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Corruption in the Banking Sector and Economic Growth in MENA Countries

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Abstract:

Our purpose in this article is to study the impact of corruption on the banking performance and on economic growth for a group of MENA countries during the period 2000-2016. Our work is done in two stages. First, we conduct an empirical study on this panel of countries using the static panel method and we show that the effect of corruption on the soundness of the banking sector is not linear and that from a certain threshold, corruption significantly affects the problem of impaired loans in the banking sector of these economies.

In a second step, we estimate a model of economic growth. We apply the instrumental variable method for the same panel of countries and we show that the non-performing loans significantly affect the economic growth of these economies. Thus, in highly corrupt economies, the banking sector may be a channel for conveying the effects of corruption on economic growth.

Key words: corruption, non-performing loans, economic growth, panel data method

JEL : O43, D73, G21, C33.

1. Introduction :

Recognized as "an abuse of public or private power for a personal gain" (International Transparency, 1999), corruption is increasingly prevalent in the main sectors of national economies and in particular in the banking sector. In this regard, numerous theoretical and empirical studies focus on the negative effect of corruption on the performance of the banking sector. Results from various cross-sectional regressions show that corruption significantly worsens the problem of impaired loans in the banking sector (Detragiache, Tressel and Gupta (2008), Junghee (2012), Messai and Jouin (2013), Breuer (2006))). Moreover, Junghee (2012) shows that corruption in this sector can cause not only bank failures, which are not only manifested by financial losses for economic agents, but also by a destabilization of the entire system through the contagion mechanism. Thus, the literature on the financial crisis of 1997-1998 in East Asia shows that corruption contributed to this crisis by its negative impact on the balance sheet of banks and in particular on the relative weight of non-performing loans. The case of Hanbo in South Korea is a typical example of the fact that the close ties between companies and politicians

have led to a serious deterioration in the quality of bank assets and ultimately to the financial crisis.

Our purpose in this paper is to study the effect of corruption on the soundness of the banking sector and on economic growth. In the economic literature, many studies are interested in the effect of corruption on economic growth through various channels such as investment in physical capital, investment in human capital, technology transfer and public spending ((Mauro , (1995, 1998), Ehrlish and Lui (1999), Souissi (2014a), Murphy Shleifer and Vishny (1993)). However, very little academic effort and very little research are interested in the impact of corruption on economic growth through the performance of the banking sector. Basing on Jungee's article (2012), we show that the banking sector is a channel for transmitting the effects of corruption on economic growth. We focus on countries in the MENA region and we show that corruption in these economies significantly affects the strength of the banking sector and consequently reduces the economic growth of these economies. In spite of the reforms introduced by the countries of the region, notably Algeria, Egypt, Morocco and Tunisia, since 1998, the banking sector of these economies continues to record modest performances, given the importance of non-performing loans in total bank loans. In addition, numerous studies show that these economies are characterized by widespread corruption in all sectors. The Transparency International's Corruption Perceptions Index consistently ranks the MENA countries below the global median in terms of public sector corruption. The Arab Spring has unveiled the corruption of politicians as a major political influence in many countries in the region. Thus, the diversion of tens of billions of US dollars of state resources by former leaders in Egypt, Libya and Tunisia has been the subject of numerous publications (Rijkers, Freund and Nucifora, (2014), Baccar (2012) and Raghavan (2011)). Otherwise and in the same context, Souissi (2014b) shows that the governance system in the Arab countries is characterized by crony capitalism and a strong collusion between the economic and political elites. The governance institutions are weak and are dominated by informal and interpersonnel arrangements.

Thus, we study to what extent this institutional failure or the omnipresence of corruption in these economies affects the performance of the banking sector and consequently impacts the economic growth of these economies.
To do this, our work is organized as follows: In a first section, we review the literature on the effect of corruption on credit behavior and on economic growth. We show that corruption in the banking sector reduces the volume of loans granted to entrepreneurs and also leads to a bad allocation of financial resources, which limits the level and quality of private investment and thus slows down economic growth. In a second section, we conduct an empirical study on a panel of six MENA countries during the period 2000-2016. We estimate two econometric models, inspired from the article of Jungee (2012). The results of the estimation of the first model show that the effect of corruption on the soundness of the banking sector is not linear and that from a certain threshold, corruption aggravates the problem of impaired loans in the banking sector of these economies. The estimation of the second model shows that the deterioration of the quality of loans in the banking sector reduces economic growth. Thus, the pervasiveness of corruption in an economy leads to a proliferation of non-performing loans and consequently reduces economic growth. In highly corrupt economies, the banking sector is therefore a channel for transmitting the effects of corruption on economic growth.

2. Corruption in the banking sector and economic growth: a review of the literature

In the economic literature, one of the pioneering contributions that highlight the negative impact of corruption on bank loans are those of La Porta (1997, 1998). In this regard, the author highlights the adverse impact of corruption on bank lending through the relationship between finance and the legal institutions. Thus, in a transparent legal and institutional system, contracts are guaranteed and bank recovery procedures are ensured. In the event of bankruptcy of the borrower, the legal and legislative system allows the bank to recover its funds through collateral or take possession of the business. In the contrast, in a failing legal and institutional system, corruption increases the uncertainty of banks and the impossibility of recovery of funds lent and damages, in case of judgment against defaulting debtors[1] Banks should refrain from lending and taking more risk. Recognizing that credit risk is the primary risk a bank faces (Caprio and al. (1998), Campbell, (2007)) and is the fondamental cause of bank failure (Thomson (1991), Wallen (1991), Cole and Gunther, (1995), Barnhill and al (2002), Vazquez and al (2012)), *corruption in an economy increases this "credit risk" and consequently limits the volume of loans granted*. This hampers investment and economic growth, as the banking sector is the main source of finance for the productive sector in most economies (Beck and al (2000), Beck and Levine (2004)). Moreover, Weil (2009) for the case of Russia advocates that corruption has a negative effect on bank credits. It is a barrier to financing the investment and acts as a tax that increases the cost of credit to the borrower. This in turn hinders financial development and economic growth.

Another negative effect of corruption on bank loans is *the selection of projects and the allocation of credits*. This effect illustrates the complicity that can exist between the lender and the borrower, which means that the selection of projects is based on the amount of the "bribe" paid to the lender, and not on the profitability of the project. Thus, it is not the most profitable project that will be funded, but the most corrupt entrepreneur. This leads to the deprivation of the economy of the projects according to their importance and their priorities. In this regard, Junghee (2012) shows that the greater the degree of corruption in an economy, the lower the marginal efficiency of capital. This in turn reduces the incentive for individuals to invest since the expected rate of return will be low and risky. Breuer (2006) conducts an empirical study of 52 countries around the world and shows that corruption is an important determinant of the proliferation of non-performing loans in the banking sectors of these economies. Similarly, Minghua and al (2014), show that corruption in the banking sector leads to a misallocation of financial resources and increases banks' vulnerability to risks.

Therefore, given the particularity of the economic role of banks, the International Monetary Fund and the World Bank affirm that a banking supervisory authority is necessary to ensure the soundness and stability of the banking system. It promotes an efficient allocation of capital and finances companies that are trustworthy and based on market criteria and not on opportunism and favoritism. However, many theoretical and empirical studies show that supervisory and regulatory organs may not serve the social interests assigned to it if they are captured by the political power and provide for it its private interests. In this case, the government will protect only the individual interest of a certain group in power.

Such behavior is called « state capture » and the monopolized rent is called "grand corruption" (Kaufmann and Vicente¸ 2005). Similarly, and in the same vein, Kane (1995)

[1] Since they can not rely on judicial decisions or the courts to require such recovery

shows that entrepreneurs who have proven relationships with influential politicians can benefit from bank credit with the minimum of collateral and a high risk of default. In addition, Beck, Asli Kunt, Levin (2006) study the impact of different bank supervisory policies on the financing hurdles of 2,500 companies in 37 countries and show that the traditional approach of bank supervision by official authorities does not improve the integrity of bank loans. By contrast, a surveillance strategy focused on the empowerment of private control helps to attenuate bank corruption as well as its effects on corporate finance.

In addition, numerous empirical studies show that public participation in the banking sector is negatively related to its performance. La Porta et al. (2002), in an empirical study of the effect of ownership structure on bank performance, show that the share of government-owned shares in banks is associated with low efficiency in the banking sector. In addition, Boubakri et al (2003) study the specificity of the governance of newly privatized banks in Asia and show that the privatization of these companies has led to a significant improvement in their profitability. Similarly, and in the same vein, Taktak (2010) adds that the level of inefficiency of Tunisian banks is mainly due to the failures of the big public banks.

In this regard, Shleifer and Vishny (1994) show that state ownership politizes the allocation of resources and state-owned enterprises are no longer a means of achieving a social goels, but rather those of politicians. Similarly, Shleifer (1998) states that state-ownership entreprises are inefficient because they allow the transfer of the wealth from politicians to their supporters. Micco et al (2007), in turn, confirm the influence of the political lobby on state –ownership banks.

This detrimental effect of state intervention in the banking sector is based on the theory of public choice[2]. The intervention of the State in economic activity and in this case in the banking sector creates rents of situation and consequently generates rent-seeking behavior on the part of individuals. Such behavior leads to a misallocation of financial resources and a decrease in economic growth.

In addition, a contrasting view of the impact of corruption on bank loans can also be advanced. Thus, corruption does not necessarily lead to bad loans in the banking sector. In this regard, Stiglitz and Weiss (1981) have shown that in order to escape the phenomenon of adverse selection[3] resulting from the information asymmetry exante between the lender and the borrower, the banks opt for a credit rationing policy. Nevertheless, credit rationing suggests that some borrowers are willing to pay a higher interest rate than the official rate. This creates a favorable situation to corruption in the sense that those who are most likely to obtain loans are the ones who will have bribed the bank's employers the most. In this case, corruption is a "grease" of the credit granting mechanism since it enhances the flexibility of the bank lending process and corrects, in part, the consequences of the imperfection of the information. Moreover, Mauro (1995) for a similar « speed mony » argument shows that a borrower who has a good project may bribe a loan officer to save time by passing the usual loan review process. In this case, the probability of success may

[2] However, according to public choice theory, the collective interest is not totally excluded from the concerns of public officials, knowing that this objective is realized through a personal or ideological conception of the public agents.

[3] The adverse selection or the anti-election is manifested by the choice of the bad borrower, because of imperfect information

increase due to the timely implementation of the project. So corruption does not necessarily lead to bad loans in the banking sector.

3. Corruption in the banking sector and economic growth in the MENA: An empirical study

Our purpose in this section is to study the effect of corruption on the performance of the banking sector and on economic growth. Thus, we conduct an econometric study on a cylinder panel composed of six MENA countries (Saudi Arabia, Egypt, Jordan, Kuwait, Morocco and Tunisia) during the period 2000-2016. We rely on Junghee's article (2012) and we adopt macroeconomic data for these economies. Moreover, it is worth remembering that Junghee (2012), is conducting a cross section study on the impact of corruption on non-performing loans and on economic growth in 76 countries, with an uneven level of development. Moreover, by breaking the sample into two groups of countries, highly corrupt countries and weakly corrupt countries, Junghee (2012) shows that corruption makes the problem of impaired loans more acute in highly corrupt economies than in weakly corrupt economies. Moreover, Junghee (2012) estimates a model with simultaneous equations and shows that corruption simultaneously affects bank strength and economic growth.

In this study, we introduce the temporal dimension and we conduct a panel data study for a set of MENA countries. We adopt the Junghee methodology (2012) and estimate two econometric models. As a first step, we estimate a quadratic model and we show, contrary to previous studies, the effect of corruption on non performing loans is not linear and that from a certain threshold, corruption increases non performing credits and affects the soundness of the banking system. Secondly, we estimate a model of economic growth and show that the banking sector is a channel for transmitting the effects of corruption on economic growth in the MENA region.

3.1 Non-linear effect of corruption on non-performing loans: Estimation of a quadratic model:

Referring to many empirical works on the determinants of non performing loans, we recognize that they are related to bank-specific factors, macroeconomic factors, and institutional factors. In this regard, Jouini and Messai (2013) use microeconomic data for 85 banks in 3 countries (Italy, Greece and Spain) for a period from 2004 to 2008 and show that the rate of non-performing loans varies negatively with the GDP growth rate and profitability of bank assets while it varies positively with the unemployment rate, loan loss reserves and the real interest rate. Similarly, Boudriga, Taktak, and Jellouli (2010) conduct an empirical study of 46 banks in 12 MENA countries over a five-year period (2002-2006) and show that non performing credits in this region are explained by a set bank specific variables such as credit growth rate, loan loss provision, bank size, asset profitability, foreign equity from developed countries, an indicator of capital requirements (capital banking regulations). Similarly, Boudriga et al show that the non-performing loans of these banks are also explained by macroeconomic variables, namely the growth rate of GDP and the unemployment rate, as well as by the business climate. Moreover, Espinoza and Prasad (2010) for a panel made up of 80 banks in the Gulf Cooperation Council (GCC) region during the period 1995-2008 show that the size of the non-performing loans of these banks is explained by macroeconomic factors and bank specific factors.

Moreover, Junghee (2012) assumes that the determinants of non-performing loans are related to economic factors, bank-specific factors and institutional factors. We adopt the Junghee model (2012) which focuses on macroeconomic data. So, the specification of the model to be estimated is given by the following equation:

$$\mathrm{NPL}_{i,t} = \beta_0 + \beta_1 \mathrm{RGDP}_{i,t} + \beta_2 INFLATION + \beta_3 \mathrm{ROE}_{i,t} + \beta_4 \mathrm{CAP}_{i,t} + \beta_5 \mathrm{PROV}_{i,t} + \beta_6 \mathrm{Ln(CPI)}_{it} + \varepsilon_{i,t} \quad (1)$$

Where,

NPL : ratio of non-performing loans / total loans

RGDP: growth rate of Gross Domestic Production (annual%)

INFLATION : rate of inflation

CAP: ratio of capital / assets

PROV: provisions on non-performing loans

ROE: return on equity ratio

IPC: perception of corruption index

We note that the index i designates the country i and the index t designates the date t. β_0 is a constant of the model, $\varepsilon_{i,t}$ is a random term and $\beta_1, \beta_2 \ldots, \beta_6$ are the coefficients to estimate

The overall economic conditions are controlled by the GDP growth rate (RGDP). Thus, in a period of economic expansion, with an increase in the GDP growth rate, the likelihood that existing or new loans will be classified as bad debts decreases. In this case, companies face favorable economic conditions and are able to meet deadlines and repay their loans. The overall economic situation can also be controlled by the level of GDP per capita (*GDPPC*). Thus, the increase in GDP / capita assumes a favorable economic environment that supports the solvency of companies and reduces the credit risk assumed by banks.

The inflation rate is another indicator cited in the literature that identifies the overall economic context of the economy. Thus, the increase in the inflation rate reduces the purchasing power of economic agents and consequently reduces their repayment capacity. The coefficient associated with the inflation rate therefore has a positive sign.

Regarding bank specific variables, many regulatory measures are taken by banks to strengthen their banking strength. For example, capital regulation mitigates credit risk. In this regard efforts made by the Basel II Committee to launch a new agreement on capital accord, named Basel II, may verify that this regulatory measure may be helful reduce banks' risk-taking incentives. In this study, we consider the capital / asset ratio (*CAP*). The higher this ratio, the lower the risks assumed by the banks and the lower the non-performing credits. The expected coefficient associated with this variable is therefore negative.

Provisions on non-performing loans (*PROV*) are another regulatory measure cited in the literature and taken by banks to strengthen their banking strength. The lower these

provisions, the higher the credit risk. The sign of the coefficient associated with the PROV variable is therefore negative.

The return on equity ratio (*ROE*) is a bank-specific variable and is also used in the literature as a determinant of non-performing loans. Improving the profitability of bank assets may be helpful to mitigate credit risk. The expected sign associated with the variable ROE is therefore negative.

The Corruption Perception Index (CPI), measures the degree of corruption in an economy. The scores of this index are based on a scale ranging from 0 (very corrupt) to 100 (no corruption). So the higher the index, the healthier the institutional environment and the lower the corruption. The expected sign of the coefficient associated with the corruption index is therefore negative.

It should be noted that in order to homogenize the data, the CPI index and the GDP / capita are linearized, by applying the Neperian Log function to the various values associated with the CPI index and the GDP / capita. The variables that control corruption and GDP / capita have become *LnCPI* and *LnGDPPC* respectively. Note that the GDP / capita is expressed in purchasing power parity and in constant international dollars, that of 2011.

Sources of data

For bank specific data, we used the World Bank's Global Financial Development database. Data on non-performing loans (*NPL*) and macroeconomic variables (*RGD, GDPPC,* and *INFLATION*) are taken from the World Development Indicators database published by the World Bank. The Corruption Perception Index (CPI) is extracted from Transparency Internationnal (2018).

Method and results of model (1) estimates

The estimation of a model in panel data requires firstly the verification of the homogeneous or heterogeneous specification of the sample studied. This is to check if the theoretical model studied is perfectly identical for all countries, or on the contrary there are individual specificities specific to each country. The Fisher statistic associated with the homogeneity test, shows the existence of individual specific effects specific to each country. Moreover, a descriptive study of the sample shows a strong inter-individual variability (variability between) with respect to intra-individual variability (variability within) which confirms our econometric result concerning the existence of an individual effect. The model is therefore an individual effect model. The Haussman specification test shows that this individual effect is fixed.

In addition, it should be noted that the unit root test (Dickey Fuller) performed on our panel shows that all series are stationary.

The results of model estimation (1) are presented in Table (I) below.

Table I : Results of the estimation of the model (1)

Dependent variable : NPL

Ln(CPI)	**0.046** **(1.44)**
PROV	-0.062*** (-3.27)
ROE	-0.081 (-1.05)
CAP	-0.548*** (-2.94)
Ln(GDPPC)	-0.225*** (-6.99)
INFLATION	0.108*** (2.55)
Constant	2.202*** (6.17)
R^2	0.237
Fisher's value	28.29***
Observation number	102

Notes: (***) The coefficients are significant to a level of 1% risk. (**) The coefficients are significant for a risk level of 5%. (*) The coefficients are significant to a degree of risk of 10%. The values in parentheses are the t-student of estimated coefficients.

The coefficients associated with the bank specific variables (*PROV* and *CAP*) have the expected signs and are statistically significant at the 1% level. Adoption of regulatory policies such as loan loss provisions and capital regulation help mitigate credit risk and reduce non-performing loans[4]

In addition, the coefficients associated with GDP / capita (*Ln GDPPC*) and inflation rate (*INFLATION*) have the expected signs and are statistically significant at the 1% level. The increase in GDP per capita assumes a favorable economic environment that supports the solvency of companies and reduces the credit risk assumed by banks. Otherwise,

The increase in the inflation rate destroys the real income of economic agents and increases the risk of non-payment of credits.

The coefficient associated with the corruption variable (*LnCPI*) is not significant. However, the adoption of a quadratic form of the model allows us to obtain different results. Indeed, this quadratic form allows us to determine a threshold or a critical level beyond which corruption increases non-performing credits and affects the banking strength.

Thus, the new specification of the model is presented by the following equation (2):

[4] It should be noted that in this study, another regulatory measure, cited by Junghee (2012), was used by banks to improve their banking performance, ie the existence of a deposit insurance system (DI). It is an indicator variable, it takes the value 1 for countries with an explicit deposit insurance system and the value of 0 for other countries. However, since we estimate a fixed-effect model, any dummy variable will be eliminated in the estimation.

$$NPL_{i,t} = \beta_0 + \beta_1 RGDP_{i,t} + \beta_2 INFLATION + \beta_3 ROE_{i,t} + \beta_4 CAP_{i,t} + \beta_5 PROV_{i,t} + \beta_6 Ln\ CPI_{it} + \beta_7 (Ln\ CPI)^2 + \varepsilon_{i,t} \quad (2)$$

The marginal effect of corruption on nonperforming credits and the determination of the threshold effect :

$$\frac{\partial NPL}{\partial Ln\ CPI} = \beta_6 + 2\beta_7 Ln\ CPI$$

Corruption increases nonperforming credits if and only if $\frac{\partial NPL}{\partial Ln\ CPI} < 0$

Which means that $\beta_6 + 2\beta_7 Ln\ CPI < 0$ and $Ln\ CPI < \frac{-\beta_6}{2\beta_7}$ which means $CPI < e^{\frac{-\beta_6}{2\beta_7}}$

So, $e^{\frac{-\beta_6}{2\beta_7}}$ is a threshold or critical level below which corruption has a negative effect on bank performance.

The estimation of equation (2) by applying the panel data method applied to the fixed effects model gives the results presented in the following table (II)

Table II: Results of the estimation of the quadratic form of the model (1)

Dependent Variable: NPL

Log (CPI)	**-2.297**** **(-2.07)**
[Log (CPI)]^2	**0.325**** **(2.19)**
PROV	-0.107*** (-4.42)
ROE	-0.155* (-1.66)
CAP	-1.129*** (-5.58)
RGDP	-0.062 (-0.46)
INFLATION	0.069 (1.23)
Constant	4.327** (2.10)
R^2	0.474
Fisher's value	12.35***

Notes: (***) The coefficients are significant to a level of 1% risk. (**) The coefficients are significant for a risk level of 5%. (*) The coefficients are significant to a degree of risk of 10%. The values in parentheses are the t-student of estimated coefficients

Thus, the coefficients associated with LnCPI and (LnCPI) ^{2} are statistically significant at the 5% threshold. The marginal effect of corruption is therefore given by:

$$\frac{\partial NPL}{\partial LnCPI} = - 2.297 + 2 * 0.325\ Log\ (CPI)$$

This marginal effect is negative if $\frac{\partial NPL}{\partial LnCPI} < 0$ that is, if and only if :

$$Log\ CPI < \frac{2.297}{2*0.325} \quad \text{and CPI} < 34.226$$

So if the CPI corruption perception index is below a critical level of 34.226, then corruption increases the credit risk and affects the soundness of the banking system. This result undoubtedly enriches the debate or controversy, mentioned above, as to the positive or negative effect of corruption on bank performance. According to our results, ***the effect of corruption on banking performance is not linear*** and that if corruption reaches a certain ***threshold*** and becomes ubiquitous in an economy then it has a disastrous effect on the banking performance. On the other hand, moderate levels of corruption constitute a "lubrication" of the credit granting mechanism.

In addition, the description of our statistical data on the evolution of the perception index of corruption during the period 2000-2016 (Table III in Appendices) shows an average of 41,823, a minimum of 28 and a maximum of 57. Similarly, the figure I (in Appendices) shows that the countries in our sample experience a fluctuation of their CPI indices. Egypt is perpetually located below the critical value of the CPI, along the along the studied period. Countries, other than Jordan and Kuwait, are sometimes located below the CPI pipeline value, sometimes located above this value. Thus, corruption is omnipresent in Egypt throughout the period 2000-2016 and its magnitude, and consequently its effect, is variable for the case of Morocco in Tunisia and Saudi Arabia.

3. 2 Banking Performance and Economic Growth in the MENA Region:

The purpose of this section is to study the effect of banking sector performance on economic growth in the MENA region. We show that the deterioration in the quality of lending in the banking sector eventually contributes to the decline in economic growth.

Moreover and from what has just been shown, the omnipresence of corruption in an economy generates a proliferation of non-performing loans. Thus, in highly corrupt economies, the banking sector may be a channel for conveying the effects of corruption on economic growth.

To do this, we estimate the growth model proposed by Junghee (2012) and which is as follows

$$RGDP_{i,t} = constante + \gamma_1 NPL_{i,t} + \gamma_2 HUMAN_{i,t} + \gamma_3 POPG_{i,t} + \gamma_4 INVT_{i,t} + \gamma_5 GOV + + \varepsilon_{i,t} \quad (3)$$

Where,

HUMAN[5]: human capital in the economy, which is approximated by the average level of schooling in the economy

POPG: the growth rate of the population

INVT: the rate of investment in physical capital

[5] Note that the Neperian Log function has been applied to the different values associated with the variable Human.

GOV: an indicator of governance.

The variables *RGDP* and *NPL* are already defined in the previous section.

Knowing that non-performing loans denote the performance of the banking sector in the economy, so the lower the non-performing credits (*NPL*), the better the banking sector and the higher the economic growth. So the expected sign of the coefficient associated with *NPL* is negative.

Similarly, remember that the sign of the coefficients associated with the variables investment rate in physical capital, human capital and growth rate of the population is positive.

In addition, a governance indicator (*GOV*) has been introduced to monitor the quality of the political and institutional environment in the region and its effects on economic growth. Since some countries in the region are in a period of political and democratic transition, the indicator of governance chosen is political instability. These are scores that vary between (-2.5), when it comes to high political instability and (+2.5), when it comes to high political stability. Therefore, the higher the index of political stability, the better the business climate and the higher the economic growth. The expected sign of the coefficient associated with the *GOV* variable is therefore positive.-

Data source

Data on the growth rate of GDP (*RGDP*), the investment rate (*INVT*), the population growth rate (*POPG*) and the non-performing credit rate (*NPL*) are taken from the World Development Indicators database (2018), published by the World Bank. Human capital data are extracted from the Barro and Lee database. The Political Stability Index (GOV), it is extracted from the database of World Governance Indicators (2018), published by the World Bank.

Method and results of model (2) estimates

As noted above, the estimation of a panel data model first requires verification of the homogeneous or heterogeneous specification of the sample under study. The Fisher statistic associated with the homogeneity test shows the existence of heterogeneity or individual specific effects to each country. The model is therefore an individual effect model. The haussman test shows that this individual effect is fixed. However, the presence of institutional variables among the explanatory variables in a model of development or economic growth causes a problem of simultaneity. In fact, if institutional development promotes economic growth, wealth growth or improved economic performance would in turn help to finance a more developed institutional infrastructure. The two governance and growth rate variables are therefore correlated with the error term. In this case, in the presence of endogeneity of one of the regressors, the generalized least squares (GLS) estimator or the within estimator are biased and non-convergent. The use of the instrumental variables method is therefore necessary. This method allows us to obtain unbiased and convergent estimators.

Moreover, note that the variable NPL is another endogenous variable in the model (equation (1) and (2)). To estimate the model (3), we use the instrumental variable method applied to the panel data. The instruments must be highly correlated with the variables to

be instrumented and not with the residuals (orthogonality condition). Our estimation method goes through two steps:

In a first step, we are interested in instrumenting the endogenous explanatory variables using the ordinary least square method.

$$NPL_{it} = a + B\,X\,it + a\,Z\,it + \mu it \quad (4)$$
$$GOV\,it = b + C\,X\,it + \beta\,Z\,it + \mathcal{E}\,it \quad (5)$$

X is the vector of exogenous variables in the model and *Z* being the vector of instrumental variables. The instruments used are endogenous lagged one-period variables (*NPL-1* and *GOV-1*) and an exogenous variable set, *CAP, PROV, LnCPI, and INFLATION*. These instruments are strongly correlated with the endogenous explanatory variables of the model (*NPL* and *GOV*). In fact, the correlation coefficients between these instruments and the variables to be instrumented are significant at the 5% threshold (Table IV in Appendices). Moreover, the results of the estimation of equations (4) and (5), allowing the instrumentation of the NPL and GOV variables, show a strong explanatory power and a Fisher statistic that is globally significant (Table V in Appendices). This allows us to conclude that the instruments seem to be relevant.

In a second step, we are interested in estimating the structural equation of the model using the instrumental variable method applied to the fixed effect model. The descriptive statistics of model (2) are shown in table VI (in appendices). The results of the estimates are presented[6] in the table VII below.

Table VII : Results of Model (2) Estimation

Dependent Variable: RGDP

NPL	**-0.303**** **(-2.19)**
GOV	0.035* (1.87)
INVT	-0.085 (-0.80)
HUMAN-	-0.037 (-1.28)
POPG	-1.521*** (-4.06)
Constant	0.207*** (2.76)
R^2	0.015
Observation Number	96
Estimation Method	Instrumental variable method applied to the fixed effect model (model 2)
Instruments used (Z)	(NPL)-1 (GOV)-1 LnCPI

[6] Recall that the initial GDP / capita (measured in PPP and expressed in constant $) is introduced in equation (3) to take into account the phenomenon of economic convergence. However, since we estimate a fixed-effect model, this variable reflecting a constant for each country, disappears when estimating

	CAP PROV INFLATION
Sargan Test [(1)]	8.64 (0.07)[(1)]

Notes: (***) The coefficients are significant to a level of 1% risk. (**) The coefficients are significant for a risk level of 5%. (*) The coefficients are significant to a degree of risk of 10%. The values in parentheses are the t-student of estimated coefficients. (1) It is the p-value associated with the Sargan test (p-value =0.07 > 0.05). This result shows that we must accept the hypothesis H0: instruments are not correlated with the error term. Using the method of instrumental variable, the R2 is not an appropriate measure of explanatory power. Sources: Mauro (1995)"The effects of Corruption on Growth, Investment, and Government Expenditure": A Cross-Country Analysis. "Barro (1991) International Business, Political Risk Services, Inc ." IRIS Center, University of Maryland.

The coefficients associated with non-performing loans (*NPL*) and political stability (*GOV*) are in line with the predictions of the theoretical model and are significant for a degree of risk of 5% and 10%, respectively. Similarly, the coefficient associated with the *POPG* variable is significant at the 1% level. On the other hand, the rate of investment in physical capital (*INV*) and human capital (*HUMAN*) shows no significant effect on economic growth in the region.

Finally, the application of Sargan's over-identification test (1957)[7] shows that the null hypothesis can not be rejected so the instruments are not correlated with the error term. As a result, the instruments are valid.

The economic interpretation of these results postulate that, the reduction of non-performing loans and the improvement of the performance of the banking sector help to increase economic growth. However, according to the results of section 3.1, the pervasiveness of corruption in some of these economies amplifies the volume of nonperforming credits and leads to a misallocation of financial resources, thereby reducing economic growth. ***The banking sector is therefore a channel for transmitting the effects of corruption on economic growth***.

In addition, the establishment of a stable political environment improves the business climate and boost economic activity in the MENA region.

However, the increase in the size of the population decreases the economic growth of GDP. Indeed and at first, the increase in the unemployment rate in these economies is a waste of human resources. Secondly, the deterioration of the purchasing power in most

[7] If we have a single instrument by endogenous explanatory variable, there is just identification. We can not test this hypothesis. If the number of instruments is greater than the number of endogenous variables, we are talking about over-identification of the model. One can test if some instruments are uncorrelated with the error term, it is the test of overidentifying restrictions or the test of validity of the instruments.
This test can be done in stages: i) in a first step, the structural equation is estimated using the instrumental variables method in the static panel, then the residues are recovered; ii) in a second step, the residues are regressed on all the exogenous variables including the instruments, then the R2 is recovered; iii) under the null hypothesis of the validity of the instruments, the statistic n * R2 follows a law of chi2 with q degree of freedom, n being the number of observations and q the number of instruments outside the model minus the number of endogenous explanatory variables.

countries of the region implies that the enlargement of the population size can not be converted into an increase in aggregate demand or an increase in the size of the market.

The coefficients associated with the *INV* variable are not significant. This result is not in line with our expectations, but it may be due to the decline in investment in some economies in the region, such as Tunisia and Egypt, which are in a period of democratic transition, and which has spawned a decline in economic activity.

Similarly, human capital in these economies does not show a significant effect on economic growth. This result is not surprising, as many studies show the existence of a weak or insignificant relationship between GDP growth and schooling. In this regard, Pritchett (2001) and Roger (2008) show that the effect of schooling on economic growth varies according to the economy's ability to use schooling productively. Thus, schooling has no effect on economic growth in economies characterized by a high level of corruption, a high black market premium and a high brain drain. In this case, human capital is allocated to lucrative but socially unproductive private activities.

3. Conclusion

In this work, we obtained significant results thanks to the empirical analyzes carried out.

First, the effect of corruption on bank performance is not linear and beyond a certain threshold, corruption increases nonperforming credits. So, if corruption reaches a critical level and becomes ubiquitous in an economy, then it has a detrimental effect on bank performance. On the other hand, moderate levels of corruption constitute a "lubrication" of the credit granting mechanism.

Second, deteriorating banking sector performance in turn reduces economic growth. However, the pervasiveness of corruption in an economy increases the volume of non-performing loans, which leads to a misallocation of financial resources and consequently reduces economic growth. So the banking sector is a channel for transmitting the effects of corruption on economic growth.

Such considerations normally lead to institutional choice policies that make it possible to fight against all forms of rent seeking and to ensure an optimal allocation of resources.

In addition, the results of the Model (2) estimate show that the accumulation of human and material resources has no significant effect on the economic growth of these economies. Hoowever, the establishment of a stable political environment makes it possible to boost economic activity in the MENA region.

So it is in the institutional component, "which is the primary factor of long-term economic growth" (Olson, 1983) that these economies must deal with it. It allows the mobilization of factors of production and makes this mobilization efficient in time.

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Data availability

https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database

https://databank.worldbank.org/source/world-development-indicators

https://www.transparency.org/cpi2018

https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators La

http://www.barrolee.com/data/dataexp.htm

Appendices

Table III Descriptive Statistics of Model (1)

Variable	Obs	Mean	Std.Dev.	Min	Max
NPL	102	0.083	0.061	0.011	0.265
PROV	102	0.79	0.369	0.269	2.028
ROE	102	0.134	0.058	0.014	0.316
CAP	102	0.1	0.032	0.005	0.148
Ln GDPPC	102	9.668	0.981	8.408	11.481
INFLATION	102	0.047	0.078	-0.26	0.224
Ln CPI	102	3.718	0.178	3.332	4.043
CPI	102	41.823	7.219	28	57

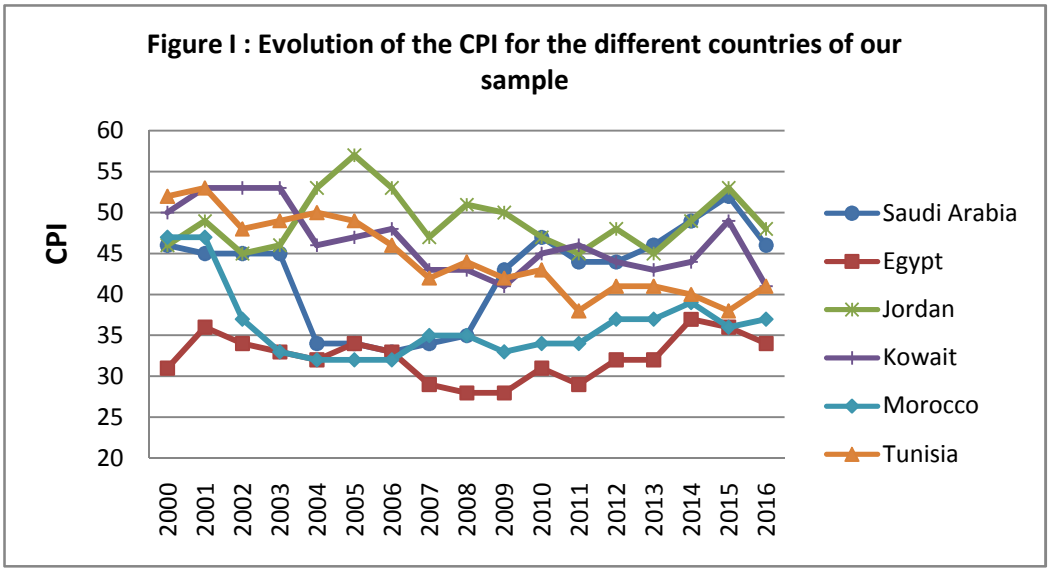

Table IV : The Correlation Matrix

	NPL	GOV	NPL-1	GOV-1	LnCPI	PROV	INFLATION	CAP
NPL	1.00							
GOV	-0.02	1.00						
NPL-1	0.93*	-0.08	1.00					
GOV-1	-0.07	0.88*	-0.04	1.00				
Ln CPI	-0.28*	0.52*	-0.31*	0.49*	1.00			
PROV	-0.39*	-0.29*	-0.31*	-0.29*	-0.15	1.00		
INFLATION	0.07	-0.43*	0.13	-0.39*	-0.38*	0.04	1.00	
CAP	-0.63*	0.35*	-0.65*	0.38*	0.65*	0.00	-0.16	1.00

(*)The correlation is significant at the 5% level

Table V : Relevance of instruments

	Variable dépendante : NPL	Variable dépendante GOV
POPG	-0.0712 (0.1915)	1.9512 (2.0984)
HUMAN	0.0134 (0.01351)	-0.1779 (0.1480)
INVT	-0.0065 (0.0388)	0.3489 (0 .4256)
NPL-1	0.8111 (0.0539)	-0.3227 (0.5908)
GOV-1	0.0008 (0.0062)	0.7962 (0.0682)
Ln (CPI)	-0.0322 (0.0203)	0.5200 (0 .2228)
PROV	-0.0204 (0.0076)	-0.0059 (0.0837)
INFLATION	-0.0291 (0.0295)	0.2335 (0.3241)
CAP	-0.1129 (0.1143)	-1.2292 (1.2531)
Constant	0.1365 (0.0640)	-1.6903 (0.7014)
R^2	***0.8947***	***0.7989***
Fisher	***81.23***	***37.97***
Observation Number	96	96
Estimation Method	Ordinary Least Square	Ordinary Least Square

Note : Values in parenthesis are standard errors

Table VI Descriptive Statistics of Model (2)

Variable	Obs	Mean	Std.Dev.	Min	Max
RGDP	102	0.0419199	0.0321322	-0.07076	0.1732
NPL	102	0.0830882	0.060674	0.0108	0.265
GOV	102	-0.318793	0.4752951	-1.648251	0.65
INVT	102	0.2360252	.0625565	0.1067	0.39089
HUMAN	102	1.883505	0.25487	1.34025	2.351375
POPG	102	0.024932	0.0150856	0.00761	0.06238