The Broken Link: Bank Credit and Non-hydrocarbon Output Growth in Oil-Dependent Economies.

Anthony Anyanwu¹, Christopher Gan², Baiding Hu³

Abstract

Economies dominated by hydrocarbons possess certain characteristics not shared by other economies because their economic dynamics are mainly determined by the prices of oil and gas at world markets. Over the last decade, oil-dependent countries have been promoting diversification towards the non-oil sector. In particular, significant priority has been given to the financial sector. To this end, this paper explores the impact of bank credit in the growth of oil-rich economies and tests if it differs in the emerging non-oil sectors. The study utilizes both the panel cointegration and pooled mean group estimators for 28 oil-dependent countries over the period 1990-2012. The findings suggest that bank credit significantly increases GDP per capita but has no impact on non-oil GDP per capita. The economic potential of non-natural resource sectors is great and the resources remain largely untapped.

Keywords: banks, oil-dependent, non-oil sector, credit, growth.

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1. Introduction

The need to diversify the economy is more pronounced in oil-dependent economies because their economic dynamics are mainly determined by the prices of hydrocarbons rather than by domestic factors. The hydrocarbon sector is better positioned to source for bank credit and financial services than the non-hydrocarbon sector due to their increasing cash flows and higher profits. Bank lending is concentrated in the oil and gas sectors and are reluctant to hand out loans, especially in sectors of the economy outside of hydrocarbons. For example, agriculture in Nigeria contributes 40% of GDP and 60 per cent of employment in 2013, but over the decade, the sector received an average of 3% of the total loans disbursed by Nigerian banks (Central Bank of Nigeria, 2014). In Dem. Rep. of Congo, agriculture contributes 45% of GDP and over 60 per cent of employment in 2012, but over the decade, commercial bank credit represents an average of 5% of total GDP of which is dominated by the mining companies (African Development Bank, 2013).

It seems the non-hydrocarbon sector receives disproportionate bank credit even though they are the major drivers of the economy; they are a labour intensive industry, have more linkages to the rest of the economy, and generate more employment unlike the oil sector, which is capital intensive. This reflects a skewed level of financial intermediation and thus seems to accentuate the vicious cycle of mono-product economy.

However, over the last decade, oil-rich countries have ramped up their efforts to diversify the economy towards the non-oil sector. In particular, significant priority has been given to the financial sector. In this paper, we examine the impact of bank credit on economic growth and more importantly on the non-oil growth.

The remainder of the paper is organized as follows. Section 2 discusses related literature between finance and economic growth. Section 3 explains the methodology. Section 4 describes the data. Section 5 presents and discusses the empirical results. Section 6 concludes the paper.

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4 A country is considered oil-dependent if its average share of hydrocarbon in total fiscal revenue and/or an average share of hydrocarbon in total export is at least 25 per cent. Source: http://www.imf.org/external/np/fad/trans/guide.htm, p. 2).
2. Previous Literature

Financial development and economic growth nexus has four hypotheses. The first hypothesis hypothesized that financial development is *supply–leading*, in the sense that financial development is a causal factor for economic growth. The second hypothesis hypothesized that financial development is *demand-following*, such that as the economy develops, the demand for financial services increases and as a result more financial institutions, financial instruments and services appear in the market. The third hypothesis hypothesized that financial development is one of *bi-directional causality*. In other words, economic growth provides means for development in the financial sector and the financial sector in turns foster growth by allowing more savings and investment. The fourth hypothesis hypothesized that financial development and economic growth are *not causally related*, that is there is no relationship between finance and growth.

Most of the empirical studies (e.g. King and Levine 1993; Levine, 1997; Levine et al. 2000; Beck et al. 2000) showed that the level of financial development is a good predictor of future rates of economic growth, capital accumulation, and technological change. However, Rioja and Valev (2004) suggest that the relationship between financial development and economic growth varies according to the level of financial development of countries. They found that additional improvements in financial markets have an uncertain effect on growth in the low-income countries, a large and positive effect in the middle-income countries, and a positive but smaller effect in the high-income countries.

Gylfason and Zoega (2001) used OLS regression analysis across countries from 1965 to 1998 and found that natural capital crowds out physical and human capital, thereby hindering economic growth. However, the authors did not address the problems of omitted variables bias that are prevalent in growth models. This was addressed in Nili and Rastad (2007) who applied a dynamic panel estimation technique (GMM) on 12 oil-exporting countries from 1975-2000. They found a lower level of financial development for the oil-based economies than the rest of the world; a higher rate of investment in the oil-based economies caused mainly by oil, and a strong link with the weakness of financial institutions and the poor performance of the private sector. Beck (2011) found that firms in resource-based economies used less external finance and a smaller proportion used bank loans, although the level of demand was similar as in other countries, which points to supply constraints. Barajas, Chami and Yousefi (2012) used a dynamic panel estimation technique (GMM) in oil-rich Middle Eastern and North African
countries (MENA) and found that financial development has a lower if not negative effect on economic growth.

A different perspective was taken by Samargandi, Fidrmuc, Ghosh (2013) who allowed for the effect of financial development to be different for the oil and non-oil sectors of the economy in Saudi Arabia, using the Autoregressive Distributed Lag (ARDL) bounds test technique. The authors found that financial development has a positive impact on the growth of the non-oil sector in Saudi Arabia but its impact on total GDP growth is negative but insignificant. Similarly, Hasanov and Huseynov (2013) explored the impact of bank credits on non-oil tradable sector in Azerbaijan using ARDL Bounds Testing approach, Engle-Granger two-step methodology, and Johansen's approach. The results indicate that bank credits have a positive impact on non-oil tradable sectors. But the opposite result was found by Cevik and Rahmati (2013) in Libya during the period 1970–2010. The VAR-based estimations showed that financial development exhibit a statistically insignificant negative effect on real non-hydrocarbon GDP per capita growth.

Our study differs from the existing empirical studies in several ways. Most of other studies are based on individual country estimates obtained with relatively small samples and, as such, inference may be unreliable compared to panel data methods. The techniques we utilize avoid these problems by combining 23 time observations with 28 cross-sections, resulting in a sample of 539 observations. This generates remarkable improvements in the reliability of statistical inference. We bypass the limitations of conventional panel cointegration methods by allowing for cross-country dependence. Moreover, we make provisions for short-run and long-run estimates. Finally, the study on sector-based growth is scanty, as majority of the studies focussed on aggregate economic growth.

3. Methodology

We use panel ARDL model based on the three estimators: the mean group (MG) of Pesaran and Smith (1995), pooled mean group (PMG), and dynamic fixed effect (DFE) estimators developed by Pesaran et al. (1999).
The basic empirical model we postulate for modelling the nexus between financial intermediation and economic development are denoted by $FD_{it}$ and $Y_{it}$ respectively, in the following log-linear function.

\[
\ln(Y_{it}) = u_i + \beta_i \ln(FD_{it}) + e_{it}
\]  

(1)

where the index $i = 1,...,N$ denotes countries , $t = 1, 2,..., T$ denotes time.

Estimating a model in the form of equation (1) poses some endogeneity issues. This is due to the simultaneity bias arising from a simultaneous determination of the independent and the dependent variable (Kumar and Woo, 2010). Another reason is related to potential omitted variable bias that could arise when an excluded variable is correlated with both the dependent variable and one or more of the independent variables.

3.1. Panel unit root test

The first step is to test for stationary in the variables to ensure that no series exceeds 1(1) order of integration. We employ Fisher-type test because it does not require balanced panel. The testing for the order of integration of variables is not important when applying the dynamic fixed effect, the mean-group, and the pooled mean-group estimators (Pesaran and Smith, 1995; Pesaran et al, 1997, 1999).

3.2. Panel cointegration test

The second step tests whether bank credit and economic growth are cointegrated. We use the four panel cointegration tests of Westerlund (2007), which have good small-sample properties and high power relative to the popular residual-based panel cointegration tests (e.g. Pedroni, 2004). Second, one advantage of using Westerlund (2007) panel cointegration tests is that the time series are allowed to be of unequal length.

Westerlund (2007) considers the following error correction model where all variables in levels are assumed to be integrated of order 1;

\[
\Delta Y_{it} = \delta_t d_t + \alpha_i (Y_{i(t-1)} - \beta_i x_{i(t-1)}) + \sum_{j=1}^{p_i} \alpha_{ij} \Delta Y_{i(t-1)} + \sum_{j=-q_t}^{p_i} Y_{ij} \Delta x_{i(t-j)} + e_{it}
\]  

(2)
Where \( d_t = (1, t)' \) holds the deterministic components, \( \delta_i' = (\delta_{i1}, \delta_{i2})' \) are the associated vector of parameters. In order to allow for the estimation of the error correction parameter \( \alpha_i \) by least square:

\[
\Delta Y_{it} = \delta_i' d_t + \alpha_i Y_{i(t-1)} - \lambda_i x_{i(t-1)} + \sum_{j=1}^{p_i} \alpha_{ij} \Delta Y_{i(t-1)} + \sum_{j=-q_i}^{p_i} Y_{ij} \Delta x_{i(t-j)} + e_{it}
\]

(3)

The parameter \( \alpha_i \) in equation (3) provides an estimate of the speed of error correction towards the long run equilibrium. The parametrization of the equation (3) takes the parameter \( \alpha_i \) which remains unaffected by imposing an arbitrary \( \beta_i \). Next, it is possible to construct a valid test of \( H_0 \) versus \( H_a \) that is asymptotically similar and whose distribution is free of nuisance parameters. Westerlund (2007) proposes four tests based on the least squares estimates of \( \alpha_i \) and its t-ratio for each individual \( i \).

The first two are called group mean and given as:

\[
G_t = \frac{1}{N} \sum_{i=1}^{m} \frac{\tilde{\alpha}_i}{SE(\tilde{\alpha}_i)} \quad \text{and} \quad G_\alpha = \frac{1}{N} \sum_{i=1}^{m} \frac{T\tilde{\alpha}_i}{\tilde{\alpha}_i(1)}
\]

Where \( SE(\tilde{\alpha}_i) \) is the standard error of \( \tilde{\alpha}_i \). \( G_t \) and \( G_\alpha \) test the null of \( H_0: \alpha_i = 0 \) for all \( i \) versus the alternative of \( H_a: \alpha_i < 0 \) for at least one \( i \). In other words, the \( G_t \) and \( G_\alpha \) test the null hypothesis of no cointegration for all cross-sectional units against the alternative that there is cointegration of at least one cross-sectional unit. The rejection of the null should therefore be taken as evidence of cointegration of at least one of the cross-sectional units.

The other two tests are called panel statistics and given as follows:

\[
P_t = \frac{\bar{\alpha}}{SE(\bar{\alpha})} \quad \text{and} \quad P_\alpha = T\bar{\alpha}
\]

The \( P_t \) and \( P_\alpha \) test \( H_0: \alpha_i = 0 \) for all \( i \) versus the alternative of \( H_a: \alpha_i < 0 \) for all \( i \). In other words, \( P_t \) and \( P_\alpha \) test statistics pool information over all the cross-sectional units to test the null of no cointegration for all cross-sectional units against the alternative of cointegration for
all cross-sectional units. The rejection of the null should therefore be taken as evidence of cointegration for the panel as a whole.

With a small dataset, such as the one in our study with T=23, Westerlund (2007) cautioned that the results of the tests may be sensitive to the choice of lag and lead lengths, which means if there is a cross sectional dependence over the units, the group mean and panel statistics are no longer reliable. Therefore, to avoid over-parameterization and the loss of predictive power, robust critical values is obtained through bootstrapping.

### 3.3. Dynamic Fixed Effect, Mean-Group and Pooled Mean-Group Estimators

Panel cointegration test of Westerlund (2007) shows whether there is a long-term relationship; it does not show the short-run and long-run estimates.

There are several advantages in using the PMG estimator over other dynamic panel data estimators i.e. panel dynamic OLS (DOLS) of Pedroni (2001); panel fully modified OLS (FMOLS) of Pedroni (2000); GMM of Arellano and Bond, (1991) and Blundell-Bond (1998). DOLS and FMOLS requires pretesting for unit roots in the variables as well as pre-testing for cointegration between integrated regressors. The stationary variables that do not appear to be part of the estimated cointegrating vector are usually eliminated (Pedroni, 2000, 2001). For example, if any of the variables say bank credit, and government consumption are stationary, I(0); and other variables such as oil price, and non-oil GDP per capita are non-stationary, I(1); some variables will be dropped in the DOLS/FMOLS in order to keep the same order of integration. Therefore, we ignore this dynamic panel data estimators.

Generalised methods of moment (GMM) addresses potential misspecification and obtains consistent estimates in the presence of endogenous regressors. However, Pesaran et al. (1999) argue that the GMM estimation procedure for dynamic panel data model can produce inconsistent and misleading coefficients of the long run coefficients. The problem is exacerbated when the time denomination of the panel is large. GMM captures only the short-run dynamics and the stationarity of the variables are ignored because the models are mostly restricted to short time series. Thus, it is not clear whether the estimated panel models represent a long-run equilibrium relationship or a spurious one (Christopoulos and Tsionas, 2004). More so, the imposition of homogeneity assumptions on the slope coefficients of lagged dependent variables could lead to significant biases (Kiviet 1995)
Pesaran, Shin, and Smith (1997) show the consistency of the PMG estimator even if the variables of interest are integrated or stationary, or endogenous. Therefore, in estimating the PMG estimator one might not need to check for the presence of unit roots in the panel variables. The PMG assumes cross-sectional independence of the regression residuals. In panels with large N and large T, it is also important that the regression errors are serially uncorrelated. The inclusion of sufficient lags of the right-hand side regressors will ensure that the regression errors are serially uncorrelated and the explanatory variables are exogenous, which provides consistent and efficient parameters of interest (Pesaran et al., 1999).

There are good reasons to believe that the long run equilibrium relationship amongst the variables of interest should be identical across the oil-rich economies (i.e. the presence of a common factor, oil prices), while the short run dynamics are heterogeneous. Thus, the PMG estimator is likely to capture the true nature of the data. However, making a choice between DFE, MG and PMG can be tested using the Hausman test. Under heterogeneity of slope coefficient, the DFE approach would produce inconsistent and potentially misleading results (Baltagi, Griffin, and Xiong, 2000). Under the assumption of homogenous long-run elasticities, both the PMG and MG estimators are consistent. But if the true long-run parameters are heterogeneous, the PMG estimation will produce inefficient and inconsistent estimates. In this case, the MG estimates are consistent.

The Hausman test examines the trade-off between consistency and efficiency in the choice between the two estimators. Hausman test first calculates the difference between the MG and PMG estimators. Then it compares the difference (scaled by the variance-covariance matrix of the efficient model) to critical values from the chi-squared distribution. Under the null hypothesis of cross-section parameter homogeneity in the long-run, one would expect the difference to be small. Therefore, if the p-values is > 0.05) (i.e insignificant, use PMG)

Let us assume that the long-run growth relationship is given by:

\[
Y_{it} = \theta_{0i} + \theta_{1i}BANKCREDIT_{it} + \theta_{2i}GOVERNMENTSIZE_{it} + \theta_{3i}TRADEOPENNESS_{it} \\
+ \theta_{4i}OILPRICE_{it} + \alpha_{4i}t + u_{it}
\]  

Assume the variables in equation (4) are I (1) and cointegrated. This implies \( u_{it} \) is an I (0) process for all \( i \) and is independently distributed across \( t \). They are also assumed to be distributed independently of

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5 (Pesaran et al., 1999)
the regressors. Suppose our maximum lag of every variable is one, the autoregressive distributed lag, ARDL (1, 1, 1, 1, 1) model becomes:

\[
Y_{it} = u_{it} + \delta_{10i} \text{BANKCREDIT}_{it} + \delta_{11i} \text{BANKCREDIT}_{it-1} + \delta_{20i} \text{GOVERNMENTSIZE}_{it} + \delta_{21i} \text{GOVERNMENTSIZE}_{it-1} + \delta_{30i} \text{TRADEOPENNESS}_{it} + \delta_{31i} \text{TRADEOPENNESS}_{it-1} + \delta_{40i} \text{OILPRICE}_{it} + \delta_{41i} \text{OILPRICE}_{it-1} + \beta_{1i} t + \lambda_i Y_{it} + e_{it}
\]

The error correction equilibrium representation is derived as:

\[
\Delta Y_{it} = \phi_i \left( Y_{it-1} - \theta_{0i} - \theta_{1i} \text{BANKCREDIT}_{it} - \theta_{2i} \text{GOVERNMENTSIZE}_{it} - \theta_{3i} \text{TRADEOPENNESS}_{it} - \theta_{4i} \text{OILPRICE}_{it} - \alpha_{1i} t - \Delta \delta_{11i} \text{BANKCREDIT}_{it-1} - \Delta \delta_{21i} \text{GOVERNMENTSIZE}_{it-1} - \Delta \delta_{31i} \text{TRADEOPENNESS}_{it-1} - \Delta \delta_{41i} \text{OILPRICE}_{it-1} \right) + e_{it}
\]

Where \( \theta_{0i} = \frac{u_{it}}{1-\lambda_i} \), \( \theta_{1i} = \frac{\delta_{10i}+\delta_{11i}}{1-\lambda_i} \), \( \theta_{2i} = \frac{\delta_{20i}+\delta_{21i}}{1-\lambda_i} \), \( \theta_{3i} = \frac{\delta_{30i}+\delta_{31i}}{1-\lambda_i} \), \( \theta_{4i} = \frac{\delta_{40i}+\delta_{41i}}{1-\lambda_i} \), \( \phi_i = 1 - \lambda_i \)

The results obtained using the mean group (MG) and the dynamic fixed effect (DFE) will be reported to facilitate comparison.

4. Data Description

This study covers 28 oil-dependent countries over the period 1990–2012. The study by King and Levine (1993), Levine and Zervos (1998), and Levine et al. (2000) identified three indicators of financial sector development that best explain the differences in economic growth between countries over long periods. They are credit to the private sector, stock market activity (proxy by the ratio of traded value to GDP), and features of the legal system i.e. extent of shareholder and creditor protection.

4.1. Dependent variable:

Non-hydrocarbon GDP Per Capita Growth → This study follows the convention in the literature using real per capita GDP as an indicator of growth. Hence, we measure economic development in terms of real GDP per capita growth. Thereafter, we differentiate the hydrocarbon sector and non-hydrocarbon sector.

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6 The cross-section and time series dimension of the dataset is chosen to obtain a near balanced panel
4.2. Independent variable of interest:

Bank Credit → Bank credit captures the credit provided by financial intermediaries to the private sector as a percentage of GDP. This measure is better than other measures of financial development used in the literature (i.e. M2 and M3 as a ratio of nominal GDP) because it is more directly linked to investment and growth, that is, credit granted to the private sector by the banks (Calderón and Liu, 2003, p. 326; Fitzgerald, 2006). Some studies such as Demetriades and Hussein (1996), Favara (2003), Khan and Senhadji (2003), and Ang and McKibbin (2007) argue that M2 and M3 are poor proxies especially in countries with underdeveloped financial systems because high level of monetization might be linked to financial underdevelopment and vice versa. Furthermore, M2 and M3 mostly capture the ability of the financial system to provide transaction services rather than the ability to channel money from savers to borrowers in the economy. Several studies\(^7\) have used stock market indices such as stock market capitalization to GDP, and stocks traded to GDP to quantify financial development. We use bank credit due to the dearth of long-span time series data for the stock market indices in most of our sample countries.

4.3. Potential determinants of economic growth:

Government Consumption → This variable is measured by the share of government consumption as a percentage of GDP. It excludes expenditure on capital, transfers and debt servicing. Countries with relatively higher government expenditure are more likely to experience lower economic growth because higher government spending requires more tax revenue which leads to misallocation i.e. by transferring additional resources from the productive sector of the economy to the government, which uses them less efficiently. This indicator is particularly important in oil-dependent economies because of the high level of fiscal leakage coupled with lack of transparency and accountability (Ades and Di Tella, 1999).

Trade Openness → The Openness Index is calculated as the ratio of country's total trade, the sum of exports plus imports, to the country's gross domestic product. This will possibly facilitate economic growth by increasing domestic firms’ markets and by allowing them to acquire inputs at competitive prices (Shan, 2005).

\(^7\) (e.g. Atje and Boyan, 1993; Beck, and Levine 2003; Ang , and McKibbin, 2007)
Price of Crude Oil  Refer to crude oil prices of the front month futures contract of the benchmark crude oil grades WTI (WTI; traded at the NYMEX, New York) or Brent (traded at the IPE, London). We use annual average Brent Crude oil spot price as a major benchmark price for purchases of oil worldwide. Using the oil price index as an independent variable allows us to measure the impact of world oil price fluctuation on the non-oil sector. We deflate this variable by the consumer price index (CPI) to obtain the real crude oil price in each country.

5. Results and Discussion

Table 4 reports the results of the unit root tests, which suggest that one of the variables under consideration (i.e. non-hydrocarbon GDP) is stationary of order I(0), while bank credit, government expenditure, trade openness, and the price of crude oil are integrated of order I(1).

### Table 4. Unit root test

<table>
<thead>
<tr>
<th>Variables</th>
<th>Fisher-type test</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>P-values</td>
<td>Ist Difference</td>
</tr>
<tr>
<td></td>
<td>Test Values</td>
<td>Test Values</td>
<td></td>
</tr>
<tr>
<td>Non-Hydo. GDP</td>
<td>-4.8361</td>
<td>-18.4309</td>
<td>0.000</td>
</tr>
<tr>
<td>Bank Credit</td>
<td>-0.6069</td>
<td>-14.5823</td>
<td>0.000</td>
</tr>
<tr>
<td>Govt. Consumption</td>
<td>-1.3236</td>
<td>-16.4452</td>
<td>0.000</td>
</tr>
<tr>
<td>Trade Openness</td>
<td>-1.4412</td>
<td>-19.0764</td>
<td>0.000</td>
</tr>
<tr>
<td>Price of Crude Oil</td>
<td>1.7918</td>
<td>-21.4115</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Notes: all unit root are implemented with a constant and trend and take unit root as null hypothesis. The lags are chosen according to the Akaike criterion. Source: Author’s calculations.

5.1. Panel cointegration tests

The cointegration test identifies the presence of long run relationships among the integrated variables. The right lag-length is crucial since short lags may fail to capture the system’s dynamics, could lead to omitted variables, or bias the coefficients, and likely produce serially correlated errors. Meanwhile too long a lag leads to loss of degrees of freedom and to over-parameterization (Kireyev, 2000). Given the small number of variables included in our study and the somewhat short time dimension of the time series, the system could not be tested for a lag length of more than two. In order to choose an optimal lag and lead length for each series,
we use AIC criterion while the Bartlett Kernel window width is set to $4/ (T/100)^{2/9} = 3$. We thus apply the panel cointegration test using the first-differenced variables.

Table 5 summarizes the result of Westerlund (2007) cointegration test\(^8\). In testing for the existence of a long run relationship between bank credit and nonhydrocarbon GDP per capita, both the group mean and panel statistics accept the null of no cointegration. This suggests there is little evidence of cointegration. However, we also test the existence of a long run relationship between bank credit and GDP per capita; two of the four tests rejected the null that the whole panel is cointegrated, while the other two tests accepted the evidence of cointegration for at least one cross sectional unit. Hence, there is some evidence of cointegration.

### Table 5. Westerlund (2007) Panel cointegration test

<table>
<thead>
<tr>
<th>Test</th>
<th>Nonhydrocarbon GDP Per Capita</th>
<th>GDP Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
<td>Z-value</td>
</tr>
<tr>
<td><strong>Gt</strong></td>
<td>-4.058</td>
<td>-11.212</td>
</tr>
<tr>
<td><strong>Ga</strong></td>
<td>-13.32</td>
<td>-1.132</td>
</tr>
<tr>
<td><strong>Pt</strong></td>
<td>-17.383</td>
<td>-7.225</td>
</tr>
<tr>
<td><strong>Pa</strong></td>
<td>-10.339</td>
<td>-1.227</td>
</tr>
</tbody>
</table>

Notes: the Westerlund (2007) tests take no cointegration as the null. The test regression is fitted with a constant, and a range of lags (1 2) and leads (1 2).

Source: Author’s calculations

Westerlund (2007) cautioned that, in small datasets (such as our study with $T= 23$), the results may be sensitive to the choice of parameters such as lag and lead lengths and the kernel width. Hence, to avoid over-parametrization, we restrict the short-run dynamics and use a shorter kernel window (e.g. Westerlund, 2007; Demetriades and James, 2011). The test still accepts the null of no cointegration for non-hydrocarbon GDP per capita, and reject the null of no cointegration for GDP per capita\(^9\).

Panel-data models tend to exhibit significant cross-sectional dependence in the errors, which could arise due to the presence of common shocks and unobserved components that become

\(^8\) The cointegration test shows that bank credit and non-hydrocarbon GDP per capita is not cointegrated, whereas bank credit and GDP per capita is cointegrated.

\(^9\) The optimal changes in lags, leads and band width did not significantly alter our results.
part of the error (Pesaran, 2004; Baltagi, 2005). One reason for this may be the increasingly economic and financial integration of countries, and particularly in our study, the common shock of oil price fluctuations seems to affect government consumption, which implies likely strong interdependencies between cross-sectional units. The absolute correlation is 0.29\(^{10}\), which seems high. Hence, there is evidence to suggest the presence of cross-sectional dependence\(^{11}\). This indicates the presence of a common factor affecting the cross sectional units.

We then bootstrapped\(^{12}\) robust critical values for the test statistics. The test accepts the null of no cointegration for non-hydrocarbon GDP per capita and reject the null of no cointegration for GDP per capita. The computed values of the asymptotic and bootstrapped Robust P-values are presented in Table 6.

**Table 6. Westerlund (2007) Panel cointegration test, bootstrapped**

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Z-value</th>
<th>P-value</th>
<th>Robust P-value</th>
<th>Value</th>
<th>Z-value</th>
<th>P-value</th>
<th>Robust P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gt</td>
<td>-2.518</td>
<td>-0.985</td>
<td>0.162</td>
<td>0.136</td>
<td>-2.101</td>
<td>-0.736</td>
<td>0.048</td>
<td>0.027</td>
</tr>
<tr>
<td>Ga</td>
<td>-7.188</td>
<td>3.753</td>
<td>1.000</td>
<td>0.511</td>
<td>-7.812</td>
<td>-2.837</td>
<td>0.038</td>
<td>0.021</td>
</tr>
<tr>
<td>Pt</td>
<td>-11.021</td>
<td>0.179</td>
<td>0.571</td>
<td>0.351</td>
<td>-10.263</td>
<td>-9.462</td>
<td>0.046</td>
<td>0.034</td>
</tr>
<tr>
<td>Pa</td>
<td>-6.283</td>
<td>2.287</td>
<td>0.889</td>
<td>0.385</td>
<td>-8.173</td>
<td>-1.287</td>
<td>0.062</td>
<td>0.056</td>
</tr>
</tbody>
</table>

Notes: Because the Akaike optimal lag and lead search is time-consuming when combined with boot-strapping, we held the short-term dynamics fixed.
Source: Author’s calculations

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\(^{10}\) Pesaran’s test of cross sectional independence = 40.368, Pr = 0.0000. Average absolute value of the off-diagonal elements = 0.292.

\(^{11}\) We use the Pesaran (2004) CD test on the residuals of under the FE specification. The CD test statistic is normally distributed under the null hypothesis of no cross-sectional dependence.

\(^{12}\) Bootstrapping correct critical values in tests; it reduces the difference between the true and nominal rejection probabilities. Thus, it provides asymptotic refinements for hypothesis tests and confidence intervals.
5.2. Empirical results of PMG, MG and DFE

We proceed to estimate the long-run coefficient of nonhydrocarbon GDP per capita as the dependent variable. Table 7 presents the results of the parameter estimates of the short-run and long-run.

Table 7. Non-Oil GDP = \( f(\text{Bank Credit, Govt. Consumption, Trade Openness, Oil Price}) \)

<table>
<thead>
<tr>
<th>Pooled Mean Group</th>
<th>Mean Group</th>
<th>Hausman Test</th>
<th>Dynamic Fixed Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-Run Coefficients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank Credit</td>
<td>-0.0149</td>
<td>0.0084</td>
<td>0.2287</td>
</tr>
<tr>
<td>Government consumption</td>
<td>0.1493***</td>
<td>0.0476</td>
<td>0.8282</td>
</tr>
<tr>
<td>Trade Openness</td>
<td>0.0036</td>
<td>0.0058</td>
<td>-0.1389</td>
</tr>
<tr>
<td>Price of crude Oil</td>
<td>0.2227***</td>
<td>0.0335</td>
<td>0.7132</td>
</tr>
<tr>
<td>Error correction Coefficient</td>
<td>-0.1064***</td>
<td>0.0225</td>
<td>-0.5313***</td>
</tr>
<tr>
<td>( \Delta ) Bank Credit</td>
<td>0.2392</td>
<td>0.1411</td>
<td>0.1503</td>
</tr>
<tr>
<td>( \Delta ) Government consumption</td>
<td>0.1357</td>
<td>0.0773</td>
<td>-0.0081</td>
</tr>
<tr>
<td>( \Delta ) Trade Openness</td>
<td>0.0039</td>
<td>0.0116</td>
<td>-0.0123</td>
</tr>
<tr>
<td>( \Delta ) Price of crude Oil</td>
<td>-0.1926**</td>
<td>0.0628</td>
<td>-0.0592</td>
</tr>
<tr>
<td>Intercept</td>
<td>3.562**</td>
<td>1.486</td>
<td>6.824*</td>
</tr>
<tr>
<td>Country</td>
<td>28</td>
<td>28</td>
<td>539</td>
</tr>
<tr>
<td>Observation</td>
<td>539</td>
<td>539</td>
<td>539</td>
</tr>
</tbody>
</table>

Note: *, **, and *** indicate significance at 10 %, 5 % and 1 %, respectively.

Estimations are estimated using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, control for country and time effects. The first panel (LR) shows the long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec). Hausman test indicates that PMG is consistent and efficient estimator than MG and DFE. The lag structure is ARDL (1, 1, 1, 1, 1) and the order of variables is non-hydrocarbon GDP per capita growth, bank credit, government consumption, trade openness, liquid liabilities, and oil price.
The efficiency of the PMG estimates relies on several specification conditions. The first is that the regression residuals should be serially uncorrelated and the explanatory variables are treated as exogenous. We address this endogeneity concerns in two ways: we augmented with lags of the regressors and dependent variables to minimize the bias and to ensure the regression residuals are serially uncorrelated. In choosing the optimal lag structure, we apply the Akaike Information criterion and the Schwartz Bayesian criterion, we constrain our lags to a maximum of three due to our times series dimension and the number of regressors.

The second condition is that the long-run parameters should be the same across countries. We test the null hypothesis of homogeneity; the validity of the long run homogeneity restriction across countries, and hence the efficiency of the PMG estimator over the other estimators, is examined by the Hausman test. The Hausman test accepts the null hypothesis of the homogeneity restriction on the regressors in the long run, which indicates that PMG is a more efficient estimator than MG. Similarly, comparing the result of DFE and PMG, the Hausman test favours the PMG specification over DFE. Since the Hausman test clearly favours the PMG specification over the other error correction based estimations, we focus exclusively on PMG. The PMG estimator indicates that financial intermediation has an insignificant, albeit negative impact in the long run and a positive and insignificant impact in the short run on non-hydrocarbon GDP per capita growth. Our results show the growth of non-hydrocarbon activity depends largely on government spending and hydrocarbon earnings However, in the economy as a whole, financial intermediation has a positive and significant effect on GDP per capita growth (see Table.8).

13 Sufficient augmentation of the order of the ARDL model can correct for the problem of residual serial correlation and endogenous regressions (Pesaran, 1999; Pesaran and Shin, 1999)
14 The P-values associated with the Hausman Test for PMG, MG, DFE is greater than 0.04 and do not reject the long run homogeneity restriction hypothesis. The constraint of common long-run coefficient in our preferred estimator, the PMG, has lower standard errors and slower speed of adjustment.
Table 8. GDP = f(Bank Credit, Govt. Consumption, Trade Openness, Oil Price)

<table>
<thead>
<tr>
<th></th>
<th>Pooled Mean Group</th>
<th>Coef.</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long-Run Coefficients</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank Credit</td>
<td>0.0657***</td>
<td>0.0143</td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>-0.1583**</td>
<td>0.0439</td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td>-0.0762</td>
<td>0.0618</td>
<td></td>
</tr>
<tr>
<td>Trade Openness</td>
<td>0.0712***</td>
<td>0.0107</td>
<td></td>
</tr>
<tr>
<td>Error correction</td>
<td>-0.2890***</td>
<td>0.0259</td>
<td></td>
</tr>
<tr>
<td>△ Bank Credit</td>
<td>0.6317</td>
<td>0.0541</td>
<td></td>
</tr>
<tr>
<td>△ Government</td>
<td>0.1322</td>
<td>0.1132</td>
<td></td>
</tr>
<tr>
<td>△ Consumption</td>
<td>0.0575</td>
<td>0.2059</td>
<td></td>
</tr>
<tr>
<td>△ Trade Openness</td>
<td>'0.1782</td>
<td>0.1751</td>
<td></td>
</tr>
<tr>
<td>△ Price of crude</td>
<td>3.5631</td>
<td>2.2472</td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation</td>
<td>539</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *, **, and *** indicate significance at 10 %, 5 % and 1 %, respectively

Source: Author’s calculations

Our results is consistent with Cevik and Rahmati (2013) but inconsistent with Hasanov and Huseynov (2013), and Samargandi et al., (2013), which are based on time series analysis. Without delving into details of the advantages of panel data analysis over time series data\(^{15}\); our panel data methodology shows there is a broken link between finance and the non-hydrocarbon sector.

There are serval possible reasons for the disconnection. The financial system in most of the oil-rich countries is still in the early stage or at best, transformation phase, and has only started to lend to the non-oil sector in the last decade. Financial intermediation needs to reach a certain level of development before it could promote economic growth. Second, the weak regulatory environment inherent in the oil-rich economies could explain the reluctance of banks to lend outside the oil related businesses as banks avoid risks associated with eventual difficulties in loan recovery. Third, the returns from financial development depend on allocation of funds to productive investment projects but due to high misallocation of resources, the interaction

\(^{15}\) For details (see Hsiao et al., 1995)
between bank credit and economic growth is not strong in the non-oil sector. The banking sector does not seem to fulfil its traditional role of a financial intermediary by turning customers’ deposits into loans.

6. Conclusion

Financial sector development is more important for industries with high dependence on external financing. The oil sectors are not as dependent on domestic bank lending as non-oil sectors. Oil-dependent countries have attempted to modernize their financial system despite challenges posed by the large hydrocarbon sector and an inefficient public sector. Have the financial reforms contributed in enhancing the growth of the non-oil sector? Our results shows that bank credit significantly increased growth in oil-dependent economies but unfortunately it exhibits no significant impact on the growth of non-oil sector. Our findings have several policy implications.

First, the non–oil sectors received ‘inadequate’ bank credit even though they contributed more to employment and total GDP. There is a need to increase financial access to the non-oil sector because it has the potential to absorb the burgeoning labour force.

Second, oil price drives the growth of the non-oil sector. The high dependency on oil revenues coupled with its volatile price contributes to the volatility of government revenues and spending. Volatility undermines productivity growth and private sector investment. Increased financial access to the non-oil sector will help expand non-oil sector activities which will help cushion the adverse effects of oil price volatility.

Third, a considerable share of the non-oil growth over the last two decades was driven by the public sector. This seems to be running out of steam as government finances become tighter amidst falling oil prices. Increased financial access to the non-oil sector will increase private sector spending and investment, in some cases crowd-in government consumption, and in other cases help scale back government consumption.

Fourth, banks dominate the financial system, lend mostly to the oil and gas related sectors, and are reluctant to lend to the non-oil sector. The stock markets are small and the non-bank financial institutions, such as insurance companies and pension funds do not play an active role. Given the dependence of oil, a major oil shock poses a risk to the banking sector. The
more robust the financial sector and its supportive infrastructure, the more likely that the non-oil sector will be able to access funds. Therefore, the role of government in the development of incentives for financial inclusion is critical.

Like any other study, our finding also suffers from some limitations. It is almost impossible to account for all possible factors that may foster growth; this is because there are many variables that exert an effect on growth.

Notwithstanding, we believe our findings shed some light on the average impact of bank credit on the non-hydrocarbon sector. This growth of non-oil sector is crucial to the creation of a more inclusive, resilient and sustainable economy, but the reluctance of banks to lend to the non-oil sectors is a handicap.
Table 9. Sample of countries used in the regression analysis

<table>
<thead>
<tr>
<th>Africa</th>
<th>Latin America</th>
<th>Middle East</th>
<th>Eastern Europe</th>
<th>Asia Pacific</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>Bolivia</td>
<td>Saudi Arabia</td>
<td>Azerbaijan</td>
<td>Papua New Guinea</td>
</tr>
<tr>
<td>Angola</td>
<td>Mexico</td>
<td>Qatar</td>
<td>Kazakhstan</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>Ecuador</td>
<td>Syria</td>
<td></td>
<td>Malaysia</td>
</tr>
<tr>
<td>Gabon</td>
<td>Trinidad</td>
<td>Kuwait</td>
<td>Iran</td>
<td>Vietnam</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Venezuela</td>
<td>Yemen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cameroon</td>
<td></td>
<td>Bahrain</td>
<td>Iran</td>
<td></td>
</tr>
<tr>
<td>Chad</td>
<td></td>
<td>Dem. Rep. Congo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congo Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References:


