# IMF Working Paper

# Searching for the Finance-Growth Nexus in Libya

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**Searching for the Finance-Growth Nexus in Libya**

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Abstract

This paper investigates the causal relationship between financial development and economic growth in Libya during the period 1970–2010. The empirical results vary with estimation methodology and model specification, but indicate the lack of long-run relationship between financial intermediation and nonhydrocarbon output growth. The OLS estimation shows that financial development has a statistically significant negative effect on real nonhydrocarbon GDP per capita growth. However, the VAR-based estimations present statistically insignificant results, albeit still attaching a negative coefficient to financial intermediation. It appears that nonhydrocarbon economic activity depends largely on government spending, which is in turn determined by the country's hydrocarbon earnings.

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# I. INTRODUCTION

**Financial development is a critical channel for fostering economic growth and maintaining macroeconomic stability.** A growing body of evidence indicates an intertwined relationship between financial intermediation and economic growth; the direction of causality appears to be running from financial development to the growth rate of a country's per capita income. A sound and well-functioning financial system basically performs two leading roles at the same time. The first is to facilitate payment and transaction services and provide financial instruments to protect investors from the risks inherent in economic activity and against exogenous shocks. The second is to catalyze economic growth by efficiently mobilizing savings into profitable investment opportunities and screening firms in order to ensure the proper use of such financial resources. Even though structural features result in varying degrees of influence, cross-country studies show that countries with financial systems that foster capital accumulation and enhance efficiency in the allocation of resources tend to have higher and more equitable economic growth over the long run.

**This paper investigates the causal relationship between financial intermediation and nonhydrocarbon GDP growth in Libya.** There is an established theoretical and empirical link between financial development and long-run economic growth, but the majority of the empirical literature looks at the finance-growth nexus through cross-sectional studies that tend to disregard country-specific features. Even if country-specific institutional factors are taken into account, cross-sectional analysis does not necessarily establish the direction, timing, or relative strength of causal linkages between financial deepening and economic development. Furthermore, some scholars argue that economies with good growth prospects develop financial institutions that support the expected growth, which means that there could be nonlinear relationships between financial development and economic activity. Therefore, a case study approach can facilitate more conclusive causal inferences than is possible in cross-sectional studies, especially in resource-based economies where banking systems tend to be smaller and stock markets less liquid. Accordingly, this paper investigates empirically the finance-growth nexus in Libya over a period spanning from 1970 to 2010, with the objective of developing a better understanding of the underlying dynamics.

**We conduct a range of econometric tests, including cointegration and causality, to assess the finance-growth nexus.** While the possibility that financial development spurs economic growth over the long run has been supported by a growing plethora of empirical studies, there are also well-identified empirical contradictions and methodological problems. First, fast-growing countries may have more capital available for lending, or countries with a higher growth trajectory have more demand for credit, which may lead to a misleading inference that additional bank lending causes growth. Second, selection bias may arise if those countries that have well-developed banking sectors are also those with better institutions to uphold the rule of law and protect property rights, which may misleadingly attribute higher growth to intermediation capacity rather than to better institutions. Hence, we

examine the nature and extent of association between financial development and output growth in Libya with a range of econometric tools including the ordinary least squares (OLS) method and the vector autoregression (VAR) framework. We regress real nonhydrocarbon GDP per capita growth on financial development, as measured by commercial bank credit to the private sector scaled by nonhydrocarbon GDP, and other potential determinants of growth, such as changes in real price of crude oil, the growth rate of real government spending per capita, trade openness, and a dummy variable for international sanctions.

**The results vary with methodology and model specification, but indicate the lack of relationship between finance and growth.** Despite a significant expansion, financial intermediation in Libya remains rudimentary and shallow. The empirical results vary with econometric technique and model specification, but indicate that there is no long-run relationship between financial intermediation and nonhydrocarbon growth during the period 1970–2010. The OLS estimation shows that financial development has a statistically significant negative effect on real nonhydrocarbon GDP per capita growth. However, the VAR-based estimations present statistically insignificant results, albeit still attaching a negative coefficient to the measure of financial intermediation. According to the empirical findings presented in this paper, nonhydrocarbon economic activity depends largely on government spending, which is in turn determined by the country's hydrocarbon earnings. Looking forward, financial development is essential to mobilizing domestic savings in order to fund private sector–led economic diversification, as well as to providing a greater range of high-quality financial services. In turn, the development of a growth-enhancing, vibrant financial system requires a far-reaching spectrum of structural reforms and policy measures.

**The remainder of this paper is organized as follows.** Section II is a summary of the evolution of Libya's financial system, while Section III provides a brief overview of the bourgeoning theoretical and empirical literature on the finance-growth nexus. Sections IV and V describe the salient features of our empirical methodology and data sources, respectively. The econometric results are presented in Section VI; and we offer concluding remarks in Section VII, focusing on a reform strategy that would help remove impediments to financial development and economic diversification.

## II.  A SYNOPSIS OF LIBYA'S FINANCIAL SYSTEM

**The financial system in Libya has undergone substantial changes over the past decade, but remains rudimentary, shallow, and bank-dependent.** Libya's financial system is composed of a network of 15 commercial banks, four specialized credit institutions, five insurance companies, and a recently established stock market.[1] Although the banking system

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[1] Because of data constraints, we exclude specialized credit institutions (SCIs) from the analysis, even though the scope of their operations has expanded substantially, accounting for more than 65 percent of total outstanding credit as of end-2010.

managed to sustain its stability with a significant balance sheet expansion over the past decades, financial intermediation remains shallow and concentrated. Commercial bank lending to the private sector increased from 2.2 percent of GDP in 1970 to 31.5 percent in 1990, but then declined to 21.8 percent in 2000 and 9.5 percent by end-2010. This is particularly surprising given the massive amount of excess liquidity in the banking sector. While credit to the private sector increased in nominal terms from 2.7 billion dinars in 1990 to 8.8 billion dinars by end-2010, commercial bank deposits with the Central Bank of Libya (CBL) expanded from 1.4 billion dinars (or 20 percent of total assets) to 43.9 billion dinars (or 67.2 percent of total assets). In other words, the share of credit to the private sector in total banking assets declined from over 40 percent to about 13.5 percent, as banks accumulated "excess" liquidity in the balance sheet. This behavior reflects, in our view, an amalgamation of factors including the volatility of hydrocarbon earnings, lack of adequate lending opportunities in nonhydrocarbon sectors of the economy, and institutional bottlenecks such as nonexistence of a credit information system.

**The banking system appears to be sound, but its growth is driven mainly by off-balance sheet items.** Asset quality steadily improved, as demonstrated by a decline in the nonperforming loan (NPL) ratio, and better loan-loss provisioning. The NPL ratio fell from the peak of 35.5 percent in 2004 to 20.2 percent as of end-2010, while the capital adequacy ratio increased from 10.4 percent to 17.3 percent. On the other hand, profitability indicators, such as the return on assets and the return on equity, remained practically unchanged over the past decade—at an average of about 1 percent and 11.5 percent, respectively. Particularly after the removal of international sanctions in 1999, Libya's banking sector experienced a momentous increase in off-balance sheet items such as letters of credit and guarantees. As of end-2010, off-balance sheet items amounted to 84 percent of on-balance sheet assets, compared to 12 percent in 2004, which is partly an indication of banks' aim to generate fee income when lending is constrained and net interest margin is low.

**Figure 1. A Snapshot of Financial Intermediation**



Sources: Central Bank of Libya.
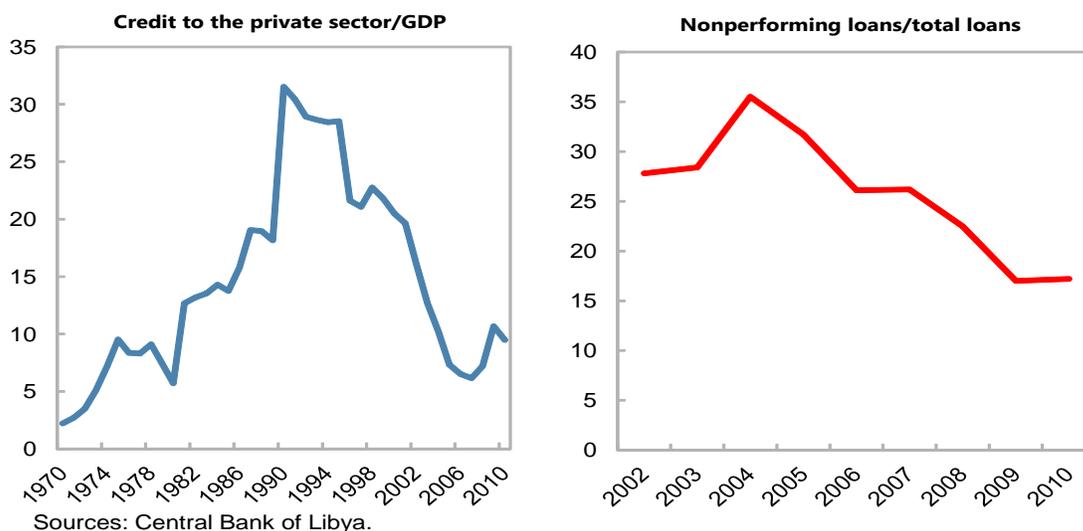
**Libya moved forward with reform initiatives prior to the revolution, but the banking system remains predominantly in the hands of the public sector.** The extent and diversity of financial services provided are limited and hindered by institutional weaknesses including the lack of a robust system of property rights, the absence of credit assessment information, the lack of competition, and government ownership. Since the removal of international sanctions, Libya moved forward with a broad spectrum of reform initiatives aimed at achieving greater openness and gradual liberalization of the financial system. Nevertheless, in spite of the privatization of two state-owned banks, the banking sector still remains predominantly in the hands of the public sector and operates under extensive controls of the government.[2] Furthermore, specialized credit institutions continue to function as an extension of the government in providing support to certain sectors such as agriculture, real estate, and manufacturing, through heavily subsidized credit facilities.

### III.   A BRIEF OVERVIEW OF THE LITERATURE

**Theoretical arguments suggest that financial development plays an essential role in promoting economic growth.**[3] The theoretical literature—dating back to Bagehot (1873) and Schumpeter (1911) and later broadened by Hicks (1969), McKinnon (1973), Shaw (1973), and Diamond (1984)—highlights the importance of financial intermediation in facilitating economic activity. The hypothesis is straightforward: an efficient allocation of financial resources would reduce information and transaction costs, support entrepreneurship and innovation, and thereby lead to more rapid accumulation of physical and human capital, which in turn would elevate the path of economic development. However, the direction of causality is not clear: Robinson (1952) suggests that economic growth creates demand for more financial services and leads to financial development. In other words, financial development may simply follow economic growth through technological changes, such as improvements in communication, or through increased demand for financial services. On the other hand, some scholars, including Lucas (1988), Stiglitz (1994), and, more recently, Rodrik and Subramanian (2009), argue that financial intermediation does not play an important role in economic development.

**A well-functioning financial system is critical for enhancing the pace—and quality—of economic growth.**[4] Empirically, Goldsmith (1969) is the first to show a positive correlation between the size of the financial system and economic growth over the long run, driven by efficiency gains from financial intermediation, based on an econometric analysis of 35 countries over the period 1860–1963. Along the same line, covering 77 countries during the

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[2] The government owns 5 of the 15 commercial banks or about 60 percent of total banking assets.

[3] Levine (2005) presents a survey of the theoretical literature on the finance-growth nexus.

[4] Demirguc-Kunt and Levine (2008) provide a comprehensive survey of the empirical literature on this subject.

period 1960–89, King and Levine (1993) identify a causal link between the depth of the financial system and economic growth. Similarly, Levine and Zervos (1998) show that stock market liquidity is a robust predictor of growth, while Rajan and Zingales (1998) provide additional evidence for a causal link running from financial to economic development. Other scholars, including Roubini and Sala-i-Martin (1992) and Acemoglu and Zilibotti (1997), point to financial underdevelopment as a factor that could both reduce long-run growth and increase the volatility of growth. However, Barajas, Chami, and Yousefi (2013) find that the beneficial effect of financial deepening on growth exhibits significant heterogeneity and that these differences may reflect regulatory characteristics as well as the extent of financial access for a given level of financial depth. On the whole, while a growing body of empirical research demonstrates a strong positive link between the functioning of the financial system and long-run growth in advanced and developing countries, some studies identify no causal link or an effect in the opposite direction. As Demetriades and Hussein (1996), Arestis and Demetriades (1997), and Bell and Rousseau (2001) argue, country-specific institutional characteristics may affect the relationship between finance and growth, making the findings from cross-sectional empirical exercises difficult to interpret.

**The effect of financial development varies according to differences in institutional structures and resource endowments.** Countries with developed financial systems may also have strong enforcement of property rights and rule of law, making it difficult to distinguish the effect of one factor from the effect of another, as pointed out by La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998). Indeed, Demetriades and Law (2006) show that financial depth does not affect growth in countries with weak institutions. Similarly, countries that grow rapidly may also have ample savings available for banks to lend, or may generate higher demand for financing. Beck (2011), for example, shows signs of a "resource curse" in financial development—that is, resource-rich countries tend to have less developed financial systems, which in turn limits private sector-led economic diversification. Although subsequent studies including Beck, Levine, and Loayza (2000) have used instrumental variables and panel data methods in an attempt to overcome these econometric problems, there are still lingering concerns that these approaches do not truly overcome potential biases in the estimation. Particularly, with respect to this paper, within-country changes in the financial system may not be exogenous to economic growth, and instrumental variables such as legal origins may have their own independent effect on economic growth (La Porta, Lopez-de-Silanes, and A. Shleifer, 2008). In general, as Khan and Senhadji (2003) conclude, while the effect of financial development on economic growth appears to be positive, the magnitude of this effect varies with different measures of financial development, estimation methodology, data frequency, and the functional form of the relationship.

#### IV. EMPIRICAL METHODOLOGY

**Estimating the direction of causality between banking capacity and economic growth is difficult because of potential simultaneity and selection biases.** Fast-growing countries

may have more capital available for lending, or countries with a higher growth trajectory have more demand for credit, which may lead to a misleading inference that additional bank lending causes growth. Similarly, selection bias may arise if those countries that have well-developed banking sectors are also those with better institutions to uphold the rule of law and protect property rights, which may misleadingly attribute higher growth to banking capacity rather than to better institutions. To overcome these empirical challenges, we examine the nature and extent of association between financial development and economic growth in Libya with a range of econometric tools including the OLS method and the VAR framework.

**This study adopts bank credit to the private sector as a proportion of nonhydrocarbon GDP as the key measure of financial development.** There is no single aggregate measure of financial development. Easily available monetary aggregates such as M2 or M3 are widely used in the literature to gauge financial deepening, but these indicators tend to measure monetization rather than financial development and its impact on economic growth, especially in the case of developing countries. Instead, Khan and Senhadji (2003), Beck, Demirguc-Kunt, and Levine (2005), and Demirguc-Kunt and Levine (2008) argue that the empirical analysis should focus on the allocation of credit to the private sector in analyzing the finance-growth nexus. Accordingly, we estimate the growth model for Libya in the following form:

(1)   $\Delta y_t = \alpha + \beta FD_t + \gamma X_t + \varepsilon_t$

where $\Delta y_t$ is the rate of real nonhydrocarbon GDP per capita growth at time $t$; $FD_t$ is the ratio of credit to the private sector to nonhydrocarbon GDP; $X_t$ represents a vector of other influential growth determinants such as the lagged dependent variable, the rate of change in real price of crude oil, the growth rate of real government spending per capita, trade openness, and a dummy variable for international sanctions; and $\varepsilon_t$ is the error term.

**Our empirical estimation aims to identify the dynamic causal relationship between the variables in the long run.** While the OLS model can provide useful insights about the relationship between financial development and real nonhydrocarbon GDP per capita growth, it cannot help identify the direction of causality. Furthermore, since regressing non-stationary time series can lead to biased coefficients and seemingly significant results while there is actually no underlying association between variables, we use the Augmented Dickey-Fuller (ADF) test to investigate whether the series are nonstationary and integrated of order one. The second step is to test for cointegration, for which we rely on the maximum likelihood cointegration methodology developed by Johansen (1988) and Johansen and Juselius (1990), as it allows for testing cointegration in a system of equations in one step and also avoids *a priori* assumptions of endogeneity or exogeneity of variables. The Johansen cointegration procedure evaluates whether a long-run linear combination of variables is stationary, with a

null hypothesis that the number of cointegrating vectors is less than or equal to the cointegrating rank.[5] The existence of cointegration indicates the possibility of a causal link, but does not identify the direction of causality between the variables. As an additional step, if two or more series are cointegrated, we can expand the analysis by using the vector error correction model (VECM)—a restricted form of a VAR—to identify inter-temporal linkages.

## V. DATA

**We put together annual data covering the period 1970–2010 to investigate the impact of financial deepening on economic growth.** The dataset used in this paper is compiled from the IMF's *International Financial Statistics* and *World Economic Outlook* databases. To study the impact of financial deepening on economic growth in Libya, we exclude the hydrocarbon sector and focus on real nonhydrocarbon GDP per capita. We quantify financial deepening with the ratio of credit issued to the private sector to nonhydrocarbon GDP, adjusted for the potential stock-flow problem in measurement, as suggested by Levine, Loayza, and Beck (2000). Because financial variables are measured at the end of the year, whereas GDP is measured throughout the year, we deflate end-of-year financial variables by end-of-year consumer price index (CPI), and then we compute the average of the real financial variable in years $t$ and $t – 1$, and divide it by real GDP in year $t$. We also include a set of other potential determinants of economic growth, such as the rate of change in real price of crude oil, the growth rate of real government spending per capita, trade openness, and a dummy variable for international sanctions.

**We test the unit root or stationarity properties of our dataset and find no evidence of nonstationarity.** Standard correlation statistics and regression tests may not be appropriate, because regressing nonstationary time series can lead to biased coefficients and seemingly significant results while there is actually no underlying association between variables. Accordingly, the ADF test is performed to investigate whether the series are non-stationary and integrated of order one.[6] The results, presented in Appendix Table 1, show that both the ratio of credit to the private sector to nonhydrocarbon GDP and real nonhydrocarbon GDP per capita growth are stationary. Since both series are I(1), we can also use cointegration tests in our empirical assessment of the finance-growth nexus.

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[5] Hamilton (1994) provides a comprehensive presentation of the cointegration framework and alternative tests.

[6] The objective of the ADF procedure is to test the null hypothesis that a series contains a unit root. If the null hypothesis can be rejected then the variable is stationary. If not, the series should be transformed through differencing until stationarity is established. The most common occurrence in macro-financial variables is that the first-differenced values are stationary, in which case the variable is integrated of order one.

## VI. EMPIRICAL RESULTS

**A windfall in hydrocarbon revenue tends to increase nonhydrocarbon GDP, while hampering financial deepening.** There appears to be a high degree of correlation between hydrocarbon GDP and nonhydrocarbon GDP, which can be interpreted as a reflection of the spillover effects, mainly through the fiscal channel (Figure 2). At first glance, this may seem contrary to the "resource curse" literature that documents a negative relationship between resource rents and output growth (Sach and Warner, 1996). However, these studies tend to focus on the long-run effects of resource abundance by using cross-sectional data. In the case of Libya, although there is a robust relationship between the hydrocarbon windfall and nonhydrocarbon GDP growth, there is also a negative correlation between the hydrocarbon windfall and commercial bank lending to the private sector.[7] Although data constraints prevent a conclusive analysis, we reason that the crowding-out effect may be a dominant factor in Libya. In other words, a large expansion in government spending as a share of GDP shrinks the private sector's role in overall economic activity.

**Figure 2. Financial Development and Economic Growth**
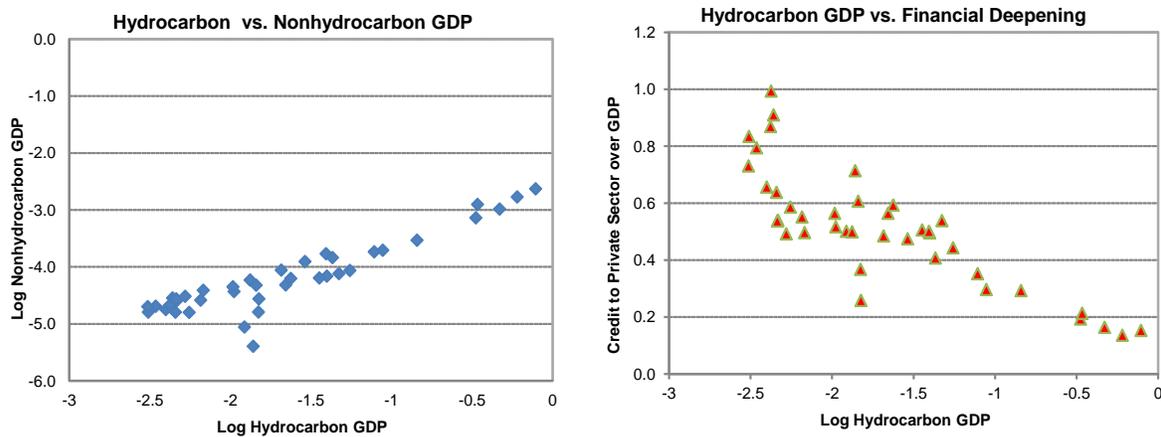


Source: Central Bank of Libya; authors' calculations

**The results vary with estimation methodology and model specification, but indicate the lack of relationship between financial intermediation and output growth.** The estimated coefficients for Equation 1 are presented in Table 1, with the baseline model including all the variables in the ninth column. The regression results show that the effect of financial development on nonhydrocarbon GDP growth is negative and statistically significant across all specifications. The estimated size of the coefficient on bank lending to the private sector

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[7] It is important to stress that the decline in the measure of financial deepening stems from a disproportionate increase in the level of GDP, which is the denominator, relative to the level of commercial bank credit to the private sector.

ranges between -0.176 and -0.328, with the baseline specification of the model generating the largest impact. In other words, over the sample period 1970–2010, financial intermediation made a negative contribution to real nonhydrocarbon GDP growth.  In our view, this empirical finding highlights the fact that the financial system is negligibly small and rudimentary, and that banks failed to function in a growth-enhancing manner. Furthermore, because banks' funding base is determined mainly by the country's hydrocarbon earnings rather than endogenous dynamics of depository institutions, these exogenous flows of liquidity tend to exceed the intermediation capacity of the financial sector. As a result, commercial banks end up accumulating excess liquidity, which is deposited idly with the central bank or leads to unproductive loans with a higher incidence of non-performance.

**Table 1. Determinants of Real Nonhydrocarbon GDP Growth, 1970-2010**

| Variables | Models | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Real nonhydrocarbon GDP per capita growth $_{t-1}$ | 0.419** | | | 0.222 | 0.439*** | 0.174 | 0.183 | 0.213 | 0.173 |
| | (2.712) | | | (1.144) | (2.949) | (1.329) | (1.574) | (1.659) | (1.204) |
| Credit to the private sector/nonhydrocarbon GDP | | -0.180* | | | -0.176* | -0.230*** | -0.311*** | -0.328*** | -0.328*** |
| | | (-1.882) | | | (-2.010) | (-3.273) | (-4.611) | (-4.438) | (-4.400) |
| International sanctions | | | -0.166*** | -0.108 | | | | | -0.036 |
| | | | (-3.174) | (-1.616) | | | | | (-0.642) |
| Real government spending per capita | | | | | | 0.438*** | 0.304*** | 0.318*** | 0.318*** |
| | | | | | | (4.672) | (3.246) | (3.252) | (3.216) |
| Real price of crude oil | | | | | | | 0.164*** | 0.179*** | 0.180*** |
| | | | | | | | (3.170) | (3.066) | (3.052) |
| Trade openness | | | | | | | | -0.100 | -0.156 |
| | | | | | | | | (-0.576) | (-0.798) |
| Constant | 0.026 | 0.064** | 0.136*** | 0.089* | 0.027 | 0.039* | 0.025 | 0.040 | 0.069 |
| | (0.908) | (2.307) | (3.947) | (1.854) | (0.964) | (1.781) | (1.237) | (1.209) | (1.224) |
| Observations | 38 | 39 | 39 | 38 | 38 | 38 | 38 | 38 | 38 |
| R-squared | 0.170 | 0.087 | 0.214 | 0.227 | 0.256 | 0.547 | 0.652 | 0.656 | 0.661 |

Notes:

The dependent varibale is real nonhydrocarbon GDP per capita growth.

All variables are in log, and the model is estimated with OLS for the period 1970-2010.

z-statistics are reported in paranthesis, with ***, **, and * indicating significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Source: Authors' estimations.

**Nonhydrocarbon economic activity depends largely on government spending, which is in turn determined by hydrocarbon earnings.** The coefficient on lagged nonhydrocarbon GDP growth does not appear to be statistically significant across all specifications, although its economic impact is positive, as expected. The coefficient is statistically significant at the 1 percent level with an economically large impact when lagged nonhydrocarbon GDP growth is included alone (the first column of Table 1) or along with the credit measure (the third column of Table 1). However, other specifications including the baseline model with all the explanatory variables yield statistically insignificant coefficients for the lagged growth rate of real nonhydrocarbon GDP per capita. In our view, this pattern is a reflection of the resource-dependent nature of the Libyan economy. Indeed, the inclusion of either the rate of change in real crude oil prices or the growth rate of real government spending per capita captures the economic effect of lagged real nonhydrocarbon GDP per capita growth. The regression results show that the coefficients on real price of crude oil and real government spending per capita are statistically significant at the 1 percent level across all specifications of our model, with economically large effects on real nonhydrocarbon GDP per capita

growth. Moreover, the coefficient of real government spending per capita remains positive and statistically robust at the 1 percent level of significance, even when the impact of changes in real oil prices is captured in the model. This is consistent with the fact that nonhydrocarbon economic activity depends largely on government spending, which is in turn determined by the country's hydrocarbon earnings.

**International sanctions appear to have a significant effect on growth, but not when other explanatory factors are included in the model.** The coefficient on the dummy variable for international sanctions imposed on Libya during the period 1983–99 is statistically significant at the 1 percent level, but that result disappears when other explanatory factors are included in the baseline specification of our model. In our view, this reflects the steady decline in oil prices and production volume during the sanctions period. As a result, when both real crude oil prices and a dummy variable for international sanctions are included in the growth model, the impact of the latter fades away. We also find that trade openness, measured by the ratio of total imports and exports to GDP, does not appear to have a statistically significant effect on real nonhydrocarbon GDP per capita growth.

### Table 2. Johansen Cointegration Test Results

| Maximum Rank | Parameters | LL | Eigenvalue | Trace Statistic | 5% Critical Value | 1% Critical Value |
|---|---|---|---|---|---|---|
| 0 | 6 | 48.54 | . | 11.52* | 15.41 | 20.04 |
| 1 | 9 | 53.87 | 0.244 | 0.87 | 3.76 | 6.65 |
| 2 | 10 | 54.31 | 0.022 | | | |

Notes:
Trend is constant with two lags over the sample period 1970-2010.
Source: Authors' estimations.

**The cointegration analysis confirms the lack of a long-run relationship between financial intermediation and nonhydrocarbon output growth.** The OLS exercise indicates that there is no short-run relationship between financial development and growth in nonhydrocarbon sectors of the Libyan economy, but the possibility of a long-run relationship remains unanswered. To study the extent and nature of long-run relationship, we conduct a test for cointegration, using the methodology developed by Johansen (1988) and Johansen and Juselius (1990), which evaluates whether a long-run linear combination of variables is stationary, with a null hypothesis that the number of cointegrating vectors is less than or equal to the cointegrating rank. This approach provides a direct test of whether real nonhydrocarbon GDP per capita growth is positively related to the change in the credit to private sector/nonhydrocarbon GDP ratio. The results, presented in Table 2, show that the null hypothesis $H_0: r = 0$ cannot be rejected. In other words, there is no evidence for a long-run relationship—or a causal link—between financial development and nonhydrocarbon GDP growth in the case of Libya.

**Table 3. VAR Model of Real Nonhydrocarbon GDP Growth, 1970-2010**

| Variables | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|
| | GDP Growth | Credit Growth | GDP Growth | Credit Growth | GDP Growth | Credit Growth |
| Real nonhydrocarbon GDP per capita growth $_{t-1}$ | 0.368** | 0.101 | 0.233 | 0.126 | 0.173 | 0.018 |
| | (2.428) | (0.355) | (1.303) | (0.378) | (1.235) | (0.062) |
| Real nonhydrocarbon GDP per capita growth $_{t-2}$ | | | 0.211 | -0.082 | | |
| | | | (1.266) | (-0.262) | | |
| Credit to the private sector/nonhydrocarbon GDP $_{t-1}$ | -0.125 | -0.024 | -0.142 | -0.058 | -0.047 | 0.089 |
| | (-1.389) | (-0.141) | (-1.559) | (-0.338) | (-0.594) | (0.558) |
| Credit to the private sector/nonhydrocarbon GDP $_{t-2}$ | | | -0.019 | -0.164 | | |
| | | | (-0.202) | (-0.960) | | |
| Real government spending per capita | | | | | 0.313*** | -0.038 |
| | | | | | (2.796) | (-0.171) |
| Real crude oil prices | | | | | 0.067 | 0.304*** |
| | | | | | (1.156) | (2.607) |
| Constant | 0.029 | 0.003 | 0.021 | 0.014 | 0.032 | -0.020 |
| | (1.057) | (0.065) | (0.737) | (0.269) | (1.323) | (-0.420) |
| Observations | 38 | 38 | 37 | 37 | 38 | 38 |

Notes:

The dependent varibales are real nonhydrocarbon GDP per capita growth (GDP Growth) and credit to the private sector/nonhydrocarbon GDP (Credit Growth); it estimated with a VAR Model for the sample period 1970-2010.

z-statistics are reported in paranthesis, with ***, **, and * indicating signficance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Source: Authors' estimations.

**The VAR-based estimations suggest that a lack of relationship between financial deepening and output growth.** To test the null hypothesis that financial intermediation does not Granger cause nonhydrocarbon growth in Libya, we construct a VAR model, which addresses the potential interdependency of endogenous variables, without imposing *a priori* structural restrictions, and helps answer the question of whether credit expansion is causing output growth or vice versa. The results, presented in Table 3, are based on up to two lags for each variable and include exogenous variables such as the changes in real government spending per capita and real price of crude oil.[8] As demonstrated by vanishing—and statistically insignificant—coefficients of first and second lag of credit to the private sector, there is no relationship between financial intermediation and nonhydrocarbon output growth. The results also indicated that controlling for changes in real crude oil prices, fiscal expansion contributes to real nonhydrocarbon GDP per capita growth, but has no effect on financial deepening. On the other hand, controlling for changes in real government spending per capita, we find that the impact of changes in real price of crude oil on nonhydrocarbon output growth diminishes over time. In other words, growth dynamics are determined largely by government spending during the sample period 1970–2010.[9] The impulse response

[8] Government spending is ideally an endogenous variable, but expanding the numbers of endogenous variables in this analysis from two to three would increase the number of parameters by five, which is impossible to estimate with only 38 observations.

[9] Since the cointegration analysis shows no evidence for a long-run relationship—or a causal link—between financial development and nonhydrocarbon GDP growth, we do not further investigate by testing the direction of causality with the VECM methodology. Nevertheless, the VECM results, not presented in this paper, are consistent with previous findings and validate that financial intermediation does not Granger cause real nonhydrocarbon output growth over the sample period.

functions, presented in Appendix Figure A3, provide further evidence on the sign and timing of the adjustment of nonhydrocarbon output growth to changes in credit to the private sector.

## VII.  CONCLUSION

**The results vary with estimation methodology and model specification, but indicate the lack of relationship between financial intermediation and output growth.** There is now a growing body of evidence indicating an intertwined relationship between financial development and economic growth; the direction of causality appears to be running from financial intermediation to the growth rate of a country's per capita income. In the case of Libya, however, the empirical findings presented in this paper show that there is no finance-growth nexus. The OLS estimation shows that financial development has a statistically significant negative effect on real nonhydrocarbon GDP per capita growth. However, the VAR-based estimations present statistically insignificant results, albeit still attaching a negative coefficient to financial intermediation. According to our empirical findings, nonhydrocarbon economic activity depends largely on government spending, which is in turn determined by the country's hydrocarbon earnings. In our view, the lack of long-run relationship between financial intermediation and nonhydrocarbon growth in Libya reflects an amalgamation of factors including the volatility of hydrocarbon earnings, lack of adequate lending opportunities in nonhydrocarbon sectors of the economy, and institutional bottlenecks such as nonexistence of a credit information system.

**The development of a growth-enhancing financial system requires a far-reaching spectrum of structural reforms.** Financial development is essential to mobilizing domestic savings to fund private sector–led economic diversification, as well as to providing a greater range of high-quality financial services. That in turn requires a comprehensive strategy based on a well-sequenced set of structural reforms and policy measures that will bring Libya's financial system more in line with international practices:

- Safeguarding macroeconomic stability, especially through a countercyclical fiscal policy stance that minimizes the impact of volatile oil prices;

- Improving the legal framework to protect creditor and minority shareholder rights;

- Streamlining the insolvency regime;

- Enhancing competition in the banking sector to improve the quality of intermediation and to strengthen bank governance;

- Reducing the role of state banks, including SCIs, which tend to lead to distortions and impede financial intermediation;

- Augmenting the system of credit information gathering and sharing, which would enable banks to better assess credit risk and thereby improve access to finance, especially for small and medium-sized enterprises and low-income households; and

- Introducing market-oriented monetary policy instruments, which would help in managing large amounts of structural excess liquidity

**Regulatory and supervisory reforms are necessary to reap the benefits from financial development in the post-revolution era.** Financial development represents both an opportunity and a risk. While financing that is readily available to a wide array of consumers and investors is a prerequisite for strong and inclusive growth, rapid credit expansion can destabilize the economy. Striking the right balance between financial deepening and financial stability—to avoid boom-bust cycles in credit growth—requires stronger microprudential regulation as well as effective macroprudential oversight. Accordingly, measures to mitigate systemic risks should deal with vulnerabilities stemming from macroeconomic developments, market infrastructures, and banks' balance sheets. For the post-revolution banking system, the CBL should consider measures aiming primarily at strengthening balance sheet resilience and risk management, and at preventing the buildup of excessive exposures in certain sectors of the economy.

# Appendix Tables and Figures

## Appendix Table A1. Augmented Dickey-Fuller Test

| | | Interpolated Dickey-Fuller | | | |
| | Test Statistics | 1% Critical Value | 5% Critical Value | 10% Critical Value | MacKinnon P-Value |
| --- | --- | --- | --- | --- | --- |
| Credit to the private sector/nonhydrocarbon GDP | -1.629 | -3.655 | -2.961 | -2.613 | 0.468 |
| Δ Credit to the private sector/nonhydrocarbon GDP | -5.889 | -3.662 | -2.964 | -2.614 | 0 |
| Log nonhydrocarbon GDP per capita | -0.686 | -3.655 | -2.961 | -2.613 | 0.8503 |
| Δ Log nonhydrocarbon GDP per capita | -3.756 | -3.662 | -2.964 | -2.614 | 0.0034 |

Notes:

ADF test for unit root, with data covering the period 1970-2010. Both series are found to be I(1).

Source: Authors' estimations.

## Appendix Table A2. Summary Statistics

| Variable | Obs | Mean | Std. | Min | Max | Integration |
| --- | --- | --- | --- | --- | --- | --- |
| Real nonhydrocarbon GDP per capita | 40 | 0.02 | 0.02 | 0.00 | 0.07 | I(1) |
| Credit to the private sector/nonhydrocarbon GDP | 40 | 0.51 | 0.21 | 0.14 | 0.99 | I(1) |
| Real government spending per capita | 40 | 0.03 | 0.02 | 0.01 | 0.06 | I(1) |
| Real crude oil price | 40 | 34.48 | 18.93 | 7.88 | 77.79 | I(1) |
| International sanctions (dummy) | 40 | 0.43 | 0.50 | 0 | 1 | - |
| Trade openness | 40 | 0.19 | 0.15 | 0.17 | 0.54 | I(0) |
| Real nonhydrocarbon GDP per capita growth | 39 | 0.00 | 0.30 | -0.34 | 1.19 | I(0) |
| Change in credit to the private sector/nonhydrocarbon GDP | 39 | 0.06 | 0.18 | -0.27 | 0.48 | I(0) |
| Real government spending per capita growth | 39 | 0.05 | 0.31 | -0.65 | 1.19 | I(0) |
| Change in real crude oil price | 39 | 0.10 | 0.43 | -0.49 | 2.17 | I(0) |

Source: Authors' calculations.

**Appendix Figure A3. Impulse Response Functions**



Graphs by irfname, impulse variable, and response variable
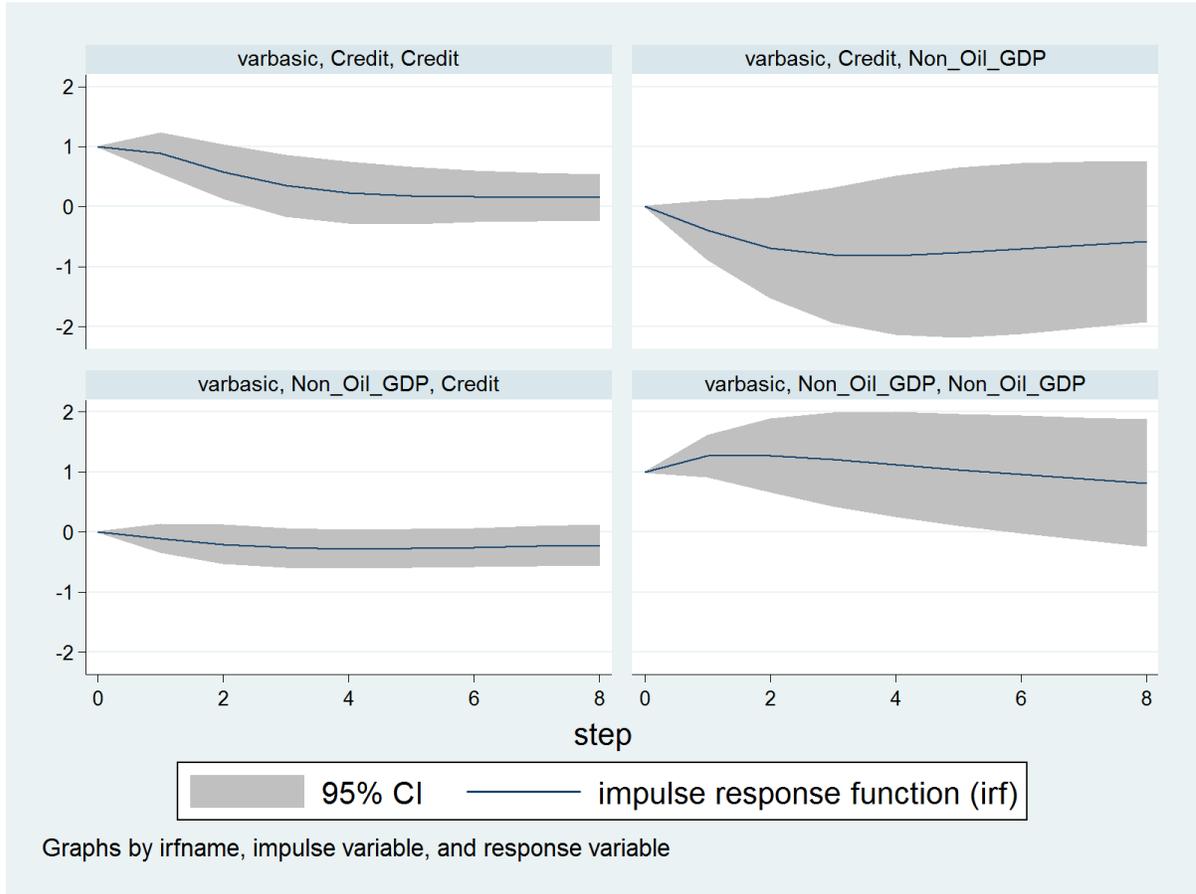
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