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Sectoral Value Added and Labor Market Outcomes in Zambia: An Empirical Analysis

Valor añadido sectorial y resultados del mercado laboral en Zambia: un análisis empírico

Tryson Yangailo
Independent Researcher
ytryson@yahoo.com
https://orcid.org/0000-0002-0690-9747

ABSTRACT

This study examines the impact of value added of the Agriculture, Forestry and Fishing, Manufacturing, and Services sectors on Zambia's unemployment rates and employment-to-population ratio. Using World Bank data from 1994 to 2023, the analysis employs Jamovi software for descriptive statistics, correlation analysis, and regression modeling. The findings indicate that the value added in the Agriculture, Forestry and Fishing sector is positively and significantly associated with the unemployment rate, implying that growth in this sector does not necessarily translate into job creation, possibly due to low productivity and the prevalence of informal employment. In contrast, expansion in the Services sector is positively associated with the employment-to-population

ratio, indicating its stronger capacity to generate employment. The Manufacturing sector exhibits a weaker relationship with labor market indicators, suggesting its limited direct contribution to employment outcomes. In addition, the study reveals distinct sectoral dynamics: agricultural growth is associated with lower employment levels, whereas expansion in the services sector corresponds to higher employment rates. These findings highlight the need for policies that enhance agricultural productivity while fostering the expansion of the services sector to improve labor market performance. By providing new evidence on the relationship between sectoral growth and employment in Zambia, this study offers practical insights for policymakers seeking to strengthen sectoral contributions to inclusive employment growth.

Keywords: sectoral contributions; labor market outcomes; unemployment rates; employment-to-population ratio: economic development; economic history.

JEL Codes: J64; O14; O55; R11; E24

RESUMEN

Este estudio examina el impacto del valor agregado de los sectores de Agricultura, Silvicultura y Pesca, Manufactura y Servicios en las tasas de desempleo y la relación empleo-población de Zambia. Utilizando datos del Banco Mundial de 1994 a 2023, el análisis emplea el software Jamovi para estadísticas descriptivas, análisis de correlación y modelado de regresión. Los resultados indican que el valor agregado en el sector de Agricultura, Silvicultura y Pesca está asociado de manera positiva y significativa con la tasa de desempleo, lo que implica que el crecimiento en este sector no necesariamente se traduce en creación de empleo, posiblemente debido a la baja productividad y la prevalencia del empleo informal. Por el contrario, la expansión en el sector de Servicios está asociada positivamente con la relación empleo-población, lo que indica su mayor capacidad para generar empleo. El sector de Manufactura muestra una relación más débil con los indicadores del mercado laboral, lo que sugiere su limitada contribución directa a los resultados de empleo. Además, el estudio revela dinámicas sectoriales distintas: el crecimiento agrícola se asocia con menores niveles de empleo, mientras que la expansión en el sector de servicios corresponde a tasas de empleo más altas. Estos hallazgos resaltan la necesidad de

políticas que mejoren la productividad agrícola y, al mismo tiempo, fomenten la expansión del sector servicios para optimizar el desempeño del mercado laboral. Al aportar nuevas evidencias sobre la relación entre el crecimiento sectorial y el empleo en Zambia, este estudio ofrece perspectivas prácticas para los responsables políticos que buscan fortalecer la contribución sectorial al crecimiento inclusivo del empleo.

Palabras clave: contribuciones sectoriales; resultados del mercado laboral; tasas de desempleo; ratio empleo-población; desarrollo económico; historia económica.

Códigos JEL: J64; O14; O55;

Introduction

Zambia's economy comprises a diverse set of sectors, including Agriculture, Forestry and Fishing, Manufacturing, and Services, each making distinct contributions to the country's economic development. Agriculture, traditionally a cornerstone of Zambia's economy, continues to play a critical role by providing raw materials, employment, and food, despite its declining share of GDP (Alston & Pardey, 2014). The manufacturing sector, historically a key driver of economic growth, remains important for job creation and industrial development (Szirmai, 2013; Haraguchi et al., 2017). Meanwhile, the service sector has become an increasingly important component of Zambia's economy, reflecting a broader global shift toward service-oriented economies (Ndulo & Chanda, 2016). Understanding how these sectors influence employment metrics is essential for explaining how labor markets respond to economic change. As of 2023, Zambia's unemployment rate stood at 5.91 percent (World Bank, 2024). However, this figure may not fully capture the extent of labor market challenges due to factors such as underemployment and the prevalence of informal unemployment. Therefore, examining how sectoral contributions influence employment metrics is essential for informing effective economic planning and policymaking.

The existing literature often overlooks the distinct ways in which different sectors of the economy influence labor market outcomes, such as

unemployment rates and the employment-to-population ratio. Although previous studies have emphasized the importance of sectoral contributions, they have not fully examined how these sectors interact to shape labor market indicators, particularly in the Zambian context (Ketu & Ningaye, 2024; Herrmendorf et al., 2014). This gap highlights the need for a more detailed examination of the relationship between sectoral contributions and labor market indicators, providing deeper insights into the underlying dynamics.

Research Objectives

The primary objectives of this study are:

1. To examine the impact of value added by the agriculture, manufacturing, and services sectors on unemployment rates in Zambia.
2. To examine the influence of sectoral value added on the employment-to-population ratio in Zambia.
3. To examine the interactions among the Agriculture, Manufacturing, and Services sectors and their collective effects on employment dynamics in Zambia.

Significance of the Study

The results of this study will have significant implications for policymaking, economic planning, and labor market strategies in Zambia. By providing insights into how sectoral shifts impact employment outcomes, the study can inform strategies designed to improve labor market performance and support sustainable economic development. The findings will be valuable to policymakers and economic planners seeking to address labor market challenges and strengthen the contributions of the agriculture, manufacturing, and services sectors to economic growth.

Literature Review

Theoretical Framework

Economic theories related to sectoral contributions and labor markets provide a foundation for understanding economic growth and employment dynamics. The dual-sector model explains economic growth through the movement of labor from the agricultural sector to the industrial sector, where expanding industries absorb surplus labor (Moloi & Marwala, 2020). This model emphasizes labor mobility as a key driver of economic development. Similarly, the concept of structural transformation describes the shift from agriculture to industry and services, driven by factors such as globalization, technological change, and economic policy (Herrendorf et al., 2014).

Empirical Studies on Sectoral Impact

Previous research indicates that advanced services and manufacturing are primary drivers of economic growth, whereas the role of traditional agriculture has gradually declined (Ketu & Ningaye, 2024). For example, the manufacturing sector continues to play a critical role in economic growth and job creation despite its declining share of GDP (Haraguchi et al., 2017). Evidence from other regions suggests that strengthening the manufacturing sector through reindustrialization can promote economic growth and reduce unemployment (Moyo & Jeke, 2019).

Sector-Specific Insights

The Agriculture, Forestry and Fishing sector remains essential to many livelihoods despite technological advances that have reduced its contribution to the economy (Alston & Pardey, 2014; Johnson, 1997). Although agriculture continuous to play an important role in employment and productivity, its overall economic significance has declined relative to the expanding manufacturing and services sectors. Manufacturing has long

been associated with economic growth and productivity gains, particularly in middle-income countries, and continuous to play a key role despite the expansion of the service sector (Szirmai, 2013; Haraguchi, 2017). In Zambia, the Service sector has become a major driver of economic growth, although challenges persist in areas such as energy and telecommunications (Ndulo & Chanda, 2016).

Gaps in the Literature

Despite extensive research on sectoral impacts, important gaps remain, particularly in understanding how sectoral shifts influence labor market outcomes in Zambia. Existing studies often lack a focused analysis of this issue within the Zambian context, highlighting the need for further research. This study addresses these gaps by providing a detailed examination of how sectoral interactions and contributions influence employment metrics in Zambia.

Methodology

Research Design

This study employs a quantitative research design to examine the impact of the agriculture, manufacturing, and service sectors on unemployment and employment outcomes in Zambia. The analysis focuses on how sectoral contributions influence labor market outcomes, using secondary data and statistical software to provide a comprehensive assessment.

Data Collection

The primary data source for this study is the World Bank database, which provides comprehensive statistics on economic indicators relevant to Zambia. The dataset includes key variables, such as sectoral GDP value added (Agriculture, Forestry and Fishing, Manufacturing, and Services), unemployment rates, and employment-to-population ratios covering the

period from 1994 to 2023. The World Bank database was selected because of its reliability and comprehensive coverage of the economic indicators essential to this analysis

Data Analysis

Data analysis was conducted using Jamovi, a statistical software package for data analysis and visualization. Jamovi was selected for its user-friendly interface and robust analytical capabilities, which support the detailed examination and interpretation of the relationships between sectoral value added and labor market outcomes.

Descriptive Statistics: The initial analysis involves calculating descriptive statistics, including means, standard deviations, and correlation coefficients to summarize the data. These statistics provide an overview of sectoral contributions and labor market outcomes.

Regression Analysis: Multiple regression models are used to examine the effects of sectoral contributions on unemployment rates and employment-to-population ratio. Separate models are estimated for agriculture, manufacturing, and service sectors to assess their individual effects.

Triangulation

Data Triangulation: By relying on data from the World Bank, this study draws on a reputable source with extensive historical records, allowing the findings to be compared with those of previous studies and other datasets.

Methodological Triangulation: The combination of descriptive statistics, regression analysis, and interaction effect analysis provides a comprehensive assessment of sectoral impacts. This approach helps mitigate the limitations of any single analytical technique and enhances the robustness of the findings.

Theoretical Triangulation: The study integrates insights from different theoretical frameworks, including the dual-sector model and structural transformation theory, to interpret the findings within established economic theories and provides a more comprehensive understanding of the relationships under investigation.

Ethical Considerations

All data used in the study are secondary and publicly available, ensuring compliance with ethical standards related to privacy and confidentiality.

Limitations

Although this study provides valuable insights, several limitations should be acknowledged. First, the reliance on secondary data may introduce limitations related to data accuracy and completeness. Second, the analysis is restricted to indicators available from the World Bank, which may not capture all factors relevant to labor market outcomes.

Conclusion

The methodology outlined in this study provides a structured approach to examining the effects of sectoral contributions on unemployment and employment outcomes in Zambia. By combining statistical analysis using Jamovi with triangulation techniques to strengthen the reliability and validity of the findings, the study provides a comprehensive understanding of the sectoral dynamics shaping Zambia's labor market.

Results

Descriptive Statistics on Agriculture, Forestry and fishing, Manufacturing, Services, and Unemployment

The descriptive statistics presented in Table 1 provide an overview of the contribution of the agriculture, manufacturing, and service sectors to Zambia's GDP, along with the unemployment rate. The analysis focuses on four variables: Agriculture, Forestry and Fishing, Manufacturing, Services, and Unemployment.

Table 1. Descriptive Statistics for Agriculture, Forestry and Fishing, Manufacturing, Services, and Unemployment

	Agriculture, forestry, and fishing, value added (% of GDP)	Manufacturing, value added (% of GDP)	Services, value added (% of GDP)	Unemployment, total (% of total labor force) (modeled ILO estimate)
N	28	28	28	28
Missing	62	62	62	62
Mean	10.4	8.63	50.0	10.7
Median	11.5	8.67	50.1	10.6
Standard deviation	4.99	1.37	4.26	3.60
Minimum	2.86	6.02	39.6	5.03
Maximum	18.2	10.9	56.2	16.8

The Manufacturing sector contributes an average of 8.63% to GDP. Its standard deviation of 1.37 percentage points indicates substantially less variability than that of the Agriculture, Forestry and Fishing sector, with contributions ranging from 6.02% to 10.9%. This relatively low variation suggests a more stable industrial sector, although manufacturing accounts for a smaller share of the GDP than agriculture and services.

The Services sector is the largest contributor to GDP, with a mean value added of 50.0%. The standard deviation is 4.26 percentage points indicates moderate variability, with the sector's contribution to GDP ranging from 39.6% to 56.2%. The prominence of the services sector underscores its crucial role in Zambia's economy, possibly reflecting factors such as urbanization, technological change, and the expansion of the tertiary sector.

Finally, the unemployment rate has a mean of 10.7%, with a standard deviation of 3.60 percentage points. The unemployment rate ranges from a minimum of 5.03% and a maximum of 16.8%, highlighting the challenges facing the labor market, possibly reflecting structural economic changes, population growth, and the transition from agriculture to manufacturing and services.

In summary, the descriptive statistics provide valuable insights into the sectoral composition of Zambia's GDP and unemployment rate. The agricultural sector exhibits the greatest variability, whereas the services sector is the largest contributor to the economy. The unemployment rate shows moderate variability, reflecting persistent challenges in the labor market.

Table 2. Correlation Matrix on Agriculture, Forestry and fishing, Manufacturing, Services, and Unemployment

		Agriculture, Forestry and fishing, value added (% of GDP)		Manufacturing, value added (% of GDP)		Services, value added (% of GDP)		Unemployment, total (% of total labor force) (modeled ILO estimate)
Agriculture, Forestry and fishing, value added (% of GDP)	Pearson's r	—						
	df	—						
	p-value	—						
	Spearman's rho	—						
	df	—						
	p-value	—						
Manufacturing, value added (% of GDP)	Pearson's r	0.767	***	—				
	df	26		—				
	p-value	< .001		—				
	Spearman's rho	0.791	***	—				
	df	26		—				
	p-value	< .001		—				
Services, value added (% of GDP)	Pearson's r	-0.706	***	-0.780	***	—		
	df	26		26		—		
	p-value	< .001		< .001		—		
	Spearman's rho	-0.786	***	-0.819	***	—		
	df	26		26		—		
	p-value	< .001		< .001		—		
Unemployment, total (% of total labor force) (modeled ILO estimate)	Pearson's r	0.869	***	0.745	***	-0.729	***	—
	df	26		26		26		—
	p-value	< .001		< .001		< .001		—
	Spearman's rho	0.812	***	0.750	***	-0.735	***	—
	df	26		26		26		—
	p-value	< .001		< .001		< .001		—

Note. * p < .05, ** p < .01, *** p < .001

The correlation matrix in Table 2 provides a comprehensive view of the relationships among the value added of the agriculture, forestry and fishing, manufacturing, and services sectors , as well as the unemployment rate in Zambia.

The first relationship to note is between Agriculture, Forestry and Fishing, and Manufacturing. The Pearson correlation coefficient (*r*) is 0.767, indicating a strong positive correlation between these two sectors. This suggests that as the contribution of agriculture to GDP increases, the contribution of the manufacturing sector also increases, possibly reflecting the interrelated nature of these sectors in the Zambian economy. The *p*-value of less than 0.001 confirms that this relationship is statistically significant. Similarly, Spearman's rho, a non-parametric measure, is 0.791, also indicating a strong, statistically significant positive correlation.

Conversely, the correlation between Agriculture, Forestry and Fishing, and services is negative, with a Pearson's correlation coefficient (*r*) of -0.706. This strong negative correlation suggests that an increase in the contribution of agriculture sector to GDP is associated with a decrease in the contribution of services sector. The *p*-value is again less than 0.001, indicating that this relationship is statistically significant. The Spearman's rho confirms this finding with a value of -0.786, further emphasizing the inverse relationship between these two sectors.

The Manufacturing sector also shows a strong negative correlation with the Services sector, with a Pearson's correlation coefficient (*r*) of -0.780. This suggests that as the contribution of the manufacturing sector to GDP increases, the contribution of services sector tends to decrease. This inverse relationship is statistically significant, as indicated by the *p*-value of less than 0.001. Spearman's rho also supports this finding, with a value of -0.819.

Finally, the relationship between unemployment and the other sectors reveals interesting patterns. There is a very strong positive correlation between Unemployment and Agriculture, Forestry and Fishing, with a Pearson's correlation coefficient (*r*) of 0.869. This suggests that higher unemployment rates are associated with a greater contribution of the agriculture sector to GDP. This relationship is highly statistically significant, with a *p*-value of less than 0.001. The Spearman's rho value of 0.812 supports this finding.

Unemployment also has a strong positive correlation with Manufacturing, with a Pearson's correlation coefficient (*r*) of 0.745, indicating that higher unemployment rates are associated with a greater contribution of the manufacturing to GDP. This relationship is statistically significant with a *p*-value of less than 0.001. Spearman's rho is 0.750 further confirms this positive correlation.

However, the correlation between Unemployment and Services is negative, with a Pearson's correlation coefficient (*r*) of -0.729. This suggests that higher unemployment rates are associated with a lower contribution of services to GDP. The *p*-value of less than 0.001 indicates that this negative correlation is statistically significant, and the Spearman's rho of -0.735 confirms this finding.

In summary, the correlation matrix reveals significant relationships between the value added and unemployment in Zambia. The positive correlations between Unemployment and the Agriculture, Forestry and Fishing and Manufacturing sectors suggest that these sectors may not be absorbing labor effectively. In contrast, the negative correlation between Unemployment and the Services sector suggests that a stronger services sector could help reduce unemployment.

Linear Regression Analysis

Table 3 presents the overall model fit measures for the regression analysis examining the relationships between sectoral value added and the unemployment rate. The model has an R value of 0.885, indicating a strong correlation between the predictors and the unemployment rate. The R^2 value of 0.784 suggests that approximately 78.4% of the variance in the unemployment rate is explained by the model. The adjusted R^2 of 0.757 accounts for the number of predictors in the model, providing a more accurate measure of model fit. The F-statistic of 29.0, with degrees of freedom (df1 = 3, df2 = 24) and a *p*-value of less than 0.001 confirms that the model is statistically significant and provides a good fit to the data.

Table 3. Model Fit Measures

				Overall Model Test			
Model	**R**	**R^2**	**Adjusted R^2**	**F**	**df1**	**df2**	**p**
1	0.885	0.784	0.757	29.0	3	24	< .001

Table 4. Omnibus ANOVA Test

	Sum of Squares	df	Mean Square	F	p
Agriculture, Forestry and Fishing, value added (% of GDP)	60.661	1	60.661	19.247	< .001
Manufacturing, value added (% of GDP)	0.657	1	0.657	0.209	0.652
Services, value added (% of GDP)	4.622	1	4.622	1.467	0.238
Residuals	75.639	24	3.152		

Note. Type 3 sum of squares

Table 5. Model Coefficients - Unemployment, total (% of total labor force) (modeled ILO estimate

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept	11.918	9.415	1.266	0.218	
Agriculture, Forestry and Fishing, value added (% of GDP)	0.486	0.111	4.387	< .001	0.6736
Manufacturing, value added (% of GDP)	0.209	0.457	0.457	0.652	0.0794
Services, value added (% of GDP)	-0.161	0.133	-1.211	0.238	-0.1909

Table 4 presents the results of the omnibus ANOVA, which assesses the contribution of each predictor to the overall model. The variable Agriculture, Forestry and Fishing has a sum of squares of 60.661, with a mean square of 60.661 and an F-value of 19.247. The *p*-value of less than 0.001 indicates that this predictor contributes significantly to the model. In contrast, Manufacturing and Services have much lower F-values of 0.209 and 1.467, respectively, with *p*-values of 0.652 and 0.238, indicating that these predictors do not contribute significantly to the model. The residuals, with a sum of squares of 75.639 and a mean square of 3.152, represent the variance not explained by the model.

Table 5 presents the regression coefficients for predicting unemployment based on sectoral value added. The intercept is estimated at 11.918, but it is not statistically significant (p = 0.218). Among the

predictors, Agriculture, Forestry and Fishing has a significant positive relationship with unemployment, with an estimate coefficient of 0.486, a standard error of 0.111, and a t-value of 4.387. The *p*-value of less than 0.001 confirms its statistical significance, and the standardized estimate of 0.6736 indicates a strong effect. In contrast, Manufacturing and Services do not show statistically significant effects on unemployment, with estimated coefficients of 0.209 and -0.161, standard errors of 0.457 and 0.133, and *p*-values of 0.652 and 0.238, respectively. The standardized coefficients for these predictors are 0.0794 and -0.1909, reflecting their small effects compared with Agriculture, Forestry and Fishing.

In summary, the analysis shows that Agriculture, Forestry and Fishing is a significant predictor of unemployment, whereas Manufacturing and Services are not significant predictors of the unemployment rate. Overall, the model fits the date well, with the significant contribution of Agriculture, forestry and Fishing highlighting its important role in shaping employment dynamics in the Zambian economy.

Descriptive on Agriculture, Forestry and Fishing, Manufacturing, Services, and Employment to population ratio

Table 6. Descriptive Statistics on Agriculture, Forestry and Fishing, Manufacturing, Services, and Employment-to-population ratio

	Agriculture, Forestry and Fishing, value added (% of GDP)	Manufacturing, value added (% of GDP)	Services, value added (% of GDP)	Employment to population ratio, 15+, total (%) (modeled ILO estimate)
N	28	28	28	28
Missing	62	62	62	62
Mean	10.4	8.63	50.0	52.9
Median	11.5	8.67	50.1	53.0
Standard deviation	4.99	1.37	4.26	2.33
Minimum	2.86	6.02	39.6	49.2
Maximum	18.2	10.9	56.2	57.2

Table 6 presents the descriptive statistics for sectoral value added and employment-to-population ratio for individuals aged 15 and older. The

table summarizes the mean, median, standard deviation, minimum, and maximum values for these variables.

For Agriculture, Forestry and Fishing, the mean contribution to GDP is 10.4%, with a median of 11.5%. This sector exhibits considerable variability, as indicated by a standard deviation of 4.99 percentage points. Its contribution to GDP ranges from a minimum of 2.86% to a maximum of 18.2%, reflecting the sector's fluctuating performance and its sensitivity to external factors such as weather conditions and market demand.

In the Manufacturing sector, the mean value added to GDP is 8.63%, with a median of 8.67%. The sector exhibits relatively less variability compared to Agriculture, Forestry and Fishing, with a standard deviation of 1.37 percentage points. Its value added ranges from 6.02% to 10.9%, indicating a more stable, although smaller, contribution to total GDP.

The services sector is the largest contributor to GDP, with a mean value of 50.0% and a median of 50.1%. The standard deviation is 4.26 percentage points, indicating moderate variability. Its contribution to GDP ranges from a minimum of 39.6% to a maximum of 56.2%, highlighting its dominant role in the economy and the relative stability of its contribution.

The employment-to-population ratio for individuals aged 15 and older has a mean of 52.9% and a median of 53.0%. The standard deviation is 2.33, indicating moderate variability in the employment-to-population ratio. The ratio ranges from a minimum of 49.2% to a maximum of 57.2%, reflecting variations in employment levels relative to the total population in this age group.

In summary, while the Services sector remains the largest contributor to GDP and exhibits moderate variability, Agriculture, Forestry and Fishing shows substantial fluctuations. The Manufacturing sector is more stable but contributes a smaller share of GDP. The employment-to-population ratio reflects the proportion of the working-age population that is

employed, with a relatively narrow range of values indicating moderate stability in employment levels.

Table 7. Correlation Matrix on Agriculture, Forestry and Fishing, Manufacturing, Services, and Employment-to-population ratio

		Manufacturing, value added (% of GDP)		Agriculture, forestry, and fishing, value added (% of GDP)		Services, value added (% of GDP)		Employment to population ratio, 15+, total (%) (modeled ILO estimate)
Manufacturing, value added (% of GDP)	Pearson's r	—						
	df	—						
	p-value	—						
	Spearman's rho	—						
	df	—						
	p-value	—						
Agriculture, forestry, and fishing, value added (% of GDP)	Pearson's r	0.767	***	—				
	df	26		—				
	p-value	< .001		—				
	Spearman's rho	0.791	***	—				
	df	26		—				
	p-value	< .001		—				
Services, value added (% of GDP)	Pearson's r	-0.780	***	-0.706	***	—		
	df	26		26		—		
	p-value	< .001		< .001		—		
	Spearman's rho	-0.819	***	-0.786	***	—		
	df	26		26		—		
	p-value	< .001		< .001		—		
Employment to population ratio, 15+, total (%) (modeled ILO estimate)	Pearson's r	-0.696	***	-0.866	***	0.703	***	—
	df	26		26		26		—
	p-value	< .001		< .001		< .001		—
	Spearman's rho	-0.729	***	-0.823	***	0.734	***	—
	df	26		26		26		—
	p-value	< .001		< .001		< .001		—

Note. * p < .05, ** p < .01, *** p < .001

Table 7 presents the correlation statistics between sectoral value added and the employment-to-population ratio for individuals aged 15 and older. Specifically, the table examines the relationships among Agriculture, Forestry and Fishing, Manufacturing, Services, and the employment-to-population ratio.

The correlations reveal several statistically significant relationships. The Manufacturing sector has a strong positive correlation with Agriculture, Forestry and Fishing, with a Pearson's correlation coefficient (*r*) of 0.767 and a Spearman's rho of 0.791. Both correlations are statistically significant with *p*-values of less than 0.001. This suggests that increases in the value added of the agriculture sector is closely associated with increases in the value added of the manufacturing sector.

In contrast, the Manufacturing sector has a strong negative correlation with the Services sector. The Pearson's correlation coefficient (*r*) is -0.780, and the Spearman's rho is -0.819, both of which are statistically significant, with *p*-values of less than 0.001. This indicates that as the value added by the manufacturing sector increases, the value added of the services sector to GDP tends to decrease, and vice versa.

The services sector is also negatively correlated with Agriculture, Forestry and Fishing, with Pearson's correlation coefficient (*r*) of -0.706 and a Spearman's rho of -0.786. Both correlations are statistically significant, with *p*-values of less than 0.001, indicating an inverse relationship between the value added of these sectors.

Regarding the employment-to-population ratio, there are notable correlations with each sector. The employment-to-population ratio has a strong negative correlation with Manufacturing, with Pearson's correlation coefficient (r) of -0.696 and a Spearman's rho of -0.729, both of which are statistically significant, with *p*-values of less than 0.001. This suggests that as the added value of the manufacturing sector increases, the employment-to-population ratio tends to decrease.

The employment-to-population ratio also has a strong negative correlation with Agriculture, Forestry and Fishing, with Pearson's correlation coefficient (r) of -0.866 and a Spearman's rho of -0.823. This strong inverse relationship suggests that higher value added of the agricultural sector is associated with a lower employment-to-population ratio.

Conversely, the employment-to-population ratio is positively correlated with Services, with a Pearson's correlation coefficient (r) of 0.703 and a Spearman's rho of 0.734. Both correlations are statistically significant with *p*-values of less than 0.001, suggesting that an increase in value added of the services sector is associated with a higher employment-to-population ratio.

In summary, the correlations reveal complex relationships among these variables. Manufacturing and Agriculture, Forestry and Fishing are positively correlated with each other but negatively correlated with Services sector and the employment-to-population ratio. In contrast, the services sector is negatively correlated with Agriculture, Forestry and Fishing and Manufacturing, but positively correlated with employment-to-population ratio. These findings provide insights into how different sectors of the economy are associated with employment outcomes in Zambia.

Linear Regression Analysis

Table 7 presents the model fit measures for the linear regression analysis examining the relationship between sectoral value added and the employment-to-population ratio for individuals aged 15 and older. The model shows a good overall fit, with an R value of 0.876, indicating a strong correlation between the predictors and the employment-to-population ratio. The R^2 value of 0.767 suggests that approximately 76.7% of the variance in the employment-to-population rate is explained by the model. The adjusted R^2 of 0.738 accounts for the number of predictors in the model, providing a more accurate measure of its explanatory power. The F-statistic of 26.4, with degrees of freedom (df1 = 3, df2 = 24) and a *p*-value of

less than 0.001 confirm that the model is statistically significant and fits the data well.

Table 7. Model Fit Measures

				Overall Model Test			
Model	**R**	**R^2**	**Adjusted R^2**	**F**	**df1**	**df2**	**p**
1	0.876	0.767	0.738	26.4	3	24	< .001

Table 8. Omnibus ANOVA Test

	Sum of Squares	df	Mean Square	F	p
Agriculture, forestry, and fishing, value added (% of GDP)	31.8984	1	31.8984	22.4181	< .001
Manufacturing, value added (% of GDP)	0.0645	1	0.0645	0.0454	0.833
Services, value added (% of GDP)	2.1466	1	2.1466	1.5086	0.231
Residuals	34.1493	24	1.4229		

Note. Type 3 sum of squares

Table 9. Model Coefficients - Employment to population ratio, 15+, total (%) (modeled ILO estimate)

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept	50.5352	6.3260	7.988	< .001	
Agriculture, forestry, and fishing, value added (% of GDP)	-0.3523	0.0744	-4.735	< .001	-0.7538
Manufacturing, value added (% of GDP)	0.0654	0.3070	0.213	0.833	0.0384
Services, value added (% of GDP)	0.1099	0.0895	1.228	0.231	0.2008

Table 8 presents the results of the Omnibus ANOVA, which assesses the contribution of each predictor to the overall model. Agriculture, Forestry and Fishing has a sum of squares of 31.8984, with a mean square of 31.8984 and an F-value of 22.4181. The *p*-value of less than 0.001 indicates that this predictor contributes significantly to the model. In contrast, Manufacturing and Services have much lower F-values of 0.0454 and 1.5086, respectively, with corresponding *p*-values of 0.833 and 0.231. These results suggest that Manufacturing and Services do not contribute significantly to the model, indicating that their association with the employment-to-population ratio is weaker than that of Agriculture, Forestry and Fishing.

Table 9 presents the regression coefficients for predicting the employment-to-population ratio based on the sectoral value added. The intercept is estimated at 50.5352, with a standard error of 6.3260 and a t-value of 7.988, which is statistically significant (*p*-value of less than 0.001). This represents the estimated employment-to-population ratio when all predictors are equal to zero.

Among the predictors, Agriculture, Forestry and Fishing has a significant negative association with the employment-to-population ratio, with an estimate of -0.3523, a standard error of 0.0744 and a t-value of -4.735. The *p*-value of less than 0.001 confirms its statistical significance, and the standardized coefficient of -0.7538 indicates a strong inverse relationship. This suggests that higher value added of the agricultural sector is associated with a lower employment-to-population ratio.

In contrast, Manufacturing and Services are not significant predictors of employment-to-population ratio. The estimated coefficient for Manufacturing is 0.0654, with a standard error of 0.3070 and a t-value of 0.213, and a *p*-value of 0.833, indicating no statistically significant association. Similarly, the estimated coefficient for Services is 0.1099, with a standard error of 0.0895, and a t-value of 1.228, and a *p*-value of 0.231, indicating no significant association.

In summary, the analysis indicates that Agriculture, Forestry and Fishing is a significant predictor of the employment-to-population ratio, whereas manufacturing and Services are not significant predictors. The strong model fit and significant contribution of Agriculture, Forestry and Fishing highlight its important role in shaping employment dynamics in the Zambian economy.

Discussion

The analysis provides a comprehensive understanding of how different economic sectors —Agriculture, Forestry and Fishing, Manufacturing, and Services— are associated with unemployment and employment outcomes in Zambia. The results reveal several key insights

into the relationships among these sectors and labor market outcomes. The findings indicate that the Agriculture, Forestry and Fishing has a significant, positive association with the unemployment rate. As agricultural value added increases, unemployment rates also tend to increase. This suggests that growth in the agricultural sector may not translate effectively into job creation, possibly because of factors such as low productivity or the large informal sector. This finding is consistent with that of Katongo et al. (2024), who reported that although agriculture plays an important role in Zambia's economy, its capacity to absorb labor and generate employment remains limited.

In contrast, Manufacturing and Services are not significant predictors of unemployment. The lack of statistically significant associations for these sectors suggests that their value added does not explain variations in the unemployment rates. This observation differs from that of Moyo and Jeke (2019), who reported a positive correlation between manufacturing value added and economic growth in Africa. Their results suggest that although manufacturing remains an important driver of economic growth, its relationship with unemployment rates may be less direct or shaped by other structural factors.

Employment-to-Population Ratio

The study also highlights the relationship between these sectors and the employment-to-population ratio. There is a strong negative association between the value added by Agricultural, Forestry and Fishing and the employment-population ratio. This suggests that higher agricultural value added is associated with a lower employment-to-population ratio, indicating that growth in the agricultural sector may not translate into higher employment levels as expected. This finding is consistent with that of Alston and Pardey (2014), who emphasized that despite advances in agriculture, its declining share of the global economy has a limited role in job creation.

Conversely, the Services sector is positively associated with the employment-to-population ratio, suggesting that higher value added in the services sector is associated with higher employment levels. This finding is consistent with that of Ndulo and Chanda (2016), who reported that the services sector has been a major driver of economic growth and employment in Zambia. In contrast, Manufacturing is not a significant predictor of the employment-to-population ratio, suggesting that its value added is not significantly associated with this labor market indicator. This finding contrasts with that of Haraguchi et al. (2017), who highlights the importance of the manufacturing sector in driving economic growth, although its relationship with employment may vary.

Sectoral Interactions

The relationship among the sectors reveals important labor market dynamics. For example, higher agricultural value added is associated with lower employment-to-population ratios, whereas higher value added in the Services sector is associated with higher employment-to-population ratios. This contrast highlights the different ways in which these sectors are associated with labor market outcomes. The negative association between Agriculture, Forestry and Fishing and the employment-to-population ratio may reflect structural challenges or limited labor absorptive capacity, consistent with Herrendorf et al.'s (2014) analysis of structural transformation and sectoral contributions. In contrast, the positive association between Services and the employment-to-population ratio may reflect the sector's greater potential to generate diverse employment opportunities, a finding consistent with Szirmai (2013), who emphasized the growing importance of the services sector in economic development.

Policy Implications

The findings have important implications for policy and economic strategy. Policies aimed at increasing agricultural productivity and diversification may help address high unemployment, particularly in regions heavily dependent on agriculture. Improving the efficiency of the

agricultural sector may also help mitigate adverse labor market outcomes. This recommendation is consistent with Ketu and Ningaye (2024), who advocate agricultural mechanization to facilitate movement of labor into more productive sectors. In addition, expanding the Services sector may contribute to improved employment outcomes, suggesting that policies supporting service-based industries could represent an effective strategy for job creation. This recommendation is consistent with that of Ndulo and Chanda's (2016), who emphasized strengthening the Services sector to promote economic growth and employment.

Overall, the analysis highlights the need for a balanced approach to economic planning that takes into account the different relationships between each sector and labor market outcomes. A strategic focus on increasing productivity in Agriculture, Forestry and Fishing while supporting growth in the Services sector may provide a more comprehensive approach to addressing Zambia's labor market challenges. This recommendation is consistent with the findings of Szirmai (2013) and Haraguchi et al. (2017), who emphasized the importance of sectoral development in improving labor market outcomes.

Future Research Directions

Future research should examine the factors underlying the negative association between Agriculture, Forestry and Fishing and the employment-to-population ratio, as well as the mechanisms through which the Services sector is associated with this labor market indicator. In addition, future studies could examine the role of technological progress and sectoral innovation in shaping labor market outcomes. Research could also be expanded to include comparative analysis across countries to validate these findings and provide a broader understanding of the relationship between sectoral value added and labor market outcomes, consistent with Grabowski and Self's (2021) call for roader regional comparisons to better understand economic dynamics.

Conclusion

The analysis underscores the distinct relationships between Agriculture, Forestry and Fishing, Manufacturing, and Services and Zambia's labor market outcomes. The positive association between agricultural value added and the unemployment rate suggests that growth in the agricultural sector may not translate effectively into job creation, possibly due to low productivity or the large informal sector. The positive association between Services and the employment-to-population ratio highlights the sector's potential contribution to employment, reflecting the broader global shift toward service-oriented economies. In contrast, Manufacturing is not a significant predictor of either the unemployment rate or the employment-to-population ratio, suggesting that its current contribution is not significantly associated with this labor market indicators. The findings underscore the need for targeted policies to improve agricultural productivity and support the expansion of the Services sector. Future research should examine the mechanisms underlying these relationships and explore the role of innovation and technological progress in shaping labor market outcomes. Overall, this study provides valuable insights for policymakers and economic planners seeking to optimize sectoral development and improve labor market outcomes in Zambia.

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