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The impact of sectoral value added to economic growth in a developing country: The Zambian case

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Abstract

With the help of the ARDL bounds test approach, the analysis of the effect of sectoral value added on economic growth in Zambia was made for the period 1994 – 2021. It has been observed that agriculture, industry and service sectors have a positive effect on economic growth in the long run. The effect of imports on economic growth was negative as expected, while the manufacturing sector and exports were found to be insignificant. The same relationship between imports and growth is also found in the short run. All other independent variables were found to have no effect on economic growth in the short run. For this reason, promotion of agriculture, industry and service sectors should be given priority for long-term impact.

Keywords: Sectoral impact, Economic Growth, ARDL bounds test, Zambia

JEL Codes: C22, O55, Q13

1. Introduction

The impact of a number of variables on economic growth has been one of the major areas of study in economics. However, studies have long-established that there is need to have a constant check on the evolution of the impact of the main economic sectors on economic growth. These drivers of economic growth tend to encapsulate the overall effects of policy and implementation, globalization and other economic shocks. Moreover, the growth of the inherent sectors in the economy is relatively a good indicator of a potential increase in a country's economic growth and/or its potential national income. For instance, the development of the agricultural sector has been posited as a catalyst for inter-sector development and, ultimately, economic growth, from the seminal research by Lewis (1954) and Hirschmann (1958) to some countless recent studies. In addition to producing or supplying some of the fundamental inputs for the majority of industrial and manufacturing operations, agriculture provides food for all economic agents. Moreover, because of this aforementioned role, it also acts as a harbinger for increased agricultural sector, other related sector employment and an antecedent of the living standards in an economy. Furthermore, through the above-mentioned points and the obvious rendition of how commerce works, the interconnectivity across economic sectors is characteristically confirmed and cannot be underplayed. The mutually beneficial functions that the agricultural sector, the industrial sector, the manufacturing sector, and the service sector play ensure simultaneously their respective growth and the growth of the economic system as a whole. Moreover, the industrial revolution is a fantastic example of the manner in which industry might influence economic growth while avoiding the possibility of undervaluing the agricultural sector comparative to other sectors. For economists to better understand the underlying dynamics and steer policy, particularly for a developing nation like Zambia, it is crucial to evaluate the recent sectoral effects on economic growth. The few research on the effects of sectoral value-addition in Africa and for the majority of developing countries have encouraged the choice of Zambia. Because it has better estimating efficiency than the more common residual-based approaches, the study adopts the ARDL bounds testing time-series-based procedure.

The remaining portions of the investigation are shown as follows: The Zambian economy is briefly described in the next part, which is followed by a discussion of related literature on the issue, the methodology, a discussion of the findings, and finally some closing notes.

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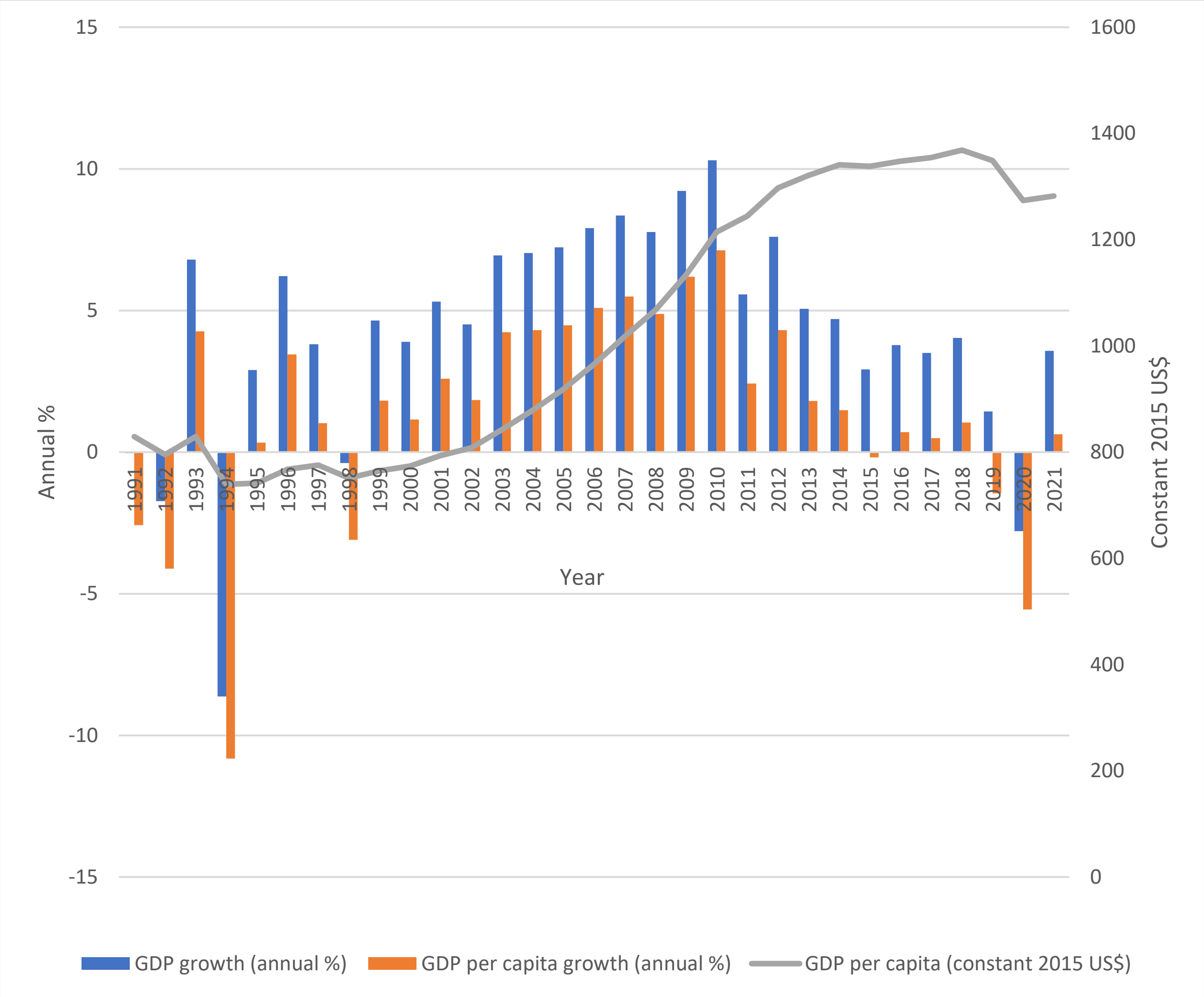
2. Overview of the Zambian Economy

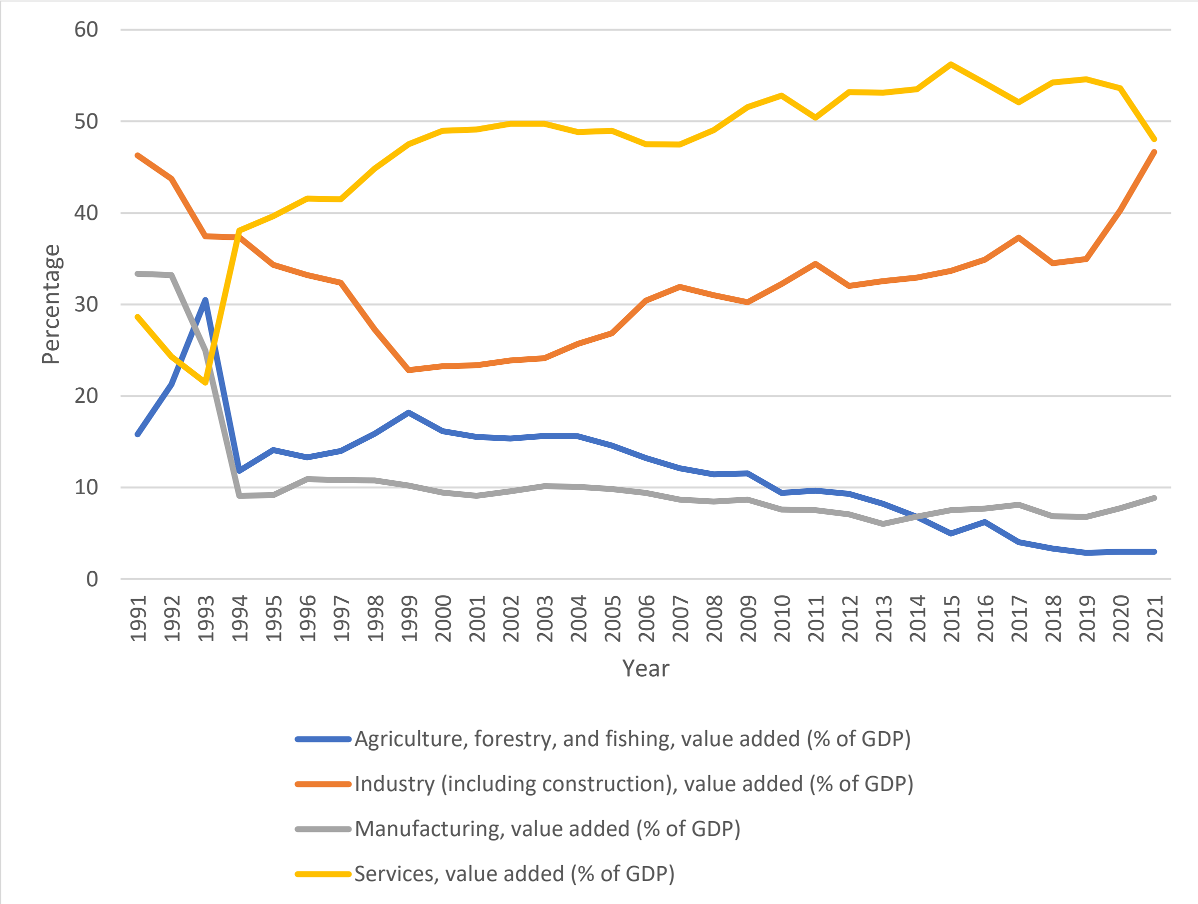
An overview of the GDP-related trends of the Zambian economy is shown in Figure 1. Trends show that the real GDP per capita started increasing after the year 2001 after being relatively stagnant before then. From an average of $800 before 2001 to an average of $1260 by 2021, which shows a 50% assumed increase in the standard of living in Zambia. The year on year GDP growth and GDP per capita growth trends closely mirror each other with the GDP growth being, relatively, always higher than the GDP per capita growth. With the exception of the year 2020, both variables had above zero growth levels for the period spanning from 1999 to 2021. Overall, this shows that the Zambian economy has experienced some sustained economic growth despite it rarely reaching double digit growth.



Source: Author's own computations from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

Figure 1. GDP Growth and Per Capita Trends

As far as value-added is concerned, the service sector has been the dominant sector especially after the year 1994 when it maintained an above 40% value added proportion of GDP. The industry sector despite leading the pack before 1994 has maintained second place with above 20% value added proportion of GDP. Contrary to forecasts, the agriculture sector's contribution of value added as a percentage of GDP throughout 1991 to 2021, particularly in the previous decade, has actually fallen. Before 2010, it had levels exceeding 10%, but by 2021, it had a 3% contribution to value addition, making it the least valuable sector. The manufacturing sector, like all other sectors, appears to have been harmed by the high rise in the value added to GDP by the service sector in 1994, as it fell to below 10% (from 33% in 1992 and 25% in 1993) and has remained at that level ever since. Failures in manufacturing development may be to blame for this (Haraguchi, *et al.* 2017). It seems that 1994 was a critical year for Zambia since the dynamics of value-added altered forever. Figure 2 displays the trends in value added by sector as a proportion of GDP.



Source: Author's own computations from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

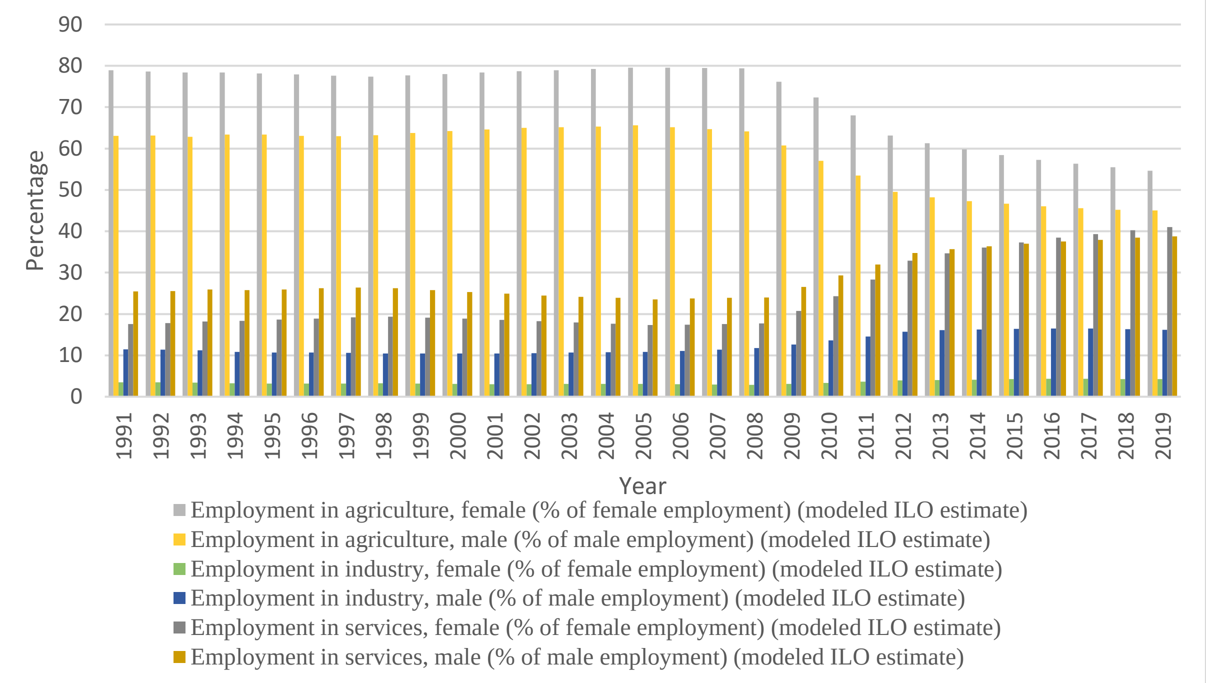
Figure 2. Value Added by Sector (% of GDP)

Even though it contributes the least value addition to the GDP relative to other sectors, agriculture is the largest employer in Zambia with a more than 50% share of all employees. The industrial sector comes in second, employing little over 30% of the workforce. In spite of being the largest provider of value added to the GDP, the service industry employs only 9% of the entire workforce on average. Figure 3 displays the sectoral share of total employment.

Source: Author's own computations from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

Figure 3. Sectoral Share of Total Employment

Figure 4 displays the overall percentage of workers by gender for each industry. The agriculture sector is dominated by women, whereas the industrial and service sectors are dominated by males, according to data on employment by gender in each sector from 1991 to 2019. But by 2019, the gender disparity in the service industry has largely disappeared. This demonstrates that more women have been able to advance their careers from being farm laborers to more tertiary jobs.



Source: Author's own computations from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

Figure 4. Sectoral Total Percentage Employed by Gender

2.1. Literature Review

Although there are several studies examining the effects of the various industries covered here, only a few have looked at the influence of value addition on economic growth. Additionally, studies that were conducted more recently concentrated on other elements (other than value addition) and their effects on economic growth. For instance, extensive study on the effects of the following determinants on investment has been done on financial development and liberalization (Levine, 1997), investment dynamics (Muyambiri and Odhiambo, 2018), human capital (Pelinescu, 2015), and other aspects. The list is endless, but the underlying classical economic theories have had a substantial influence on the selection of dependent variables in evaluating the impact on economic growth, which is the most widely accepted premise in these research.

Numerous studies have examined how agriculture affects economic expansion. The majority of these studies have proven that the agriculture industry has a real positive impact on economic expansion. For instance, Diao, Hazell, and Thurlow (2010) evaluate the case of 6 African countries, including Zambia, while Hwa (1988) investigates the case of 86 countries. They both agree that the agricultural industry is crucial to promoting economic development and growth.

Block (1999) examines the relationship between economic growth and agriculture by assessing the growth multipliers for four industries. The study's findings demonstrate the existence of reliable but highly unequal intersectoral links in the economy, which produce favorable simulated results for economic growth.

The dual economy theory, which holds that agriculture only contributes to the development of the industrial sector and has little long-term impact on economic growth, is examined by Blunch & Verner (2006). They examine the development of the agricultural, industrial, and service sectors in Cote d'Ivoire, Ghana, and Zimbabwe and find that for long-term economic success, there must be a great deal of interconnectedness between sectors.

Kobayashi *et al* (2009), on their study of Cambodia using an input-output analysis, evaluate the significance of the agriculture and fishery sectors on economic growth. They find that the agriculture, fishery, and food industry sectors have a high potential to realize economic growth in Cambodia.

By contributing to economic growth and the expansion of other sectors, Bashir et al. (2019), who studied Indonesia, demonstrate the importance of the agriculture sector to the economy.

The impact of agriculture on Zambia's economic growth from 1983 to 2017 is examined by Phiri et al (2020). Both in the short and long terms, it was discovered that agriculture has a considerable effect on economic growth.

Khan *et al* (2020) establish the significance of agriculture in the economic growth of West Bengal. The role of agriculture is examined on four contributions, that is, product contribution (forward linkage), market contribution (backward linkage), factor contribution, and foreign exchange contribution. The study reveals that the agricultural sector is an important contributor to drive West Bengal’s economic growth and has significant impact on the industry and service sectors in West Bengal.

Zhang & Diao (2020) use China as an illustration to examine the effects of structural change on the evolving role of agriculture. They discover that agriculture still has a significant impact on the economy and that, in order to develop a new growth plan, deeper economic integration between agriculture and the rest of the economy needs to be investigated.

In the context of Turkey, Tufaner (2021) studies the contribution of sectoral value addition to economic growth. According to the report, the services sector, followed by industry and then agriculture, is the one that contributes the most to economic growth.

Chu *et al* (2022) show that the agricultural sector improvement is highly connected to industrial sector firm size and is a significant determinant of innovation and activates an endogenic evolution from unproductivity to growth.

The majority of them did not include value addition to GDP in their studies, therefore there are limited studies on the effect of the value added by the agricultural, industry, manufacturing, and services sectors on economic growth (Tufaner, 2021).

3. Methodology

The auto regressive distributed lag (ARDL) bounds testing strategy is the preferred methodology to assess the effect of sectoral value added on economic development in Zambia. When estimating the short- and long-run relationship between variables, the auto regressive distributed lag (ARDL) methodology is a reliable and adaptable technique that takes non-stationarity, heterogeneity, normalcy, and other typical problems in econometric analysis into account. Additionally, it has the unique benefit of being able to estimate the stated relationship using a combination of variables with different levels of stationarity.

Equation 1 provides the general model which has to be estimated.

$$EG = f(AG, IN, MA, SR, IM, EX) \quad (1)$$

Where the variables EG,AG,IN,MA,SR,IM,EX stand for economic growth, industry value added as a percentage of GDP, manufacturing value added as a percentage of GDP, services value added as a percentage of GDP, imports as a percentage of GDP, and exports as a percentage of GDP, in that order. The stochastic autoregressive function that results from taking the natural logs of all the model's variables is as follows:

$$LEG_t = \rho_0 + \rho_1 LAG_t + \rho_2 LIN_t + \rho_3 LMA_t + \rho_4 LSR_t + \rho_5 LIM_t + \rho_6 LEX_t + \rho_7 LEG_{t-1} + \varepsilon_t \quad (2)$$

Where: ρ_0 is the intercept, ρ_1, ρ_2, ρ_3, ρ_4, ρ_5, ρ_6 and ρ_7 are the associated coefficients of each independent variable,

LEG stands for real per capita GDP (a proxy for economic growth), LAG stands for agriculture, forestry, and fishing, value added (% of GDP), LIN stands for industry (including construction), LMA stands for manufacturing, LSR stands for services, LIM stands for imports to GDP, LEX stands for exports to GDP, and ε stands for the error term. Natural logs are used for all variables.

The constant elasticity coefficients ρ_1, ρ_2, ρ_3, ρ_4, ρ_6 and ρ_7 are all predicted to have positive signs, but ρ_5 is predicted to have a negative sign.

The ARDL cointegration test equation is given by:

$$\Delta LEG_t = \propto_0 + \sum_{i=0}^{n} \propto_{1i} \Delta LAG_{t-i} + \sum_{i=0}^{n} \propto_{2i} \Delta LIN_{t-i} + \sum_{i=0}^{n} \propto_{3i} \Delta LMA_{t-i} + \sum_{i=0}^{n} \propto_{4i} \Delta LSR_{t-i} + \sum_{i=0}^{n} \propto_{5i} \Delta LIM_{t-i} + \sum_{i=0}^{n} \propto_{6i} \Delta LEX_{t-i} + \sum_{i=1}^{n} \propto_{7i} \Delta LEG_{t-i} + \beta_1 LAG_{t-1} + \beta_2 LIN_{t-1} + \beta_3 LMA_{t-1} + \beta_4 LSR_{t-1} + \beta_5 LIM_{t-1} + \beta_6 LEX_{t-1} + \beta_7 LEG_{t-1} + \mu_{1t} \quad (3)$$

Where $\propto_0$, $\propto_{i,1} - \propto_{i,7}$ and $\beta_{i,1} - \beta_{i,7}$ are respective coefficients, μ_{1t}-is the error term and all other variables are as defined with the exception of Δ, the difference operator.

Following Muyambiri and Odhiambo (2017), the null hypothesis that there is no cointegration relationship—i.e., that all the coefficients of the undifferenced variables are equal to zero (see equation 4]—is used to test the aforementioned model.

$$H_0: \beta_{i,1} = \beta_{i,2} = \beta_{i,3} = \beta_{i,4} = \beta_{i,5} = \beta_{i,6} = \beta_{i,7} = 0 \quad (4)$$

Against the alternative hypothesis that the coefficients are significantly different from zero (see equation 5), hence proving a cointegration relationship:

$$H_1: \beta_{i,1} \neq \beta_{i,2} \neq \beta_{i,3} \neq \beta_{i,4} \neq \beta_{i,5} \neq \beta_{i,6} \neq \beta_{i,7} \neq 0 \quad (5)$$

The derived F-statistic from the estimated model is then compared to the lower and upper critical bound values from Pesaran *et al.* (2001:300). Only when the estimated F-statistic exceeds the upper bound critical value is there proof of cointegration.

The following long-run model (equation 6) and the short-run error correction model (equation 7) are estimated if it is determined that the variables are cointegrated:

$$LEG_t = \propto_0 + \sum_{i=0}^{n} \propto_{1i} LAGR_{t-i} + \sum_{i=0}^{n} \propto_{2i} LIND_{t-i} + \sum_{i=0}^{n} \propto_{3i} LMAN_{t-i} + \sum_{i=0}^{n} \propto_{4i} LSRV_{t-i} + \sum_{i=0}^{n} \propto_{5i} LIMP_{t-i} + \sum_{i=0}^{n} \propto_{6i} LEXP_{t-i} + \sum_{i=1}^{n} \propto_{7i} LEG_{t-i} + \mu_t \quad (6)$$

$$\Delta LEG_t = \propto_0 + \sum_{i=0}^{n} \propto_{1i} \Delta LAGR_{t-i} + \sum_{i=0}^{n} \propto_{2i} \Delta LIND_{t-i} + \sum_{i=0}^{n} \propto_{3i} \Delta LMAN_{t-i} + \sum_{i=0}^{n} \propto_{4i} \Delta LSRV_{t-i} + \sum_{i=0}^{n} \propto_{5i} \Delta LIMP_{t-i} + \sum_{i=0}^{n} \propto_{6i} \Delta LEXP_{t-i} + \sum_{i=1}^{n} \propto_{7i} \Delta LEG_{t-i} + \xi_1 ECM_{t-1} + \mu_t \quad (7)$$

ECM is the error correction term that has been delayed by one period, and μ_t is the residual term, with all other variables remaining as previously defined.

The coefficient of the lagged error-correction factor, ξ_1, should be negative and statistically significant in order to further confirm the existence of cointegration.

The study examined data for Zambia from 1994 to 2021 because trade statistics prior to 1994 were not available. The World Development Indicators (World Bank, 2023) used as the primary data source.

3.1. Empirical Results

Unit roots tests (Augmented Dickey-Fuller Generalized Least Square (ADF-GLS), Perron (1997) PPURoot, and Ng-Perron Modified unit root tests) were run to validate that all included variables in the ARDL estimation are less than I(2). This is a necessary condition for the ARDL bounds testing approach to yield accurate results. The findings are shown in Table 1 along with confirmation that the prerequisites are satisfied in order to apply the preferred econometric approach.

Table 1. Unit Root Tests Results

DICKEY-FULLER GENERALISED LEAST SQUARE (DF-GLS)					**PERRON (1997) UNIT ROOT TEST (PPUROOT)**			
Variable	Level		First difference		Level		First difference	
	No trend	Trend	No trend	Trend	No trend	Trend	No trend	Trend
LEG	-1.176	-2.178	-2.481**	-3.334**	-1.522	-2.206	-5.132*	-5.415*
LAG	-2.321**	-1.671	-	-6.728***	-3.714	-2.993	-7.194***	-8.700***
LIN	-0.455	-1.601	-2.737***	-3.539***	-2.199	-3.683	-5.487**	-5.371**
LMA	-1.404	-2.027	-3.599***	-3.966***	-2.540	-3.016	-5.103*	-7.973***
LSR	-1.465	-1.485	-3.465***	-4.292***	-1.840	-2.253	-5.044*	-4.733*
LIM	-2.549**	-2.607	-	-5.302***	-3.553	-3.398	-6.506***	-6.365**
LEX	-0.595	-2.396	-5.071***	-5.604***	-2.635	-2.923	-5.970***	-6.409***
NG-PERRON MODIFIED UNIT ROOT TEST								
	Mza				**MZt**			
Variable	Level		First difference		Level		First difference	
	No trend	Trend	No trend	Trend	No trend	Trend	No trend	Trend
LEG	-5.282	-391.4***	-8.143**	-	-1.522	-13.95***	-2.012**	-
LAG	1.123	-2.372	-6.496*	-60.25***	0.806	-0.972	-1.801*	-5.46***
LIN	-0.842	-2.137	-9.422**	-22.198**	-0.383	-0.797	-1.960*	-3.300**
LMA	-3.486	-6.693	-92.62***	-23.247**	-1.319	-1.631	-6.76***	-3.345**
LSR	-1.250	-3.268	-12.146**	-19.015**	-0.764	-0.856	-1.991**	-2.889*
LIM	-8.649**	-8.874	-12.913**	-16.759*	-2.07**	-2.106	-2.520**	-2.862*
LEX	-10.70**	-60.25***	-	-	-2.02**	-5.404***	-	-
	MSB				**MPT**			
Variable	Level		First difference		Level		First difference	
	No trend	Trend	No trend	Trend	No trend	Trend	No trend	Trend
LEG	0.288	0.035***	0.247*	-	4.895	0.294***	3.028**	-
LAG	0.717	0.409	0.277*	0.090***	39.815	33.450	3.773*	1.637***
LIN	0.455	0.373	0.208**	0.148**	14.568	31.034	3.363*	4.286**
LMA	0.378	0.243	0.073***	0.143**	7.0266	13.690	0.340***	4.294**
LSR	0.610	0.262	0.163***	0.151**	18.737	20.225	3.656*	5.910*
LIM	0.239**	0.237	0.195**	0.170*	2.862**	10.268	1.976**	5.624*
LEX	0.189**	0.089***	-	-	3.319*	1.892***	-	-

Note: The asterisks (***), (**) and (*) indicate significance at 1%, 5%, and 10% respectively.

Source: Authors' estimation from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

The Perron (1997) PPURoot test verified that all variables were suitably valid to be included in the ARDL estimation despite the existence of structural breaks. The estimated breakpoints according to the Perron (1997) PPURoot test are shown in Table 2.

Table 2. PPURoot Breakpoints

	LEVELS		FIRST DIFFERENCE	
Variable	No trend	Trend	No trend	Trend
LEG	2017	2015	2002	2008
LAG	2014	2010	2015	2016
LIN	2016	2003	2015	1999
LMA	2009	2012	2013	2013
LSR	1998	2014	2008	2016
LIM	2004	2004	2006	2006
LEX	2009	2016	2012	2013

Note: The asterisks (***), (**) and (*) indicate significance at 1%, 5%, and 10% respectively.

Source: Authors' estimation from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

The outcomes are then presented in Table 3 following estimation of the ARDL estimation for cointegration.

Table 3. Bounds F-Test for Cointegration

Dependent Variable	**Function**			**F-Statistic**	**Cointegration Status**
LEG	F (LEG| LAG, LIN, LMA, LSR, LIM, LEX)			5.488***	Cointegrated
Asymptotic Critical Values					
	1%		5%		10%
Pesaran et al., 2001: 300 Table CI(iii) case III	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
	3.15	4.43	2.45	3.61	2.12	3.23

Note: The asterisks (***), (**) and (*) indicate significance at 1%, 5%, and 10% respectively.

Source: Authors' estimation from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

There is enough evidence to reject the null hypothesis of no cointegration between the variables because the estimated F-statistic is greater than the upper critical constraint at the 1% level of significance. The cointegration test thus validates the cointegration of economic growth, imports, exports, agriculture, industry, manufacturing, and services across the research period. Additionally, ARDL (1,1,1,0,1,0,0) is chosen as the best latency for the following long run and short run ARDL models. The Schwarz Bayesian Criterion (SIC) was used to select the ideal lag.

Table 4 provides the estimated long-run and short-run coefficients for the estimated ARDL model.

Table 4. Estimated Long Run and Short Run Coefficients

ESTIMATED LONG-RUN COEFFICIENTS			
ARDL (1,1,1,0,1,0,0) selected based on Schwarz Bayesian Criterion			
Dependent variable is LEG			
Regressor	Coefficient	T-Ratio	Prob. Values
LAG	0.19665**	2.5560	0.022
LIN	1.0624***	6.3004	0.000
LMA	-0.17685	-1.5557	0.141
LSR	2.3138***	6.9404	0.000
LIM	-0.16660*	-1.7836	0.095
LEX	0.045967	0.44946	0.660
C	-5.3347**	-2.6734	0.017

ESTIMATED SHORT-RUN COEFFICIENTS			
Dependent variable is dLEG			
Regressor	Coefficient	T-Ratio	Prob. Values
dLAG	-0.041227	-1.0368	0.314
dLIN	0.10832	0.74651	0.465
dLMA	-0.093980	-1.1804	0.253
dLSR	0.43774	1.4204	0.173
dLIM	-0.088533*	-2.0546	0.055
dLEX	0.024427	0.46830	0.645
ecm(-1)	-0.53140*	-2.0791	0.052

Note: The asterisks (***), (**) and (*) indicate significance at 1%, 5%, and 10% respectively.

Source: Authors' estimation from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

As also found by Blunch & Verner (2006), the long-run results show that the sectors of industry, services, and agriculture all positively influence economic growth. Economic growth is found to be significantly yet unfavorably impacted by imports. It has been determined that the manufacturing industry and exports have a negligible influence on economic growth.

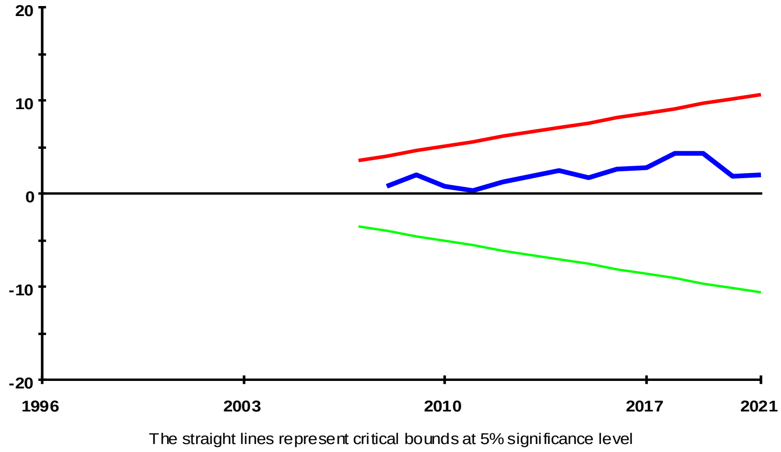
Only imports are found to have a considerable but unfavorable short-run impact on economic growth. It is discovered that none of the other independent factors have any bearing on economic growth in the short run.

Table 5. ARDL – VECM Diagnostics Tests

Test Statistics	LM Version	Prob. Values	f-version	Prob. Values
A: Serial Correlation	0.0089470	0.925	0.0048193	0.946
B: Functional Form	2.3020	0.160	2.0367	0.214
C: Normality	0.97177	0.615	Not applicable	
D: Heteroscedasticity	0.43953	0.507	0.41269	0.527

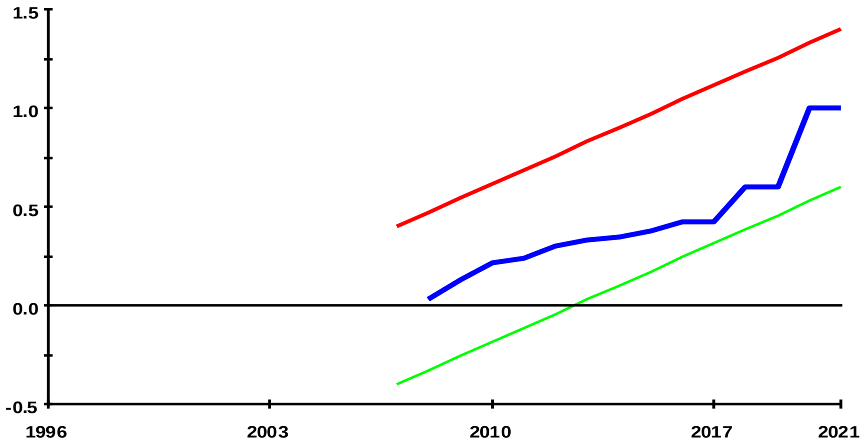
Source: Authors' estimation from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

The coefficient for the lagged error correction term was found to be negative and significant, further supporting the notion of a cointegrating link. Table 5 shows that the null hypothesis for the absence of serial correlation, heteroscedasticity, the proper functional form, and normality was not rejected in any of the cases. The CUSUM and CUSUMQ plots further supports the model's stability. Figures 5 and 6 show them, respectively.



Source: Authors' estimation from compiled data. Data compiled from *World Bank, World Development Indicators, 2023*

Figure 5. Plot of Cumulative Sum of Recursive Residuals



Source: Authors' estimation from compiled data. Data compiled from *World Bank, World Development*

Figure 6. Plot of Cumulative Sum of Squares of Recursive Residuals

4. Conclusion

Using the ARDL bounds testing method, this study investigated the effects of value added in the agricultural, industrial, manufacturing, and service sectors on economic growth for the case of Zambia for the years 1994 to 2021.

The long-run findings demonstrate that the sectors of industry, services, and agriculture all contribute significantly to economic growth. Economic growth is found to be significantly yet unfavorably affected by imports. It has been determined that the manufacturing industry and exports have a negligible influence on economic growth. However, only imports are revealed to have a considerable but unfavorable short-term impact on economic growth. It is discovered that none of the other independent factors have any bearing on economic growth in the short run.

Policy initiatives should focus on promoting the agriculture, industry and service sectors to achieve increased economic growth.

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ETİK VE BİLİMSEL İLKELER SORUMLULUK BEYANI

Bu çalışmanın tüm hazırlanma süreçlerinde etik kurallara ve bilimsel atıf gösterme ilkelerine riayet edildiğini yazar beyan eder. Bu çalışma etik kurul izni gerektiren çalışma grubunda yer almamaktadır.

ARAŞTIRMACILARIN MAKALEYE KATKI ORANI BEYANI

1. yazar katkı oranı: %100