

Financial Development, Human Capital, and Economic Growth: New Evidence from Sierra Leone

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Abstract

The financial sector performance and human capital development have been weak in most Sub-Saharan Africa countries since the 1970s to 2000s. The region has suffered tremendously from low level of human and physical capital accumulation leading to severe constraint on resources used for development of the financial sector and consequently impacted negatively on financial sector stability and hence economic growth. This is the case for Sierra Leone, the financial sector performance and human capital accumulations have been poor and leading to considerable financing gap for investment with adverse consequences on poverty alleviation and economic growth. Given the relevance of finance and human capital on growth, this study examines the link between financial development and human capital accumulation on economic growth in Sierra Leone from 1980-2012, using the Ordinary Least Squares (OLS) regression estimation technique. This study shows that the simultaneous interaction of financial development and human capital accumulation are significant and impact positively on growth. However, inflation is found to reduce the growth of output and is insignificant. The policy implication is that the enable environment for investment in the real as well as the financial sector growth policy should be pursued. Therefore, the government should strive to ensure sound macroeconomic stability. This study contributes to the current literature by providing an econometric understanding of relationships in finance, human capital, and economic growth for SSA countries. This understanding is of relevance to academics, policy makers, and development partners in shaping future financial development, human capital accumulation, and economic growth.

Keywords: Financial Development, Human Capital, Economic Growth, Inflation, Sub-Saharan Africa and Sierra Leone.

Introduction

Development economics literature attached greater importance to the rate of physical and human capital accumulation in the process of economic growth and hence economic development. However, the relationship between financial development, human capital and economic growth is a controversial issue because, the issue as to whether financial development and human capital play a casual role on economic growth is mixed, with the debates still ongoing. Despite this understanding, however, this research does not undermine the role of finance, human capital on growth. This is because poor performance in the financial system may impact negatively on investment and hence economic growth. It is the case that, recently the world witnessed one of the most devastating financial meltdowns of 2007-2009 since the great depression of the 1930s and affected investment, employment, remittances and trade thus leading to world recession. The relationship between financial development, human capital on economic growth has been one of the most debated in the recent past, yet with little consensus. Central to this debate is the notion that whether strong economic performance is finance-human capital led or growth driven

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The causal relationship between financial development and human capital on economic growth has been of great interest in the recent past. While most theoretical and empirical work support the view that vibrant and efficient financial development are channels to support and increase economic growth, an increasing literature also examines whether economic growth leads to growth in financial infrastructure, or whether there are other factors which lead to a well developed financial market. Romer (1990) noted that, technological change depends on investment in technology, and that the amount of investment required by a firm goes from one technological level to a higher level which depends on two key factors: the level of general and scientific knowledge in the world and the barriers to be adopted in the firm's country. (Parente and Prescott, 1994) used firm level data and found that technology is a key factor in long run economic growth and development.

However, previous empirical studies have produced mixed and conflicting results on the nature and direction of the causal relationship between finance and human capital on economic growth. Despite advances in the growth literature, the question as to whether financial systems and human capital play a causal role on economic growth remains an unsettled puzzle. For instance, (Parente and Prescott, 1994) argue that financial systems are important in promoting innovations and that economy with more efficient financial systems and strong human capital base grow faster relative to those without. The development of a country's financial system and human capital development on economic growth is consistent with the "supply-leading" view of the finance, human capital and growth relationship (Patrick, 1966). The philosophy underpinning this view argues for the existence of a positive causal relationship flowing from financial development and human capital to economic growth. The "supply-leading" argument of the finance-growth literature states that the development of a viable financial sector and human capital is a pre-requisite for economic growth.

It is more imperative to gather theoretical and empirical ideas at a time when Sub-Saharan African countries have set its sight on growth and development. The financial sector development and human capital base are key areas for growth and development. It is also important to note that the instability of the financial sector including banks offer important theoretical insights and policy recommendation that are particularly valuable in areas of the world suffering from banking and financial crisis, low human capital development and weak level of domestic mobilization of capital for investment and economic growth. Consistent with the notion of building a safe, sound and stable banking system, Sub-Saharan African region have suffered tremendously from low level of human and physical capital accumulation, limited capital inflows and declining export receipt due to deteriorating terms of trade and mounting external debt leading to severe constraints on resources used for development of the banking sector and consequently posed difficulty of maintaining financial sector stability and economic growth.

During the 1980s and early 1990s, to promote financial development many countries in Africa undertook financial sector reforms such as liberalizing interest rates, phasing out directed credit, adopting indirect instruments of monetary policy, restructuring banks, and improving banking supervision. Despite the widespread financial sector reforms that have taken place, the financial systems in Sub Saharan Africa still exhibit some level of inefficiency, illiquidity, and thinness. Owing to widespread over-regulation of the financial systems, the region continues to experience high levels of capital flight. Informal savings channels are prevalent in view of the grossly inadequate formal financial systems. All these factors – dearth of private international capital, low level of domestic resource mobilization, capital flight, limited degree of human capital development and untapped resources in the informal sectors - lead to considerable financing gap, with adverse consequences on growth and poverty alleviation in Africa. (Beck et al. 2005)

This situation is the case in Sierra Leone, the banking sector dominates the financial sector, and as such any failure in the sector has an immense implication on the economic growth of the country. The economy experienced moderate growth in the 1970s, and growth performance in the 1990s and 2000s was mixed. The poor performance of the economy is partly blamed to the ineffective functioning of the financial system as demonstrated by inadequate bank supervision, weak coordination among banks, inadequate payment system infrastructure and the subjective assessments of credit creation not consistent across banks and leading to high volume of non-performing loans and liquidity problem and impacts negatively on the financial sector, and hence growth (Financial Sector Development Plan, 2009). To address these problems, the Bank of Sierra Leone and Banking Acts were revised in 1995 to provide sound legal framework for the banking system consistent with a more independent central bank and effective supervision. New banking regulations were issued to the commercial banks, requiring increased capitalization, reporting standards comparable with international standards and actions to make the institutions more robust.

The Bank of Sierra Leone was now better placed to pick up early warning signals of weaknesses in the financial sector. As a result, commercial banks were able to survive the devastating events of the ten year rebel incursion. The regulatory and supervisory role was extended to other financial institutions, which led to the enactment of the financial services Act in 2010. One fundamental intermediation gap that requires attention, in the context of providing appropriate financing for poverty reduction is the lack of medium to long term lending facilities by commercial banks in particular. Despite the widespread financial sector reforms that have taken place, the financial systems in Sierra Leone is still underdeveloped and the country continues to experience high levels of capital flight (Bank of Sierra Leone Annual Report, 2011).

Over the past decade, the country has ranked at the near bottom of the United Nation Development Program Human Development Ranking Index due to low literacy rates, limited human development capacity, low level of education, employment, and low life expectancy leading to considerable financing gap, with adverse consequences on growth and poverty alleviation in Sierra Leone. (Sierra Leone White Paper Report on Education, 2010).

Now that growth promotion in the financial sector and human capital development are being actively supported by the IMF, World bank, and other international institutions and the Government, all these effects requires research to find out how the growth in the financial sector and human capital development would impact on the economic growth. Therefore, the Sierra Leone economy provides a good test laboratory. Reliable and a long term time series data is available for Sierra Leone that allows for an econometric analysis to make reasonable conclusions about the relationship between financial development, human capital, and economic growth. Studies thus, far have looked at some of the key determinants to sustained economic growth, but studies on how financial development and human capital can impact on the economic growth of developing country like Sierra Leone are scant.

Despite the introduction of the IMF and World Bank programs, growth in Sierra Leone has been bad. To address these issues, this study therefore, endeavors to carry out a systematic examination on the extent to which financial development has affected growth in Sierra Leone. Specifically, the study seeks to; (i) empirically determine the effect of specific measures of financial development on economic growth in Sierra Leone; (ii) examining the direction of causality between financial development, human capital and economic growth; and (iii) providing policy recommendations to academics, policy makers and development organizations in shaping the future financial sector infrastructure, human capital development and hence economic growth. These specific characteristics of Sierra Leone's growth process offer us the test case to investigate the link between financial development, human capital and economic growth in Sierra Leone, and are one of the motivations of this current study.

Therefore, we propose the following hypotheses that can be tested. This is because hypotheses are statements that can be proven or disproven. Hence, we test the Null hypothesis against the alternative hypothesis thus;

Null Hypothesis (H_0): There exist positive correlation among financial development, human capital and economic growth

Alternative Hypothesis (H_1): There exist negative correlation among financial development, human capital, and economic growth

Null Hypothesis (H_2): Causal relationship exists among financial sector development, human capital, and economic growth in Sierra Leone

Alternative Hypothesis (H_3): Causal relationship does not exist among financial development, human capital, and economic growth.

Null Hypothesis (H_4): long run equilibrium relationship exists among financial sector development, human capital, and economic growth in Sierra Leone.

Alternative Hypothesis (H_5): long run equilibrium relationship does not exist among financial development, human capital, and economic growth in Sierra Leone.

The attempt to provide logical explanations on the above issues constituted major challenges of the current study. Data on annual growth variables such as Real Gross Domestic Product, and financial data on an annual basis such as Broad Money to GDP, liquidity liabilities, Credit to the Private Sector, Gross Capital formation, Gross National Saving as a share of GDP, Population Growth Rate and Secondary School Enrollment rate were collected from the International Financial Statistics, the World Bank and World Development Indicators (WDI), over the period 1980-2012. The Ordinary Least Square (OLS) regression estimation technique is applied in the study. The Pair-wise correlation matrices and the Granger Causality test are also applied to test the first and second hypothesis respectively. E-views 6, software are used in the analysis.

This study contributes to the literature in the following ways: First, studies on the simultaneous effect of finance and human capital on growth are limited; this study explores the simultaneous effect (interactive terms) of financial development and human capital on the economic growth in Sierra Leone. Second, the study investigates the marginal impact of financial development and human capital on growth of output in Sierra Leone and finally provides an econometric relationship of finance and human capital on growth. This understanding is important for academics and policy makers in shaping the future stability of the financial sector and human capital in the African region and globally.

Primary weakness of the study is the limited availability of data. Analysis is therefore, restricted to a smaller number of variables than desired because of these restrictions. However, reasonable data is available for the purpose of this research. The rest of this paper is organized as follows: section 2 is literature review, followed by section 3, theoretical model, and methodology. Section 4 is results and discussions of the study. Finally, section 5 provides the conclusion.

2. Literature Review

This section reviews the theoretical underpinnings and empirical literature in the context of developing and developed countries and to review a broader literature strand on the connection between financial development, human capital, and economic growth. This understanding is crucial and important for carrying out an empirical analysis on the link between financial development, human capital, and economic growth for the Sierra Leone economy.

2.1 Theoretical Literature

The basic assumption of the endogenous growth theory is that increases in the capital stock (both physical and human capital) generate positive externalities which increase the level of technology such that if the spillovers are strong, they can prevent diminishing returns to capital. The implications for growth are similar to those found when technological progress and human capital are analyzed separately, but by assuming that there are decreasing returns to human capital both in final output production and in schooling. The interaction between human capital and finance on economic growth generates some interesting implications for the transitional dynamics (Fischer, 1993). However, Young (1998) observed that, where long run growth is driven by improvements in product quality which is independent of scale, and also does not exhibit scale effects and the economy long run growth rate impact is the presence of human capital. Noting that, the growth rate of the economy is ultimately determined by the capacity to accumulate human capital, since the accumulation of human capital drives the incentives for investment.

Diamond and Dybvig (1993) noted that a well developed financial system is an important complement to the development of human resource in the growth process. The relationship between financial development and human capital, although acknowledged in the theoretical literature remains less explored at the empirical level. The literature suggests that better educated people are less risk averse, have high information, and are high savers. Therefore, improving educational levels including adult education provides new opportunities to people empowerment. Education also allows people to move from informal sector to formal sector opportunities enabling them access to formal financial services. Financial sector development through credit channels also enables human capital accumulation and influences economic growth. Thus, the effect is both ways.

Financial development and strong human capital endowment can foster an efficient use of borrowed funds better than savers acting individually. It can also improve managerial efficiency by promoting competition through effective takeover or threat of take over.

Demirguc-Kunt and Maksimovic (2005) argue that financial development and human capital enable particular entrepreneurs to undertake innovative activity, which affects growth through productivity enhancement, and viewed financial and human capital climate as playing an important role in dampening the impact of external shocks on the domestic economy. They conclude that, financial systems without the necessary institutional development, human development, educational attainment has led to a poor handling or even magnification of risk rather than mitigation. These relationships provide the theoretical underpinnings for the current study

2.2 Empirical Literature

The next question concerns the empirical evidence of financial development, human capital, and economic growth. Empirical studies of economic growth have introduced a variety of explanatory variables to account for cross-country variation in growth performance, e.g. school enrolment rates, human capital stock proxies, labour force participation rates, private and public investment rates, foreign direct investment, equipment investment, and number of people employed in general economic activities (Fischer, 1993). The results from these studies were put in three key areas of importance for growth, namely, human capital, investments, and variables related to the business environment. In particular, empirical studies have found that, a country tends to grow rapidly with strong human capital endowment. Most studies also find savings and investment rates (whether in physical or in human capital) to be positively correlated with growth. The growth accounting model was employed by Demirguc-Kunt and Maksimovic (2005) to demonstrate that investment in human capital and physical capital accounts for a very high proportion of growth in both education and productive sector for the US economy over the post-war period. Their findings reveal that specifically, growth in labour input is held to account for just over 60% of overall economic growth and increases in labour quality (education and training) explain some what 32% of the labour contribution and concluding that international output differences in productivity and growth rates derives almost entirely from differences in the growth of efficiency level.

However, the growth accounting model poses potential weaknesses such as the many assumptions imposing on the inputs rather than testing them empirically. For it is the case that the rate of change of each input is weighted by the share of that input within the total. While human capital has a significant role to play in explaining output growth in the model, the measurement of this human capital is usually a complex mix of educational, demographical and labour market variables. Recent growth theories have therefore, favors the endogenous growth model that assumes constant and increasing return to scale; noting that the neoclassical model fails to explain the observed differences in per capita income across countries (Fischer, 1993).

Diamond and Dybvig (1993) examined the impact of financial development on the rates of investment in physical and human capital. Financial development in their study leads to the accumulation of physical capital positively and significantly. The authors however, noted a weak relationship between the financial development and human capital. This could be due to the choice of particular variables (the authors also mention that different results may be possible if enrolment ratios instead of average years of schooling is considered and the rigours of the cross-country exercise. Hakeem (2010) employing augmented Solow model in a panel data framework examined the impact of financial development and human capital in facilitating economic growth in the East Asia region. The study found a complementary relationship of the financial development and human capital to economic growth in the region. However, it noted lower impact of the financial development on growth which could be due to the existence of financial repression, low institutional development, and poor infrastructure.

On balance, literature survey reveals that numerous studies have looked at the link between financial development and economic growth using a number of cross country approach; results of these studies are mostly inconclusive. These contradictory conclusions emerging from the empirical literature are also one of the motivations for the present investigation. This study is different from most of the previous studies in the literature by examine the case of a typical Sub-Saharan Africa economy (Sierra Leone) that is structurally constrained and the financial sector climate and human capital are still quite underdeveloped. Findings of the study contribute to theory by explaining the relationship between financial development, human capital, and economic growth. This is of important for policy makers who seek to develop policies for sustained financial infrastructure and economic growth.

This understanding is also of significance for investors and businesses who seek to invest in profitable ventures for superior risk-adjusted returns.

3. Theoretical Framework and Methodology

We pursue a modified version of the endogenous growth framework in specifying a model of growth that can account for the effect of finance, human capital in the growth process. Here, the analysis is heavily drawn from the contributions of the "endogenous growth literature" by Romer (1986). One of the many insights of this literature is that, savings behavior will generally influence equilibrium growth rates. We assume a competitive economy with identical firms and households such that there is a coincidence between per firm and per capita values⁴. We also assume that the stock of capital, K_t at any point in time is made of both physical and human capital. We let the aggregate level of output produced in the economy at time t , Q_t to follow a linear function of the aggregate capital stock (K_t) as follows:

$$Q_t = \lambda K_t \quad (1)$$

Where λ , the approximate state of technology or the rate of transformation of capital input into output. We assume further that, even though each of the N firms in the economy faces a constant returns to scale technology, productivity is however an increasing function of the stock of capital K_t . On the basis of this assumption, we assume that each firm's output is given as follows:

$$q_t = \Omega K_t^\beta \quad (2)$$

Where q_t is firm-specific output, K_t is firm-specific capital stock and Ω is a parameter that responds to the capital stock $\Omega = \lambda K_t^{1-\beta}$. In this framework, we further assume that the stock of physical capital depreciate at the rate of π per period. Thus, gross investment, which is defined as the rate of growth of the capita stock (after adjusting for capital depreciation) is given as:

$$I_t = K_{t+1} - (1 - \pi) K_t \quad (3)$$

Assuming a closed economy with no government intervention, a necessary condition for capital market equilibrium dictates that gross savings (S) equal gross investment. However, since a proportion of savings $(1 - \alpha)$ leaks from the process of financial intermediation, capital market equilibrium requires that $I_t = \alpha S$. Hence, $1 - \alpha + \alpha = 1$. from the aggregate production function in equation (1), the growth rate of output in period $t + 1$ is given as:

$$g_{t+1} = \left(\frac{Y_{t+1}}{Y_t} \right) - 1 = \left(\frac{K_{t+1}}{K_t} \right) - 1 \quad (4)$$

By re-arranging equation (11), we have $I_t = K_{t+1} - (1 - \pi) K_t$. Thus, by substituting for $K_{t+1} = I_t + (1 - \pi) K_t$ in equation (4) above, we have:

$$g_{t+1} = \frac{I_t + K_t - \pi K_t - K_t}{K_t} = \frac{I_t}{K_t} - \pi \quad (5)$$

Again, re-arranging equation (1), we have $K_t = \frac{Q}{\lambda}$ now, by substituting for K_t in equation (5) above, the growth of output at time $t + 1$ becomes:

⁴That is, we assume that the marginal product of the firm is exactly equal to the wage rate.

$$g_{t+1} = \frac{\lambda \alpha S}{Q} - \pi \quad (6)$$

By invoking the capital market equilibrium condition that $I_t = \alpha S_t$ then equation (6) reduces to:

$$g_{t+1} = \lambda \alpha \left(\frac{S}{Q} \right) - \pi \quad (7)$$

The steady state solution can then be deduced from equations (6) and (7) to obtain:

$$g_t = \lambda \left(\frac{I}{Q} \right) - \pi = \lambda \alpha \beta - \pi \quad (8)$$

Where $\beta = \frac{S}{Q}$ (i.e the saving rate). In the context of the endogenous growth framework (Pagano, 1993; and Barro, 1989a), equation (8) predicts that financial development affects growth by either raising α or accelerating the social productivity of capital λ ; or it can influence the saving rate β .

3.1 Model Specification

According to Barro (1989a), the growth of real GDP is considered to depend on several variables. For the purpose of our study, the relationship between finance and growth can be augmented from the Barro-growth regression of financial development variables which takes the form thus;

$$\text{Growth} = \alpha_0 + \beta_1[\text{Finance}] + \gamma_i[\text{conditioning set}] + \mu_t \quad (9)$$

Where β_1 the coefficient of the measures of financial sector development/indicators and γ_i is the coefficients of the set of control variables.

However, it is difficult to identify proxies for measuring financial sector development and growth. For instance, Beck et al., (2008) discuss different indicators of financial development capturing the size, activity, and efficiency of the financial sector, institutions or markets. However, this study improves on their models by including the human capital, proxied as secondary enrolment on finance to capture the simultaneous effect of finance and human capital on growth of output via (the interactive terms of financial development and human capital). Financial markets development, such as stock market, bond markets, capital markets, and insurance companies are still quite underdeveloped and limited in Sierra Leone. Therefore, data on financial markets in Sierra Leone is extremely limited. In this study, our measures of financial development indicators are purely banking. Therefore, the selection of banking development indicators as appropriate proxies to financial development (FD) justifies the choice of financial development in Sierra Leone.

This study uses three financial development indicators mainly banking development indicators and includes broad money, liquidity liabilities, and credit to the private sector. The regression model is therefore specified with the RGDP as dependent variable, measured as GDP growth on an annual basis adjusted for inflation. The explanatory variables comprise both the financial sector indicators and the control variables as follows:

Financial Sector indicators

- The overall financial depth of the financial system (measured as the ratio of broad money to GDP, ie $\left(\frac{M_2}{GDP} \right)$)
- The extent of financial intermediation in the economy (measured as the ratio of liquid liabilities as a share of GDP, ie $\left(\frac{M_3}{GDP} \right)$)

- Credit to the private sector as a share of GDP, which is the value of loans made to the private enterprises and households used as a measure of financial sector development. (i.e $\frac{CP}{GDP}$)

The Control/Conditioning variables include;

- INF= The consumer price index with 2000 as the base year
- K= Physical capital, measured as gross capital formation as a share of GDP
- GNS = Gross National Savings as a share of GDP, measured as gross national income less total consumption, plus net transfers)
- PGR=Population Growth Rate, measured as measured as the average percent in the population, resulting from a surplus or deficit of births over death and the balance of migrants entering and leaving a country
- H= Human Capital , measured as secondary enrolment rate

Hence,

$$FD = f\left(\frac{M_2}{GDP}, \frac{M_3}{GDP}, \frac{CP}{GDP}\right) \quad (10)$$

From equations (9), above, we specify our model for this study in a more explicit form thus;

$$\ln(RGDP) = \alpha + \beta_1 \ln FD + \lambda_1 \ln(INF) + \lambda_2 \ln(K) + \lambda_3 \ln(GNS) + \lambda_4 \ln(PGR) + \lambda_5 \ln(H) + \mu_t \quad (11)$$

By the interaction of financial development and human capital, equation (11) can be decomposed thus;

$$\ln(RGDP) = \alpha + \beta_1 \ln FD + \lambda_1 \ln(INF) + \lambda_2 \ln(K) + \lambda_3 \ln(GNS) + \lambda_4 \ln(PGR) + \lambda_5 \ln(H) + \theta \ln(FD * H) + \mu_t \quad (12)$$

This study further examines the marginal effect of financial development on economic growth at various level of human capital indicator is assessed by taking the partial differential of equation (12) with respect to financial development indicators.

$$\frac{\partial \ln(RGDP)}{\partial \ln(FD)} = \beta_1 + \theta \ln(H) \quad (13)$$

Similarly, the marginal effect of human capital on economic growth at various level of financial development is assessed by taking the partial differential of equation (12) with respect to human capital indicator.

$$\frac{\partial \ln(RGDP)}{\partial \ln(H)} = \lambda_5 + \theta \ln(FD) \quad (14)$$

$$\beta_1 <0 \text{ or } >0, \quad \lambda_1 <0, \quad \lambda_2 >0, \quad \lambda_3 >0, \quad \lambda_4 <0 \text{ or } >0, \quad \lambda_5 >0, \text{ and } \theta >0$$

The rationale for making these restrictions is based on economic theory and their expected behavior in the signs (coefficients to be estimated) can be tested in the analysis,

3.2 Methodology

Most time series data are non-stationary, hence using the OLS technique may imply that the result obtained would be spurious in the sense that the variables may seem to have causation when there is no causation and the regression is meaningless. However, to overcome this notion, time series data requires being de-trended in a regression analysis. Thus, we apply the idea of differencing using the Unit root tests.

3.2.1 Unit Root Tests:

The Augmented Dickey-Fuller (ADF) unit root test and the Phillip-Perron (PP) unit root test is used and both tests have the same null hypothesis that unit root exist (Dickey and Fuller, 1979) and (Phillips and Perron, 1988). The Augmented Dickey Fuller (ADF) test regression of a unit root is given by

$$\Delta x_t = \mu + \beta t + \delta x_{t-1} + \dots \sum \delta_i \Delta x_{t-i} + \delta_m \Delta x_{t-m} + \mu_t \quad (15)$$

$$\Delta x_t = \mu + \delta x_{t-1} + \dots \sum \delta_i \Delta x_{t-i} + \delta_m \Delta x_{t-m} + \mu_t \quad (16)$$

Equation (15) contains a trend term, while equation (16) does not contain a trend time, and the lag terms are introduced in the model as additional repressors to account for heteroskedasticity and auto-correlation. But for the Phillip Perron, the lag m , is omitted to adjust for the standard error in order to correct for auto-correlation, heteroskedascity and problem of endogeniety.

The PP test equation is specified as:

$$\Delta x_t = \mu + \beta t + \delta x_{t-1} + \dots \sum \delta_i \Delta x_{t-i} + \delta_m \Delta x_{t-m} + \mu_t \quad (17)$$

The inclusion of the time trend in both unit root tests in equations (15) and (17) explains the importance attached to trended series but can be dropped if found to be insignificance, However, dropping it requires caution. The tests are carried under the condition that:

Null Hypothesis $H_0 : \delta = 0$, the series has a unit root (non-stationary) that is $I(1)$ against the Alternative Hypothesis $H_1 : \delta < 0$ the series has no unit root (Stationary) that is $I(0)$, if the calculated value of the tests statistic is less than the critical value at 0.05 of one tailed test, we reject H_0 and accept H_1 . That is the series is $I(0)$, stationary otherwise the series is $I(1)$, non-stationary.

3.2.2 Co-integration Tests

We test whether the dependent variable exhibit long run equilibrium-relationship with the explanatory variables or are co-integrated using the Co-integrating Regression Augmented Dickey–Fuller (CRADF) test. This test uses residuals form of a co-integration regression, we estimate the model using OLS estimation by minimizes the sum of the squares residuals; (Engel and Granger, 1987) considers this test as one of the preferred test of co-integration and became known as Co-integration Regression Augmented Dickey Fuller (CRADF) test.

The Co-integration Augmented Dickey Fuller (CRADF) test regression equation is given by

$$\Delta e_t = \alpha_1 e_{t-1} + \delta_1 \Delta e_{t-2} + \dots + \delta_m \Delta e_{t-m} + \mu_t \quad (18)$$

From equation (14) Δe terms are included to eliminate any autocorrelation so that $\mu_t \sim \text{IID}(0, \delta^2)$ (Mackinnon, 1991). We carry the CRADF test thus:

$H_0 : \alpha_1 = 0$ and e_t are $I(1)$, the series are not co-integrated

$H_1 : \alpha_1 < 0$ and e_t are $I(0)$, the series are co-integrated

If the calculated value of the test statistic is less than the critical value, then the null hypothesis of no co-integration is rejected; the series are co-integrated, m is the number of lagged terms is selected in the same way as for the unit root tests. We use (Mackinnon, 1991) critical values to make a decision on the test statistic and not the individual unit root values of the ADF test.

3.2.3 Granger Causality Test:

The Granger (1969) causality procedure is developed to test for causal relation. According to Granger, Y causes X if the past values of Y can be used to predict X more precisely than simply using the past values of X and vice versa. The idea behind this test is to run the following bi-variety regression models, if we want to determine the direction of causality between X and Y

$$X_t = \gamma_0 + \sum_{i=1}^n \delta_i X_{t-i} + \sum_{j=1}^m \sigma_j Y_{t-j} + \mu_{1t} \quad (19)$$

$$Y_t = \alpha_0 + \sum_{i=1}^n \alpha_i X_{t-i} + \sum_{j=1}^m \beta_j Y_{t-j} + \mu_{2t} \quad (20)$$

Where m and n are the number of lagged, X and Y are the terms respectively. μ_{1t} , μ_{2t} are the random errors and follows $N(0, \sigma^2)$. Equation (19) predicts that X_t is related to past values of itself as well as that of Y_t an equation (20) predicts similar trend for Y_t . If we want to test whether X Granger cause Y or/and Y Granger cause X we carry out an F-test on the joint significance of σ_j and α_i respectively. Therefore, we proceed with the test thus:

$$H_0 : \sum_{j=1}^m \sigma_j = 0 \text{ and } H_0 : \sum_{i=1}^n \alpha_i = 0, \text{ respectively}$$

We reject the H_0 , if the calculated $F^* > F_{n-k}^m$ (k is the number of parameters estimated in equations (19) and (20), n is the number of observations. Otherwise we do not reject H_0 . We may also use the Probability value of the F-statistic to make a decision based on the significance level, usually 1%, 5% and 10% respectively.

4. Results and Discussions

4.1 Summary Statistics

The summary statistics in table 1 below reveals on average growth of output (RGDP) is 14.9% , the broad money which is the depth of financial deepening averaged around 14.1% is considered low and reveals that significant proportion of the financial assets are held outside the formal financial sector. The liquidity liabilities as a share of GDP, (M3) averaged around 7.8%. The level of gross national savings averaged around 7.7%, which indicates weak capital base for investment. Credit to the private sector stood at 6.75%, which may reveal that substantial credit goes to the public sector, a notion of crowding out of the private sector in the development process and thus demonstrates the underdeveloped nature of financial intermediation in the Sierra Leone economy.

The double digit inflation rate 15.4% indicates weak macroeconomic management and has high standard deviation (**5.7%**) which is more risky and volatile. The overall physical capital formation as a share of GDP averaged around 11.0%, indicating that high proportion of income is spent on consumption rather than investment and thus impact negatively on long run economic growth. The growth rate of population averaged around 2.6% which may pose challenges to output growth if not properly checked and hence affect long run growth. Human capital development averaged around 15.2%.

Table 1: Descriptive Statistics

Variable	lnRGDP	lnM2	lnM3	lnCP	lnINF	lnK	lnGNS	lnPGR	lnH
Mean	14.9	14.1	7.8	6.75	15.4	11.0	7.7	2.6	15.2
Median	14.7	13.9	5.2	6.1	15.6	11.8	7.5	4.1	14.0
Maximum	17.8	16.9	19.1	10.5	25.9	18.4	15.0	7.8	19.1
Minimum	14.2	11.45	1.1	2.4	-1.1	-6.1	-5.0	-8.3	13.0
Std. Dev.	1.7	1.4	4.8	2.2	5.7	4.4	5.0	4.2	1.9

4.1.1 Correlation Result

The correlation matrix is conducted among the financial variables and reported in table 2 below, there is positive correlation among the financial variables. The correlation RGDP and the stock of physical capital (K) is positive and strong (0.53) and also the correlation between RGDP and human capital (H) measured as secondary school enrolment is positive and fairly strong (0.46). The correlation between Real GDP and the financial indicator variables are positive but weak, this result supports the view that financial intermediation in Sierra Leone is still quite underdeveloped as evidenced in the result of the descriptive statistics in table 1. Hence, the hypothesis that positive correlation exists among financial development, human capital, and economic growth is supported. The correlation between RGDP and Inflation (INF) is negative (-0.11), which implies that high inflation reduces the growth of output for the Sierra Leone economy. The correlation between real GDP and population growth rate is positive but weak (0.13) and the correlation between Real GDP and GNS is also weak (0.08). This means that savings mobilization is low, which may affect investment and hence growth. The population growth rate also has weak relationship with the growth of output in Sierra Leone. The values of the correlation are fairly moderate indicating absence of multi-collinearity.

Table 2: Correlation Result

Variable	lnRGDP	lnM2	lnM3	lnCP	lnINF	lnK	lnGNS	lnPGR	lnH
lnRGDP	1								
lnM2	0.15	1							
lnM3	0.03	0.48	1						
lnCP	0.12	0.65	0.14	1					
lnINF	-0.11	0.24	0.62	0.20	1				
lnK	0.53	0.28	0.08	0.55	0.13	1			
lnGNS	0.08	0.02	0.42	0.31	0.18	0.18	1		
lnPGR	0.13	0.44	0.01	0.13	-0.30	0.17	-0.05	1	
lnH	0.46	0.06	0.59	0.24	-0.36	0.35	0.37	0.38	1

4.1.2 Stationary Tests:

The ADF unit root test is performed under the null hypothesis that unit root exist against the alternative hypothesis that unit root does not exist. The ADF unit root test in table 3, below shows that all the variables are not stationary in level but stationary at first difference, implying that all the variables are integrated of order one, denoted as I(1).

Table 3: Result of the Augmented Dickey Fuller (ADF) Unit Root Test

Variable		Constant	Constant and Trend	Conclusion
lnRGDP	level	-0.563609	-0.512893	I(1)
	first difference	-5.123441**	-5.413131**	
lnM2	level	-1.655340	-1.386761	I(1)
	first difference	-5.931707**	-5.971414**	
lnM3	level	-1.029521	-3.026758	I(1)
	first difference	-5.994316**	-5.868134**	
lnCP	level	-1.968821	-1.814477	I(1)
	first difference	-6.456478**	-6.965521**	
lnINF	level	-2.263617	-3.168336	I(1)
	first difference	-6.425744**	-6.322246**	
lnK	level	-2.699311	-2.634515	I(1)
	first difference	-6.914294**	-6.990299**	
lnGNS	level	-3.343562	-3.771782	I(1)
	first difference	-8.153249**	-8.091619**	
lnPGR	level	-2.596774	-2.605803	I(1)
	first difference	-4.407286**	-4.338915**	
lnH	level	-0.299316	-1.441825	I(1)
	first difference	-9.070959**	-9.007943**	

The Phillip-Perron test in table 4, below also confirms the existence of unit root at first differencing. The graphs of the series as shown in appendix clearly indicate that the series are non- stationary in levels, but stationary at first difference.

Table 4: Result of the Phillip- Perron Unit Root Test

Variable		Phillip- Perron Unit Root Test		
		Constant	Constant and Trend	Conclusion
lnRGDP	level	-0.563609	-0.512893	I(1)
	first difference	-5.123872**	-5.412785**	
lnM2	level	-1.647260	-1.327287	I(1)
	first difference	-5.933270**	-5.971798**	
lnM3	level	-1.040442	-3.026758	I(1)
	first difference	-6.470521**	-6.291748**	
lnCP	level	-1.970070	-1.612348	I(1)
	first difference	-6.450787**	-7.386891**	
lnINF	level	-2.249275	-3.179463	I(1)
	first difference	-7.577552**	-7.342544**	
lnK	level	-2.679789	-2.621234	I(1)
	first difference	-8.148916**	-13.77272**	
lnGNS	level	-3.422879	-3.745635	I(1)
	first difference	-8.169929**	-8.109339**	
lnPGR	level	-1.884602	-1.882339	I(1)
	first difference	-3.975574**	-3.982034**	
lnH	level	-0.997958	-2.376099	I(1)
	first difference	-9.175382**	-9.121901**	

(**) denotes 5%, significance level and I (1) = order of integration. Each variable is tested using the Schwarz Information Criteria (SIC). For all series, the presence of a unit root cannot be rejected at 0.05 level of significance indicating that all the series are integrated of order one I(1).

4.1.3 Co-integration Test

Having found the series to confirm the existence of unit root and are stationary at first difference I (1), the next sensible thing to do, is to test for long-run equilibrium relationship between the dependent variable and the explanatory variables using the Co-integration Regression Augmented Dickey Fuller (CRADF) test. The test-statistic on E (-1) is **-5.618796**, with 31 included observations after adjustment and at 0.05 Mackinnon (1991) critical values is **-3.6583** as shown in table 5. The calculated value of the test statistic is less-than the critical value rejecting the null hypothesis of no co-integration; the series are co-integrated. The presence of co-integration implies that long run equilibrium relationship exists between the dependent variables and the explanatory variables. Hence, the hypothesis that long-run equilibrium relationship between financial development, human capital and economic growth exists in Sierra Leone is supported.

Table 5: Result of the (CRADF) Test.

Null Hypothesis: E has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=2)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.618796	0.0001
Test critical values: 1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

4.1.4 Regression Result

Table 6, presents the regression result with no interaction between financial development and human capital development. All the variables of financial development are statistically significant at the level of their t-statistic. (M3 and CP are statistically significant at 1% level and M2 is significant at 5%) and are rightly signed. The coefficients INF have been found to be negative and statistically insignificant, this implies that inflation reduce the growth of output in Sierra Leone. The coefficients of the stock of physical capital have been positive and significant at the 10%. The GNS is found to be significant at 5% level and positively impact on RGDP. The coefficients of PGR have been negative but significant at the level of its t-statistic. The coefficients of the human capital accumulation measured as secondary school enrolment have been positive and statistically significant at 5% level. This tends to lend credence that human capital development may increase output growth.

Table 6: Regression output with no interactive term

Variable	Broad Money (M2)	Liquidity Liability (M3)	Credit to the Private Sector (CP)
Constant	0.85 (0.05)	-2.98* (0.44)	2.03* (0.19)
lnInf	-0.05 (-0.18)	-0.02 (-0.01)	-0.93 (-0.15)
lnlnK	1.81* (0.29)	1.84* (0.32)	1.89* (0.34)
lnGNS	1.89* (0.09)	2.92** (0.18)	2.14** (0.02)
lnPGR	-1.90* (-0.10)	-4.36*** (-0.18)	-2.93** (-0.03)
lnH	2.27** (0.12)	2.99** (0.10)	2.92** (0.18)
lnFD	2.05** (0.26)	5.08*** (0.06)	6.9*** (0.09)
R2	0.55	0.52	0.62

Table 7, presents the regression result with interaction between financial development and human capital development. The financial development indicators are found to be statistically insignificant and impact negatively on RGDP, except credit to the private sector that is statistically significant at 5% and impact positively on RGDP. INF is still negative and insignificant; the PGR is still negative and significant. The stock of physical capital is still positive and statistically significant at 1%; this may implies that the stage of development as well as the underdeveloped nature of the financial system in Sierra Leone makes physical assets as alternate source of holding financial assets. GNS is still positive and significant. The coefficients of human capital accumulation are positive, but statistically insignificant. However, the interaction term of financial development and human capital accumulation (FD*H) are positive and statistically significant at 1% for all the measures of financial development used in this study. This tends to lend support to the study by Hakeem (2010) of the complimentary role of financial development and human capital development in accelerating economic growth.

Table 7: Regression output with interactive term

Variable	Broad Money (M2)	Liquidity Liability (M3)	Credit to the Private Sector (CP)
Constant	0.11 (0.03)	-2.08* (0.36)	2.21** (0.22)
lnInf	-1.45 (-0.14)	-0.50 (-0.05)	-0.97 (-0.12)
lnlnK	5.3*** (0.06)	18.5*** (0.57)	16.9*** (0.54)
lnGNS	1.82* (0.07)	3.12** (0.16)	2.17** (0.12)
lnPGR	-1.89* 0.16	-10.1*** (0.71)	-2.88** (-0.02)
lnH	1.69 (0.04)	1.09 (0.01)	1.65 (0.03)
lnFD	-0.34 (-0.27)	-0.08 (-0.17)	2.67** (0.21)
Ln(FD*H)	9.10*** (0.35)	11.4*** (0.41)	10.2*** (0.38)
R2	0.61	0.59	0.66

*** Significant at 1%, ** significant at 5% and * significant at 10%. R²(R-squared; coefficients of determination), Figures in the parentheses are the coefficients and figures with *(Asterisks) are the t-statistics.

4.1.5 Result of the Marginal Effect

To further account for the relevance of human capital and financial development on economic growth in Sierra Leone, we empirically determined the marginal effects of financial development (Human capital) on economic growth in the presence of human capital (financial development) by finding the cross partial derivative of equation 12 above, the model with the interaction term of finance and human capital (FD*H) that yielded equations 13 and 14. The results are reported in the descriptive statistics in tables 8 and 9.

Table 8, shows the marginal effects of financial development in the presence of human capital. The minimum positive impact is **0.15**, which is credit to the private sector (CP) and the maximum positive impact (**3.02**) is broad money (M2). This may implies that high proportion of credit goes to the public sector. This situation may crowd-out private sector in the development process in Sierra Leone.

Table 8: Descriptive Statistics (Marginal effects of financial development on economic growth at various values of human capital in Sierra Leone)

Financial Development Variable	Broad Money (M2)	Liquidity Liability (M3)	Credit to the Private Sector (CP)	Model of equation 13
Mean	6.10	0.89	0.45	$\frac{\partial \ln(RGDP)}{\partial \ln(FD)} = \beta_1 + \theta \ln(H)$
Minimum	0.45	0.21	0.15	
Maximum	3.02	0.31	0.25	

Similarly, the marginal effects of human capital on economic growth in the presence of financial development are also reported in table 9. The result indicates that the minimum value of credit to the private sector is **2.82** and its maximum value of is **11.3**. The effects are higher than the result obtained in table 8 above. This may suggest that a well functioning and developed financial system can improve human capital development in Sierra Leone and thus provide the impetus to promote private sector development through credit to the private sector. Therefore, to enhance more positive impact of human capital on growth, there is a need for policy makers to focus more attention on financial system development as well in Sierra Leone.

Table 9: Table 8: Descriptive Statistics (Marginal effects of human capital on economic growth at various values of financial development in Sierra Leone)

Financial Development Variable	Broad Money (M2)	Liquidity Liability (M3)	Credit to the Private Sector (CP)	Model of equation 14
Mean	23.5	30.4	35.7	$\frac{\partial \ln(RGDP)}{\partial \ln(H)} = \lambda_5 + \theta \ln(FD)$
Minimum	4.20	3.11	2.82	
Maximum	12.1	18.4	11.3	

4.1.6 Granger Casualty Test

The result of the Granger causality test in table 10, indicates a uni-directional relationship between M2 and RDGP at 5%, the causation runs from RGDP to M2. Bi-directional relationship exists between RGDP and M3 at the level of their p-values. CP granger causes RGDP at 5%, H granger causes RGDP at 10%. M3 Granger causes M2 at 5%, M2 and CP exhibit a uni-directional relationship at 5%, the causation runs from M2 to CP. There exist a unidirectional relationship between H and M2 at 10% level of significance, the causation runs from H to M2. Uni-directional relationship exists between CP and M3; the causation runs from CP to M3 at the 5% level of significance. H granger causes M3 at the 5% level. There exist a uni-directional relationship between H and CP at 10% level of significance; causation runs from H to CP. In general, the Granger causality test result demonstrates evidence of a casual relationship between financial development, human capital and the growth of output. Hence, confirming the hypothesis that causality exists between financial development, human capital development, and economic growth in Sierra Leone. This could also be seen from the coefficients of determination (R-squared) in the regression output of both the term with no interaction and with interaction and ranges from 0.52 (52%) to 0.66 (66%) as shown in tables 6 and 7 above.

Table 10: Result of the Granger Causality Test

Hypothesis	No. of lags	F-Stat	Prob.	Conclusion
dlnM2 does not Granger Cause dlnRGDP	2	0.15311	0.8588	Unidirectional Relationship
dlnRGDP does not Granger Cause dlnM2	2	3.85865	0.0346**	
dlnM3 does not Granger Cause dlnRGDP	2	3.90211	0.0335**	Bi directional Relationship
dlnRGDP does not Granger Cause dlnM3	2	8.10683	0.0019***	
dlnCP does not Granger Cause dlnRGDP	2	3.77554	0.0369**	Unidirectional Relationship
dlnRGDP does not Granger Cause dlnCP	2	0.68992	0.5109	
dlnH does not Granger Cause dlnRGDP	2	2.69872	0.0869*	Unidirectional Relationship
dlnRGDP does not Granger Cause dlnH	2	0.26298	0.7709	
dlnM3 does not Granger Cause dlnM2	2	4.71968	0.0182**	Unidirectional Relationship
dlnM2 does not Granger Cause dlnM3	2	0.19884	0.8210	
dlnCP does not Granger Cause dlnM2	2	1.21349	0.3141	Unidirectional Relationship
dlnM2 does not Granger Cause dlnCP	2	4.65230	0.0192**	
dlnH does not Granger Cause dlnM2	2	0.34942	0.7098	Unidirectional Relationship
dlnM2 does not Granger Cause dlnH	2	2.64942	0.0804*	
dlnCP does not Granger Cause dlnM3	2	3.5564	0.043**	Unidirectional Relationship
dlnM3 does not Granger Cause dlnCP	2	0.9946	0.3723	
dlnH does not Granger Cause dlnM3	2	4.5879	0.0176**	Unidirectional Relationship
dlnM3 does not Granger Cause dlnH	2	0.7865	0.4611	
dlnH does not Granger Cause dlnCP	2	3.1678	0.0623*	Unidirectional Relationship
dlnCP does not Granger Cause dlnH	2	0.1425	0.8667	

***, ** and * indicates that the null hypothesis is rejected at 1%, 5% and 10% level of significance respectively. The appropriate lag length is selected based on the Schwarz Information Criteria (SIC), the test is performed on the stationary data series.

5. Conclusions

This study examines the link between financial development, human capital development and economic growth in Sierra Leone using growth and financial data from 1980-2012. The result of the study supports the existence of positive correlation among financial development, human capital, and economic growth. The Granger casualty test result also confirms the hypothesis that causality exists between financial sector development, human capital accumulation, and economic growth. Our findings further reveals that the complementary relationship between financial development and human capital development has positive impact on the economic growth. Inflation is found to reduce the growth of output. Therefore, the Government should strive to attain sound macroeconomic management, including low inflation, efficient financial system and the improvement of human capital base. This is because; a more robust financial system and human capital accumulation could positively impact on investment and hence economic growth.

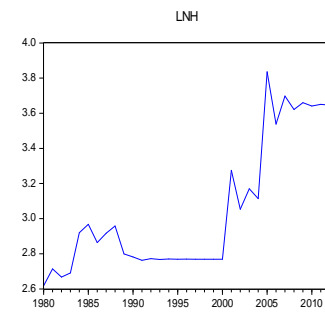
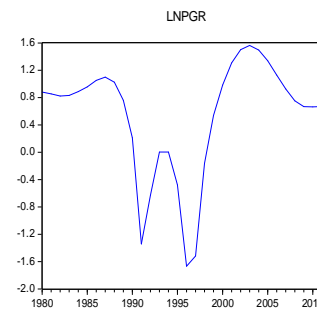
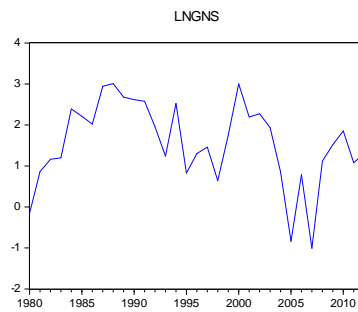
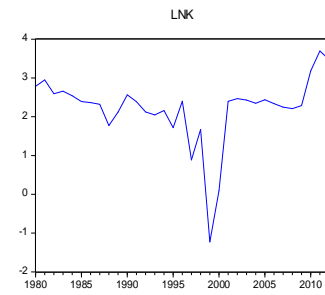
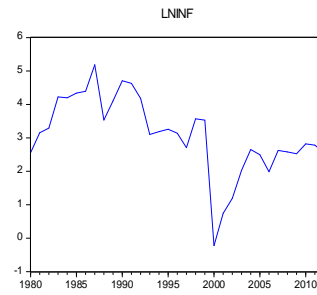
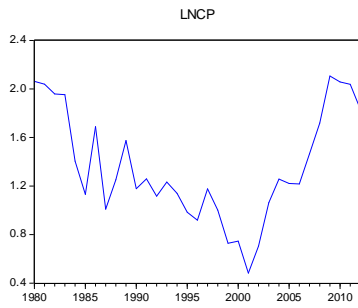
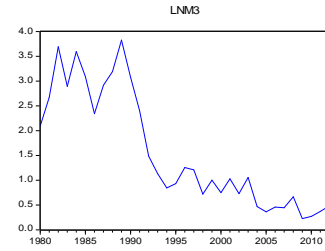
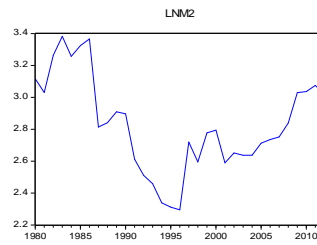
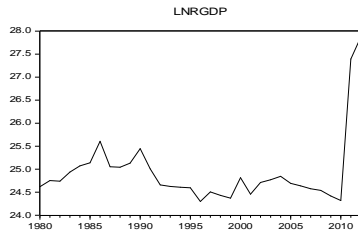
Despite data limitation, our findings have an important implication not only for policy makers in Sierra Leone but also for development partners that are helping in the growth process of Sierra Leone and other Africa countries. Therefore, we look forward to future study on growth dynamics in the hope to further provoke policy dialogue. Such a study could be the link between financial development, corruption environment, and economic growth in Sub-Saharan Africa countries.

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Appendix
Appendix A: Graphs of Level (Non- Stationary)



Appendix B: Graphs of first difference (Stationary)

