Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.8, No.16, 2017

The Transmission Channels from Financial Development to Economic Growth: An Empirical Analysis in the CEMAC Zone

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Abstract
This article provides an empirical assessment of the transmission channel of the relationship between financial development and the sources of economic growth, namely, the growth rate of GDP per capita, the growth rate of capital and global productivity of factors. The analysis covers the period 1985 - 2014 and covers a sample of six countries of the Economic and Monetary Community of Central Africa (CEMAC). Using econometrics of panel data methodology, we show that the predominant transmission channel from financial development to growth is that of factor productivity. Concerning resources collection, financial development affects economic growth positively; while difficulties in accessing bank credit freezes the financing of productive investment and damage economic growth. In other to let financial development useful to economic development, it is necessary to adopt appropriate financial policies.
Keywords: Financial Development, Economic Growth, Panel data, CEMAC

1. Introduction

In the presence of financial liberalisation, the need for financial development of economies becomes quit acute because of its positive influence on growth. Theses on financial development state that the financial environment is the place where resources are allocated, in facts banks provide the funds for the financing of innovation, the engine of economic growth. Here, priority is given to financial intermediaries in the optimal allocation of financial resources for capital accumulation.

However, there are doubts on the channel through which financial mechanisms are transmitted to growth. In fact, the issue of transmission channels of financial development to economic growth has remained controversial in literature. Several empirical studies have not been able to provide a clear answer to the nature of the relationship even though generally the authors are unanimous that the effect of financial development on growth is positive. In other words, these studies do not indicate whether growth is allocated through an efficient allocation of resources or a high rate of investment or both.

In fact, the analysis of the channel of transmission between finance and growth was carried for the first time by King and Levine (1993). From a longitudinal data analysis, these authors explain that the financial system allocates economic growth through increase in productivity or a high level of profitable investment. Later on, Rioja and Valen (2004) insist that this channel of productivity is valid only for the case of high income countries, in countries with low income; it is the accumulation of capital that serves as the transmission mail between financial development and growth. The recent analysis of Acclassato and Eggoh (2012) on the sample of 7 countries of the Economic and Monetary Union of West African States (ECOWAS) based on the GMM System methodology on dynamic panel, confirms that financial development is positively related to growth and that the dominant channel of transmission is that of capital accumulation.

But, Trabelsi (2002) tests this relationship within the framework of Sub-Saharan African Countries considered to essentially low income countries, he confirms the pioneering idea of King and Levine that the financial sector allocates economic growth only through investment efficiency or productivity channel.

Thus, in low income countries the results remain mitigated and cannot conveniently serve as basis for a good orientation of economic policy.

The analysis of Gregorio and Guidotti (1995) highlights that financial development affects growth through the combination of two effects: accumulation of capital and productivity of investments, the first being higher. In addition, according to these two authors, financial development has a negative incidence on growth.

The countries of the Economic and Monetary Community of Central Africa are not exempt. They are low income countries who are among the most financially under developed in the world (Honohan et Beck, 2007) and enterprises mostly SME (Small and Medium Sized Enterprises) face difficulties in the financing of their development (Hugon, 2007, 2008) which contrasts with the situation of excess liquidity of the banking system (Fouda Owoundi,2009). A good knowledge of the transmission channel from financial development to growth could reduce this excess liquidity and increase SM access to bank credit by creating links between the demand and supply of liquidity.

The aim of this article is to identify the channel through which financial development affects economic growth in CEMAC countries. The identification of the dominant channel of transmission will lead to a better orientation of financial policies and development since the private sector in the economies of the CEMAC zone faces the acute problem of lack of finance (Awounang, 2015). The banking sector remains the major provider of

essential funds to SME whose access to finance guarantees the solidarity of the economies of this zone.

Therefore, we will test these two channels of transmission using the panel data methodology which in contrast with the longitudinal analysis has several advantages. An increase in the number of observations from the panel data enables to guarantee a better precision in estimations and reduce the risk of Multicolinearity. Panel data equally enables the exploitation of two sources of variability statistical information: an intra individual variability from the temporal dimension and an inter-individual variability offered by individual dimension, which are advantageous for the interpretation of the economic results obtained.

The rest of the paper is organised as follows. Section 2 presents a literature review on the relationship between financial development and economic growth. Section 3 analyses the stylistic facts of the financial system of CEMAC, section 4 presents the model of analysis and the results of the estimations. Section 5 concludes.

2. Financial Development and Growth: A Brief Literature Review

In the 1990s, there were several empirical analyses on the role and the nature of the relationship between financial development and growth. Most of the studies approve the existence of a positive relationship between financial factors and economic growth. King and Levine (1993) focused on the empirical analysis of the relationship finance-growth and show from a study based on longitudinal data that beyond the positive relationship between the two variables, financial development enables to predict economic development in ten to thirty years. Similar results were obtained by other authors such as Bencivenga and Smith (1991), King and Levine (1993) or Pagano (1993).

Contrary to previous results, de Gregorio and Guidotti (1995) from a sample of 12 countries of Latin America found that the ratio of bank credit granted to the private sector to GDP is negatively correlated to growth. They conclude that this result is linked to the putting in place of a policy of financial liberalisation in inappropriate regulatory frameworks.

Levine (1997) analyses the incidence of financial development on economic growth and shows that financial intermediaries react essentially on the treatment of information and the reduction in costs of financial operations or transaction costs, by identifying them five major functions: the ease of exchange of goods and services, the mobilisation and collection of savings, the production of information on possible investments and the allocation of savings, the diversification and management of risk and finally, the follow up of ongoing investments and the control of the governance of enterprises concerned.

He equally presents capital accumulation and the financing of technological innovations and the resultant positive externalities, as the major channels through which financial development is transmitted to growth (see Figure 1).

King and Levine (1993) and Beck et al. (2000) conclude on the dominance of the productivity channel or efficiency allocation. Because of the bank's ability to allocate resources for the funding of investments with high expected returns, it improves the marginal productivity of the factors of production and thus impacts growth positively.

Moreover, the choice of the channels of transmission depend on the income level of the economy considered, it is in this light that the studies of Rioja and Valev (2004), and Eggoh (2008), expresses the idea that financial development affects economic growth in high income countries through increase in productivity, whereas in low income countries, it is capital accumulation that serves as the transmission mail.

he arguments in favour of capital accumulation as transmission channel from financial development to growth are supported by authors such as De Gregorio and Guidotti (1995) who explain that financial deepening affects growth through the combination of these two effects, with that of capital efficiency being highest. Later on, Trabelsi (2002) corroborates this hypothesis that the effect of financial intermediation on growth passes through an increase in productive investments. In addition, Acclassato and Eggoh (2012) affirm, based on the GMM dynamic panel system, that financial development is positively associated to all the sources of growth and that the main channel of transmission is capital accumulation.

Therefore, as providers of resources, banks favour a better allocation of capital given the liquidity needs. Also, they modify the composition of portfolios so as to favour consumption, which favours capital accumulation and economic growth.

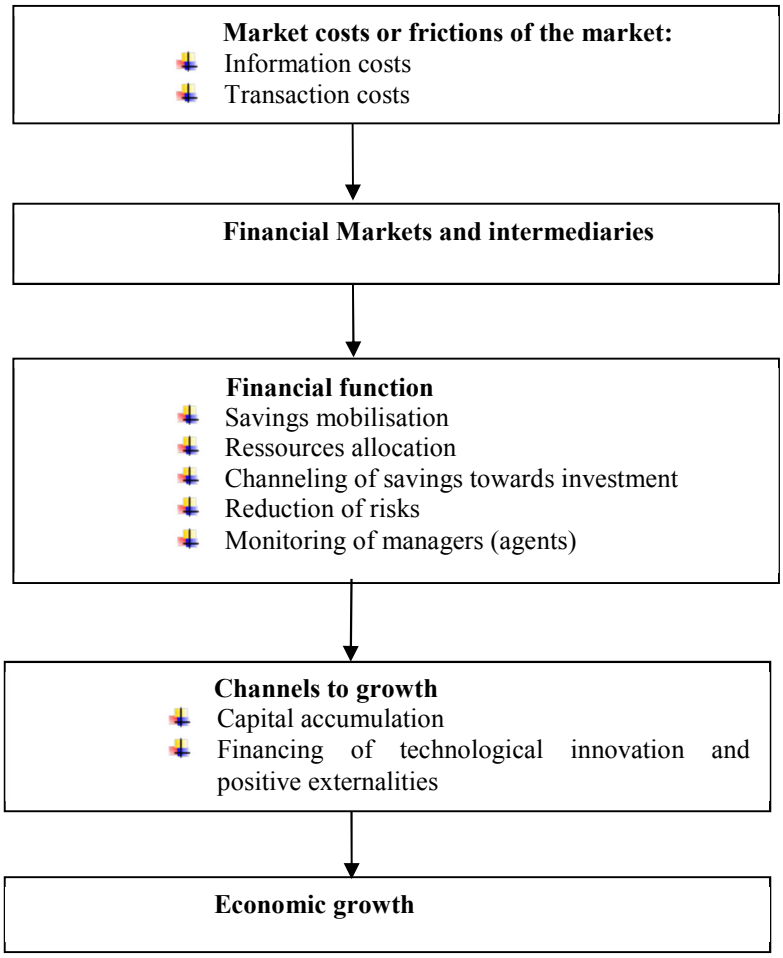
The criticisms of studies using longitudinal data which include the non inclusion of the temporal dimension and the systematic inclusion of specific effects in the error term, have lead to the use of more performing econometric techniques in the evaluation of the relationship between financial development and economic growth, for example, the panel data methodology. Beck, Levine and Loayza (2000) use this methodology and found a positive and significant relationship between financial development and the different indicators of growth which are: the rate of economic growth, capital accumulation and the general productivity of factors.

Studies that are exclusively based on the panel data methodology on samples of African countries are few. Nevertheless, the study of Fowowe (2008) is based on a sample of 19 sub-Saharan African countries suggest a

positive and significant relationship between economic growth and financial liberalisation policies. Equally, the study of Assane and Malamud (2010) shows that financial development contributes positively to economic growth in African Countries of common law origin, whereas in the countries of the CFA zone, the constraints related to the monetary union hinder financial development and compromises the growth of the countries of monetary zone.

If the study carried out by Fouda Owoundi (2009) is particularly interested in the banking system of CEMAC and especially to the paradox between excess liquidity of banks and the situation of insufficient financing of private enterprises of this economic and monetary zone, very few empirical studies deal with the relationship between financial development and economic growth in this sub-regional area.

Figure 1: The functions of the financial system and the transmission channels from finance to growth.



Source : Levine, 1997.

3. The Stylised Facts of Financial Development in the CEMAC area

The countries of CEMAC are members of the Franc zone which in addition to France brings together eight West African countries (in ECOWAS) and the Comorian Island. Each of these monetary zones has a central bank that issues the Franc CFA or the Comorian franc. These currencies are linked by a fixed parity to the French currency (Euro) and the French treasury through the mechanism of operation accounts ensures unlimited convertibility. This free convertibility of the franc CFA enables member states to trade freely with their foreign partners and contributes enormously to reinforce the credibility of the Comorian and CFA franc currencies.

The monetary policy of CEMAC which the main objective is prices stability is carried out by the Central African States central Bank (BEAC) using interest rates and obligatory reserves as instruments. These instruments experienced changes during the 1990s following the banking and economic crisis that stroke these countries at the end of the 1980s. The financial system then moves from a system of financial repression to a system of financial liberalisation giving more powers to the markets through the determination of financial equilibrium by the forces of demand and supply.

Also, financial repression characterised by the strong presence of the state in the management of banks, an

increase in obligatory reserves and a selective policy of credits in favour of priority sectors of the state has given way to a financial liberalisation policy framework within which the banking system was restructured, the privatisation of the social capital of banks, the change in the objective of monetary policy and the structure of the directive interest rates[2] of the central bank or the creation of the monetary market of the sub-region in which secondary banks manage liquidity.

Equally, financial liberalisation has enabled countries of the CEMAC zone to come out of the banking crisis by creating conditions of return of liquidity through increase in deposits and the profitability of banks. The architecture of the banking system improved greatly over time. On 31 December 1999, the banking system of CEMAC had 30 banks, 48 banks in 2012: better still, it had 50 banks in 2014 including 13 in Cameroon, 10 in Gabon, 10 in Congo, 5 in Equatorial Guinea, 4 in Central African Republic and 8 in Chad (COBAC, 2012).

The proportion of the population having a bank account increased tremendously moving from 1.8% in 2005 to 4.2% in 2010 then, 5.1% in 2015, as well as the network density (the number of inhabitants per bank agency) progressively improved moving from one agency for about180 000 inhabitants in 2005 to an agency for 120 000 inhabitants in 2010 then an agency for 103 386 inhabitants in 2014[3].

Moreover, the structure of the repartition of the social capital of banks according the region or country of origin of the major shareholders changed tremendously in favour of private nationals with 38% of CEMAC origin in 2014 as against 21% ten years earlier.

Thus, the banking landscape of the sub-region progressively developed in favour of financial liberalisation and the development of new information and communication technologies. This dynamism of the banking market of the sub-region improved the indicators of financial development. Therefore the proportion of bank credit to the private sector in the GDP increased from 5.59% in 2000 to 13.04% in 2014, in the same light, the indicator of liquidity of the economy increased from 13.37% to 24.35% in the same period.

On the contrary, the structure of credits has undergone very few modifications in favour of growth, long term credits have remained very low (2%) in comparison to short term credits. The real growth rate of GDP per head has dropped progressively, moving from 5.3% in 2005 to 2.89% in 2010 and then to 1.52% in 2014.

The banks are mostly foreign owned and are bound to respect the profitability objectives of their headquarters only by the financing of growth. Consequently, the banking market is segmented, these banks give priority to big enterprises (corporate finance) made up of big foreign groups with respect to local SME which represent about 90% of the economy of the countries of the sub-region but their lack of transparency and required collateral presents them from obtaining bank loans. The economies of CEMAC suffer from a problem of lack of financing of enterprises that is contrary to a situation of excess liquidity of banks.

4. Methodology and Statistics

4.1 The Model and the Variables

We use the panel data methodology to estimate an endogenous growth model similar to that of Pagano (1993)[4].This model enables to summarise all the important observable interactions between financial development and economic growth.

Just as Levine (1997) we retain a real sector – financial sector model that is formulated as follows:

$$Yi = \alpha + \beta\, Finance + \theta\, Real + \varepsilon, \quad (1)$$

$$g = \alpha + \beta F(i) + \theta X + \varepsilon \quad (2)$$

Where g measures economic growth, F(i) is the matrix of financial variables and X the matrix of control variables.

Moreover, in other to take into account the importance of initial financial conditions in the improvement of economic growth of the different states, we integrate the initial level of development of financial intermediation in the model and we obtain:

$$g_{it} = \alpha + \beta F_{it} + \theta X_{it} + \varphi F_{i,t_0} + \varepsilon_{it} \quad (3)$$

Finally, we measure the effect of the transmission channel between finance and growth through the importance of the channel of capital and that of productivity in the finance – growth relationship by the following equation:

$$gY_{it} = \alpha + \beta F_{it} + \theta X_{it} + \varphi F_{i,t-1} + \beta_1 F_{it} * gK_{it} + \beta_2 F_{it} * gP_{it} + \varepsilon_{it} \quad (4)$$

This last equation represents the general formulation of the model that serves as basis of our estimations.

- **Variables**

Real variables

These are variables measuring all the production of the different sectors of activity; particularly the primary, secondary and tertiary sectors.

The growth variables: the indicator that is most often retained to measure the importance of real activities and the growth rate of real GDP per capita (gY). This indicator is deflated making comparison between countries easy from a strictly economic stand point.

The growth rate of capital (gK), that is measured by gross fixed capital formation and the global productivity of factors (p), measured by Solow's residue from the neoclassic production function[5].

The control variables: the level of education (*proxy* of human capital), measured by the enrolment rate in secondary school ; the rate of economic exposure, measured by the ratio of exports and imports to GDP and finally, the rate of inflation, measured by the index of consumption prices.

Financial variables :

Financial variables according to King and Levine, 1993:

We will use three of these ratios within the framework of this study.

- The liquidity ratio (M_2/GDP) that measures the liquidity rate of the economy or the proportion of liquid money in the GDP;
- The ratio of financial savings (quasi-money /GDP) expressing the volume of long term liquidity available in the banking system;
- The indicator of the degree of intermediation (credit to private sector /GDP): it expresses the proportion of credit in the GDP made available to private entrepreneurs by banks.

The pertinent financial variables in CEMAC:

The ratio of sustainability of resources (sight deposits/total deposits), that measures the quality of bank liquidity, such as long term liquidity. The ratio of transformation of financial resources TC/TD, that measures the capacity of deposits to cover bank credits. The TC/T.RESS ratio that translates the reticence to bank credit or the degree of risk aversion of bankers, given all the possibilities they have in granting credit to the economy.

- Data sources

The data that we use especially real variables and financial variables as used by King and Levine, is from the CR-ROM of the world bank (2016), it covers the period 1985 -2014. The important financial variables in CEMAC are from the annual report of activities of COBAC (the Banking Commission of Central Africa) and BEAC (the Bank of Central African States).

4.2 Statistics

- The homogeneity test of Hsiao, 1986

Homogeneity tests are aimed at determining if the process that generates the data is good enough for all the individuals or on the contrary, if there are specificities for each individual.

$$gY_{it} = \alpha + \beta F_{it} + \theta X_{it} + \varphi F_{i,t-1} + \varepsilon_{it} \quad (5)$$

The algorithm of the test of analysis of homogeneity of this model gives results presented in the table below.

Table 1: Results of the test of Homogeneity of HSIAO.

Stages of the test	***$H_0$1***	***$H_0$2***	***$H_0$3***
Associated p-value	*0,06*	*0,12*	*0,04*
Decision	*we reject $H_0$1*	*we accept $H_0$2*	*we reject $H_0$3*

Source : Our analysis on STATA.

The p-value associated to the Fischer test of the hypothesis **$H_0$1** of equality of all the coefficients leads to the rejection of the hypothesis of total homogeneity of coefficients, on the contrary the hypothesis of equality of individual constants α_i is rejected. Finally, it is necessary to introduce individual effects in this model. The general form of the model is thus as follows:

$$gY_{it} = \alpha_i + \beta F_{it} + \theta X_{it} + \varphi F_{i,t-1} + \beta_1 F_{it} * gK_{it} + \beta_2 F_{it} * gP_{it} + \varepsilon_{it} \quad (6)$$

This equation translates the idea that in CEMAC, even if the decisions relative to the monetary domain are the same in all the countries (given that they use a common monetary policy implemented by BEAC, there is therefore no difference in monetary policy between countries), there are specificities that are unique to each country and react positively or negatively on the estimation of the finance-growth relationship.

- **Hausman test results**

The test of Jerry A. Hausman (1978) is a specification test of individual effects that discriminate fixed effects from random effects. It is therefore necessary to know the good model for our sample. The hypothesis tested concerns the correlation between individual effects and explanatory variables:

$$\begin{cases} H_0 : E(\alpha_i / X_i) = 0 \\ H_1 : E(\alpha_i / X_i) \neq 0 \end{cases}$$

The idea behind this test is simple: it is aimed at testing a default of specification or an eventual presence of correlation.

For each hypothesis, the estimator of MCG of the random effect model is unbiased and minimal variance for the null hypothesis with good specification of the model. On the contrary, the estimator of the fixed effect model is supposed to be without any bias in the two cases. The statistics of the Hausman test is as follows:

$$H = (\hat{\beta}_{within} - \hat{\beta}_{MCG})' [Var (\hat{\beta}_{within} - \hat{\beta}_{MCG})]^{-1} (\hat{\beta}_{within} - \hat{\beta}_{MCG})$$

Under the null hypothesis, the H statistics asymptotically follows a chi-square (χ^2) at k degree of freedom[6].

At the practical level, the H statistics calculated is represented by the variance-covariance matrix of the difference between the two estimators. If the test is significant at least at a 5% threshold, the null hypothesis is rejected consequently the estimators of the fixed effect model are more efficient.

The calculated chi-square (χ^2) of the test of Hausman's specification test of the model is χ^2 (5) = 20.98. The critical probability is p=0.0008, less than 1%. In this context, the fixed effect model is preferable to the random effect model. We will therefore estimate fixed individual effect panel.

- The descriptive statistics

The following table presents the descriptive statistics of the different variables. The results obtained revealed that the growth rate of average GDP per capita of the CEMAC zone from 1985 to 2014 is 1.92%; that of capital is 4.69% as against 3.27% for productivity, thus average economic growth rate of the sub-region during this period at less than 3.5%.

Table 2: Descriptive Statistics

VARIABLES	*MEAN*	*STANDARD DEVIATION*	*MIN*	*MAX*	*BETWEEN*	*WITHIN*	*NUMBER OF OBSERVATIONS*
gGDP_head	*1,92*	*10,03*	*-19,68*	*65,69*	*4,93*	*8,95*	*180*
Gcap	*4,69*	*25,03*	*-54*	*146,13*	*4,25*	*24,72*	*180*
Pgf	*3,27*	*11,27*	*-29,97*	*65,26*	*4,16*	*10,6*	*180*
M2GDP	*15,76*	*4,69*	*4,82*	*30,77*	*2,67*	*4*	*180*
CSPGDP	*9,62*	*6,89*	*2,08*	*32,46*	*3,07*	*6,29*	*180*
QMGDP	*3,72*	*2,91*	*0,43*	*11,4*	*2,94*	*1,12*	*180*
TCTD	*1*	*0,45*	*0,25*	*2,64*	*0,16*	*0,43*	*180*
DVTD	*0,52*	*0,14*	*0,28*	*0,87*	*0,095*	*0,11*	*180*
TCTRESS	*0,69*	*0,2*	*0,24*	*2,08*	*0,066*	*0,19*	*180*
KH	*29,77*	*16,26*	*5,61*	*69,53*	*16,03*	*7*	*180*
INFLATION	*3,7*	*8,37*	*-17,64*	*42,43*	*0,89*	*8,3*	*180*
T. O	*83,14*	*46,32*	*25,71*	*275,23*	*39,94*	*28,41*	*180*

Source: Calculations of the author.

The respective maximal values of the different sources of growth are registered in Equatorial Guinea that is 65.69%, 146.13% and 65.26% respectively for the growth rate per head, the growth rate of capital and global productivity of factors. It is equally Equatorial Guinea that registers the worst performance with minimal values of -54% and -29.9% respectively for the growth of capital and productivity with the exception of GDP growth per head whose lowest value is registered by Gabon in 1987.

The case of Equatorial Guinea is an illustration of the strong intra-country variability that is observed through the *within* coefficient measuring variability in each country. This later is largely higher than that measuring the variance between the countries (*between*), that is 8.95%; 24.72% and 10.6% respectively for the observable differences in each country as against 4.93%; 4.25%; 4.16% for the other inter-country observations.

As for financial variables, the average liquidity of the whole sample is 15.76% as against only 3.72% for quasi-money; the rate of bank credit to the private sector is 9.62%. More particularly, short term liquidity occupies an important volume in the assets of banks in this sub-region that is an average of 52%.

In effect, these differences reflect the dynamics of the monetary policy applied by BEAC, even though the instruments used to attain the final objective of price stabilisation are the same, the mechanisms through which these instruments are applied differently from one country to the other according to the needs expressed by each of the economies of the sub region. In the same line of ideas the policy of obligatory reserves varies from one country to the other according to the liquidity situation of the country. In addition, the refinancing policy of the central bank is different from one country to another, the policy of statutory advancement gave way to public securities which enable the different public treasuries to mobilise resources for the government. Thus, even if the monetary policy is common in the sub-region there are specificities that are unique to each country that is observed that is by a strong inter-country variability.

Concerning the control variables, the average inflation rate of the zone between 1985 and 2014 is 3.7%, the coefficients *within* and *between* indicate that intra-country variability remains dominant for this variable. The average rate of secondary education is situated at 29.77%, the average rate of economic coverage on its part is 83.14%. This last two variables show inter-country dominance. Because of the intercultural diversity a country such as Chad where the Muslim culture is dominant, this country will instead have a low literacy rate given the reticence of the population in educating young girls. On the contrary, external trade is in difficulty in the Central African Republic due to the growing political instability in the country.

- Unit roots tests

We will proceed here to the panel stationary test of Im-Pesaran and Shin (IPS).

Table 3: The Im Pesaran and Shin's unit root test.

List of variables	***IPS with Constant***		***IPS with Constant and Trend***	
	Z-t-bar	*P*	*Z-t-bar*	*P*
Endogenous variables				
Growth rate of GDP per capita	*-5.1515*	*0.0000*	*-5.9883*	*0.0000*
Growth rate of gross fixed capital Formation	*-5.8526*	*0.0000*	*-6.6338*	*0.0000*
Global productivity of factors	*-6.3963*	*0.0000*	*-6.4735*	*0.0000*
Financial variables				
Indicator of liquidity M2/GDP	*-0.6017*	*0.2737*	*-0.2261*	*0.4106*
Indicator of the degree of intermediation of credit to the private sector	*-0.2260*	*0.4106*	*-0.0810*	*0.4677*
Indicator of Quasi-money /GDP	*-1.8088*	*0.0352*	*-1.8146*	*0.0348*
Ratio of transformation of financial resources TC / TD	*-0.7883*	*0.2153*	*-3.1039*	*0.0010*
Ratio of long term ressources or ratio of sustainability of resources	*0.2503*	*0.5988*	*-2.3379*	*0.0097*
Ratio TC / T. RESS	*-2.3966*	*0.0083*	*-3.5337*	*0.0002*
Real variables				
Level of education /human Capital	*4.1283*	*1.0000*	*1.8089*	*0.9648*
Inflation	*-5.5814*	*0.0000*	*-5.5525*	*0.0000*
Economic Openess	*-2.6718*	*0.0038*	*-4.4386*	*0.0000*
Governement expenditures	*8.6569*	*1.0000*	*1.0167*	*0.8454*

Z-t-bar : Statistic of IPS test; P : p-value.

Source: Calculation of the author

It is shown from the IPS test at a threshold of 1% that the endogenous variables are all stationary in constant and trend formulations. As a result the variables; growth rate of GDP, growth rate of gross fixed capital formation and global productivity of factors have a zero order integration I(0).

At the level of financial variables, only the indicator of liquidity M2/GDP and the indicator of the degree of credit intermediation to the private sector /GDP are not stationary at a threshold of 10% according to IPS test. We consider them as having a unit roots. Then these two financial variables will be differentiated once with the aim of making them stationary before the estimation of the models.

The other financial variables, namely: the quasi-money/GDP indicator, the ratio of transformation of financial resources TC/TD, the ratio of sight deposit to total deposit or ratio of sustainability of resources and the TC/T.RESS ratio, are stationary at a threshold of 1%.

Among the real variables, the level of education (human capital) and public expenditure are non stationary at a threshold of 10%. On the contrary inflation and economic exposure/rate of exposure are stationary at threshold of 1%.

All the three growth variables (growth rate of GDP per head, growth rate of gross fixed capital formation and global productivity of factors) are stationary [I(0)].

Moreover, four financial explanatory variables (quasi-money/GDP indicator, ratio of transformation of financial resources TC/TD, ratio of sight deposit to total deposits or ratio of sustainability of resources and the TC/T.RESS ratio) are stationary [I(0)]. It is equally the same for two real explanatory variables namely Inflation and economic openness.

On the contrary, two explanatory financial variables (indicator of liquidity M2/GDP and indicator of the degree of credit intermediation to the private sector/GDP) are non stationary [I(1)]. In addition, two real explanatory variables (the level of education/human capital and public expenditure) are non stationary [I(1)].

In total, three variables are integrated at an order of 1 namely: the indicator of liquidity M2/GDP, indicator of the degree of credit intermediation to the private sector/GDP (Csppib), and the level of education/human capital (kh).

Since all the variables are not stationary, it is necessary to proceed to the test of co integration so as to verify if it is possible to infer a long term relationship between the two processes generated by the explanatory variables and independent variables.

- The co-integration panel test

The existence of a co-integration relationship translates the idea that a combination of non stationary variables can be stationary, that is why the unit square tests are preliminary to the analysis of co integration[7].

The co integration tests enable to verify the temporal dimension (short and long term) between the variables. They differ with the formulation of the null hypothesis of absence or the presence of co integration.

The Westerlund's test of co integration is carried out here by taking the variables two by two. This test enables us to verify if there exist a long term relationship between the endogenous variable and each explanatory variable. But in a panel, we can proceed as suggested by Johansen (1991)[8] for temporal series to a multiple vector of co integration which enables to identify the existence of a multiple co-integration. Thus, this test provides four statistic tests (Gt, Ga, Pt, Pa) with four associated probabilities respectively which provides a better interpretation.

The results of the test are presented in the form of tables in the appendix. It is seen that the critical probabilities of the statistics of the Westerlund test between the growth rate of GDP per head and explanatory variables are all less than 5%.

5. Results and interpretation

We verify the paradigm of a growth initiated by financial intermediation, either directly through an increase in investment resources or through the improvement in the efficiency of investment, from a cross effect modelling.

5.1 The results of a cross effect model

The modelling integrates all the financial and control variables; they are increased by the joint effects of financial variables and variables identifying the sources of growth (growth rate of capital and the global production of factors). The equation to be estimated is[9]:

$$\ln gY_{it} = \alpha_i + \beta \ln F_{it} + \theta \ln X_{it} + \varphi \ln F_{i,t-1} + \beta_1 \ln F_{it} * gK_{it} + \beta_2 \ln F_{it} * gP_{it} + \varepsilon_{it} \quad (7)$$

We estimate this model using generalised iterative least square so as to avoid any eventual residual autocorrelation or heteroscedasticity problem. This model is globally significant.

In fact, the Wald statistics of overall significant is evaluated at Wald chi 2(22) = 8451.56 (p = 0.0027).

Table 4: Estimation of the effects of accumulation and allocation of capital.

Explanatory variables	***B***	***t***	***Influence***
Constant	*1,277*	*1,051*	*Positive*
Financial variables augmented by their lateness			
Indicator of liquidity M2/GDP	*0,048*	*0,779*	*Positive*
Lateness of the indicator of liquidity	*0,079**	*1,456*	***Positive***
Indicator of the degree of credit intermediation to the private sector /GDP	*-0,003*	*-0,061*	*Negative*
Lateness of the indicator of the degree of intermediation	*0,030*	*0,724*	*Positive*
Indicator quasi-money /GDP	*-0,033*	*-0,140*	*Negative*
Ratio of transformation of Financial resources	*-0,302*	*-0,342*	*Negative*
Ratio of sustainability of resources	*8,867***	*5,163*	***Positive***
TC / T. RESS Ratio	*2,129**	*1,580*	***Positive***
Real variables			
Level of education /Capital humain	*-0,049*	*-1,149*	*Négative*
Inflation	*0,005*	*0,346*	*Positive*
Economic openess	*0,002*	*0,528*	*Positive*
Joint effects of financial variables and the growth rate of capital (gK)			
Indicator of liquidity M2/GDP and gK	*0,006****	*2,978*	***Positive***
Indicator of intermediation by credit and gK	*-0,003*	*-1,301*	*Negative*
Indicator of quasi-money /GDP and gK	*0,026****	*4,648*	*Positive*
Ratio of transformation of financial resources TC / TD and gK	*0,032*	*0,627*	*Positive*
Ratio of long term liquidity and gK	*0,435****	*10,876*	***Positive***
TC / T. RESS ratio and gK	*0,115*	*1,340*	*Positive*
Joint effects of financial variables and the global productivity of factors (P)			
Indicator of liquidity M2/GDP and P	*0,016****	*3,166*	***Positive***
Indicator of degree of intermediation and P	*-0,004*	*-0,563*	*Negative*
Indicator of near money /GDP and P	*0,080****	*4,192*	***Positive***
Ratio of transformation of financial resources TC / TD and P	*0,022*	*0,213*	*Positive*
Ratio of sustainability of resources and P	*1,403****	*16,140*	***Positive***
TC / T. RESS ratio and P	*0,365***	*2,312*	***Positive***

*The effects of a variable is highlighted in italics when its estimated coefficient is ***= Significant at 1%, **= Significant at 5%, *= 10%.*

Source : Estimations of the author on the STATA software 12

The ratio of long term liquidity is positive and significant at a confidence level of 99%, as well as the hypothesis of reticence of banks when granting credit is relatively relaxed; this ratio is significant at a critical threshold of 10%. Nevertheless, the tests of joint effects of financial variables and sources of growth suggest that financial intermediation affects growth mostly through the channel of efficiency of productivity.

5.2 Financial development and economic growth in CEMAC area: The domination of the productivity channel

The results expressing the joint effect of financial variables and growth rate of capital show that financial development affects economic growth through the channel of capital accumulation. With the exception of the intermediation ratio, all the financial variables are positive; the intermediation variables through the channel of liquidity are all significant at the critical threshold of 1%. This expresses the idea that banks accumulate productive savings and are supposed to allocate for the financing of the economy given the liquidity needs of economic agents.

As for the joint effect between financial variables and the overall productivity of factors, in addition to keeping their significance the coefficients of intermediation variables by liquidity channel all increase. The ratio of liquidity increases from 0.006 to 0.016; the ratio of financial savings from 0.026 to 0.080 and finally, the ratio of sustainability of resources also increase from 0.435 to 1.403. Equally, the ratio measuring the engagement of banks in the supply of credit (from all the resources at its disposal) registers a positive sign and is significant at a threshold of 5%.

These results suggest that the financial sector affects economic growth mainly through the channel of productivity of investment or allocative efficiency. This does not mean that banks in the CEMAC zone allocate the financing of productive investment efficiently but instead imply that the accumulation or the collection of resources especially the holding of liquidity in the banking system of the sub-region does not exercise a favourable significant effect on growth. On the contrary it is the activity of supply of bank credit that is susceptible of having a favourable peer effect on economic growth.

In fact, these results are similar to those of King and Levine (1992, 1993), Beck et al. (2000), Trabelsi (2002) who suggest that financial intermediation affects growth through a combination of these two effects, that of productivity of capital being the highest.

6. Conclusion

This article had as objective to identify the dominant transition channels through which finance affects economic growth. The idea is that financial development reacts on growth through its sources which are productivity of factors and capital accumulation. The analysis is carried out on a sample of six countries if the CEMAC zone from 1985 to 2014. The methodology of econometrics of panel data is applied since it has two advantages, the variability of information and the elimination of biases of endogenity.

The results suggest that the liquidity indicator of financial development positively affects economic growth. On the contrary, the development expressing credit to the private sector has a negative impact and is non significant on the growth of CEMAC countries, the difficulties of access to bank credit faced by the entrepreneurial private sector hinders the economic growth of this zone.

More explicitly, the high impact of financial development on overall productivity of factors in comparison to the growth rate of capital suggests that the productivity channel is the dominant channel through which financial development affects economic growth. Also, banks have to speed up the activity of allocation of investment resources to the private sector by increasing the volume of credit granted to entrepreneurs especially medium and long term credits for the financing of structural investment projects guarantors of growth.

For resource allocation to develop and become a vector of growth, it is necessary that the actions of the three actors be put in place, this includes that of secondary banks, the state and managers of enterprises. Banks have to improve the quality of information through the reduction of asymmetric information between banks and borrowers, the role of the legal system to protect the rights of creditors in case of default of the debtor should encourage bankers. Enterprises have to equally endeavour to be transparent in their financial statements.

Generally there is a cause-effect relationship between financial intermediation and growth, this vision remains however very problematic according to Joan Robinson (1952) who expressed the idea that the growth of real activity is an explanatory variable of financial intermediation and not the contrary. By making this reservation as to the power of the financial system to explain growth, it highlights the need to verify the nature of the causality between these two spheres of the economy.

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NOTES

Note 1. The Economic and Monetary Community of Central Africa, it is made up of six countries namely, Cameroon, the Central African Republic, Congo, Gabon, Equatorial Guinea and le Chad.

Note 2. The liberalisation of interest rate conditions are first manifested by fixing of minimum creditor rates and a maximum debtor rate and continues later by the suppression of the maximum debtor rate that henceforth has been an object of free negotiation between those who demand credit and bankers, only the minimum creditor rate is conserved with the aim of protecting small savers.

Note 3. Calculations of the author from COBAC data on the proportion of the population having bank accounts and those of the world bank on the total population per country.

Note 4. Pagano developed a model that is in line with new theories of growth in the United States of America and with the studies of Romer (1986) on the knowledge and education and those of Lucas (1988) on public expenses and infrastructure in general. This model formulates the basic hypothesis that the production function is linear, this signifies that the marginal productivity is not decreasing is at least constant.

Note 5. See Beck, Levine et Loayza (2000), Rioja et Valev (2004) or Acclassato et Eggoh (2012). The global productivity of factor is obtained by assuming that the elasticity of substitution of capital by labour is 0.3. Thus, $PROD_{it}= PGF_{it} = gPIB_{it} – O,3*gCAP_{lt.}$

Note 6. Number of explanatory variables.

Note 7. Saying that a process is I(d) significant, that it is integrated at an order d or that there exist unit squares and they have to be differentiated d times so as to make them stationary if it is for example of DS type.

Note 8. See Bourbonnais, 2011.

Note 9. We will retain the logarithmic form of the model developed above this form is no longer easy to use since the coefficients are expressed in terms of elasticity which enables to carry out an analysis in relative terms.

APENDIX

Apendix: Co-integration test between growth rate of GDP per capita and explanatory variables.

Label of explanatory variables	**ggdp_ per capita**
Indicator of liquidity M2/GDP	Statistic / Value / Z-value / P-value Gt −3.256 −4.030 0.000 Ga −16.190 −4.071 0.000 Pt −6.207 −2.677 0.004 Pa −11.408 −3.960 0.000
Indicator of the degree credit intermediation to the private sector /GDP	Statistic / Value / Z-value / P-value Gt −3.714 −5.279 0.000 Ga −19.225 −5.437 0.000 Pt −6.410 −2.880 0.002 Pa −13.478 −5.102 0.000
Indicator of Quasi-money /GDP	Statistic / Value / Z-value / P-value Gt −2.595 −2.229 0.013 Ga −13.064 −2.665 0.004 Pt −5.274 −1.738 0.041 Pa −8.636 −2.431 0.008
Ratio of transformation of financial resources TC / TD	Statistic / Value / Z-value / P-value Gt −3.384 −4.381 0.000 Ga −20.643 −6.075 0.000 Pt −6.259 −2.729 0.003 Pa −13.380 −5.048 0.000
Ratio of sight deposits to total deposits or ratio of long term resources	Statistic / Value / Z-value / P-value Gt −3.153 −3.750 0.000 Ga −17.048 −4.457 0.000 Pt −6.573 −3.045 0.001 Pa −12.109 −4.347 0.000
TC / T, RESS ratio	Statistic / Value / Z-value / P-value Gt −3.469 −4.611 0.000 Ga −19.530 −5.574 0.000 Pt −6.273 −2.743 0.003 Pa −13.153 −4.923 0.000
Level of education /Human Capital	Statistic / Value / Z-value / P-value Gt −2.978 −3.274 0.001 Ga −15.642 −3.825 0.000 Pt −6.759 −3.232 0.001 Pa −12.798 −4.727 0.000
Inflation	Statistic / Value / Z-value / P-value Gt −2.574 −2.171 0.015 Ga −12.986 −2.629 0.004 Pt −5.541 −2.007 0.022 Pa −9.565 −2.944 0.002
Economic exposure / Rate of exposure	Statistic / Value / Z-value / P-value Gt −3.470 −4.615 0.000 Ga −18.937 −5.307 0.000 Pt −9.402 −5.890 0.000 Pa −22.384 −10.016 0.000