THE EUROPEAN JOURNAL OF APPLIED ECONOMICS

EJAE 2021, 18(2): 95 - 126
ISSN 2406-2588
UDK: 005.334:336.71(64)
330.43:336.774
DOI: 10.5937/EJAE18-30597
Original paper/Originalni naučni rad

THE LONG-RUN IMPACT OF BANK CREDIT GROWTH ON SOCIAL AND ECONOMIC INEQUALITIES IN MOROCCO EVIDENCE FROM THE JOHANSEN'S COINTEGRATION ANALYSIS

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Abstract:
The subject of the economic and social inequalities growth has become a major concern for economic researchers around the world. As a result, there is a great attention and concern about the significant costs of rising inequalities on peace and social coherence in society. To counteract the harms of these inequalities, Morocco has undertaken several reforms, including the implementation of a new development model set up in 2018. The main objective of this article is to estimate the impact of bank credit growth on the increase of economic and social inequalities in Morocco. In other words, we have verified whether there is a positive impact on the rise of income inequalities in Morocco. For this reason, in this study, we tested an econometric model, using the cointegration method, particularly, the error correction model. Thus, our results confirms that the degree of trade openness, bank credit and gross domestic product per capita are considered to be determinants of the equilibrium of the Gini index in the long run. We used annual data covering the period 1990-2019 from the Central Bank of Morocco (BAM) database and the World Bank database (WBD). A wide range of studies demonstrate the significant positive impact between bank credits and income inequalities.

Article info:
Received: February 16, 2021
Correction: March 31, 2021
Accepted: April 15, 2021

Keywords:
Income inequalities,
bank credits,
economic growth,
trade openness,
cointegration.

INTRODUCTION

In recent years, researchers have given more importance on the issue of global wealth distribution. We are all convinced today that natural laws, as they are described in the capitalist system; where private actors own and control goods in accordance with their interests, and supply and demand freely set prices in self-regulating markets optimally for society. In reality, however, these laws do not work effectively as liberal theorist's postulate. It is thus understood that these laws exert a fatal influence creating an order of things that is advantageous only to capitalists, and that the distribution of wealth is becoming increasingly unequal in both developed and underdeveloped countries.

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Indeed, financial globalization through the mobility of capital, logically leads to another sharing between profits and wages. Competition from countries with low wages or social protection has a fatal influence on state policies to create an order of things that is advantageous only to the few rich, either by influencing wage negotiations or by redistributing taxes. Thus, favoring capital responds to the concern to preserve the capacity of firms to invest and puts the vast majority of the population at a disadvantage against the domination of the rich. In a word, this leads to an unequal growth of income, wealth and living conditions.

From an empirical point of view, we find that several authors have attempted to verify empirically the existence of a relationship between, on the one hand, the dynamics of income inequality and, on the other hand, the expansion of credit. Income inequality on the higher and continuous level will create a significant social cost. It will weaken the choices of education, healthcare, and occupation. It will also cause other social problems such as corruption, nepotism, criminal, and many others Stiglitz (2012). The increase in income inequality, accompanied by low purchasing power of the affected households, has in fact occurred in parallel with a rapid growth in private indebtedness, which can be explained as a response by households suffering from economic insecurity and seeking to improve their quality of life or simply to maintain it at an acceptable level.

Through this study we try to participate in the debate on the link between finance and income inequality by modeling the impact of the bank credit growth in Morocco, especially during the period of real estate growth, on the increase in income inequality and the decrease in household purchasing power, through macro-econometric modeling. In this sense, our problem can be formulated as follows: What is the impact of the bank credit growth on the increase in inequalities in Morocco?

To answer this question, we based on existing concepts in the literature, we are expecting four possible scenarios regarding the impact of bank credit on income inequality: i) The bank credit growth has a positive impact on the increase of income inequality in Morocco, ii) The Bank credit growth has a negative impact on the rise of income inequality in Morocco.

Methodologically, the method used to analyze the data in this study was the Vector Error Correction Model (VECM) Method. In order to increase the explanatory power of financial development on inequality, we use the following as control variables; income inequality (Gini index) in Morocco, traded openness index, financial development (private credit as a ratio of GDP) and real per capita GDP growth. We find a positive and statistically significant relationship between bank development and the growth of the Gini coefficient, suggesting that improvements in banking sector may increase income inequality in emerging economies.

The paper is structured as follows: The next section briefly reviews the pertaining theoretical concepts and relevant empirical studies on the relationship between financial development and inequality. In section 3 discusses the methodology and presents our results, which are interpreted in section 4. Section 5 draws conclusions and offers policy recommendations.

LITERATURE REVIEW

Defining inequalities is a very complex operation, given those inequalities are constructed in a relationship between individuals through differences that may exist on several levels, for example biological, social or economic. However, these differences are not sufficient for them to become inequality; they must therefore be accompanied by unequal access between these individuals to certain resources that are valued because of their difference. That is to say that differences in color or gender, for example, are not inequalities only when they are taken as an obstacle to access to socially hierarchical goods and services.

Inequalities are therefore defined in the Social Science as a difference judged unfair in access to valued resources including all possibilities of human action: political, economic, cultural, social, etc.

For the sociologist Zamora (2019), two opposing conceptions of the response to inequality are opposed, "A conception limited to effects, and therefore focused on strict income disparity, leads to increase equality by reducing the monetary gap between rich and poor. The result would be a world where economic competition would still be ruthless, but where no one would fear material deprivation. A world that none of the socialist thinkers of the nineteenth century could have imagined, so strongly did they associate inequality with the problem of economic liberalism". A second conception seeks to achieve equality through the demarcation and democratization of goods such as health care, education, transport, energy, etc. A world that, by socializing and guaranteeing access for all to the most important elements of our existence, would reduce dependence on the market, and thus on the mechanism that is at the origin of inequalities. For a long time, this project was not considered scandalously utopian, even by the most moderate reformers.

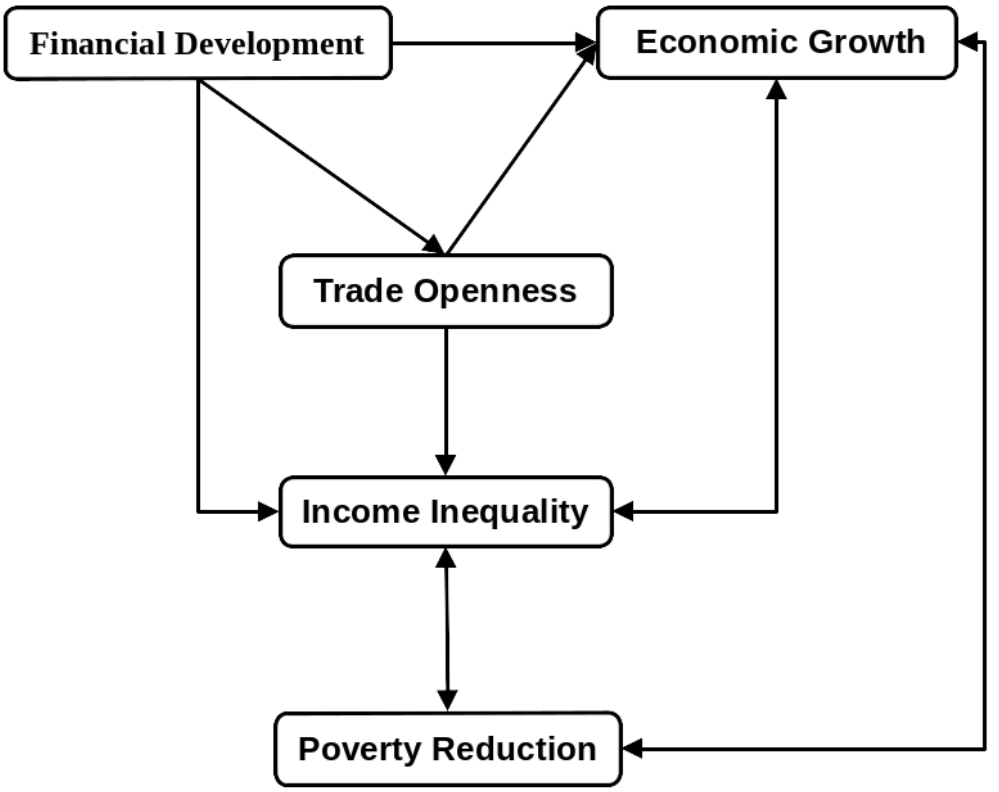
For Polymnia Zagefka (2009), slavery is "as an emblematic form of inequality, the negation of all identity to the other". Formally, five main orders of inequality can be distinguished:

- Political inequalities;
- Legal inequalities;
- Economic inequalities;
- Social inequalities (in which gender inequalities are often classified; health inequalities which sometimes also have political, religious and legal origins);
- Ecological inequalities.

Dynamic aspects (development, reproduction, or reduction of inequalities) can also be taken into account.

So, it is a multi-dimensional phenomenon that affects several domains, although the question of inequalities is often reduced to income and, more broadly, it extends to education, employment, health, and leisure.

Figure. Financial development and social inequalities.



Source: Author's research.

Economic growth and income inequalities

The question of the distribution of wealth was not always a subject of debate since the ancient economy was very largely based on slavery and the question did not arise, in which a small part of the population represented by the owners, who had a divine right, could take the largest share of the wealth without any objection from the others. It was in the Middle Ages and with the birth of Islam that we have given more importance for the individual, which is explained by the gradual disappearance of slavery, and that the idea of the value of labor power developed, giving a little balance to society. On the other hand, the application of Islam has been a way of dealing with the systematic discrimination against women, religious minorities and, on the other hand, on a policy of redistribution to the lower social classes "Azzakat" which takes place through compulsory levies on household wealth, whether granted in monetary and then redistributed to those in need. In this regard, Tohirin *et al.,* (2019), Mohamad *et al.,* (2020) find that Islamic banking financing has potential to reduce income inequality.

In the 19th century, economists believed that the dynamics of private capital accumulation led to an ever-increasing concentration of wealth and power in the hands of a small social group.

For David (1815), during a period when economic activity was based on the cultivation of foodstuffs such as wheat, the main concern was the long-term evolution of land prices and the level of land rent.

Moreover, from the moment when population and production growth is prolonged over time, we notice that because of the law of supply and demand, land tends to become increasingly scarce and expensive, as do the rents paid to landowners. Thus, an increase in the number of workers makes the demand for labor increasingly greater for identical supply, hence the tendency for wages to fall to the limit where the level of the wage allows simple survival. In the end, therefore, landowners will receive an increasingly large share of the national income, and the rest of the population which is an increasingly smaller share, and this situation will threaten the social balance and give rise to inequalities. For Ricardo, the only solution to get out of this situation will be heavier taxes on land rents.

For Marx *et al.*,l (1936) the question was very obvious in his thinking, as he believed that the economic laws specific to the mode of production of the old regime allowed the appearance of a new social class, which was the bourgeoisie represented by the industrial capitalists. The interplay of these economic laws leads to a strengthening of the power of the bourgeoisie, and an urban misery of the industrial proletariat that will be more extreme than the rural misery. Indeed, as a result of industrial growth, a huge rural exodus to industrial zones will make the working days longer for the proletariat and wages increasingly low. It was in this context that the communist and socialist movements developed, which demanded the concentration of industrial capital accumulating without a limit, so that a small social group would appropriate an ever-increasing share of production and income. Thus, capitalism mechanically produced inequalities that continued to worsen.

Towards the 20th century, in the Glorious Thirties, a new theory of Kuznets (1955) appeared, according to which income inequalities were in fact spontaneously destined to decrease in the advanced phases of capitalist development, and then to stabilize at an acceptable level. According to Kuznets (1955) growth is a rising wave that carries all the boats, it is in fact a balanced growth path, in which all social classes progress at the same rate, and each social group benefits from growth in the same proportions without considerable differences, unlike the inequalities of Ricardo & Marx.

This is an optimistic theory according to which inequalities would follow a bell-shaped curve, that is, increasing and then decreasing, where the first stage of industrialization is characterized by a natural growth of inequalities, after which it will decrease as an increasingly large fraction of the population that did not benefit from the new wealth brought by industrialization in the first stage, will take its share of the wealth, thus reducing inequalities. This theorem influenced the world considerably until the 1990s.

Since the 1990s, we notice that inequalities have reached a record level in most northern and southern countries, even in emerging countries that have experienced very strong growth in recent decades, such as China, India, and Brazil. This worsening of inequality now occupies a primordial place in world current affairs and calls into question the character of the balanced growth path described by Kuznets (1955).

Empirical studies also provide evidence on whether the linkage between growth and income inequality. For example, Woo (2011) introduced fiscal policy volatility as a new channel to explain the negative link between inequality and growth. Amri (2018), Binatli (2012), Neves *et al.,* (2016), Malinen (2013), Herzer & Vollmer (2012) also find a negative and significant relationship between the economic growth and income inequality in the long-run.

In a theoretical paper, Majeed Region (2010) provided a unified theory that combines both contradictory approaches, by analyzing the linkage at the global level for some developing countries in Asia, the authors suggest a positive and significant relationship between growth and inequality. They stated that inequalities and growth are positively correlated at earlier stages, due to the main role played by physical capital accumulation in economic growth. Furthermore, Huang *et al.,* (2015), using the annual state-level panel data of United States, also proves that growth volatility is positively and significantly associated with higher income inequality.

Finally, Stewart & Moslares (2012), Dabla-Norris *et al.,* (2015), and Saez & Zucman (2016) also demonstrate that income inequality has a negative impact on growth. They perform their work analyzing Indian states for the period 1980-2010, and conclude that the regional coefficient of Gini has a negative impact on growth.

Finance and income inequalities

The imbalance in access to financing is a major finding that proves that we do not have the same opportunities between different social classes. While we notice that the richest people take on debt at low cost and invest in more lucrative investments, on the contrary, the middle classes take on debt at higher interest rates for the sole purpose of maintaining their standard of living. In addition, it is the rich who still hold these credits through securitization. Thus, either the poor classes who cannot access bank loans or the middle classes who will also be victims, finance plays a role that aggravates income inequality.

In theory, financial development should in the first place benefit the most modest, by relaxing this constraint and improving the allocation of capital, thus reducing inequalities. This idea of a linear and positive relationship between financial development and inequality was first widely accepted in the economic literature, particularly in development economics. Neil & Goldstein (2015, Jakob & Jan-Egbert (2016), Olivier Godechot (2016), Allen, Todd & Wallace (2018), Haan & Sturm (2017), Tan & Law (2012) summarizes this apparent consensus, "The results indicate that finance has a disproportionately positive impact on the poor and contributes to rising income inequality. Thus, according to Seven & Coskun (2016) find that neither banks nor stock markets play a significant role in poverty reduction. Several other studies support this result Muhammad, Bhattacharya & Mantu (2017) a 1% increase in financial development increases income inequality by 0.09% in the long run and in short-run estimate of 0.047, Mookerjee & Kalipioni (2010), Jeanneney & Kpodar (2011), Jakob & Jan-Egbert (2017), Jeong & Kim (2018) show that financial development increases inequalities in urban (rural) areas.

The relationship between financial development and inequality could be non-linear Kim & Lin (2011), Bayaran & Yilmaz (2017), Thorntona & Tommaso (2020) thus show that financial development reduces inequality only beyond a certain threshold of depth of financial markets, while Tan & Law (2012) from another database of inequality also find non-linearity, but in the opposite direction to Kim & Lin (2011). For them, financial development reduces inequality at low levels of financial development, but tends to increase it at higher levels. As a note of Chen & Kinkyo (2016), Hyde & Wallace (2018), the detrimental effect of financial development on income inequality can be associated with susceptibility to financial crises and the quality of governance. They show that the low frequency of crisis and good governance can soften this detrimental effect. Therefore, it is worth investigating the relationship between financial development and income inequality at different levels of institution.

Another recent breakthrough in the belief that financial development is systematically beneficial to inequality reduction is the analysis of Denk & Cournède (2015) for various periods between 1974 and 2011, they conclude that the expansion of the financial sphere (represented by private credit, the share of value added from the financial sector and the size of stock markets) has fueled income inequality in OECD countries.

Also, in a panel of 59 countries for the period 1985–2015, Anthony & Kwon (2017), Yi & Chien (2019) find a positive relationship between financial development and income inequality for low-income countries.

Another dimension to be taken into account concerns the effect of high wages on inequality, Philippon & Reshef (2012) show that employees in the financial sector in the United States enjoy wages that are 50% higher than in the non-financial sector, with equal characteristics. This could explain between 15% and 25% of the increase in inequality observed since the early 1990s. Denk & Cournède (2015) shows a similar effect for the European Union, but with a smaller amplitude (28% higher wages in the financial sector on average).

In a study of some African countries, Batuo *et al.,* (2010) find a linear negative relationship between financial development and inequality in their study on African countries in the years from 1980-2004. In addition, in a panel of 62 countries for the period 1973 to 2005, Agnello *et al.,* (2012), (Delis *et al.,*(2014) find that financial reforms, measured by the aggregate financial index due to Abiad *et al.,* (2010), is associated with less income inequality. In addition, their study also suggests that the effect on income distribution varies across liberalization policies. Especially directed credit and removal of excessively high reserve requirements seem important for reducing income inequality. Yet, other financial liberalization policies, such as privatization, reducing entry barriers and increases in international capital flows do not affect income distribution.

Moreover, Rewilak (2013), "I examine Whether the revenues of the poor are systematically increasing with an average income, and if financial development improves the poorest Quintile revenues ", using cross-country regression analyzes. Rewilak (2013) concludes that on economic growth benefits universally with rich and poor, Financial development does not necessarily take poverty in all regions. In this regard, Rewilak (2013) attracts particular attention to South Asia and Latin America as two opposite examples. Although the results show positive effects of financial development at the poorest quintile income in South Asia, the opposites the case for Latin America. Lower results suggest a negative effect of low Sahara Africa's income funding and a positive impact in Eastern Europe and Central Asia.

Kunieda *et al.,* (2014), suggest that an increase in financial depth improves income distribution only in closed economies. By employing data for the period of 1975-2011. (Abosedra *et al.,* (2016) find that financial development reduces poverty when domestic credits to the private sector is used as proxy for financial development. In this respect, Uddin *et al.,* (2014) Examine short and long-run relationships between financial development, economic growth and poverty reduction in Bangladesh. The authors show that a long-run relationship exists between these variables.

More recently, Park & Shin (2015), Chiu (2019) examines the relationship between financial development and income inequality. Their results indicate that financial development helps reduce inequalities to a point, but since financial development goes further, it contributes to greater inequality. In this context, the banking sector seems to exert stronger influence on income inequality Gimet & Lagoarde-Segot (2011). While an analysis of the strong presence of financial sector employees at the top of the income distribution is interested in itself, it provides at the same time one channel behind the negative relationship between finance and income equality established in Denk & Cournède (2015). The inequality-narrowing hypothesis puts forward the idea that when the financial sector grows, the poor, who were previously excluded from obtaining loans, might gain access Mookerjee & Kalipioni (2010), Jalil & Feridun (2011), Hamori & Hashiguchi (2012), Amine & Samir (2015), Manish & Colin Reilly (2019), Ibrahim & Tidjani (2020), Fligstein & Goldstein (2015), Shahbaz & Mahalik (2017).

In contrast, other studies predict that financial development may fail to reduce income inequality and poverty. Sehrawat & Giri (2015) investigate the finance-inequality nexus in India for the period 1982-2012, and suggest that financial development aggravates the income inequality in both long-run and short-run.

Stiglitz (2013) contends that the financial sector has contributed so powerfully to inequality in the US through several channels. The author underlines that while financial firms pursue their own benefits via several rents seeking channels, inefficient regulation/supervision/enforcement framework and regulatory capture have also played roles, with consequences for distribution.

Financial crises will have diverse effects on income distribution and inequality. Bourguignon states that the consequences of financial crises depend on the size of the financial sector, which is directly correlated to the severity of the crisis. The 2007-2008 crisis also allowed progress to be made in understanding the distributive effects of crises, which may pass through more indirect channels linked to fiscal policies. Jenkins *et al.,* (2012) study country-by-country effects within the OECD. They find few direct effects on income distribution in the two-year following the crisis (2007-2009). Nevertheless, it seems that social protection systems and counter-cyclical policies implemented at the beginning of the crisis played a major role in this result. Fiscal consolidation policies certainly had a greater anti-distributive effect. This intuition is confirmed by Ball *et al.,* (2013), who show a very clear positive correlation between the level of inequality and these consolidation policies. The latter also reduce the share of labor in value added and increase the level of long-term unemployment. Woo *et al.,* (2013) evaluate the effect of a fiscal contraction of 1 percentage point of GDP at a [0.4%-0.7%] increase in the Gini coefficient in the first two years. 15% to 20% of this increase in inequality would be explained by the rise in unemployment directly attributable to the policies of fiscal austerity.

Finally, Jauch & Watzka (2016) in an empirical analysis of 138 countries over the period 1960-2008, find a positive effect of financial development on inequality, according to their estimates, 10% increase in credit would increase the Gini coefficient by 0.23.

Trade openness and income inequalities

According to Stiglitz, international trade is a game positive-sum, the absence of full employment and free trade can lead to job destruction at a faster rate than job creation, these limited fruits of trade openness are increasingly unevenly distributed, and the distribution of wealth becomes more unequal as the bargaining power of employees is reduced, Unskilled workers are the ones who benefit the least from it. Socials support measures are therefore necessary to compensate for the negative effects of free trade according to the study by Azevêdo, the opening of trade is solely responsible for the rise in inequalities, 80% of jobs have been destroyed in recent years due to technological progress. According to Romer, trade is not alone responsible for the rise in inequalities. He takes the example of the United States and Denmark, which have been confronted since the 1990s with the same economic changes but have not experienced the same changes in terms of inequalities. Inequalities have decreased in Denmark (the Gini coefficient has gone from 31% to 21%) while they have increased in the United States (the Gini coefficient has risen from 43% to 47%). The failure of our laws and public policies, which instead of mitigating the process of rising inequality in periods when market forces would have led to growing gaps between the rich and the rest, shows that the State has not tempered the excesses of the market.

However, higher rates of trade between countries, partly activated by improving technology often lead to income inequality Norris *et al.,* (2015). Technology can reduce transportation and communication costs, and the degree of automation is increasing. Trade opening makes way for economic growth in developed and developing countries. Nevertheless, this also increases the income inequality rate. This fact is due to the imbalance between technical proficiency and other aspects of the growth process.

Krugman (2005) noted out that owners with a many number of factors of production in a country can benefit from trade, but owners with many factors of production suffer losses due to international trade if a country has a large amount of capital. Trade openness will increase income inequality, and if there is a large amount of labor, trade openness will reduce income inequality Asteriou *et al.,* (2014).

Internal forces result in market forces that drive, for example, the balance between supply and demand, and that manages competition, or in general the fundamental rules of the game of social life. It is clear that the contribution of these market forces in the rise of income inequality is approved, because the rich have the power to edict these rules in their favor, while at the same time not giving others any chance to balance the game or make it fair.

DATA AND METHODOLOGY

In order to assess the impact of bank credit on inequalities, it is necessary to explain the model to be estimated, the introduced variables, and the estimation method, before presenting the econometric results.

In this section, we will first present the explanatory variables and the dependent variable of our econometric model, the sample and the frequency of observation of the data, and finally, we will graphically present the descriptive statistics of the variables.

The method used to analyze the data in this study is the Vector Error Correction Model (VECM). It is a restricted VAR model, used for non-stationary variables, but has co-integrated potencies. After testing the model, it is recommended to enter the cointegration equation into the model used. On time series data mostly has stationary on the first difference or I (I). Then, VECM uses that co-integrated restriction information into its specification. Therefore, VECM is often known as VAR design for the non-stationary series that has a co-integrated correlation. Furthermore, in this econometric model, there is a speed of adjustment from short term to long term. The analysis tool provided by VAR/ VECM had done through four kinds of usage, such as forecasting, Impulse Response Function (IRF), Forecast Error Variance Decomposition (FEDV), and Co-integration tests Johansen (1988), Johansen and Juselius (1990) confirmed the presence of potential long run equilibrium relationship between two variables. We used Johansen's technique in order to establish how many cointegration equations exist between variables. Our test suggests that our set of cointegrated time series have an error-correction representation, which reflects the long run adjustment mechanism. The diagnostic tests are lastly performed to examine serial autocorrelation, normality in error distribution and stability of the model.

In this study the error correction model as suggested by Hendry (1995) has been used. The general form of the VECM is as follows:

$$\Delta Y_t = \beta_0 + \lambda EC_{t-1} + \sum_{i=1}^{m} \beta_i \Delta Y_{t-1} + \sum_{j=1}^{n} \beta_j \Delta X_{t-j} + \varepsilon_t \quad (1)$$

Where Δ is the first difference operator; EC_{t-1} is the error correction term lagged one period; λ is the short-run coefficient of the error correction term $(-1 < \lambda < 0)$; and ε is the white noise. The error correction coefficient (λ) is very important in this error correction estimation as the greater co-efficient indicates higher speed of adjustment of the model from the short-run to the long-run. The error correction term represents the long-run relationship. A negative and significant coefficient of the error correction term indicates the presence of long-run causal relationship.

The Empirical Model:

For this study, we estimated the following model:

Referring to the work of Li *et al.* (1998), Beck *et al.* (2007), Kpodar and Jeanneney (2008), Bazillier *et al.* (2017), the basic model is written as follows:

$$LogGINI_t = \beta_0 + \beta_1 \log PC_t + \beta_2 \log GDPP_t + \beta_3 \log CO_t + \varepsilon_t \quad (2)$$

Where $GINI_t$ represents income inequality, designed by the statistician Corrado Gini (1912), it measures the degree of deviation of the income distribution within an economy from a perfectly equal distribution, PC_t represents the private credit, CO_t is trade openness index, and $GDPP_t$ is real income per capita.

Statistical analysis

The purpose of descriptive statistics is to structure and represent the information contained in the data. It includes many techniques: central tendency indicator, dispersion indicator and shape indicator. The following table presents the descriptive statistics for each variable.

The descriptive statistics for these variables are given in the following table:

Table 1. Summary statistics of variables

Variable	Mean	SD	Min	Max
Gini	39.98	0.6187	38.20	40.72
PC	0.1578	0.0974	0.0456	0.288
CO	65.43	14.12	47.1	87.99
GDPP	2440.6	586.13	1704.7	3396.1
Observations	30	30	30	30

Source: Authors, results obtained from the software (GRETL).

Econometric analysis:

- Stationarity test of the variables

According to the graphical representation of the variables (Figure. 3), it can be seen that all the variables studied are not stationary, which is why the Gini index, bank credits, trade openness and gross domestic product per capita are not integrated in level.

The analysis of stationary is the first step before estimating our econometric model; it consists of verifying the order of integration of the variables used. The search for stationarity was carried out using Dickey and Fuller's tests on unit root search according to the strategy proposed by Harris (1995). The method applied makes it possible to analyze the level of stationary and the existence of cointegration between all the variables.

Table 2. ADF Unit Root Test

Variables	At Level			At First difference			I(1)
	Constant and trend	Constant	None	Constant and trend	Constant	None	
GINI	0.9999	0.9851	0.2690	0.2450	0.0000	0.0000	I(1)
PC	0.5986	0.7478	0.0516	0.1988	0.0470	0.0378	I(1)
CO	0.1801	0.9397	0.9996	0.0000	0.0000	0.0000	I(1)
GDPP	0.1400	0.8348	0.9485	0.0000	0.0000	0.0000	I(1)

Source: Authors, results obtained from the software (GRETL).

According to this table, we notice that the results obtained for the level variables indicate that the series are not stationary at the 5% threshold, we also notice that the variables are integrated of order one I (1). Therefore, this shows that these variables are stationary in first differences, we notice that the trend is not significant for the four time series retained. The test is based on a model containing constants. In all cases, the observed value is lower than the significant value, which means that hypothesis I (1) is retained.

Subsequently, we tested the existence of two unit roots to avoid the problems reported by Dickey and Pantula (1987). After the first distinction of each series, the tests are carried out on a model containing neither constants nor trends. In all cases, we reject the hypothesis of a series I (2). Consequently, we can deduce that the four time series retained are integrated of order 1.

The optimal number of delays

Selection Criteria:

Before proceeding with Johansen's multivariate cointegration test, one step is preliminary. The magnitude of the lags in each series are determined according to the BIC criterion of Schwarz *et al.* (1978), the calculation of the information criteria, AIC, SC, and HQ for lags ranging from 1 to 5, show that the majority of the criteria indicate that the number of lags to be retained is P=5.

Table 3. Results of the selection criterion

Lag	AIC	SC	HQ
0	-9.069678	-8.874658	-9.015588
1	-13.32622	-12.35112	-13.05577
2	-14.40164	-12.64646	-13.91483
3	-13.98841	-11.45315	-13.28524
4	-14.74114	-11.42580	-13.82161
5	-18.24595*	-14.15053*	-17.11006*

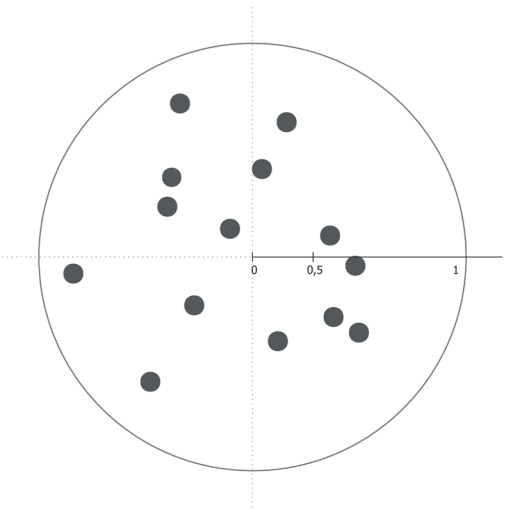
Source : Authors, results obtained from the software (GRETL).

$$\begin{cases} Min\,\text{AIC} : \text{-18.24 qui correspond à } p = 5, \\ Min\ \text{SC: -14.15 qui correspond à } p = 5, \\ Min\,HQ : -17.11 \text{qui correspond à } p = 5. \end{cases}$$

The delay that minimizes the three criteria AIC, SIC and HQ is -18.24 and corresponds to P = 5. Thus, we obtain the VAR (5).

Eigenvalues of the characteristic polynomial:

Figure 2. Inverse roots of characteristic polynomial in the VAR model



Source: Authors, results obtained from the software (GRETL).

The VAR model (5) is stationary because all characteristic roots lie inside the unit circle. As a result, the system is stable and converges towards its long-term equilibrium, which is confirmed by the Student test associated with the calculated "t" of the model parameters are in absolute value greater than 1,96 which represents the value tabulated at the 5% threshold.

Johansen cointegration test:

Johansen's approach consists of a cointegration test based on trace analysis (λ_{trace}) and maximum eigenvalue analysis (maximum Egenvalue (λ_{max})). In addition, this model is estimated in order to determine the existence of a long-term equilibrium relationship between all the variables integrated into the econometric model. λ_{max} tests the hypothesis of a number of cointegrating relationships at most equal to "r" against an alternative hypothesis of "r + 1" of cointegrating relationships while λ_{trace} tests the hypothesis of at most "r" cointegrating relationships against an alternative hypothesis of at least "r + 1" vectors.

The test works by exclusion of alternative hypotheses, i.e., the null hypothesis is tested first: r = 0 against the alternative hypothesis r > 0 (r being the number of cointegrating relations). If it is accepted, the procedure stops, there are no cointegrating relations, if not, we move on to the next step by testing r = 1 against r > 1. The results of the λ_{max} statistics and the employee λ_{trace} to determine the level of cointegration are presented in Tab. 4 and Tab. 5, according to the multivariate approach of Johansen, (1988), with the estimation of an error-correction model (ECM) which should lead us to the final choice of the model.

Estimation by the trace test:

$$\begin{cases} H_0 : r = q \\ H_1 : r > q \end{cases}$$

The following statistic is used:

$$LR^0_{trace}(r_0) = -T \sum_{i=r_0+1}^{N} \log(1-\hat{\lambda}_i) \quad (3)$$

Where: "T" is the number of observations, "N" the number of variables, and λ_i is the eigenvalue (when ordered in ascending order).

The critical values of the *LRtrace* statistic were tabulated by Johansen and Juselius (1990) and then by Osterwald-Lenum *et al.* (1992). H_0 is accepted when the value of the *LRtrace* statistic is below its critical value.

The maximum eigenvalue test:

The following statistic is used:

$$LR^0_{max}(r_0) = -T \log(1-\hat{\lambda}_{r_0+1}) \quad (4)$$

The results obtained from this test are presented below:

Table 4. Cointegration test (trace statistics).

		Trace test		Max Eigenvalue test	
H(r)	**Eigenvalue**	**Statistic**	**5% p-value**	**Statistic**	**5% p-value**
$r = 0$	0.945555	144.6714	0.0000	72.76418	0.0000
$r \leq 1$	0.849954	71.90727	0.0000	47.42032	0.0000
$r \leq 2$	0.566354	24.48695	0.0017	20.88815	0.0039
$r \leq 3$	0.134071	3.598806	0.0578	3.598806	0.0578

Source: Authors, results obtained from the software (GRETL).

Trace test:

The results obtained from this test are as follows:

- H_0: $r = 0$: H_1: $r > 0 = 144.67 > 47.85$.

We reject H0 so there is at least one cointegrating relation.

- H_0: $r = 1$: H_1: $r > 1 = 71.91 > 29.80$.

We reject H0 so there is at least one cointegrating relation.

- H_0: $r = 2$: H_1: $r > 2 = 24.49 > 15.49$.

We reject H0 so there is at least one cointegrating relation.

- H_0: $r = 3$: H_1: $r > 3 = 3.60 < 3.84$.

The null hypothesis (existence of 3 cointegrating relations) was accepted because we have 3.60 < 3.84. So, we have found three cointegrating relations; the error-correction model can then be estimated.

Max Eigenvalue test:

The results obtained from this test are as follows:

- H_0 : $r = 0$: H_1 :$r > 0 = 72.76 > 27.58$.

We reject H0 so there is at least one cointegrating relation.

- H_0: $r = 1$: H_1: $r > 1 = 47.42 > 21.13$.

We reject H0 so there is at least one cointegrating relation.

- H_0: $r = 2$: H_1: $r > 2 = 20.88 > 14.26$.

We reject H0 so there is at least one cointegrating relation.

- H_0: $r = 3$: H_1: $r > 3 = 3.60 < 3.84$.

The null hypothesis (existence of 3 cointegrating relations) was accepted because we have 3.60 < 3.84. So, there are three cointegrating relations. The error-correction model can then be estimated.

The results, therefore, indicate the existence of a long-run relationship between the variables. Since a long-run relationship exists between the variables, the vector error correction model is next estimated for short-run and long-run coefficients.

The Short-Run and Long-Run Effects:

The final outcome is given in Table 5, 6 and 7. The entire Eq 1 can be deduced from Table 5. The target model D (GINI) which is the dependent variable given in Eq 5 (a) (b), (c) between Table 5 & 6. D (GINI) is identified as $\Delta GINI$.

$$GINI_t = 0.0805PC_t + 0.1991CO_t - 0.0608GDPP_{t-1} + 3.235 + \varepsilon_{1t} \quad \text{(a)}$$

$$\Delta GINI = -1.0853(GINI_{t-1} - 0.07955GDPP_{t-1}) + 0.0805(PC - 0.6860\text{GDPP}_{t-1}) + 0.1991(CO_{t-1} - 0.46175\text{GDPP}_{t-1}) + 3.235 + \varepsilon_{1t} \quad \text{(b)(5)}$$

$$\Delta GINI = -1.0853Co\,\text{int}\,Eq_1 + 0.0805Co\,\text{int}\,Eq_2 + 0.1991Co\,\text{int}\,Eq_3 + 3.235 + \varepsilon_{it} \quad \text{(c)}$$

Table 5. Long-Run Coefficients

	CointEq1	**CointEq2**	**CointEq3**
GINI	1.0000 (0.00000)	-	-
PC	-	1.0000 (0.00000)	-
CO	-	-	1.0000 (0.00000)
GDPP	0.079554 (0.031768)	0.68603 (1.0622)	0.46175 (0.45385)
Constant	-4.2501 (0.24383)	-0.59620 (8.1524)	-6.6783 (3.4835)

Source: Authors, results obtained from the software (GRETL).

Table 6. Short-Run Coefficients

	D(GINI)	D(PC)	D(CO)	D(GDPP)
EC_{t-1}	−1.08538 (1.50337) [−0.7220]	3.04774 (2.13836) [1.425]	6.75635 (1.09527) [6.169]	2.54901 (1.12809) [2.260]
EC_{t-2}	0.0805839 (0.240341) [−0.3353]	−0.659333 (0.341855) [−1.929]	0.586695 (0.175099) [3.351]	0.0716799 (0.180345) [0.3975]
EC_{t-3}	0.199190 (0.627394) [0.3175]	1.29052 (0.892390) [1.446]	−1.84936 (0.457084) [−4.046]	−0.274560 (0.470779) [−0.5832]
$\Delta GINI_{t-1}$	0.111682 (1.51870) [0.07354]	−4.53589 (2.16017) [−2.100]	−8.07833 (1.10644) [−7.301]	−2.45044 (1.13959) [−2.150]
$\Delta GINI_{t-2}$	5.16058 (4.09831) [1.259]	16.2508 (5.82933) [2.788]	14.5977 (2.98580) [4.889]	0.296903 (3.07526) [0.09655]
$\Delta GINI_{t-3}$	−2.22632 (2.25869) [−0.9857]	−0.506290 (3.21270) [−0.1576]	−1.47738 (1.64555) [−0.8978]	1.93935 (1.69486) [1.144]
$\Delta GINI_{t-4}$	−1.20713 (2.89783) [−0.4166]	−15.0651 (4.12179) [−3.655]	−11.6548 (2.11119) [−5.520]	−2.50844 (2.17445) [−1.154]
ΔPC_{t-1}	−0.114666 (0.175131) [−0.6547]	0.109303 (0.249102) [0.4388]	−0.0442864 (0.127591) [−0.3471]	0.0194306 (0.131414) [0.1479]
ΔPC_{t-2}	−0.159371 (0.164036) [−0.9716]	−0.303333 (0.233321) [−1.300]	−0.385272 (0.119507) [−3.224]	0.0713866 (0.123088) [0.5800]
ΔPC_{t-3}	0.0419384 (0.134058) [0.3128]	−0.177047 (0.190681) [−0.9285]	−0.653157 (0.0976672) [−6.688]	0.00516872 (0.100594) [0.05138]
ΔPC_{t-4}	0.0136402 (0.206621) [0.06602]	0.0386999 (0.293892) [0.1317]	−0.101676 (0.150532) [−0.6754]	−0.0727191 (0.155043) [−0.4690]
ΔCO_{t-1}	0.0109583 (0.374894) [0.02923]	−1.28411 (0.533239) [−2.408−]	0.388465 (0.273126) [1.422]	−0.0451870 (0.281310) [−0.1606]
ΔCO_{t-2}	0.129525 (0.340923) [0.3799]	−0.450767 (0.484920) [−0.9296]	0.670267 (0.248377) [2.699]	−0.0212034 (0.255819) [−0.08288]

	D(GINI)	D(PC)	D(CO)	D(GDPP)
ΔCO_{t-3}	0.0989050 (0.244137) [0.4051]	−0.307420 (0.347254) [−0.8853]	0.499004 (0.177864) [2.806]	−0.0304529 (0.183194) [−0.1662]
ΔCO_{t-4}	0.173160 (0.204725) [0.8458]	−0.132674 (0.291195) [−0.4556]	0.252569 (0.149151) [1.693]	−0.00989379 (0.153620) [−0.06440]
$\Delta GDPP_{t-1}$	−0.00989379 (0.153620) [−0.06440]	3.17486 (0.780059) [4.070]	1.05049 (0.399548) [2.629]	−0.312189 (0.411519) [−0.7586]
$\Delta GDPP_{t-2}$	1.17794 (0.753815) [1.563]	4.18467 (1.07221) [3.903]	0.117177 (0.549187) [0.2134]	−0.159584 (0.565642) [−0.2821]
$\Delta GDPP_{t-3}$	1.04999 (0.980975) [1.070]	4.11626 (1.39531) [2.950]	−0.329000 (0.714683) [−0.4603]	−0.478141 (0.736096) [−0.6496]
$\Delta GDPP_{t-4}$	0.294360 (0.672035) [0.4380]	2.28910 (0.955886) [2.395]	0.102849 (0.489607) [0.2101]	−0.425444 (0.504277) [−0.8437]

Source: Authors, results obtained from the software (GRETL).

Table 7. Statistical data of the outcome with the AIC.

	D(GINI)	D(PC)	D(CO)	D(GDPP)
R-squared	0.653037	0.964277	0.982049	0.926194
Adj.R-Squared	0.565420	0.828530	0.913837	0.645729
Sum sq.resids	0.005412	0.010950	0.002873	0.003047
F-statistic	0.850445	189.3956	81.76158	98.84134
Mean dependent	−0.001399	0.064111	0.022873	0.024201
S.D dependent	0.025454	0.092142	0.078250	0.033321
Log likelihood			305.01899	
Akaike information criterion			-18.0015	
Bayesian information criterion			-14.1011	
Hannan–Quinn information			-16.9197	
Determinant resid covariance			2.9693238e-016	

Source: Authors, results obtained from the software (GRETL).

Validation of the VECM model

This step consists in checking the absence of autocorrelation and the homoscedasticity at the level of the residues of each model. To do this, we will use the following tests:

- The Ljung-Box test for the absence of autocorrelation;
- The ARCH test for homoscedasticity.

Autocorrelation test:

This step consists of verifying that the residues are white noise, using the Q-statistic of Box and Pierce (1970).

The Ljung-Box test is based on the analysis of the Q-statistic which is defined by:

$$Q = n(n+2)\sum_{i=1}^{h}\frac{\hat{\rho}_k^2}{n-k} \tag{6}$$

Where "n" is the number of observations and refers to the empirical autocorrelation of order "k", the null hypothesis of white noise ($p1 = p2 = - - - = pk = 0$) is rejected at the threshold of "a" if the statistic "Q" is higher than the critical value read in the table of "X^2" to "h" degrees of freedom.

- Residuals of the VAR system, GINI: The Ljung-Box Q statistic with delay h = 15 confirms that there is no autocorrelation. Indeed, the test probability of h = 15 is 0.999> 0.05, so the null hypothesis of white noise is accepted (see Table. 10 and Figure. 6 in the Appendix).
- Residuals from the VAR system, PC: The Ljung-Box Q statistic with delay h = 15 confirms that there is no autocorrelation. Indeed, the test probability of h = 15 is 0.170 > 0.05, so the null hypothesis of white noise is accepted (see Table. 10 and Figure. 6 in Appendix).
- Residuals from the VAR system, CO: The Ljung-Box Q statistic with delay h = 15 confirms that there is no autocorrelation. Indeed, the test probability of h = 15 is 0.083 > 0.582, so the null hypothesis of white noise is accepted (see Table. 10 and Figure. 6 in Appendix).
- Residues from the VAR system, GDPP: The Ljung-Box Q statistic with delay h = 15 confirms that there is no autocorrelation. Indeed, the test probability of h = 15 is 0.230 > 0.05, so the null hypothesis of white noise is accepted (see Table. 10 and Figure. 6 in appendix).

We conclude that all values are not random and independent in time, so there is no autocorrelation in our model.

Homoscedasticity test:

We used the ARCH test. The multivariate version is based on the following regression:

$$V_m(\hat{u}_t\hat{u}_t^{'}) = \beta_0 + \beta_1 V_m(\hat{u}_{t-1}\hat{u}_{t-1}^{'}) + \ldots + \beta_q V_m(\hat{u}_{t-q}\hat{u}_{t-q}^{'}) + p_t \tag{7}$$

Where: "p_t" is a white noise process and "V_m" the vectorization operator for symmetrical matrices. "β_i" pour $i = 1,\ldots,q$ are of dimensions $\frac{1}{2}K(K+1)\times\frac{1}{2}K(K+1)$.

The assumptions of the ARCH test are as follows:

$$\begin{cases} H_0: \text{homoscedasticity } \beta_1 = \beta_2 = \ldots = 0, \\ H_0: \text{heteroskedasticity and there is at least one coefficient "} \beta_i \text{" significantly different from 0.} \end{cases}$$

The test statistic is defined as follows:

$$VARCH_{LM}(q) = \frac{1}{2} TK(K+1)R_m^2 \tag{8}$$

with:

$$R_m^2 = 1 - \frac{2}{K(K+1)} tr(\hat{\Omega}\hat{\Omega}_0^{-1}) \tag{9}$$

where " $\hat{\Omega}$ " designates the variance-covariance matrix of the regression relationship.

The test statistic follows a law $\chi^2\left(\frac{qK^2(K+1)^2}{4}\right)$.

Using the ARCH test, one finds: 231.72 < 233, 994 =χ^2(q) designates the critical value appearing in the Chi-square table, we accept the hypothesis of homoscedasticity at the threshold of 5%.

Using the ARCH test, we find: 231.72 < 233, 994 = (q) designates the critical value in the Chi-square table, we accept the hypothesis of homoscedasticity at the 5% threshold.

EMPIRICAL RESULTS AND DISCUSSION

In this framework, we will analyze the results obtained from the estimation of the elasticities of our econometric model, through the comparison of the signs and values of the coefficients with the economic theory, and the results of other empirical work.

First of all, it should be noted at this level that the estimated parameters of the model represent elasticities because we have worked with logarithmic data. For this reason, we have used the (Log) of the variables. Based on the result of Johansen's cointegration test, we can see that there is a long-term equilibrium relationship between income inequality (GINI), bank credits (PC), trade openness (CO) and average per capita income (GDPP). To estimate this relationship, the Vector Error Correction Model (VECM) was used.

The short-run effects of private credit on income inequality are mixed; the effect is not significantly negative at lower lags and significantly positive at higher lags (both the short-run coefficients are significant at 10% significance level). The short-run effect of per-capita real on income inequality is significantly negative at 5% significance level; thus, greater gross domestic product (GDP) per capita will expectedly reduce income inequality in the Morocco in the short-run. The short-run effect of trade openness on income inequality is significantly positive at 5% significance level; thus, greater trade openness will increase income inequality in the short-run (Table .6).

With respect to long-term dynamics (LT), the equation shows the existence of a long-term equilibrium relationship (LT). This explains that there is an impact of variations in the explanatory variables on the variation of the dependent variable. In other words, variations in bank credit, trade openness, and gross domestic product per capita have an impact on income inequality (Table. 6).

Eq 5(c) is the long-term relationship as each variable at (t−1) is equal to each variable at t. An outlier can be defined as an observation with a larger residual, which represents the difference (positive or negative) between the actual value and the estimated value from the regression model. When the residual is large, compare with other residuals. Usually, a large residual will attract attention because the vertical distance between it and the estimated regression line is quite large. The relationship of GINI is deduced from (Table. 6) using the error correction model where the values in brackets '()' is the standard error, and the values in square brackets '[ ]' is the t statistic.

In fact, an increase of 1% in GDPP, for example, will lead in the long term to a decrease of 0.0608 in the Gini index. Moreover, the impact of trade openness on the dependent variable is positive, because simply an increase of 1% in this variable causes an increase of 0.1991 in the Gini index. In addition to the complexity of the distribution effect, the long-term results are consistent with the theorem of (Hecksher-Ohlin Samuelson and Stolper-Samuelson), that, in developed economies, increased trade openness will lead to increased income inequality, an increase of 1% in bank credits, for example, will lead in the long term to a 0.0806 increase in the Gini index.

The estimated elasticities of our econometric model were in accordance with the economic theory. All the coefficients have the expected signs, and they are all statistically significant. Thus, the growth in bank credit has a positive impact on the rise in income inequality in the long run.

Finally, based on the signs and values of the estimated elasticities, we find that our result is consistent with results obtained from other empirical work, for example, Arora (2012), Gimet & Lagoarde-Segot (2011), (Kim & Lin, 2011), Bazillier *et al.,* (2015), Jauch & Watzka (2016), Bazillier *et al.,* (2017). These empirical studies have found that the growth of bank credit has a positive impact on income inequality.

Impulse Response Functions

The objective in impulse analysis is to show the impact of a shock to one variable in the system on the other variables since there is a dynamic structure in the composition of a VAR, i.e. to represent the effect of a shock to an innovation on the other variables.

In the (Figure. 5), we notice that the shock on GINI has an instantaneous impact on itself, which explains why the curve relating to GINI ⇒ GINI starts from a value sufficiently higher than 0. A positive shock on bank credit results in a negative effect on the Gini index during the same period. A positive shock on trade openness translates into a positive effect on the Gini index during the first 10 years. In addition, a shock to gross domestic product per capita has a negative effect on the Gini index during this period.

A positive shock on bank credits has an instantaneous effect on itself, which explains why the curve for PC ⇒ PC starts from a value sufficiently above 0, while a positive shock on the Gini index translates into a positive effect on PC throughout the first 10 years, moreover it is an increasing function. Thus, this confirms that the impact of PC volatility on GINI remains positive in the long term. And a positive shock on trade openness creates a positive effect on PC over the same period. A positive shock on GDPP creates a positive effect on PC during this period.

A positive shock on trade openness has an instantaneous effect on itself, which explains why the curve for CO ⇒ CO starts from a value sufficiently above 0, a positive shock on the Gini index has a negative effect on CO throughout the first 10 years. And a positive shock on bank loans creates a positive effect on CO over the same period, a positive shock on GDPP creates a positive effect on CO during this period.

A positive shock to GDP per capita results in a positive impact on GDP per capita during the first 10 years, while a positive shock to PC has a positive effect on OGDI, a positive shock to CO has a positive effect on GDPP over the same period. Finally, a shock on GDPP has an instantaneous impact on itself, which explains why the curve for GDPP ⇒ GDPP starts from a value that is sufficiently higher than 0.

Variance Decomposition Analysis

The interest is to know what is the contribution of each innovation to the total variance of the prediction error. The percentage contribution of the residuals of each variable to the variance of the prediction error of the variable under consideration is presented in (Table. 9), from which conclusions can be drawn on the variable that has the greatest influence on the other variables.

But to make this study, it is necessary to order the variables from the most exogenous to the most endogenous because in the decomposition of "Cholesky" there will be a change of innovations in a way that the first variable will be according to its innovations; the second according to its innovations as well as the innovations of the first variable etc.

Variance decomposition for GINI:

According to (Table. 9), we obtain on average an innovation of the GINI index that contributes 99.09% of its variance of the prediction error, bank credits contribute on average 0.2353% of the variance of the GINI error, 0.5779% for trade openness, 0.0936% for the gross domestic product per capita. So, we conclude that the GINI index contributes a good part in the determination of the variance of the prediction error.

Variance decomposition for PC:

Also, on average an innovation of the Gini index which contributes 0.1276% of the variance of the forecast error, bank credits contribute on average 86.84% of its own variance of the error, 1.012% for trade openness, 12.01% for the gross domestic product per capita. We conclude that the gross domestic product per capita has the largest contribution after bank credits in the determination of the variance of the forecast error.

Variance decomposition for CO:

A Gini index innovation contributes 4.23% of the variance of the forecasting error, bank credits contribute on average 80.85%, trade openness contributes on average 14.45% of its own variance of the error, 0.452% for the gross domestic product per capita. It is concluded that trade openness has the largest share after bank credits in determining the variance of the forecast error.

Variance decomposition for GDPP:

On average, an innovation of the Gini index that contributes 0.1272% of the variance of the error of prediction, the bank credits contribute on average 12.83%, 10.73% for the commercial opening, the gross domestic product per capita contributes on average 76.31% its own variance of the error. It is concluded that bank credits have the second largest share after gross domestic product per capita in determining the variance of the forecast error.

CONCLUSION

While remaining within the framework of the main lines dealt with in this article and while basing ourselves on the explanatory economic theories presented and the explanatory models that allow us to study the problematic posed on the impact of the bank credit on inequalities and also on the reduction of purchasing power in the Moroccan economy, we have demonstrated the theoretical and empirical links between the two variables as it has already been done in several research works of economists on the international level.

This paper examines the short-run and long-run effects of bank credits on income inequalities in the Morocco. Due to the limitation of data availability, the study is limited to 1990-2019, we conclude that there is a positive impact of bank credits on income inequalities in the short-run and the long-run, so we find in fact that bank credits (consumer credits and real estate credits) represent a direct consequence of the rise of income inequalities. Reason why the number of poor people in the world is increasing and the income inequality between rich and poor is also increasing.

This regression model does not have evolutionary technologies such artificial intelligence (neural networks, etc.). Future work will solve this problem by establishing a hybrid model that combines Johansen's cointegration principle and machine learning technique.

Finally, inequality remains a subject of analysis and economic reflection among economists by continuing to carry out theoretical and empirical research in order to develop new economic theories and simplified econometric modeling. It is preferable to propose new avenues of research, given that the problem of rising inequality is multidimensional and that the study of the impact of several other variables on the rise in inequality is still an acute question.

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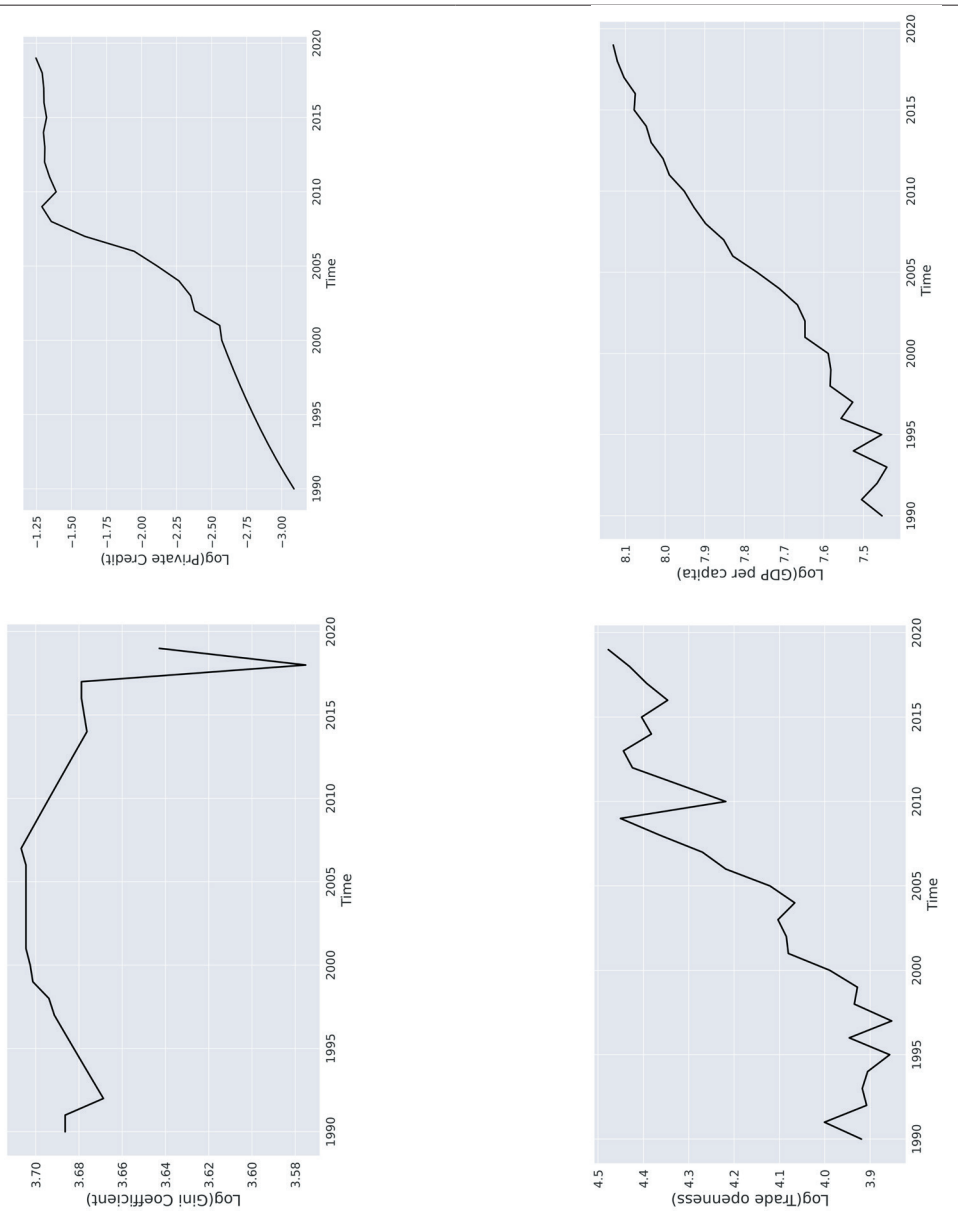
APPENDIX

Table 8. Variable information.

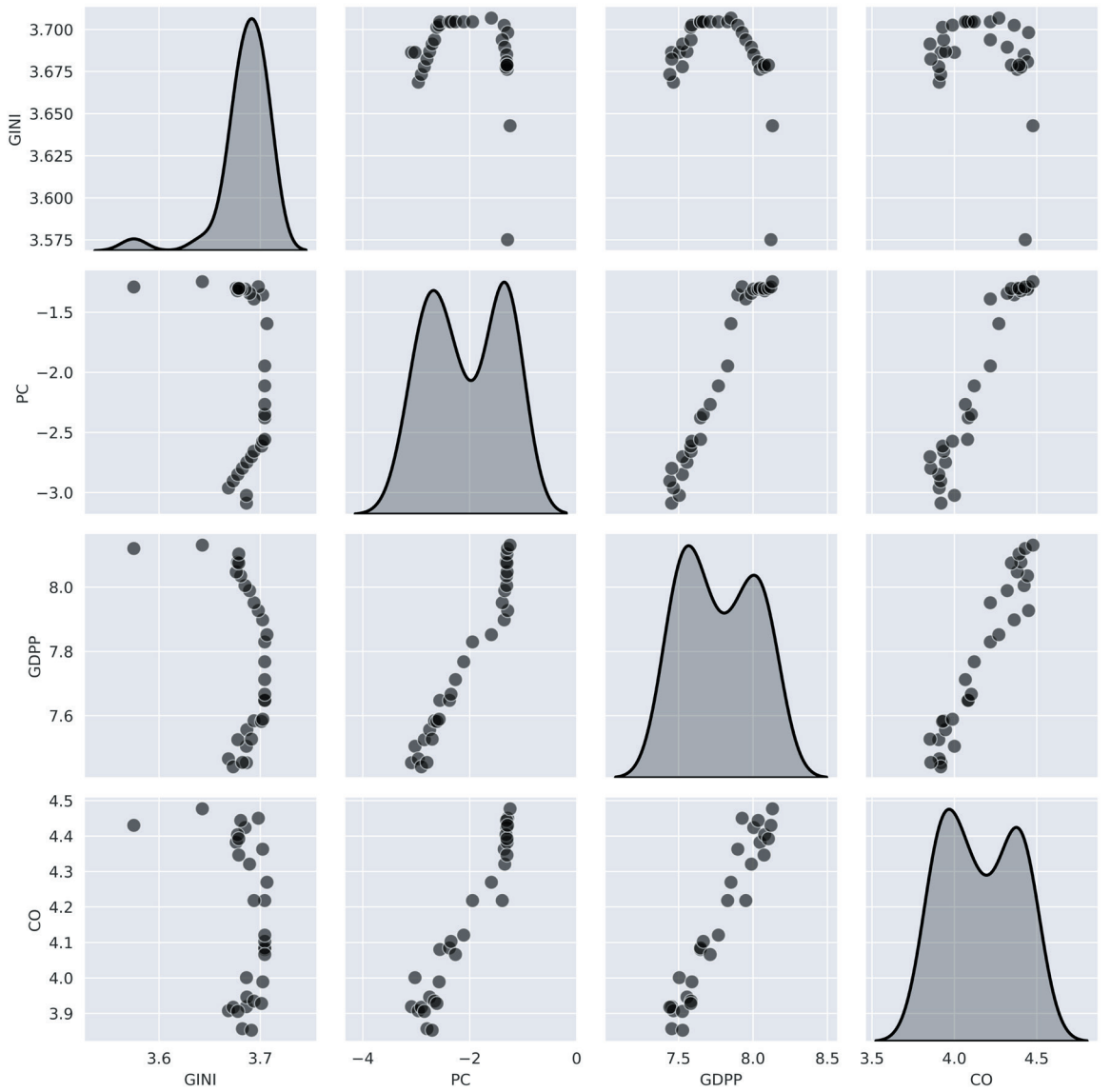
Variable name	Code	Definition	Source
Gini Coefficient	GINI	Household Income Inequality	World Bank (2020)
GDP per capita	GDPP	GDP per capita is gross domestic product divided by mid-year population.	World Bank (2020)
Trade openness	CO	Exports and Imports added together as a ratio of GDP	World Bank (2020)
Private credit	PC	Calculated as private credit as a ratio of GDP, measured by credit to the private sector (consumer credit and real estate credit)	Bank Al-Maghrib

Figure 3.Graphical representation of the variable



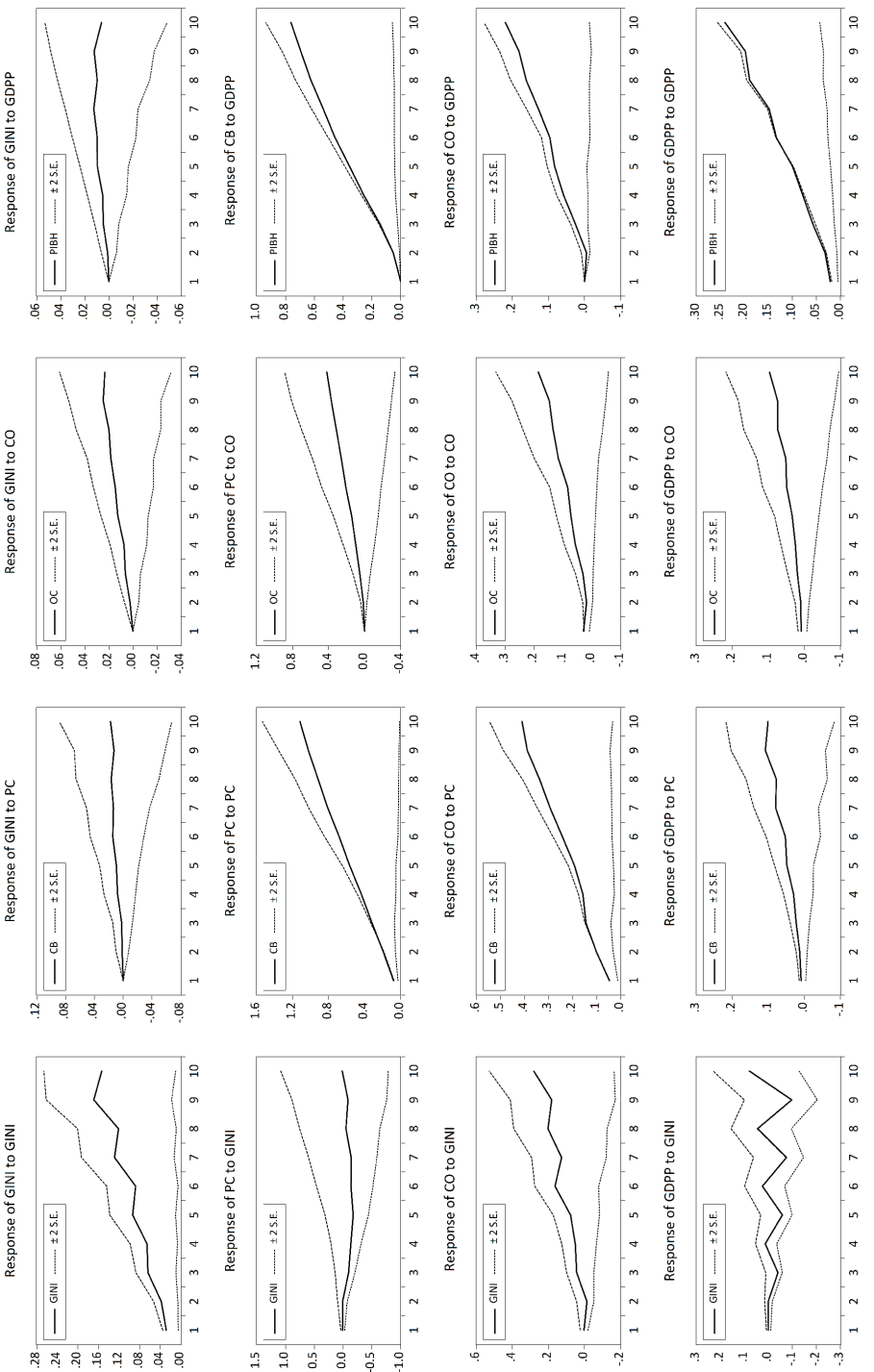
Source: Authors, results obtained from the software (Jupyter Notebook).

Figure 4. Relationships Between Variables



Source: Authors, results obtained from the software (Jupyter Notebook).

Figure 5. Impulse Response Function (IRF)



Source: Authors, results obtained from the software (Jupyter Notebook).

Note: The numbers on the axis suggest the percentile, the model is fixed to see the response in a period of 10 years

Figure 6. Test For Serial Correlation

Source: Authors, results obtained from the software (Jupyter Notebook).

Table 9. Variance decomposition analysis

Period	Variance decomposition of GINI					Period	Variance decomposition of PC				
	Erreur Std	GINI	PC	CO	GDPP		Erreur Std	GINI	PC	CO	GDPP
1	0.0282	100.00	0.0000	0.0000	0.0000	1	0.0796	0.2328	99.767	0.0000	0.0000
2	0.0300	99.094	0.2335	0.5779	0.0936	2	0.1482	0.1276	86.846	1.0121	12.013
3	0.0400	97.673	0.1518	1.3010	0.8735	3	0.2419	18.521	59.522	2.9876	18.968
4	0.0404	95.527	2.2625	1.3423	0.8674	4	0.2976	13.896	55.096	4.1688	26.838
5	0.0497	95.012	1.6046	1.9941	1.3866	5	0.3449	11.662	55.305	4.9726	28.058
6	0.0503	94.027	2.4946	2.1225	1.3550	6	0.3850	10.317	53.470	6.7267	29.484
7	0.0650	95.892	1.5099	1.5887	1.0089	7	0.4169	8.8114	54.968	7.1740	29.046
8	0.0656	95.488	1.7134	1.6153	1.1829	8	0.4517	11.527	52.516	7.6561	28.300
9	0.0816	96.389	1.3555	1.3900	0.8646	9	0.4742	11.006	52.839	8.2897	27.864
10	0.0835	95.612	1.6632	1.3571	1.3674	10	0.5008	13.914	50.783	8.4261	26.875
	Variance decomposition of CO						Variance decomposition of GDPP				
1	0.0547	0.3116	72.709	26.978	0.0000	1	0.0246	0.0015	13.124	12.956	73.917
2	0.0794	4.2364	80.858	14.452	0.4520	2	0.0272	0.1272	12.835	10.728	76.308
3	0.1118	27.834	55.913	8.5209	7.7308	3	0.0568	51.103	6.0726	5.4289	37.394
4	0.1203	24.487	49.379	11.984	14.149	4	0.0811	67.993	3.7440	3.1554	25.107
5	0.1315	24.445	48.586	11.517	15.449	5	0.1121	76.360	4.6786	2.2304	16.730
6	0.1661	42.387	39.632	7.6649	10.315	6	0.1443	79.108	2.9160	2.4802	15.495
7	0.1833	38.879	40.293	9.3669	11.459	7	0.1782	83.248	4.2201	1.6427	10.888
8	0.2069	44.096	36.108	8.1158	11.679	8	0.2199	84.539	2.7787	2.1329	10.548
9	0.2155	41.600	38.904	7.8715	11.623	9	0.2638	87.786	3.2830	1.4824	7.4477
10	0.2445	48.967	31.062	8.5452	11.424	10	0.3208	89.454	2.2769	1.4949	6.7736

Source: Authors, results obtained from the software (GRETL).

Table 10. Autocorrelation Test

Delay	Autocorrelation function of GINI				Delay	Autocorrelation function of PC			
	ACF	PACF	Q-stat	P.crit		ACF	PACF	Q-stat	P.crit
1	0.039	0.039	0.0437	0.834	1	-0.060	-0.060	0.1056	0.745
2	0.002	0.000	0.0438	0.978	2	-0.206	-0.211	1.3952	0.498
3	0.014	0.014	0.0503	0.997	3	-0.037	-0.068	1.4377	0.697
4	-0.027	-0.029	0.0753	0.999	4	-0.206	-0.272	2.8484	0.584
5	-0.026	-0.024	0.0980	1.000	5	-0.014	-0.093	2.8555	0.722
6	-0.142	-0.140	0.8297	0.991	6	0.324	0.225	6.6824	0.351
7	0.026	0.038	0.8557	0.997	7	0.242	0.300	8.9230	0.258
8	0.089	0.088	1.1740	0.997	8	-0.374	-0.312	14.575	0.068
9	-0.109	-0.116	1.6844	0.996	9	-0.157	-0.173	15.630	0.075
10	0.088	0.091	2.0347	0.996	10	-0.066	-0.104	15.830	0.105
11	0.054	0.042	2.1775	0.998	11	-0.019	0.047	15.848	0.147
12	-0.028	-0.049	2.2172	0.999	12	0.144	-0.121	16.919	0.153
13	0.073	0.088	2.5177	0.999	13	0.116	-0.136	17.673	0.170
14	-0.046	-0.033	2.6454	1.000	14	-0.159	-0.125	19.201	0.157
15	0.096	0.071	3.2597	0.999	15	-0.114	0.166	20.062	0.170
	Autocorrelation function of CO					Autocorrelation function of GDPP			
1	0.052	0.052	0.0800	0.777	1	0.181	0.181	0.9535	0.329
2	-0.035	-0.037	0.1163	0.944	2	-0.313	-0.357	3.9209	0.141
3	-0.442	-0.440	6.3056	0.098	3	-0.119	0.027	4.3684	0.224
4	-0.142	-0.127	6.9702	0.137	4	0.117	0.034	4.8204	0.306
5	0.091	0.093	7.2598	0.202	5	0.011	-0.073	4.8245	0.438
6	0.384	0.238	12.617	0.050	6	-0.293	-0.270	7.9468	0.242
7	0.092	-0.022	12.940	0.074	7	-0.120	-0.004	8.5016	0.290
8	-0.229	-0.253	15.062	0.058	8	0.112	-0.047	9.0087	0.342
9	-0.249	-0.009	17.709	0.039	9	0.095	0.003	9.3981	0.401
10	-0.113	0.021	18.295	0.050	10	-0.102	-0.104	9.8705	0.452
11	0.097	-0.108	18.747	0.066	11	-0.168	-0.131	11.239	0.423
12	0.066	-0.251	18.975	0.089	12	0.080	0.013	11.572	0.481
13	0.143	0.113	20.122	0.092	13	0.038	-0.150	11.655	0.556
14	-0.206	-0.057	22.702	0.065	14	-0.098	-0.076	12.240	0.587
15	-0.075	-0.101	23.072	0.083	15	-0.124	-0.133	13.261	0.582

Source: Authors, results obtained from the software (GRETL)

DUGOROČNI UTICAJ RASTA BANKARSKIH KREDITA NA SOCIJALNE I EKONOMSKE NEJEDNAKOSTI U MAROKU: DOKAZI IZ JOHANSENOVE ANALIZE KOINTEGRACIJE

Rezime:

Predmet rasta ekonomskih i društvenih nejednakosti postao je glavna briga za ekonomskih istraživača širom svijeta. Kao rezultat toga, postoji velika pažnja i zabrinutost zbog značajnih troškova rastućih nejednakosti u pogledu mira i socijalne koherentnosti u društvu. Da bi se suzbila šteta ovih nejednakosti, Maroko je preduzeo nekoliko reformi, uključujući i implementaciju novog razvojnog modela postavljenog 2018. Glavni cilj ovog članka je proceniti uticaj rasta bankarskih kredita na povećanje ekonomskih i društvenih nejednakosti. u Maroku. Drugim rečima, proverili smo da li postoji pozitivan uticaj na porast nejednakosti u prihodima u Maroku. Iz tog razloga smo u ovoj studiji testirali ekonometrijski model, koristeći metodu kointegracije, posebno model ispravljanja grešaka. Dakle, naši rezultati potvrđuju da se stepen otvorenosti trgovine, bankarski kredit i bruto domaći proizvod po glavi stanovnika dugoročno smatraju determinantama ravnoteže Gini indeksa. Koristili smo godišnje podatke za period 1990-2019 iz baze podataka Centralne banke Maroka (BAM) i Svetske banke (VBD). Širok spektar studija pokazuje značajan pozitivan uticaj između bankarskih kredita i nejednakosti u prihodima.

Ključne reči:

Nejednakosti u prihodima, bankarski krediti, ekonomski rast, otvorenost trgovine, kointegracija.