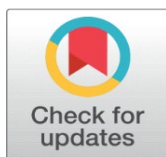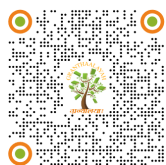# EFFECT OF POPULATION DYNAMICS ON ECONOMIC GROWTH IN TANZANIA: 1990-2022

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ABSTRACT

The study analysed the correlation between population dynamics and economic expansion in Tanzania using time series information covering from 1990 - 2022. The study was influenced by persistent population growth in the country. Comprehending this matter will offer a dependable basis for formulating development policies. The author sought to determine the effect of crude birth rate, crude death rate and net migration on her economic growth. VECM was employed for estimation. Stationarity test results demonstrated that variables became stationary after being differentiated twice and cointegration test results detected that the variables were cointegrated at rank 5 which compelled the use of the Vector Error Correction Model (VECM). The VECM findings showed that the long-term expansion of the economy is significantly affected by population dynamics. Moreover, crude birth rate positively affects economic growth while crude death rate and net migration negatively affect economic growth. The study recommends that the government should control the outflow of Tanzanians to other countries to avoid loss of human resources, the government is supposed to pump in more resources on the health sector to minimize and delay mortalities thus increasing output growth and the government must ensure that birth rate is controlled although it is positively related with economic growth, precaution must be observed.

Keywords: Population Dynamics, Economic Growth, VECM, Tanzania

1. INTRODUCTION

Tanzania's population stood at approximately 61.7 million people in 2022, up from 44.9 million in 2012. The country has witnessed significant population growth over the past decade, boasting an average annual growth rate of 3.2 percent between 2012 and 2022 NBS (2022). However, future projections, such as those for the years 2044 (123.5 million people) and 2050 (151.3 million people) NBS (2022). The trend emphasise the urgency of addressing population growth. This substantial population not only complicates planning for national development but also poses serious risks to the overall economic growth of the nation. Consequently, population

dynamics have raised concerns regarding their impact on the country's economic growth.

Similar to many emerging economies globally, Tanzania has implemented various economic policies to improve the quality of life for its citizens and ensure sustained economic growth and development. With abundant natural resources such as coal, natural gas, gold, timber, and more, along with a substantial population, Tanzania ranks sixth in Africa by population size, according to the World Bank (2014). However, any significant economic growth plan must carefully consider population factors, particularly for a nation with such a sizable population.

The famous work publication "An Essay on the Principle of Population" Malthus (1978) is credited with demonstrating the connection between population growth and economic expansion. Aidi and Ngwudiobu (2016). The population of Tanzania has been steadily increasing throughout the years. However, evidence from the Bank of Tanzania. (2022) revealed that economic growth has been fluctuating over time. For example, in 2019 and 2022 economic growth rate was 7 and 4.8 percent respectively. According to World Bank, the birth rate steadily decreased from 49 births to 35 births per 1000 population between 1990 to 2022 and the death rate has relatively decreased from 19 deaths to 6 deaths per 1000 population. Perhaps as a result of nations improving their total medical services, natality and mortality rates have started to drop. Additionally, there is an uneven migration trend, with both entry and emigration of individuals from the nation. Drinkwater et al. (2003) argued that because motivated and educated individuals are typically more likely to relocate in quest of chances, migration may drain away prized abilities. It is estimated that as of 2000 about 215.5 thousand Tanzania people dwelled and worked in other countries and the number of emigrants progressively increased to over 327.8 thousand in 2020 who could have contributed to the development of Tanzania but their knowledge and intelligence are being used to contribute to the growth of other nations.

The Asian Development Bank (1997) asserts that several factors contribute to economic growth, including trade policy, investments, capital accumulation, health and education spending, savings within the country, and technological breakthroughs. Nevertheless, demographics have emerged as a major factor in determining economic growth, according to economists Bloom and Sevilla (2001).

Klasen and Lawson (2007) argues for negative impact. According to Savas. (2008), population dynamics have a favourable impact on economic expansion. On the other hand, some academics assert that there is no relationship between population dynamics and economic growth Liddle (2003). Similarly titled studies carried out in Tanzania have yielded varying conclusions. For instance, Loiboo and Osoro (2021) who employed VAR, discovered a strong and positive relationship between population growth and economic growth throughout the analysis, while Ishumael and Akarro (2022), who applied ARDL, discovered a Tanzania's population growth and economic growth are negatively correlated.

Population dynamics is important to be studied for promoting sustainable economic growth and development and improving the quality of life for Tanzanians. Based on the trend of population dynamics in Tanzania particularly for the period of 10 years back, there is an increase of more than 16.8 million people from 44.9 to 61.7 million people NBS (2022). This raises an important question: To what degree do population dynamics impact economic growth?

The Tanzanian population has been increasing to an alarming threshold. This is a very telling statistical reality if left unchecked over time it can constrain socio-economic growth sustainability depending on the government's policy in place. The

implications can be persistent increase of unemployment low life expectancy due to poverty rate caused by low per capita income and decrease of the natural resources. Moreover, social service provisions like health, education and clean water supply may be jeopardised by too huge population. It is in this regard therefore; By deploying Vector Error Correction Model, the current study aimed to analyse the effect of population dynamics on economic growth in Tanzania between 1990 - 2022.

1.1. MAIN OBJECTIVE

The study aimed to analyse the effect of population dynamics on economic growth in Tanzania.

1.2. SPECIFIC OBJECTIVES

1) To determine the effect of crude birth rate on economic growth in Tanzania
2) To find out the effect of crude death rate on economic growth in Tanzania
3) To estimate the effect of net migration on economic growth in Tanzania

1.3. RESEARCH HYPOTHESIS

In light of the specific objectives and the statement of the problem, the study intended to test the following null hypothesis;

1) Ho: There is no significant link between the crude birth rate and economic growth in Tanzania
2) Ho: There is no significant link between the crude death rate and economic growth in Tanzania
3) Ho: There is no significant link between the net migration and economic growth in Tanzania

2. LITERATURE REVIEW

This study reviewed two theoretical learning which were Malthus's theory (classical and Solow's growth theory (neo-classical). According to Malthus's theory, the economic growth of a nation may decline with an increase in population and limited resources. Food would expand at an arithmetic pace (for example, 1, 2, 3, 4... th) due to significantly diminishing returns to increasing scarce land, whereas population would grow at a geometric rate (i.e., 2, 4, 8, 16... th) mostly due to lack of conscious restrictions on fertility (Malthus, 1798). Starvation, fatalities, and a shortage of food would be the result.

The neo-classical growth model Solow (1956) concurred that rapid technological advancement promotes economic expansion and advancement. Labour and capital are not the only factors contributing to economic progress. Solow posits that economic growth is contingent upon three factors: advancements in technology, capital accumulation, and labour growth.

Hakeem and Ikenna (2016) Using time-series data covering the years 1970–2014, examined the connection between Nigeria's economic expansion and population demographics. The data analysis method employed was the OLS estimation methodology. The findings show that during the studied period, net migration, fertility, and mortality had a negative relationship with economic growth. The analysis goes on to show that domestic savings and total stationary capital

creation are significant contributors to Nigeria's economic expansion. The report finds that immediate action should be taken by the Nigerian government to reduce the worrying fertility rate. To raise productivity in Nigeria, more money should be invested in education and skill-building initiatives to enhance the caliber of the country's labor force.

Degu (2020) analysed the correlation between economic growth and population increase in Ethiopia, second populated country in Africa devoted time to studying disagreement among economists and academics regarding how population increase and economic expansion interact in Ethiopia, second populated country in Africa Using annual time series data from 1981 to 2018 with estimation techniques namely unit root tests (the Augmented Dickey Fuller, Phillips-Perron) ARDL, Cointegration and Toda-Yamamoto Causality tests approaches are used to study how population increase and economic expansion interact. Results show that, the bound test cointegration approach demonstrates a sustained partnership between population increase and economic expansion meanwhile estimations from the ARDL model show population dynamics have a short- and long-term negative and considerable impact on economic growth. It is therefore suggested to the relevant body that anti-natal policies, which discourage the fertility rate, be reconsidered to supplement with policies for economic growth.

Rizk (2018) "Does demographic transition matter for economic growth"? was studied in the economy of Egypt third populated country in Africa with population of working age, Domestic saving, tertiary enrolment, trade openness and GDP per capita as independent variables with economic growth being the dependent variable. An expanded exogenous Solow-Swan growth model was used along with a time series framework from 1971 to 2015, estimation technique was multivariate cointegration analysis. One of the main findings was that, both in the short and long term, the rise of the working-age population was beneficial and stimulated GDP per capita. For Egypt to benefit from the demographic dividend, it is recommended therefore, the age structure of the population must be prioritised.

Akintunde and Oladeji (2013) conducted a study about how death and fertility have affected Sub-Saharan African economic growth between 1970 and 2005. In contrast to other parts of the world, Sub-Saharan Africa has a peculiar combination of rapid population increase and slow economic growth. The study used dynamic panel data analysis and pooled OLS. The findings indicate that while There was a benefit to the crude birth death rate on economic growth, the total fertility rate had a negative impact. If the region wants to have sustained economic progress, it must address the high rate of population dynamics, the study concluded.

Loiboo and Osoro (2021) employed vector auto-regression (VAR) to analyse annual time series data from 1971 to 2017 to test the following theories regarding the connection between economic expansion and population growth: the first theory maintains that population dynamics promotes economic growth, the second theory maintains that population dynamics hurts economic growth, and the third school of thought maintains that population growth is unrelated to economic growth and is determined in ways other than those predicted by standard conventional growth models.

Results indicate that economic shocks due to population dynamics are positive and negative. Moreover, there are both short and extended correlations among population increase and economic expansion. The study recommends a methodically planned population dynamics strategy as well as the institutional and policy improvements that will ensure that the population and economy are enhancing each other without worries that the country's population dynamics will

cause famines and a lack of further socio-economic resources. The government must also make sure that economic growth outpaces population growth. By doing this, it will be possible to meet the expanding demand for services brought on by population dynamics. Economic benefits from having a larger, healthier, and better-educated workforce will only materialize if the additional people can find employment. Countries may be able to benefit from their demographic shift if they have open economies, adaptable labour markets, and modern institutions that can win over the public's confidence.

Ishumael and Akarro (2022) investigated the causal association among the population dynamics and expansion of the economy between 1980 – 2019 by applying time series information on an annual basis obtained from the World Bank. The Granger causality test and the cointegration test were used to determine whether the dynamics of population increase and economic growth are correlated over the short or long term. The findings indicate that whereas other parameters including population dynamics, total capital creation, government spending, rate of fertility, crude death rate, dependence percentage, and an increase of foreign direct investment hurt economic growth, trade openness has a positive effect.

The only variable that is correlated with the dependent variable both over the long and short terms is trade openness, the findings showed that there is no long-term association between the variables. Thus, population dynamics have a detrimental impact on Tanzania's economic expansion. As stated by study's findings, the report suggests that to reduce the dynamics of population increase, the government should be directed to give family planning policies top priority. Increasing trade openness by creating opportunities both domestically and internationally will facilitate the flow of resources more efficiently and increase the availability of goods and services.

Research Gap

The variable gap, to the best knowledge of the researcher of this study, none of the studies on similar topics in the Tanzanian space has included net migration. Therefore, the study was planned to bridge the identified gap in the literature about the impact of population dynamics on economic expansion in Tanzania.

3. METHODOLOGY OF THE STUDY

The study sought to determine how population dynamics (captured by crude birth rate, crude death rate and net migration) relate to economic growth (using gross domestic product as a proxy) using data spanning from 1990 - 2022. The control variables included in this study were trade openness, foreign direct investment (movement of people cause population fluctuations) and savings is incorporated as an underlying cause of GDP. The study applied Vector Error Correction Model. Data were analysed by using STATA a computer software for data analysis. The researcher used a quantitative approach that made it possible to apply econometric statistical techniques.

Since the study used time series data, a quantitative correlational research design was appropriate for this study that enabled to apply mathematical theories, models and hypotheses to describe the situation under study. In addition, ethical considerations were observed such as providing relevant citations Kothari (2004).

Neo-classical growth theory served as the study's compass Solow (1956). This is because, according to Akintunde and Oladeji (2013) the theory provides a thorough examination of demographic variables in the analysis of growth in any

economy. Neo-classical economists hold the view that positive economic outcomes and population increase are tied to technological advancements. Moreover, the theory maintains that there are two methods to enhance total output: either by increasing savings or by slowing down the rate of population growth. Following Framework was established to conceptualise the interrelationship between dependent and independent variables.
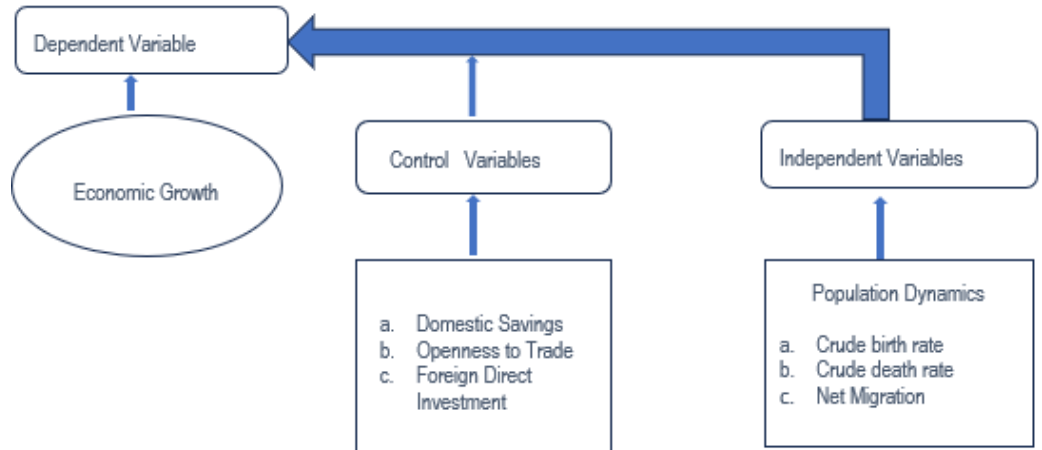
The following is the neoclassical growth theory's aggregate production function:

$$Y = P f (K, L) \dots\dots\dots\dots\dots i$$

Where:

Y = (GDP)

L = the quantity of workers

K = capital reserve and

P = factor of productivity (i.e., exogenously determine the degree of technological advancement).

The study used the neo-classical growth model in which the vector of all other variables that can affect economic growth, as well as the vector of variables that are used to represent population dynamics, or the forces that influence population change are included as a component of the demographic factor (P) as well as the control variable (C) correspondingly. The total work force is removed from the model because there is no trustworthy data for total labour in Tanzania for the time frame being examined. Once more, take note that GDP and domestic savings are employed as stand-ins for economic growth and capital reserve. As a result, equation 1 is reformulated as follows:

$$GDP = f (P, DOMESTIC\ SAVINGS, C) \dots\dots\dots\dots 2$$

Therefore, equations 3 and 4 define the population component (P) and control variable (C) correspondingly:

$$P = f (CBR, CDR, NM) \dots\dots\dots\dots 3$$
$$C = f (OT, FDI) \dots\dots\dots\dots 4$$

Domestic savings was a control variable since it is an underlying cause of GDP also openness to trade and foreign direct investment involves cross-border movement of people that cause dynamics in population size.

Where;

CBR=crude birth rate (live births per 1000 people as its proxy)

CDR =crude death rate (mortality rate per 1000 people as its proxy)

NM=net migration (defined as immigration minus emigration as its proxy)

DS=domestic savings (a structural variable) total domestic saving in the economy percent of GDP. It serves as a proxy of national capital reserve used for the productivity of output

OT = openness to trade

FDI=foreign direct investment

Understanding Tanzania's population dynamics and economic expansion between 1990 - 2022 was the main goal of this study. Equation 2 when combined with equations 3 and 4 resulted in the operational version of our model, which was represented here under:

$$GDP=f (CBR, CDR, NM, DS, OT, FDI) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 5$$

[Gujarati and Porter (2009)](#) advise the use of a log-linear model in determining every economic variable's growth rate. By this advice, equation 5 was written as follows in log form:

$$lgGDP = f (lgCBR, lgCDR, lgNM, lgDS, lgOT, lgFDI) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 6$$

Equation 6's econometric form was written as the following equation 7 (noting that all variable measurements are in rates hence, natural Logarithms are not applied).

$$GDP_t = \beta_o + \beta_1 CBR_t - \beta_2 CDR_t - \beta_3 NM_t + \beta_4 DS_t + \beta_5 OT_t + \beta_6 FDI_t + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots 7$$

To establish the link between population dynamics and economic growth, the above (equation 7) was estimated using Vector Error Correction Model. 0.05 is the choice level of significance for all tests because is relevant and most appropriate for social science studies.

4. FINDINGS AND DISCUSSION
4.1. STATIONARITY TEST

A stationarity test was performed for each variable used in the analysis as a necessary step to prevent erroneous

regression. It should be possible to ascertain from this test whether or not these variables' variance and mean values

change over time. In this investigation, the widely used Augmented Dickey-Fuller (ADF) test *was utilized. Findings

indicated that the variables needed to be differentiated twice to become stationary because they were not

stationary at the level and the first difference. The hypotheses tested were;

Ho: The variables are not stationary

H_1: The variables are stationary

Decision Rule: The variables are statistically significant (i.e., stationary) at the 5 percent significance level since the t-value (in absolute terms) of -2.986 is more than 2 and the MacKinnon approximation p-value for z(t) 0.0000 is lower than 0.05. As a result, the null hypothesis was rejected.

Table 1

Table 1 Results of Stationarity Test (at Second Difference)				
Variable	Test statistic	Critical value	P value Z(t)	I (d)
GDP	-10.910	-2.986	0.0000	I (2)
CBR	-5.286	-2.986	0.0000	I (2)
CDR	-5.302	-2.986	0.0000	I (2)
NM	-5.299	-2.986	0.0000	I (2)
DS	-10.420	-2.986	0.0000	I (2)
OT	-7.161	-2.986	0.0000	I (2)
FDI	-12.328	-2.986	0.0000	I (2)
Critical Value -2.989 at 5%				

Source Author (2023)

Table 1 shows that all the variables became stationary after being differentiated twice since values in the test statistic for each variable were greater than the critical value (-2.986) and the p-value for all the variables was less than 0.05 level of significance implying that all the variables were stationary.

4.2. TEST OF COINTEGRATION

Two order integration of the variables raises sufficient doubts about cointegration. If two or more variables have an equilibrium or long-term relationship, they are said to be cointegrated Engle and Granger (1987). When two variables are cointegrated, the stochastic trend between the two series is cancelled out by their liner combination so, the regression of the two variables is meaningful and not erroneous Gujarati (2004). The hypotheses tested were;

Ho: There is no sustained correlation between the independent and dependent variables.

H_1: There is sustained long-term correlation between the independent and dependent variables

Decision rule: If an asterisk sign (*) appears in the column of the trace statistic shows that the regressant cointegrates with the regressors

Table 2

Table 2 Results of Johansen Cointegration Test					
Maximum				Trace	5% critical
Rank	Parm	LL	Eigenvalue	Statistic	value
0	56	-165.86359	.	216.7558	124.24
1	69	-135.38693	0.86002	155.8025	94.15
2	80	-107.74482	0.83193	100.5183	68.52
3	89	-85.762638	0.75785	56.5539	47.21
4	96	-73.107325	0.55801	31.2433	29.68
5	101	-62.19758	0.50533	9.4238*	15.41
6	104	-57.677285	0.25296	0.3832	3.76
7	105	-57.485686	0.01229		

Note: At the 5% significance level, an asterisk * denotes the null hypothesis' rejection.
Source: Author (2023)

Table 2 demonstrates the rejection of the null hypothesis (Ho), which states that "there is no cointegrating equation," and suggests the existence of five cointegration equations, as shown by the asterisk (*) in the trace statistic (9.4238*), which uses five lag lengths at the critical value (15.41) at the five percent significance level. Because of their stationarity, the dependent and independent variables can only have short- and long-term associations established by running a Vector Error Correction Model.

Table 3

Table 3 VECM Speed of Adjustment Results						
Sample: 1993 - 2022				No. of obs	= 30	
Log likelihood = 11.08188				AIC	= 7.127875	
Det (Sigma_ml) =1.13e-09				HQIC	= 8.891011	
				SBIC	= 12.63925	
	Coef.	Std. Err.	Z	P>|z|	[95% Conf. Interval]	
D_gdp_ce1 L1.	-1.216244	0.3101737	-3.92	0.000	-1.824173	-.6083143

Source: Author (2023)

Table 3 shows that the VECM (-cel Ll) indicated a negative coefficient of (-1.216244), which is greater than 1 and is statistically significant (0.000) at the 5 percent significance level implying that dependent and independent variables oscillatoraly adjusts to steady state equilibrium. The negative sign shows the presence of the speed of adjustment of dependent and independent variables towards equilibrium.

Table 4

Table 4 VECM Long-run Johansen normalization Estimates Results						
Beta	Coef.	Std. Err.	Z	P>|z|	[95%	Conf. Interval]
_ce1 GDP	1	.	.	.	.	.
cbr	1.32487	.0299647	-44.21	0.000	-1.383599	-1.26614
cdr	-.5234815	.0352219	14.86	0.000	.4544478	.5925151
nm	1.162132	.0251716	-46.17	0.000	-1.211468	-1.112797
ds	.1294	.0069844	-18.53	0.000	-.1430891	-.1157109
ot	-.2157551	.0026401	81.72	0.000	.2105807	.2209296
fdi	.6606158	.0192197	-34.37	0.000	-.6982858	-.6229458
cons	-42.4059	.	.	.	.	.

Source: Author (2023)

Table 4 shows that in the long-term population dynamic significantly affect economic growth since their corresponding p-values (0.000) are less than 0.05 level of significance but short-term estimates were statistically insignificant.

4.3. REGRESSION RESULT AND INTERPRETATION

Equation 7, which estimates our model will yield a dependable and constant result rather than a spurious one since the cointegration test results proved that

there was of a long-term correlation among the regressant and regressors of this research Gujarati and Porter (2009). The following were the regression's results:

Table 5

Table 5 Synopsis of Findings for the Study's Estimated Model (Equation 7) Regressant GDP						
GDP	Coef.	Std. Err.	t-	P>| t |	[95% Conf.	Interval]
CONS	-22.34147	10.30963	-2.17	0.040	-43.53322	-1.149725
CBR	1.102733	.33077	3.33	0.003	.4228257	1.782641
CDR	-1.180566	.3268072	-3.61	0.001	-1.852328	-.5088045
NM	-.7027019	.3152406	-2.23	0.035	-1.350688	-.0547155
DS	-.1012689	.0827954	-1.22	0.232	-.2714573	.0689196
OT	-.0410377	.0308226	-1.33	0.195	-.1043944	.022319
FDI	-.1*309448	.260265	-0.50	0.619	-.6659271	.4040375

Prob > F   = 0.0000
R-Squared   = 0.6956
Adj R-squared   = 0.6254
Root MSE   = 1.2146
Source: Author (2023)

Estimated Empirical Model

GDP = -22.34147+1.102733**CBR**-1.180566   **CDR**-.7027019**NM**-.1012689**DS**-.0410377**OT**-.1309448**FDI**

Std. Err. (10.310)   (0.331)   (0.327)   (0.315)   (0.083)   (0.031)   (0.260)

p-value (0.040)   (0.003)   (0.001)   (0.035)   (0.232)   (0.195)   (0.619)

Constant: When the values of all explanatory variables are zero, the intercept term clarifies or forecasts the value of the regressant (GDP). There is no clear (meaningful) economic significance to be inferred from the intercept term's coefficient (-22.34147) which is negative and statistically significant (t-statistics of -2.17 and P-value of 0.040).

Crude Birth Rate: Considering t-vale (3.33) which is greater than 2 and p-value (0.003) which is less than 0.05. The output showed that the intercept of this variable (1.102733) is positive and statistically significant. It suggests that, if all other variables remain constant, a one percent rise in the crude birth rate will on average boost economic expansion by about 1.1 percent. This validates the results of Ogunbadejo and Zubair (2021) and conforms to the prior sign of expectation.

Crude Death Rate: It was discovered that the mortality rate was statistically significant and correlated adversely with GDP, the regressant. The P-value, t-statistics, and coefficient are, in that order, 0.001, -3.61, and -1.1800566. It can be deduced that a one percent increase in the death rate is anticipated to result in an average reduction of 1.18 percent in GDP while keeping all other factors fixed. Ishumael and Akarro (2022) found similar results in Tanzania. Also, Turtiyus and Peter (2015) got the same results in Nigeria.

Net migration: The intercept, t-statistics and P-value of -0.7027019, -2.23 and 0.035 correspondingly demonstrated that, when it comes to the study of economic growth, net migration is a statistically relevant variable. Well, it is also important to remember that the variable's inverse relationship with economic growth is explained by the negative coefficient, as shown. Consequently, assuming all other factors remain equal, GDP is predicted to decline by 0.7 percent for every 1 percent

rise in net movement. This outcome is especially consistent with the study of Hakeem and Ikenna (2016).

Domestic savings: As can be seen from the above table, the intercept of this variable is -0.1012689; the P-value is 0.232, and the t-statistics are -1.22. This variable is statistically unimportant (as seen by the P-value and t-statistics). This implies that domestic savings is not a strong driver of economic growth in Tanzania.

Openness to Trade: Openness to trade and the dependent variable (GDP) have a negative connection, as demonstrated by the minus sign of the coefficient (-0.0410377) for this variable. This suggests that the economy of Tanzania would have benefited economically from the lifting of trade barriers, but the P-value (0.195) and the t-statistics (-1.33) demonstrate that the variable has no statistically significant impact on economic growth in Tanzania.

Foreign Direct Investment: The sign of the intercept (-0.1309448) demonstrates that it is negatively connected with regressant (GDP). The t-statistics (-0.50) and the P-value (0.619) show that the variable is statistically insignificant in the model. Thus, foreign direct investment does not trigger economic growth in Tanzania.

R-Squared: Based on the outcome that the goodness of fit metric is 0.6981 (i.e., 70 percent). The proportion of the regression of variability that is impacted by the regressors is explained by the R-squared. According to this model, the regressors (CBR, CDR, NM, DS, OT, and FDI) account for about 70 percent of the variation in GDP with other factors which cause GDP growth accounting for the remaining 30 percent.

F-Statistics (F-test): The likelihood value of the F-test, also known as the F-statistics, allows us to evaluate if the model as a whole is statistically significant. The table's likelihood value (i.e., Prob of F-stat) from the table is 0.0000. Given that the probability of the F-statistic is less than 0.05 percent, this suggests that the model is statistically significant.

5. CONCLUSION AND RECOMMENDATIONS

The primary goal of the research was to analyse the effect of population dynamics on economic expansion in Tanzania. According to findings, population dynamics had a significant long-term correlation with economic expansion. However, in the short run crude birth rate, crude death rate and net migration were statistically insignificant. The regression analysis revealed that the crude birth rate positively affects economic growth which means an increase in the number of births caused economic growth to increase while the crude death rate and net migration were negatively affecting economic growth which implies that an increase in crude death rate and net migration decreased economic growth in Tanzania.

Generally, the null hypothesis which stated that population dynamics do not affect economic growth was rejected, meaning that in the long run, changes in the headcount of individuals affect economic growth in Tanzania. These results are locked up together with the neoclassical growth theories which believe that population increase has a positive impact on economic expansion Solow (1956). Meanwhile, the results contradict classical theories which believed increased population is detrimental to economic growth Malthus (1798). Aligning the results, the recommendations that follow are based on this study.

Since encouraging a high birth rate can lead to negative outcomes like competition for resource extraction, usage and unemployment challenges, a precaution must be observed, the government must ensure that the birth rate is

controlled although it is positively related to economic growth. The government is supposed to allocate more resources to the health sector to minimize and delay mortalities to increase productivity as results have confirmed that death rates significantly reduce economic growth. Appropriate measures are to be enforced to control the outflow of Tanzanians to other countries to avoid loss of human resources like engineers and doctors among others which drags back output growth and provision of quality service within the country.

Finally, future studies should also focus on other econometric tests such as Machine Learning Techniques and Bayesian Modelling among others.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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