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Empirical Investigation of the Determinants of Tanzania's National Savings

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Abstract

Understanding the nature of national savings behavior is critical in designing policies to promote savings and investment which in turn enhance economic growth through capital formation. This paper empirically examines the determinants of savings in Tanzania for the 1970-2010 period. The conceptual framework for the paper is derived from the life-cycle/permanent income hypothesis. Augmented Dickey Fuller and Phillips-Perron tests are used to test stationarity of all time series. To test long-run relationship of the variables, Johansen test is applied. The results reveal that disposable income, real GDP growth, population growth and life expectancy have a positive impact on savings in Tanzania. The results also reveal that inflation, has a negative impact on national savings. Furthermore, the paper establishes the direction of causality between national savings and economic growth. The results on this causal relationship suggest that real GDP growth causes national savings and not otherwise. This implies that that policies geared towards real GDP growth rate should be given first priority if the national savings trend is to be enhanced over time. Furthermore, from a policy point of view the precautionary motive for saving is not supported by the findings as inflation which captures the degree of macroeconomic volatility has a negative impact on savings in Tanzania.

Keywords: National Savings, Life-Cycle Hypothesis, Granger Causality

JEL Classification: C32, E12, E21

1. Introduction

The long-debated relationship between savings and the level and growth rate of income provides a strong stimulus for analyzing the determinants of savings more thoroughly (Ozcan et al., 2003). Understanding the nature of national savings behavior is critical in designing policies to promote savings and investment which in turn enhance economic growth through capital formation (Kudaisi, 2013).

Unsurprisingly, development economists have been concerned about the crucial role of domestic saving mobilization in the sustenance and reinforcement of the saving-investment-growth chain in developing economies (Nwachukwu, 2009). Studies indicate that unsatisfactory growth performance in developing countries has been attributed to poor saving and investment (Nwachukwu, 2009, Loayza, et al., 2000; Khan and Villanueva, 1991). Thus, despite the importance of international flows of capital, the most important factor for a country's investment is indeed its own savings (Ozcan et al., 2003).

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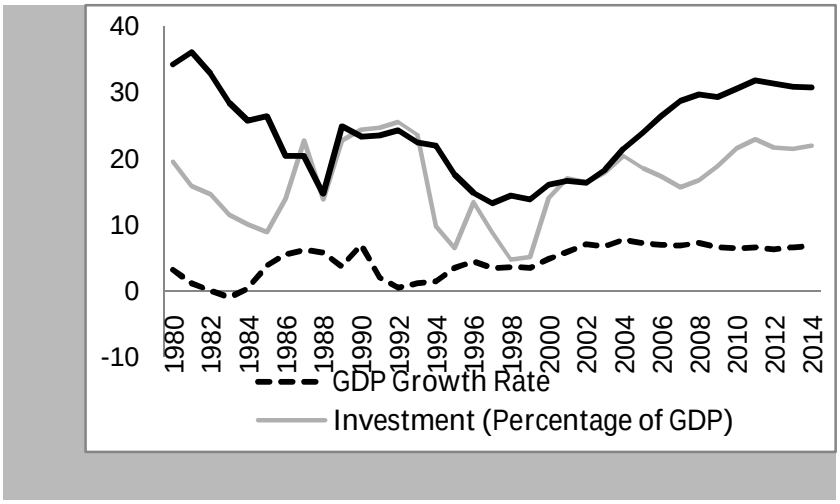
However, the extent to which the higher rate of savings in a country is translated into higher investment depends on well connected financial structure in form of financial institutions, assets and markets that link savers and investors by bridging the information gap and the transaction costs that may be involved (Tesha, 2013).

In many sub-Saharan African countries, the rate of economic growth has been impeded by the low level of savings mobilization making them depend on foreign assistance in form of loans and aid to cover their current account deficit (Tesha, 2013). Indeed, Tanzania's continuing external deficit problem is generally viewed as a symptom of inadequate domestic savings. Figure 1 and Table 1 show the trend of savings-to-GDP ratio, investment-to-GDP ratio and GDP growth rate in Tanzania during the 1980-2014 period. During this period, the level of savings-to-GDP ratio stood at an average of 23.91 percent. During the same period, investment-to- GDP and GDP growth rate were 16.71 and 4.63 percent respectively.

In Tanzania, both savings and investment declined significantly during the 1990s. Similarly, GDP growth rate declined from 3.33 percent during the 1980-1990 period to 2.92 percent during the 1991-2000 period. During this period Tanzania experienced immense difficulties with high inflation.

Figure 1: Savings, Investment, and GDP Growth Rate in Tanzania, 1980-2014



Source: Computed Using Data from World Bank (Various Issues)

Table 1: Figure 1: Savings, Investment, and GDP Growth Rate in Tanzania

	1980-1990	1991-2000	2001-2014	1980-2014
National Savings (Percent of GDP)	26.14	17.68	26.18	23.91
Gross Investment (Percent of GDP)	16.24	13.67	19.24	16.71
GDP Growth Rate	3.33	2.92	6.89	4.63

Source: Source: Computed Using Data from World Bank (Various Issues)

The relationship between savings-to- GDP ratio and GDP growth rate can be observed. However, the direction of causality between savings and growth remains a question of empirical investigation. Questions have been raised regarding the significance of the savings as an independent determinant of economic growth in developing countries. Sajid and Safraz (2008) point out that savings need to be considered seriously if the growth is to be sustainable.

For example, although an open economy can attract foreign savings to help in the financing of growth, risk, policy uncertainty and other considerations limit the extent to which domestic investment can proceed independently of domestic savings (Rodrik, 1991). In the same vein, the formulation of policies designed to increase savings has suffered from a dearth of knowledge regarding the variables that determine savings in developing countries. Thus, to understand the variables that determine national savings behaviour and the causal relationship between savings and GDP growth aiming at reducing the reliance on foreign finance and associated risks is of great significance for policy makers. This paper examines the main determinants of national savings in Tanzania. The paper uses unit root and co-integration tests, which allow for heterogeneity in parameters and dynamics, to examine the long-run determinants of national savings in Tanzania during the 1970-2010 period. These techniques are more powerful than the conventional tests and overcome the inconsistency problem of the fixed effect estimator typically employed in some previous studies of saving behavior (Touny, 2008).

2. Review of Theory and Evidence

2.1. Theoretical Literature Review

There are four widely accepted theories that explain the saving behaviour of economic agents. These theories are Absolute Income Hypothesis (AIH) by Keynes (1936), Relative Income Hypothesis (RIH) by Duesenberry (1949), Permanent Income Hypothesis (PIH) by Friedman (1957), and Life-Cycle Hypothesis (LCH) by Modigliani (1963).

2.1.1. The Keynesian Theory of Absolute Income Hypothesis

Keynes in his theory argues that consumption and savings are an increasing function of absolute/disposable income. Keynes postulates that consumption will increase at a decreasing rate as the income increases other things being constant. This implies that part of the income will be saved at an increasing rate as the disposable income increases. Generally, the Keynesian saving function takes a form of linear function with constant marginal propensity to save (MPS) (Equation 1).

$$S_t = \varsigma + \beta Y_t \qquad (1)$$

where S_t and Y_t denote the real value of savings and total disposable income, respectively at time *t.* $\beta = \frac{\Delta S}{\Delta Y}$, the marginal propensity to save is expected to be constant and positive but less than unity, so that the higher income leads to higher savings. Moreover, Keynes postulates that as the level of income rises, the average propensity to save $\left(APS = \frac{S}{Y}\right)$ also rises. ς is constant with value less than zero. Hence, with $Y_t = 0$, savings is negative or very low and in general, income-savings relationship is not proportional. Other things being constant, the theory assumes that rich people save more than poor people (Keynes, 1936).

2.1.2. Duesenberry Relative Income Hypothesis

Duesenberry (1949) postulates that an household consumption function depends on household income in relation to other household income, as a result, for any given relative income distribution, the percent of income saved by a household will tend to be unique, invariant, and increasing function of its percentile position in the income distribution. The RIH assumes that the percent of income saved will be independent of the absolute level of income. Hence, the aggregate saving ratio will be independent of the absolute level of income (Alimi, 2013, Alvarez-Cuadrado and Long, 2011). This implies that the *MPS* of an individual would be higher if his percentile position in the income distribution is higher.

Moreover, the RIH suggest that if there is an upward change in income of a household, it would not aspire for a similar upward change in consumption level than the one already achieved implying that its saving rate will increase due to increase in income. Duesenberry (1949) concludes that aggregate saving rate is independent of aggregate income, which is consistent with the time series evidence; and the propensity to save of an individual is an increasing function of his or her percentile position in the income distribution, which is consistent with the cross-sectional evidence.

2.1.3. Milton Friedman's Permanent Income Hypothesis

The core of Friedman's *PIH* is that individuals are rational and they seek to maximize their lifetime utility subject to the constraint that all their lifetime resources must be spent. In this hypothesis, income and consumption are divided into two major components, the transitory and permanent components[2]. This is because an individual economic agent is thought to plan his expenditures on both income received during the current period and income expected during his lifetime. Therefore, consumers plan their expenditure on the grounds of a long-run view of the resources that will accrue to them in their lifetime. Friedman argues that, permanent income should be considered when studying the saving and consumption behavior of economic agents, not absolute income as Keynes suggests.

According to Friedman's *PIH*, the saving function at time *t* in its simplest form given the transitory and permanent income can be expressed as

$$S_t = \varsigma + \phi Y^P + \varphi Y^T \qquad (2)$$

where, $Y = Y^P + Y^T$, ϕ is the marginal propensity to save given permanent income (Y^P), φ is the marginal propensity to save given transitory income (Y^T). Friedman hypothesizes that individuals consume virtually no transitory income implying that $\varphi = 1$. This shows that past behavior will determine the consumption spending. However, changes in transitory income will lead to changes in savings, that is, the higher the transitory income, the higher the saving rate (Tesha et al., 2013; Mikesell and Zinser 1973).

2.1.4 Life-Cycle Hypothesis

Ando and Modigliani (1963) postulate a life-cycle hypothesis of consumption of an individual in a specified period of time. According to this hypothesis, the individuals have an income stream which is relatively low at the beginning and the end of their life, when their productivity is low and high during the middle of their life (Branson, 1979). This model suggests that in the early years of a persons' life they are net borrowers. In the middle years, they save to repay debts and provide for retirement. Borrowing will always attract interest rate. The life cycle model predicts that a higher interest rate increases the current price of consumption vis-à-vis the future price, thus leading to an increase in savings. It also assumes absence of bequests (Baranzini, 2005). The individuals maintain their standard of consumption throughout their lifetime period (Tesha, 2013).

In the light of life-cycle analysis, GDP growth will result in an increase of aggregate savings, because it increases the lifetime earnings and savings of younger age groups relative to older age groups (Athukorala and Sen, 2004). Thus, countries with higher GDP growth rates are expected to have higher savings than countries with lower growth rates. However, the size of this effect is likely to decline as GDP growth rises and may even become negative for rich countries where investment opportunities and growth are relatively lower (Masson et al, 1998). In another aspect, although, the life cycle model suggests that inflation does not have a real impact on saving behaviour because of the absence of money illusion, macroeconomic instability in the form of inflation is likely to rise savings since risk-averse consumers tend to save more as a precaution against possible adverse changes in future income (Loayza et al, 2000).

[2] The permanent income is defined as the lifetime income an individual is expected to earn out of the physical and human assets that he possesses while transitory income has been defined as the difference between actual income and permanent income over a specified period of time.

In that case, households will reduce their present consumption and save more in order to consume more in future. In the same vein, inflation acts as a tax on money balance holdings, so if households wish to maintain the real value of their money balance holdings, saving will rise with the rate of inflation (Hussein and Thirlwall, 1999).

2.2. Empirical Evidence

There are a number of empirical studies that have been done in developed and developing countries trying to examine the key determinants of savings behaviour. Some studies concentrate mainly on fixed-effect models using Ordinary Least Squares (OLS) estimates to explain the variations in savings performance among countries. Other studies apply co-integration analysis, which allow for heterogeneity in parameters and dynamics across countries, to arrive at their conclusion. Generally, previous studies concentrate on the demographic factors such as life expectancy and dependency ratio, and macroeconomic factors such as income, money supply, real interest rate, disposable income, inflation, and deposit rate. Some of these studies are as discussed below.

Athukorala and Sen (2004) examine the determinants of private saving in India during the 1954-1998 period. They estimate saving rate function that is derived from the life-cycle model. This model has been the standard theory for the explanation of changes in saving over time and across countries. The results of the estimated saving rate model suggest a statistically positive effect of the real interest rate, the growth and the level of per capita income, and the rate of inflation on domestic saving. Terms of trade, on the other hand, seems to have a negative effect on the saving rate. In another study Mwega et al. (1990) test McKinnon-Shaw hypothesis that higher real deposit rate of interest would translate into higher private savings in Kenya. The study reveals that real deposit rate of interest does not affect private savings. Similarly, the studies by Odhiambo (2008), Ndanshau (2012) and Lipumba et al (1990) on interest rate reforms, financial deepening and savings in Tanzania conclude that there is no strong evidence on the effect of real interest rate on national savings in Tanzania. However, the interest rate reform has positive impact on financial deepening which ultimately affects saving rate. Likewise, the study by Giovannini (1985) on the impact of real interest rate on savings in Less Developed Countries, suggest a presence of very low responses of aggregate saving to changes in real interest rate.

Özcan, et al. (2003) investigate the determinants of private savings for Turkey during the 1968-1994 period. The study reveals that income level has a positive effect on the private savings, however, the growth rate of income is not statistically significant. The results also suggest that the rate of life expectancy tends to have a negative impact on savings. Similarly, a study by Doshi (1994) on the role of life expectancy as a determinant of saving performance, demonstrates that life expectancy is a statistically significant and important factor affecting savings levels in Least Developed Countries. With regard to inflation which captures the degree of macroeconomic uncertainty, Özcan, et al. (2003)'s results suggest that inflation has a positive effect on private savings. These results are also similar to Olusoji (2003)'s findings of the study on determinants of private savings in Nigeria. In the same study Olusoji (2003), points out that savings in Nigeria are being influenced by income.

Elbadawi and Mwega (2000)'s study for Sub-Saharan Africa, Latin America, East Asia and Caribbean reveal that gross private domestic income, the growth of gross private domestic income per capita and the growth in the term of trade have positive impact in determining the rate of savings in the countries in consideration. Similarly, study by Edwards (1996) reveals that per capita income growth is the most important determinant of private and public savings. Furthermore, Dayal-Ghulati and Thimann (1997) analyze the determinants of private savings for a sample of economies in Southeast Asia and Latin America during the 1975-1995 period. The results suggest that fiscal policy is the core policy instrument that influences saving rates in some Asian countries.

The findings also indicate that inflation volatility has a negative effect on the private savings rate in Latin America. Generally, the study reveals that macroeconomic stability and financial deepening are important determinants of saving behaviour in the two regions.

Metin_Özcan and Özcan (2005) examine the effect of a number of macroeconomic variables on private savings using a sample of 15 countries in the Middle East and North Africa over the 1981-1994 period. The results suggest a significantly positive effect of the growth rate of income, and per capita income on private savings. Results also suggest that deeper financial systems tend to have higher private savings. Moreover, macroeconomic stability proxied by the inflation rate is found to have a positive impact on savings. Similarly, Hadjimicheal et al. (1995), reveal that, a stable macroeconomic environment is important to stimulating saving. However, they point out that the rates of saving are enhanced in an environment where the budget deficits and the rate of inflation are low. Macroeconomic uncertainty, as measured by standard deviation of inflation has negative influence on saving.

The vast majority of the studies on the life-cycle theory have focused on patterns of savings behavior and its determinants as discussed above. However, to adequately interpret whether observed savings patterns are consistent with the life-cycle theory, it is also necessary to examine consumption patterns. As the population ages, the life-cycle consumption patterns of older persons will shift the composition of aggregate private household demand. In addition, public expenditures will shift in response to population aging. Thus, consumption expenditure, population growth rate and life expectancy are expected to affect national savings. As the population continues to age and the relative proportion of the population of those reaching retirement age grows relative to the middle-aged population, the life-cycle hypothesis predicts a reduction in aggregate savings.

3. Methodology

3.1. Conceptual Framework: Life Cycle-Permanent Income Hypothesis

The conceptual framework for this paper is derived from Life-Cycle model. This model incorporates the issue of time in explaining the saving behaviour. However, the general life-cycle framework cannot include every variable affecting consumption and savings decisions. Therefore, the theoretical framework adopted in this paper is rooted in the life-cycle/permanent-income hypothesis developed by Hall (1978). This theory, also known as the random-walk hypothesis**,** combines the lifecycle/permanent income variables. The theory assumes that an individual is rational and aiming at maximizing the present value of lifetime utility subject to the budget constraint. The budget constraint equals the current income plus the present value of expected income in life time. Given that income fluctuates over the course of life of an individual, each stage in the life cycle is an important determinant of saving behaviour (Kudaisi, 2013). The basic idea of the life-cycle/permanent-income hypothesis is that saving is a future consumption, and therefore, anything that affect consumption will similarly determine saving. This theoretical model is modified to capture a number of variables that determine savings in Tanzania. It is assumed that any variable that affect consumption and both current and future income will have an impact on saving function.

3.2. Model Specification, Data Type and Source

Model for this study is specified using the variables identified by life-cycle/permanent income hypothesis with some additional variables suggested by previous studies, which might be important in determining saving behaviour in Tanzania. The model is presented in natural logarithm as

$$\begin{aligned}\ln S_t = {} & \zeta_0 + \zeta_1 \ln(PG_t) + \zeta_2 \ln(C_t) + \zeta_3 \ln(GR_t) + \zeta_4 \ln(Y_t) \\ & + \zeta_5 \ln(DR_t) + \zeta_6(\pi_t) + \zeta_7 \ln(LE_t) + \mu_t\end{aligned} \tag{3}$$

Where

S	=	Total savings, percent of GDP
PG	=	Population growth rate
C	=	Consumption expenditure
GR	=	Real GDP growth rate
Y	=	Disposable income
DR	=	Deposit rate, included in the model to capture the effect of interest rate liberalization on savings in Tanzania
π	=	Inflation rate, measured as the growth rate of consumer price index as a proxy of macroeconomic stability
LE	=	Life expectancy
$\zeta_0, \zeta_1, .., \zeta_7$	=	Parameters to be estimated
μ	=	Disturbance (error) term

The rationale for including different variables in the savings function is summarized below. The life-cycle hypothesis suggests a positive relationship between saving and income. High incomes improve the per capita income of the households, which will induce them to save more. Thus, richer people can afford the luxury of saving for their future consumption. The poor on the other hand, have low incomes that only allow them to consume at the maximum level. It therefore follows that higher incomes enhance the saving's ability of households and consequently raises the national savings. Similarly, the life cycle and permanent income models of consumption and savings suggest that population growth and life expectancy affect the savings rate. Assuming that the bequest motive for saving is of little importance, the young and the old thus tend to have low saving rates, whereas the highest saving rates are observed among people who are at or around the peak of their earnings.

The deposit rate of interest is intended to capture the relationship between interest rate liberalization and savings. The McKinnon (1973) and Shaw (1973) hypotheses stipulate that, in a repressed interest rate environment, the liberalization of interest rates will encourage savings. However, the effect of interest rate on savings is ambiguous and remains an empirical issue. On one hand, higher real interest rate on saving raises the stream of future income and wealth, thus raising the current consumption level. On the other hand, higher returns on savings are expected to encourage households to increase savings because postponing the current consumption would imply larger future consumption out of current income.

Inflation rate captures the effects of macroeconomic uncertainty on savings primarily via its impact on precautionary savings. Inflation rate is expected to have a positive impact on savings, as economic agent in such an environment would try to hedge risk by saving (Ozcan et al., 2003). However, higher anticipated inflation in developing countries such as Tanzania could reduce savings. In these countries inflation serves as a measure of the authority's commitment to macroeconomic stability. Higher and variable inflation therefore may lower the credibility of the authorities and as a result discourages savings. Lastly, if households are consumption oriented, there will be less saving in the country. The consumption function shifts upward, while savings function shifts downward. In case, people consume less and save more, then national savings will increase.

The time series data for the 1970-2010 period on the variables discussed above is obtained from Bank of Tanzania (Annual Reports, Various series), and World Bank data bases.

3.3. Estimation Techniques

In order to avoid the problem of spurious regression results which may emanate from estimation of non-stationary macroeconomic time series, Augmented Dickey Fuller (ADF)(1979 and 1981) and Phillips Perron (PP) (1988) tests are used to check for a unit root for all variables in both levels and first differences. Furthermore, test for the presence of co-integration, the Johansen (1991) test is employed. This is the powerful method particularly when the multivariate model is involved.

The ordinary least squares method (OLS) is used for estimation. OLS is simple and widely used in empirical work. If the model's error term is normally, independently and identically distributed (*n.i.i.d.),* OLS yields the most efficient unbiased estimators for the model's coefficients, i.e. no other technique can produce unbiased slope parameter estimators with lower standard errors (Ramírez et al., 2002). In testing for the direction of causality between savings and real GDP growth rate, the vector autoregressive (VAR) model is applied simply because it is more suitable for the analysis as the direction of the causal relationship between savings and real GDP growth rate is unknown. It is also expected that past values of savings and real GDP growth rate could have a significant impact on their current values. The optimal lag length for the VAR model is determined by using the Akaike Information Criterion (AIC) and the Schwartz Bayesian Information Criterion (SBIC). Engle and Granger (1987) test is used to determine the direction of causality between savings and real GDP growth rate.

4. Empirical Results and Discussion

4.1. Descriptive Data Analysis and Statistical Tests

Descriptive analysis is conducted to ascertain the statistical properties of the variables. Table 2 presents descriptive statistics of the variables of the estimation model. The descriptive statistics suggest that savings (S), population growth *(PG),* consumption expenditure (C), disposable income (*Y),* and inflation rate (π) are approximately normally distributed because their respective skewness is less than 0.5 in absolute values. However, growth rate *(GR),* deposit rate *(DR)*, and life expectancy *(LE)* are not normally distributed. The necessary condition for normal distribution requires skewness of zero and kurtosis of at least 3. The failure of the normality test is addressed by transforming all variables, except the inflation rate, by using a natural logarithm operator (Stock and Watson, 2003; Murkhejee, White and Wuyts, 2003).

Table 2: Descriptive Data Analysis

	S	*PG*	C	*GR*	*Y*	*DR*	π	*LE*
Mean	10.74	3.17	10.12	1.22	13.16	1.97	17.72	3.91
Median	10.77	3.17	13.44	1.43	13.27	1.77	16.10	3.93
Maximum	14.85	3.73	16.58	2.05	16.69	3.25	36.10	3.99
Minimum	6.68	2.58	1.85	-0.91	9.07	0.91	2.40	3.78
Std. Dev.	2.82	0.33	6.05	0.80	2.67	0.73	11.25	0.05
Skewness	0.07	-0.06	-0.30	-1.40	-0.10	0.61	0.21	-0.68
Kurtosis	1.49	1.86	1.21	4.32	1.46	1.90	1.48	2.67
Jarque-Bera	3.92	2.24	6.09	16.47	4.11	4.60	4.25	3.42
Probability	0.14	0.32	0.04	0.000	0.12	0.09	0.11	0.18
Observations	41	41	41	41	41	41	41	41

Source: Computed Using Data from World Bank (Various Issues)

Table 3 reports the correlation matrix of the variables of the estimation model. It suggests that S is strongly positively correlated with *PG*, *LE*, *Y*, and *C* but negatively correlated with π. The correlation between *S* and *DR* appears to have been positive but weak.

The correlation matrix also shows that the pair-wise correlations between explanatory variables are not quite high (i.e. less than 0.8), indicating that multicollinearity is not a serious problem. Figure 2 (panel A-D) reports the graphical data analysis and scatter diagrams that show correlation between savings and explanatory variables. Panel A shows the trend of savings and consumption expenditure in natural logarithm. In general, both savings and consumption expenditure had an upward trend during the 1970-2010 period. During the 1970-1986 savings were low although they were above consumption expenditure.

Table 3: Correlation Matrix of the Variables

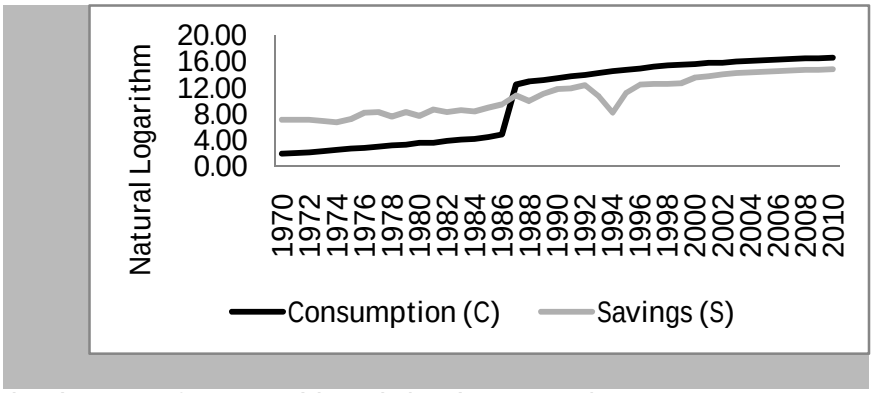
	S	*PG*	C	*GR*	*Y*	*DR*	π	*LE*
S	1							
PG	0.958	1						
C	0.921	0.728	1					
GR	0.442	0.358	0.351	1				
Y	0.954	0.726	0.744	0.363	1			
DR	0.347	0.386	0.575	0.080	0.426	1		
π	-0.357	-0.244	-0.179	-0.439	-0.260	0.4257	1	
LE	0.583	0.647	0.657	0.051	0.623	0.717	0.416	1

Source: Computed Using Data from World Bank (Various Issues)

During this period Tanzania suffered serious macroeconomic imbalances including persistent budget deficits and declining per capita income. However, during the 1986-2010 period consumption expenditure was above savings and its growth path shifted in 1986. This may be due to economic liberalization that started in 1986. Consumption expenditure restored to its normal growth path in 1987. Similarly, sharp increase in deposit rate occurred in the 1990s when interest rate was liberalized (see Panel B). Inflation rate showed an upward trend until the beginning of second half of 1990s where it started to decline. The reduction in inflation rate reflects macroeconomic stabilization in Tanzania and therefore, savings improved during that period (see Panel C). Increased deposit rate and general stabilization of macroeconomic variables in Tanzania might have led to improved GDP growth rate and per capita income, which in turn led to high savings. The positive correlation between savings and per capita income is presented in Panel D.

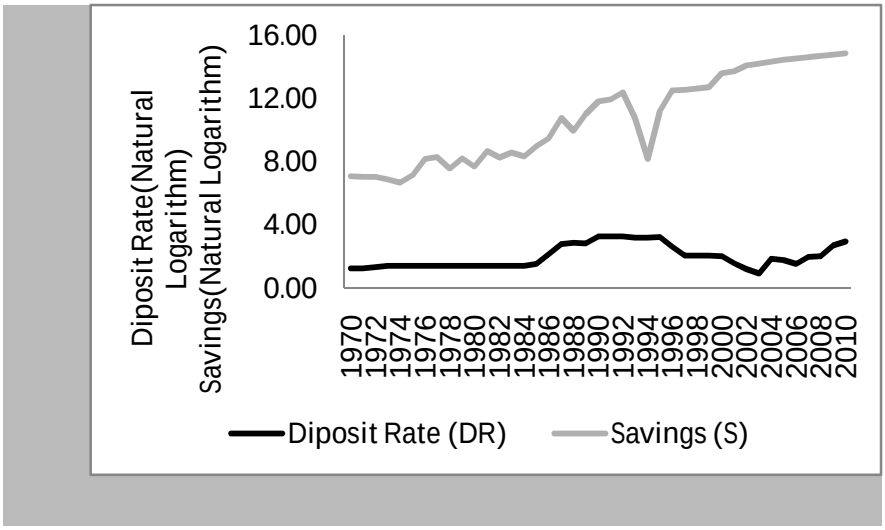
Figure 2 (Panel A-F): Description of Variables

Panel A: Savings and Consumption



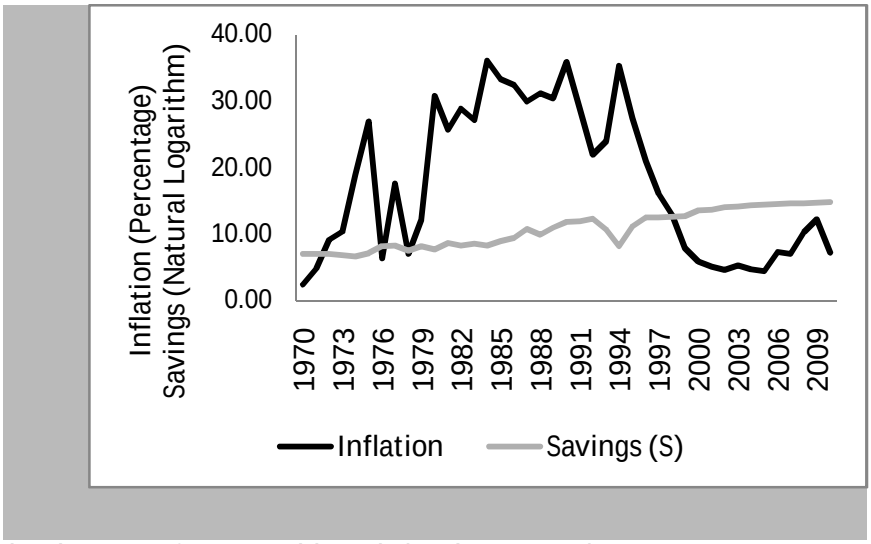
Source: Constructed Using Data from World Bank (Various Issues)

Panel B: Savings and Deposit Rate



Source: Constructed Using Data from World Bank (Various Issues)

Panel C: Savings and Inflation

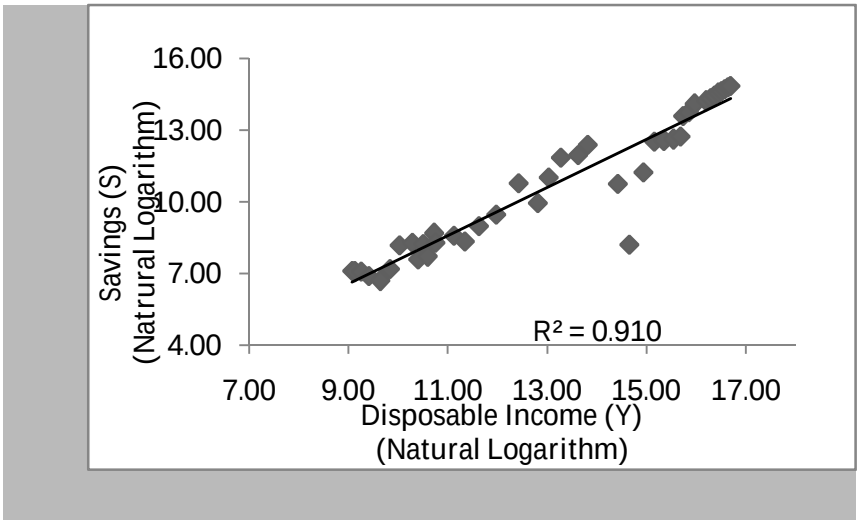


Source: Constructed Using Data from World Bank (Various Issues)

Income received by households can be disposed of in three ways: it can be paid in tax, consumed or saved. Income after tax is disposable income. In Keynes, since consumption is a function of disposable income, and saving is income not spent, saving is also primarily a function of disposable income. Disposable income has been taken to be the main, but not the only, determinant of savings. Panel D shows a positive correlation between savings and disposable income in Tanzania.

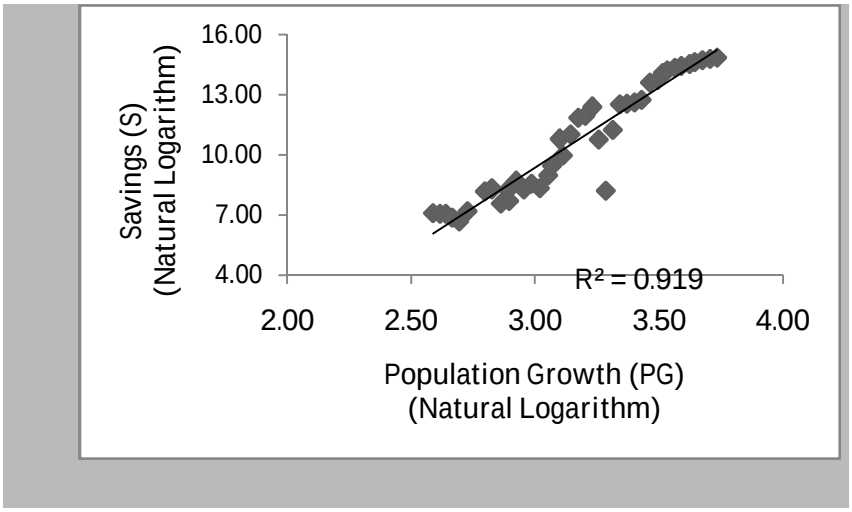
In another aspect, one of the most celebrated predictions of the life cycle theory of saving is that the national saving-to-national income ratio depends positively on the rate of population growth. People save for retirement, so saving is positive for young and negative for the old. Increase in population growth favours saving over dissaving. Panel E supports this argument while applying time series data for Tanzania.

Panel D: Savings and Disposable Income



Source: Constructed Using Data from World Bank (Various Issues)

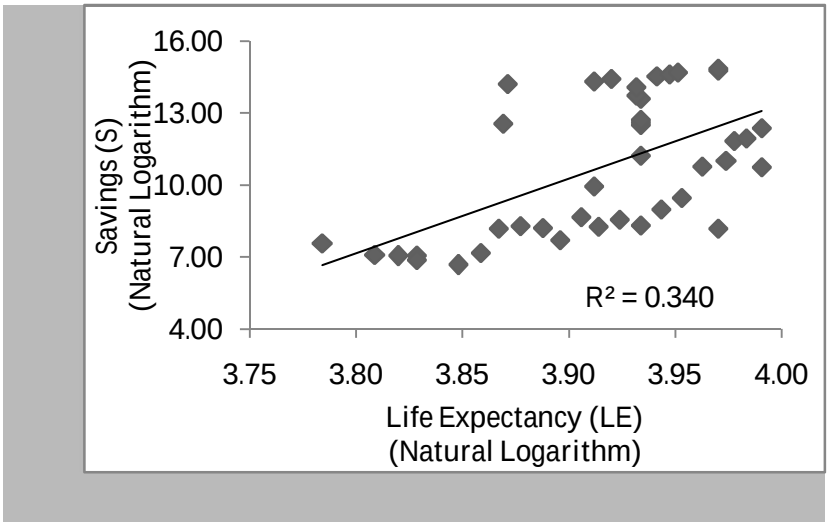
Panel E: Savings and Population Growth



Source: Constructed Using Data from World Bank (Various Issues)

Moreover, an increase in life expectancy seems to increase national savings in Tanzania (Panel F). This may be due to the fact that each person requires higher wealth accumulation to finance a constant consumption stream over a longer retirement span.

Panel F: Savings and Life Expectancy



Source: Constructed Using Data from World Bank (Various Issues)

4.2. Time Series Properties of the Data

4.2.1. Stationarity Tests

A basic assumption of the Classical Linear Regression model requires all variables to be stationary. The violation of this assumption leads to spurious regression. To avoid this shortfall, the unit root test with and without trend is conducted on all variables to find out whether they are stationary or non-stationary. The Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) methods are conducted to check for a unit root for all variables in both levels and first differences. The results of these tests are presented in Table (4), which indicates that the hypothesis of a unit root cannot be rejected in all variables in levels. It is therefore concluded that *S, PG, C, GR*, *Y, DR,* π and *LE* are non-stationary at their levels. However, the hypothesis of a unit root is rejected in first differences which indicates that all variables are integrated of degree one (Table 5). This also suggests that, further estimations could be carried while in first difference in order to avoid spurious correlation.

Table 4: *ADF* and *PP* Unit Root Tests for Stationarity: Level Variables

Variable	ADF t-value		PP t-value		I(d)
	Without Trend	With Trend	Without Trend	With Trend	
Savings (S)	-0.780	-4.325	-0.780	-4.095	I(0)
Population Growth *(PG)*	0.822	-2.655	-0.849	-2.506	I(0)
Consumption (C)	-0.992	-1.538	-0.925	-1.560	I(0)
Growth Rate *(GR)*	-2.988	-3.676	-3.615	-4.185	I(0)
Disposable Income *(Y)*	-1.359	-0.378	-1.073	-0.105	I(0)
Deposit Rate *(DR)*	-1.611	-1.761	-1.361	-1.521	I(0)
Inflation Rate (π)	-1.654	-2.182	-1.981	-2.367	I(0)
Life Expectancy *(LE)*	-1.982	-2.040	-2.340	-2.698	I(0)
Critical Values (1%)	**-3.606**	**-4.209**	**-3.601**	**-4.202**	
Critical Values (5%)	**-2.937**	**-3.527**	**-2.935**	**-3.527**	

Notes: (1) I(d) = Order of Integration (2) Included in the test equation: (i)lagged difference (1).

Table 5: ADF and PP Unit Root Tests for Stationarity: Level Variables

Variable	ADF t-value		PP t-value		I(d)
	Without Trend	With Trend	Without Trend	With Trend	
Savings (S)	-5.981*	-5.895	-6.790	-7.144	I(1)
Population Growth *(POP)*	3.915	-4.008	-5.939	-5.944	I(1)
Consumption (C)	-4.146	-4.136	-5.894	-5.851	I(1)
Growth Rate *(GR)*	-6.624	-6.636	-8.034	-7.960	I(1)
Disposable Income *(Y)*	-3.619	-3.822	-3.619	-3.822	I(1)
Deposit Rate *(DR)*	-3.736	-3.664	-4.761	-4.699	I(1)
Inflation Rate (π)	-5.177	-5.367	-8.069	-8.262	I(1)
Life Expectancy *(LE)*	-5.412	-5.404	-9.503	-9.448	I(1)
Critical Values (1%)	**-3.611**	**-4.216**	**-3.606**	**-4.209**	
Critical Values (5%)	**-2.939**	**-3.531**	**-2.937**	**-3.527**	

Notes: (1) I(d) = Order of Integration (2) Included in the test equation: (i)lagged difference

4.2.2. Cointegration Analysis

Having established that the variables are of the same order of integration, the next procedure is to test the possibility of cointegration among the variables used in the model. Trace and Maximum Eigen value are used to determine the presence of co-integration between variables. The results of the cointegration test are presented in Table 6.

Table 6: Johansen Test for Cointegration

Maximum Rank (r)	Eigen Value	Trace Statistic	5% Critical Value
0		174.243	156.00
1	0.682	128.394	124.24
2	0.599	91.809*	94.15
3	0.572	57.792	68.52
4	0.466	32.652	47.21
5	0.289	18.986	29.68
6	0.202	9.938	15.41
7	0.167	2.605	3.76
8	0.063		

Sample: 1971-2010

On the basis of the maximum eigenvalue test, the null hypothesis of no cointegration $(r = 0)$ is rejected at the 5 percent level of significance in favour of the specific alternative, namely that there is at most two cointegrating vector $(r = 2)$[3]. The implication is that a linear combination of all the eight series is found to be stationary and that there is a stable long-run relationship between the series.

[3] 10 This is because the first significant value, where trace statistic is less than critical value at 5% level, was found at maximum rank of two.

4.3. Estimation Results

Estimation results presented in Table 7 indicates that the F-statistic of 111.8 rejects the null hypothesis that all the explanatory variables have coefficients not different from zero. The data also shows minimal impact of autocorrelation since the Durbin-Watson statistic *(DW)* of 1.7 is close to 2. Moreover, adjusted R-squared, which measures the goodness of fit of the variables, is sufficiently large; suggesting that about 95 percent of the variations in savings behaviour is explained by the explanatory variables.

Table 7: Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant *(C)*	-39.506	15.515	-2.546***	0.014
Population *(POP)*	8.136	2.504	3.249***	0.002
Consumption (C)	0.312	0.106	2.941***	0.005
Growth Rate *(GR)*	0.383	0.152	2.519***	0.016
Disposable Income *(Y)*	0.820	0.445	1.840*	0.064
Deposit Rate *(DR)*	0.428	0.283	1.512	0.139
Inflation Rate (π)	-0.049	0.014	-3.320***	0.002
Life Expectancy *(LE)*	8.573	4.560	1.880**	0.051
R-squared	0.959	F-statistic		111.807
Adjusted R-squared	0.950	Prob(F-statistic)		0.000
S.E. of regression	0.626			
Durbin-Watson stat	1.715			

*Notes: (*1)Included Observations: 41 after adjusting endpoints (2) * significant at 10 percent; **Significant at 5 percent; ***Significant at 1percent.

Results for savings function indicate that the growth rate of income has a positive effect on savings as expected and statistically significant at 1 percent level. Other factors being constant, a 1 percent increase in GDP growth rate may lead to a 0.38 percent increase in national savings. This supports the argument that, for countries in the initial stages of development such as Tanzania, the level of income is an important determinant of the capacity to save. Similarly, the coefficient of population growth is found to be positive and statistically significant as hypothesized; implying that, other things being constant, 1 percent increase in population will increase savings by 8 percent**.**

Contrary to expectations, the coefficients of consumption expenditure and inflation rate are found to be positive and negative respectively. Results suggest that, inflation is significant at 1 percent level with the coefficient of -0.049, which implies that 1 percent increase in inflation will lead to about 0.049 percent decrease in national savings in Tanzania. However, these results do not provide support of precautionary motives for saving in the face of increased uncertainty in Tanzania. Negative impact of inflation rate on savings suggests that, in Tanzania, higher anticipated inflation reduces national savings. In this regard, the results imply that lower inflation raises growth which in turn increases savings in the country in consideration.

The coefficient of the life-cycle variable 'life expectancy' is positive and statistically significant at 5 percent, indicating that a 1 percent increase in life expectancy may increase the national savings by about 8.5 percent. This result however, is in line with the predictions of the life cycle model. The coefficient of the level of disposable income is positive and statistically significant at 10 percent. The magnitude of its coefficient is 0.82, indicating that a 1 percent increase in disposable income will have an 8 percent increase in the national savings.

The coefficient of real deposit rate is statistically insignificant. Thus, there is no empirical evidence that supports the influence of interest rate liberalization on national savings in Tanzania. Although, McKinnon (1973) and Shaw (1973) point out that interest rate is key factor that influences savings of a country, a general implication drawn in this paper is that real deposit rate would not bring about automatic improvement in national savings when policies are formulated basing on these variables.

4.4. Post-Estimation Diagnostics

4.4.1 Ramsey RESET Test of Regression Specification Error

Specification error test is carried out to ascertain if the estimated model is properly specified in terms of the regressors that have been included. The Ramsey RESET test is based on the null hypothesis of a properly formulated model. Among the reasons for the popularity of this test are the fact that it is easily implemented, and the fact that it is an *exact* test, whose statistic follows an F-distribution under the null (DeBenedictis and Giles, 1996).

The results from the test are reported in Table 8. The probability value of the F-statistics fails to reject the null hypothesis of no model misspecification error, indicating that the model is not misspecified.

Table 8: Ramsey RESET Test Results

F-Statistic	0.4851	Probability	0.6203

Source: Computed Using Data from World Development Indicators, 2011

4.4.2 Breusch-Pagan/Cook-Weisberg Test for Heteroskedasticity

Heteroskedasticity test is conducted to ascertain if variance of the error terms or residuals do not differ across observations. This is conducted based on the null hypothesis of homoscedasticity, against the alternative of heteroskedasticity. The results are presented in Table 9. These results suggest that the residuals of the model are homoskedastic at the levels of significance. In otherwords, the probability values of both F-statistic and observed R-squared fail to reject the null hypothesis of no heteroskedasticity.

Table 9: White Heteroskedasticity Test Results

F-statistic	3.075187	Probability	0.140837
Obs*R-squared	38.56671	Probability	0.311443

Source: Computed Using Data from World Development Indicators

4.4.3 Breusch-Godfrey Test for Serial Correlation

Breusch-Godfrey Test for Serial Correlation, also known as autocorrelation, is applied to ascertain if residuals are correlated. A test for serial correlation is conducted using the Breusch-Godfrey LM Test and the null hypothesis of no serial correlation is tested against the alternative hypothesis of serial correlation. Results are reported in Table 10.

Table 10: Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.810648	Probability	0.180968
Obs*R-squared	4.308336	Probability	0.116000

Source: Computed Using Data from World Development Indicators

The results as indicated by the probability values of both F-statistic and observed R-squared fail to reject the null hypothesis of no serial correlation.

4.4.4 Autoregressive Conditional Heteroskedasticity

Autoregressive Conditional Heteroskedasticity (ARCH) is conducted to ascertain the stability of the coefficients of the saving model. The results as reported in Table 11, show that the F-statistic of 5.9 relative to the probability value of 0.019 suggests that in general the coefficients of the explanatory variables are statistically different from zero.

Table 11: ARCH Test Results

F-statistic	5.963603	Probability	0.019503
Obs*R-squared	5.413431	Probability	0.019982

Source: Computed Using Data from World Development Indicators

4.5 Causality between Savings and Economic growth

It is important to determine the direction of causality between savings and growth for policy purposes due to the fact that literature review has a contradicting result on the relationship between savings and economic growth. The VAR (3) model is used to determine the direction of causality. Three lags are chosen and the results are presented in Table 12.

Table 12: Results of Granger Causality Wald Test

Null hypothesis (H_0)	Obs	F-Statistic	Prob. Value	Results
Lags:1				
S does not Granger Cause GR	39	2.235	0.143	Do not Reject H_0
GR does not Granger Cause S		8.975	0.004	Reject H_0
Lags:2				
GR does not Granger Cause S	38	4.053	0.026	Reject H_0
S does not Granger Cause GR		1.238	0.303	Do not Reject H_0
Lags: 3				
S does not Granger Cause GR	37	0.192	0.900	Do not Reject H_0
GR does not Granger Cause S		4.413	0.010	Reject H_0

Source: Computed Using Data from World Development Indicators

Notes: For F-statistics, probabilities that are less than 5% level null hypotheses are rejected at that level.

From Table 11, we fail to reject the null hypothesis that saving *(S)* does not Granger cause real GDP growth rate *(GR)* at 5 percent level of significance but we reject the null hypothesis that real GDP growth rate does not Granger cause saving. That means real GDP growth rate causes saving but saving does not cause real GDP growth rate. This is consistent with other studies that have been done in DCs and LDCs, among others, the work of Carol and Weil (1993).

5. Conclusions

This paper empirically examined the determinants of savings in Tanzania for the 1970-2010 period. Augmented Dickey Fuller and Phillips-Perron tests were used to test stationarity of all time series. To test long-run relationship of the variables, Johansen test was applied. The results of the paper provide evidence that national savings in Tanzania is determined by a number of factors. First, disposable income and GDP growth rate have a positive impact on the national savings for Tanzania. This finding is consistent with the empirical results of the cross country studies, which indicate, ceteris paribus, that more advanced countries tend to save a higher percentage of their GDP.

Second, the precautionary motive for saving is not supported by the findings as inflation which captures the degree of macroeconomic volatility has a negative impact on national saving in Tanzania. Third, population growth and life expectancy rates have positive and statistically significant impact on savings, supporting to the life-cycle hypothesis. The life-cycle hypothesis suggests that population aging will initially lead to an increase in national savings as the proportion of the population in the maximum savings years increases

Last, the paper established the direction of causality between national savings and economic growth in Tanzania. The results on this causal relationship suggest that economic growth (real GDP growth rate) causes national savings and not otherwise. This implies that that policies geared towards real GDP growth rate should be given first priority if the national saving trend is to be enhanced over time. The results, however, do not support the hypothesis that there is a virtuous circle that goes from faster growth to increased saving to even higher growth; notwithstanding, growth rate of income is positive and statistically significant.

Due to the fact that savings play crucial role in investment as revealed by the investment-saving relationship there is a need to improve national savings in Tanzania. The results of this paper help to understand the effectiveness of policy variables in raising the national savings in terms of their magnitude and direction. Some major recommendations for policy can be drawn from the analysis. Policies geared towards improvement in economic growth and real per capita income as suggested by Keynes (1936) would improve saving rates. That can be achieved by improving the economic base by focusing on key sectors such as agriculture in which a large part of labour force is involved. Other key sectors such as tourism and natural resource could act as the key stimuli to the growth of the economy.

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