

Research Article

Financial Development and Real Gross Domestic Product in Rwanda

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Abstract

Real gross domestic product as a macro-economic indicator measures the value of economic output after adjustment for price changes. In this regard, due to the role played by financial development in economic growth, financial intermediation has been regarded as an important factor in boosting gross domestic product in the both developed economies and developing economies. The study investigated the effect of financial development on Real Gross Domestic Product in Rwanda. The study adopted *ex post facto* design. Time series data were collected from 2011-2022 and Ordinary Least Squares (OLS) was deployed. Findings revealed that financial liberalization, domestic credit to private sector, monetary policy rate, market capitalization and all share index jointly and significantly influenced real gross domestic product (*Adj. R*² = 78.65%, *p* = 0.009028 < 0.05, F-stat = 9.108778) in Rwanda. The study concluded that financial development enhanced real gross domestic product in Rwanda. It was recommended that the government of Rwanda should improve on real gross domestic product by improving financial development through more liberalization of the financial sector, expansion of domestic credit to the private sector, market capitalization, all share index and use of monetary policy rate as effective channel of monetary transmission mechanism in the economy.

Keywords

All Share Index, Domestic Credit, Financial Liberalization, Market Capitalization, Monetary Policy, Real Gross Domestic Product

1. Introduction

Economic performance has always been the crucial socio-economic issue in both developed and in emerging markets. The rationale is that following their shift to market economies, transitional nations encounter numerous challenges in terms of reorganizing the financial system, enhancing the quality of institutions, and achieving macroeconomic stability.

According to World Bank [30], a slowdown in the world economy, continuously high inflation, and quicker than an-

anticipated monetary tightening have all contributed to a dramatic tightening of global financial conditions and a reduction in risk appetite [30]. Aligning it with Hiroyuki and Masahiro [8], research in the field of finance pertaining to macroeconomic issues has long acknowledged the impact of financial development on real gross domestic product [8].

Numerous academic studies have underlined how important financial development is for boosting the economy by fostering investments, industries, the distribution of loanable funds, and

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wealth accumulation. However, because it has become increasingly important; it has taken a center stage in recent decades in terms of economic performance. In the same vein, the significance of financial development and its role in financial intermediation have been cemented in the literature controversies [5, 13, 20].

The global economic performance has faced challenges to the level that global economy was about to collapse just after a short period following global pandemic occurred in 2020. Due to a dramatic decline in confidence, high inflation, and swift monetary policy tightening, economic performance conditions in advanced economies have deteriorated [30].

Growth in the US was predicted to be severely slowed by one of the most dramatic monetary policy tightening cycles in recent memory. The supply of energy faced an increase in price due to the invasion of Russia in Ukraine. Generally, it was anticipated that growth in developed countries will decrease to 0.5% in 2023 from 2.5% in 2022. Due to monetary policy and less fiscal stimulus than anticipated in the October 2021 prediction, the US gross domestic product was predicted to contract by 1.5% in 2022 [50].

In emerging countries such as in Brazil, Russia, India, China and South Africa; the level of expanding businesses is well recognized in these nations (BRICS). In this case, financial institutions and other related companies have seen tremendous growth and support which keep improving business opportunities and room for business growth [1].

On the same note, low-income countries were expected to grow 5.1% in 2023, with forecasts downgraded in about 65% of countries [36]. While the middle class is increasingly facing high demand in terms of financial facilities with regard to lack of developed financial institutions, middle income countries are using more debts in order to meet the demand of financial services [1].

In Nigeria, growth was predicted to peak at 3.4 percent in 2022 and then revert to 2.9 percent starting in 2024 (IMF, 2022). Projected to stay high at 16.9% in 2022 and above pre-pandemic levels in 2023, rising food, diesel, and gas costs together with ongoing supply interruptions exacerbated by the conflict between Russia and Ukraine were the main causes of inflation. While oil exports are predicted to marginally grow, capital inflows are expected to recover [3].

Real gross domestic product (GDP) in Kenya was expected to grow from 5.5% in 2022 and 5.2% in 2023. Though there is a slight decrease in GDP, on the average, the growth is high but it will be hampered while recovering the global pandemic in 2021. This tremendous growth is higher than average growth estimated in the Sub-Saharan Africa [29].

In Rwanda, the expansion of services (12%), industry (13%), and agriculture (6%), was the main driver of economic growth. After declining by 5.9% in 2020, Rwanda's GDP per capita increased by 7.4% in 2021. During that time, inflation decreased from 7.7% to 0.8%, mostly as a result of low food prices. Monetary policy remained accommodating, with the policy rate held at 4.5% from May 2020 to February 2022 to

promote economic recovery. The banking sector remained steady with an anticipated jumps in inflation [2].

COVID-19 pandemic kept the fiscal deficit high in 2021 at 7.1%. Due to rising oil prices and an increase in the import of capital and intermediate goods, the current account deficit grew by 1.3% of Gross Domestic Product (GDP) from 2020 to 2021. Though Rwandan Francs depreciated over dollar, about 2.6% versus the dollar in 2021, the Rwandan franc remained comparatively stable. The debt-to-GDP ratio is moderate though it increased from 71.2% in 2020 to 74.6% in 2021 [2]. Therefore, the study on the effect of financial development on real gross domestic product in Rwanda is crucial.

Statement of the Problem

According to Aamir et al. [1], the development of the financial system has a substantial impact on economic performance, evidently; the financial system of advanced economies are better compared to that in less advanced economies. Countries with a sufficient level of financial sector development are most likely not affected by the global financial crisis at any point in time, which is also one of the reasons why emerging countries are considerably more severely hit by financial crises than developed countries.

As per the official data provided by the World Bank, Rwanda's GDP in 2022 reached a maximum of 13.31 billion US dollars [30]. Rwanda's gross domestic product (GDP) amounts to 0.01 percent of the global economy [30]. Besides, few studies such as Nyalihamu and Kamanzi [19], on financial development in Rwanda, Tugume et al. [31], also carried a study in Rwanda on financial development and economic growth in respect to real gross domestic product and the empirical analysis was built on quarterly data covering the period 2000Q1-2015Q4.

Another study by Mikebanyi and Kigabo [15], on financial development and economic growth in Rwanda and a study by Mugabe et al. [16], on financial system in Rwanda and as well as a study of Gisanabagabo [5], on financial sector development and economic growth which focused on non-performing loans did not consider financial liberalization and all share index to measure financial development and as well as time difference.

To the researcher's knowledge, these few studies have explored the effect of financial development of economic growth in the context of Rwanda and the current study investigated the effect of financial development on real gross domestic product in Rwanda by measuring financial development using financial liberalization, domestic credit to private sector, monetary policy rate, market capitalization and all share index as proxies. Therefore, the study examined the effect of financial development on real gross domestic product in Rwanda.

2. Review of Literature

2.1. Financial Development

According to World Bank [27], financial development is

the term used to describe long-term structural adjustments made to machinery and mechanisms that improve the effectiveness and efficiency of the transfer of funds from savers to investors and all other auxiliary processes that influence the transformation of financial resources into actual productive resources. The concept also comprises the financial products' dependability, comfort, continuity, and adaptability [27].

In the same line, the World Bank [27], states that a well-developed financial system efficiently facilitate its functionality in diverse ways such as depth, access and stability as well as increased efficiency that reflects decreased costs of a nation's financial system in delivering these functions. Financial development has been clarified to encompass the financial market's dependability, ease of use, continuity, and flexibility [13].

2.2. Financial Liberalization

Financial liberalization according to Abdelrahman [33], simply means removing financial systemic constraints in terms of restrictions. It also encompasses actions intended to weaken or eliminate regulatory oversight of the various financial sector agents' actions, instruments, and institutional frameworks. Both internal and external liberalization initiatives are regarded as financial liberalization measures to facilitate the flows of funds.

In the same vein, Ogbekor and Siyanbola [20], hypothesized that the idea behind market liberalization as it is defined as deregulation of domestic market is to balance the trade loss and profit within and out of the home country and it is measures as the percentage change of foreign ownership of listed equities on the local exchange. Idrees et al. [10], stressed that financial liberalization is practiced and has begun in different countries of the world. Thus, financial liberalization contributes to economic growth in both less advanced and advanced economies.

2.3. Domestic Credit to Private Sector

According to IMF [11], domestic credit to the private sector by banks refers to the financial resources that other depository corporations aside from central banks as deposit taking corporations lend to the private sector. Examples of these financial resources include trade credits, purchases of non-equity securities, loans, and other accounts receivable that create a claim for repayment. In certain countries, these assertions encompass acknowledgment of public businesses.

Idowu et al. [9], conceptualized private sector credit as the means by which financial institutions lend money to the private sector, whether it be through trade credits, loans, the purchase of non-equity securities, or other accounts receivable that give rise to a repayment claim.

World Bank [28], essentially views domestic credit to the private sector as being in line with deposit money banks, which take deposit liabilities and provide credit facilities to

those who require them. While stock markets do not provide credit facilities, they do serve as a means for individuals to purchase shares of publicly traded companies and thereby become owners of a portion of the business.

2.4. Monetary Policy Rate

According to Olaoluwa and Shomade [32], monetary policy is a tool used by central banks to control, regulate and stabilize the amount, cost, availability and flow and as well as circulation of money in terms of credit in the economy. Its goals are to achieve specific macroeconomic policy objectives and to counteract any negative trends in the economy by putting policy measures in practice.

Central Bank of Nigeria [4], sees monetary policy rate (MPR) as an intrinsic part of the monetary policy of the Central Banks that serves as the instrument to monitor the supply of money in the country in a way that there should not be much money in the economy that is beyond the control of the central bank authority. Monetary policy rate is imposed to financial institutions such as deposit money banks for better monetary control.

2.5. Market Capitalization

According to Corporate Finance Institute [34], market capitalization determines the worthiness and strength of the company in the stock market. It is calculated as company's outstanding shares by the value of a share at market value in the stock exchange industry. Large-cap firms are regarded as lower-risk investments because they typically possess more capital and assets. Small-cap companies typically have greater room for expansion and offer investors more chances to make capital gains.

Kaiboi et al. [35], opines that market capitalization as the total value of the stock and it represents the worth of the company. As also argued by Shahbaz et al. [36], the role of stock market is to act as institution that is similar to that of a financial institution merely to increases the viability of capital creation and allocation, enables businesses and governments to increase long-term investment to fund new initiatives, and boosts other activities.

2.6. All Share Index

According to Uzuke et al. [37], investors and financial analysts use stock market indices as a tool to compare the returns on various investments and to characterize the market. One way to gauge the worth of a segment of the stock market is through the use of stock indices. A market index monitors and evaluates the performance of a particular stock basket that is thought to represent a certain market or economic sector.

As per Ifeoluwa and Motilewa [38], Governments and companies can raise long-term capital on the stock market to finance new projects, as well as to expand and modernize industrial and commercial concerns. The ability of the stock market to provide corporate entities with non-financial,

non-creative capital is one of its special advantages.

2.7. Real Gross Domestic Product

Real gross domestic product refers to the activities of goods and services produced within a country over a given time period typically a year. It is used to assess the nation's economic growth. One of the main metrics for assessing the nation's economic growth or performance is by using real gross domestic product (RGDP). Demand for goods and services rises when the economy is doing well, and this could lead to higher profits for the nation as a whole as well as for producers. Producers will put more of their excess profits into the bank, which will inevitably result in a rise in deposits [12].

Aghion et al. [39], conceptualize RGDP as the country's value of goods and services produced within a period of time. According to Karen and Louise [40], goods and services used in the production process are not part of the calculation of real gross domestic product. Gross domestic product is also equal to the sum of personal consumption expenditures, gross private domestic investment, net exports of goods and services, and government consumption expenditures and gross investment.

2.8. Theoretical Review

The study is underpinned by McKinnon and Shaw hypothesis, supplying-leading hypothesis and endogenous growth theory.

McKinnon and Shaw Hypothesis

McKinnon [42], Shaw [51], developed the hypothesis assuming that imposing interest rate on financial instruments for instance by the use of interest rate ceiling, high reserve requirement and tough credit policies hamper financial deepening and affect economic growth adversely. The McKinnon and Shaw Hypothesis is as:

$$I = I(r)$$

$$S = S(r, g)$$

Where, $\frac{\partial(I)}{\partial(r)} < 0$; $\frac{\partial(S)}{\partial(r)} > 0$ and $\frac{\partial(S)}{\partial(g)} > 0$

Tajudeen et al. [41], support the theory arguing that high interest rate policy stimulates savings and investment which leads to financial deepening and ultimately economic growth. Ogbobor et al. [21], also agree that productive investment and capital accumulation happen as a result of a large real money stock, which increases the amount of loanable funds available to borrowers, thereby enhancing financial deepening. Thus, the theory stands.

Stiglitz and Weiss [26], criticized the theory by claiming that the financial sector is susceptible to market failures and that the government ought to step in somehow to address these failures by providing guidelines and policies regarding the success of the financial sector.

In support of this study, financial development lowers interest rates, which encourages saving. Central banks, on the other hand, are in charge of promoting savings by mobilizing incentives for both investors and savers. In this scenario, the financial system will grow and bring in more goods and services, leading to the development of the financial system's infrastructure and an increase in the real gross domestic product.

Supply-leading hypothesis

This hypothesis was pioneered by Schumpeter [25] implying that financial institutions are mechanisms for an economy's expansion in terms of its productive magnitude. According to the theory, finance promotes economic growth. It is further stressed that financial institutions mobilize funds, allocate them efficiently, mitigate the issue of information failure, monitor the production progress of firms, regulate risk factors, and concentrate on reducing transaction costs, to name a few. All of these factors have a positive impact on economic growth of any country.

Ogbobor et al. [21], support the theory of supply-leading hypothesis stating that the mobilization of savings, the ease of trading, and the diversification of risks are all ways that a well-developed financial intermediation system aids in the growth of the economy. In this sense, the effective use of resources is facilitated by these significant services.

The theory of supply-leading hypothesis was criticized by Thanvegelu [52], contenting that supply leading hypothesis, which is based on financial deepening, has no appreciable effect on economic growth and that, rather, as the economy expands, new financial products, innovations, and institutions enter the market in response to increased demand for financial services. The theory support this study is a sense that financial institutions provide necessary information, products and services to the need which later is translated to economic growth.

2.9. Endogenous Growth Theory

Romer [24], and Lucas [14], propounded the endogenous growth theory under the assumption that a very strong financial sector enhances economic performance. Romer [24] and Lucas [14], highlighted that human capital plays a major role in the economic performance. The theory claims how the workforce with greater knowledge, education and training can help to increase the rate of technological advancements.

$$Y = A(R) f(R_j K_j L_j)$$

Where,

Y = Output growth

K_j = Stock of physical and human capital

R = Aggregate stock of knowledge

L_j = Stock of labor

R_j = Stock of research and development expenditures a country with initial higher level of K, encounters a higher rate of growth as human capital has increasing returns to scale,

leading to a higher level of growth of capital income. The rate of growth depends on the type of capital a country invests in.

In support of the theory, Howitt [43], stated that there are grounds for discerning that the choices made by economic actors can have an impact on the advancement of technology. According to the endogenous growth theory, advancements in technology are what ultimately drive long-term economic growth. Hence, in endogenous growth theory, technological advancement becomes endogenous.

The endogenous growth theory was criticized by Comin and Mulani [44] arguing that by presuming the symmetry of economic sectors or the existence of a single product market, the endogenous growth theory incorrectly abstracts from reality. In developing economies, inefficiencies stemming from inadequate infrastructure, insufficient institutions, ideal markets, and high transaction costs are among the common factors impeding economic growth.

The theory is related to the study in a way that Rwanda is advancing in technology with also no much resource, the financial development in Rwanda relies on its population as human capital. Therefore, the economic performance is derived from internal sources with aid of human capital and technology. Hence the endogenous growth theory.

2.10. Empirical Literature

Omankhanlen et al. [23], analyzed from 1990 to 2019 the Nigeria's economic growth and the effect of financial development. The results showed that the market capitalization of the financial industry and the money supply to GDP ratio have a higher impact on Nigeria's economic growth. The amount of private sector credit relative to GDP does not, however, significantly affect Nigeria's economic expansion.

Weli et al. [45], aimed to examine the type of causal relationship that exists between 1996 and 2020 on financial development of both Nigeria and South Africa. The results demonstrate that, while there was no relationship in Nigeria, there is a unidirectional causal relationship in South Africa that runs from economic growth to financial stability (stock price volatility).

Nyalihama and Kamanzi [19], studied how Rwanda's macroeconomic stability was affected by the development of its financial systems. Despite the widespread agreement that the expansion of financial institutions has a favorable impact on macroeconomic stability, this relationship has come under increased scrutiny in recent years, notably in the wake of the global financial crisis of 2007-2009. Results from local projection techniques generally imply that the development of the financial system has aided in the maintenance of macroeconomic stability.

A study by Nguyen [18], on the impact of financial development, human resources and economic growth was carried out in transition countries. The study employed GMM, OLS and fixed effects model. The results of the study revealed that while financial depth hinders economic growth, financial

accessibility and efficiency do. Economic growth has also been shown to be driven by human development. Furthermore, a strong boost to economic growth was shown by the interaction between the human development index and aggregate financial development.

A study by Hasan [46], carried out in 19 developing countries on the link between financial development and economic growth adopted Toda Yamamoto causality test. In an effort to determine which direction, data from 19 developing nations was examined separately. The co-integration relationship in the analysis was ascertained using the bounds test. Consequently, in four countries, financial development affect economic growth and vice versa. There was no evidence of causation in 11 nations. The findings bolster the idea that no strategy works in every nation.

Nguyen and Trinh [17], examined the contribution of financial development to economic growth in several transitional economies, where the financial systems were only recently formed or restructured in the early 1990s to help these countries move from centrally planned to market-oriented economies. A dataset spanning from 1990 to 2020, gathered from 29 transitional economies and 5 Asian developing economies were used. The study employed generalized method of moment (GMM) linked to an empirical endogenous growth model. The findings demonstrate the critical role that the three financial development indicators play in predicting economic growth in transitional economies, although the relationship appears to be shaped like an inverted U.

Ayadi [47], examined the effects of financial development on savings and on Nigeria's economic growth between 1981 and 2015 using autoregressive distributed lag (ARDL), simple ordinary least squares (OLS) and kernel quartile regression models. While broad money as a percentage of GDP had a significant negative impact on economic growth, the study found that two measures of financial development had a fairly significant positive impact on growth in Nigeria. The results were inconsistent. Savings had a sizable positive influence on economic expansion.

Senuga et al. [49], in the study of how financial development affect economic growth in Nigeria used multiple regression analysis to ascertain the effect of financial development proxies on economic growth. The findings showed that, when combined, two of the variables the real interest rate and gross domestic savings have an inverse relationship with the dependent variable (the GDP annual growth rate), but domestic credit to the private sector has a positive relationship with the dependent variable. The coefficient of multiple determination indicates that the model has a high level of fit, accounting for approximately 93% of the GDP, with the remaining 7% coming from growth-inducing factors that the model did not account for.

Another study by Mikebanyi and Kigabo [15], carried out in Rwanda on the relationship between financial development and economic performance laid foundation on two theories:

Supply leading hypothesis and demand following hypothesis. The study replicated the hypotheses in the context of Rwanda to assess whether Rwandan economy falls in both hypotheses. The study used financial development index which are access, depth and efficiency. The study used augmented Granger non – causality test by Toda and Yamamoto. The findings revealed that Rwandan economy is driven by demand following hypothesis.

3. Materials and Methods

As per study design, this study used annual time series and *ex post facto* design was used as secondary data sourced from World Bank, National Bank of Rwanda Statistical Bulletin and Rwanda Stock Exchange to determine the effect of financial development on real domestic product in Rwanda over a period of 12 years spanning from 2011 to 2022.

Method of Data Analysis

The study used descriptive analysis and as well as inferential analysis to establish the effect of financial development on real gross domestic product in Rwanda. The study used Ordinary Least Squares (OLS) and appropriate diagnostic tests such as normality, autocorrelation, heteroskedasticity, multicollinearity and stability test were adopted.

Model for determining the effect of financial development on real gross domestic product in Rwanda

The study used the econometric model as real gross domestic product was the outcome variable and financial development (financial liberalization, credit to private sector, monetary policy rate, market capitalization and all share index) were treated as predictors of real gross domestic product. Hence, the model:

$$RGDP_t = f(FL_t, DCPS_t, MPR_t, MC_t, ASI_t)$$

The algebraic form of the econometric model shows the relationship between the variables. In this case, Real Gross Domestic Product was treated as linear function of financial development. Hence, the model:

$$RGDP_t = \alpha_0 + \alpha_1 FL_t + \alpha_2 DCPS_t + \alpha_3 MPR_t + \alpha_4 MC_t + \alpha_5 ASI_t + \mu_t$$

Similarly, some variables were in natural log while others were not in the natural log. The reason to log some variables is

because some variables have different units of measurement. Rates were not transformed. Hence, the natural log abates the likelihood of the variables prone to heteroskedasticity [6]. Hence,

$$\ln RGDP_t = \alpha_0 + \alpha_1 FL_t + \alpha_2 DCPS_t + \alpha_3 MPR_t + \alpha_4 MC_t + \alpha_5 \ln ASI_t + \mu_t$$

Where:

RGDP = Real Gross Domestic Product

FL = Financial Liberalization

DCPS = Domestic Credit to Private Sector

MPR = Monetary Policy Rate

MC = Market Capitalization

ASI = All share index

Ln = Natural logarithm

t = number of observations

α_0 = Intercept, the mean value of the response variable when all independent variables are equal to zero.

$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ are the coefficients or parameters that were estimated.

μ = Error Term: the deviation results from random variable represented in the model, which accommodates influences of other variables not explicitly included in the model.

A' priori Expectation

The *a' priori* expectation predicted that a unit increase in financial liberalization, domestic credit to private sector, monetary policy rate, market capitalization and all share index leads to a unit increase in real gross domestic product.

Table 1. A' priori expectation.

Variables	RGDP
Financial Liberalization	+
Domestic Credit to Private Sector	+
Monetary Policy Rate	+
Market capitalization	+
All Share Index	+

Source: Researcher's compilation, 2023

Table 2. Variables, Measurement and Sources.

Variables	Measurement	Source(s)	Abbreviation
Financial Liberalization	A ratio of capital inflows to GDP	World Bank (2023)	FL
Domestic Credit to Private Sector	Resources such as finance in terms of loans, purchase of non- equity securities and trade credits provided by financial institutions measured as a ratio of to GDP.	World Bank (2023)	DCPS

Variables	Measurement	Source(s)	Abbreviation
Monetary Policy Rate	Inflation rate subtracting interest rate by banks measured in terms of percentage	National Bank of Rwanda (2023)	MPR
Market Capitalization	A ratio of market capitalization to GDP	Rwanda Stock Exchange (2023)	MC
All Share Index	Number of shares in issue multiplied by price of each issue.	Rwanda Stock Exchange (2023)	ASI
Real Gross Domestic Product	Good and services produced within a country for a period of a year measured in US Dollar.	World Bank (2023)	RGDP

Source: Researcher's compilation, 2023

4. Results and Discussion of the Findings

The study investigated the effect of financial development on real gross domestic product in Rwanda for a period of 12 years spanning from 2011-2022.

Table 3. Descriptive Statistics.

Descriptive Statistics	FL	DCPS	MPR	MC	LASI	LRGDP
Mean	2.7317	20.567	12.508	31.426	2.1000	9.9500
Median	2.9754	20.800	12.515	33.500	2.1000	9.9500
Maximum	3.8110	28.600	17.670	47.060	2.2000	10.100
Minimum	1.5001	13.270	8.3300	17.000	1.9000	9.8000
Std. Dev.	0.8248	4.3993	2.9486	8.8644	0.1044	0.0797
Skewness	-0.2045	0.124	0.2059	-0.1120	-1.0000	2.48E-
Kurtosis	1.6765	2.3533	2.2159	2.3581	3.0000	2.6326
Jarque-Bera	0.9593	0.2400	0.3922	0.2311	2.000	0.0674
Prob.	0.6189	0.8869	0.8219	0.8908	0.3678	0.9668
Sum	32.781	246.81	150.10	377.12	25.200	119.400
Sum Sq. Dev.	7.4847	212.89	95.638	864.35	0.1200	0.0700
Observations	12	12	12	12	12	12

Source: Researcher computation, 2023

The descriptive statistics of the variables adopted in the analysis of the sample was vital for the study. Table 3 presents the descriptive statistics of the data series used in the analysis.

The mean of financial liberalization showed that over 12 years since 2011-2022, the financial liberalization which is capital inflows over GDP was 2.7317 which is high meaning that capital inflows is high in Rwanda. The average mean for domestic credit to private sector was 20.567, implying that Rwanda gives credit to private sector at a considerable extent. The average mean for monetary policy rate was 12.508, implying that monetary policy rate in Rwanda is tight.

Averagely, market capitalization in Rwanda was \$31.42 bil-

lion implying that market capitalization in Rwanda is improving considering that Rwanda Capital Market started in 2011. Though Rwanda Capital Market is still at infant level but, there is a significant improvement according the study findings. All share index also is improving as per study findings. On the average, real gross domestic product is 9.95 billion. The real gross domestic product is still small and there is always room for improvement by improving the financial development.

Financial liberalization reached 3.8110 value as maximum ratio of capital inflows over gross domestic product and 1.5001 minimum value of ratio of capital inflows over gross domestic product. Domestic credit to private sector reached

its maximum of 28.6 as a ratio to GDP for the period of the study and 13.270 minimum value of DCPS to GDP ratio for the period of the study.

Monetary policy rate reached a maximum of 17.670% for the period of the study and 8.3300% minimum value of monetary policy rate for the period of the study. Market capitalization to real gross domestic product reached the maximum value of 47.060 and a minimum value of 17.000 for the period of the study. Real gross domestic product reached a maximum of \$10.100 billion and \$9.8000 Billion for the period of the study.

The Jarque-Bera statistic indicated in the [table 3](#) shows that financial liberalization, domestic credit to private sector,

monetary policy rate, market capitalization, all share index and real gross domestic product are normally distributed. This is due to the assumption rule that if the probability of Jarque-Bera statistics is greater than 0.05.

4.1. Stationarity Test

There was no need to conduct unit root tests since the study's time scope which is 12 years spinning from 2011-2022 was small with few observations. According to Gujarati [6], studies with few observations as less than 30 years, there is no need to conduct unit root tests as the results of the p-values would not be accurate.

Table 4. Financial development and Real Gross Domestic Product.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.663874	0.293804	32.89224	0.0000
FL	0.024690	0.014296	1.727009	0.1349
DCPS	0.019654	0.004250	4.624713	0.0036
MPR	-0.000821	0.003965	-0.207172	0.8427
MC	-0.001434	0.001549	-0.925863	0.3902
LASI	-0.062000	0.177013	-0.350258	0.7381
R-squared	0.883594	Mean dependent var		9.950000
Adjusted R-squared	0.786590	S. D. dependent var		0.079772
S. E of regression	0.036852	Akaike info criterion		-3.456964
Sum squared resid	0.008148	Schwarz criterion		-3.214511
Log likelihood	26.74178	Hannan-Quinn criter.		-3.546729
F-statistic	9.108778	Durbin-Watson stat		2.077066
Prob(F-statistic)	0.009028			

Source: Researcher's computation, 2023.

4.2. Interpretation

$LRGDP_t = 9.663874 + 0.024690FL_t + 0.019654DCPS_t - 0.000821MPR_t - 0.001434MC_t - 0.062000LASI_t + \mu_t$

[Table 4](#) shows the regression analysis of how financial development affect real gross domestic product. The results of the explanatory variables of financial liberalization (FL), domestic credit to private sector (DCPS), monetary policy rate (MPR), market capitalization (MC) and all share index (LASI) affect real gross domestic product. The probability of the t-test was used in determining the statistical significance of the effect of each indicator on real gross domestic product (RGDP) at 5% level of significance.

As per the findings, financial liberalization (FL) had a

p-value of 0.1349, domestic credit to private sector (DCPS) had a p-value of 0.0036, monetary policy rate (MPR) had a p-value of 0.8427, market capitalization (MC) had a p-value of 0.3902 and all share index (LASI) had a p-value of 0.7381. This implies that domestic credit to private sector (DCPS) positively and significantly affected RGDP since its p-value was less than 0.05 level of significance. On the contrary, the results indicated that financial liberalization (FL), monetary policy rate (MPR), market capitalization (MC) and all share index (LASI) do not affect real gross domestic product.

The magnitude and direction of the effect of each of the explanatory variables of financial development, as estimated, revealed positive and negative effects on the real gross domestic product as some had a positive coefficients and others negative coefficients. The findings showed that financial

liberalization (FL) and domestic credit to private sector (DCPS) exerted a positive effect while MPR, MC and LASI exerted a negative effect ($\beta_1 = 0.024690$, $t = 1.727009$ and $p\text{-value} = 0.1349$; $\beta_2 = 0.019654$, $t = 4.624713$ and $p\text{-value} = 0.0036$; $\beta_3 = -0.000821$, $t = -0.207172$ and $p\text{-value} = 0.8427$; $\beta_4 = -0.001434$, $t = -0.925863$ and $p\text{-value} = 0.3902$; $\beta_5 = -0.062000$, $t = -0.350258$ and $p\text{-value} = 0.7381$) respectively. The findings suggest that a percentage change in FL, DCPS, MPR, MC and ASI will lead to 0.024690, 0.019654, -0.000821, -0.001434 and -0.062000 percentage change in real gross domestic product.

AdjR² measures the composition of the explanatory variables of financial development. In the effect, the values of the coefficient of the combined explanatory variables of financial development based on the adjusted R-square revealed 0.786590 this implies that the combined variations in financial development (FL), domestic credit to private sector (DCPS), monetary policy rate (MPR), market capitalization (MC) and all share index (ASI) resulted in 78.65% changes in real gross domestic product (RGDP), while the remaining changes of 21.35% resulted from other factors which are not captured by the model of the study.

Furthermore, the findings of the joint explanatory variables of financial development based on the results of the p-value representing five constructs of independent variable for a period of 12 years had a p-value of $0.009028 < 0.05$ and F-statistic of 9.108778; implying that all the explanatory variables as financial liberalization, domestic credit to private sector, monetary policy rate, market capitalization and all share index jointly had a positive and significant effect on real gross domestic product. Thus, the study concludes that financial development affect positively real gross domestic product in Rwanda.

The data of the analysis on the effect of financial development on real gross domestic product revealed mixed results. Domestic credit to private sector (DCPS) significantly affected real gross domestic product (RGDP). On the contrary, the results indicated that financial liberalization (FL), monetary policy rate (MPR), market capitalization (MC) and all share index (LASI) do not affect real gross domestic product. This implies that domestic credit to private sector plays a great role in stimulating the real gross domestic product growth. Additionally, financial liberalization, monetary policy rate, market capitalization and all share index do not influence real gross domestic product significantly, implying that they don't contribute to the real gross domestic product.

Furthermore, the findings of the joint analysis of the effect of the combined financial development predictor variables of domestic credit to private sector (DCPS), monetary policy

rate (MPR), market capitalization (MC) and all share index (ASI) showed a positive and significant effect on real gross domestic product in Rwanda. This suggests that as financial development is improved, the real gross domestic product will also be improved. Thus, financial development affect positively real gross domestic product in Rwanda. The findings of financial liberalization and domestic credit to private sector on real gross domestic product were in line with the *a priori* expectations. However, the findings of monetary policy rate, market capitalization and all share index on real gross domestic product negated the *a priori* expectations.

The findings were found to be in line and consistent with previous studies such as Omankhanlen et al. [23], who revealed that private sector credit relative to GDP significantly affect Nigeria's economic growth, Ayadi [47], reported a positive effect. Mugabe et al. [16] also reported a positive effect, Nyalihama and Kamanzi [19] in their findings support the idea that Rwanda's macroeconomic stability has been influenced by the development of its financial system. The results were also in line with Senuga et al. [49], revealing that domestic credit to the private sector is positively related to economic growth. The findings also were consistent with the study of Oyindamola and Chinonso [48], where the results of the ARDL estimates indicate that financial development has a positive and significant relationship with real gross domestic product.

Contrary, some other studies found negative effect, Ayadi [47], showed that broad money has a negative effect but significant with economic growth. Ha et al. [7], revealed that financial development affect positively economic growth. Nguyen [18], investigated the impact of financial development, human resources, and economic growth in transition countries, the findings showed that financial depth does not influence economic growth. Hasan [46], revealed that in 11 developing countries, no causality was found. The results support the view that no approach is valid for every country.

The study findings were also supported by the supply-leading hypothesis which was developed by Schumpeter [25]. This hypothesis assumes that finance leads to economic growth stressing that a well-developed financial intermediation mobilizes savings, facilitate trading and enhances diversification of risks. Thus, there is a strong relationship between financial development and economic growth.

4.3. Diagnostic Tests

The following diagnostic tests were used: Test for Normality, Test of Multicollinearity, Heteroskedasticity test, Autocorrelation Test and Stability Test.

Table 5. Diagnostic Tests.

Tests	Coefficient	P-values	Results
Normality Test	Jarque-Bera	0.682702	Normally distributed
Multicollinearity Test	Variance Inflation Factor	1.872298	No multicollinearity
Heteroskedasticity	Breusch-Pagan	0.4749	No heteroskedasticity
Autocorrelation Test	Breusch-Godfrey	0.9637	No serial correlation
Stability Test	Ramsey regression equation specification	0.5106	Stable

Source: Author's computation (2023)

From the results in Table 5, the probability value of Jarque-Bera is 0.682702 which is more than 0.05 implying that data was normally distributed. The results again showed that the VIF factor was 1.8722986 and taking into consideration it was less than 5, there was no doubt that multicollinearity was not an issue since the recommended tolerance or acceptable value is 5. Hence, the multicollinearity among the variables was not present.

The study conducted a Breusch-Pagan test to determine if heteroskedasticity existed [6]. The findings of the study revealed that the p-value at 0.4749 was higher than 0.05 which means that the study did not reject the null hypothesis and thus there was no heteroskedasticity. From the findings, the p-value (0.9637), which is greater than the significance level (0.05) and hence the study accepted the null hypothesis that there was no serial correlation. These findings show that there was no serial correlation among the variables. The Ramsey regression equation specification test (RESET) for this study was 0.5106 which is greater than the cut-of (0.05). Hence, the expletory variables of this study explain the response variable. Thus, there was stability in the model.

5. Conclusion and Recommendations

The study envisages financial development as a key solution to the real gross domestic product in Rwanda by extending finance to the private sector. All of the applied diagnostic tests confirmed the robustness of the data. The importance of financial development in the Rwandan economy cannot be underrated and the financial development policies are responsible for the economic growth of Rwanda.

Hence, the study concluded that financial liberalization, domestic credit to private sector, monetary policy rate, market capitalization and all share index significantly affect positively real gross domestic product as joined together. Hence, the study concluded that financial development affect positively real gross domestic product in Rwanda. Though the study indicated a positive effect of financial development on real gross domestic product in Rwanda, nevertheless, there is always room to improve on real gross domestic product in Rwanda. Therefore, the

Government of Rwanda should encourage domestic production and continue to support made in Rwanda and as well as supporting local industries.

Abbreviations

ARDL: Autoregressive Distributed Lag
BRICS: Brazil, Russia, India, China, South Africa
DCPS: Domestic Credit to the Private Sector
FL: Financial Liberalization
GDP: Gross Domestic Product
GMM: Generalized Method of Moment
IMF: International Monetary Fund
LASI: Log of All Share Index
MC: Market Capitalization
MPR: Monetary Policy Rate
OLS: Ordinary Least Squares
RGDP: Real Gross Domestic Product

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Author Contributions

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Sunday Ajao Owolabi: Conceptualization, Formal Analysis, Supervision

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Conflicts of Interest

The authors declare no conflicts of interest.

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