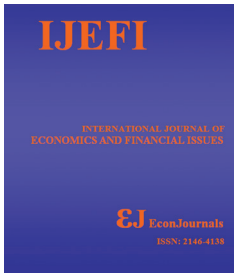

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Financial Development, Financial Instability and Economic Growth: The Case of Maghreb Countries

Khattab Ahmed[1]*, Mpabe Bodjongo Mathieu Juliot[2], Ihadiyan Abid[3]

[1]Department of Economics, Abdelmalek Essaadi University, Tangier, Morocco, [2]Department of Economics, Faculty of Economics and Management Sciences, Yaoundé 2 University, BP 1365, Cameroun, [3]Department of Economics, Abdelmalek Essaadi University, Tangier, Morocco. *Email: khattab.ahmed.mmo@gmail.com

ABSTRACT

The objective of this article consists in examining the interactions between the financial development, financial instability and economic growth in the Maghreb countries. The analysis covering the period of 1995-2013 relates to a sample of five countries of the region. By using the World Bank Data (2013) and the Heritage Foundation Data (2013), the panel vector autoregressive model estimation revealed that: (a) The financial development has positive effects on itself but a negative impact on the financial instability as well as a combined impact on the economic growth, (b) the financial instability has a negative impact on the financial development, a positive impact on itself and a combined effect on the economic growth, (c) The economic growth promotes the financial development and the financial instability; it has also a positive effect on itself, (d) finally, the financial liberalization in a less corrupt environment promotes the financial development.

Keywords: Financial Development, Financial Instability, Economic Growth
JEL Classifications: E44, G10, O16, O50

1. INTRODUCTION

The dependence of the Maghreb countries on the revenues, which are derived from the export of raw materials, has placed them in a situation of the economic and financial crisis in the early 1980s. This situation, which is characterized by the decline in the economic growth and the trade balance deficit as well as the increase in debt, led them to subscribe to the structural adjustment programs proposed by the Bretton Woods institutions between 1983 and 1993 (Joumady, 1999). These structural adjustment programs have given a prominent place to the financial reforms (Alouani, 2008). These financial reforms are based on the theory of the financial liberalization, which is developed by McKinnon (1973) and Shaw (1973). Thus, according to these theorists, the financial liberalization promotes the financial development (increasing the savings and financing the economy) and the economic growth.

Moreover, these financial reforms aim at restructuring and privatizing the public sector banks, authorizing the establishment of the private financial institutions, improving banking supervision and modernizing prudential regulation. Bentahar (2005) informed us that, before these financial reforms, the financial systems of the countries of the Maghreb "had presented the specificities of a repressed economy characterized by a predominance of banks and a widespread participation of state in their capital." The financial stock markets, when existed, were embryonic and their contribution to the financial system activities was small. Similarly, the local banks were led to accumulate a large volume of non-performing loans since they were responsible for financing the public investments and standing surety for the public businesses in failure.

If the implementation of the financial liberalization measures in countries of the Great Maghreb has been globally achieved in a gradual manner (Joumady, 1999; Bentahar, 2005), the growth rate of the financial liberalization index varies according to the different countries. For example, as it is mentioned in the Table 1, we can see an increase in the growth rate of the financial liberalization index by 20% in Morocco and by 293.03% in Mauritania; but this index witnessed a drop of 40% in Tunisia and Algeria.

These financial reforms have had overall positive effects on the financial development in the countries of the Great Maghreb except Libya. Indeed, we see, for example, an increase in the ratio (credit to the economy to gross domestic product [GDP]) by 127.27% and the mass ratio (cash on GDP) by 72.02% in Morocco. In Libya, on the other hand, it shows a decrease of the credit ratio to the economy on GDP (respectively the money supply to GDP ratio) by 67.55% and 23.44% referring to the Table 2.

This weak financial development can find an explanation in the extreme political instability that Libya has witnessed since the "Arab Spring" which led to the fall of the Gaddafi regime[1]. In the Maghreb countries, as shown in the Table 3, we can also notice that the corruption is in a high level. The freedom from corruption index has withdrawn by 32 points in Morocco between 1995 and 2012.

During the implementation of the reforms, the financial liberalization could generate significant costs in the emerging and developing countries in terms of instability and crises (Rodrik, 1999). Thus, the process of the financial liberalization may question the relevance of the policies adopted by these countries. Again, in this context of financial globalization, these countries might be affected by the external financial shocks. Benhabib and Zenasni (2013) argued that the Maghreb countries were vulnerable to financial crises. However, the Table 4 below shows that the GDP per capita increased in the Maghreb countries over the period 1995-2012.

In the light of these observations, we raise the following question: What are the interactions between the economic growth, financial development and financial instability in the Maghreb countries?

Specifically, we ask the following questions:

- What are the effects of the financial development on the economic growth and financial instability?
- What is the impact of the economic growth on the financial development and financial instability?
- What is the influence of the financial instability on the economic growth and financial development?

The answer to these questions is based on four sections. The first section will be devoted to the review of the economic literature on the interactions between the financial development, financial instability and economic growth. The second section will describe the methodology used by presenting and justifying the choice of the econometric model used, the model variables and the sources of data. The third section will discuss the descriptive statistical results on the one hand, and the results of the econometric model on the other hand. The last section will be devoted to the conclusion and recommendations.

1 The "Arab Spring" has been witnessed in Egypt and Tunisia too.

Table 1: Growth rate of the index of financial liberalization between 1995 and 2012

Growth rates of Financial liberalization index	Morocco	Tunisia	Algeria	Libya	Mauritania
Financial liberalization index	20%	−40%	−40%	98.01%	296.03%

Source: Authors from the Heritage Foundation Data (2004)

2. LITERATURE REVIEW

Although the first study had dealt with the empirical relationship between the growth and the finance that went back to Goldsmith (1969), the works of King and Levine (1992; 1993) were used to provide a validation to the endogenous growth models of Bencivenga and Smith (1991), St. Paul (1992), Greenwood and Jovanovic (1990) and Pagano (1993). Moreover, it should be noted that there is a large discrepancy between the studies devoted to this issue, but most advancements conclude that there is a positive relationship between the finance and growth.

In what follows, we will first present the studies that have highlighted the relationship between the financial development and economic growth; particularly, the works investigating the relationship between the financial development and economic growth while involving the financial instability in this connection.

2.1. Financial Development and Economic Growth

Historically we notice a clear relationship between the financial development and the growth of economies. If the financial development is recognized to stimulate growth (which is the viewpoint of Schumpeter, 1912), the economic growth can also lead to the financial development.

One of the pioneering works goes back to Goldsmith (1969) who studied the financial development over a long period (1861-1963) of 35 economies. The results of his study indicated that the financial development was accompanied by an upward trend of the ratio of the financial assets and by the real capital, in terms of flows, of the emission report of the financial assets to the GDP (Kpodar, 2006). However, the study of Goldsmith has some weaknesses, because the growth is not controlled for the effect of other factors that determine it and the double causality between the financial development and the growth has not been studied.

During the last decade, King and Levine (1992; 1993) exceeded the limits of the study of Goldsmith (1969). They conclude through a cross section study that beyond the positive relationship between the two variables, the financial development is a good predictor of the economic growth in the 10-30 coming years. They also found that a high level of the financial development was associated with

Table 2: Growth rates of financial development indicators between 1995 and 2012

Financial development indicators	Morocco (%)	Tunisia (%)	Algeria (%)	Libya (%)	Mauritania (%)
Credit to private sector/PIB	127.27	10.96	179.71	−67.55	23.42
Money supply (M2)/PIB	72.02	47.19	64.14	−23.44	33.31

Source: Authors from the data of the World Bank (2013)

future improvement of the rate of accumulation and efficiency in terms of capital allocation. The obtained results go together with those previously obtained: The initial level of the financial development has a positive and significant impact on the average of the economic growth for the period 1960-1989. Therefore, the financial development does not simply follow the growth, but also predicts it in the future.

The similar results showing a positive relationship between the financial development and the economic growth were obtained by other authors, namely Savvides (1995), Oldedokun (1996) and Ozturk (2008). These results are consistent with the predictions of the theorists of the financial liberalization, as opposed to the financial repression. This contribution is made through the impact of the financial system on trade and the initially exchanges at first; and then on the volume and quality of the investment. The financial intermediation by the banks affects positively the savings and investment in several ways. Firstly, the financial intermediaries thanks to the economies of scale reduce the information costs of the external financing, and thereby increase the implied investment returns while reducing the cost of borrowings. Moreover, they adapt the financial assets to the preferences, which are often divergent, of the savers and investors by reducing the information asymmetry between lenders and borrowers. This is due to the fact that they have control over the activity and management of the company directors, or because of inventing new financial assets, which reduce the risks related to the activities of loans and borrowings, insolvency risks, liquidity and unexpected changes in asset prices. Indeed, the financial intermediaries make an optimal equation of supply and demand of the financing by increasing the volume of savings invested. At the same time, they improve the selection of investments and thus the marginal productivity of the capital.

These arguments underpinning the benefits of the financial development explain that Shaw (1973) and McKinnon (1973) have criticized the policy generally followed by most of the developing countries and, to a lesser extent, by certain developed countries (e.g. France) and through which the state exercised a tight control on the financial intermediaries. Hence, the interest rates on loans and deposits were capped while the minimum reserve ratios for banks were excessively raised. For this reason, many distortions related to public action prevailed (administrative allocations of credit, barriers to entry of banks, nationalization of banks or creation of public banks). Simultaneously, as the inflation was generally massive in these countries, it resulted in real interest rates, which are significantly negative. These interventions have been called policy of "financial repression" hindering the financial development and consequently the economic growth. Furthermore, these two authors therefore recommended releasing the financial systems of these obstacles due to the economic policy.

Table 3: Growth rates of postage corruption index between 1995 and 2012

Growth rates of postage corruption index	Morocco	Tunisia	Algeria	Mauritania
Postage corruption index	−32%	−14%	−42%	−23.58%

Source: Authors from the Heritage Foundation Data (2004)

The analysis of Christopoulos and Tsionas (2004) with a different approach seemed to confirm the previous results. For a sample reduced to 10 developing countries over the period 1970-2000 for instance, they proceed to a co-integration analysis panel. Their results support a causal long period starting from the financial development to the growth (there is only one co-integrating vector) in favor of the absence of short-term relationship between the two phenomena. However, some authors question the strength of the empirical relationship between the financial development and growth. Thus, Andersen and Tarp (2003) have shown that the positive relationship between the financial development and the growth rate output per capita, which was highlighted by Levine et al. (2000), was no longer verified when they restricted their sample to the countries of Africa in the south Sahara and Latin America. They have also emphasized that the studies on the temporal data that were peculiar to a specific country did not clearly highlight the causality that rose from the financial development to the growth. On the other hand, Luintel and Khan (1999) found a bi-directional causality between the financial development and the growth for the ten developing countries they had been studying. Demetriades and Hussein (1996) estimated that, in several of the 16 countries of their sample, the causality seemed to move from the growth to the financial development and not *viz*. Acaravci et al. (2007) found one-way causal relationship running from the financial development to the economic growth in Turkey. Acaravci et al. (2009) found bi-directional causal relationship between the growth of real GDP per capita and the domestic credit provided by the banking sector for the panels of 24 sub-Saharan African countries.

2.2. Financial Development and Financial Instability

Most economists believed that the financial development is favorable to the economic development (Levine, 1997). This opinion was based on the theoretical reflection and empirical works that we have presented in the previous section. But we must recognize that the growth of the developing countries, especially those so-called emerging countries, is paired with the financial crises. There were also many works analyzing the unfavorable consequences of these crises, which have slowed the growth, and have deepened poverty (World Bank, 2000; Barro, 2001). Nevertheless, few works simultaneously considered the impact of the financial development and its instability level on the economic growth[2]. If the financial development and financial instability exert

2 An exception study of Ranciere (2002). The authors found that the long-term positive relationship between the financial development and the economic

Table 4: Relative variation of GDP per capita of the Maghreb countries between 1995 and 2012

Variation of GDP per capita	Morocco	Tunisia	Algeria	Libya	Mauritania
GDP per capita	1.38322986	1.08525927	2.72712623	1.47271622	0.7200298

Source: Authors based on data from the World Bank (2013), GDP: Gross domestic product

opposite effects on the economic growth, it seems essential to truly appreciate the financial contribution to the growth by taking into account the possible link between the magnitude and regularity of the financial development.

By the mid-seventies and even eighties, many developing countries have liberalized their financial system from the internal constraints that limited their economic development through capping the interest rates, higher reserves requirements, administrative credit allocation and entry barrier to new banks; they simultaneously opened them to the outside by reducing or removing exchange controls on capital movements.

The analysis of the financial crises experienced new developments after the Asian crisis. It has been shown particularly that the increase in bank credit was one of the indicators that allowed the best prediction of the financial crises (Kaminski and Reinhart, 1999)[3]. We also found that the financial development of the developing countries, which was measured mostly by the growth of the ratio of the money supply of bank credit to GDP, has been accompanied by a strong short-term instability of these ratios.

Considering the case of a barter economy, Wachtel (2001) emphasized that there could be no banking crisis or currency crisis. Once the country is developing a banking system (with reserve requirements and free trade with other countries) it can be prone to crises. Therefore, it may appear that the development of the financial sector is a source of crisis. Liquidity risk was also highlighted in the model of Gaytan and Ranciere (2004).

Thus, the increased competition led banks to raise interest-crediting rates in order to retain or attract deposits, which tended to reduce their margin. This was often seen as favorable to the development of savings and investment. But it is also possible that this reduction results in lower margins of the value related to banking privileges (given the mandatory minimum ratio between capital and risk assets). This decrease might encourage banks to increase efficiency by acquiring riskier assets, i.e., having the behavior of speculators (Hellmann et al., 2000). For this reason, a certain control of the interest rates on deposits is useful. In fact, a better regulation and bank monitoring might prevent the behavior of gamblers from the banks, but the implementation was generally beyond the expertise available in the developing countries (Andersen and Tarp, 2003).

Many arguments referring to the sources and nature of the financial instability have been advanced to uncover the weak link and the negative impact of the financial development on the economic growth. As a matter of fact, some studies have established the undeniable link between the financial development and the financial instability (Demirgüç-Kunt and Detragiache, 1999; Kaminsky and Reinhart, 1999). If the financial instability was detrimental to the economic growth, then we could easily take into account the positive link between the financial instability and the financial development by considering that the latter would control growth. However, it shall be noted in the economic literature on the subject that only two studies have focused on the consideration of the financial instability in the analysis of the relationship between the financial development and the economic growth: Kpodar (2004) and Loayza and Rancière (2004). The results obtained by Loayza and Rancière (2004) suggested a positive relationship between finance and the long-term growth against a negative relationship in the short-term. Loayza and Rancière (2004) estimated that the variation of the impact of the financial development on the economic growth between the short- and the long-term was highly related to the financial fragility. They measured this fragility through the recurrence of the financial crises (number of financial crises within each country over the period 1960-2004) and the volatility of the financial development index (standard deviation of the growth rate of the financial development variable). Following the example of Loayza and Rancière (2004), Guillaumont and Kpodar (2004) included in the analysis of the impact of the financial development on the growth the financial instability variable. They showed that the positive effect of the financial development on the economic growth rate was reduced by 58% because of the financial instability it generated. For an increase in the volatility of the financial development by 20% in 7 years, the additional annual growth rate is only 0.9% instead of 2.3% in the absence of the induced financial instability. The recommendation in terms of the economic policy of Guillaumont and Kpodar (2004) was that the financial development should be encouraged, but it was desirable to be as regular as possible. That is to say, the financial liberalization policy must not be established in any condition. Thus, the conclusion is that the financial development will be more conducive to growth and poverty reduction while the macroeconomic policies will be stable; the external opening, including financial, will be gradual and that the banks will be subject to rigorous monitoring.

Finally, Rancière et al. (2006) decomposed the effects of the financial liberalization into two components: A direct effect on growth (positive) and an indirect effect through crises (negative). The empirical estimation by the authors showed that the direct effects of the financial liberalization on growth outweighed the indirect effects related to the strong propensity of crises. According to these authors, there are two contrasting visions of the financial liberalization. Firstly, the financial liberalization strengthens the financial development and contributes to long-term economic growth. Secondly, it leads to crises of increasing frequency.

On their part, the financial instability following some empirical studies can influence the economic growth. Thus, the positive impact of the financial development on economic growth that is evidenced in many theoretical studies is empirical; it does not necessarily mean a prescription to encourage the uncontrolled growth of the financial intermediaries. Indeed, although the financial instability does not necessarily refer to a bank closure,

growth exists with a short-term negative relationship between the two variables. Countries that have experienced financial crises are experiencing a positive but small impact of financial development on growth.

3 Note that the example of Mexico is striking. In the early 1990s, the country undertook a financial liberalization policy and a wave of privatization of banks. Reserve requirements on deposits have been removed. Mishkin (1997) emphasized that bank credits to private enterprises increased from 10% of GDP at the end of the 80-40% of GDP in 1994. The bubble burst in 1994, prices of financial assets collapsed followed by a banking crisis and a currency crisis. The country is experiencing a subsequent severe recession.

it can induce a stable investment rate and a real exchange rate, which may negatively affect the growth through the instability of the latter. Noting first that Ramey and Ramey (1995) showed that there was a negative statistical relationship between the average growth rate of the countries and the volatility of the annual rates, it was therefore possible that the financial instability resulting in the instability of the rate of the economic growth would reduce it. However, this means through which the financial instability slows down the long-term growth is not as obvious as it first seems.

3. METHODOLOGY

This study aims to analyze the interaction between the financial development and the economic growth in the Maghreb countries (Algeria, Morocco, Libya, Mauritania and Tunisia) between 1995 and 2013. The choice of this period of study was motivated by the unavailability of the index of the financial liberalization and corruption data. In this section, we will describe the econometric model that will be used at first, and then give a presentation of the model variables.

In this study, the estimation of interactions between the financial development and the economic growth will be performed by using a vector autoregressive (VAR) model panel data developed by Inessa and Zicchino (2006). Unlike the conventional VAR model, this model can take into account the observations of several individuals over time. Moreover, it also has the advantage of being a multivariate time series model in which each dependent variable relies on its lagged variables, dependent variables and other exogenous variables. This will enable us as a part of this study to analyze simultaneously the interaction between the financial development, financial instability and economic growth.

The relationship between the financial development and the economic growth has been examined in three ways. Some studies have investigated the effect of the financial development on the economic growth (Schumpeter, 1912; Gurley and Shaw, 1960; Goldsmith, 1969; McKinnon, 1973; Shaw, 1973; Diamond and Dybvig, 1983; King and Levine, 1993; Rajan and Zingales, 1998; Andersen and Tarp, 2003; Beck and Levine, 2004; Levine, 2005; Eggoh, 2010). Others have analyzed the impact of the economic growth on the financial development (Patrick, 1966; Boyd and Smith, 1996; Greenwood and Smith, 1997). Moreover, several studies have examined the interaction between the financial development and the economic growth (Luintel and Khan, 1999; Levine et al., 2000).

As for the relationship between the financial development and financial instability, it was examined in two-ways in the literature. Some studies have analyzed the impact of the financial development on the financial instability (Wachtel, 2001; Gaytan and Ranciere, 2004; Rajan, 2005; Kpodar, 2006), and others have studied the influence of the financial instability on the financial development (Kpodar, 2006; Eggoh, 2010). But to our knowledge, no study was conducted to deal with the interaction between these two variables.

Besides, the financial instability is likely to influence the economic growth (Ranciere et al., 2003; Kpodar, 2006), as the economic growth may also have an impact on the financial instability (Kpodar, 2006). Very few studies have examined the interactions between the financial instability and the economic growth.

Given that no study has simultaneously examined the interactions between the financial development, financial instability and economic growth, we have considered it an appropriate problematic to work on using a VAR model with panel data.

In this study, we will estimate two VAR models with panel data, while each model is constituted of three equations:

Model 1:

$$LNCSP_{i,t} = a_0^1 + \sum_{j=1}^{p} a_j^1 LNCSP_{i,t-j} + \sum_{j=1}^{p} b_j^1 LNGDP_{i,t-j} + \sum_{j=1}^{p} c_j^1 INSFINCSP_{i,t-j} + d_1^1 LNLFCOR_{i,t} + \varepsilon_t^1 \quad (1)$$

$$INSFINCSP_{i,t} = a_0^2 + \sum_{j=1}^{p} a_j^2 LNCSP_{i,t-j} + \sum_{j=1}^{p} b_j^2 LNGDP_{i,t-j} + \sum_{j=1}^{p} c_j^2 INSFINCSP_{i,t-j} + d_1^2 LNLFCOR_{i,t} + \varepsilon_t^2 \quad (2)$$

$$LNPIB_{i,t} = a_0^3 + \sum_{j=1}^{p} a_j^3 LNCSP_{i,t-j} + \sum_{j=1}^{p} b_j^3 LNGDP_{i,t-j} + \sum_{j=1}^{p} c_j^3 INSFINCSP_{i,t-j} + d_1^3 LNLFCOR_{i,t} + \varepsilon_t^3 \quad (3)$$

Model 2:

$$LNM2_{i,t} = a_0^1 + \sum_{j=1}^{p} a_j^1 LNM2_{i,t-j} + \sum_{j=1}^{p} b_j^1 LNGDP_{i,t-j} + \sum_{j=1}^{p} c_j^1 INSFINCSP_{i,t-j} + d_1^1 LNLFCOR_{i,t} + \varepsilon_t^1 \quad (4)$$

$$INSFINM2_{i,t} = a_0^2 + \sum_{j=1}^{p} a_j^2 LNM2_{i,t-j} + \sum_{j=1}^{p} b_j^2 LNGDP_{i,t-j} + \sum_{j=1}^{p} c_j^2 INSFINM2_{i,t-j} + d_1^2 LNLFCOR_{i,t} + \varepsilon_t^2 \quad (5)$$

$$LNPIB_{i,t} = a_0^3 + \sum_{j=1}^{p} a_j^3 LNM2_{i,t-j} + \sum_{j=1}^{p} b_j^3 LNGDP_{i,t-j} + \sum_{j=1}^{p} c_j^3 INSFINCSP_{i,t-j} + d_1^3 LNLFCOR_{i,t} + \varepsilon_t^3 \quad (6)$$

According to the literature on the subject, there are many financial development indicators (King and Levine, 1993; Verdier, 2004). But due to the unavailability of data for many of these indicators, to indicators of the financial development were retained in this study as follows: The logarithm of the ratio credit to private sector to GDP (*LNCSP*) and the logarithm of the ratio Money supply M2 to GDP (*LNM2*).

The financial instability indicator is calculated through the standard deviation of the residue of the standard deviation of the growth rate of the financial development variable (Loayza and Rancière, 2006). But there are other methods for estimating the financial instability: The standard deviation of the residue of the financial development variable regressed on its declined value

and tendency (Guillaumont and Kpodar, 2006), and the standard deviation of the cyclical component of the financial development variable (Eggoh, 2010). In the present study, *INSFINCSP* captures the financial instability associated with the ratio of the credits to private sector to GDP, while *INSFINM2* measures the financial instability associated with the ratio money supply M2 to GDP.

The indicator of the economic growth that has been retained is the logarithm of the GDP per capita expressed in US dollar (Eggoh, 2010; Guillaumont and Kpodar, 2006, etc.). This indicator is noted *LNPIB*, which is one of the most used indicators to measure the economic performance of a country.

The variable *LNLFCOR* jointly captures the financial liberalization and freedom from corruption. This indicator has the advantage of taking into account the financial liberalization and institutional environment in which it is applied. The index used for financial liberalization comes from Heritage Foundation (2004). This indicator has the advantage of simultaneously taking into account the internal measures and external measures of financial liberalization. Demetriades and Luintel (1996) proposed a method for estimating the index of internal financial liberalization while Chinn and Ito (2005) developed a method for estimating the index of the external financial liberalization. The used indicator regarding freedom from corruption also comes from Heritage Foundation (2004).

4. STATISTICAL AND ECONOMETRIC RESULTS

The analysis of the descriptive statistics was mainly based on analyzing means and correlation coefficients between the variables of the model. The correlation coefficient is used to assess the degree of connection and sense of evolution of all variables. As Bourbonnais said (2015), "the correlation is not causality." It is the analysis of causality between the variables in the model that justified the use of econometric techniques: Stationarity test, VAR model with panel, impulse functions, variance decomposition.

4.1. Statistical Results

The Table 5 shows that the economic growth average rate of the sample during the studied period is 7.809%. The average value of the minimum economic growth rate is registered in Mauritania (6.584%), while the maximum achievement returns to Libya (8.945%). In what concerns the ratio money supply to GDP, Morocco records the maximum value while Mauritania shows the lowest value. In terms of the ratio credit to the private sector to GDP, Tunisia recorded the highest value while Algeria has the lowest value. Moreover, Libya is the country that has recorded the highest scores of the financial instability.

Regarding the correlation between the variables in the Tables 5 and 6, the following observations deserve to be made. Firstly, there is a negative correlation (respectively positive) and significant among the variables credit in the private sector to GDP (*LNCSP*) and economic growth rate (*LNPIB*). Also, we notice that there is a positive and significant correlation between the financial development indicators. The financial liberalization coupled with freedom from corruption is positively correlated with the two financial development indicators (*LNM2* and *LNCSP*), but negatively to the economic growth (*LNGDP*), and the two indicators of the financial instability (*INSFINCSP* and *INSFINM2*). We can therefore conclude that according to the results obtained from the correlation analysis between the different variables confirm moderately the predictions of McKinnon (1973) and Shaw (1973).

4.2. Econometric Results

As it appears in the Table 7, The *INSFINCSP* and *INSFINM2* variables are stationary at level. On the other hand, the variables *LNPIB*, *LNM2*, *LNCSP* and *LNLFCOR* are not stationary at level. In order to make these variables stationary, we turned them into a first different level. Thus, they will be integrated of order 1.

The estimated VAR models (p) require determining in advance the number of lags (p). For this reason, we used the Schwarz criterion in the estimation of the two VAR models as mentioned in Table 8. The optimal lag (p) equals to 1 because it minimizes the Schwarz function.

In Model 1, and referring to the Table 9, the Granger causality test shows that the financial instability does not influence the financial development; but it affects significantly the economic growth by 1%. However, the financial development influences significantly the financial instability by 1%. Moreover, the economic growth

Table 5: Descriptive statistics of the model variables

Descriptive statistics	*LNCSP*	*INSFINCSP*	*LNPIB*	*LNLFCOR*	*LNM2*	*INSFINM2*
General mean	3.258	0.115	7.809	12.056	3.938	0.060
Median	3.208	0.031	7.818	12.784	4.017	0.028
Maximum	4.334	0.859	9.671	16.620	4.880	0.888
Minimum	1.362	6.60-05	6.131	5.301	3.081	3.76×10^{-6}
SD	0.796	0.180	0.858	3.223	0.436	0.113
Observations	100	100	100	100	100	100
Morocoo mean	3.940	0.063	7.565	14.234	4.469	0.045
Tunisia mean	4.155	0.009	8.035	14.297	3.999	0.020
Algeria mean	2.289	0.227	7.916	13.100	3.948	0.047
Libya mean	2.662	0.262	8.945	7.326	3.937	0.168
Mauritania mean	3.245	0.014	6.584	11.324	3.339	0.018

Source: Authors, from Eviews 8, SD: Standard deviation

Table 6: Correlation of VAR model variables

Variables	*LNCSP*	*LNM2*	*LNPIB*	*LFCOR*	*INSFINCSP*	*INSFINM2*
LNCSP	1.000000					
LNM2	0.428785*	1.000000				
LNPIB	−0.167332***	0.430982*	1.000000			
LFCOR	0.282332*	0.148926	−0.350435*	1.000000		
INSFINCSP	−0.592805*	−0.086990	0.357227*	−0.197163**	1.000000	
INSFINM2	−0.305655*	0.040635	0.328362*	−0.207811**	0.426405*	1.000000

Source: Authors, from Eviews 8, VAR: Vector autoregression, *: significant at 1%, **: significant at 5%, ***: significant at 10%

Table 7: Stationarity tests of ADF and PP panel data of the model variables

Method	At level		At first difference	
	IPS statistic	P**	IPS statistic	P**
	ADF	PP	ADF	PP
LNPIB	0.699	0.578	34.553*	67.547*
LNM2	1.474	1.472	44.970*	86.612*
LNCSP	3.150	3.544	56.087*	75.560*
LNLFCOR	12.068	8.599	41.311*	72.830*
INSFINCSP	27.439*	27.528*	-	-
INSFINM2	27.564*	23.557*	-	-

Source: Authors estimations from Eviews 8, ADF: Augmented Dickey–Fuller, PP: Philips–Perron, IPS: Im, Pesaran, Shin, **: significant at 1%

Table 8: Determination of the optimal lag

Lag	Model 1		Model 2	
	Akaike criterion	Schwarz criterion	Akaike criterion	Schwarz criterion
0	3.64	3.80	1.691	3.80
1	−3.744	−3.341*	−4.53	−4.127*
2	−3.758	−3.092	−4.557	−3.890

Source: Authors, from Eviews 8, *: significant at 1%

impacts significantly the financial development and the financial instability by 5%. Nevertheless, the financial development has no significant effect on the economic growth.

In Model 2, the Granger causality test shows that the financial instability influences significantly the financial development (by 10%) and the economic growth (by 1%). In addition, the financial development has a significant effect on the financial instability (by 1%) and economic growth (by 5%). Finally, the economic growth has a significant impact of 1% on the financial development and the financial instability.

All these results suggest the existence of interactions between the financial development, economic growth and financial instability.

The results in Table 10 enable us to draw the following conclusions concerning the interactions between the financial development, financial instability and economic growth according to the estimation of the panel VAR model.

4.2.1. Model 1

In this model, the variable explaining the financial development is the ratio of credit to the private sector in a percentage of GDP. We note that the financial development lagged by a period affects positively the increase of the financing of the economy. This impact is significant at 1%. This result is consistent with the achievement

Table 9: Granger causality test

Null hypothesis	F-statistic	P
Model 1		
INSFINCSP does not granger cause *LNCSP*	1.55303	0.2075
LNCSP does not granger cause *INSFINCSP*	4.20271*	0.0082
LNPIB does not granger cause *LNCSP*	4.83638**	0.0039
LNCSP does not granger cause *LNPIB*	0.93723	0.4268
LNPIB does not granger cause *INSFINCSP*	3.05278**	0.0333
INSFINCSP does not granger cause *LNPIB*	4.10038*	0.0093
Model 2		
INSFINM2 does not granger cause *LNM2*	2.86485***	0.0625
LNM2 does not granger cause *INSFINM2*	7.46788*	0.0010
LNPIB does not granger cause *LNM2*	4.88347*	0.0098
LNM2 does not granger cause *LNPIB*	3.96069**	0.0227
LNPIB does not granger cause *INSFINM2*	7.15478*	0.0013
INSFINM2 does not granger cause *LNPIB*	14.6297*	3.10^{-6}
Observations	95	

Source: Authors, from Eviews 8, *: significant at 1%, **: significant at 5%, ***: significant at 10%

Table 10: Results of unrestricted VAR model

Model 1			
Exogenous variables	Endogenous variables		
	D.LNCSP	*D.IINSFINCSP*	*D.LNPIB*
D.LNCSP (−1)	0.945*	−0.044**	−0.017
	(0.027)	(0.017)	(0.029)
D.INSFINCSP (−1)	−0.078	0.584*	−0.075
	(0.126)	(0.080)	(0.132)
D.LNPIB (−1)	0.029	0.019	0.994*
	(0.023)	(0.014)	(0.024)
C	−0.240	0.010	0.113
	(0.219)	(0.139)	(0.229)
D.LNLFCOR	0.017*	0.002	0.003
	(0.006)	(0.003)	(0.006)
Model 2			
Exogenous variables	Endogenous variables		
	D.LNM2	*D.INSFINM2*	*D.LNPIB*
D.LNM2 (−1)	0.830*	−0.088*	0.086**
	(0.040)	(0.027)	(0.039)
D.INSFINM2 (−1)	−0.640*	0.179**	0.878*
	(0.137)	(0.095)	(0.135)
D.LNPIB (−1)	0.109*	0.063*	0.928*
	(0.022)	(0.016)	(0.022)
C	−0.334*	−0.113	0.191
	(0.189)	(0.132)	(0.187)
D.LNLFCOR	0.017*	0.001	0.001
	(0.005)	(0.003)	(0.005)

Source: Authors, from Eviews 8, VAR: Vector autoregression, *: significant at 1%,**: significant at 5%

of the studies of Eggoh (2010). In our case, an increase in credits to the economy of a unit committed an improvement financing of the economy in the order of 0.945 point in the following year.

Consequently, the credit expansion to the private sector lagged by a period tends to reduce significantly the financial instability at 5%. It seems that an increase in credit in the private sector of 10 points contributes to the decline of the financial instability by 0.4 points.

Besides, an increase in credit to the private sector impact negatively economic growth by 1%. Indeed, an increase in private sector credit of 10 points leads to the decline in the economic growth of 1.7 points. This result seems to be contradicted with the findings of Levine et al. (2000), but seems consistent with the results of some works (Gregorio and Guidotti, 1995; Eggoh, 2010).

Furthermore, an increase in the initial financial instability worsens significantly the financial instability lagged by one period at the threshold level of 1%. This result does not seem surprising since the financial crisis deepens in intensity over time if the adequate economic measures of resolution of the crisis are not implemented.

Finally, the initial economic growth promotes the economic growth significantly by 1%. An increase in the initial GDP per capita leads to an increase in the GDP per capita by 0.994 points. This result is in contradiction with the results obtained by Eggoh (2010).

4.2.2. Model 2

In this model, the variable explaining the financial development is the ratio of the supply money M2 as a percentage of GDP. It is found that the initial financial development affects positively the growth of the supply money M2. This impact is significant at the threshold of 1 %. This result is consistent with the experience of Eggoh (2010). In our case, an increase in the money supply of an initial unit resulted in the increase of the supply money by 0.83 %.

Furthermore, the increase in the initial money supply promotes the decline of the financial instability in any significant way to the threshold of 1%. It is to be noted that an increase in the money supply of a point contributes to the decline of the financial instability of 0.088 points. This result is in contradiction with the one provided by Guillaumont and Kpodar (2006).

An increase in the initial money supply promotes the economic growth significantly at the threshold of 1% in the Maghreb countries. Indeed, an increase in the money supply leads to a positive evolution of the economic growth of 0.086 points. This result seems consistent with the results of the work of Gregorio and Guidotti (1995) and Eggoh (2010).

On the other hand, we notice that the financial instability influences negatively the growth of the money supply in the countries of the region. This impact is significant at the threshold level of 1%. This result is consistent with the one given by Eggoh (2010). Furthermore, an increase in the initial financial instability exacerbates significantly the financial instability by 1%, since the adequate economic measures to the resolution of crises are not implemented.

However, the financial instability lagged by one period affects positively the economic growth in a significant way at 1%. This conclusion does not reflect the penalizing effect of the financial instability that is found among many authors (Kpodar, 2006). But according to Eggoh (2010), the relationship between the financial instability and the economic growth is not significant in all cases.

Increasing the initial economic growth favors the increase in the money supply. This effect is significant at 1%. An increase in the economic growth by one point causes a positive evolution in the money supply by 0.109 points. This result is consistent with the theoretical predictions of Robinson (1952).

Furthermore, an increase in the economic growth lagged by one period fosters the financial instability in the Maghreb countries by 1%. In effect, an increase in the economic growth of a point led to an escalation of the financial instability of 0.063 points. This result is in contrast to the one obtained by Guillaumont and Kpodar (2006).

The economic growth lagged by one period promotes the economic growth in any significant way to the threshold of 1%. An increase of the initial economic growth of one point causes the increase in growth of 0.938 points. This result is in contradiction with those obtained by Guillaumont and Kpodar (2006) and Eggoh (2010).

Finally, the financial liberalization coupled to the freedom from corruption favored the increase of credit to the private sector and the increase in the supply of the monetary mass in significant threshold of 1%. This result is consistent with the predictions of the theory of the financial liberalization (McKinnon, 1973; Shaw, 1973) and the theory of the law and finance (Laporta et al., 1996; Rajan and Zingales, 1998; Guiso et al., 2004).

4.3. Impulse Response Functions

4.3.1. Model 1[4]

According to the Appendix Figure 1, a positive shock on the credit to the private sector variable has resulted in a positive effect on the latter over the first 10 years while a positive shock on the financial instability has resulted in a negative effect on credit to the private sector over the same period. Furthermore, a positive shock on the economic growth has resulted in a positive impact on credit to the private sector over the first 10 years.

A positive shock on the financial instability has also resulted in a positive effect on the latter over the first 10 years as well. In addition to this, a positive shock on the economic growth results in a positive effect on financial instability during the same period. Also, a positive impact on credit to the private sector has resulted in a negative effect on the financial instability for the same period.

A positive shock on the economic growth results in a positive impact on itself. And a positive shock on both credit to the private sector credit and the financial instability result in a negative effect on the economic growth.

4 Refer to Figure 1 in the appendix for reading the results.

4.3.2. Model 2

A positive shock on the money supply is reflected by a positive effect on the latter over the first 10 years. A positive shock on the financial instability results in a negative effect on the money supply within the same period. Furthermore, a positive shock on the economic growth results in a positive effect on the money supply during this period.

A positive shock on the financial instability results in a positive effect on the latter over the first 10 years while a positive shock on the economic growth results in a positive effect on the financial instability throughout the first 10 years. And a positive shock on the money supply creates a positive effect on the financial instability over the first 2 years and a negative effect over the next 8 years.

A positive shock on the on economic growth results in a positive impact on the latter during the first 10 years while a positive shock on the money supply results in a negative effect on the economic growth. Finally, a positive shock on the financial instability results in a positive effect on the economic growth over the same period.

4.4. Variance Decomposition Analysis

The variance decomposition of the forecast error aims to calculate for each of the innovations its contribution in percentage to the variance of the error. When an innovation explains a significant share of the variance of the forecasting error, we deduce that the economy is very sensitive to the shocks affecting this series. Referring to the Appendix Table 1, we notice that:

4.4.1. Model 1

The variance of the forecasting error in credit to the private sector is due to 99.85% in its own innovations, to 0.12% in the innovations of the financial instability and to 0.03% in the economic growth innovations within the second period. Credit to the private sector thus exercised an important influence on itself and the financial instability and economic growth can slowly impact the credit to the private sector[5].

In Model 1, the variance of the forecasting error of the financial instability is due to 82.76% in its own innovations, to 17.20% of innovations credit to the private sector and to 0.04% in the economic growth innovations. The financial instability therefore exerts a major influence on itself. Credit to the private sector slightly influences the financial instability while the economic growth influences it faintly.

Also, the variance of the forecasting error of economic growth is due to 48.55% in its own innovations, to 51.05% in the credit innovations to the private sector and to 0.40% to innovations in the financial instability. In comparison with the private sector credit, the economic growth therefore has a relatively little impact on itself while the financial instability has a little impact on the economic growth.

5 Appendix Table 1 shows the variance decomposition.

4.4.2. Model 2

The variance of the forecasting error of the monetary mass is due to 88.67% in its own innovations, to 10.90% in the innovations of the financial instability and to 0.43% in the innovations of the economic growth in the second period. The supply money thus exercised a considerable impact on itself but the financial instability and economic growth can slightly affect the supply money.

In Model 2, the variance of the forecasting error of the financial instability is due to 77.59% in its own innovations, to 21.99% in the innovations of the credit to the private sector, to 0.42% to the innovations of the economic growth in the second period. The financial instability thus exercised a significant influence on itself. Credit to the private sector affects slightly the financial instability while the economic growth impact is very slightly.

In Model 2, the variance of the forecasting error of the economic growth is due to 55.26% in its own innovations, to 29.88% in the innovations of the monetary mass and to 14.86% in the innovations of the financial instability. The economic growth therefore exerts a clearly influence on itself. Consequently, the monetary mass and financial instability slightly affect the economic growth.

5. CONCLUSION

This study was conducted in order to analyze the interactions between the financial development, financial instability and economic growth in Maghreb countries over the period 1995-2013. The Granger causality test enables us to predict the existence of interactions between financial development, economic growth and financial instability in the region. The panel VAR model revealed that: (a) The initial financial development fosters the financial development, reduces the financial volatility and has combined effects on the economic growth; (b) the initial financial instability aggravates the financial instability, make slower the financial development and promotes the economic growth; (c) the initial economic growth accelerates the financial development, exacerbates the financial instability and stimulate the economic growth; (d) finally, the financial liberalization in an environment that is free from corruption encourages the financial development.

We therefore recommend to the Maghreb countries to pursue a gradual financial liberalization policy in an environment of good governance in order to promote firstly the financial development. This will then allow us to control the financial instability and promote the economic growth.

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APPENDIX

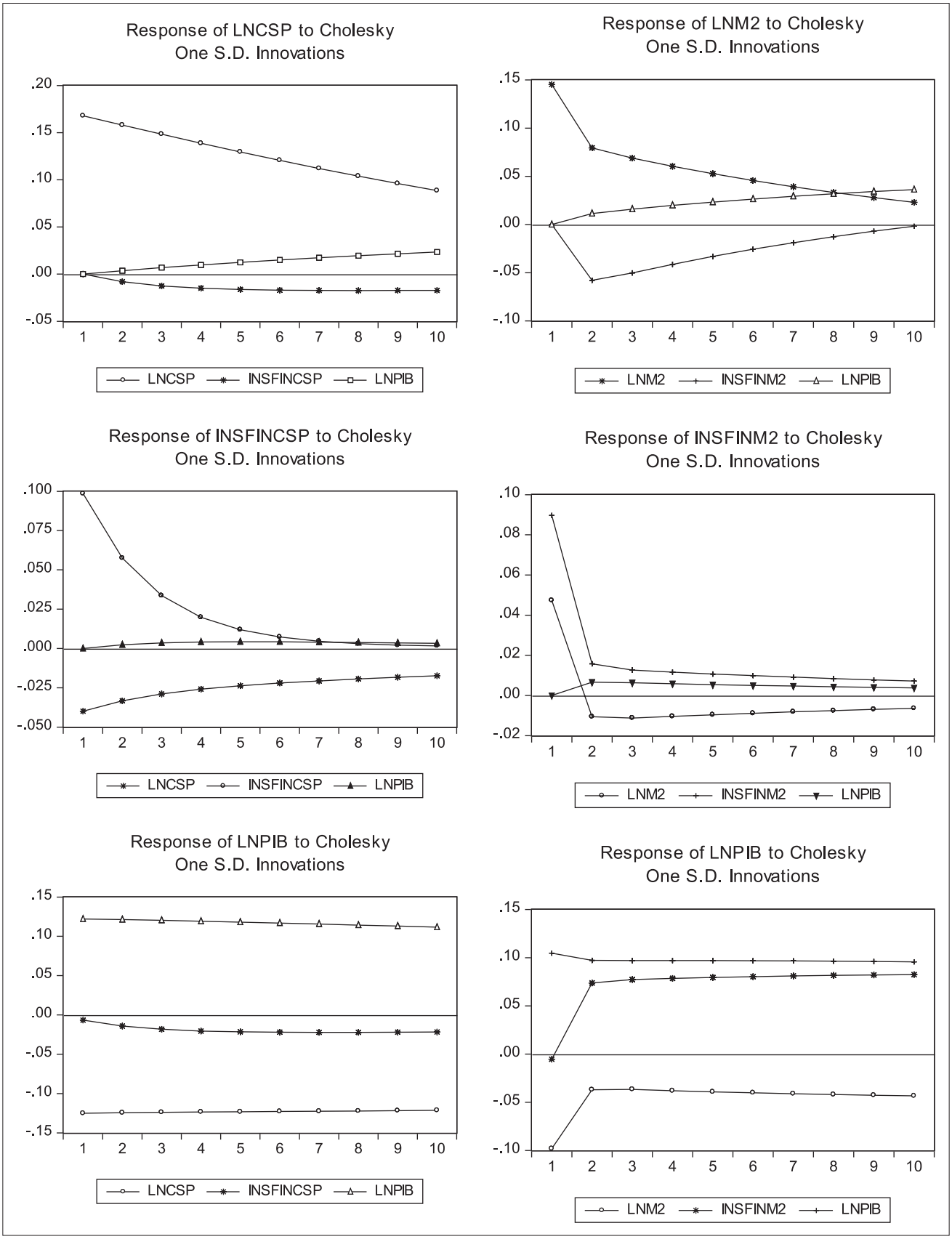
Table 1: Variance decomposition analysis

Model 1					Model 2				
Period	**SE**	***LNCSP***	***INSFINCSP***	***LNPIB***	**Period**	**SE**	***LNM2***	***INSFINM2***	***LNPIB***
Variance decomposition of *LNCSP*					**Variance decomposition of *LNM2***				
1	0.168	100.000	0.000	0.000	1	0.145	100.000	0.000	0.000
2	0.230	99.855	0.119	0.024	2	0.175	88.672	10.906	0.420
3	0.274	99.629	0.290	0.079	3	0.195	83.663	15.344	0.991
4	0.308	99.368	0.467	0.163	4	0.210	81.033	17.225	1.741
5	0.334	99.089	0.633	0.277	5	0.220	79.377	17.932	2.689
6	0.356	98.793	0.786	0.420	6	0.227	78.128	18.023	3.847
7	0.374	98.480	0.926	0.593	7	0.233	77.010	17.777	5.212
8	0.389	98.146	1.055	0.797	8	0.238	75.870	17.352	6.777
9	0.402	97.790	1.175	1.033	9	0.242	74.625	16.852	8.521
10	0.412	97.409	1.288	1.301	10	0.246	73.230	16.349	10.419
Variance decomposition of *INSFINCSP*					**Variance decomposition of *INSFINM2***				
1	0.106	14.125	85.874	0.000	1	0.101	21.765	78.234	0.000
2	0.125	17.204	82.760	0.034	2	0.103	21.994	77.598	0.407
3	0.132	20.001	79.897	0.101	3	0.104	22.498	76.746	0.754
4	0.136	22.423	77.393	0.183	4	0.106	22.910	76.051	1.038
5	0.139	24.478	75.252	0.268	5	0.107	23.242	75.485	1.271
6	0.141	26.220	73.432	0.347	6	0.108	23.513	75.021	1.464
7	0.143	27.702	71.878	0.418	7	0.109	23.735	74.637	1.626
8	0.144	28.975	70.545	0.478	8	0.109	23.917	74.319	1.763
9	0.145	30.076	69.393	0.529	9	0.110	24.068	74.052	1.878
10	0.146	31.034	68.394	0.571	10	0.110	24.193	73.829	1.976
Variance decomposition of *LNPIB*					**Variance decomposition of *LNPIB***				
1	0.174	51.208	0.142	48.648	1	0.143	46.796	0.140	53.063
2	0.246	51.052	0.395	48.551	2	0.191	29.889	14.846	55.264
3	0.301	50.984	0.627	48.388	3	0.231	23.082	21.355	55.562
4	0.347	50.987	0.817	48.195	4	0.265	19.574	24.93226	55.493
5	0.388	51.044	0.964	47.990	5	0.296	17.488	27.224	55.287
6	0.424	51.139	1.078	47.781	6	0.324	16.138	28.838	55.023
7	0.456	51.261	1.164	47.574	7	0.350	15.215	30.048	54.735
8	0.487	51.399	1.230	47.370	8	0.374	14.561	30.996	54.441
9	0.515	51.549	1.280	47.169	9	0.397	14.085	31.765	54.149
10	0.541	51.706	1.318	46.974	10	0.419	13.732	32.403	53.864

Source: Authors, from Eviews 8, SE: Standard error

Appendix Figure 1: Impulse response functions

Model 1 **Model 2**



Appendix Source: Authors, from Eviews 8