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THE INSTITUTIONAL ENVIRONMENT  
AND THE BANKING - GROWTH NEXUS:  
THEORY AND INVESTIGATION FOR MENA

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# **The Institutional Environment and the Banking - Growth Nexus: Theory and Investigation for MENA**

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## Abstract

This paper seeks to provide some theoretical and empirical answers to the following question: Does the institutional environment affect the causality relationship between banking development and economic growth?

In the theoretical part, we develop an endogenous growth model where the institutional environment is captured through two indicators: the judicial system efficiency and the easiness of informal trade. We show that an improvement of the institutional environment has two effects. First, it intensifies the causality direction from banking to economic growth through a reduction of defaulting loans. Second, it reduces the interest rate spread. In the empirical part, considering twenty-two MENA countries over the period 1984-2004, we find a bi-directional causality. The first one, which runs from banking development to economic growth, is more intense in countries with a more developed institutional environment. The second causality runs from economic growth to banking and indicates that a more developed economy has a more developed banking system.

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## 1. Introduction

The positive interrelationship between financial development and economic growth was first empirically established by Goldsmith (1969) and confirmed by King and Levine (1993) who found evidence that a well-developed financial system promotes growth by channeling credit to its most productive uses. However, the causality direction in this interrelationship seems to depend on the studied countries. Demetriades and Hussein (1996) found bidirectional causality for half of their sample, and for the other countries it is the economic development which causes the financial development. Beck et al. (2000) found a positive effect of financial development on growth. Shan et al. (2001) affirmed that the causality direction depends on the studied countries. Is there a plausible explanation for these results?

Some empirical studies (Stulz (2001), Levine (1998) and Beck et al. (2001)) established that a country's financial development is related to its institutional characteristics. Particularly, they argued that the legal framework is crucial in the establishment of a developed financial system. Hence, we expect that the causality direction between the financial development and economic growth will depend on the institutional environment. For the banking system the legal framework is particularly important. Indeed, in case of a loan default the bank often has the right to seize a collateral. However, the implementation of this right in practice depends on the cost of the judicial procedure and the rule of law. Besides, in many developing countries most banks are public and are constrained to finance the government and to rationalize private firms which may undermine economic growth. This paper, delves into the potential interaction of the institutional environment (Law and order, regulation) with the interrelationship between banking development and economic growth.

After the emergence of the endogenous growth theory many theoretical models were constructed (Bencivenga and Smith (1993), Bose and Cothorn (1996), Blackburn and Hung (1998) ) to analyze the causality direction in the banking development/economic growth relationships. Their common approach consists of the integration of a micro-economic model of financial contract theory in a dynamic general equilibrium framework. These studies explain how important is financial development for economic growth (through increasing of invested capital and improving its quality and allocation). However, they don't include any role of the institutional environment in their analysis. While related to the above cited studies, the model we develop in the theoretical part of this paper ponders the effective role of the institutional environment in the banking development/economic growth relationship. The model assigns two roles to a competitive banking sector: diversifying the risks of the entrepreneurs' projects and enforcing the debt contract. Indeed, banks receive deposits from lenders and offer loans to the entrepreneurs. Each entrepreneur is endowed with one-period investment project which is subject to random, idiosyncratic productivity shocks (as in Townsend (1979)). When the shock is sufficiently bad (under a determined threshold) the entrepreneur finds it optimal to default on loan. In this case, the bank seizes a fraction of the realized output by turning to the judicial system. The higher the seized fraction, the more efficient the judicial procedure is. In case of default, the entrepreneur has no choice but to informally sell the unseized part of the output. The more institutionally developed an economy is, the higher its cost of informal trade is. Hence, in this model the institutional environment is captured through two indicators: the judicial system's efficiency and how easy it is for the defaulting entrepreneurs to sell their production informally. This model enables the institutional environment to affect the economy's equilibrium and its development path in each period. We show that an improvement of the institutional environment reduces the proportion of defaulting entrepreneurs. This enhances the positive effect of banking on economic growth. Besides, we show that the interest rate spread is endogenously determined and decreases with the quality of the institutional environment.

From the empirical perspective, Arestis and Demetriades (1997) is, to our knowledge, the only empirical study that analyzes the effect of the institutional environment on the relationship between financial development and economic growth. The empirical methodology they use classifies the twelve studied countries in two groups that have different institutional factors (the types of financial systems and financial policies). In the empirical part of this paper, we analyze the effects of the institutional environment using a more robust approach. A twenty-two Middle Eastern and North African (MENA) countries panel is used to analyze the dynamic relationship between economic growth and banking development, (defined as the size of credit to the private sector plus the spread between the lending and deposit rates), over the period 1984-2004. Bivariate Granger causality relationships between the two variables are investigated. The model controls for inflation, institutional factors such as the rule of law and regulation, and the interaction of institutional factors with banking and economic growth. Given the cross-sectional heterogeneity present in many panel data sets, we use two approaches. The first is the mixed fixed and random (MFR) Model suggested by Hsiao (1989) and applied by Nair and Weinhold (NW, 2001) in a dynamic panel context. Unlike traditional fixed effects estimators, MFR estimation allows for heterogeneous dynamics and thus avoids the serious Pesaran (2003) type biases induced by imposing unrealistic homogeneity conditions on coefficients of the lagged dependent variables. The second is Granger-causality testing using average Wald statistics. Recent theoretical developments in Granger causality methods have made tests using limited time series possible through the use of panel data (Larraín et al. (1997), Hurlin and Venet (HV) (2003) and Hurlin (2004)). This study employs bivariate Granger causality tests using Hurlins (2004) methodology. The empirical analysis shows bidirectional causality. The existence of feedback causality between banking development and economic growth (or lack thereof) has far-reaching policy implications. Banking development spurs economic growth and will, simultaneously, be reinforced by it.

This paper attempts to answer theoretically and empirically the following question (for MENA region): Does the institutional environment affect the causality relationship between banking development and economic growth? The paper is organized as follows: Section 2 develops the theoretical model. Section 3 investigates the model empirically. Section 4 presents relevant policy recommendations. Section 5 offers some concluding remarks.

## **2. The Theoretical Model**

The model integrates some features of Townsend (1979) in an endogenous growth model with overlapping generations. It enables the institutional environment to play a role in the banking-growth nexus. This is channeled through the lending interest rate which will be endogenously determined. The structure of the model is detailed in the following sub-section.

### *2.1. The Economic Environment*

Time is discrete and indexed by  $t = 0, 1, \dots, \infty$ . There is an infinite number of two-period-lived agents belonging to overlapping generations of non-altruistic families. Each generation is composed of a mass 1 identical lenders and a mass 1 of identical entrepreneurs. All agents consume in the second period of life and are all risk neutral. An initial generation of old agents coexists with young agents at date  $t = 0$ . There are two goods (two sectors) in the economy: a final (or consumption) good and a capital good.

Each young lender is endowed with one unit of labor which he supplies during its first-period-live inelastically at no disutility cost to the final good sector. In compensation for his work, he earns a wage which he entirely saves in the bank for old-period consumption. The bank receives deposits from lenders and loan to entrepreneurs of the same generation.

Each entrepreneur invests in one investment good project in the first period of life and operates it in the second period of life. The project uses the final good as an input to produce the capital good and is subject to random, idiosyncratic productivity shocks which are revealed to the bank ex post only at a cost. In case of the entrepreneur's default on loans, the bank seizes a fraction of the realized output which reflects the efficiency of the judicial system. In all cases the investment good is sold to the final good sector. However, we assume that defaulting leaves no choice to the entrepreneur but informally selling the unseized part of its output to the final good sector. Thus, he incurs an additional cost relative to the non-defaulting entrepreneur. This cost will be higher in a more institutionally developed economy where the incentive to be a defaulting entrepreneur is weaker.

## 2.2. The Final Good Sector

The final good is obtained instantaneously from the combination of two substitutable factors: capital (good)  $K$  and labor  $L$ . The technology which is assumed to be of Cobb-Douglas type exhibits constant factors' return but includes an aggregate level of "knowledge"  $A$  (à la Romer (1986)) which enables the endogenous growth of the aggregate production:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha}$$

We associate  $A_t$  to the aggregate stock of capital:

$$A_t = \bar{k}_t^{1-\alpha} = (K_t/L_t)^{1-\alpha}$$

This specification is common in the literature (Bose and Cothorn (1996)) and allows for a constant price of the final good which simplifies the financial structure of the model. Hence, the final good production is equal to the capital stock

$$Y_t = K_t$$

and the per capita output is given by

$$y_t = k_t$$

The output is entirely distributed to the workers and to the entrepreneurs producing the capital good. Finally, capital depreciates fully after production and the factor's prices are equal to their marginal productivities:  $\alpha$  for capital and  $(1-\alpha)k_t$  for labor. Hence, wages are given by

$$w_t = (1 - \alpha)k_t \tag{1}$$

This signifies that wages increase with capital accumulation.

## 2.3. The Entrepreneurs

Each generation contains a continuum of mass 1 entrepreneurs indexed by  $h$ . An entrepreneur of generation  $t$  (born at  $t-1$ ) invests in a capital good project during his first period of life and acquires entrepreneurial skills. He then operates the project in the second period of life. Having no initial wealth he seeks external financing. Thus, he signs a debt contract  $(d_t^h, r_t^h)$

with a bank providing him an amount  $d_t$  of the consumption good at date  $t$ . At date  $t + 1$  he should repay  $(1 + r_t^l)d_t$  where  $r_t^l$  designs the lending interest rate during period  $t + 1$ . The production function relating the capital good output  $\kappa_{t+1}^h$  of the entrepreneur  $h$  to the consumption good input  $d_t$  is given by

$$\kappa_{t+1}^h = (1 + \varepsilon_h) d_t \quad (2)$$

where  $\varepsilon_h$  is an idiosyncratic shock assumed to be distributed symmetrically with a density  $f(\varepsilon_h)$  over  $[-\varepsilon_m, \varepsilon_m]$  where  $\varepsilon_m < 1$  to ensure the output is always positive.

The producer  $h$  may have an incentive to default on the debt. In this case, the bank is able to seize a fraction  $\lambda < 1$  of the realized value of output. The fraction  $\lambda$  reflects the efficiency of the judicial system. Whether the entrepreneur defaults or not the output is sold to the final good sector. The non defaulting entrepreneur sells it at the price  $\alpha$  in terms of the final good and honors its debt. However, in case of default the bank seizes the amount  $\lambda \kappa_{t+1}^h$  of the output and then sell it for the final good sector at the price  $\alpha$ . For the defaulting entrepreneur we assume that the unseized output is sold informally to the final good sector, otherwise it will also be seized. Besides, only a fraction  $\gamma \leq 1$  will be sold. One expects that the more institutionally developed the economy the lower the informal activity will be. Then, the entrepreneur wealth at date  $t+1$  is  $\alpha \gamma (1 - \lambda) \kappa_{t+1}^h$  in case of default and  $\alpha (\kappa_{t+1}^h - (1 + r_t^l)d_t) = \alpha (\varepsilon_h - r_t^l)d_t$  otherwise. At this stage we can derive the expression of the productivity shock threshold  $\varepsilon_t^*$  below which default occurs. Indeed, default occurs when, ex-post  $\alpha \gamma (1 - \lambda) \kappa_{t+1}^h > \alpha (\varepsilon_h - r_t^l)d_t$  which gives us

$$\varepsilon_t^* = [r_t^l + \gamma(1 - \lambda)] / [1 - \gamma(1 - \lambda)] > 0 \quad (3)$$

#### 2.4. The Lenders and the Banking System

A lender of generation  $t$  (born at  $t-1$ ) receives a wage  $w_t$  after having supplied his unit of labor to the consumption good sector. This wage is entirely deposited in the bank for old-period consumption. We denote the deposit interest rate by  $r^d$  and assume it is exogenous. The bank receives deposits from lenders of generation  $t$  and loan to entrepreneurs of the same generation. Since entrepreneurs and lenders are of same size, and given that all entrepreneurs are identical ex ante, the amount of the loan per entrepreneur is equal to the lender deposit:

$$d_t = w_t \quad (4)$$

The banking system is assumed to be competitive which forces the bank to earn zero profit. Besides, the representative bank is assumed to deal with a large number of entrepreneurs which enables it to diversify the idiosyncratic risk  $\varepsilon_h$ . At date  $t+1$ , the representative bank's net profit realized on the non defaulting entrepreneurs  $\Pi_{b,t+1}$  is given by the difference between contractual repayment and the gross cost of funds:

$$\Pi_{b,t+1} = \int_{\varepsilon_t^*}^{\varepsilon_m} [(1 + r_t^l)d_t - (1 + r^d)w_t] f(\varepsilon_h) d\varepsilon_h \quad (5)$$

The representative bank's net profit realized on the defaulting entrepreneurs  $\tilde{\Pi}_{b,t+1}$  is equal to the seized fraction of the output minus the cost of deposits:

$$\tilde{\Pi}_{b,t+1} = \int_{-\sigma_m}^{\sigma_t^*} [\lambda \kappa_{t+1}^h - (1 + r^d)w_t] f(\varepsilon_h) d\varepsilon_h \quad (6)$$

Assuming a competitive banking system the lending interest rate is set such that the total bank's net profit is zero:  $\Pi_{b,t+1} + \tilde{\Pi}_{b,t+1} = 0$ . Using equations (2), (5) and (6) we obtain

$$(1 + r_t^l) \int_{\sigma_t^*}^{\sigma_m} f(\varepsilon_h) d\varepsilon_h + \lambda \int_{-\sigma_m}^{\sigma_t^*} (1 + \varepsilon_h) f(\varepsilon_h) d\varepsilon_h = 1 + r^d \quad (7)$$

that is

$$(1 + r_t^l) p(\varepsilon_t^*) + \lambda [1 - p(\varepsilon_t^*)] + \lambda s(\varepsilon_t^*) = 1 + r^d \quad (8)$$

where  $p(\varepsilon_t^*) = \int_{\sigma_t^*}^{\sigma_m} f(\varepsilon_h) d\varepsilon_h$  and  $s(\varepsilon_t^*) = \int_{-\sigma_m}^{\sigma_t^*} \varepsilon_h f(\varepsilon_h) d\varepsilon_h$  represents the mean of the productivity shock faced by the defaulting projects

### 2.5 The Dynamics of Capital Accumulation

Capital dynamics depend on the quantity of capital good available at each period for the final good production sector. This quantity is produced by defaulting and non-defaulting capital good projects. Contrarily to the later, only a fraction of the former production is sold. At date  $t+1$ , the available quantity of the capital good is the sum of three terms: the quantity seized and sold by the bank, the fraction  $\gamma$  of the unseized output sold by defaulting entrepreneurs and the quantity produced and sold by the successful entrepreneurs:

$$k_{t+1} = \lambda \int_{-\sigma_m}^{\sigma_t^*} \kappa_{t+1}^h f(\varepsilon_h) d\varepsilon_h + \gamma(1 - \lambda) \int_{-\sigma_m}^{\sigma_t^*} \kappa_{t+1}^h f(\varepsilon_h) d\varepsilon_h + \int_{\sigma_t^*}^{\sigma_m} \kappa_{t+1}^h f(\varepsilon_h) d\varepsilon_h$$

which yields the following gross growth expression using (1), (2) and (4)

$$\frac{k_{t+1}}{k_t} = (1 - \alpha) [(1 - \lambda)(1 - \gamma)(p(\varepsilon_t^*) - s(\varepsilon_t^*) - 1) + 1] \quad (9)$$

### 2.6 The Institutional Environment and the Banking-Growth Nexus

#### Proposition 1

An improvement of the institutional environment (more efficient judicial system and/or costliest informal trade) reduces the proportion of unsuccessful projects financed by banks.

#### Proof

In the Appendix we show that  $\partial \varepsilon_t^* / \partial \gamma > 0$  and  $\partial \varepsilon_t^* / \partial \lambda < 0$ . Therefore the proportion of successful project  $1 - p(\varepsilon_{t+1}^*) = \int_{-\sigma_m}^{\sigma_t^*} f(\varepsilon_h) d\varepsilon_h$  decreases when the judicial system is more efficient ( $\lambda$  increases) or when the cost of informal trade increases. That is, entrepreneurs have less incentive to default.

#### Corollary 1

An improvement of the institutional environment enhances the positive effect of banking on economic growth.



### *Proof*

See Appendix. An intuitive explanation that improves the institutional environment reduces the proportion of unsuccessful projects financed by banks. Therefore, capital accumulation accelerates to bolster economic growth.

### *Corollary 2*

An improvement of the institutional environment reduces the interest rate spread.

Proof. See Appendix. More succinctly, this result can be interpreted in the context of the banking-growth nexus. In specific, the interest rate spread is frequently used as an indicator of banking development (more precisely of credit rationing). Hence, one possible channel through which economic growth may enhance banking development is the improvement of the institutional environment. For this result to apply in this model we need an additional assumption: the cost of informal selling of the capital good increases as the economy develops (capital accumulates):  $\partial\gamma/\partial w_t < 0$ . This is not an unrealistic assumption since many empirical studies confirm that the share of the informal sector in the total economic activity decreases with the level of economic development (Pratap and Quintin (2006)). However, this is obviously not the case for the efficiency of the judicial system.

## **3. The Empirical Model**

### *3.1 Data and Methodology*

In this paper a panel of twenty-two Middle Eastern and North African (MENA) countries over the period 1984-2004 is used to analyze the dynamic relationship between economic growth and banking development (emergence). Bivariate Granger causality relationships between the two variables are investigated. The model controls for inflation, institutional factors such as the rule of law and regulation, and the interaction of institutional factors with banking and economic growth. The list of countries and definitions of the data and their sources are included in Tables 1 and 2.

Only GDP per capita is expressed in natural logarithmic form, the others may take on negative values. Modeling banking development (economic growth) as a function of economic growth (banking development growth) and the control variables, as opposed to levels, ensures that the results from a panel of countries applies as much as possible to individual countries. Growth rates are more predictive of variables' changes than their levels. Another advantage of using growth rates of the independent variables is that the variables are much more likely to be stationary, which is a prerequisite for causality testing<sup>1</sup>.

Given the cross-sectional heterogeneity present in many panel data sets, even with a correctly specified model, it is reasonable to expect that one variable may help predict another for most but not all of the cross-sectional units. In a heterogeneous data set it is possible that the mean coefficient could take statistically significant (or insignificant) values of either sign without reflecting much underlying economic meaning. We should, therefore, be wary of judging the degree of causality by how significant the test statistic is. To mitigate the problems associated with heterogeneity, this paper uses the following two approaches:

- a) The first is the mixed fixed and random (MFR) Model suggested by Hsiao (1989) and applied by Nair and Weinhold (NW, 2001) in a dynamic panel context. Unlike traditional panel fixed effects estimators, MFR estimation allows for heterogeneous dynamics and thus avoids the serious Pesaran (2003) type biases induced by imposing

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<sup>1</sup> Unit root tests using the Im-Pesaran-Shin (2002) test has been performed.

unrealistic homogeneity conditions on coefficients of the lagged dependent variables<sup>2</sup>.

- b) The second approach is Granger-causality testing using average Wald statistics. Recent theoretical developments in Granger causality methods have made tests using limited time series possible through the use of panel data (Larraín et al. (1997); Hurlin and Venet (HV) (2004); and Hurlin (2004))<sup>3</sup>. This study employs bivariate Granger causality tests on economic growth and banking development using Hurlin's (2004) methodology.

In this paper the main emphasis is on exploring causal relationships rather than contemporaneous correlations<sup>4</sup>. The basic MFR model is:

$$g(gdppc)_{i,t} = \alpha_i + \gamma_{i,t} g(gdppc)_{i,t-1} + \beta_{1,i} g(banking)_{i,t-1} + \beta_{2,i} g(law)_{i,t-1} + \beta_{3,i} g(infl)_{i,t-1} + \beta_{4,i} g(regulation)_{i,t-1} + \beta_{5,i} g(banklaw)_{i,t-1} + \beta_{6,i} g(bankreg)_{i,t-1} + \varepsilon_{i,t-1}$$

Similar equations are set for the growth of banking development as a dependent variable of development. Besides the dynamic effect of growth, the lagged dependent variable provides an excellent proxy for many omitted variables. As NW demonstrate, the MFR procedure requires only the assumption of homogeneity in the distribution of the estimates on the lagged dependent variable, rather than homogeneity of the parameters themselves. Thus MFR causality models allow for complete heterogeneity of the coefficients on the lagged dependent variable and hence avoid the potentially serious bias imposed by the assumption of homogeneity in the coefficients on these terms. As an added feature, in the course of its estimation MFR also provides important panel diagnostics. In particular, the variance of the coefficients on the xi provides an indicator of heterogeneity in the panel. Where these variances are large compared to their respective coefficients, the researcher must treat the causality estimates from any estimation procedure as highly suspect<sup>5</sup>.

Weinhold (1996) uses simulations to demonstrate how such a specification outperforms traditional panel data causality procedures (such as Holtz-Eakin et al. (1988)) in the presence of heterogeneity. MFR estimated coefficients, standard errors, and variance of the indicated causal variables are reported in Tables 5. Hurlin (2004) adapts a simple Granger (1969) causality test for heterogeneous panel data models with fixed coefficients. Granger (1969) posits that for each individual (country) the variable x is causing y if we are better able to predict y using all available information than if we exclude x. Hurlin (2004), thus, contends that if x and y are observed on N individuals, we should be able to determine the optimal information set used to forecast y. The basic idea is to assume that there exists a minimal statistical representation common to x and y for at least a subgroup of individuals. Granger (1969) causality applies to homogenous time series when N causality relationships exist and when the individual predictors of y obtained conditionally on past values of y and x are identical. Heterogeneity exists when the individual predictors of y are not the same across

<sup>2</sup> Pesaran (1992, 1995) argues that the imposition of homogeneity assumptions on the coefficients of lagged dependent variables, when in fact the dynamics are heterogeneous across the panel, can lead to serious biases that cannot be corrected with instrumental variables estimation.

<sup>3</sup> Coondoo and Dinda (2002) used panel data Granger causality to test for causality between pollution and per capita GDP.

<sup>4</sup> To save on space the results from contemporaneous correlations or the Holtz-Eakin type of dynamic panel (based on one lag and no differencing) will not be reported. However, the model is the first difference of the one-lag model. Using two lags did not change the results.

<sup>5</sup> Following NW, the RHS variables are orthogonalized. As explained by NW, MFR is achieved through a transformation formula developed by Hsiao (1989). To do this transformation, we used a modified version of the code available on Weinhold's (1996) web site.

countries. Hurlin (2004) and Hurlin and Venet (2001) incorporated Granger causality testing between variables  $x$  and  $y$ , taking into account potential cross-sectional heterogeneity in the panel by distinguishing between the heterogeneity in the causal relationship between  $x$  and  $y$ , and the heterogeneity of the data generating process (DGP). This is done by distinguishing between a heterogeneous non-causality (HENC) hypothesis and a homogenous non-causality (HNC) hypothesis adopted by Holtz-Eakin and al. (1988). Under HENC, causality between two variables (not necessarily with the same DGP) may be present in one subgroup of countries and absent in another.

Following Hurlin (2004), a Granger non-causality test statistic is generated by averaging standard individual Wald statistics. Hurlin and Venet (2001) and Hurlin (2004) characterize the distribution of this estimator and provide approximations for its first moments. From this characterization, an approximated standardized average Wald statistic is proposed to test the heterogeneous non-causality hypothesis (HNC) for small  $T$  and  $N$  sample. Hurlin's (2004) model is:

$$y_{it} = \alpha_i + \sum_{k=1}^K \gamma_i^{(k)} y_{i,t-k} + \sum_{k=1}^K \beta_i^{(k)} x_{i,t-k} + \varepsilon_{i,t}$$

where  $\varepsilon_{i,t}$  are iid with  $E(\varepsilon_{i,t}) = 0$  and  $E(\varepsilon_{i,t}^2) = \sigma_{i,t}^2$  finite heterogeneous variances.  $x$  and  $y$ , observed on  $T$  periods and  $N$  individuals, are covariance stationary variables.  $\alpha_i$  are assumed to be fixed. Lag orders  $K$  are identical for all cross-section units of the panel and the panel is balanced. Autoregressive parameters  $\gamma_i^{(k)}$  of the lagged dependent variables and  $\beta_i^{(k)}$  regression coefficients of the explanatory variables are different across groups. Importantly, unlike Weinhold (1999) and Nair-Reichert and Weinhold (2001), parameters  $\gamma_i^{(k)}$  and  $\beta_i^{(k)}$  are both constant, not random. That is, the model has fixed coefficients with fixed individual effects. Unlike Holtz-Eakin et al. (1988), Hurlin's (2004) causality is more general where non-causality may exist for  $N_1 < N$  individual processes with no causality from  $x$  to  $y$ , while causality may exist for  $N_1 + 1, N_1 + 2, \dots, N$ .

If  $N_1 = 0$ ,  $x$  Granger causes  $y$  for all individuals, irrespective of the homogeneity (or lack thereof) of the data generating process. Likewise, if  $N_1 > 0$  then the causality relationship is heterogeneous. To allow for the possibility of non-causality in a subgroup  $N_1$  and possible causality in other subgroups  $N_1 + 1, N_1 + 2, \dots, N$ , Hurlin (2004) proposed using the average of individual Wald statistics to test the homogeneous non-causality hypothesis (HNC) for subgroups (low-income, middle-income, oil, non-oil countries),  $i=1, \dots, N$ , such that<sup>6</sup>:

$$W_{N,T} = \frac{1}{N} \sum_{i=1}^N W_{i,T}$$

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<sup>6</sup>  $W_i$  are generated as summation of the F-statistic,  $(K/N)\sum F_i$ , where:  $F_{K,df_u-df_r} = \frac{(RSS_r - RSS_u)/K}{RSS_u/(df_u - df_r)}$  where  $RSS_r$  = restricted sum of squared residual and  $RSS_u$ = unrestricted sum of squared residuals computed from equation (1);  $K$ = number of lags or number of parameters  $\beta_i^{(k)}$ ;  $df_u$  and  $df_r$  are the degrees of freedom of unrestricted and restricted regressions, respectively;  $df_u - df_r = T - 2K - 1$ ; and  $T$ = number of years.

### *3.2 Empirical Results*

Table 3 displays the descriptive statistics. The standard deviation and range between the minimum and maximum show that in MENA the lending rates and deposit rates spreads are very high. That is, the high lending rates are used as a tool of rationing credit and slowing down the banking development process. It is also clear that inflation and the interaction of economic growth with the rule of law are highly volatile. Similarly, the interaction of GDP growth with government regulation shows high volatility.

We test for causality rather than perform correlation-based regressions, using MFR (Table 5) as well as Hurlin's (2004) approach. A summary of the causality results is included in Table 6. The two approaches yield similar causality results. This enhances the reliability of the results and their policy implications. Each of the two approaches provides a different set of useful information about the data. Specifically, Wald statistics show causality results that are based on dynamic fixed effects heterogeneous panel data. MFR results are dynamic, mixed, fixed, and random effects panel data analyses, displaying signs and variances of the coefficients. To mitigate heterogeneity, the sample countries have been subdivided into low and middle income countries, and for comparative purposes, the results for the entire sample have been produced.

Using the Hurlin (2004) approach, Table 4 shows that in all countries there is bidirectional causality between banking and economic growth. This emphasizes that banking and growth are simultaneously determined. The results are consistent with our theoretical findings which found similar feedback causality. However, the MFR methodology revealed more information – that the two-way causality of economic growth exists only with the interaction variable of banking and the rule of law, indicating that without application of the rule of law, banking development may not cause economic growth.

In all countries the interaction of the banking system with the rule of law is significant. That is for banking to be effective in economic development, the rule of law has to apply. Laeven and Giovanni (2003) have found that judicial efficiency and low inflation decrease the cost of credit from banks. In fact, the rule of law causes a significant and positive impact on economic growth. As expected, inflation negatively impacts growth and banking development. Regulation is also significant and negatively impacts economic growth.

Notice that banking development is defined as the size of credit to the private sector (credit to the private sector as a ratio of GDP) plus credit rationing (the spread between the lending and deposit rates). Thus, causality running from economic growth to banking indicates banking development and loosening of credit rationing. Mitigation of credit rationing is also indicative of lower (negative change) regulations (market imperfections) as the results clearly show. Also, the feedback causality going from banking development to economic growth shows that banks are financing productive projects, despite the existence of credit rationing.

## **4. Policy Recommendations**

Several economic studies and country experiences support the financial liberalization policy arguing that it leads to increased domestic saving and investment. Our analysis suggests that, in order to be growth-enhancing, this policy should be coupled with an improvement of the institutional environment. It is particularly urgent to modernize the judicial system (and let's say the entire administrative procedure that takes part of the litigation process), improve the legal framework and reduce corruption and informal activities which are partly responsible of the high levels of non-performing loans. Indeed, the theoretical and empirical models show that the banking development enhances economic growth conditioning on the quality of the

institutional environment. Reciprocally, economic growth will lead to a more developed banking system when the quality of the institutional environment is not mediocre.

## **5. Conclusion**

This paper seeks to provide some theoretical and empirical answers to the following question: Does the institutional environment affect the causality relationship between banking development and economic growth? In the theoretical part of this paper an endogenous growth model is developed where the institutional environment is captured through two indicators : the judicial system efficiency and the easiness to trade informally. We show that an improvement of the institutional environment reduces the proportion of defaulting entrepreneurs. This enhances the positive effect of banking on economic growth. Besides, we show that the interest rate spread is endogenously determined and decreases with the quality of the institutional environment. The empirical analysis shows a bidirectional causality banking development and economic growth. Causality runs from banking development to economic growth. Thus, a more developed banking system finances more successful productive projects. An important result that elucidates the theoretical findings is that causality direction is more intense in countries with more developed institutional environment (measured by the rule of law and regulation). The feedback causality, running from economic growth to banking, indicates that a more developed economy has a more developed banking system. This implies that the credit to the private sector increases and the interest spread diminishes as the economy develops for a given institutional environment.

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## Appendix

### Proof of Proposition 1

Let's omit the time index  $t$  from notation. Using equation (3) we have  $1 + r^t = (1 + \varepsilon^*)\beta$  where  $\beta = (1 - \gamma)(1 - \lambda)$  and replacing it in (8) we find that the productivity shock threshold  $\varepsilon^*$  is solution of the equation  $g(\varepsilon) = h(\varepsilon)$  on  $[-\varepsilon_m, \varepsilon_m]$  where

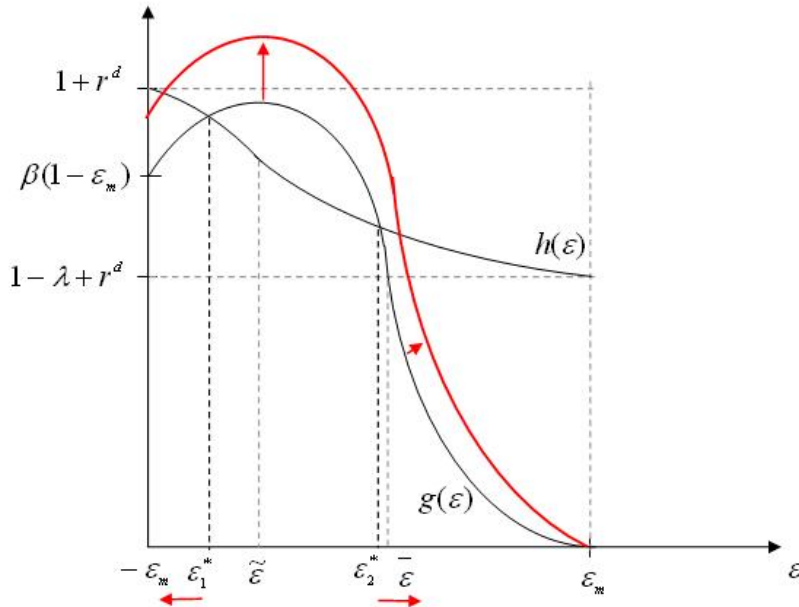
$$\begin{aligned} g(\varepsilon) &= \beta(1 + \varepsilon)p(\varepsilon) \\ h(\varepsilon) &= 1 + r^d - \lambda[1 + s(\varepsilon) - p(\varepsilon)] \end{aligned}$$

Let's analyze some properties of the functions  $g$  and  $h$ . First, noting that  $p(-\varepsilon_m) = 1$  and  $p(\varepsilon_m) = 0$  we have  $g(-\varepsilon_m) = \beta(1 - \varepsilon_m) > 0$  and  $g(\varepsilon_m) = 0$ . Second, noting that  $s(-\varepsilon_m) = s(\varepsilon_m) = 0$  we have  $h(-\varepsilon_m) = 1 + r^d$  and  $h(\varepsilon_m) = 1 - \lambda + r^d > 0$ . Besides, noting that  $p'(\varepsilon) = \partial p / \partial \varepsilon = -f(\varepsilon) < 0$  and  $\partial s / \partial \varepsilon = -\varepsilon p'(\varepsilon) > 0$  we obtain

$$\begin{aligned} g'(\varepsilon) &= -\beta(1 + \varepsilon)f(\varepsilon) + \beta p(\varepsilon) \\ h'(\varepsilon) &= -\lambda[s'(\varepsilon) - p'(\varepsilon)] = -\lambda(1 + \varepsilon)f(\varepsilon) < 0 \end{aligned}$$

$$\begin{aligned} g''(\varepsilon) &= -\beta[(1 + \varepsilon)f'(\varepsilon) + 2f(\varepsilon)] \\ h''(\varepsilon) &= -\lambda[(1 + \varepsilon)f'(\varepsilon) + f(\varepsilon)] \end{aligned}$$

Let's remember the classic property of the symmetric distribution function  $f$ : there is  $\varepsilon$  in  $[-\varepsilon_m, \varepsilon_m]$  such that  $f' \geq 0$  over  $[-\varepsilon_m, \varepsilon]$  and  $f' \leq 0$  over  $[\varepsilon, \varepsilon_m]$ . Therefore, there exists  $\varepsilon$  in  $[-\varepsilon_m, \varepsilon_m]$  such that  $g'' \leq 0$  over  $[-\varepsilon_m, \varepsilon]$  and  $g'' \geq 0$  over  $[\varepsilon, \varepsilon_m]$ . Similarly, there exist  $\varepsilon$  in  $[-\varepsilon_m, \varepsilon_m]$  such that  $h'' \leq 0$  over  $[-\varepsilon_m, \varepsilon]$  and  $h'' \geq 0$  over  $[\varepsilon, \varepsilon_m]$ . Hence, it is easy to show that the equation  $g(\varepsilon) = h(\varepsilon)$  have at most two solutions:  $\varepsilon_1^* < \varepsilon_2^*$ . The following figure represents a possible configuration of two solutions and how they move if  $\beta$  increases.



In this case, it is the solution  $\varepsilon_1^*$  which takes place in practice. Indeed, remember that for a given institutional environment ( $\beta$  is given) the default threshold is linked to the lending interest rate through the following relation  $1 + r^t = (1 + \varepsilon^*)\beta$ . Since we assume that the banking system is perfectly competitive, therefore banks will charge the lowest interest rate

that insure a zero profit which corresponds to a minimum unsuccessful projects or equivalently to  $\varepsilon_1^*$ . Note that in the region  $]-\varepsilon_m, \varepsilon_m[$  the profit is strictly positive. The previous figure shows that an increase of  $\beta$  decreases  $\varepsilon_1^*$ . Hence, an increase of the judicial system efficiency (an increase of  $\lambda$ ) or a more costly informal trade (a decrease of  $\gamma$ ) will decrease  $\varepsilon_1^*$  and increase the proportion of successful projects. Let's analyze analytically how  $\varepsilon^*$  a solution of  $g(\varepsilon) = h(\varepsilon)$  will vary if  $\gamma$  or  $\lambda$  varies. Simple algebra calculus based on differentiation of (8) relatively to  $\gamma$  respectively to  $\lambda$  gives us the following equations :

$$\begin{aligned}\Delta(\varepsilon^*) \frac{\partial \varepsilon^*}{\partial \gamma} &= p(\varepsilon^*)(1 + \varepsilon^*)(1 - \lambda) > 0 \\ \Delta(\varepsilon^*) \frac{\partial \varepsilon^*}{\partial \lambda} &= [1 - \gamma(1 + \varepsilon^*)]p(\varepsilon^*) - 1 - s(\varepsilon^*) < 0\end{aligned}$$

where

$$\Delta(\varepsilon^*) = g'(\varepsilon^*) - h'(\varepsilon^*) \quad (10)$$

Hence, if  $\Delta(\varepsilon^*) > 0$  we obtain  $\partial \varepsilon^* / \partial \gamma > 0$  and  $\partial \varepsilon^* / \partial \lambda < 0$ . From the previous figure this is the case of the economically acceptable solution  $\varepsilon_1^*$  which verifies  $g'(\varepsilon^*) > h'(\varepsilon^*)$  or equivalently  $\Delta(\varepsilon_1^*) > 0$ .

*Proof of Corollary 1*

From proposition 1 we showed that  $\partial \varepsilon^* / \partial \gamma > 0$  and  $\partial \varepsilon^* / \partial \lambda < 0$ . This implies  $\partial p(\varepsilon^*) / \partial \gamma < 0$ ,  $\partial p(\varepsilon^*) / \partial \lambda > 0$ ,  $\partial s(\varepsilon^*) / \partial \gamma > 0$  and  $\partial s(\varepsilon^*) / \partial \lambda < 0$  where  $p(\varepsilon_t^*) = \int_{\varepsilon_t^*}^{\varepsilon_m} f(\varepsilon_h) d\varepsilon_h$  and  $s(\varepsilon_t^*) = \int_{-\varepsilon_m}^{\varepsilon_t^*} \varepsilon_h f(\varepsilon_h) d\varepsilon_h$ . From equation (9) it is obvious that

$$\frac{\partial (k_{t+1}/k_t)}{\partial \gamma} < 0$$

To show that  $\partial (k_{t+1}/k_t) / \partial \lambda > 0$  some algebra should be done. From (9) we have

$$\frac{\partial (k_{t+1}/k_t)}{\partial \lambda} = (1 - \alpha)(1 - \gamma) \left[ \frac{\partial \varepsilon_t^*}{\partial \lambda} (1 - \lambda)(p' - s') - (p - s - 1) \right]$$

From proof of proposition 1 we have

$$\frac{\partial \varepsilon_t^*}{\partial \lambda} = ([1 - \gamma(1 + \varepsilon_t^*)]p - 1 - s) / \Delta$$

Replacing it in the previous equation shows that  $\partial (k_{t+1}/k_t) / \partial \lambda > 0$  has the same sign as the following term  $\{[1 - \gamma(1 + \varepsilon_t^*)]p - 1 - s\} (1 - \lambda)(1 + \varepsilon_t^*)p' - (p - s - 1)\Delta$  which can be easily shown to be positive using equation (10) and  $\beta = (1 - \gamma(1 - \lambda))$ .

*Proof of Corollary 2*

From equation (3) we have

$$1 + r_t^f = (1 + \varepsilon_t^*)(1 - \gamma(1 - \lambda))$$

Therefore

$$\frac{\partial r_t^f}{\partial \lambda} = \frac{\partial \varepsilon_t^*}{\partial \lambda} (1 - \gamma(1 - \lambda)) + \gamma(1 + \varepsilon_t^*)$$

From proof of proposition 1 we have

$$\frac{\partial \varepsilon_t^*}{\partial \lambda} = ([1 - \gamma(1 + \varepsilon_t^*)]p - 1 - s) / \Delta$$

Replacing it in the previous equation shows that  $\frac{\partial r_t^f}{\partial \lambda}$  has the same sign as the following term

$$\gamma(1 + \varepsilon_t^*)\Delta + \{1 - \gamma(1 - \lambda)\} \{[1 - \gamma(1 + \varepsilon_t^*)]p - 1 - s\}$$

which can be easily shown to be negative using equation (10) and  $\beta = (1 - \gamma(1 - \lambda))$ . The

proof of  $\frac{\partial r_t^f}{\partial \gamma} > 0$  is based on a similar reasoning.

**Table 1: Country List****Countries**


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Algeria  
 Bahrain  
 Cyprus  
 Egypt  
 Iran  
 Iraq  
 Israel  
 Jordan  
 Kuwait  
 Lebanon  
 Libya  
 Malta  
 Morocco  
 Oman  
 Qatar  
 Saudi Arabia  
 Sudan  
 Syria  
 Tunisia  
 Turkey  
 UAE  
 Yemen

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**Table 2: Variable definitions**

<b>Var</b>	<b>Definition</b>	<b>Source</b>
law	Law and order	International County Risk Guide (ICRG)
infl	Inflation	World Bank Development Indicators (WB)
banking	Private credit/GDP +spread	International Financial Statistics (IFS), WB
regulation	Credit to government/total credit	IFS and WB
spread	Lending rate-deposit rate	IFS
gdppc	Natural log of per-capita GDP	WB
banklaw	banking*law	
bankreg	banking*regulation	
gdplaw	gdppc*law	
gdpreg	gdppc*reg	

**Table 3: Descriptive Statistics**

Low Income					
Variable	Obs	Mean	Std. Dev.	Min	Max
law	220	3.257	1.342	0	6
banking	129	0.092	0.246	-0.029	2.533
regulation	219	0.418	1.030	-1.037	15.079
gdppc	223	7.962	0.753	6.215	9.041
spread	136	5.118	3.570	-2.950	23.12
infl	219	19.466	26.193	-9.809	132.824

Middle Income					
Variable	Obs	Mean	Std. Dev.	Min	Max
law	251	3.823	1.413	1	6
banking	150	0.170	0.496	0.004	3.847
regulation	229	0.099	2.612	-20.890	29.712
gdppc	181	9.483	0.550	6.445	10.415
spread	179	8.79	37.4	0.41	385
infl	194	11.535	50.250	-9.892	487.578

**Table 4: Hurlin Summary**

Income	Dep var	Caus var	Wald	DFr	DFur	Nr	Nur	Groups
Overall	g(banking)	g(gdppc)	60.551	98	80	194	188	12
Overall	g(gdppc)	g(banking)	3.352	102	80	198	188	12
Low	g(banking)	g(gdppc)	1.838	45	36	93	90	6
Low	g(gdppc)	g(banking)	4.185	48	35	96	89	6
Middle	g(banking)	g(gdppc)	119.339	53	43	101	97	6
Middle	g(gdppc)	g(banking)	4.185	48	35	96	89	6

**Table 5: MFR Summary**

Dep var: g(banking)	Income Group		
Variable	Overall	Low	Middle
L.g(law)	.069***	0.110***	-0.004
L.g(infl)	.0129***	0.014	0.012***
L.g(regulation)	-0.004	-0.008	0.006
L.g(gdppc)	0.001	0.010	0.004*
L.g(gdpreg)	-0.007	-0.017	0.004
L.g(gdplaw)	-0.018***	-0.017*	-0.016**
Cons	0.082*	0.247***	0.048*
N	204	106	98
Number of groups	12	6	6

Dep var: g(gdpc)	Income Group		
Variable	Overall	Low	Middle
L.g(law)	0.356***	0.315***	0.346***
L.g(infl)	-0.041***	-0.079**	-0.008
L.g(banking)	0.052***	-0.016	0.016
L.g(regulation)	-0.080***	-0.058	-0.061***
L.g(bankreg)	-0.010	-0.034	0.018
L.g(banklaw)	-0.190***	-0.152***	-0.193***
Cons	8.610***	8.423***	8.803***
N	214	115	99
Number of groups	12	6	6

**Table 6: Causality Summary**

<b>Income</b>	<b>Dep Var</b>	<b>Caus Var</b>	<b>Wald</b>	<b>MFR</b>
Overall	g(banking)	g(gdppc)	60.551	0.001
Overall	g(gdppc)	g(banking)	3.352	0.052***
Low	g(banking)	g(gdppc)	1.838	0.010
Low	g(gdppc)	g(banking)	4.185	-0.016
Middle	g(banking)	g(gdppc)	119.339	0.004*
Middle	g(gdppc)	g(banking)	4.185	0.016