

# Financial Development and Income Inequality: Evidence from African Countries in the Franc Zone

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## Abstract

The aim of this article is to evaluate the effect of financial development on income inequality in a sample of African countries of the Franc Zone. Using data from Worldwide Governance indicators, UNESCO, COBAC, the Banking Commission of West African States and the World Bank, based on cylindrical dynamic panel whose instrumentalisation and stationarity of variables enabled us to use GMM in system, the results show that financial development through its components which are credit to the private sector, network development as well as the monetary mass significantly reduce income inequality among households. This result is robust by alternative or dual use of the components as well as when several control variables are integrated.

## Keywords

Financial Development, Income Inequality

## 1. Introduction

Based on the developments observed in the financial sector in the last two decades, the World Bank and the International monetary fund made it a strategic tool for the achievement of the aim of reduction of income inequality between the rich and the poor. Among financial development indicators, credit to the private sector as a percentage of GDP increased from 28.09% to 46% in Sub-Sahara Africa between 2010 and 2015 and from 15.4% to 16.3% for countries of the Franc Zone [1]. Equally, during the same period the monetary mass in terms of percentage of GDP increased respectively from 24.7% to 28.9% in the Franc Zone and 44.7% to 45.5% for Sub-Saharan African Countries. In addition to this dynamic of financial development, there is persistent income inequality

among populations. Despite the fact that several studies highlight the importance of financial development in the explanation of the evolution of income inequalities which is a phenomenon that can easily be observed in developing countries.

In this regard, studies carried out so far have led to the conclusion that, the effects of financial development on income inequality are not uniform. For example [2] show that financial development is susceptible of modifying the income level of the population through a non-linear relation; [3] estimates that the integration of the ratio of financial depth among the control variables has a positive and significant impact on but relatively weak on income inequality. Whereas [4] followed by [5] show that the influence of financial development on income inequality mainly depends on the structure of the economy considered. As a result they integrate interaction variables between financial intensity and the size of the modern sector in their regression. By estimating in transversal cuts using data on 71 countries for the period 1960 to 1995, [6] show that financial development affects the convergence of economies through growth of productivity instead of the accumulation of capital. The study of [7] on the role of financial development in the explanation of the inequality in income for a panel of 98 countries on the period 1980-2006, reveals that the reduction of the differences in income more often from a stable macroeconomic environment than an intensive financial sector. Contrary to this conclusion, [8] or again [9] established the existence of a linear relationship between financial development and income inequality. In the same way, [10] in a study on the rural area of China lead to the conclusion that there is an inverse relationship between financial development and income inequality.

The non-uniform nature of the results highlights the fact that these studies have a lot of weaknesses relative to the absence of certain considerations such as: 1) the bring together of countries belonging to different sub regions, but characterised by the use of a common currency; 2) the geographic dimension of financial development through the variable density of the network that enables not only to increase the size of the sample but also to appreciate the dynamism of the banking sector since a strong density facilitates access to credit by economic agents and reduces the inequality in revenue among them; 3) financial development as a composite variable is measured by 3 indicators namely credit to the private sector, an increase in the monetary mass and the non integrated variable which is the density of the network; and 4) the method of econometric analysis since that consecrated to the method of generalised moments in systems that is not widely used produces robust results on the analysis of the impact of financial development on income inequality.

In this light, the objective of this study is to evaluate the impact of financial development on income inequality for the period 2000 to 2014, on a sample of 14 countries<sup>1</sup> belonging to the Franc zone which form a homogenous group of

<sup>1</sup>These countries are respectively: Benin, Burkina Faso, Cameroon, Congo, Ivory Coast, Gabon, Equatorial Guinea, Guinea Bissau, Mali, Niger, the Central African Republic, Senegal, Chad and Togo.

countries united since the colonial period by a monetary policy based on the use of the Franc CFA as a unique currency with different macroeconomic specificities.

The rest of the study is presented as follows; in Section 2 the empirical strategy is presented. Section 3 presents and describes the data. Whereas Section 4 is dedicated to the results and Section 5 concludes the study.

## 2. Empirical Strategy

### 2.1. The Econometric Model

With the aim of evaluating the impact of financial development on income inequality two types of variables are taken into consideration. There are endogenous variables, Gini's index ( $GI_{i,t}$ ) that captures income inequality between individuals. Then, exogenous variables that are susceptible to affect the Gini's index and which are in two categories. The first is made up of financial development variables. In this regard, the recent specifications of the model of income inequality incorporates financial variables so as not to take into account the absolute effects of the development of the financial sector, but those relative to it [11]. In order to do this the financial development variable is measured by bank credit to the private sector to GDP ( $BC_{i,t}$ ). This ratio is related to investment and economic growth through the allocation of resources to entrepreneurs [12], master of the innovation process according to Schumpeter. Also, in the context of an expansionist monetary policy, financial development is measured by an increase in the monetary mass ( $M2/PIB$ ) represented by  $MM_{i,t}$ . Low-income economies often resort to such policies to boost demand and favour the reduction in income inequality [13]. This can explain the differences in income levels among the populations. Finally, the density of the banking network ( $DB_{i,t}$ ) that captures the penetration rate of banks in the geographical area where the population lives.

The second category is the control variables which are also determining factors of income inequality. They include, the growth rate of the GDP ( $Y_{i,t}$ ); [14] developed an explicit relationship between economic growth and income inequality with a causality link such that the different phases of economic development determine the distribution of income. This hypothesis is explained by the fact that growth is beneficial to the poor at the stages of development of a traditional sector. Also, included are the demographic variable namely the population growth rate ( $POP_{i,t}$ ), corruption ( $COR_{i,t}$ ), good governance ( $GG_{i,t}$ ) and political stability ( $PS_{i,t}$ ). They are incorporated into the model because they reflect the manner in which income distribution is carried out [15] [16]. These variables contribute enormously in the comprehension process of income inequalities and their variations. Moreover, development variables are taken into account. As such exposure to trade ( $ET_{i,t}$ ) is retained to take into account the influence of a policy of commercial integration. Nevertheless, based on the study carried out by [17], the relationship between income inequality and human cap-

ital ( $HC_{i,t}$ ) is explained by the education level of the population; the more literate the population is, the higher the demand for financial products. Therefore, there is a positive relationship between level of education and income differences. The indicator of the level of education that is generally used is the gross rate of enrolment in secondary school. However, countries in which government expenses ( $GE_{i,t}$ ) huge tend to redistribute more; these expenses constitute an intuitive manner of evaluating the redistribution of income. Finally, the rate of inflation ( $RI_{i,t}$ ) is introduced to capture the impact of macroeconomic stabilisation on income disparities. It modifies the income structure and increases inequality among high-income households and the others. During inflation, interest rates tend to be high, households with high purchasing power can benefit from the increase in income from their investments. On the contrary, modest income households cannot save. Thus, they do not benefit from this opportunity and at the end, the differences in direct income increase given the growth differential of incomes linked to the returns on saving [18].

Taking into consideration the size of the sample and the more or less available data as well as the fact that the impact of financial development on income inequalities can take some time, inequality would be measured as the variation of its indicator during the period 2000 to 2014. This leads to the specification of the model in the form:

$$IG_{i,t} = \beta_0 + \beta_1 GI_{i,t-1} + \gamma_1 BC_{i,t} + \gamma_2 MM_{i,t} + \gamma_3 DB_{i,t} + \alpha_1 Y_{i,n} + \alpha_2 POP_{i,n} + \alpha_3 GG_{i,n} + \alpha_4 COR_{i,n} + \alpha_5 PS_{i,n} + \alpha_6 ET_{i,n} + \alpha_7 HC_{i,n} + \alpha_8 GE_{i,n} + \alpha_9 RI_{i,n} + u_i + v_t + \varepsilon_{i,t} \quad (1)$$

In Equation (1), the explanatory variables are made up of the retarded values of a year of income inequality in addition to financial development variables and control variables. The error term is  $\varepsilon_{i,t}$ ;  $\beta_0, \beta_1, \gamma_1, \gamma_2, \gamma_3, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8$  and  $\alpha_9$  are parameters to be estimated;  $n$  is the effective duration of time at the end of which the control variables have an impact on income inequality, it is the optimal retardation that translates the difference in time often experienced by all the countries that is obtained from the information criteria of FPE<sup>2</sup>, AIC<sup>3</sup>, HQIC<sup>4</sup> and SBIC<sup>5</sup>; finally,  $u_i$  and  $v_t$  are respectively the fixed effects of the countries and time that control the common fixed effects of the countries and the economic cycle.

## 2.2. The Econometric Strategy

The estimation of the impact of financial development on income inequality has a problem of endogeneity that can come from the omission of pertinent variables, a bias of simultaneousness or even the presence of a measurement error in one or the other of the control variables. In fact, at a precise date the level of income inequality in a country or a region can be influenced by its level at a pre-

<sup>2</sup>Final Prediction Error.

<sup>3</sup>Akaike's Information Criteria.

<sup>4</sup>Hannan and Quinn Information Criterion.

<sup>5</sup>Scharz's Bayesian Information Criterion.

vious date. With the aim of controlling such a problem we have considered retarded variables of order 1. They do not only enable to eliminate the individual effects of but also to annul eventual problems related to endogeneity of variables. The stationarities of variables resulting from first generation tests based on the hypothesis of inter-individual independence of residuals and assume an heterogeneous specification of the auto regressive square. The eventual correlations between individuals constitute parameters of nuisance [19]. All the variables are stationary of order 2 (one) in their specification with the constant and trend. More specifically, the dependent variable (income inequality), the growth rate of real GDP, public expenses and exposure to trade (business environment) as well as institutional variables are stationary at a threshold of 1%. On the contrary, all the other control variables such as demography, annual inflation rate as well as financial variables are stationary at a threshold of 5. For all these reasons, the method of generalised moments (GMM) in system as a technique of estimation in a panel enables to bring solutions to the study of the impact of financial development on income inequality. The GMM test in system is based on the validity of the two tests associated to it [20] and that justifies its robustness. This includes on one hand the test of Sargan or Hansen that enables to test the validity of retarded variables as instruments and on the other hand to test the self-correlation based on the null hypothesis of the absence of serial self-correlation of the 2<sup>nd</sup> order.

### **3. Presentation and Description of Data**

#### **3.1. Variables and Sources of Data**

Two types of variables are taken into account in this study. There is the endogenous variable, the exogenous variables which are divided into two categories that is financial development variables and control variables. The data relative to all these variables are not from the same source. Moreover, they cover the period from 2000 to 2014. The choice of this period was dictated by the availability of data on the banking sector and the aspect related to the quality of institutions (Table 1).

#### **3.2. Descriptive Statistics and the Correlation Structure**

The descriptive statistics presented in Table 2 below shows that for the entire sample the average Gini index is 49%. The best distribution of income is in Niger with the lowest Gini index that is 31% as against 99% for Chad in 2010 with the highest value. As for financial development variables, the volume of credit granted by banks to the private sector is on average at 12.46% of the GDP as against 23.14% for the monetary mass issued by countries of the zone studied. On average 169,907.6 individuals use the services of the same bank. The density of the banking network is stronger in Gabon with 23,576 individuals in 2013, weaker in the Central African Republic where 784,658.8 persons use the services of the same bank. Togo has the highest financial development indicators with 48.97% and 34.11% for the monetary mass and credit to the private sector as a

**Table 1.** Description of variables used.

Variables	Descriptions	Sources of data
<i>Endogenous Variable</i>		
<i>GI</i>	The Gini index	Calculations of authors from world bank data [21]
<i>Exogenous variables of financial development</i>		
<i>BC</i>	Bank credit to the private sector with respect to GDP	Extract of the data base of the world bank
<i>MM</i>	Increase in the monetary mass	Calculations of authors from gross data supplied by COBAC and the BCEAO banking commission to the number of annual bank tellers of each member country.
<i>DB</i>	Density of the banking network	
<i>Exogenous control variables</i>		
<i>Y</i>	Gross domestic product	
<i>POP</i>	The population growth rate	
<i>RI</i>	The rate of inflation	Extract of the database of the world bank
<i>GE</i>	Government expenditure	
<i>ET</i>	Exposure to trade	
<i>COR</i>	Corruption	
<i>GG</i>	Good governance	Data from worldwide governance indicators (WGI) that are produced by [22].
<i>PS</i>	Political stability	
<i>HC</i>	Human capital	UNESCO
$\varepsilon$	The error term	
$\mu$	Country fixed effects	
$\nu$	The fixed effects of time	

Source: the authors.

**Table 2.** Descriptive statistics of income inequality and explanatory variables.

Variables	Means	Stand-deviation	Min	Max	Between	Within	Number of observations
<i>GI</i>	0.49	0.13	0.31	1.03	0.11	0.086	210
<i>BC</i>	12.46	7.32	0.8	34.11	6.51	3.75	210
<i>MM</i>	23.14	9.71	5.73	48.97	8.03	5.83	210
<i>DB</i>	169,907	177,973	23,576.44	784,658.8	155,358.9	95,681.5	210
<i>Y</i>	1.64	6.67	-37.28	57.99	2.71	6.14	210
<i>GE</i>	104.5	20.86	50.99	202.31	14.49	15.47	210
<i>RI</i>	37.68	26.05	-1.08	175.55	24.71	10.43	210
<i>POP</i>	2.86	3.13	-8.97	14.01	1.03	2.96	210
<i>ET</i>	4.56	6.71	1.63	40.61	6.83	1.21	210
<i>COR</i>	-0.87	0.39	-1.83	0.31	0.36	0.17	210
<i>GG</i>	-0.98	0.41	-1.86	0.02	0.39	0.14	210
<i>PS</i>	-0.58	0.73	-2.68	0.73	0.66	0.37	210
<i>HC</i>	31.86	15.58	6.83	66.23	13.67	8.27	210

Sources: calculations of the authors.

percentage of GDP. The minimal value is that of Equatorial Guinea (for monetary masses as a whole) and Guinea Bissau (for credit to the private sector). The inter-individual variations are however strong enough compared to intra-individual variations leading to disparities between the countries considered at the level of the implementation of economic policies and even the stability of institutions.

There is a negative correlation between the Gini index and the financial variables (**Table 3**), especially credit to the private sector and the monetary mass. This signifies that the more credit is distributed the lower the Gini index and consequently inequalities in income are lower. The positive correlation between the density of the network and the Gini index shows that financial development reduces income inequalities given that statistically the lower the value of network density the easier individuals have access to financial services and this leads to a better distribution of income which is translated by a low Gini index. The rate of inflation, the rate of population growth as well as corruption has a positive correlation with the Gini index. Low values of these three variables have direct positive effects that reduce income inequalities through a low Gini index. On the contrary, all the other variables have a negative correlation with the Gini index translating the idea that an increase in the later leads to a reduction in income inequalities.

#### 4. Results

**Table 4** below presents the results of the estimation of the effects of financial development on income inequality measured by Gini's index. For all the regression, all the financial variables as well as the Gini index have been instrumented. Based on the results, the financial variables which are bank credit to the private

**Table 3.** Correlations.

Variables	<i>IG</i>	<i>C</i>	<i>M</i>	<i>DR</i>	<i>Y</i>	<i>DP</i>	<i>I</i>	<i>POP</i>	<i>OC</i>	<i>COR</i>	<i>BG</i>	<i>SP</i>	<i>KH</i>
<i>IG</i>	1												
<i>C</i>	-0.3	1											
<i>M</i>	-0.3	0.8	1										
<i>GR</i>	0.03	-0.5	-0.4	1									
<i>Y</i>	0.3	-0.1	-0.2	-0.008	1								
<i>DP</i>	-0.1	0.2	0.1	0.2	0.2	1							
<i>I</i>	0.4	-0.2	-0.2	-0.2	0.4	0.001	1						
<i>POP</i>	0.2	-0.1	-0.1	0.03	0.1	0.02	0.2	1					
<i>OC</i>	-0.07	0.1	0.2	-0.07	0.01	0.1	-0.3	0.01	1				
<i>COR</i>	-0.5	0.5	0.3	-0.2	-0.1	0.1	-0.4	-0.2	0.1	1			
<i>BG</i>	-0.4	0.4	0.3	-0.2	-0.006	0.1	-0.4	-0.1	0.3	0.8	1		
<i>SP</i>	-0.02	0.2	0.1	-0.4	0.08	0.09	0.01	0.01	0.3	0.2	0.4	1	
<i>KH</i>	-0.03	0.2	0.4	-0.6	-0.03	-0.3	0.2	-0.03	0.07	-0.09	0.01	0.2	1

Sources: calculations of the authors.

**Table 4.** The effects of financial development on income inequality.

	1	2	3	4	5	6	7	8	9	10
<i>BC</i>	-2.01e-13*** (2.63e-14)	-2.48e-12 (3.67e-12)	-6.70e-12*** (2.52e-12)	-2.77e-11*** (4.94e-12)	-7.33e-12** (4.21e-12)	-1.53e-11*** (5.09e-12)	-6.93e-14 (4.22e-12)	-1.53e-11*** (5.45e-12)	-1.60e-14 (4.69e-12)	-9.49e-12 (8.52e-12)
<i>MM</i>	-6.22e-14*** (1.22e-14)	-4.37e-12** (1.76e-12)	-3.56e-12** (1.18e-12)	-4.67e-12* (2.40e-12)	-4.62e-12** (2.19e-12)	3.50e-12 (2.51e-12)	-6.84e-12*** (2.16e-12)	2.85e-12 (2.74e-12)	-8.14e-12*** (2.29e-12)	-5.77e-12 (4.20e-12)
<i>DB</i>	-5.12e-18*** (6.61e-19)	-6.50e-16*** (9.38e-17)	-2.23e-16*** (6.63e-17)	-5.63e-16*** (1.24e-16)	3.28e-17 (1.19e-16)	-1.05e-15*** (1.36e-16)	-5.85e-17 (1.28e-16)	-9.57e-16*** (1.43e-16)	-9.93e-17 (1.13e-16)	-3.87e-16* (2.04e-16)
<i>Y</i>		-2.06e-12*** (7.52e-13)	-5.16e-12*** (6.78e-13)	-3.16e-12* (1.40e-12)	-3.28e-12*** (1.10e-12)	-7.10e-13 (1.32e-12)	-4.10e-12*** (1.07e-12)	-1.26e-12 (1.37e-12)	-3.73e-12*** (1.14e-12)	-6.06e-12** (2.17e-12)
<i>GE</i>			-8.27e-13*** (2.84e-13)	-2.35e-12*** (7.99e-13)	-1.75e-12** (7.59e-13)	2.69e-12*** (9.15e-13)	-1.04e-12 (9.31e-13)	-2.30e-12*** (9.69e-13)	-6.27e-13 (7.52e-13)	-8.50e-13 (1.39e-12)
<i>RI</i>				-2.79e-12 (1.65e-12)	-1.46e-12 (1.24e-12)	-2.05e-12 (1.55e-12)	5.47e-13 (1.20e-12)	-4.16e-12** (1.61e-12)	1.20e-12 (1.27e-12)	-4.61e-13 (2.38e-12)
<i>POP</i>					1.35e-11*** (1.71e-12)	-1.53e-11*** (2.05e-12)	6.02e-12*** (1.60e-12)	-1.33e-11*** (2.26e-12)	5.67e-12*** (1.69e-12)	2.07e-11*** (3.04e-12)
<i>ET</i>						-1.62e-11 (1.09e-11)	-5.98e-12 (6.11e-12)	-3.04e-12 (8.02e-12)	-4.87e-12 (6.39e-12)	1.33e-11 (1.25e-11)
<i>COR</i>							-2.46e-10*** (4.30e-11)	-2.36e-10*** (6.24e-11)	-2.80e-10*** (5.01e-11)	1.85e-10* (8.58e-11)
<i>GG</i>								-7.22e-11 (7.64e-11)	2.20e-11 (6.56e-11)	-4.12e-10*** (1.13e-10)
<i>PS</i>									-3.55e-11 (2.13e-11)	-7.71e-11* (3.77e-11)
<i>HC</i>										-1.37e-11** (4.23e-12)
Observations	168	154	154	154	168	168	154	168	154	154
AR (1)	-6.47 (0.000)	-4.58 (0.000)	-5.66 (0.000)	-6.30 (0.000)	-4.94 (0.000)	-6.04 (0.000)	-7.73 (0.000)	-5.66 (0.000)	-6.52 (0.000)	-6.69 (0.000)
AR (2)	1.82 (0.069)	1.54 (0.026)	-1.30 (0.194)	1.17 (0.243)	-5.09 (0.000)	-1.72 (0.085)	0.08 (0.933)	-2.04 (0.041)	-0.36 (0.721)	-4.49 (0.000)
Sargan	173.92 (0.169)	174.85 (0.028)	176.68 (0.017)	151.02 (0.179)	177.21 (0.079)	167.39 (0.17)	146.10 (0.157)	155.21 (0.285)	160.97 (0.019)	178.05 (0.001)
Number of instruments	165	154	154	154	168	168	154	168	154	154
Number of group	14	14	14	14	14	14	14	14	14	14

\*\*\*, \*\* and \* respectively indicate levels of significance at 1%, 5% and 10%. Source: calculations of the authors.

sector and the monetary mass significantly reduce income inequality at a threshold of 1% whereas this reduction is 10% for the density of the network. The





Continued

	HC	GE	ET	PS	COR	GG
	4.08e-15	1.66e-15	9.70e-16	1.37e-15	3.52e-15	3.98e-15
		-3.85e-15**	-2.20e-16	-3.22e-15**	-9.02e-15**	-1.47e-14***
		2.87e-14	2.45e-15	-6.03e-15**	4.81e-15	6.00e-15
		-1.05e-13***	7.98e-14	1.04e-14	-1.96e-14***	-2.13e-14***
		-3.92e-14***	2.92e-14	-8.85e-14***	6.47e-14	7.88e-14
		1.19e-14	4.52e-14	-1.79e-14	-2.20e-14	8.14e-14
		-3.82e-14*	1.21e-15	-7.41e-15***	2.74e-15	3.48e-15
		1.99e-14	1.92e-15	-6.06e-15***	4.52e-15	5.58e-15
		-6.70e-15***	6.16e-16	-5.68e-16	-2.33e-14***	-1.75e-14***
		1.81e-15	1.50e-14	-4.54e-14***	-3.08e-13**	1.02e-13
		-7.13e-16	1.05e-14	-5.58e-14**	1.48e-13**	7.39e-14
		-2.67e-16	2.33e-14	-5.58e-14**	5.67e-14	-2.09e-13***
		1.22e-15***	3.53e-15	3.31e-14**	3.00e-14	3.48e-14
		-8.68e-15**	1.41e-14	-6.65e-14**	-6.65e-14**	-1.12e-13***
		8.77e-16	3.21e-13	-3.25e-13	8.12e-13	1.03e-12
		-1.50e-15	2.69e-13	-3.61e-13	6.68e-13	-2.84e-12***
		-2.47e-14**	1.21e-13	-3.20e-13***	-2.33e-12***	7.38e-13
		1.05e-14	2.25e-13	-4.14e-14	1.20e-12	1.71e-12
		-2.67e-16	5.39e-13	-2.06e-12***	1.55e-12	-6.73e-12***
		4.50e-16	7.82e-14	-5.04e-13**	5.60e-13	7.09e-13
		-1.55e-14**	2.45e-13	-1.24e-12**	-1.24e-12**	2.17e-12***
		-6.36e-14***	1.01e-13	-2.64e-13	4.98e-13	6.15e-13
		1.34e-14	1.01e-13	-2.64e-13	4.98e-13	6.15e-13
		5.59e-15	1.01e-13	-2.64e-13	4.98e-13	6.15e-13
		-4.37e-14	1.01e-13	-2.64e-13	4.98e-13	6.15e-13
		8.33e-15	1.01e-13	-2.64e-13	4.98e-13	6.15e-13
		-1.84e-14**	1.01e-13	-2.64e-13	4.98e-13	6.15e-13
		-1.22e-13***	1.01e-13	-2.64e-13	4.98e-13	6.15e-13
		2.84e-14	1.01e-13	-2.64e-13	4.98e-13	6.15e-13
		2.55e-14	1.01e-13	-2.64e-13	4.98e-13	6.15e-13

## Continued

					$-1.61e-14^{***}$					$-1.72e-15^{**}$					$-5.95e-14^{***}$
					$2.52e-15$					$7.34e-16$					$1.42e-14$
Observations	168	168	168	168	154	182	182	168	168	168	168	168	168	182	182
AR (1)	-8.92 (0.000)	-7.40 (0.000)	-9.02 (0.000)	-9.61 (0.000)	-5.34 (0.000)	-6.69 (0.000)	-5.53 (0.000)	-9.70 (0.000)	-7.39 (0.000)	-8.08 (0.000)	-8.51 (0.000)	-14.56 (0.000)	-9.04 (0.000)	-6.44 (0.000)	-5.96 (0.000)
AR (2)	2.64 (0.008)	-1.39 (0.166)	2.85 (0.004)	2.19 (0.28)	-2.22 (0.026)	0.20 (0.840)	-2.65 (0.008)	2.84 (0.004)	-0.88 (0.380)	0.49 (0.623)	0.59 (0.555)	1.33 (0.182)	0.85 (0.395)	-6.85 (0.000)	-2.19 (0.028)
Sargan	136.84 (0.735)	147.68 (0.422)	141.77 (0.490)	120.55 (0.869)	15807 (0.003)	175.14 (0.317)	175.90 (0.285)	140.22 (0.527)	165.57 (0.062)	181.81 (0.005)	140.17 (0.664)	154.64 (0.277)	203.17 (0.001)	200.87 (0.020)	224.47 (0.001)
Number of instruments	168	168	168	168	154	182	182	168	168	168	168	168	168	182	182
Number of group	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14

\*\*\*, \*\* and \* indicate levels of significances at 1%, 5% and 10% respectively. Source: calculations of the authors.

monetary mass or a good level of network development significantly respectively reduce income inequality at a threshold of 1%. These results are robust when new control variables are introduced especially public expenses (regressions 3 and 12), human capital (regressions 4, 10 and 15).

More specifically bank credit to the private sector impacts negatively and significantly the Gini index. [23] came out with such results that indicate that the expansion of credit to the private sector can stimulate the growth of income at the level of poor quintiles and consequently reduce income inequality. The illustration of the poor peasant of [24] who needs credit to invest reinforces the idea of a positive effect of credit to the private sector on the reduction of income inequalities. The more credit to the private sector increases, the higher the incomes of poor households who have invested. Thus, a reduction of income differences between the poor and the rich [25].

Moreover, as for the ratio of the monetary mass as a percentage of GDP, the results show that an increase in this ratio leads to a significant fall in the Gini index. This variable that represents the rate of monetisation of the economy or adduction of money in the economy translates the idea of a positive impact of the quantity of money in circulation in an economy on income inequality. In fact, an increase in the quantity of money available increases the speed of circulation of money this improve access to money by economic agents which facilitates the transactions of economic agents who can use the money to have access to health services, nutrition, education, ... Thus, by improving the living conditions of citizens, financial development through an increase in the quantity of money in circulation leads to an increase in the income of the populations even

the very poor and consequently to a reduction in the possible differences in income between these later [26].

Finally, as concerns the variable access to financial services which translates the density of the banking network, it appears that an increase in the number of tellers in banks reduces the average number of persons using the services of the same bank branch. This increases the average efficiency per teller and a better access to financial services by economic agents. Under these conditions, a better access of the population to bank services is translated by a fall in the density of the network and by an induced effect that is translated by a fall in the Gini index. This result is similar to that of [11] who explained that an increase in the number of bank accounts for every one thousand adults reduces income inequalities. That is why the efforts made by countries of the Franc zone since the year 2000 are appreciable. As such, the network density of the CEMAC sub-region moved from 151,520 inhabitants per branch in 2006 to 90,414 in 2014 [27]. In the UEMOA countries this network density was already estimated at 116,000 inhabitants in 2005 per teller [28]. This increase in financial penetration is an indicator of development of the financial sphere that improves the distribution of income among the populations concerned.

Secondly, the analysis of the robustness consists of taking into account couples of financial variables (Table 6). Even in this case, financial variables reduce income inequality. The results of the tests confirm these results. By using these

**Table 6.** The effects of financial development on income inequality.

		I				II				III					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>BC</i>		-5.41e-16***	-6.95e-16***	-2.48e-14***	-2.28e-14***	-1.29e-14***	-1.91e-13***	-7.30e-13**	-1.91e-13*	-2.39e-13***	-5.74e-13**				
	1.79e-16	1.85e-16	4.71e-15	6.54e-15	3.18e-15	2.47e-14	2.50e-13	8.56e-14	5.85e-14	2.84e-13					
<i>MM</i>	-4.07e-16***	-5.59e-16***	-4.89e-15**	-7.01e-15**	-4.70e-15***						-6.14e-14**	-5.84e-14*	-8.35e-14**	-1.00e-13**	-6.00e-14**
	9.01e-17	1.02e-16	2.36e-15	2.77e-15	1.52e-15						2.20e-14	3.16e-14	3.43e-14	4.26e-14	2.25e-14
<i>DB</i>						-1.86e-18**	-1.51e-17*	-5.57e-18*	-5.90e-18***	-1.32e-17*	-1.12e-17***	-7.17e-18***	-9.02e-18***	-9.31e-18***	-6.68e-18***

## Continued

<i>ET</i>	<i>PS</i>	<i>COR</i>	<i>GG</i>	<i>POP</i>	<i>Y</i>				
8.99e-16	-7.24e-15***	1.99e-15	-5.97e-15***	2.53e-15	-1.18e-14***	7.66e-17	-3.89e-16***	3.83e-17	1.27e-16***
-1.15e-15***	9.34e-16	-1.86e-15**	2.12e-15	-4.30e-15***	2.63e-15	6.85e-15**	7.83e-17	-2.50e-16***	3.93e-17
-2.41e-14***	2.39e-14	6.90e-14***	5.38e-14	-6.68e-15***	6.70e-14	-2.04e-13***	2.00e-15	1.18e-14***	1.10e-15
-1.61e-14**	2.69e-14	-3.17e-14	6.74e-14	-7.90e-14	7.25e-14	-1.14e-13	2.50e-15	-8.93e-15***	1.59e-15
-8.24e-15	1.54e-14	-5.79e-14***	3.36e-14	7.15e-15	4.33e-14	1.75e-13***	1.32e-15	-9.47e-15***	7.61e-16
1.37e-13	4.66e-13***	3.15e-13	-7.34e-13*	3.83e-13	8.90e-13*	8.90e-13*	1.15e-14	4.73e-14***	6.52e-15
-1.85e-14	1.18e-12	2.24e-12*	2.71e-12	-4.51e-12	2.80e-12	-8.62e-12***	9.67e-14	-5.62e-13***	5.87e-14
3.80e-13*	4.11e-13	-9.93e-13*	9.71e-13	1.12e-12	1.14e-12	-6.17e-12***	3.73e-14	3.89e-13***	1.97e-14
-9.84e-14	2.93e-13	7.62e-14	6.71e-13	-8.67e-13	8.15e-13	-3.39e-12***	2.49e-14	1.79e-13***	1.35e-14
2.54e-14	1.31e-12	2.53e-12*	2.65e-12	7.05e-12**	3.14e-12	-6.68e-12**	1.42e-13	6.62e-13***	8.13e-14
2.25e-13	2.25e-13	-5.30e-13**	5.18e-13	-4.86e-13	6.22e-13	-2.05e-13	1.90e-14	7.74e-14***	9.47e-15
-1.93e-13	3.22e-13	-1.20e-12***	7.09e-13	-1.40e-12*	8.90e-13	-4.27e-12***	2.72e-14	-5.63e-14**	1.36e-14
-1.49e-13	3.58e-13	-4.56e-13	8.47e-13	1.86e-13	1.05e-12	-3.24e-12***	3.22e-14	7.57e-14**	1.71e-14
-1.07e-13	4.01e-13	-9.09e-13**	9.02e-13	2.01e-12**	1.09e-12	-2.73e-12**	3.71e-14	2.18e-13***	2.47e-14
-1.06e-13	2.29e-13	-8.16e-13***	4.44e-13	-9.68e-13**	6.62e-13	-1.52e-12**	2.06e-14	1.75e-13***	1.42e-14
									5.95e-14***
									1.38e-18

Continued

	GE			HC			RI								
	4.25e-16														
		5.33e-16	-1.19e-15**	7.50e-16	2.96e-15***										
				7.50e-16	2.96e-15***										
						1.00e-14***									
							2.23e-15								
								1.75e-15							
									-2.55e-15*						
										9.86e-16					
Observations	182	182	182	154	182	182	140	182	182	154	182	182	182	168	182
AR (1)	-6.36 (0.000)	-6.06 (0.000)	-5.680.0 (0.000)	-16.11 (0.000)	-6.81 (0.000)	-6.02 (0.000)	-5.36 (0.000)	-4.58 (0.000)	-8.33 (0.000)	-11.00 (0.000)	-6.79 (0.000)	-6.45 (0.000)	-7.28 (0.000)	-9.95 (0.000)	-5.01 (0.000)
AR (2)	-0.92 (0.356)	-1.48 (0.138)	-2.83 (0.005)	2.58 (0.010)	-2.29 (0.022)	-1.12 (0.264)	-0.40 (0.688)	-0.68 (0.000)	-0.18 (0.853)	1.60 (0.110)	0.56 (0.573)	-1.07 (0.286)	-2.55 (0.011)	2.98 (0.003)	-2.72 (0.007)
Sargan	174.01 (0.320)	176.79 (0.234)	195.22 (0.038)	123.72 (0.211)	188.39 (0.050)	192.78 (0.076)	207.38 (0.000)	197.21 (0.338)	164.47 (0.019)	154.65 (0.002)	160.44 (0.604)	176.58 (0.238)	180.75 (0.149)	155.19 (0.124)	193.38 (0.029)
Number of instruments	182	182	182	154	182	182	140	182	182	154	182	182	182	168	182
Number of group	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14

\*\*\*, \*\* and \* indicate levels of significance at 1%, 5% et 10% respectively. Source: calculations of the authors.

variables in pairs the results on the control variables are robust; more specifically we find the favourable effect of population growth (regressions 1, 7 and 12) and government expenses (regressions 3, 8 and 13) on income inequality as well as the unfavourable effect of corruption (regressions 5 and 10).

## 5. Conclusion

The aim of this study was to determine the impact of financial development on

income inequalities in African countries of the Franc zone during the period from 2000 to 2014. Recent theoretical studies have showed through different methodological approaches that financial development plays a primordial role in the reduction of income inequalities either by credit to the private sector or by an increase in the monetary mass. This article however investigates from a different dimension of financial development that integrates geographical aspects of the development of the financial system namely, the density of the banking network or the rate of penetration of bank branches in the economic territory. Using the method of generalised moments in system our results suggest that the effects of financial development on income inequality are statistically significant and of real important economic contributions. The geographical increase in the number of bank tellers increases the average efficiency per teller and improves access of economic agents to financial services at a lower cost and leads to the development of new activities that create income for poor households. Equally, financial development increases the rate of monetisation of the economy and enables a better supply of bank credit to households and entrepreneurs. This offers better possibilities of raising income to economic agents with low income and reduces the income gap between the rich and the poor.

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### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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