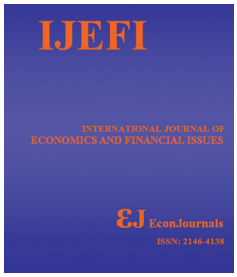

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Public and Private Sector Capital Formation and Economic Growth in Malawi

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ABSTRACT

This paper investigates the relative importance of public and private sector capital formation on economic growth in Malawi. Employing both the Two-Stage Least Squares and dynamic Generalised Method of Moments techniques on quarterly data from 1970Q1 to 2019Q4, the study finds that private sector capital formation makes a significant contribution to economic growth. The relationship between public sector capital formation and economic growth, however, is insignificant. The study finds no evidence of complementarity between public and private sector capital formation in Malawi. The study observes that private sector capital formation affects public sector capital formation, and not vice versa. Consistent with orthodox classical political economics, we recommend a small government for Malawi with a lean budget, especially since there are no observed benefits from large government spending in spurring economic growth. The only public sector investments that may be undertaken are public goods in areas associated with market failure.

Keywords: Endogenous Growth, Capital Formation, Public Sector, Private Sector
JEL Classifications: C18, E61, O43

1. INTRODUCTION

While there is near-consensus that gross capital formation is necessary for economic growth, the relationship between public and private sector capital formation is an outstanding issue that has triggered considerable debate in the recent literature. Some authors have suggested that public capital formation could be a close substitute for private capital, driving down the rate of return on private investment (Epaphra, 2017). Others contend that public sector capital formation crowds in private investment (Monastiriotis and Randjelovic, 2023; Abbas and Masih, 2017), while more are cautious of committing themselves, arguing that there is considerable uncertainty about whether public sector investment raises or lowers private investment and stressing that there is no appropriate reason to believe that they are necessarily substitutes (Al-Sadiq, 2013).

For purposes of policy, it is inaccurate to propose a cut in one and an increase in the other type of capital formation prior to establishing their respective impact on macroeconomic performance. Notwithstanding their relationship, the role of either form of capital formation on aggregate macroeconomic performance stands out as an issue of relevant concern in developing countries. In Malawi, public sector capital formation has been upheld as a driving force behind economic growth since the attainment of independence in 1964 till the early 1980s when the Malawi Government embarked on privatisation and divestiture of private enterprises. Government intensified the privatisation process in 1996 through the Public Enterprises Act of Parliament (Makuyana and Odhiambo, 2014), which initiated the setting up of a Privatisation Commission. This move marked a policy reversal to reduce public and promote private sector capital formation with rapid and sustainable economic growth as the ultimate goal. To the

best of our knowledge, there is no study that we are aware of that has investigated the relative importance of public and private sector capital formation on macroeconomic performance in Malawi; or the nature of the relationship between the two forms of capital formation in the country.

This study, therefore, contributes to the debate on the theoretical and empirical relationship between public and private sector capital formation and economic growth in a low-income economy (Malawi). The primary objective of the study is two-fold. The first is to determine the gross impact of public and private sector capital formation on economic growth; and the second is to examine the nature of the relationship between the two forms of capital formation. It is expected that the findings of the study will help enlighten policy makers on the wisdom of formulating policies that enhance either public or private sector capital formation at the expense of the other as has been the case in Malawi since independence.

Following this introduction, the rest of the paper is organised as follows. Section two is a brief overview of the economy of Malawi from 1964 to date. A discussion of growth theories and the complementarity hypothesis of public and private sector capital formation is presented in Section three. Section four is an outline of the estimation model, estimation methods, data and data sources. Empirical results are presented in Section five. Section six concludes the paper.

2. CAPITAL FORMATION IN MALAWI: AN OVERVIEW

Malawi has been classified as one of the poorest and least developed countries in the world. The country has a narrow economic base, a low per capita income level, a high population density, a landlocked status with prohibitive costs of external trade, few known mineral resources, and high rates of unemployment and infant mortality (World Bank, 2023). When the country attained independence in 1964, there were three notable resources in which it was endowed: fertile agricultural soils, abundant unskilled labour and plentiful water supply. The government put the first two resources into extensive use by emphasizing on agricultural production and the export of unskilled labour to mineral rich countries of Northern and Southern Rhodesia (Zambia and Zimbabwe, respectively) and South Africa (Ngalawa, 2018). (MDC Visibly absent from the economy were physical capital resources, skilled manpower and an entrepreneurial class to lead in the development of the private sector. With the intention of initiating the process of capital accumulation while bypassing the resource constraint in the private sector, the Malawi Government established two major statutory corporations: Malawi Development Corporation (MDC) in 1964 and the Agricultural Development and Marketing Corporation (ADMARC) in 1971. MDC succeeded Nyasaland Industrial Board of the colonial government with the purpose of developing mineral resources and the agricultural, commercial and industrial sectors of the country (Kaunda, 2021). ADMARC, on the other hand, took over from the Farmers' Board but with a broader mandate: to market agricultural inputs and output, and to invest the net proceeds in various sectors of the economy (Makuyana and Odhiambo [2019]).

The two parastatals, ADMARC and MDC, embarked on large-scale capital formation, making heavy investments in almost all sectors of the economy. By 1982, ADMARC was a dominant shareholder in 39 companies in the agricultural and manufacturing sectors. Its average share ownership position was 51.3%, and it enjoyed voter strength of between 50% and 99% in 12 companies. MDC had equally heavy investments, which were diversified in real estate, tourism, finance and manufacturing. By 1983, the corporation had direct ownership in 34 companies with average voter strength of 55.4%. Further, the corporation's subsidiaries had portfolios in 39 companies with an average ownership of 58.2% (Makuyana and Odhiambo, 2019).

Besides ADMARC and MDC, the Malawi Government established other parastatals, which added to 35 by 1987. These parastatals received grants and subsidies amounting to 10% of government recurrent expenditure in the mid-1980s and accounted for 25% of Gross National Product (GNP) in the early 1990s (Makuyana and Odhiambo, 2019). Though intended to promote capital accumulation and economic growth, most of these parastatals were making losses and ended up being a drain to the treasury.

With the heavy public investments, the share of public sector capital formation averaged 53.6% during 1964-69. It rose to 55.6% during 1970-74 and 60.8% during 1975-80. The increasing public capital formation reflected a government policy bent on propelling economic growth using public investments. Between 1980 and 1984, with the introduction of Structural Adjustment Programs (SAPs), public capital formation declined to 40.7% of gross capital formation. However, it rose again to 45.8% during 1985-89, 56.9% during 1990-94 and 68.5% during 1995-97. This trend was probably due to increasing government expenditure on investments directed at containing adverse shocks that had hit the country in the mid-1980s and persisted for almost a decade.

In the early 1980s, the external environment deteriorated and, following the country's dependence on international markets, the Malawi economy went into a deep recession. Profits plummeted, more and more firms were unable to repay their debt obligations and a severe credit crunch resulted (USAID, 1982). GDP fell from 3.3% in 1979 to 0.4% and −0.5% in 1980 and 1981, respectively, while Balance of Payments (BOP) came to be characterised by a chronic deficit (MG/UN, 1993).

Among the ways of moving out of the financial crisis, the Malawi Government embarked on a major public enterprise reform program in 1988, which constituted divestiture, deregulation and liberalisation. This was undertaken to curb the observed poor performance of public enterprises, which was attributed to inefficiency, mainly due to unsystematic and wasteful investments combined with several organisational and objective conflicts (Makuyana and Odhiambo, 2019). However, it was not until 1996 that a Privatisation Program was commissioned and ratified in parliament with the passing of the Public Enterprises (Privatisation) Act of 1996 (MCCCI, 1997), marking the implementation of a

policy reversal with emphasis taken away from public and placed on private sector capital formation.

The foregoing discussion indicates that the Malawi Government chose to follow a public sector led development strategy after taking over from the colonial regime. The absence of physical capital resources, skilled manpower and an entrepreneurial class to lead in the development of the private sector provided reason to adopt the strategy. With time, the government has attempted to reduce the role of the public sector and enhance private sector participation in the process of capital formation for sustainable economic growth. However, the trend of economic growth in the country reveals that growth has not followed a stable pattern (i.e. has fluctuated wildly), suggesting that an effective development strategy is yet to be drawn.

3. PUBLIC AND PRIVATE INVESTMENT, THE COMPLEMENTARITY HYPOTHESIS AND ECONOMIC GROWTH

Public capital formation usually takes the form of goods and services that are lumpy, indivisible and risky in nature and subject to extreme difficulties in rationing their use to potential consumers (the free rider problem resulting from non-exclusion and non-rivalry in consumption). These goods and services, referred to as social goods, are seldom produced by the private sector though the sector enjoys their spill-over effects in such necessary infrastructure as public roads, airports, health facilities, education services, water supply and sewer systems, electricity, street lights, telephone lines and national defence. Public capital formation is also seen to augment overall aggregate demand for private sector goods and services and to influence the private sector's future profits and sales expectations (Erden and Holcombe, 2005).

However, public sector capital formation can also crowd out private capital formation if it utilises scarce physical and financial resources that would otherwise have been available to the private sector; if it is invested in heavily subsidised and inefficient public enterprises producing private goods and services; and if its financing, through taxation for instance, lowers the resources available to the private sector (Makuyana and Odhiambo, 2018).

(Tulin et al., 2015) undertook a study on the relationship between public and private sector capital formation and economic growth in a framework of a growth model designed to highlight the role of public investment in Korea and India. The model identifies four channels through which public investment influences private sector investment. (Tulin et al., 2015) argued that first, public investment competes with the private sector for scarce resources and hence exerts a negative influence on private investment (a crowding out effect). Second, public investment raises aggregate output and savings, supplementing the economy's physical and financial resources, and thus offsets, at least a part, of any initial crowding out effects on private investment. Third, increased public investment raises demand for the output of the private sector (an element of complementarity). Fourth, it is maintained that to the extent that public investment complements private investment, private investment requirements per unit of output are reduced.

Employing a variant of the Jorgenson (1971) version of the flexible accelerator model of investment behaviour (Bahal et al., 2018) found positive and large effects of public investment on private investment, both in the immediate and subsequent periods, reflecting the public sector's strong positive effect on aggregate output and output expectations of the private sector in the case of Korea. In the case of India, however, they established that there is substantial crowding out in the initial period, but private investment is stimulated in all subsequent periods. Nevertheless, these latter effects were observed to be weak in each period so that the initial negative effect is not offset for a considerable period. The impact of increasing public investment on aggregate output was also observed to be negative.

Scholars have divergent views on the link between public and private investment in stimulating economic growth. The primary question is whether public or private investment promotes economic growth. According to Bint-e-Ajaz and Ellahi (2012), public investment in infrastructure boosts private investment indirectly that in turn increases the marginal productivity of private capital and enhances economic growth. Ghani and Din (2006) examine the same relationship and find that public investment has an insignificant negative impact on output. In contrast, the study finds a positive relationship between private investment and economic growth. Ghani and Din (2006) observe that public investment has no positive impact on private investment, which suggests that it 'crowds out' private investment, consequently confirming the fear that people have about the efficiency of public investment.

Swaby (2007) finds similar results and reveal that public investment has a positive insignificant impact on GDP. The study further observes that public investment also crowds-out net private investment as it results in higher domestic private investment but lower foreign domestic investment, with the latter effect being much more significant. In a related study, Hatano (2010) shows that public investment has no effects on economic growth. The study argues that public investment crowds out private investment.

Employing a panel data sample of 15 developing countries, Phetsavong and Ichihashi (2012) investigated the impact of public and private investment on economic growth. The empirical results show that private domestic investment plays a relatively large role compared to public investment and foreign direct investment (FDI) in contributing to economic growth. The study finds that public investment in developing countries reduces the positive effect of FDI and private domestic investment on economic growth (crowding-out effect). To (2011) found similar results. The study established that the impact of private investment is higher than that of public investment on economic growth, revealing a crowding-out effect of private investment by public investment.

(Turan et al., 2021) investigated the impact of public and private investment on economic growth in Latin America. The results suggest that both public and private investment spending contribute to economic growth. Employing a dynamic panel analysis, Bukhari

et al. (2007) also investigated the relationship between public and private investment and economic growth in Korea, Singapore, and Taiwan. They found that both public and private investment and public consumption have a long-term dynamic impact on economic growth in all the countries. Similar findings have been reported by Haque (2013) and Uddin and Aziz (2014).

In a study of Vietnam, Cành and Lua (2020) find that there is a curvilinear relationship between public investment and economic growth. Specifically, the study shows that the relationship between the two variables follows an inverted-U shape pattern. That is, public investment has both positive and negative effects on economic growth, with the former commonly occurring in the short run (from the 1st-2nd year) while the latter are dominant in the long run.

4. METHODOLOGY

4.1. Data and Data Sources

The study employs 216 observations from quarterly frequency data over a period of 54 years covering 1970Q1-2019Q4. The choice of the starting and cut-off date is dictated by data availability (there isn't a lot of reliable data for many African countries in the 1960s) and an attempt to avoid global COVID-19 period and prevent structural breaks in the dataset. The data were sourced from the Reserve Bank of Malawi, International Monetary Fund's (IMF) International Financial Statistics, World Bank's World Development Indicators (WDI), the United Nations Development Programme's Human Development Index (HDI) dataset, Penn World Tables, Trading Economics, Federal Reserve Bank of St. Louis, and Organization for Economic Co-operation and Development (OECD). Data for all the variables were expressed in natural logarithms in order to limit the effects of outliers (Turkmen and Billor, 2013).

4.2. Definition and Description of Variables

- The Output growth (RGRY): Following Ntwaepelo (2021), the GDP growth rate, which reflects the final value of goods and services produced in the country, is employed to capture output growth. Since GDP measures the final goods and services produced within a country at a given period, therefore, employed to proxy output growth in Malawi.
- Private capital formation (PVTK): This is the private sector net accumulation of capital goods, such as equipment, tools, transportation assets, and electricity, during an accounting period. This variable is rooted from Ibrahim (2000), Naqvi (2003) and Erden and Holcombe (2006) that carry out a study on Public and private capital formation and economic growth in Malaysia, Pakistan and developing countries.
- Public capital formation (PUBK): Public capital formation on the other hand is the public sector net accumulation of capital goods, such as equipment, tools, transportation assets, and electricity, during an accounting period. The variable is also rooted from the empirical studies of Ibrahim (2000), Naqvi (2003) and Erden and Holcombe (2006). Both the private and public capital formation are important because the higher the capital formation of an economy, the faster an economy can grow its aggregate income (Shuaib and Ndidi, 2015).
- Human capital development (GHK): Borrowing from Son (2010) and Currie and Almond (2011), the human capital development, which captures the process of enhancing and improving the skills, knowledge, abilities, and overall potential of individuals in an organization is employed. This is because this indicator encompasses knowledge, skills, know-how, good health, and education at improving employee capacity in a country.
- Exports (EXPO): the exports simply represent the total value of goods and services that is sold into another country. This variable is rooted from Sultanuzzaman et al. (2019) that carry out an investigation on the effects of export and technology on economic growth in some selected emerging Asian economies.
- Foreign aid (FRAID): this represents the total international transfers or resources received by the country over a given period. In line with Nyasulu (2013), this variable is included in order to investigate the contribution of foreign aid received by the country to economic growth.

4.3. The Model

Following Ghura and Hadjimichael (1996), we assume the production function is Cobb-Douglas given by:

$$Y=A_t(A_PK_P)^{\propto}(A_h K_h)^{\beta}(A_L L)^{(1-\alpha-\beta)} \quad (1)$$

where Y is real output, A_t is an index of technology and efficiency, A_P is physical capital augmenting technology (changes in technology that improve the productivity of physical capital stock), A_h is human capital augmenting technology (technological improvements that lead to higher labour productivity), K_P is labour-augmenting technology, K_P is physical capital stock, K_h is human capital stock and L is labour. Expanding equation (1), we obtain:

$$Y = A_L^{(1-\alpha-\beta)}\left(A_T A_P^{\alpha} A_h^{\beta}\right)K_P^{\alpha}K_h^{\beta}L^{(1-\alpha-\beta)} \quad (2)$$

Let:

$$A = A_L\left(A_T A_P^{\alpha} A_h^{\beta}\right)^{\frac{1}{(1-\alpha-\beta)}} \quad (3)$$

Equation (3) reduces to:

$$A^{(1-\alpha-\beta)} = A_L^{(1-\alpha-\beta)}\left(A_T A_P^{\alpha} A_h^{\beta}\right) \quad (4)$$

Substituting equation (4) into (2):

$$Y = A^{(1-\alpha-\beta)}K_P^{\alpha}K_h^{\beta}L^{(1-\alpha-\beta)} \quad (5)$$

Equation (5) can be rewritten as:

$$Y = (AL)^{(1-\alpha-\beta)}K_P^{\alpha}K_h^{\beta} \quad (6)$$

where A is the economy-wide factor augmenting technology. Assume labour grows according to the function:

$$L=L_0e^{nt} \quad (7)$$

while the economy-wide factor-augmenting technology grows according to the function:

$$A=A_0e^z \tag{8}$$

where n is exogenous growth rate of the labour force, t is a time index and Z are factors that affect technological change in the economy. Substituting equations (7) and (8) into equation (6) gives:

$$Y = K_P^{\alpha} K_h^{\beta} \left(A_0 e^{Z} L_0 e^{nt}\right)^{(1-\alpha-\beta)} \tag{9}$$

Equation (9) can be rewritten as:

$$Y = K_P^{\alpha} K_h^{\beta} \left(A_0 L_0 e^{Z+nt}\right)^{\lambda} \tag{10}$$

where. $\lambda=1-\alpha-\beta$ Log-linearising equation (10) gives:

$$\ln Y=\alpha \ln K_P+\beta \ln K_h+\lambda \ln(A_0L_0e^{Z+nt}) \tag{11}$$

Equation (11) can be rewritten as:

$$\ln Y=\alpha \ln K_P+\beta \ln K_h+\lambda \ln(L_0A_0)+\lambda(Z+nt) \tag{12}$$

Assume the variables in equation (12) grow according to the following function:

$$\frac{dY}{Ydt} = \alpha\left(\frac{\mathrm{d}K_P}{K_Pdt}\right) + \beta\left(\frac{\mathrm{d}K_h}{K_hdt}\right) + \lambda\left(\frac{\mathrm{d}Z}{Zdt}\right) + \lambda(nt) \tag{13}$$

$\lambda \ln(L_0A_0)$ disappears because L_0A_0 is a constant. Let:

$$K_P=K_P(KPVT, KPUB) \tag{14}$$

Equation (14) states that total physical capital stock (K_P) is a function of private physical capital stock *(KPVT)* and public physical capital stock *(KPUB)*. From this equation, physical capital stock grows according to the function:

$$\frac{dK_P}{dt} = \frac{\partial K_P}{\partial KPVT}\frac{\partial KPVT}{dt} + \frac{\partial K_P}{\partial KPUB}\frac{\partial KPUB}{dt} \tag{15}$$

Dividing through equation (15) by K_P:

$$\frac{dK_P}{K_Pdt} = \frac{\partial K_P}{\partial KPVT}\frac{1}{K_P}\frac{\partial KPVT}{dt} + \frac{\partial K_P}{\partial KPUB}\frac{1}{K_P}\frac{\partial KPUB}{dt} \tag{16}$$

Multiplying the right-hand components of equation (16) by $\frac{KPVT}{KPVT}$ and $\frac{KPUB}{KPUB}$, respectively, we obtain:

$$\frac{dK_P}{K_Pdt} = \frac{\partial K_P}{\partial KPVT}\frac{KPVT}{K_P}\frac{\partial KPVT}{KPVTdt} + \frac{\partial K_P}{\partial KPUB}\frac{KPUB}{K_P}\frac{\partial KPUB}{KPUBdt} \tag{17}$$

Where $\frac{\partial K_P}{\partial KPVT}\frac{KPVT}{K_P}$ is the elasticity of physical capital stock with respect to private physical capital stock ((δ_1); $\frac{\partial KPVT}{KPVTdt}$ is growth of private physical capital stock *(PVTK)* $\frac{\partial K_P}{\partial KPUB}\frac{KPUB}{K_P}$ is the elasticity of physical capital stock with respect to public physical capital stock (δ_2); and $\left(\frac{dKPUB}{KPUBdt}\right)$ is growth of public physical capital stock *(PUBK)*. Letting Therefore, equation (17) becomes:

$$\left(\frac{dK_P}{K_Pdt}\right) = \delta_1 PVTK + \delta_2 PUBK \tag{18}$$

We further assume that in developing countries, technological advancements are explained by foreign aid *(AID)* and exports (EXPO). An important attribute of endogenous growth has been an attempt to explain the determinants of technological progress rather than simply taking technological advancements as exogenous. The state of technology in an economy is well explained, besides human capital formation, by exports of goods and services. Due to competitive production techniques abroad, the export sector has an incentive to achieve greater capital utilisation, a more efficient management of resources and improvements in technology. To the extent that exports are a component of aggregate demand, it is implied that technological progress has a positive effect on growth of real income and output.

In addition, local resources typically lag behind expenditure needs in most low-income countries. To narrow down this gap, these countries have resorted to foreign resources as a supplement to their local resources. Foreign aid is a particularly vital foreign resource disbursed in the form of loans and grants. Arguments have been advanced that foreign aid narrows down fiscal and foreign exchange gaps that retard increased productivity besides filling the savings-investment gap, the foreign exchange-earnings gap and the capital absorptive capacity that exists before an economy attains self-sustained growth.

Technological advancements, therefore, are given by the equation:

$$\frac{dZ}{Zdt} = \frac{\partial Z}{\partial AID}\frac{AID}{Z}\frac{\partial AID}{AIDdt} + \frac{\partial Z}{\partial EXPO}\frac{EXPO}{Z}\frac{\partial EXPO}{EXPOdt} \tag{19}$$

Letting $\lambda\frac{\partial Z}{\partial AID}\frac{AID}{Z} = \Pi_1$; $\lambda\frac{\partial Z}{\partial EXPO}\frac{EXPO}{Z} = \Pi_2$; $\frac{\partial AID}{AIDdt} = AIDT$; and $\frac{\partial EXPO}{EXPOdt} = EXPOT$, and substituting equations (18) and (19) into equation (13) gives:

$$\left(\frac{dY}{Ydt}\right) = \alpha\left(\delta_1 PVTK + \delta_2 PUBK\right) + \beta\left(\frac{dK_h}{K_hdt}\right) + \Pi_1 AIDT + \Pi_2 EXPOT + \lambda nt \tag{20}$$

which can be rewritten as:

$$RGRY=\alpha\delta_1 PVTK+\alpha\delta_2 PUBK+\beta GHK+\Pi_1 AIDT+\Pi_2 EXPOT+\lambda nt+\mu \tag{21}$$

Where $\left(\frac{dY}{Ydt}\right)$ is growth of real output (RGRY), $\left(\frac{dK_h}{K_hdt}\right)$ is growth of human capital (GHK), AIDT is growth in foreign aid, *EXPOT* is growth in exports, λnt is a constant (ϕ_0), and μ is a stochastic term. The estimation model, therefore, is given by:

$$RGRY=\phi_0+\phi_1PVTK+\phi_2PUBK+\phi_3GHK+\phi_4EXPO+\phi_5FRAID+\mu \quad (22)$$

Where μ is a white noise error term.

5. ESTIMATION RESULTS

5.1. Descriptive Statistics

In order to have a first-hand information about the characteristic features of the data employed for the regression analysis, a descriptive statistics is conducted on the dataset. The descriptive statistics is useful for both quantitative and qualitative analysis and helps to detect outlier in a data as well as test whether the sample data is normally distributed or not (Mishra et al., 2019). As shown in Table 1, the mean tells us the average value for each of the variables in the model while the median shows the meddle value of each of the six (6) variables. In the same description, the maximum and minimum values show the highest and lowest values in each of these variables.

The standard deviation on the other hand tells us the deviation of the sample mean with respect to each of the variables. Of most important in the interpretation of the descriptive statistics are the Skewness, Kurtosis, Jarque-Bera and the Probability values. Starting from the Skewness, for normal Skewness, the value is zero (0), meaning the variable is normally distributed (Dubauskas and Teresienė, 2005). Based on the results in the table, all the variables (except Export) mirror a normal distribution. On the Kurtosis, it measures the flatness of the distribution of the series. The benchmark value for the Kurtosis is 3, which means it is Mesokurtic (normal distribution). However, a lower or higher value can be derived. As shown in the results, PVTK, PUBK and FRAID are Mesokurtic, that is, they are normally distributed. Although GDP and GHK that are <3 mirror a normal distribution, they are clearly Platykurtic (flatted-curve, more lower values and long-right tail) because 2.137628 and 2.071290 are <3 while EXPO with a higher value of 7.536586 is Leptokurtic (peaked-curve, more higher values and lower-right tail). Jarque-Bera statistic on the other hand measures the difference of the skewness and kurtosis of the data with those from the normal distribution (Demir, 2022). At 5% level of significance (using the probability value), the RGDP, PUBK and GHK show a normal distribution Jarque-Bera statistic curve while the null hypothesis of a normal distribution is rejected for PVTK, EXPO and FRAID.

5.2. Unit Root

The study adopts the robust version of Augmented Dickey-Fuller (ADF) and Phillips Perron unit root tests to ascertain the stationarity of the data set. The two approaches were adopted to ensure consistency and to compare and validate the results (Nwakanma and Ibe, 2014; Cheng et al. 2014; Paparoditis and Politis, 2018). As shown in Table 2, the results shows that growth of output (RGRY), human capital (GHK), exports (EXPO) and foreign aid (FRAID) are not stationary in levels, but in first differences i.e. I(1). On the other hand, private physical capital stock (PVTK) and public physical capital stock (PUBK) are both stationary in levels i.e. I(0).

5.3. Results of the Two-Stage Least Squares and Generalized Method of Moments

Tables 3 and 4 show results of the Two-Stage Least Squares (2SLS) and Dynamic Generalised Method of Moments (GMM) techniques, respectively. The 2SLS estimation can be thought of as a special case of GMM. The GMM estimation is based on the orthogonality condition between a function and instruments (Bontemps and Meddahi, 2012) and uses robust standard error to account for heteroscedasticity and serial correlation. The essence of the two approaches is to ensure robust and accurate results. The statistical accuracy of the findings from the two models are further cemented by the use of 1% and 5% levels of significance. The results from the two approaches are similar and consistent, indicating that all the variables in the model (except public physical capital stock) significantly determine economic growth in Malawi.

As revealed by the coefficients of all the variables in the two models, an increase in export, foreign aid, human capital development and private physical capital stock will lead to a significant increase in economic growth. For example, exports were found to have a positive and statistically significant impact on the country's economic growth. This finding is consistent with Nyasulu (2013) who assessed the impact of exports and imports on economic growth in Malawi between 1970 and 2010. His findings revealed a significant positive relationship between exports and economic growth while imports had an insignificant impact. The finding is also in line with Tekin (2012). It can safely be concluded, therefore, that an export oriented strategy like trade aimed at enhancing Malawi's export potential should be promoted. The country can tap export earnings from value-added and manufactured products and create jobs in a country where the population is growing at 2.8%/annum on average (Department of Population and Development, 2019).

There are divergent views in the literature on the impact of foreign aid on the economy. Some studies have found a positive significant impact especially when state intervention is not included (Mallik,

Table 1: Descriptive statistics

Distribution	RGDP	PVTK	PUBK	EXPO	FRAID	GHK
Mean	9.109849	7.097029	19.19135	1.73E+11	6.01E+08	1.509599
Median	9.058826	6.377520	18.58707	3.06E+09	5.77E+08	1.443374
Maximum	9.902794	17.28781	38.44136	1.44E+12	1.46E+09	1.890814
Minimum	8.144476	2.340640	10.78028	58700000	1.73E+08	1.327043
Std. Dev.	0.478847	3.438769	6.477697	3.71E+11	3.02E+08	0.185169
Skewness	0.126247	0.889892	0.735878	2.401999	0.906670	0.656825
Kurtosis	2.137628	3.362795	3.092727	7.536586	3.554964	2.071290
Jarque-Bera	1.648521	6.735969	4.439938	89.13714	7.342214	5.284199
Probability	0.438559	0.034459	0.108612	0.000000	0.025448	0.071212

Table 2: Unit roots test results in the model variables

Variable	ADF test			PP test		
	t-Statistics	Order of integration	P-value	t-Statistics	Order of integration	P-value
Output growth	−8.2495	I (1)	0.0000***	−8.2901	I (1)	0.0000***
Private capital formation	−2.9684	I (0)	0.0452**	−3.0660	I (0)	0.0360**
Public capital formation	−3.0672	I (0)	0.0359**	−2.9707	I (0)	0.0449**
Human capital development	−6.8805	I (1)	0.0034***	−6.8821	I (1)	0.0000***
Exports	−5.8366	I (1)	0.0000***	−5.9315	I (1)	0.0000***
Foreign aid	−10.7598	I (1)	0.0000***	−10.7598	I (1)	0.0000***

***, ** and * represent statistical significance at 1%, 5%, and 10%, respectively

Table 3: Estimation results of the two-stage least squares

Dependent variable: Output growth				
Method: Two-Stage Least Squares				
Sample (adjusted): 1970Q2 2019Q4				
Included observations: 195 after adjustments				
Constant added to instrument list				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	2.1229***	0.4646	4.5694	0.0000
Exports	0.1041***	0.0122	8.5514	0.0000
Foreign aid	0.2218***	0.0252	8.7862	0.0000
Human capital development	0.2704***	0.0798	3.3904	0.0016
Public capital formation	−0.0010	0.0019	−0.5211	0.6029
Private capital formation	0.0063**	0.0031	2.0197	0.0448
R-squared	0.9704	Mean dependent var		9.1150
Adjusted R-squared	0.9696	S.D. dependent var		0.4709
S.E. of regression	0.0821	Sum squared resid		1.2736
F-statistic	1238.975	Durbin-Watson stat		2.1197
Prob (F-statistic)	0.0000	Second-Stage SSR		1.2736
J-statistic	180.4756	Instrument rank		7
Prob (J-statistic)	0.3102			

***, ** and *represent statistical significance at 1%, 5%, and 10%, respectively

Table 4: Estimation results of the generalized method of moments

Dependent variable: RGRY				
Method: Generalized Method of Moments				
Sample (adjusted): 1970Q2 2019Q4				
Constant added to instrument list				
Variable	**Coefficient**	**SE**	**t-Statistic**	**Prob.**
C	2.1289***	0.7146	2.9789	0.0033
Exports	0.0560**	0.0245	2.2859	0.0234
Foreign aid	0.2217***	0.0372	5.9627	0.0000
Human capital development	0.8417**	0.3500	2.4049	0.0171
Public capital formation	−0.0034	0.0037	−0.9389	0.3490
Private capital formation	0.0096*	0.0054	1.7637	0.0534
R-squared	0.9668	Mean dependent var		9.1150
Adjusted R-squared	0.9659	S.D. dependent var		0.4709
S.E. of regression	0.0869	Sum squared resid		1.4286
Durbin-Watson stat	2.0987	J-statistic		13.2762
Instrument rank	7	Prob (J-statistic)		0.7003

***, **and *represent statistical significance at 1%, 5%, and 10%, respectively

2008; Tchereni et al., 2013; Chirwa and Odhiambo, 2016); and others have found a long run negative significant relationship, revealing that foreign aid erodes the economy (Chiumia and Simwaka, 2012; Murshed and Khanaum, 2012; Ziaja, 2013). In line with Mallik (2008) that carried out an empirical investigation on foreign aid and economic growth in central African Republic, Malawi, Mali, Niger, Sierra Leone and Togo, this study has equally found that foreign aid has a significant positive impact on economic growth in Malawi. This finding is also similar to views expressed by Sakyi (2011) and Kargbo (2012) that foreign aid comes with stringent terms and conditions, which have important benefits to recipient countries that have a good-policy environment.

Page (2019) and Adhikari et al. (2019) reveal that Malawi has a long history of receiving foreign aid (both monetary and technical support) and that 40% of the budget comes from foreign donors. In spite of this aid dependency, the country usually experiences an average annual growth rate of about 3.5%. The World Bank attributed this growth to "sound economic policies and a supportive donor environment" (World Bank, 2023).

With human capital consistently observed to have the highest impact on economic growth with coefficients of 0.2704 (27%) and 0.8417 (84%) in the two models, it can safely be argued that human capital development is an important driver of economic growth in Malawi. This is consistent with Chirwa and Odhiambo's (2016) finding that human capital development is one of the main drivers of economic growth in Malawi. These results have significant policy implications. Since a sound economic strategy is needed to increase output growth in Malawi, focus should be on policies that promote education and training. This means that a large investments in human capital development will untimely lead to massive growth in output.

The study also finds that public sector capital formation has an insignificant relationship with economic growth. This aligns with Musaba et al. (2013) that showed no significant relationship between government sectoral expenditure and economic growth in Malawi. The implication of this finding is that government capital formation does not lead to economic growth. Accordingly, the Malawi government should not expect to spur economic growth through heavy public sector investments.

Table 5 presents results of the Granger Causality test employed to examine the relationship between the two forms of capital formation. The table shows that at 5%, there is a unidirectional Granger-causal relationship running from private sector capital formation to public sector capital formation. This means that private sector capital formation drives public sector capital formation and not vice versa.

Table 5: Granger causality tests

Pairwise granger causality tests			
Sample (adjusted): 1970Q2 2019Q4			
Lags: 2			
Null Hypothesis:	**Obs**	**F-Statistic**	**Prob.**
PVTK does not Granger Cause RGDP	195	3.10325	0.0553*
RGDP does not Granger Cause PVTK		1.48717	0.2377
PUBK does not Granger Cause RGDP	195	0.82630	0.4447
RGDP does not Granger Cause PUBK		3.13621	0.0538*
PUBK does not Granger Cause PVTK	195	2.12903	0.1316
PVTK does not Granger Cause PUBK		3.31150	0.0462**

***, ** and * represent statistical significance at 1%, 5%, and 10%, respectively

Table 6: Serial correlation LM test

Breusch-Godfrey Serial Correlation LM Test			
Null hypothesis: No serial correlation at up to 2 lags			
Obs*R-squared	15.7994	Prob. Chi-Square (2)	0.2084

Table 7: Heteroskedasticity test

Heteroskedasticity test: Breusch-Pagan-Godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	0.3775	Prob. F (6,41)	0.8891
Obs*R-squared	2.5129	Prob. Chi-Square (6)	0.8670
Scaled explained SS	2.5622	Prob. Chi-Square (6)	0.8614

Table 8: Instruments test

Weak Instrument Diagnostics	
Equation: Untitled	
Cragg-Donald F-stat 4.1872	
Stock-Yogo bias critical values	
5%	7.56
10%	5.58
20%	4.84

Similar findings are reported by Makuyana and Odhiambo (2019), who argue that an increase in public investment may crowd out private sector investment in Malawi; and that private sector capital formation Granger-causes economic growth in Malawi and not vice versa. This is also in line with the findings of Hong (2017) and Onyinye et al. (2017).

Given these findings, we argue that the role of government capital formation should be restricted to areas that provide an enabling environment for the private sector to thrive. Public expenditure on capital stock may have to be limited to the provision of social amenities or goods and services in which the private sector cannot efficiently produce optimally. Engaging in heavy public sector expenditure on physical capital to promote economic growth will not yield the required results.

Government must also be committed to invest in capital that develops and sustains the institutions that formulate, implement, oversee and regulate policies that promote private-sector-led output growth. Based on the results from the two models, private capital formation significantly contributes to output growth, which is consistent with Makuyana and Odhiambo (2019).

5.4. Diagnostic Tests

Tables 6-8 present results of diagnostic tests conducted on the two models (2SLS and dynamic GMM) in order to test their robustness and reliability. In the first instance, the study fails to reject the null hypothesis of no serial correlation (using the Breusch-Godfrey Serial Correlation LM Test) and heteroscedasticity (using the Breusch-Pagan-Godfrey Test for Heteroscedasticity) in the two models. This means that the tests show the absence of both serial correlation and heteroscedasticity in the two models (Test Results available on request).

We also carried out a diagnostic test for instruments. The findings showed that the Stock-Yogo critical value of 7.56 is greater than our Cragg-Donald F-statistic of 4.1872 at 5%, denoting that the instruments are relatively robust and relevant for the study. It can safely be argued, therefore, that the two models are consistent and reliable in analysing the relationship between public and private sector capital formation and economic growth in Malawi.

6. CONCLUSIONS, LIMITATIONS AND AREAS FOR FURTHER RESEARCH

This study set out to investigate the relationship between public and private sector capital formation and economic growth in Malawi. Estimations of an endogenous growth model using 2SLSand dynamic GMM methods and quarterly data for the period 1970 to 2019 reveal that both human capital development and private sector physical capital formation have a positive and significant functional relationship with economic growth. This finding is consistent with Chirwa (2017) and Makuyana and Odhiambo (2014, 2019), among others. The study also finds that public sector physical capital formation has an insignificant effect on output growth in Malawi. This is consistent in the estimation results of both 2SLS and GMM techniques. This tends to support the view that governments should be lean and public expenditures should be limited to the provision of social amenities or goods and services that the private sector cannot produce efficiently in optimal quantities.

The study also finds that exports play an important role in influencing the level of economic growth in Malawi. Similarly, the study reveals that foreign aid makes a positive contribution to economic growth in Malawi. This finding supports Alemu and Lee (2015) who maintain that the frequent criticism that foreign aid has not contributed to economic growth is flawed, especially in low-income African countries. Given these findings, this study contributes to the body of knowledge by unravel the relationship between public and private sector capital formation and economic growth, which has been an outstanding issue (relationship was not well understood) in the literature, especially in Malawi where research has been limited in this area. To the best of our knowledge, there is no study that seeks to establish this relationship in the country. This finding will help to enlighten policymakers on the wisdom of formulating and implementing policies that enhance either public or private sector capital formation in Malawi.

Consistent with orthodox classical political economics, we recommend a small government for Malawi with a lean balanced

budget, especially since there are no benefits from large government spending, at least in spurring economic growth. The only public sector investments that should be undertaken are public goods in areas associated with market failure. Thus, government should focus on providing an enabling environment for the private sector to thrive by scaling up private sector capital formation for resilience and providing incentives that promote adaptation investments. In addition, the study recommends that the Malawi government should focus on policies that promote quality education, lifelong learning and training in order to support human capital development, boost productivity, and subsequently enhance economic growth.

Data availability was a major limitation for this study. First, the variables were not available from one source. We had to spend time to ensure that the variables are comparable. Second, not all variables were available at the required frequency. While some of the variables were available in quarterly frequency, others were not. The latter had to be interpolated from annual to quarterly frequency, which is a statistically accepted approach, albeit not ideal.

Further studies may wish to consider conducting a similar study using a dynamic general equilibrium (DGE) model derived from microeconomic foundations of constrained decision-making and compare the results. The DGE Models describe general equilibrium allocations and prices in the economy where all agents dynamically maximise their objective functions subject to resource constraints (Tovar, 2009). They also tend to avoid the Lucas critique, where only models in which the parameters that do not vary with policy interventions are suited to evaluate the impact of a policy change (Tovar, 2009).

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