapters including the introduction. Chapter 2 will contain the theoretical part of this research. Here we will look at the ways in which the country's performance economically and see the different ways of how it improves its GDP. Chapter 3 of this study will be more focused on the Literature review on already published papers on the related topic. Chapter 4 is focused on the methodology Chapter 5 will be the summary of this study and will draw some conclusions and suggestions from this research. Finally with chapter 6 with the references.

II. ECONOMIC GROWTH

First off would like to start off by explaining what economic growth is and how it affects a country. Economic growth is an increase in the production of economic goods and services, compared from one period of time to another. It can be measured in nominal or real (adjusted for inflation) terms. Traditionally, aggregate economic growth is measured in terms of gross national product (GNP) or gross domestic product (GDP), although alternative metrics are sometimes used. In simple terms, economic growth refers to an increase in aggregate production in an economy. Often, but not necessarily, aggregate gains in production correlate with increased average marginal productivity. That leads to an increase in incomes, inspiring consumers to open up their wallets and buy more, which means a higher material quality of life or standard of living.

Zambia is a large, landlocked, resource-rich country with sparsely populated land in the center of Southern Africa. It shares its border with eight countries (Angola, Botswana, Democratic Republic of Congo, Malawi, Mozambique, Namibia, Tanzania, and Zimbabwe) that serve as an expanded market for its goods.

A. Economic Performance

After 15 years of significant socio-economic progress and achieving middle income status in 2011, Zambia's economic performance has stalled in recent years. Between 2000 and 2014, the annual real gross domestic product (GDP) growth rate averaged 6.8%. The gross domestic product (GDP) growth rate slowed to 3.1% per annum between 2015 and 2019, mainly attributed to falling copper prices and declines in agricultural output and hydro-electric power generation due to insufficient rains, and insufficient policy adjustment to these exogenous shocks.

The COVID-19 (coronavirus) pandemic pushed into contraction an economy that was already weakened by recent persistent droughts, falling copper prices and unsustainable fiscal policies. Economic activity through Q3 of 2020 contracted by 1.7%, as declines in industry and services outweighed growth in agriculture. Mining and services suffered from lower global demand and social distancing measures earlier in the year, respectively.

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However, relaxation of the lockdown measures in the second half and a global pickup of copper prices helped activity to recover. Overall, the economy is estimated to have contracted by 1.2% in 2020 the first recession for Zambia since 1998.

A gradual recovery is expected, with GDP growth projected at 1.8% in 2021, and will average 2.8% over 2021-23. Higher copper prices, the commissioning of a new hydropower station and a return to normal rainfall patterns are expected to support growth in agriculture and electricity production, key contributors to Zambia's industry and service sectors. However, the impact of COVID-19 will continue to dampen activity, especially in tourism and retail and wholesale trade. The risks to this outlook are balanced. Rainfall variability remains a key structural risk to Zambia's sustainable growth, affecting key sectors like agriculture and electricity, and highlights the need to incorporate climate-smart solutions in Zambia's long-term growth strategy.

B. Copper

To determine the extent to which Zambia will be able to benefit from increasing the growth and competitiveness of its mining industry, it is necessary to take stock of the global prospects for copper. For a century now, copper mining has featured prominently in the life of the Zambian polity and economy, and this unit takes stock of the copper mining industry's recent contribution to Zambia and what more could it offer.

Zambia before the economic recession was considered one of the best investment destinations on the continent. Its first euro bond was oversubscribed, drawing orders of almost USD$12 billion, even though it was offering lower interest rates than some developed world bonds. Zambia became the second largest producer of copper, second to the Democratic Republic of Congo. This came at the back of increased copper productivity as a result of massive investments from mining giant companies which included Canadian mining companies Barrick Gold Corp. and First Quantum Minerals Ltd., both of which were among Zambia's biggest private employers. Swiss-based mining giant Glencore PLC was another major player in Zambia. Copper accounted for approximately three quarters of Zambia's export earnings and there seemed no end to the boom.

Growth momentum in Zambia remains fragile, a change from the rapid expansion witnessed in the past decade mainly as a result of fluctuation copper prices. Zambia's economy came under strain in 2015 and 2016 as external headwinds and domestic pressure intensified. Gross domestic product (GDP) grew at 2.8 percent in 2015 and 3.3 percent in 2016, much slower than the average 7.4 percent between 2004 and 2014. Mining in Zambia continues to play a critical role in the health of the economy and remains the dominant forex earner accounting for over 80 percent of exports. The role that mining plays can be classified in 5 main categories which include; Employment, Local infrastructure, Linkages to other sectors, Foreign exchange earnings and Government revenue.

C. Evolution of Copper

Zambia has relied on mining for its development ever since commercial copper mining started in 1928 (Lungu John, 2008). Despite the existence of other minerals, copper is likely to continue to play a major role as Zambia's major export for many years to come. During the colonial rule, (1924 -1953) and the period of the federation, 1953-1963, effective power over the economy resided outside Northern Rhodesia in the hands of international companies. Copper mines were the major source of revenue for the colony. They paid money to the local authority first colonial and later federal based on a combination of royalty and export taxes (Marcia Burdette 1984).

The revenue was vital to the state and tended to act as a point of leverage between the state and any local group wishing to start some counter veiling power against the mines (Ibid). No other economic activity in Northern Rhodesia even began to compare with the scale, capital intensity and profitability of the mines. Since independence, Zambia's mining tax regimes have been very closely correlated to international price and demand trends for metals. The 1960s and 1970s were decades of high metals demand, high international mineral prices and high production. The 1980s and 1990s were an era of decreasing metals demand from industrial countries, raw mineral oversupply, and lower prices. The current phase starting around 2002 was marked by a record boom in international mineral commodity prices, fuelled by metals demand in newly industrializing countries such as China and India. In January 2009, international commodity prices were again at levels seen in the early 2000s. The prices rebounded from late 2010 to 2014 recording the highest copper prices on the London Metal Exchange (LME) before getting back into a slump period currently being experienced.

D. Economic Contribution of Copper

It is undeniable that mining in Zambia continues to play a critical role in the health of the economy and remains the dominant forex earner accounting for over threequarters of exports. The role that mining plays can be classified into 5 main categories which include: Employment, Local infrastructure, Linkages to other sectors, Foreign exchange earnings and Government revenue.

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Employment contribution of the mining sector tends to dominate public policy debate mainly because it is the one benefit that affects people most directly. It has however been observed that mining employment contribution is less significant compared to the industry. Mining was traditionally a relatively labor intensive industry, modern mining is capital intensive. The anticipated expansion in copper production is unlikely to benefit many Zambians through additional employment.

Linkages to other sectors are important in the role that mining plays. In Zambia for example, most of the industries on the Copperbelt Province were setup to provide inputs to the mines. The mining industry links with other sectors in the economy by buying an array of these inputs. This boosts aggregate demand and so increases economic growth. There are also secondary effects as mining demand increases employment in other industries. However, mining is also considered in Zambia as not well integrated into the local economy. This is because the characteristics of modern mining mitigate the development of many linkages with developing host economies. For example, most mining machinery is too sophisticated to be produced in the local economy and has to be imported and in many instances directly by the mining firms thereby eliminating the local industry in the supply chain.

Perhaps the most important role of mining in Zambia is its forex earnings. As earlier alluded to, mining accounts for over three-quarters of export earnings. The country needs foreign exchange to pay for its imports and to service its foreign debt. Because mining dominates Zambia's exports, it is the main provider of foreign exchange for the economy. But because the mining sector imports many of its inputs, it is also a significant user of foreign exchange. Along with the repatriation of profits by mining firms, this reduces the net contribution to foreign exchange earnings.

Zambia has also recorded one of largest greenfield investments in the mining sector. New "green field" mines are usually responsible for constructing social infrastructure such as housing, schools, clinics, roads and water supplies and for providing social services for their employees and their families. Much of the social infrastructure in the Copperbelt was originally provided by the mines. Further to this, there has been accelerated infrastructure development in North-western province, specifically in Mufumbwe and Solwezi with the setting up of the Lumwana Mines by First Quantum Minerals (FQM).

Lastly and definitely the most important role of mining one would argue is revenue contribution to government treasury. While the above benefits are all significant, it is increasingly recognized that the most important potential benefit of mining is the contribution the sector makes to government revenue. Between independence and the start of state control of the mines in 1972, a large proportion of government revenue was derived from mining tax. Much of Zambia's public infrastructure was built during this period, largely financed by mining. This source of public revenue dried up owing to falling copper prices and nationalization, forcing substantial cutbacks in public expenditure. Now the mines are once again (mainly) privately owned, it is important that government secures a fair share of the industry's revenues and uses them for the benefit of all Zambians.

With the above, it is clear that copper plays a critical role in Zambia's economy and any price fluctuations are most surely going to impact on the growth of the economy. Reflecting on current trends, economic growth slowed down to 3.2 percent in 2015, which was attributed to the sharp depreciation of the exchange rate that raised the cost of imports and weak copper prices that impacted negatively on mining production (Bank of Zambia, 2015). Copper dominates the external trade of Zambia, and the nominal exchange rate has little short term impact on metal production or export. Zambia does not export copper because of comparative advantage. In the case of Zambia, copper exports result from a specific natural endowment.

E. Manufacturing Industry

Many of the country's large copper-mining and -processing operations are located in Copperbelt Province in north-central Zambia. The Government retains minority interest in most of the large copper projects through its holding company, Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM-IH). The mining sector is administered by the Geological Survey Department, the Mines Development Department, and the Mines Safety Department of the Ministry of Mines and Minerals Development. The Ministry of Commerce, Trade and Industry oversees the industrial manufacturing sector. Much of the mineral industry's electrical power was distributed by Copperbelt Energy Corporation Plc (CEC), which was owned by the Zambian Energy Corporation Ltd. of Ireland (52% equity) and ZCCM I-IH (20%). CEC purchased the majority of its power from ZESCO Ltd., which was a Government parasternal company. ZESCO's 2,337 megawatts (MW) of generating capacity was powered dominantly by hydroelectric facilities and several small isolated diesel-fueled power stations.

In 2015, shortfalls in electricity supplies resulted from decreased hydroelectric generation owing to lower rainfalls and reservoir levels. In July 2015, ZESCO requested that the mining sector reduce demand load by 30% from September to December. The CEC imported 30% of its supply from the South African Power Pool to make up for the domestic supply deficit. The Energy Regulation Board of Zambia reported that the mining sector's consumption of electricity increased by 6.4% to 6,245.6 gigawatthours (GWh) in 2015 from 5,871.3 GWh in 2014.

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Maamba Collieries Limited (MCL), a subsidiary of Nava Bharat Ventures Ltd. (65%) of Singapore and ZCCM-IH (35%), completed construction of a 300-MW coal power plant, which was expected to be commissioned in August 2016. By yearend 2015, the first phase of the 120-MW Itezhi-Tezhi hydropower project had been commissioned, and the second phase was expected to be commissioned in 2016. The Government and ZESCO continued planned to develop the 750-MW Kafue Gorge Lower Hydropower project; in 2015, the engineering, procurement, and construction contract was obtained. The Solwezi fuel storage depots were completed by yearend. The Mongu fuel storage depot was expected to be completed in 2016.

F. Minerals in the National Economy

In 2016, Zambia's real gross domestic product (GDP) was $12.6 billion, which was an increase of 3.4% compared with that of 2015. The value of the mining and quarrying sector accounted for 10.5% of real GDP; the sector increased by 7% compared with an increase of 0.3% in 2015 owing to increases in beryl, emerald, and refined cobalt production. A large portion of Zambia's total exports in 2016 was composed of mineral commodities; copper accounted for 67.6% of total exports; gold, 2.9%; and cobalt, 1.7%. Zambia's total exports decreased by about 12%, largely reflected in the 17% decrease in copper. The mining sector is regulated by Act No. 11 of 2015 (the Mines and Mineral Development Act of 2015), which replaced Act No. 7 of 2008 (the Mines and Mineral Development Act of 2008). The Mines and Mineral Development Act of 2015 established guidelines for exploration licenses; large and small-scale mining licenses; import and export permits; mining rights; safety, health, and environmental protections; and mineral-trading permits. In June 2016, the 2015 act was amended by Act No. 14 of 2016 [the Mines and Mineral Development (Amendment) Act of 2016], which redefined the mineral royalty rates to 5% for all base metals (except copper), mineral fuels, and industrial minerals, and to 6% for gemstones and precious metals. For copper, the law establishes a royalty rate of 4% when the copper price (in dollars per metric ton) is below $4,500, 5% when the price is between $4,500 and $6,000, and 6% when the price is above $6,000. Investment in most types of mineral operations are covered by the Zambia Development Agency Act of 2006, although minerals produced for the construction industry, such as clay, sand, and most types of stone, are excluded. Petroleum exploration and production are regulated by Act No. 10 of 2008 [the Petroleum (Exploration and Production) Act of 2008] (Government of Zambia, 2016; International Comparative Legal Guides, 2017).

G. Agriculture

In the years 2017 and 2018, the economy's real GDP growth was at 3.40% and 3.79%, respectively. The economy continued with its reliance on copper, while production only increased by less than 4% in the year 2018. The economy has experienced huge fiscal deficits due to its debt servicing. This resulted from an escalation in capital investments by the state, leading to a rise in the debt GDP ratio from 25% to 61% between 2012 and 2016. According to the World Bank in 2015, the percentage of the population living below the poverty threshold exceeded 57.5%. Some other macroeconomic indicators, such as GDP per capita, unemployment, and the inflation rate from the years 2015 to 2018, are indicated in the table below:

Macroeconomic Indicators

	2015	2016	2017	2018
GDP per capita(USD)	1641.005	1652.284	1658.823	1672.342
Unemployment (%)	7.45	7.37	7.21	7.21
Inflation (CPI)	10.11	17.87	6.58	7.49

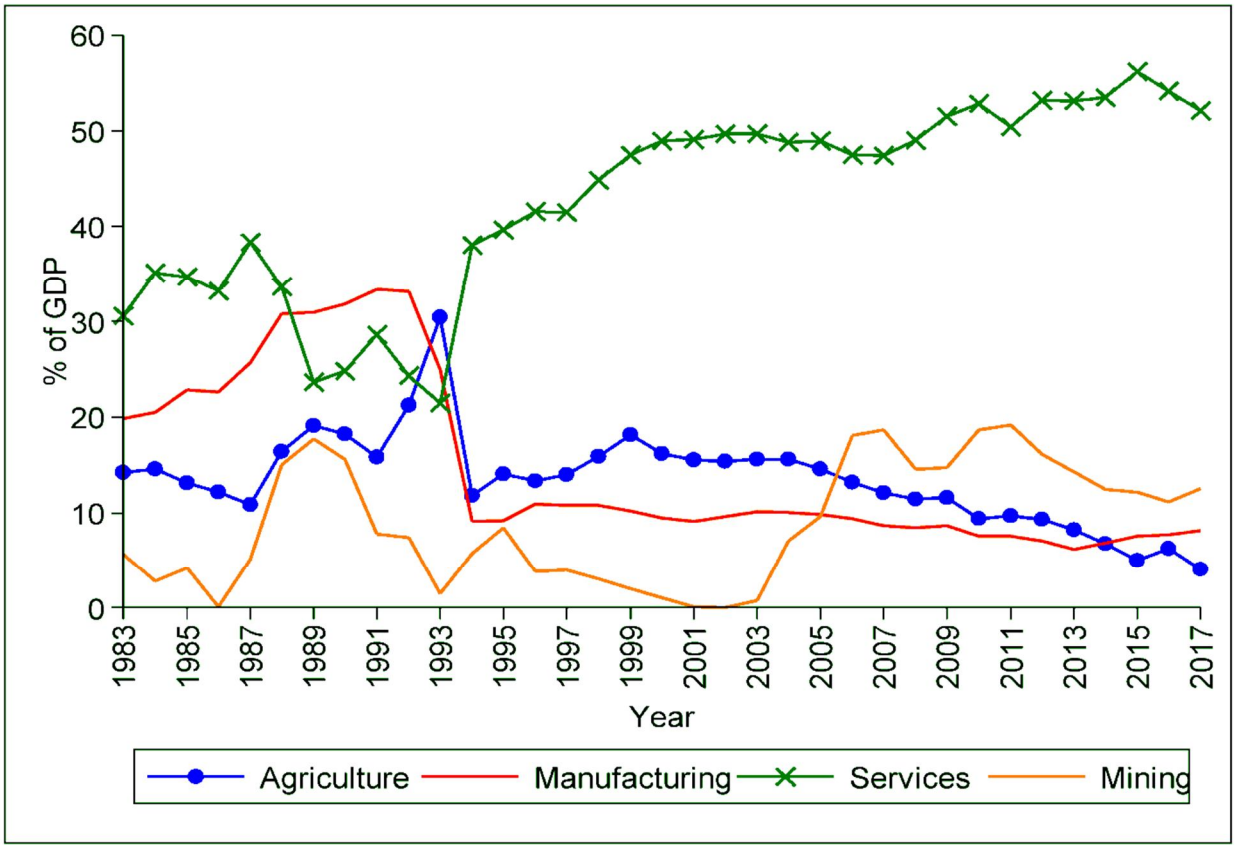
Source: World Bank

The average unemployment rate for the period 2015 to 2018 was approximately 7.31%. The inflation rates for the years 2015, 2016, 2017, and 2018 were 10.11%, 17.87%, 6.58%, and 7.49%, respectively. The highest value in CPI for the year 2016 was attributed to a depreciated currency, increased electricity tariffs, and lower supply of food commodities. In the years 2015, 2016, 2017, and 2018, the per capita GDPs were US$ 1641.005, 1652.282, 1658.823, and 1672.345, respectively.

Each stage of development has various sectors contributing differently to the national income. A 2016 World Bank and Organization of Economic Corporation and Development (OECD) report on agriculture prospects and challenges, reviewed in 2016, suggested that agriculture accounted for more than one-fifth of most SSA economies, such Zambia, Nigeria, DR Congo, Ghana, Mozambique, Uganda, Sudan, Malawi, Kenya, Tanzania, Mali, Ethiopia, and Chad [25]. In Zambia, agriculture's contribution to GDP was supported by other sectors, namely manufacturing, services, and mining.

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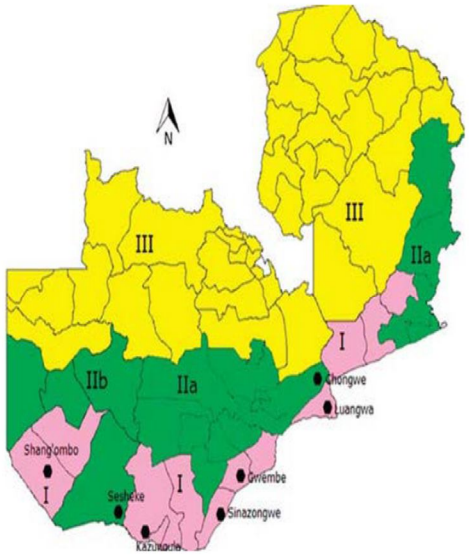
The figure below reviews the contributions to GDP by these sectors for the period 1983 to 2017.



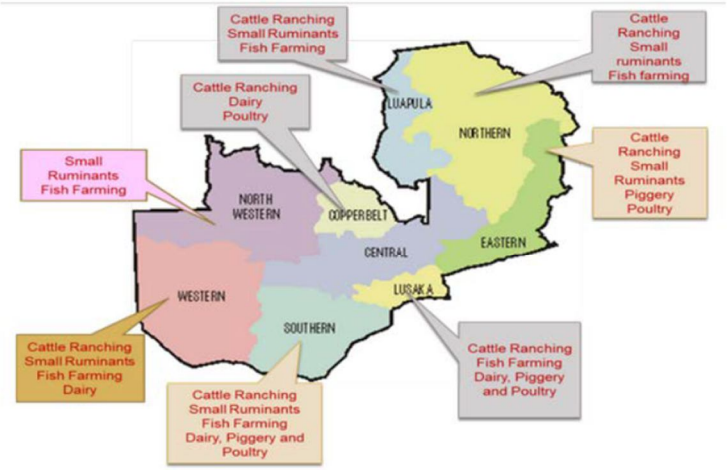
As indicated in the figure above, services were the highest contributor to GDP with its contribution averaging around 40% over the prescribed period. Agriculture played a fundamental role just behind, ranging between 15% and 25% over the period of review. Manufacturing started off well, but later had a sharp decline in the early 1990s and since then has had the lowest and least significant contribution to GDP. Mining's contribution to economic output has been fluctuating up and down, with its inconsistency being due to unstable global copper prices. This has created concerns over its prolonged role in economic growth with sustainable development in view and the knowledge that copper is a non-renewable resource.

Zambia has an estimated land area of 75 million hectares (752,000 km). Nearly two-thirds of that area is made up of medium to high potential land for agriculture production, with annual rainfall ranging between 800 to 1400 mm. This makes it a suitable habitat for a variety of crops, including fish and livestock. Despite the abundance of pastoral and arable land, over two-thirds of it is underutilized. The country has three regions—regions 1, 2, and 3—which cover the country's ten Provinces: Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, Muchinga, North-Western, Southern, and Western. Region 1 covers 12% of the total land area and has the lowest rainfall, with less than 800 mm annually. Region 1 mainly lies in parts of Southern, Eastern, and Western provinces. The suitable crops grown there are cotton, sesame, sorghum, groundnuts, beans, sweet potatoes, cassava, and millet, and the region has vast potential for irrigation. Region 2 receives between 800 and 1000 mm annual rainfall. It covers 42% of the country's total land area and is subdivided into two regions (2a and 2b). Region 2a extends to Central, Lusaka, and parts of the Eastern Provinces. Crops grown in this region include maize, cotton, tobacco, sunflower, soybeans, irrigated wheat, and groundnuts. This area is also ideal for flowers, paprika, and vegetable production, with its sub-region also suitable for beef, dairy, and poultry production. Region 2b covers parts of the Western province and has sandy soils. The region is ideal for cashew nuts, rice, cassava, millet, and vegetables, with its sub-region deemed suitable for beef, dairy, and poultry production. Region 3, which consists of the Copperbelt, Luapula, Northern, Muchinga, and North-Western provinces, constitutes 46% of the total land area and receives an annual rainfall of between 1000 and 1500 mm. It mainly constitutes highly-leached acid soils and has potential for growing millet, sorghum, groundnuts, coffee, sugarcane, rice, and pineapples. The map in Figure below shows the geographical, rainfall, and regional dimensions of Zambia.

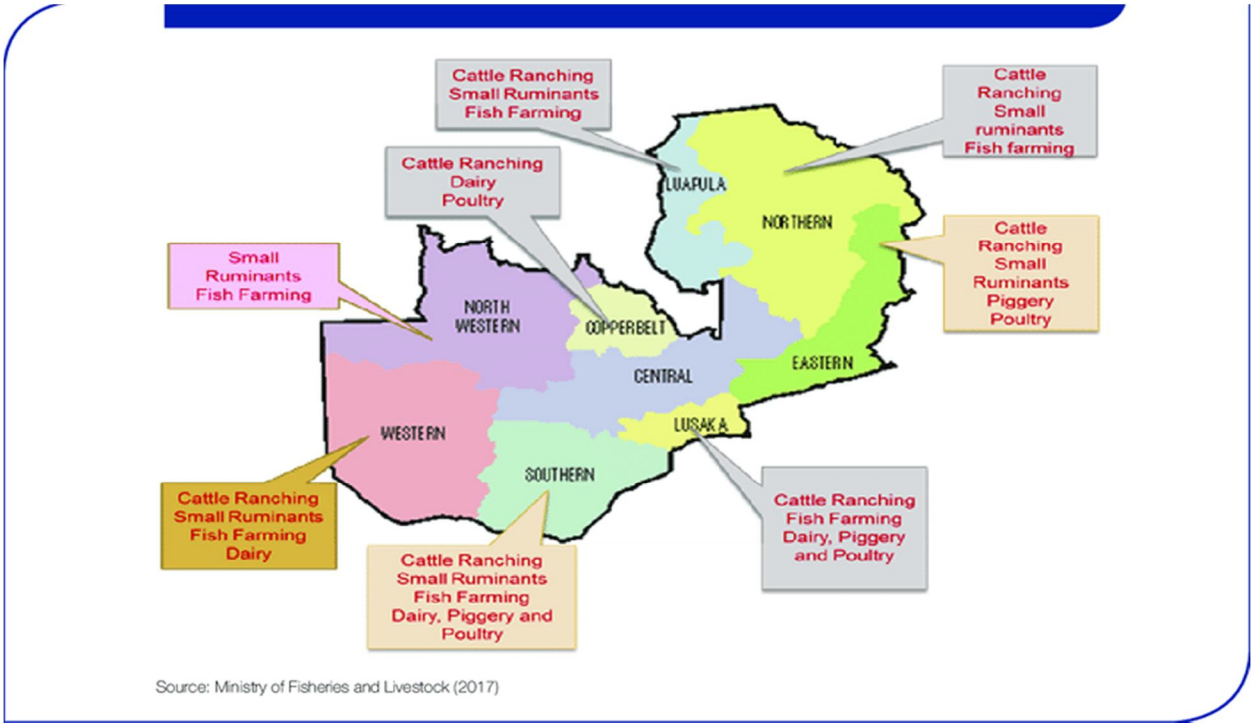
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(**A**) Regional Rainfall Demographics



(**B**) Farming Activity [26]



H. Government Agriculture Development and Policies

As far as government priorities are concerned, at least 60% of public spending towards agriculture is spent on maize, which is cultivated by 98% of smallholder households, which occupy over 54% of agricultural land. According to the National Agriculture Policy Draft, NAP under the Ministry of Agriculture, livestock contributes 7% to GDP, with 42% and 21% deemed suitable for landmass living and rangeland grazing, respectively. Fisheries also contributed 70,000 metric tons, which constituted 3.2% of annual GDP. Zambeef Product Ltd., which is publicly listed on the Lusaka Stock Exchange (LUSE) and London Stock Exchange Alternative Investment Market (AIM), is a leading player in Zambian agribusiness. It also exports agri-products, generating over US$ 300 million in revenue across the region. In 2010, over 3,042,000 people, which constituted 65% of the labor force, were directly or indirectly employed by the agricultural sector. Zambia is landlocked with eight neighboring countries and has vast endowment in terms of rivers, lakes, and underground water, which represent over 40% of Southern and Central Africa's water bodies, most of which are fresh.

The NAP was instituted on behalf of the Government of the Republic of Zambia. This Policy provides policy guidelines for the development of the agricultural sector. This policy is a product of extensive consultations between the Ministry of Agriculture and Livestock (MAL) and other stakeholders in the agricultural sector. It encompasses key facets of the agricultural sector, namely, support to agricultural research and extension services, sustainable resource use, the promotion of irrigation, food, and cash crop production, agro-processing, agricultural marketing and trade, livestock, and fisheries' development. The institutional and legislative framework, support to co-operatives and other farmer organizations, and crosscutting issues, such as gender mainstreaming, HIV and AIDS, and the mitigation of climate change, are also addressed by the policy. This was part of the government's previous fifth, sixth, and now the seventh national development plans. The incumbent national agricultural policy runs concurrently in support of the current seventh national development plan, which runs from 2016 to 2021. Over the years, the government has supported the proliferation of agriculture through the Food Reserve Agency (FRA), which was established in 1995. The FRA offers support to domestic farmers in the form of availing credit facilities, providing farmers with relevant farming information and market access through the buying of farm products, such as maize. This is ordered to ensure national food security, considering that the state is the custodian of the welfare of its citizens. Providing the farmers with a market for their business gives them a source of income.

I. Zambia and the African Development Bank Group (AFDB)

Since it commenced operations in Zambia in 1971, the Bank has committed more than USD 1 billion to public sector infrastructure projects in agriculture, industry, water and sanitation, energy, social sector (education and health), transport and multi-sector (primarily general budget support). The predominant financing modalities are project loans/grants. Additional support valued at approximately USD 150 million have been allocated to the country's private sector. Zambia also benefited from debt relief valued at USD 452 million under the HIPC and the Multilateral Debt Initiatives.

At the end of December 2015, the portfolio consisted of 19 ongoing and approved operations (16 national and 3 multinational projects) with a total value of UA 633 million (USD 886 million) compared to UA 230 million (USD 322 million) in 2011. The portfolio is distributed across six sectors namely transport (47%), agriculture (14%), energy (14%), water supply and sanitation (8%), social (7%), finance (6%) and environment (4%). More than half of the resources come from the ADB lending window while about 33% of the project value is from ADF resources. 16% comes from NTF and other resources such as the Africa Working Together Fund and other trust funds.

The Bank also supports a non-lending program that has resulted in Economic and Sector Work (ESWs) on issues ranging from analysis of value addition, job creation and competitiveness in the mining, tourism, and cattle sectors. Recent non-lending activities include the Zambia Manufacturing Study and the Zambia Private Sector Profile. A study on Domestic Resource Mobilization was completed but is currently awaiting the preparation of a Policy Brief. The Development Effectiveness Review for Zambia was published in 2014 outlining key achievements during the past decade. Looking ahead a transport master plan (currently ongoing), cost of service study on electrification (re-tender), an analysis of the prospects for developing farm blocks and a study on trade (DRC-Zambia) are planned.

In January 2011, the government launched the Sixth National Development Plan (SNDP) which covered the period 2011–2015. The new government that took over at the end of 2011 introduced the revised Sixth National Development Plan 2013-2016 for the remainder of their term. The revised Plan sets out four overarching objectives for the development of the country: promote employment and job creation through targeted and strategic investments in selected sectors; promote rural development by supporting agriculture, rural enterprises and rural infrastructure; enhance human development by investing in social sectors; and accelerate infrastructure development to enhance the growth potential of the economy. The plan also sets out strategic growth sectors in agriculture, manufacturing, energy, construction, tourism and mining. Agriculture is the major employer in the country, while reliable and efficient infrastructure is vital to economic and social development that promotes inclusive growth.

Zambia's 2011-2015 Country Strategy expired in December 2015. The main support pillars were: Pillar 1 - diversification through infrastructure development and Pillar 2 - economic and financial governance. A CSP Completion Report currently under internal review would be published in April 2016. The 2016-2020 CSP will be prepared during the course of the second and third quarter of 2016. Based on our analysis the new Strategy is expected to have a stronger focus on private sector development given its importance for creating jobs for hundreds of thousands of Zambians while improving their well-being and quality of life. Infrastructure rehabilitation and expansion is likely to continue as the other pillar as it is vital to economic and social development. Furthermore, large gaps in infrastructure development will remain. The Strategy's overall objectives are to make growth more inclusive while building a robust and sustainable (greener) basis for long term growth. The Strategy is designed to assist Zambia sustain economic growth while diversifying the economy and strengthening country competitiveness.

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The Bank's 2011-2015 Country Strategy for Zambia spanned through two ADF cycles – ADF-12 and 13. Under ADF-12, the performance-based allocation (PBA) for the three years was slightly over UA 101 million (USD 141 million). Zambia was reclassified as a blend country in 2014 which gave it access to considerable ADB resources. The Government initially opted for a quick transition to ADB-only, but due to the economic headwinds has informed the Bank that the transition will take longer. The reclassification has reduced the ADF-13 allocation for Zambia to UA 21 million (USD 29 million).

III. LITERATURE REVIEW

At independence in 1964, Zambia started as a prosperous country but subsequently declined to a low-income country for a long time before graduating to low-middle-income status. To achieve high-income status, a country has to undergo various economic development stages. There are three stages of economic growth in literature: structural transition, the transformation of the economy, and urbanization. Rostow (1960) proposed a five-stage economic development process, including traditional society, transitional stage, take off, and drive to maturity and high mass consumption. By reviewing the country's growth trends and context, this article aims to identify the factors that may predispose Zambia to the Middle Income Trap (MIT).

A. Theoretical Analysis

Gross Domestic Product (GDP) per capita is an essential factor when ascertaining a country's economic growth in relation to its population. The World Bank uses GDP per capita income thresholds to classify countries in three income levels: Low, Middle and High Income Countries. Understanding the factors that may affect a country's GDP per capita income level could provide a pathway to escaping the Middle Income-Trap (MIT). Although there is no universal definition of the MIT, it is generally agreed that countries tend to experience slow growth when they reach middle-income level as they transition from resource-driven growth to growth based on economic efficiency.

To the contrary, the convergence hypothesis predicts that Least Developed Countries (LDCs) per capita income would grow faster than developed nations due to higher returns on capital and benefits from using imported technology and skills. While the economic theory does not provide precise predictions about the convergence or divergence path, it does detail a set of factors that could determine whether a specific country will take a convergence or divergence path.

A critical condition for convergence is the existence of decreasing returns to scale in capital markets. According to Fuente (2002), output grows less than proportionally with the capital stock. As a result, this factor's marginal productivity decreases with its accumulation and reduces both willingness to save and the overall economic growth. The second factor to consider about the convergence or divergence of Income per capita or productivity is technological progress. Thus, countries' long-term growth rate will not be the same if they differ in their intensity to develop or adopt new technologies. The following section provides a detailed theoretical and conceptual analysis of growth theories and the MIT. The conceptual framework presents a foundation on the determinants of GDP per capita.

B. Theoretical and Conceptual Framework

Many studies use GDP per capita when analyzing economic growth. GDP per capita is the major variable used to determine whether a country is in the Middle-Income Trap (MIT). Eichengreen (2011) and Eichengreen et al. (2013), defined the MIT in absolute terms. According to them, a country experiences a growth slowdown when: (1) the average annual GDP per capita growth rate is 3.5% or above; (2) when growth rate is lower by 2 percent; and (3) when per capita income is greater than $10,000.

Changes in the GDP per capita growth rate of countries can be explained by the economic growth models mainly based on the neoclassical exogenous model by Robert Solow (1956). According to the model, GDP per capita growth rate is higher when countries first accumulate capital. A fundamental assumption in this model is the diminishing marginal product to capital. According to the model, the more capital is accumulated, the less additional output is produced. Thus, developing countries' per capita income is expected to grow faster than developed countries, leading to per capita income convergence. The model highlights that income convergence is due to better chances for growth available to developing countries such as technology from developed countries and higher capital returns.

C. The Structural Transformation of the Economy

Structural change models are systems by which underdeveloped nations transform their local economy from a heavy emphasis on traditional sectors, i.e. agriculture to more industrial and service-led growth. As a country's economy grows, the agriculture share of GDP is surpassed by the secondary sectors.

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The model implies that the agriculture sector's growth is the key to the overall development of the country. The Lewis two-sector surplus model is an example of the structural-change approach. The model postulates that the agriculture sector fuels rapid industrial growth by utilizing its cheap produce and labor. In this approach, Lewis emphasized the role of agriculture as a labor source for other industries.

Justin Lin et al (2018) analyzed the interactions between production led growth and service-led growth. They point out that that production led growth is mainly fuelled by the agriculture sector in developing countries. The study concluded that production led growth is asymmetric at different levels of a country economic development. Justin Lin et al (2018), recommended that to escape the MIT, government intervention is required to prevent premature de-industrialization and sustain the early development process.

Economic development requires the re-allocation of production factors from low productivity growth in the primary sectors to a more commercial industrial driven development based on high productivity and returns. According to Lewis, labor and savings have to be retrieved from agriculture to meet capital investments required by the industrial sector. This is why agricultural and industrial development always moved hand in hand.

While agriculture is important in the initial development stages of a country, recent studies have highlighted the several challenges limiting the full exploitation of agriculture by developing countries. According to Namalguebzanga C.K (2016), although agriculture produce can be used to develop manufacturing in Africa, several obstacles exist. Many African countries have limited practical and vocational skills, low exchange rate management, inadequate infrastructures, and technologies to stimulate agriculture development.

D. Lewis Model of Development

According to the Lewis model of economic development, a country's economy consists of two sectors, namely; agricultural and rural subsistence and industrial, urban, and capitalist sectors. The subsistence sector has a large population relative to products such that the marginal productivity of labour is close to zero. As such, there is 'disguised unemployment'. This can also be a potential reservoir of labour supply to the capitalist sector. When labour supply exceeds that of demand, the labour market becomes favourable for capitalists who can keep the wages constant. The Lewis model assumes that labour is unlimited and that the capitalists will have a constant supply of labour at the same wage. The utilization of excess labour occurs through urbanization as farm workers move to cities in search of work. The incorporation of surplus labour is one way of transforming a country's production mode from labour-intensive to capital intensive.

For the capitalist sector, labour is utilized to where the marginal product is equal to the wage not to reduce the capitalist surplus. As a result labour supply exceeds demand and the wage remains constant, leading to profit maximization. Gang Gong (2016) refers to the two stages as 1), digesting surplus labour and 2) the catching-up technology process. He argues that a country would grow rapidly to attain middle-income status during the digesting surplus-labour stage and transform its production from labour-intensive to capital-intensive. The inability of a successfully transition from labour intensive to capital intensive mode of production is the reason for the MIT. According to Gang Gong (2016), a country can only escape the MIT if the production mode successfully transforms from capital-intensive to a knowledge-intensive.

E. Middle-Income Trap and Economic Growth Theory

It’s clear that a developing country undergoes two main economic development stages. The MIT is caused by a failure to transition from the first economic stage to the second. When surplus labour is exhausted in the second stage, technological progress or increase in total factor productivity is the only factor that can drive economic growth. Thus, the rate of economic growth would decrease as the economy enters the second stage. Further, technological advancement is also transformed and the improvements in total factor productivity are slower in the second stage. During the second stage, a country is expected to innovate and develop new technologies and not merely import it. The development level difference means that a developing economy can simply import and imitate technologies from developed economies in the first stage were technological progress does not depend on local research efforts. During this stage, technological progress depends on a country's ability to innovate, this is the reason why technological progress is complex in middle-income countries. This is the main reason for the MIT.

The MIT can also be caused by a country's inability to get benefits from the subsistence sector and excessive labour utilization. In this case, an investigation into the factors affecting GDP per capita in relation to a country's development level would help define ways of avoiding the growth to slow down and the MIT. As highlighted in the structural change model, most developing countries in sub-Saharan Africa are still in the transitional stage were agriculture is key to their economic development. Excess labour and savings have to be retrieved from the agriculture sector in order to fuel industrial development.

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Several authors have found strong evidence indicating that Agriculture is a vital engine for economic growth in developing countries: Titus O. Awokuse, (2008), Joseph Phiri, et al. (2020). In line with the stages of growth theory, agriculture plays a vital role in developing countries' initial development process. It is the primary source of income for the rural population and a precondition for the growth of the secondary sectors such as industry and services. Cenap Ilter (2017) identified four variables affecting GDP per capita in 40 countries: population, GDP, transparency, and compulsory education.

Other studies indicate that agriculture and manufacturing have a strong influence on GDP per capita growth rates (Manak Singariya et al. (2015). Manak argues that the shocks from the agriculture sector spill over to GDP per capita and manufacturing. According to Dan Su and Yang Yao (2018), a decline in the manufacturing sector negatively affects an economy's service sector. They note that manufacturing provides an incentive for savings and can also accelerate the rate of technological progress.

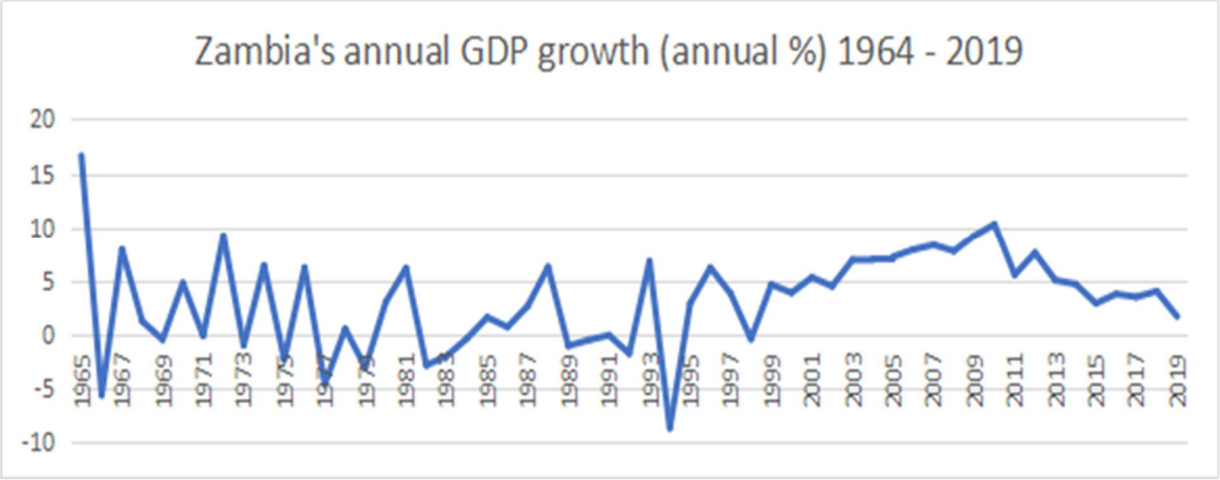
Qunhui Huang et al. (2017) investigated the experience of high-income Asian economies focusing on the size and productivity of manufacturing, during when they were in and out of the middle-income level. They found that (1) manufacturing share of GDP of the selected economies, keeps on increasing as per capita income grows, (2) despite the relative size. The drastic improvement in the productivity of manufacturing by industrial restructuring is prominent.

F. Overview of Zambia's Annual GDP Growth Rate

In order to establish the country's economic development stage, It was put into account to review Zambia's economic performance for the period 1960-2019. Understanding the stage of economic development is the key to assessing the country's vulnerability to MIT. While Rostow (1960), proposes five stages of economic development, many development economists still maintain that there are three main stages including a) a structural transformation of the economy, b) a demographic transition, and c) a process of urbanization.

This study is mainly focused on the structural economic transformation. According to Gunter (2011), structural transformation relates to the change in a country's GDP structure. In the initial stages of a country's development, major economic activities and jobs are fueled by the agriculture sector. However, as the economy grows, agriculture's share of GDP decreases and economic activities and jobs shift toward the secondary sectors, i.e. services and manufacturing.

The Gross Domestic Product (GDP) in Zambia reduced -2.33% in 2019 in 2018. The GDP annual growth rate in Zambia averaged 2.97% from 1961 until 2019, reaching an all-time high of 16.65% in 1965 and a record low of -8.63% in 1994.



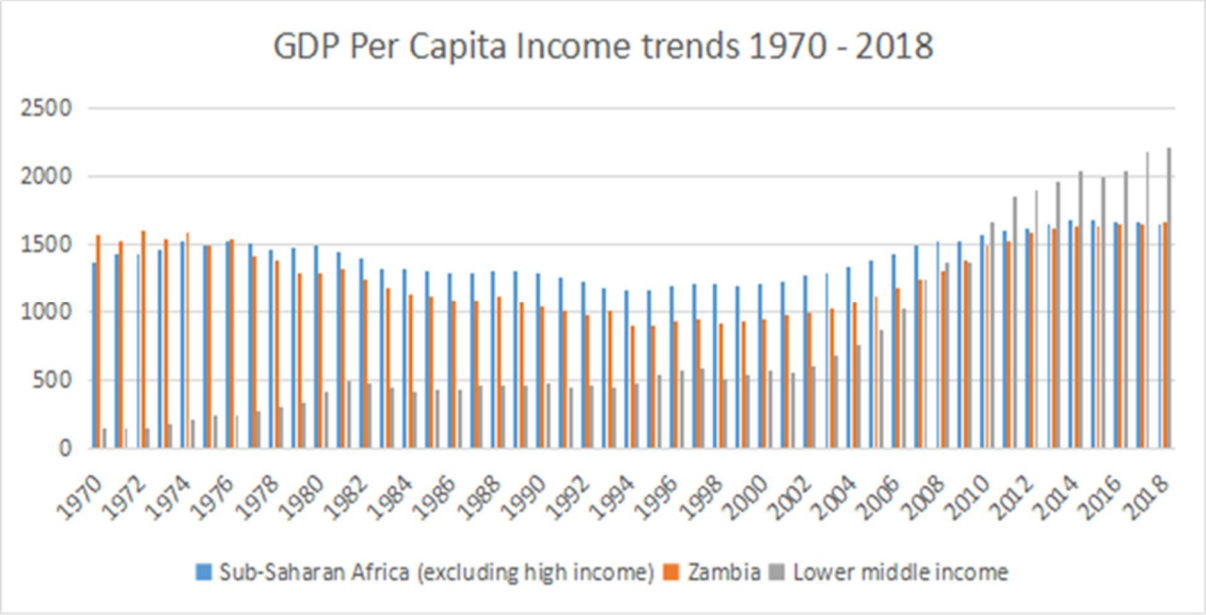
As shown in the figure above, Zambia has recorded an exceptional and exciting case beginning at independence in 1964 as a MIC (16.5% annual GDP growth rate in 1965) and subsequently declined to a low-income country for a long time before graduating to low-middle-income status. Typical of most developing countries, Zambia's economic growth was mainly input driven from the exploitation of physical and human capital resources.

In 1964, 47% of Zambia's GDP was generated by mining, while agriculture (commercial and subsistence) accounted for only 11.5% and manufacturing for 6%. Therefore, although the economy benefited from mining, it is clear that the other economic sectors were still really underdeveloped. Without economic diversification, the gains from mining alone would not lead to a sustainable economic growth.

It also shows that the Country's GDP growth rate has remained consistent (3% average) with the lowest growth experienced in the late 1970s and mid-1990s. While the new government opted for a free market economy just after independence, it broke from its market-driven policies and opted for state control in the early 1970s. Instead of adopting structural transformation and economic diversification, the Zambian government decided to adopt regulatory policies. During that period, economic growth remained unresponsive to the state intervention strategies until 1978 when the state acknowledged this approach's failure and the limited growth in the period 1977 – 1978. It was at this point that the government implemented Zambia's first Structural Adjustment Program (SAP).

Zambia recorded its lowest economic growth in the 1990s. This was mainly due to the failed economic policies of the UNIP government. At that time, the MMD took over an unstable and contracting economy coupled with high poverty levels and inequality as well as a failing copper dominated export sector and a huge external debt. With government change, the MMD implemented the fourth SAP and focused on; macroeconomic stabilization, agricultural reforms, privatization of state assets and external liberalization.

Although these reforms hoped to stimulate growth and diversify the economy, GDP growth remained stagnant at 0.2% throughout the 1990s. Despite the sustained economic growth in terms of GDP, there has been a marginal increase in GDP per capita income. The study has compared GDP per capita growth trends for Zambia to that of other countries. In particular, the average growth rates for Sub-Saharan Africa and the average for lower-middle-income countries in the world can be seen in the figure below.



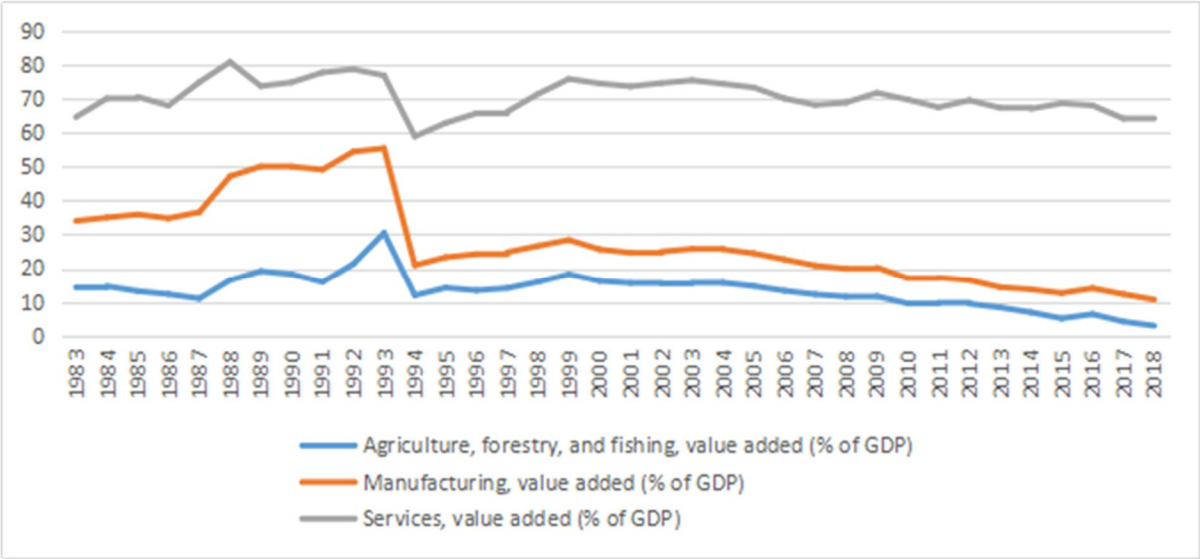
When the figure is analyzed, we can see that Zambia's GDP per capita growth rate was higher than the Sub-Saharan Africa average as well as that of lower-middle-income countries up until 1978. After this period, Zambia's GDP per capita dropped below the average in Sub-Saharan Africa until 2018.

Despite attaining middle-income states in 2010, Zambia's GDP per capita growth rate is below the average for lower-middle-income countries in the world. Analyzing the graph, economic growth regressed in Sub-Saharan Africa in the period 1980 to 2000 and is only observed to pick up from 2008 onwards. During this period, the annual GDP growth rate for Sub-Saharan Africa reduced to 2.1% compared to 4.8% during the period 1960-1980. The reduction in growth resulted from the external shocks of oil price increases, declining terms of trade, and increased interest rates.

G. Changes in Sector Contribution to GDP

Contrary to the economic growth theories, non-agriculture related revenue accounted for Zambia's GDP's large share in the country's initial development process. According to Rostow (1956), a country has to go through five development stages. These stages are namely,(1) Traditional Society,(2) Preconditions to take off, (3) Take off, (4) Drive to maturity and(5) Age of high mass consumptio n.

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In the period from 1983 to 2019, services and manufacturing sectors have maintained a larger percentage of Zambia's GDP. In terms of economic structure, it would imply that Zambia had already graduated from the Traditional Society and is now at Stage 2 (Preconditions for take-off). According to Rostow, at this stage, a country begins to develop manufacturing, and a more national/international, as opposed to regional, outlook. The stage is characterized by moderate per capita income growth, moderate structural change, increased share of non-agricultural labour and progressive infrastructure development. While services and industry seem to be on the right track, the regress in agriculture share to GDP is too fast, indicating an incomplete agricultural transformation.

A further drop in agriculture share to GDP has far-reaching implications on poverty reduction and income inequality. It is also clear from the graph above that a reduction in agriculture of GDP has a direct impact on the secondary sectors (manufacturing and services). Therefore, agriculture is the key to sustaining and increasing economic growth.

The MIT is caused by the changing role of factors that support growth in low-income countries that have reached middle-income status. More specifically, reliance on labour-intensive processes, imported technologies and foreign investment becomes less viable as growth pushes domestic prices and wages upward. It then becomes necessary to increase labor and capital productivity, facilitate rising total factor productivity, develop new technologies, and innovate. In Zambia, there is a need to boost productivity in the agriculture sector through improved technology and innovation.

IV. METHODOLOGY

We specify a model for assessing the variables that affect Zambia's GDP per capita income level. Thus, GDP per capita income, labor productivity, agriculture share to GDP, and manufacturing industry share to GDP were investigated. The model specification is inspired by a similar study conducted by Manak Singariya et al. (2015).

The study model will be:

$$PCI = a_0 + a_1 M + a_2 L + a_3 A + \mu_t$$

PCI represents per capita income level; M represents manufacturing share to GDP; L represents labor productivity; A represents agriculture's share to GDP; a represents a constant; μ_t represents the term of error. The Bayesian Hypothesis Test will be conducted with H_0: Economic growth is dependent on various sectors and H_a: Economic growth is dependent on copper.

To ensure the model is technically sound, we perform a series of tests as follows;

A. Stationarity tests

Typically, the first step in time series data modeling is to test for stationarity among the model variables. This is to ensure that the estimated relationships among the variables are not spurious. This study uses the Augmented Dicky Fuller (ADF) test, verified by Phillip Perron test.

B. Determine the Optimal lag length (k) for the model

Before testing for cointegration, we perform the optimal lag length selection test using all the criterion available in E-views 10 namely; Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Hannan-Quinn Information Criterion (HQ), adjusted R-squared and Final Prediction Error (FPE). In this study, the sequential modified LR test, Final prediction error and Hannan-Quinn information criterion will be used to determine the optimal lag selection.

C. Johnsen Cointegration test

Depending on the results of the cointegration test, we estimate either the VAR model or VECM. If the variables are integrated of order (1), we specify with (p) lags and estimate the VECM. If no cointegrations is found, we estimate the unrestricted VAR model.

D. Diagnostic tests

Depending on the cointegration test results, diagnostic tests will be conducted before the actual causality tests are done. The following tests will be done on the model

1) Autocorrelation test
2) Normality test
3) Stability test

E. Test for Causality

The final step of the methodology will be to test for causality. Having subjected the study model to a series of tests outlined in steps 1 – 4, we conduct the Ward coefficient restriction test while the pairwise granger causality test will be performed to establish the direction of causality.

National and global economic data was used from various sources including the Zambia Central Statistical Office (CSO), the World Bank and FAO. These were the main sources of quantitative data. The data dates range from 1970 to 2019 and include annual data for the variables on the model.

a) Findings

Table 1shows the descriptive statistics of all variables that were used to assess whether any causal relation exists GDP per capita, agriculture, manufacturing, and output per worker. The summary statistics show that only manufacturing as a share of GDP and Output per worker were not normally distributed because the probabilities associated with their respective Jarque-Bera test statistic of normality were less than 5%. The non-normality of these two variables does not affect the times series estimations but that of the model error term (Fox, 2015).

Table1.Variable Descriptive Statistics - Annual Data (1970- 2019)

	GDP PER CAPITA	AGRICULTURE OF GDP	MANUFACTURING OF GDP	OUTPUT PER WORKER
Mean	1226.9018	12.7046	12.7183	7014.7259
Median	1099.3054	13.2523	9.2928	6742.6945
Maximum	1678.1691	30.4787	33.3459	10299.1990
Minimum	906.5787	2.7435	6.0237	337.7323
Std. Dev.	290.1748	5.7194	8.5659	2767.7396
Skewness	0.4878	0.5550	1.6302	-0.9601
Kurtosis	1.5631	4.3908	3.9381	3.7654
Jarque-Bera	4.0219	4.2219	15.3464	5.6972
Probability	0.1339	0.1211	0.0005	0.0579
Observations	**32**	**32**	**32**	**32**

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- *Unit Root Test*

The results for the unit root tests for the four variables of interest in this study are presented in Table 2. These results are confirmed by the ADF and backed by Phillip Perron tests of stationarity.

Table2. Unit Root Tests

	ADF				P-P		
	Level	1st Diff.	Lag (SIC based)	Assumption	Level	1st Diff.	Bandwidth
GDP Per Capita	-2.49	-3.42**	4	C	0.16	-3.41**	3
Agriculture Of GDP	-1.82	-7.61***	0	C	-1.68	-10.31***	5
Manufacturing of GDP	-2.44	-4.08***	2	C&T	-1.53	-3.82***	10
Log of Output Per Worker	-2.71	-5.83***	0	C	-2.37	-5.85***	3

Notes: Assumption refers to the deterministic terms included where C = constant and T = linear trend.

The asterisks (*), (**) and (***) imply significance at 10%, 5% and 1% levels respectively. The results show that all variables only become stationary at first difference as evidenced by their respective ADF and PP statistics whose P-values are all less than 5%. Hence, the null hypothesis that there is a presence of a unit root in the variables is only rejected for each variable at first difference. That is there is sufficient evidence suggesting all variables are now stationary at first difference implying they are integrated of order 1 i.e. I (1). To ascertain whether to use the VECM or VAR, Johansen cointegration test was conducted to determine the number of cointegrating equations.

- *Optimal Lag Selection*

Before testing for cointegration, the optimal lag length selection test was done using all the criterion available in E-views10 namely; Akaike Information Critierion(AIC), Schwarz Information Criterion(SC), Hannan-Quinn Information(HQ), Adjusted R- squared and Final Prediction Error(FPE). In this study, the Sequential Modified LR test, Final Prediction Error and Hannan-Quinn Information Criterion were used to determine the optimal lag selection. The criterion shows that the optimal lag in this model is 2 as shown in Table 3.

Table3. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-303.1544	NA	18613.85	21.18306	21.37165	21.24212
1	-173.7570	214.1750	7.575789	13.36255	14.30551*	13.65787
2	-153.2995	28.21719*	5.979198*	13.05514	14.75247	13.58672*
3	-136.5271	18.50750	6.851556	13.00187*	15.45357	13.76971

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

- *Cointegration*

Having found that all the variables are integrated of order (1), we now carry out the Johansen cointegration test developed by Johansen (1988), below are results of the maximum eigenvalue test.

Table4. Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.521492	21.37539	27.58434	0.2542
At most 1	0.381463	13.93153	21.13162	0.3707
At most 2	0.167021	5.299674	14.26460	0.7036
At most 3	0.075839	2.287199	3.841466	0.1304

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Based on the maximum eigenvalue statistic, the above results show no cointegrating relationship among variables at a 5% level of significance. Thus, the null hypothesis is that no cointegrating relationship is rejected because the eigenvalue statistic is greater than the critical value at 5%. Thus, the appropriate model is the Vector autoregressive model (VAR).

- *Diagnostic Test Result*

The serial correlation test was conducted using the Breusch-Godfrey LM test as in the Table 5. Since the probability values both at lag 1 and 2 are greater than 5%, we cannot reject the null hypothesis of no serial correlation in the model. Thus, the model has no serial correlation.

Table5. Autocorrelation Test

VAR Residual Serial Correlation LM Tests

Null hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob*
1	18.26787	0.3084
2	16.47920	0.4200

- *Normality Test*

Table 6 presents normality tests of the estimated Vector autoregressive Model (VAR) which was carried to test the normality of the model. Before any formal interpretations and policy implications can be made, the normality test needs to be done to ensure the model is not mis-specified, and that parameters are stable, unbiased, and consistent.

Table6. Normality Test

Component	Jarque-Bera	df	Prob.
1	6.073299	2	0.0480
2	2.134447	2	0.3440
3	0.877689	2	0.6448
4	0.684210	2	0.7103
Joint	9.769646	8	0.2816

Based on the results presented in Table 6, the joint p-value of the joint Jarque-Bera statistic is greater than the 5%, so we have insufficient evidence to reject the null hypothesis that the residuals of the model are normally distributed. Hence, it can be concluded that the residuals are normally distributed.

- *Heteroskedasticity Test*

The results reveal that the joint P-value for Chi-square Statistic of the VAR Residual Heteroskedasticity Tests is greater than 0.05. Furthermore, all the p-values of the chi-square statistic for each individual component are greater than 5%.

Table7. Heteroskedasticity Test

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Joint test:		
Chi-sq	df	Prob.
172.4841	160	0.2365

Individual components:

Dependent	R-squared	F(16,13)	Prob.	Chi-sq(16)	Prob.
res1*res1	0.583832	1.139838	0.4111	17.51497	0.3531
res2*res2	0.707676	1.966950	0.1121	21.23028	0.1698
res3*res3	0.671335	1.659624	0.1810	20.14006	0.2140
res4*res4	0.652292	1.524233	0.2243	19.56877	0.2403
res2*res1	0.663901	1.604945	0.1973	19.91704	0.2240
res3*res1	0.587811	1.158682	0.3994	17.63432	0.3457
res3*res2	0.788480	3.028739	0.0249	23.65439	0.0973
res4*res1	0.604177	1.240186	0.3518	18.12531	0.3166
res4*res2	0.611618	1.279513	0.3307	18.34854	0.3039
res4*res3	0.571312	1.082817	0.4485	17.13935	0.3766

Therefore, we cannot reject the null hypothesis of no heteroscedasticity. Heteroscedasticity refers to data with unequal variability across a set of second, predictor variables. Data that shows heteroscedasticity gives biased coefficients.

- Tests for Causality

To determine whether GDP per Capita was sensitive to own past changes, past changes in relative manufacturing as a share of GDP, agriculture as share of GDP and output per worker, granger causality tests were conducted using the Ward coefficient restriction test. In assessing the direction of causality, the pairwise granger causality test was used. The Granger causality test results are presented in Table 8 below.

Table8. Causality Test

Pairwise Granger Causality Tests

Pairwise Granger Causality Tests

Null Hypothesis:	F-Statistic	Prob.	Type of direction
AGRICULTURE (%GDP) does not Granger Cause GDP PER_CAPITA	4.63880	0.0193	Bi
GDP PER CAPITA does not Granger Cause AGRICULTURE (%GDP)	7.84086	0.0023	
MANUFACTURING(%GDP) does not Granger Cause GDP_PER_CAPITA	3.33996	0.0518	
GDP PER CAPITA does not Granger Cause MANUFACTURING(%GDP)	6.04798	0.0072	Bi
OUTPUT PER WORKER does not Granger Cause GDP PER CAPITA	1.03713	0.3692	
GDP PER CAPITA does not Granger Cause OUTPUT PER WORKER	1.72050	0.1995	
MANUFACTURING(%GDP) does not Granger Cause AGRICULTURE (%GDP)	12.2653	0.0002	Bi
AGRICULTURE (%GDP) does not Granger Cause MANUFACTURING(%GDP)	19.2928	9.E-06	
OUTPUT PER WORKER does not Granger Cause AGRICULTURE (%GDP)	4.86007	0.0165	
AGRICULTURE (%GDP) does not Granger Cause OUTPUT PER WORKER	2.58021	0.0958	Uni
OUTPUT PER WORKER does not Granger Cause MANUFACTURING(%GDP)	4.06866	0.0295	
MANUFACTURING(%GDP) does not Granger Cause OUTPUT PER WORKER	3.12729	0.0614	Uni

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Agriculture as a share of GDP granger causes GDP per capita and the converse also holds true. That the causality between GDP per capita and agriculture as a share of GDP per capita is bidirectional. The results from the table also shows that manufacturing as a share of GDP weekly granger causes GDP per capita, on the other hand, GDP per capita as a share of GDP strongly causes manufacturing as a share of GDP. Bidirectional causality is between manufacturing as a share of GDP and agriculture as a share of GDP. That manufacturing as a share of GDP is sensitive to the changes in agriculture as a share of GDP and the opposite is true. Additionally, the results show that output per worker granger causes manufacturing as a share of GDP while manufacturing does not granger cause output per worker. That manufacturing as a share of GDP is sensitive to the changes of output per worker.

The results from the table also reveal two unidirectional results. Output per worker does granger cause agriculture as a share of GDP but agriculture as a share of GDP does not granger cause output per worker. Furthermore, the results also show that output per worker does granger cause manufacturing as a share of GDP but manufacturing as a share of GDP does not cause output per worker at a 5% level of significance. The Wald test results for causality also show that only the first lagged GDP per capita granger values cause current GDP per capita at 5% level of significance.

From the above result, two key bi-directional results are of interest based as follows;

- Agriculture share of GDP strong affects GDP per capita and the opposite is true
- Manufacturing as a share of GDP is sensitive to the changes in agriculture as a share of GDP and the opposite is true While some causality has being found on the other variables, the causality relationships are not bi-directional.

V. CONCLUSION AND SUGGESTIONS

In terms of the structural transformation of the economy, Zambia's GDP per capita is highly dependant on the share of agriculture to GDP. This result is consistent with the findings of various authors, Titus O. Awokuse, (2008), Joseph Phiri, et al. (2020). The authors agree that agriculture plays a vital role in developing countries' initial development process. It is the primary source of income for the rural population and a precondition for the growth of the secondary sectors such as industry and services.

Despite its importance, Zambia's agricultures share of GDP has maintained a downward trend reducing from about 15% in 1983 to less than 3% in 2018. Based on this study's findings, poor agriculture performance will lead to reduced GDP per capita and low levels of economic growth.

While the services and industry's GDP share has maintained an upward trend, there is a structural transitional problem as Zambia is shifting from resource-driven growth based on agriculture to growth based on advances in technology and innovation. This is confirmed by Gang Gong (2016). Gong identifies two main stages of economic development. He refers to the first stage as the period of digesting surplus labour and the second as the catching-up technology process.

To transition from the first stage to the second, a country is expected to digest the surplus labour from the agriculture sector and in the process transform its production mode from being labour intensive to capital intensive. The inability to successfully transition from labour intensive to capital intensive mode of production is the reason for the MIT. The study's findings indicate that Zambia is at a great risk of being affected by the MIT due to this transitional challenge. Zambia's agriculture sector's current performance is an indication that the country has not fully transitioned from labour intensive to capital intensive modes of production.

According to Gang Gong (2016), a country can only escape the MIT if the production mode successfully transforms from capital-intensive to knowledge-intensive.

While no strong causality has been found between the manufacturing share of GDP and GDP per capita, manufacturing share of GDP has a strong influence on agriculture share of GDP which affects GDP per capita. These findings stress the importance of investing in both manufacturing an industry as the sectors mutually benefit each other. This is consistent with the findinds of Dan Su and Yang Yao (2018).

They state that a decline in the manufacturing sector negatively affects an economy's service sector and noted that manufacturing provides an incentive for savings and can also accelerate the rate of technological progress. Qunhui Huang et al (2017), found that the increase in manufacturing share of GDP keep increasing as per capita income increases. They argue that manufacturing is key to escaping the MIT.

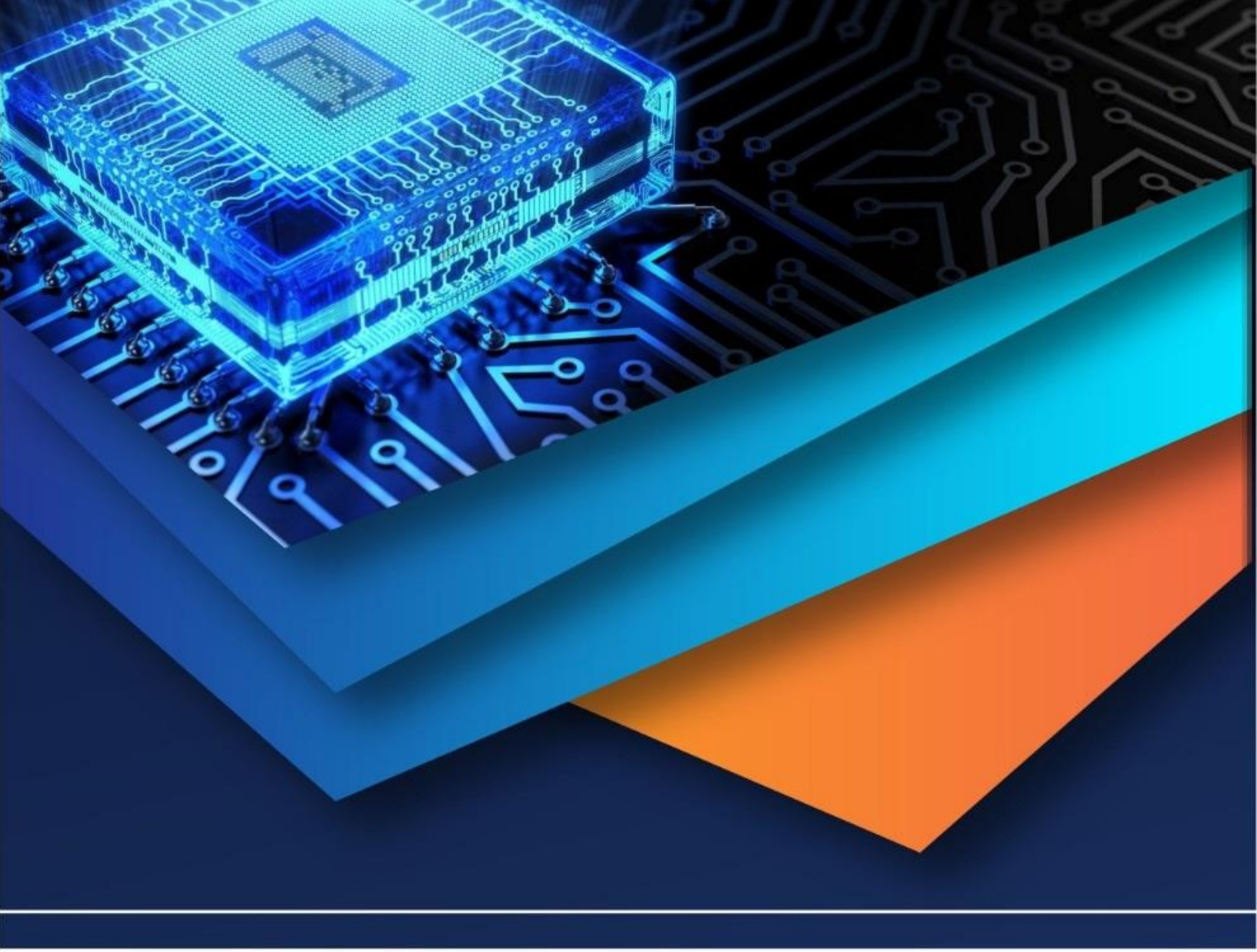
In the case of Zambia, improvements in manufacturing can help to mechanize the agriculture sector and ultimately increase agriculture production. On the other side, improved agriculture output can provide the required raw material for industrial prosperity. In both cases, industry and agriculture are strongly linked as agriculture is the source of inputs needed in the agro related industry and utilizes other industrial inputs such as chemicals and farm equipment. In order to avoid de-industrialization, the government of Zambia should ensure adequate investment to support both agriculture and industrial development. Such investment should promote improved technology utilization and innovation.

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