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# Revisiting the Finance-Growth Nexus: Further Evidence from Tunisia

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Riadh BEN JELILI\*

## **Abstract:**

The aim of this paper is to analyze the relationship between financial development and economic growth in terms of intersectoral spillovers. The econometric investigations are performed using a dynamic theoretical framework consistent with Feder (1983). For this purpose, yearly national accounts data for Tunisia during the period 1972-2008 are exploited. One of the principal motivations of this investigation goes back to the fact that the issue of the role of the financial factor in economic development in Tunisia is not adequately researched. This paper should be viewed as an attempt to fill this gap. The empirical estimations show significant externalities from the financial services industry to the real economy.

*JEL classification:* O16, O41, O55, C32

*Keywords:* Financial development; Two-sector growth model; Tunisia; Time series models

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\*Arab Planning Institute, P.O.Box 5834 Safat 13059 State of Kuwait.  
Email: [riadh@api.org.kw](mailto:riadh@api.org.kw), Tel: (965) 24843130-24844061-24848754, Ext 225.

# 1. Introduction

The significance of financial development as a means of stimulating economic growth has been a source of theoretical debate and controversy in the literature during the past few decades<sup>1</sup>. The issue is crucial in testing for empirical relevance of several theories that have been advanced on the finance-growth nexus, influencing the priority that policy makers in developing countries attach to reforming financial sector policies.

Indeed, over the last two decades, Tunisia like many other countries in the Middle East and North Africa (MENA) region has experienced a wave of liberalization in the financial sector with an expectation that the deregulation of domestic financial markets and the liberalization of the capital account will strengthen financial development and contribute to higher long-run growth. A careful investigation of the results from these experiences provides additional evidence of whether the financial sector causes economic growth. However, it should be noted that the study of this issue in the context of MENA countries seemed to be somewhat scanty compared to other regions of the world. The lack of reliable long time series explains partly this fact.

One of the few studies focusing on Tunisia was undertaken by Ghali (1999). Based on time series data over the period 1963-1993 and Granger causality tests within a bivariate VAR methodology, the study found some support to the supply-leading hypothesis according to which financial deepening promotes economic growth. To assess the robustness of his findings, the author used two measures of financial development, i.e., bank deposit liabilities/GDP ratio and private credit/GDP ratio.

Using nearly the same methodology, Boulila and Trabelsi (2004) explore the causality between financial development and economic growth considering a panel of MENA countries including Tunisia for different periods ranging from 1960 to 2002. Unlike the results obtained by Ghali, the empirical evidence presented in this paper either with cointegration techniques or granger causality tests does not corroborate the hypothesis that finance is a leading factor in the determination of long-run growth in the concerned region. However, the results provide weak support for the hypothesis that causality is running from the real sector to the financial one.

Achy (2005) assesses empirically the effect of domestic financial liberalization, considered as prerequisite for strengthening financial development, on economic performance for a sample of five MENA countries and finds that domestic financial liberalization impacts negatively private investment and economic growth over the 1970-1998 period. According to the author, financial liberalization seems to have led to further

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<sup>1</sup> Levine (2005) provides an excellent overview of the literature on economic growth and financial development. Likewise, Beck (2008) reviews brilliantly different econometric methodologies to assess the relationship between financial development and growth.

distortion of credit allocation in favor of consumption at the expense of productive activities.

Ben Naceur, Ghazouani and Omran (2008) have conducted an empirical study using a sample of 11 countries from the MENA region over the 1979–2005 period to investigate the implications of stock market liberalization on economic and investment growth and on the financial system development in the region. Their main finding was that stock market liberalization seems to have an immediate negative impact on stock market development but this impact turns positive and significant in the long run. The authors failed to find any significant relationship between stock market liberalization and both private investment and real growth whether in the short or long run.

Al-Zubi *et al* (2008) examine the link between financial development and economic growth for a set of eleven Arab countries, including Tunisia, during the period 1980-2001. The empirical investigation revealed no significant and strong positive relationship between the most commonly used financial indicators and growth rate per capita GDP in the Arab countries.

Abu-Bader and Abu Qarn (2008) study the causal relationship between financial development and economic growth in six MENA countries for the past five decades, within a quadripartite VAR framework including the investment/GDP ratio to determine whether financial development affects economic growth through enhancing efficiency or indirectly by increasing resources for investments. The empirical results show some evidence for unidirectional causality running from financial development to economic growth. In the case of Tunisia, marginal evidence for indirect causality from financial development to economic growth was detected but for only one financial measure.

More recently, Kar *et al* (2011) investigate the direction of causality between financial development and economic growth using a panel of fifteen MENA countries for the period 1980–2007. The empirical results show that there is no clear consensus on the direction of causality between financial development and economic growth for all measurements of financial development and it is also observed that the findings are country specific.

Having briefly browsed through the most important published studies which focused on MENA countries including Tunisia, it is clear that there is no general consensus on the relationship between financial development and economic growth in terms of the role and importance of finance on growth and the direction of causality. The extent of the magnitude of the relationship between finance and growth remains very much debatable, and contingent upon the financial development indicators used, the estimation method, data nature and frequency, and the functional specification. It is also obvious that empirical causality evidence based on time series in the MENA region remains relatively scarce given the scarcity of sufficiently long time national account series. This suggests

that there is much room for future research in this area, and reinforces the conviction that a more rigorous country specific study on this issue is needed. Moreover, most of the aforementioned studies suffer from two major shortcomings. In almost all cases, the testing frameworks employed in such empirical studies are ad hoc, without standard theoretical foundations. In addition, the most commonly used measure of financial sector development, financial depth, is difficult to interpret because it can be a reflection of economy wide leverage as well as the quality and quantity of intermediation in the considered country<sup>2</sup>.

It is indeed with this objective in mind that the present study is undertaken as an attempt to correct for the above defects. Inspired by the Feder's dualistic approach (Feder,1983), a framework for conducting empirical tests of the effect of financial development on economic growth is proposed and applied to time-series national accounts data for Tunisia for the period 1972-2008<sup>3</sup>. The appeal of this approach lies in the appearance of a direct link from the theoretical model to the econometric specification. The approach also provides a convenient solution to the issue of data paucity in many developing countries (Gemmell and Lloyd 2002), which explains partly the scarcity of studies with a focus on measuring and assessing financial sector development and its impact on growth in the MENA region.

The rest of the paper is organized as follows. Section 2 presents the theoretical framework. An overview of the financial sector development and reforms in Tunisia is presented in Section 3. Section 4 then introduces the data and discusses the empirical results. Some concluding remarks are expressed in the final section.

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<sup>2</sup> Four classical proxies of financial depth are generally considered: broad money or M2 as a percentage of GDP, deposit money banks assets as a share of total assets, private credit by deposit money banks to GDP, and private credit by deposit money banks to total domestic credit. These simple quantitative measures may sometimes give a misleading picture of financial development. Indeed, although a higher ratio of broad money to GDP is generally associated with greater financial liquidity and depth, the ratio may decline rather than rise as a financial system develops because people have more alternatives to invest in longer-term or less liquid financial instruments.

<sup>3</sup> In an influential contribution to the empirical growth research, Feder (1983) proposed an approach that recognized the importance of dualism or technology differences between sectors by incorporating into a neoclassical growth model a productivity differential and externality spillovers between export and non-export sectors. The same approach was later adapted to several other dichotomies, e.g., a military and civilian (Biswas and Ram, 1986; Batchelor, Dunne and Saal, 2000), government and non-government (Ram 1986,1989; Wang 2002), agriculture and manufacturing (Dowrick and Gemmell 1991; Gemmell, Lloyd and Mathew, 2000) and financial and real sectors (Odedokun 1996; Wang 2000, Bourgain and Pieretti, 2007).

## 2. The theoretical framework

The basic two-sector model distinguishes between real sector output ( $R$ ) and financial sector output ( $F$ ). It is assumed that both sectors employ homogeneous labor ( $L$ ) and capital ( $K$ ), and financial production has external effects on real sector production:

$$R(t) = R(L_R(t), K_R(t); F(t)) = F(t)^\theta r(L_R(t), K_R(t)) \quad (1)$$

$$F(t) = F(L_F(t), K_F(t)) \quad (2)$$

In equation (1),  $F$  represents externalities rather than an input since firms in the real goods sector are assumed to ignore financial sector outputs in their profit maximizing decisions.

The factor endowment constraints are given by:

$$L(t) = L_R(t) + L_F(t) \text{ and } K(t) = K_R(t) + K_F(t) \quad (3)$$

Domestic output is defined as:

$$Y(t) = R(t) + F(t) \quad (4)$$

The model allows the values of the marginal productivities of both labor ( $\partial F/\partial L_F, \partial R/\partial L_R$ ) and capital ( $\partial F/\partial K_F, \partial R/\partial K_R$ ) to differ across sectors by a constant uniform proportion  $\delta$ :

$$\partial F(t)/\partial L_F(t)/\partial R(t)/\partial L_R(t) = \partial F(t)/\partial K_F(t)/\partial R(t)/\partial K_R(t) = 1 + \delta \quad (5)$$

In the long-run equilibrium, in a perfectly flexible economy,  $\delta$  must be equal to zero. But this would be highly unlikely in any actual economy due to institutional barriers impeding free movements of factors from one sector to another<sup>4</sup>. In any case, the model should not impose the existence of any productivity differentials. Instead, it is set up with the possibility of testing for them. However, the formulation assumes, in an ad-hoc manner, that the productivity differential between sectors is the same for all inputs.

By differentiating aggregate output identity (4) with respect to time (omitted for simplicity), substituting from (1) into (3), and making use of (5), the following growth equation can be derived:

$$\frac{dY}{Y} = \frac{\partial R}{\partial L_R} \frac{dL}{Y} + \frac{\partial R}{\partial K_R} \frac{dK}{Y} + \left( \frac{\delta}{1 + \delta} + \frac{\partial R}{\partial F} \right) \frac{F}{Y} \frac{dF}{F} \quad (6)$$

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<sup>4</sup> General sources of productivity differences as discussed in the literature include sectoral disparities in terms of technological progress, informational asymmetries, government taxes and subsidies, and monopoly power.

Using the fact that the final term in (6) involves a constant elasticity of  $R$  with respect to  $F$ , (6) can be rewritten in the form:

$$\dot{Y} = \frac{\partial R}{\partial L_R} \frac{dL}{Y} + \frac{\partial R}{\partial K_R} \frac{I}{Y} + \left( \frac{\delta}{1 + \delta} - \theta \right) \frac{F}{Y} \dot{F} + \theta \dot{F} \quad (7)$$

where the dot notation indicates proportional rates of change and  $dK = I$  denotes net investment.

Equation (7) allows for the separate identification of the intersectoral externality effect  $\theta$  and the marginal factor productivity differential effect  $\delta$ , also referred to as the size effect of financial sector performance<sup>5</sup>.

In practice, the empirical investigation involves a regression of the form:

$$\dot{Y} = \alpha_1 \frac{dL}{Y} + \alpha_2 \frac{I}{Y} + \alpha_3 \frac{F}{Y} \dot{F} + \theta \dot{F} + \varepsilon \quad (8)$$

where  $\alpha_1 = \frac{\partial R}{\partial L_R}$ ,  $\alpha_2 = \frac{\partial R}{\partial K_R}$ ,  $\alpha_3 = \frac{\delta}{1 + \delta} - \theta$  and  $\varepsilon$  a random error, and where the instantaneous rate of change of the variables are replaced by their discrete equivalents.

It would be possible to estimate a spillover effect from the nonfinancial sector on the financial output by introducing the non-financial output variable into the financial sector's production function. The rationale for this is related to the fact that as the real side of the economy expands, its demands for various financial assets and related services would be expected to increase. These increments are fulfilled by the expansion in financial intermediation.

Equations (1), (2) and (5) can be replaced, respectively, by:

$$F = F(L_F, K_F; R) = R^\gamma f(L_F, K_F) \quad (9)$$

$$R = R(L_R, K_R) \quad (10)$$

$$\partial R / \partial L_R / \partial F / \partial L_F = \partial R / \partial K_R / \partial F / \partial K_F = 1 + \lambda \quad (11)$$

The following growth equation can be derived yielding:

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<sup>5</sup> As rightly emphasized by Dunne *et al.* (2005), the notion of a marginal factor productivity differential between real good and financial sectors in (5) is the source of a number of interpretational pitfalls. In the empirical literature, a non-zero  $\delta$  is usually interpreted to reflect a situation where one sector is less efficient or less productive in its factor use than the other due to the presence of some sort of organizational slack or X-inefficiency afflicting that sector (as in Antonakis (1997), Sezgin (1997) or Al-Mawali (2004), to cite only few). Such an interpretation is inconsistent with the underlying theoretical model insofar the uniformity of the factor productivity differential for both factors is imposed by (5).

$$\dot{Y} = \frac{\partial F}{\partial L_F} \frac{dL}{Y} + \frac{\partial F}{\partial K_F} \frac{I}{Y} + \left( \frac{\lambda}{1+\lambda} - \gamma \right) \frac{R}{Y} \dot{R} + \gamma \dot{R} \quad (12)$$

Equation (12) can then be rewritten into the following estimable form:

$$\dot{Y} = \beta_1 \frac{dL}{Y} + \beta_2 \frac{I}{Y} + \beta_3 \frac{R}{Y} \dot{R} + \gamma \dot{R} + v \quad (13)$$

where  $\beta_1 = \frac{\partial F}{\partial L_F}$ ,  $\beta_2 = \frac{\partial F}{\partial K_F}$ ,  $\beta_3 = \frac{\lambda}{1+\lambda} - \gamma$  and  $v$  a random error.

The previous specifications are static, in the sense that there are no lagged regressors or dependent variables. This can be a major problem in time-series where slow adjustment is pervasive. One way of introducing dynamics is to assume, as in Wang (2000), that agents in the real goods sector form their expectations about the service level produced in the financial sector  $F_t^*$  based on the latter's past performances. If so, a first-order autoregressive adaptive expectation of the financial sector output ought to be considered:

$$F_t^* = \sum_{i=0}^{\infty} \mu(1-\mu)^i F_{t-i} = (1-\mu)F_{t-1}^* + \mu F_t \quad \text{with } |\mu| < 1, \quad (14)$$

An increase in  $\mu$  implies that agents depend more heavily on the current information ( $F_t$ ) when they form their expectations. The expected level of  $F_t$ , with its effect on the externality onto the real goods sector, is a weighted average of all present and previous values of  $F_t$  given that the weights  $\sum_{i=0}^{\infty} \mu(1-\mu)^i = 1$ . Note that when  $\mu = 1$ ,  $F_t^*$  must be equal to  $F_t$  and agents would be myopic, given that they rely completely on current information as they form their expectations.

Equation (1) is then modified as follows:

$$R = R(L_R, K_R; F^*) = F^{*\theta} r(L_R, K_R) \quad (15)$$

The system now includes equations (2), (3), (4), (5), (14) and (15). An equivalent equation to (7) is then derived as:

$$\dot{Y} = \mu \frac{\partial R}{\partial L_R} \frac{dL}{Y} + \mu \frac{\partial R}{\partial K_R} \frac{I}{Y} + \mu \left( \frac{\delta}{1+\delta} - \theta \right) \frac{F}{Y} \dot{F} + \mu \theta \dot{F} + (1-\mu) \dot{Y}_{-1} \quad (16)$$

In a fairly similar manner, and on the assumption that agents in the financial sector react to their adaptive expectations of the real sector performance  $R^*$ , the dynamic growth equation can be expressed as:

$$\dot{Y} = \pi \frac{\partial F}{\partial L_F} \frac{dL}{Y} + \pi \frac{\partial F}{\partial K_F} \frac{I}{Y} + \pi \left( \frac{\lambda}{1+\lambda} - \gamma \right) \frac{R}{Y} \dot{R} + \pi \gamma \dot{R} + (1-\pi) \dot{Y}_{-1} \quad (17)$$



Equations (16) and (17) will represent the basis for the empirical investigation carried out in this paper. Given the possibility of simultaneity in generating externalities, these equations can be treated in the estimation procedure as a system of equations.

### **3. Brief review of financial reforms in Tunisia**

Over the last two decades, Tunisia has experienced a wave of liberalization in the financial sector, as an integral part of a structural adjustment program, with an expectation that the deregulation of domestic financial markets and the liberalization of the capital account will strengthen financial development, increase effective mobilization of domestic savings and achieve more efficient allocation of resources, contributing to higher long-run growth. With the adoption of the structural adjustment program in 1986, the government undertook considerable changes in the laws and institutions of the financial sector. In particular, substantial steps towards liberalization were taken in the areas of monetary policy, tax law, and banking and supervisory regulations<sup>6</sup>.

Since 1986, the Central Bank (BCT) has sought to replace its old policies of credit allocation and interest rate control with a greater reliance on money market operations to adjust the money supply and manage inflation. Interest rates on term deposits of at least three months were liberalized and rates on special saving accounts were pegged on the money market rate (TMM) of the preceding month. Lending rates, except those to priority sectors, were allowed to be set freely within a spread of 3 percentage points above the TMM. However, it had taken one decade since the launch of the reforms to abolish preferential interest rates for priority sectors (late 1996).

The requirement for prior authorization of loans by the BCT was eliminated in 1988. In 1991, mandatory holding of treasury debt instruments by banks was relaxed. In 1994 the obligation for banks to subscribe to, and hold treasury bills was abolished. New banking laws granted increased autonomy to the BCT and introduced prudential regulations in line with international standards. Amendments to the banking laws in 1994 had laid the ground for full integration of specialized institutions in the banking system, and establishing the legal foundation for investment banks and a deposit insurance fund. Banks had also been required to have their accounts certified by external auditors.

As expected, the reforms implemented have had a significant progressive impact on financial intermediation and the structure of the financial sector. Monetization and the volume of intermediation increased, as reflected in a rising ratio of the money supply M2 to GDP (nominal GDP lagged by one period). In 1986 the average monetary assets were around 46.5 percent of GDP, reaching 60.4 percent of the GDP in 2008. Banks credit to the economy rose gradually from 41.2 percent of GDP in 1986 to 53 percent in 2008. Also, the stock market capitalization which barely exceeded one percent of GDP before reforms had reached 12.1 percent in average during the period 2000-2008. In regards to

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<sup>6</sup> For more details on financial reforms undertaken in Tunisia see Jbili *et al.* (1997).

non-performing loans (NPL), the NPL ratio decreased in 2008 further to 15.5 percent, and loans' provisioning had been brought to an average of 58 percent<sup>7</sup>.

Despite efforts to encourage direct finance, the financial system remains largely dominated by commercial banks, most of which are state-controlled, and the public banks continue to play a dominating role in the financing of the economy. The banking system in a broad sense includes 21 universal banks<sup>8</sup>, 8 offshore banks, 11 leasing companies, two factoring companies, and two merchant banks. Following two privatization ventures, the first in 2002 and the second in 2005, State banks, local private banks, and foreign banks are currently in position of roughly equal market shares<sup>9</sup>. In January 2008, in the framework of the banking sector restructuring program, the Tunisian-Kuwaiti Bank was privatized through the cession of 60% of its capital to the financial company OCEOR, a subsidiary of the French group Caisse d'Epargne.

#### **4. Data description and estimation results**

Following the definition adopted by the National Institute of Statistics (INS), the financial sector under study in this paper comprises the activities of financial institutions, namely, credit institutions and insurance companies. The real sector comprises manufacturing industries (food industries; textile, clothing and leather industries; chemical industries; mechanical and electrical industries; construction materials, ceramic and glass industries; oil refining industries and miscellaneous industries), and non-financial market services (maintenance and repair; trade; hotel and restaurants service; transport and post and telecommunications).

The annual data used over the period 1972-2008 are taken from national accounts ("Les comptes de la nation") provided by INS. Output in each sector is measured in terms of value added. The aggregate real output is simply the sum of outputs of both sectors. Capital formation and output variables are deflated and expressed in constant prices as of the base year 1990. The employment series are from the "Tunisian Institute of Competitiveness and Quantitative Studies" (ITCEQ).

To implement the empirical methods, all variables must be in their stationary forms, and the augmented Dickey-Fuller (ADF) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test are performed on all data. The results reported in Table 1 indicate that all the variables are stationary.

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<sup>7</sup> To reduce the ratio of NPLs to total loans, which remains significantly high, a proactive policy of loan restructuring, including partial write-offs, with safeguards to avoid moral hazard, is required.

<sup>8</sup> The banking system comprises 21 establishments under the control of the BCT of which five are development banks recently converted into full-service banks, one microfinance bank, one SME financing bank and one Islamic bank

<sup>9</sup> Among the 21 universal banks which count the Tunisian banking system, 11 banks are listed in Tunis Stock Exchange market.

**Table 1**  
Results of unit root tests

		ADF Test	KPSS Test
		H <sub>0</sub> variable has a unit root	H <sub>0</sub> variable is stationary
$\dot{Y}$	Intercept	-7.720***	0.107
$dL/Y$	Intercept and trend	-4.509***	0.041
$I/Y$	Intercept and trend	-3.565**	0.369
$(R/Y)\dot{R}$	Intercept	-7.670***	0.285
$(F/Y)\dot{F}$	Intercept	-5.096***	0.234
$\dot{R}$	Intercept	-7.635***	0.287
$\dot{F}$	Intercept	-5.467***	0.255

About the critical value of ADF and KPSS test, see MacKinnon (1996) and KPSS (1992) respectively.

\*\* Means significantly under 5 percent significance level

\*\*\* Means significantly under 1 percent significance level

In a first step Eqs. (16) and (17) are estimated separately using ordinary least squares (OLS). To test for possible cross-relations between the financial and real sectors these equations are estimated simultaneously by the standard Seemingly Unrelated Regression (SUR) technique, with imposed cross-equation restrictions<sup>10</sup>. The ensuing estimation results are reported in Table 2.

**Table 2**  
SUR Estimation results of Eqs. (16) and (17)

<i>Finance to growth version</i>		<i>Growth to finance version</i>	
Constant	0.020 (1.962)*	Constant	-0.005 (-0.797)
$dL$	0.400 (0.363)	$dL$	-0.783 (-1.631)
$\frac{Y}{I}$	0.057 <sup>a</sup> (2.600)***	$\frac{Y}{I}$	0.057 <sup>a</sup> (2.600)***
$\frac{F}{Y}\dot{F}$	1.991 (3.327)***	$\frac{R}{Y}\dot{R}$	0.917 (19.333)***
$\dot{F}$	<b>0.092</b> (2.506)**	$\dot{R}$	0.054 (1.407)
$\dot{Y}_{-1}$	-0.042 <sup>b</sup> (-1.082)	$\dot{Y}_{-1}$	-0.042 <sup>b</sup> (-1.082)
D79	0.039 (2.536)***	D82	-0.015 (-2.299)**
D82	-0.038 (-2.378)**	D2006	0.013 (2.314)**
D88	0.074 (3.909)***		
R-squared	0.574		0.965
Breusch-Godfrey Serial Correlation LM Test <sup>c</sup>	1.616		4.206
Sum squared residuals	0.008		0.0006

Estimation method SUR with cross equation restrictions: coefficients  $a$  and  $b$  being equal in both version  $t$ -value are in parentheses: \*\*\* indicates significance level of 1%, \*\* indicates significance level of 5% and \* indicates significance level of 10%

<sup>c</sup> Including the lagged endogenous variable biases the Durbin-Watson test towards 2 or towards the null of no autocorrelation, this is not the case of Breuch-Godfrey LM Test. With a calculated value of 1.616 (4.206) and p-value of 0.446 (0.122), the test accept the null hypothesis of no serial correlation up to order 2.

<sup>10</sup> The SUR method, also known as Zellner's method, estimates the parameters of the system, accounting for heteroskedasticity and contemporaneous correlation in the errors across equations (16) and (17).

The estimation generally yields statistically significant coefficients. Introducing year dummies into regressions did substantially improve the estimation results. These dummies were necessary to take account of external economic circumstances that occurred during the considered period. The presence of first order residual autocorrelation has been rejected for both versions. The Jarque-Bera test did not reject the normality of errors (the value of the joint statistics is 3.426 with a P-value of 0.490). To overcome the problem of contemporaneous correlation between  $\dot{F}$  and  $\frac{F}{Y}\dot{F}$  (respectively,  $\dot{R}$  and  $\frac{R}{Y}\dot{R}$ ), the variable  $\dot{F}$  (respectively,  $\dot{R}$ ) was introduced in the regression with a lag of two periods.

Given the non significance of the first-order autocorrelation coefficient, the resulting estimation of the long-run elasticity-parameter  $\theta$  measuring the spillover effects from the financial sector to the non-financial industry is equal to 0.092 and is significant at the 5% level. It is to be noted that  $\theta$  is the elasticity of the real output  $R$  with respect to the financial sector services  $F$  as explicitly assumed in Eq.(2). Moreover, the financial output growth performs better than the share of capital formation in total output  $Y$ , in the sense of having a more important positive effect in promoting total output growth. On the contrary, there is no significant spillover effect from the real sector to the financial industry. This result supports the proposition that the financial development induces real growth in the Tunisian economy after controlling for the factor of productivity differentials between the two sectors. It is consistent with the results found in Ghali (1999) and Abu-Bader and Abu Qarn (2008) even though the methodological approach used in here is completely different.

To assess the structural stability of the finance-to-growth model, we also performed the CUSUMSQ test of stability. It can be seen respectively from Figures 1 and 2 that the plots of the CUSUM and CUSUMSQ statistic is well within the critical bounds implying that all the coefficients in the estimated model are stable.

Figure 1

**Cumulative Sum of Recursive Residuals of Finance to Growth Model**

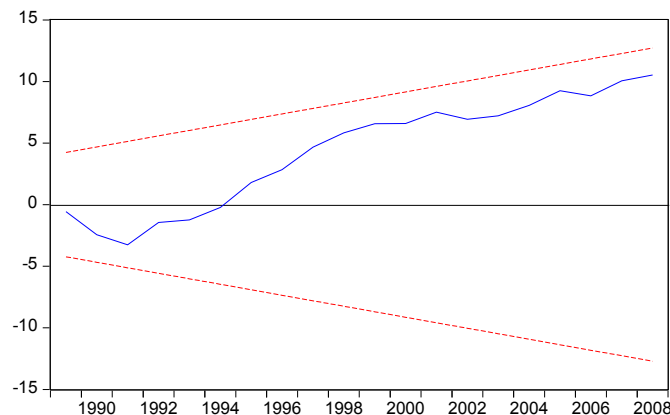
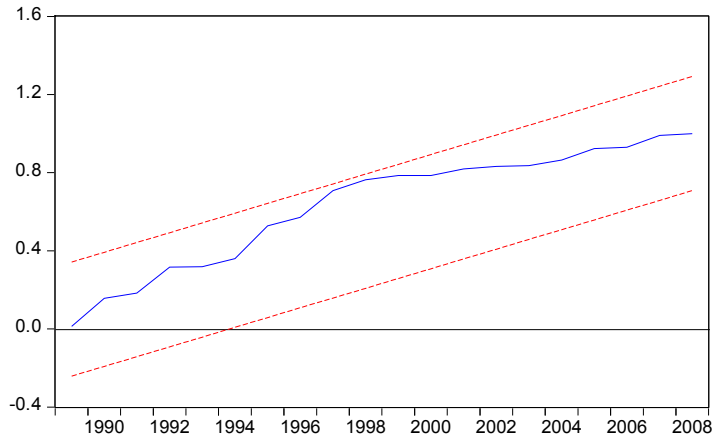


Figure 2

**Cumulative Sum of Squares of Recursive Residuals of Finance to Growth Model**

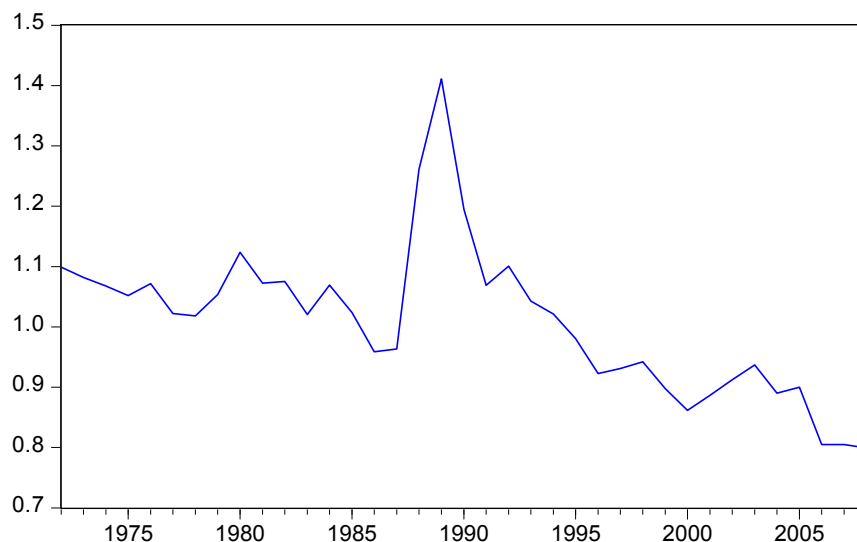


The financial-growth leading marginal externality of each period can be calculated by using the formulas  $\partial R_t / \partial F_t = \hat{\theta}(R_t / F_t)$  where  $\hat{\theta}$  is the estimated coefficient of the long run partial effect of expectations about the financial production on the real output growth. The estimated mean value of the marginal externality is 1.01.

A worth mentioning phenomenon is that the size of the marginal externality of the financial-growth leading version follows a downward trend especially since 1989 (see Figure 3). It is likely that this trend reveals a change in the causality direction in the course of development supporting moderately Patrick's hypothesis (Patrick, 1966) according to which during the early stages of economic development the causality runs from finance to growth, a scenario that should be expected in a developing country like Tunisia, and vice versa in more advanced stages of industrialization.

Figure 3

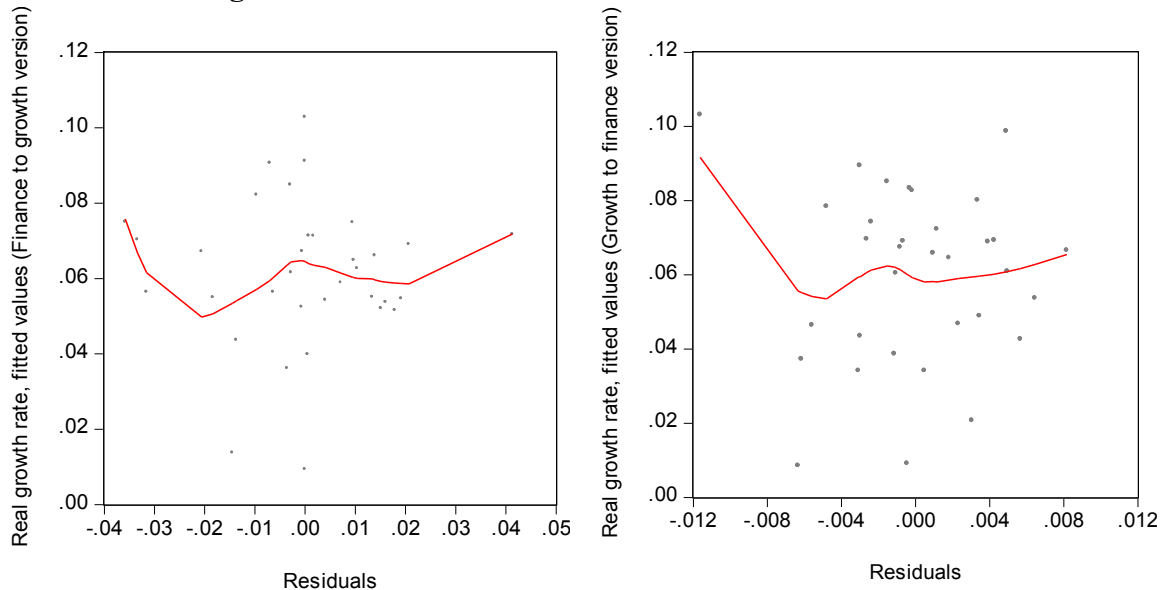
**The Marginal Externality of the Financial-Growth Leading Model**



An initial indication of the presence of non-linearities in the link between finance and growth can be established by looking at the scatterplot of the residuals of equations (16) and (17) against the fitted values and applying the Nearest Neighbor Fit method to these two series (for each version). This non parametric approach fits a local linear regression line for each data point in the sample, weighting the other observations<sup>11</sup>. Data points that are relatively far from the point being evaluated get small weights in the sum of squared residuals, with closer data points receiving higher weights. The resulting nonlinear curves are displayed in Figure 4. They suggest a leveling out of the growth-inducing effects of financial development with the possibility of reversed effect below or beyond a certain threshold<sup>12</sup>. Unfortunately, all attempts to estimate a piecewise-linear model as in Deidda and Fattouh (2002) failed to highlight the suspected nonlinearity in the relationship between financial development and growth in Tunisia.

Figure 4

**The Nearest Neighbor Fit**



<sup>11</sup> Additional discussion of these techniques may be found in Fan and Gijbels (1996)

<sup>12</sup> The notion that financial development can affect growth in a nonlinear way has already been considered by many, e.g., Greenwood and Jovanovic (1990) or Acemoglu and Zilibotti (1997). In these papers, endogenously emerging financial institutions are generally found to have positive effects on growth. The significance of the effects varies positively with the level of economic development. Deidda and Fattouh (2002) and Rioja and Valev (2004a, 2004b) showed that, while being strongly significant at high levels of per-capita income, the linkage between financial development and economic growth is generally weak or insignificant at low levels of per-capita income. More recently, Huang *et al* (2010) investigate the existence of an inflation threshold in the finance–growth nexus. They find strong evidence of a nonlinear inflation threshold in the relationship, below which financial development exerts a significantly positive effect on economic growth, and above which the growth effect of finance appears to be insignificant.

## 5. Conclusions

It is a long-held view of the orthodoxy of the 1970s and early 1980s that liberalizing financial markets would encourage better savings mobilization and greater allocative efficiency of capital, as suggested by the McKinnon-Shaw hypothesis. The underlying belief in the efficiency of financial markets led many to assert that with the implementation of deregulation, higher levels of investment and growth would be achieved. The liberalization process was expected to eliminate inefficiencies in financial intermediation and result in greater depth of the financial system.

Very few country studies at the macro level address the issue of the impact of financial liberalization on growth in Tunisia as one of the early followers of trade and financial liberalization programs in the MENA region. Using a factor productivity approach *à la* Feder (1983) within a linear dynamic framework, this paper contributes to the literature by providing new evidence on the finance-growth nexus in Tunisia. The adopted approach constitutes an alternative to the Granger-causality statistical methodology widely implemented in this literature without clear theoretical under-pinning. Moreover, given the complexity of choosing an appropriate proxy for financial development, the implemented approach doesn't require any individual or composite financial development indicator, and the spillover effect originating from the financial sector is taken into account by introducing the aggregate added value of financial activities (banking and insurance) into the real sector's production function.

The results obtained from annual national account data from 1972 to 2008 indicate a positive and significant impact of financial output growth on the real sector defined as the sum of manufacturing sectors and non-financial market services. They support the continuing reforms in the financial sector. Test for the existence of structural changes in the coefficients of interest, in case there was a specific period experiencing fast growth and fast adoption of deregulatory measures that could drive the results, was performed and no evidence of structural change has been shown, which suggests that the growth impact estimated is not of a short-run nature. Moreover, financial intermediation performs better than the share of capital formation in GDP, in the sense of having more significant positive effects than the positive effects of capital formation. The size of the intersectoral externality of the financial intermediation-growth leading model follows a downward trend corroborating Patrick's hypothesis.

The study has emphasized the importance of the financial sector in influencing economic growth in Tunisia. The findings indicate that economic growth can be stimulated by the adoption of both short run and long run policies to ensure development of the financial sector. Therefore, the policy suggestions for enhanced economic growth will be for policy makers to enhance the banking system in order to increase credit delivery to the private sector; create an enabling legal environment for efficient allocation of credit to



the private sector through the adoption of reforms to strengthen creditors' rights and enforce commercial contracts; and provide a conducive environment for investors to allocate the assets in the Tunisian Stock Exchange, which serves as a source of medium and long term finance for investment.

Finally, to enrich the findings of the present study, more robust analysis is needed to understand the precise channels through which finance exercises an effect on growth. In particular, the financial intermediation's positive impact on growth could be nonlinear in the sense that the growth effect of finance may vary with economic or financial conditions. This hypothesis should be explored further in future studies so as to address the question whether policy-induced real interest rate and improvement in financial inclusions are associated with a stronger or weaker finance and growth relationship in a bank-based economy such as that of Tunisia.

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