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Oil revenues and economic growth in oil-producing countries: The role of domestic financial markets

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ABSTRACT

The study estimates the effects of oil revenues on economic growth through financial markets development channel. Using a Panel VAR framework, we determine the proportional contribution of government oil revenue investment and private oil revenue investment among a sample of 83 oil-producing countries during the period, 1990–2015. Also, a two-step system GMM is used to estimate the effect of oil revenues on economic growth conditional on financial markets development. We find that government investment of oil revenues positively affects economic growth conditional on banking sector development but has no effect in the case of the stock market development except via turnover ratio. The findings further indicate that private investment of oil revenues negatively impacts economic growth conditional on banking sector development. In the case of stock market development, in general, we find no effect. The policy recommendation is that oil-producing countries should pay more attention to share of the oil rent that goes to the government and the development of their banking sector since this can have a positive spill over effect on the development of the economy by government investment of oil revenue.

1. Introduction

The question of whether natural resource wealth is a blessing or a curse is still not comprehensively answered in the literature. Some studies find evidence of a curse (Sachs and Warner, 1995, 1999; 2001; Gylfason and Zoega, 2002; Kim and Lin, 2017), others find evidence of a blessing (Van der Ploeg and Poelhekke, 2010; Cavalcanti et al., 2011; James, 2015).

An important channel through which natural resource wealth may benefit or inhibit the growth effort of a country is how revenue (rent) generated from the resource is managed across time in terms of the amount allocated for current consumption versus that allocated for investment. In the prior literature, most of the studies focusing on explaining the mechanism through which an abundant natural resource wealth would negatively impact growth performance tends to suggest corruption and institutional failures (Arezki and Brückner, 2011; Apergis and Payne, 2014), market failures (James, 2015) and bad management of resource revenues due to rent-seeking behaviour of some political actors (Hodler, 2006; Deacon and Rode, 2012) as the key reasons.

In this study, we explore the management channel conditional on the level of financial development to explain whether abundant natural resource wealth will hinder or spur growth, using oil producing-countries as a case study. In particular, we explore whether the management of the revenues from these resources could provide answers to the question "why some natural resource-abundant countries experience high growth performance and others low growth performance".

In providing answers to the why question, the study makes the following contributions to the literature. First, the literature on oil revenues has generally focused on the impact of oil revenues (rent) on economic growth (Mehrara, 2008; Eregha and Mesagan, 2016; Moradbeigi and Law, 2017). However, oil revenue impact on growth is via investment of the oil revenues, but there has been very little effort made by prior research to explore the nature of oil investment dynamics on growth. The success story of Norway can be attributed to the prudent investment of the oil revenue both into physical capital and financial assets, generally referred to as "the Norwegian model". The Norwegian success story suggests that investment of oil revenues into physical and financial assets is a requirement not only to achieving growth and development but also its sustainability. It is within this context that this

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study contributes to the literature by focusing on the effects of the share of oil revenue invested by the government and that invested by the private sector on growth. This among other things will contribute to our knowledge on how government investment of the oil revenue and by the private sector, contributes to the mixed findings of oil revenues on growth.

Another contribution is that previous studies on this theme tend to focus on aggregate oil revenues and the implications thereof on economic growth (Mehrara, 2008; Eregha and Mesagan, 2016; Moradbeigi and Law, 2017); how oil revenue influence specific components of economic development such as health and education (Cockx and Francken, 2014, 2016); the impact of oil revenue on growth conditional on physical capital (Karimu et al., 2017); aggregate oil revenue relationship with physical capital spending (Bhattacharyya and Collier, 2013); and the impact of oil revenue on financial development (Moradbeigi and Law, 2017; Atil et al., 2020). These studies have not explicitly addressed the question of oil revenue management in terms of the shares invested by the government and by the private sector on growth, this is the main focus of the study.

The third contribution to the literature is how financial market development influences the impact of oil revenue investments on growth. We argue that a well-functioning financial market will channel the revenues from oil into the productive sectors of the economy, which propels economic growth. Oil-producing countries' ability to translate investment of the oil revenue by government and the private sector is dependent on the quality of their financial markets. Mehrara (2008) argues that developing deeper capital markets is a solution to addressing the adverse effect of oil revenues on economic growth. We build on the existing literature by first introducing two layers of the financial system. Unlike Moradbeigi and Law (2017) who focus on credit to the private sector as a percentage of GDP, this study focuses on both the banking sector and stock market developments.

We employ PVAR model to estimate the proportional distribution of oil revenues(rent) due to government investment and private revenue (rent) investments. We then apply a two-step system GMM estimation approach to estimate the effect of oil revenue management on economic growth via financial markets development channel. First, we find that the share of oil revenue invested by the government and the private sector and the interaction term with banking sector development are significant factors for economic growth, where the total effect of government investment on growth is positive conditional on the level of banking sector development. The positive effect increases as banking sector development improves. In the case of private sector investment, the total effect is negative conditional on the level of banking sector development. The magnitude of the negative effect increases as the level of banking sector development improves, which may be explained by the specific structure of the oil industry in terms of capital intensity are skill personnel, which have to be imported for most of the oil-producing countries and also what efficient banking sector development entails for banking intermediation.

The second important finding is that the impact of government investment of oil revenue on economic growth conditional on the level of stock market development is generally insignificant and not different from zero for all except in the case of turnover ratio, where it is significant at the 10 percent level of significance.

The rest of the study is organized as follows; section 2 focuses on the theoretical and empirical literature review. Section 3 focuses on the data source and empirical specification of the model, Section 4 discusses the findings of the study, while section 5 provides conclusion and policy implications of the study.

2. Theoretical and empirical literature

2.1. Theoretical foundation

The growth theory is the underlying theory for this study. This is complemented with the capital scarcity and risk premium theory proposed by van der Ploeg and Vanables (2011). Various growth theories exist in the literature, such as the Schumpeterian theory of growth, Slow-Swan (Neo-classical) growth theory and the Endogenous growth theory. This study utilizes the endogenous growth theory to link the relationship between oil revenue management and economic growth conditional on financial markets development.

Romer (1990) and Lucas (1988) are the group of economists who began to critique the neoclassical Solow growth model arguing that it has a poor fit when it is confronted with cross-country data because growth is determined outside the model. They argue that factors such as research and development, human capital development, innovation and technical progress are the most important drivers of long-run economic growth and development. Endogenous growth theory builds from the perspectives of individual utility maximization constrained by a budget and also firm profit maximization subject to achieving certain productivity at the minimum cost. Endogenous growth theorists opine that an open society court the inflow of technology and superior ideas from other nations, especially relatively more developed nations, to stimulate growth. They also stressed the need for government's intervention in investments into research and development as the private sector may not invest at optimal levels to boost growth. Again, endogenous growth theorists contend that learning-by-doing inures to the benefit and growth of economies. Thus, developing countries which are rich in oil can learn from the robust technology that will be brought to the oil sector for production and develop their local content with the new knowledge. Similarly, in a simple endogenous growth model, the government share of oil revenues and multinational corporations' share of oil revenues for investment can stimulate economic growth in an oil-producing country. Furthermore, if two countries receive an equal amount of oil revenues, the endogenous model predicts that the country with more developed financial markets will be able to convert the oil funds into productive investments, and better able to allocate them to more productive sectors of the economy to aid economic growth.

To complement the endogenous growth theory, we employ the capital scarcity and risk premium theory developed by Van der Ploeg and Venables (2011) to manage a windfall from oil. Their theory opines that countries with abundance oil but weak in physical capital should invest the wealth from the oil into improving their physical capital rather than investing in Sovereign Wealth Funds (SWFs). They argue that countries with less abundance physical capital are likely to have interest rates higher than the world average rate so when such countries are borrowing they would borrow at a world interest rate plus a risk premium as compared to their counterparts with domestic interest rates below the world's average interest rates. The conclusion from their theory is that in countries with scarcity in the capital, domestic investment should be geared towards scaling-up their infrastructure rather than accumulating foreign assets. Therefore, investment of oil revenues in the domestic economy can scale-up infrastructure which can lead to economic growth in the long-run, especially in developing countries.

2.2. Empirical literature

There has been a plethora of research on the resource curse thesis. More broadly, the focus has been on natural resource on economic growth, natural resource and capital spending and natural resource and financial development. These help to explain how natural resource-rich countries are less developed relative to non-resource rich countries. However, what has not been studied in the literature is the management of natural resource revenues. This section surveys literature on the three thematic areas below and draws conclusion on the research gap.

2.2.1. Natural resource on capital spending

Previous research has investigated the relationship between natural resource revenues and capital spending (Farganegan, 2011; Cockx and Francken, 2014, 2016; Aregbeyen and Kolawole, 2015). Others

investigated the relationship between natural resource revenues on economic growth (Hamdi and Sbia, 2013; Apergis and Payne, 2014; Fuinhas et al., 2015). On the aspect of natural resource revenues and capital spending, Cockx and Francken in their studies in 2014 and 2016 examine how natural resource revenues affect health and educational expenditure, respectively. Collectively, they find a negative relationship between natural resource revenues on health and education expenditure. Their findings suggest the need for sustainable resource management in developing countries. They argue that the role of the private sector in the extractive industry is necessary for increasing funding towards health and education by engaging in corporate social responsibility (CSR). Similarly, using data from 31 provinces in China, Sun, Geng, Yang & Edziah (2019) document the impact of natural resource dependence on public education spending. Contrary to earlier studies, they find a positive relationship between natural resource and education spending. They also document that higher educational quality will enhance human capital, which will catalyse economic growth. Aregbeyen and Kolawole (2015) posit that government spending does not improve economic growth in Nigeria. They, however, maintain that to boost economic growth, the government should increase spending on capital expenditure.

2.2.2. Natural resource on economic growth

On the account of natural resource abundance on economic growth, Apergis and Payne (2014) find that oil abundance in MENA countries show a negative relationship with economic growth during the period, 1990–2003. This was attributed to bad institutional quality. They, however, find that better institutional reforms stimulate economic growth from 2003 onwards when those countries engaged in institutional reforms.

Again, Hamdi and Sbia (2013) study in Bahrain find that oil revenues promote economic growth and also serve as a channel through which government finances its spending. Fuinhas, Marques and Couto (2015), document that the ratio of oil production to primary energy consumption exerts a positive impact on economic growth in both the short-run and long-run. Similarly, oil rent depresses economic growth in the short and long-run. This finding suggests a curse on the economies rather than a blessing.

Mehrara (2008) also examines the nonlinear relationship between oil revenues and output growth in oil-producing countries. Using two oil revenues measures in a dynamic panel framework, the study finds that output growth is adversely affected by negative oil shocks. The study also finds that positive oil shocks do not stimulate economic growth. The study suggests that in periods where oil funds are booming, oil-rich countries should manage their revenues well through the setting up of stabilization and savings funds. This will help to support the economy in periods where oil revenues are low.

2.2.3. Natural resource, finance and economic growth

Another important issue is the link between oil revenues, finance and economic growth. Few studies have tried to underscore the link between these variables. For instance, Nili and Rastad (2007) study the relationship between oil revenues, financial development and economic growth in oil economies. They find that investment in oil economies is supported by oil investments but financial development has dampening effects on investment in those economies. This negative effect might be championed by government dominant role in investment as opposed to the private sector participation in investments. Again, Samargandi et al. (2014) investigate the relationship between financial development and economic growth in Saudi Arabia. Their study reveals that financial sector development supports growth in the non-oil sector as opposed to oil-sectors of the Saudi economy.

Similarly, Badeeb, Lean and Smyth (2016) study the oil-curse in the finance-growth framework in Malaysia. Their study suggests a positive relationship between oil rent and economic growth. They argue that the role of finance can support the productive sectors of the economy to aid economic growth. Similarly, Moradbeigi and Law (2016) underscore the relationship between oil price and economic growth volatilities for 63 oil-producing countries. The study finds that oil price volatility hurts growth volatility. Further, this negative growth volatility is dampened by financial development. In a related study, Moradbeigi and Law (2017) find that oil revenues negatively impact on economic growth but this negative effect can be mitigated by financial development. Finally, in using 20 oil-producing countries, Jarrett et al. (2019) find that financial institutions reduce output volatilities in oil-producing countries and mitigate its negative effect on growth in the year that showed a sustained decline in oil prices. The authors conclude that finance plays an important role in improving energy security and provides an avenue for economic growth.

Other recent studies that have examined the role of natural resource abundance and economic growth through financial development include (Shahbaz et al., 2018; Erdoğan et al., 2020; Atil et al., 2020). Specifically, Shahbaz et al. (2018) find education and economic growth to have a positive relationship with financial development. They also find a feedback causal relationship between natural resource abundance and financial development. Also, Erdoğan et al. (2020) find that the level of financial development is necessary to translate natural resource export to economic growth. They noted that, where the level of financial deepening is under 45%, increase in oil export does not have a significant effect on economic growth. On a second wave, they find that where financial deepening is over 45%, a unit increase in oil exports causes a 7% increase in economic growth. Finally, Atil et al. (2020) find oil prices and economic growth to have a positive effect on financial development. This suggests that natural resource as an economic tool supports financial development in the long run.

In summary, we can argue that oil revenues play a crucial economic role in oil-producing countries. Recent evidence supports the claim that oil revenues can be an enemy to economic growth unless it is mitigated by financial development. Most of the studies have neglected the investment of oil revenues by the private sector and government collectively into productive sectors of the economy to increase economic growth. Additionally, recent evidence has not considered the role financial market development may play in the dynamic relationship between investments of oil revenues by both government and the private sector on economic growth. This study, therefore, opens the black-box for this debate.

3. Methodology

3.1. Data and variables

The data for the study comes from three main sources. These are the Global Financial Development Database (GFDD), World Development Indicators (WDIs) and the International Monetary Fund. The study uses data covering the period, 1990–2015 for 83 oil-producing countries. This is because key variables of interest such as oil rent, government and private investments of fixed capital formation for all the oil-producing countries used for the study had data sufficient for the period under study. We obtain the financial markets data from the Global Financial Development Database for bank-based and capital-based economies.

This dataset covers 214 economies with about 109 indicators capturing various aspects of financial institutions and markets. For our bank-based measures, we use credit to the private sector by banks and other financial institutions, bank credit and money supply all as a percentage of GDP. For stock markets, we use market capitalization, total value traded and turnover ratio. We also use comprehensive disaggregated data from the IMF (2017), which contains investment data for both public and private sector investments as a share of stock of public capital. The public investment is measured using a gross fixed capital formation of the general government investment in billions of constant 2011 international dollars. And the private investment (gross fixed capital formation) is also in billions of constant 2011 international

dollars. This is normalized by Gross Domestic product real purchasing power parity in billions of constant 2011 international dollars.

We obtain the oil rent (used interchangeably with revenue throughout the paper) data from World Development Indicators (WDIs) of the World Bank (2017). Oil rents are the difference between the value of crude oil production at regional prices and total costs of production. This data together with the public and private investment data and other relevant variables are used to predict the variables of interests (share of government oil revenues for investment and share of private oil revenues for investment). We use real GDP per capita as a measure of economic growth. We include other variables that are relevant for the growth based on the literature. These include secondary school enrolment (a proxy for human capital development), inflation, financial openness, population, government expenditure and polity2 index (democracy) as our control variables. We obtain the Polity2 index from Polity IV project by Marshall et al. (2019) and the financial openness data is obtained from Chinn and Ito (2008).

3.1.1. Oil revenues

This is the main variable of interest, which consists of the share of oil revenue investment by government (GOR) and share of oil revenue investment by the private sector (POR). We use two measures for each of these variables. One as a predicted variable based on a panel vector autoregressive regression framework and the other one as a ratio of government and private investments over oil rent respectively. These two approaches allow us to check for the robustness of our results. The detail methodological predictions of the government oil revenue investment (GOR) and private oil revenue investment (POR) using PVAR and a variant ratio approach is presented in section 3.2 below.

3.1.2. Financial markets development

Here, we focus on the banking sector and stock markets measures. For the banking sector, we use total credit to the private sector, bank credit and money supply all as a percentage of GDP (Levine and Zervos, 1998). For the stock markets, we use stock market capitalization, which represents the size of the market measured as the total value of the firms listed divided by GDP. The large market does not imply that the market will function properly because taxes may distort the incentive for firms to list on a domestic stock exchange. The total value traded, and turnover ratio is the market liquidity measures of a domestic bourse. Turnover measure refers to the value of shares traded in the local stock exchange divided by the value of listed domestic shares. Higher turnover ratio depicts the lower transaction cost of listed firms. A stock market can be large but if it is inactive it would have a lower turnover ratio since large stock markets do not necessarily connote liquidity. Lastly, Value Traded is another liquidity measure, which equals to the value of the trades of domestic shares on domestic exchange divided by GDP. It is instructive to note a small liquid market can have a higher turnover, but very small value traded.

On the basis of these, the study hypothesises that oil-producing countries with a developed banking system have a positive effect on economic growth because oil revenues, which flow in would remain in the banks and other financial institutions, which would be used to provide credit to the private sector thereby stimulating growth due to productive investments. Similarly, oil-producing companies might list on the stock market, which is developed, and this would enable citizens to own shares in such firms. Dividend and capital gains earned will remain in the domestic economy for investment, which will stimulate economic growth. Similarly, the presence of some oil companies in the local bourse might make it active thereby improving the liquidity of the stock market. We hypothesise a positive relationship between stock market development and economic growth among oil-producing countries.

3.2. Control variables

The population is measured by using the natural log of the population to represent the size of the country. Inflation is also included in the model to capture macroeconomic stability of the economy and indirectly capture interest rate influence on economic growth. Higher inflation rates reduce the real rate of return if the rate of inflation was not anticipated, which is a disincentive to investors. This will reduce investments in the economy and ultimately reduce economic growth. Government expenditure is measured as the log of final government consumption expenditure. An increase in government consumption will lower growth if those expenses are not into investment in the economy. Countries that are less developed are more likely to use their oil revenues for consumption instead of investments and this will yield a negative effect on economic growth.

We use the log of secondary school enrolment to measure human capital since human capital development is good for growth according to the neoclassical and endogenous growth models. We hypothesise a positive link between schooling and economic growth since the well-educated population can increase their productive activity. Similarly, we use Chinn and Ito's (2008) measure of capital accounts openness as our indicator of financial openness. The indicator shows that higher values indicate more financial openness. The indicator is a de jure measure of financial openness with index ranging between −1.83 and +2.5. Financial openness makes it possible for oil-producing countries to receive foreign capital in the oil sector, which facilitates economic activities, hence a positive relationship is expected. Finally, we use polity2 index to measure democracy. It ranges from −10 to 10. This is rescaled to range between 0 and 1, where higher values denote strong democracies and lower values reflect weak democracies. We argue that in democratic countries, there are checks and balances to ensure the effective utilization of oil revenues, which can help to facilitate economic growth.

3.3. Computation of oil revenue management

This study uses a two-step estimation approach for the main objective of the study. First, we determine the proportional distribution of oil revenues for government (GOR) investments and oil revenue for private (POR) investments using the PVAR model and a variant ratio approach, where we computed the ratio of government investment to oil rent and ratio of private investment to oil rent. The GOR and POR are used in the two System-GMM as the key independent variables.

The main variable of interest is the proportion of oil rent invested by the public sector and the proportion of oil rent invested by the private sector in the domestic economy of the sampled countries in the study. The GOR and POR forms the management of oil revenues where oil rent is deemed to be converted from natural capital to physical capital. In general, management of oil fines goes beyond converting natural capital into physical and human capital to include financial assets such as sovereign wealth funds as documented in the Norwegian model of sustainable management of their oil resources. Our current measure of management of oil rent, though excludes the financial asset component, it covers a significant aspect of the proportion of the natural capital that is converted into both physical and human capital by both government and the private sector.

The first approach to compute the proportional investment of the oil rent by government and the private firms is to predict both government investments (health, education, infrastructure etc.) and private investment (fixed capital formation) via Panel Vector Autoregressive (PVAR) framework. This approach allows for a causal interpretation of the estimates, an important requirement in computing the proportions via prediction.

In the VAR framework, each variable in the system is explained by its lags, lagged values of the other variables, time fixed effect and unobserved individual effect. The PVAR can generally be specified as:

$$y_{it} = \sum_{t=1}^{n} \beta_t y_{it-1} + \mu_{it} \quad (1)$$

where y is k*1 vector of k variables, $\beta$is a k*k vector of parameters to be estimated and μ_{it} is a composite term that is made up of time fixed effects (v_t), unobserved individual effect (γ_i) and random error term (ε_{it}), t is time and i is an individual unit, which in this study represents countries. In line with Abrigo and Love (2016), the general PVAR in equation (1) in specific terms for the prediction is expressed as;

$$GI_{it} = \sum_{t=1}^{n} \beta_{gt} GI_{it-1} + \sum_{t=1}^{n} \beta_{pt} PI_{it-1} + \sum_{t=1}^{n} \beta_O Oil\mathrm{Re}nt_{it-1} + \beta_f \inf lat_{it} + \beta_{GD} GDP_{it} + \mu_{it}^{GI} \quad (2)$$

$$PI_{it} = \sum_{t=1}^{n} \alpha_{gt} GI_{it-1} + \sum_{t=1}^{n} \alpha_{pt} PI_{it-1} + \sum_{t=1}^{n} \alpha_{Ot} Oil\mathrm{Re}nt_{it-1} + \alpha_f \inf lat_{it} + \alpha_{GD} GDP_{it} + \mu_{it}^{PI} \quad (3)$$

$$Oil\mathrm{Re}nt_{it} = \mathring{a}_{t=1}^{n} \theta_{gt} GI_{it-1} + \mathring{a}_{t=1}^{n} \theta_{pt} PI_{it-1} + \mathring{a}_{t=1}^{n} \theta_{Ot} Oil\mathrm{Re}nt_{it-1} + \theta_f \inf lat_{it} + \theta_{GD} GDP_{it} + \mu_{it}^{oil} \quad (4)$$

The three equations (2)–(4) are jointly estimated, where GI denotes government investment, PI is private investment, OilRent represents oil rent, inflat is inflation and GDP is real GDP per capita. The betas (β) are the coefficient to be estimated in the government investment equation, alphas (α) are coefficients to be estimated in the private investment equation and thetas (θ) are coefficients to be estimated from the oil rent equation (4). Inflation is to proxy macroeconomic stability such as the role of interest rates on the investment climate.

Based on the coefficient estimate for oil rent (β_O) from equation (2), we compute the predicted government investment due to oil rent for each country by multiplying the oil rent coefficient (β_O) by government investments. Similarly, in the case of the proportion of private investment of the oil rent, it is computed based on the coefficient estimate for oil rent (α_O) from equation (3) multiply by private investment for each country.

A variant approach used is based on taking a ratio of government investment over oil rent ($GOR_{it} = \frac{GIP}{OILRENT}$) to proxy the amount of oil rent that goes into government investment and the ratio of private investment over oil rent ($POR_{it} = \frac{PIP}{OILRENT}$) to proxy the share of oil rent reinvested by the private sector in the domestic economy. The second approach measure government investment per unit of oil rent and private investment per unit of oil rent. This can be interpreted as the investment efficiency of the oil rent in the domestic economy (government investment efficiency of oil rent and private investment efficiency of oil rent).

Since both measures are not proxies of the real shares, we cannot rule out potential errors associated with these proxies relative to real proportions of oil rent invested by the public and private, respectively. Our interest, therefore, is to rely on the more realistic proxy and a less bias measure of the various proportions of investment from oil rent. Admittedly, both approaches are not perfect measures of the real proportion of oil rent invested, but in the absence of a real data on this, we consider the first approach (PVAR) to be more realistic and of a less bias estimate of the true proportion. This is because we fit a causal model of investment that allows for a dynamic structure in the estimation process as suggested by investment theory. Moreover, it is modelled as a system, where the key variables in the model (government investment, private investment and oil rent are considered endogenous). Also, unobserved heterogeneity is considered in the estimation via both country fixed effects and time fixed effects.

Furthermore, the PVAR accounts for macroeconomic stability via inflation that indirectly considers interest rate effect on investment. Given the system approach, the causal framework and the fact that it controls for the key factors for investment, the prediction of investment from such a model based on oil rent provides a reliable estimate of investment (government and private) due to oil rent, where all key derivers are held constant. The predicted proportions from PVAR and the ratio computations are what we use as proxies for the real shares of oil revenue invested by the government and by the private.

The results of the PVAR model is presented in Table A1in the appendix whilst the stability test is presented in Table A2. To be the focus on the objectives of the paper, we decide to only report the diagnostics of the preliminary model (PVAR) results and refer the reader to the full results in the appendix A1. First, concerning the PVAR model fit, since the model estimation approach is based on a generalized method of moment (GMM), we perform the Hansen-J test for over-identification, which is more of a specification test to determine if the over-identifying restrictions are valid. The test results reported in Table A1 in the appendix suggest that our model fit the data generation process (DGP) and therefore, not misspecified. Second, we also test for the stability of the model and results reported in Table A2 indicates that the estimated PVAR model is stable since eigenvalues are all less than 1 as suggested by Hamilton (1994) and Lütkepohl (2005) for such a stability test.

3.4. Econometric specification

The computed oil revenue management variables via the PVAR and the ratio approaches in section 3.2 are used in model 5 below to address the key objectives of the study. The objective of the study is to assess the effect of oil rent (revenue) managements (shares between government and private firms) on economic growth conditional on the level of financial markets developments. The main model of the study is specified as:

$$\ln GDPPC_{it} = \beta_1 \ln GDPPC_{it-1} + \beta_2 \ln GOR_{it-1} + \beta_3 \ln POR_{it-1} + \beta_4 \ln FMD_{it-1} + \beta_5 \ln GOR_{it-1} * \ln FMD_{it-1} + \beta_6 \ln POR_{it-1} * \ln FMD_{it-1} + \gamma' Z_{it} + \mu_i + v_t + \varepsilon_{it} \quad (5)$$

Where $lnGDPPC_{it}$ denote the log of real GDP per capita, $lnGDPPC_{it-1}$ is the lagged real GDP per capita, $lnGOR_{it-1}$ denote the share of government investment of oil rent and, $lnPOR_{it-1}$ denote the share of private investment of oil rent in the domestic economy. These were computed based on estimates from the PVAR model and a variant form based on ratio approach as outlined in section 3.2. $lnFMD_{it-1}$ is the log of financial markets development variables for both the banking sector and stock markets developments, whereas $lnGOR_{it-1} * lnFMD_{it-1}$ is the interaction term between government oil revenue and financial markets indicators. $lnPOR_{it-1} * lnFMD_{it-1}$ is the interaction between private oil revenue and financial markets variables. In line with growth theory and empirics, we include control variables relevant to our study. The control variables used in the model is denoted by the vector $\boldsymbol{Z_{it}}$, which comprises of population, inflation, education, government expenditure, financial openness and democracy (see Barro, 1997; Acemoglu et al., 2005; Arslanalp et al., 2010). We took the first lag of some of the variables such as oil revenue investments, financial markets development and the interaction term because investments of oil revenues and financial markets developments do not instantaneously affect economic growth. Also, it helps to take care of endogeneity issues because the variables at a level might be correlated with the error term and this will allow it to be endogenous. μ_i is the country fixed effects, v_t is the time effect whilst the error term is represented by ε_{it}.

Following, Baltagi, Demetriades and Law (2009), the total effect of oil revenue management on growth is obtained by taking the partial derivative of economic growth with respect to the oil revenue managements via equation (5), which is given below as:

$$\frac{\partial \ln GDPPC_{it}}{\partial \ln GOR_{it-1}} = \beta_2 + \beta_5 * \ln FMD_{it-1} \quad (6)$$

$$\frac{\partial \ln GDPPC_{it}}{\partial \ln POR_{it-1}} = \beta_3 + \beta_6 * \ln FMD_{it-1} \quad (7)$$

These equations mean that whether the effect of oil revenue management is positive, negative or zero depends on the sign and magnitude of the coefficients (β_2, β_3, β_5 *and* β_6) and the level of financial markets developments in each oil-producing country.

3.5. Estimation technique

We estimate equation (5) using a Two-Step System Generalized Method of Moment (SGMM) estimator. There are two SGMM estimators; the one-step and the two-step estimation. We use the two-step estimator with Windmeijer (2005) corrected standard errors because it is asymptotically more efficient than the one-step estimator. The two-step SGMM was introduced by Blundell and Bond (1998) designed to deal with higher persistent data. This replaces the difference GMM by (Arellano and Bond, 1991). The higher persistent data makes the instruments weak since the lagged endogenous regressors are likely to be correlated with the first difference GMM. The SGMM adds a level equation to the difference equation to deal with the issue of the weak internal instruments as a result of the persistence of the data (Roodman, 2009). Our panel has gaps, so we use the orthogonal deviations to maximise sample size.

We choose, the two-step SGMM for several reasons. First, the two-step SGMM approach allows us to treat growth as a dynamic process accounting for the initial growth level with the possibility that previous growth can influence future growth. Second, our number of countries (N) is larger than Ts (Time) making the use of the SGMM more appropriate. Third, the GMM approach allows us to control for endogeneity and potential Nickel bias due to the dynamic structure. This is because natural resource studies are inherently plagued with endogeneity issues (Badeeb et al., 2017) and since it is difficult to find valid external instruments, relying on an approach that provides internal instruments help reduce such endogeneity concerns.

To check for consistency of estimates; we employ two-tests: the Sargan/Hansen test of overidentification restrictions and the Arellano and Bond test for second-order serial correlation in the error term. According to Roodman (2009), the Sargan/Hansen tests measure the validity of instruments by analysing sample analogues of the moment conditions used in the estimation. Thus, the number of instrument count should not exceed the groups since research results reported from highly proliferated instruments cannot be trusted. Finally, the error term may be serially correlated in the first-order, however, the second-order must not be serially correlated because that could be a sign of misspecification of the model.

4. Results and discussion

First, we describe the summary statistics. Next, we assess the effect of oil revenue management on economic growth considering the role of the banking sector. The variables of interest here are the share of oil revenue invested by the government and that by the private sector, and the interaction terms between these variables and banking sector developments (credit to the private sector, bank credit and money supply). We also assess the effect of oil revenues management on economic growth by considering the role of stock market development. The stock market development variables are (capitalization, turnover ratio and total value traded). Finally, we consider the different levels of financial markets development and the role they play in oil revenue management and growth nexus. Our main results are based on the predicted data whilst we report the results of the alternative measures of the share of oil rent invested by the government and the private sector (ratio of government investment to oil rent and the ratio of private investment to oil rent respectively) in the appendix to assess whether how the shares are computed matter concerning the key results of interest.

4.1. Descriptive statistics

Table 1 below shows the descriptive statistics of the results. The average real per capita GDP for oil-producing countries over the period was US$18,533.56 showing higher per capita among oil-producing countries partly because of the inclusion of some developed countries and higher oil rent per capita countries.

Over the period, share of oil revenue (rent) invested by the government (GOR) via the predicted approach averaged 0.23. The Share of oil revenue invested by the Private sector (POR) averaged 0.79. This means that private oil revenue investment is higher than government oil revenue investment. This is also consistent based on the variant ratio measure, where the mean ratio value for the private firms is higher than that from the government.

This is expected because since the oil sector requires significant capital investment outlay, the International Oil Companies (IOCs) are

Table 1
Descriptive statistics.

Variable	Obs.	Mean	Std.Dev.	Min	Max
GDP Per Capita	2180	18533.56	21214.1	555.42	152000
Oil Revenues Management (PVAR)					
Government Oil Revenues	2182	0.230	0.190	0.000	1.400
Private Oil Revenues	2182	0.790	0.440	0.020	4.190
Variant Measure (Ratios)					
Government investment/oil rent	2064	163.495	983.456	0.000	18963.04
Private investment/oil rent	2064	588.967	2711.371	0.0154	39214.36
Banking Sector Development					
Credit to Private Sector	2039	48.110	44.350	0.000	221.290
Bank Credit	2017	47.350	43.340	0.220	212.90
Money Supply (M2)	1837	52.102	35.990	2.820	237.35
Stock Market Development					
Capitalization	1407	44.430	42.600	0.010	265.560
Turnover Ratio	1428	49.750	62.710	0.040	632.440
Total Value Traded	1456	23.480	38.380	0.000	331.270
Control Variables					
Schooling (Secondary)	1656	4.290	0.473	1.890	5.060
Inflation	2032	51.740	1.470	−3.310	10.080
Government Expenditure	2096	15.640	5.750	2.060	76.220
Financial Openness	2078	0.270	1.603	−1.910	2.360
Population	2181	16.660	1.690	12.140	21.040
Democracy	2155	0.650	0.480	0.000	1.000

often invited to invest in the sector, and it makes sense for them to have significant share of the profit that accrues to the sector. This explains why share of investment in the private sector is significantly higher than the government share.

Total credit to the private sector over the sample period averaged 48.11 percent of GDP, that of bank credit averaged 47.35 percent of GDP which are individually lower than the money supply average (52.1 percent of GDP). In considering the stock markets variables, we notice that total value traded averaged 23.48 percent of GDP, capitalization averaged 44.35 percent of GDP over the same period but lower than turnover ratio which formed an average of 49.75 percent of GDP.

Schooling is the natural logarithm of secondary school enrolment rate averaged 4.29. Inflation is the consumer price index averaged 51.74 percentage point over the period. The mean of government expenditure as a percentage of GDP is 15.64 percent. Financial openness records an average of 0.27, showing that few of the oil-producing countries open up their economies. The mean value of democracy is 0.65 indicating that the majority of the countries are fairly democratic.

4.2. Oil revenues and economic growth nexus: the role of banking sector development

In this section, we address simultaneously the impact of oil revenues management on economic growth by considering the role of the domestic banking sector. We consider the full sample and developing countries context as presented in Table 2. The first three columns (1–3) focus on full sample whilst the last three (4–6) focus on developing countries.[1] The results are interpreted as elasticities because we take the natural logarithm of the variables. The lagged dependent variable of real GDP per capita is positive and significant across all the specifications. However, the coefficient of the lagged RGDP per capita is high indicating previous levels of economic activities has a significant influence on current economic activities among the sampled oil producing countries.

Our variables of interest are the GOR and POR and its interactive terms with the banking sector variables. The result shows that GOR coefficient is negative and significant at 5% and 10%, respectively for the first two columns (credit to the private sector model and bank credit model) whilst column 3 is insignificant, which is the case for the money supply model. This means that government investment of oil revenues reduces economic growth by 2.1 percent for both private credit and bank credit models respectively. This finding contradicts that of Atil et al. (2020) who note a positive relationship. Moreover, the interaction term is positive and significant in both the private credit and bank credit models, respectively. The interaction term for the money supply model is however insignificant at any of the conventional significance levels.

The total effect of GOR on economic growth evaluated at the mean of credit to the private sector is 0.28, which is significant even at the 1% level of significance. In the case of bank credit model, the total effect of GOR evaluated at the mean of bank credit is also 0.28 and significant at the 1% level. The total effect of GOR from the money supply model, on the other hand, is insignificant. The conclusion we can draw from these results is that, generally, the share of oil revenue invested by the government in the domestic economy tend to promote economic growth given an average level of banking sector development. This positive effect of GOR conditional on the average banking sector development is from both credit provision to the private sector and bank credit provisions.

In the case of the POR, the total effect evaluated at the mean of credit to the private sector, bank credit and money supply is −0.62, −0.57 and −1.03, respectively. These estimates are all significant at the 5% level. The negative effect of POR on growth at the mean of banking sector development is from all three proxies (credit to the private sector, bank credit and money supply). This finding implies that strong banking sector development facilitates the repatriation of oil funds to the parent International Oil Companies (IOCs) instead of inhibiting it because of the nature of the extractive sector where skilled labour and capital are imported into the country. A strong banking sector facilitates the intermediation of those funds to prospect new oil wells or foreign skill workers sending money back home.

Next, we turn our attention to developing countries sample to assess if our main result is driven by the developed countries in the sample. The results for the developing countries sub-sample suggest a similar pattern in terms of the signs but the significant levels differ for all the variables of interest. We also evaluate the total effects using the means of developing countries banking sector development variables. Private credit (33.943), bank credit (33.43) and money supply (45.56). Our findings provide the positive and significant total effect of private credit and bank credit, respectively for the share of government oil revenue invested. The implication is that the development in the banking sector serves as a strong influence on the effect of oil revenue management on economic growth. Finally, we observe a negative and significant total effect for private sector investment of oil revenue. This implies that IOCs repatriate profit to their parents' companies and this has a dampening effect on economic growth in oil-producing countries. This is consistent with Moradbeigi and Law (2016). These findings are in tandem with those reported in the full sample results and those reported for the alternative measures for the shares of government and private investments of oil rent in Table A3 in the appendix.

4.3. Oil revenues and economic growth: the role of stock market development

In this section, we focus our attention on the effect of oil revenue management on economic growth by considering the role of the stock market development. Here, we present results for the full sample and developing countries sample as presented in Table 3. Our results suggest positive and significant effect of the lagged dependent real per capita GDP on economic growth across the six models reported. However, the lagged real GDP per capita is closed to 1 indicating high level of influence of previous level of GDP per capita on current level in oil-producing countries.

In our full sample, we observe a positive and significant relationship between market turnover ratio and its interactive term with a share of government oil revenues. The total effects indicate a 10% level of significance at a value of 0.176. For the developing countries context, the results show similar signs as those reported for the full sample except that there is no significant relationship among the variables of interest. In other words, they are not different from zero.

The total effects also show similar signs but there are not significant as well. The implication could be that oil-producing developing countries are not taking the advantage of the stock market development to enhance economic growth or most of them have poor stock markets and inflows of oil revenues are not entirely growth-enhancing. It could also mean that IOCs are not participating in the local burse as such, their activities do not support the stock market capitalization, turnover and stock market value traded. The insignificant nature of these findings could also be that most oil-producing countries (rentier states) do not have well-developed stock markets, as such IOCs will prefer to have their companies listed in the stock markets of their home countries or elsewhere where stock markets are buoyant. The ratio analysis shows consistent signs as presented in appendix A4.

4.4. Control variables effect on economic growth

Here, we turn our attention to the control variable used. Some of the

[1] These are country groupings as defined by the IMF World Economic Outlook (WEO): 1 = low income developing countries (LIDC); 2 = emerging markets (EM); 3 = advanced economies (AE). So, we grouped 1–2 as developing countries and took 3 as advanced economies in our sample.

Table 2
Oil revenues, banking sector development and economic growth.

Variables	Credit to Private Sector	Bank Credit	Money Supply (M2)	Credit to Private Sector	Bank Credit	Money Supply
	Full Sample.			Developing Countries		
$lnGDPPC_{t-1}$	0.971***	0.965***	0.983***	0.970***	0.960***	0.979***
	(0.016)	(0.013)	(0.016)	(0.021)	(0.021)	(0.018)
$lnGOR_{t-1}$	−0.021**	−0.021*	−0.032	−0.023*	−0.024	−0.042
	(0.011)	(0.011)	(0.024)	(0.012)	(0.016)	(0.029)
$lnPC_{t-1}$	0.008			0.010		
	(0.008)			(0.007)		
$lnGOR_{t-1}$*$lnPC_{t-1}$	0.006**			0.007**		
	(0.003)			(0.003)		
$lnPOR_{t-1}$	0.059***	0.054**	0.091**	0.059**	0.066*	0.112*
	(0.020)	(0.022)	(0.042)	(0.029)	(0.034)	(0.066)
$lnPOR_{t-1}$*$lnPC_{t-1}$	−0.014***			−0.015*		
	(0.005)			(0.00)		
$lnBC_{t-1}$		0.011			0.011*	
		(0.006)			(0.006)	
$lnGOR_{t-1}$*$lnBC_{t-1}$		0.006**			0.008*	
		(0.003)			(0.004)	
$lnPOR_{t-1}$*$lnBC_{t-1}$		−0.013**			−0.0167*	
		(0.005)			(0.009)	
$lnM2_{t-1}$			0.005			0.000
			(0.010)			(0.011)
$lnGOR_{t-1}$*$lnM2_{t-1}$			0.008			0.011
			(0.006)			(0.008)
$lnPOR_{t-1}$*$lnM2_{t-1}$			−0.022**			−0.027*
			(0.009)			(0.015)
Constant	0.243**	0.275***	0.153	0.248	0.316*	0.177
	(0.112)	(0.104)	(0.141)	(0.164)	(0.164)	(0.166)
Total Effect (GOR)	0.282**(0.125)	0.282**(0.126)	0.393(0.304)	0.211**(0.098)	0.235*(0.134)	0.478(0.323)
Total Effect (POR)	−0.624***(0.213)	−0.565**(0.228)	−1.029**(0.452)	−0.437*(0.221)	−0.492*(0.270)	−1.096*(0.637)
Observations	1259	1240	1126	990	979	967
Groups	78	78	71	62	62	61
Instruments	60	60	60	60	60	60
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
F-Test	10111.25	8676	15531.12	10908	10431	10897.78
AR (1)	0.004	0.007	0.002	0.007	0.007	0.003
AR (2)	0.138	0.296	0.241	0.186	0.352	0.315
Hansen Test	0.120	0.168	0.100	0.135	0.125	0.113

Note: The robust standard errors are in parenthesis with ***, ** and * denoting significance at 1%, 5% and 10% respectively. Details of variables are; $lnGDPPC_{t-1}$ is the log of Gross Domestic Product per capita, $lnGOR_{t-1}$ is the log of government oil revenue investment, $lnPOR_{t-1}$ is the log private oil revenue investment, $lnPC_{t-1}$is domestic credit to the private sector as a percentage of GDP, $lnBC_{t-1}$is bank credit to the private sector as percentage of GDP, $lnM2_{t-1}$ is the log of the money supply. Where $lnGOR_{t-1}$*$lnPC_{t-1}$is the interaction between government oil revenue investment and private credit; $lnPOR_{t-1}$*$lnPC_{t-1}$ is the interaction between private oil revenue investment and private credit; $lnGOR_{t-1}$*$lnBC_{t-1}$ is the interaction between GOR and bank credit; $lnPOR_{t-1}$*$lnBC_{t-1,}$ is the interaction between POR and bank credit; $lnGOR_{t-1}$*$lnM2_{t-1}$ is the interaction between GOR and money supply and $lnPOR_{t-1}$*$lnM2_{t-1}$ between POR and money supply. We controlled for schooling, democracy, government expenditure, inflation, financial openness and population. See Appendix A5 for results.

variables employed are schooling which represents gross secondary school enrolment. The highly educated population can aid the growth of a country since there will provide the needed human capital to facilitate growth. Others control variables used are inflation, government expenditure, financial openness, democracy and population. All these variables have been supported by the extant literature. These are presented in Panel A for the banking sector and Panel B for the stock markets in table A5 based on the predicted shares and table A6based on the ratios (reported in the appendix). In Panel A we find financial openness and government expenditure to positively and significantly support economic growth. This means that more government expenditure improves on the growth of the economy whilst financial openness allows for the inflows of foreign capital which induces economic growth. In Panel B we only find democracy to be positive and significant for both full and developing countries sample. This means that in highly democratic oil-producing countries the economy grows when the stock markets are functional.

4.5. Distribution of the impact of oil revenues on economic growth

In this section, we present the distribution of the impact of oil revenues on economic growth at different percentiles of banking sector development variables that have their total effects being significant at least at the 5 percent level. Results are shown in Figs. 1 and 2 below. In Fig. 1, the results of the distribution shows that at a lower level of credit to the private sector and bank credit, the impact of government investment is low. However, the impact increases at the 50th, 75th and 90th percentiles of both credit to the private sector and bank credit. This implies that the impact of government investment on the economy increase as the banking sector develops in terms of ability to provide credit to the private sector and also bank credit provisions. This finding supports the work of (Erdoğan et al., 2020) who noted a threshold of 45 percent financial deepening support economic growth in oil-producing countries for at least 7 percent at every unit of oil revenue added.

In Fig. 2, we notice the impact of private investment of oil revenue on growth is negative but small at lower percentiles (25th percentile) of credit to the private sector, bank credit and money supply. The magnitude, however, increases at higher percentiles of each of the banking sector development proxies. This means that countries with improved banking sector development, IOCs can easily take advantage of the financial system to repatriate their profits. This finding is driven by the specific nature of the extractive industry, where significant capital investment is required. Given the political and country-specific risks, greater diversification is required as a risk mitigation tool, especially in

Table 3
Oil revenues, stock market development and economic growth.

Variables	Capitalization	Turnover	Stock Value Traded	Capitalization	Turnover	Stock Value Traded
	Full Sample			Developing Countries		
$lnGDPPC_{t-1}$	0.986***	0.977***	0.983***	0.988***	0.992***	0.988***
	(0.012)	(0.008)	(0.010)	(0.013)	(0.012)	(0.013)
$lnGOR_{t-1}$	0.002	−0.009	−0.003	0.004	−0.008	0.001
	(0.009)	(0.007)	(0.004)	(0.009)	(0.010)	(0.005)
$lnCAP_{t-1}$	−0.0001			0.0001		
	(0.007)			(0.008)		
$lnGOR_{t-1}*CAP_{t-1}$	−0.0003			0.0000		
	(0.003)			(0.003)		
$lnPOR_{t-1}$	−0.002	0.004	0.003	−0.0081	0.002	0.001
	(0.011)	(0.010)	(0.005)	(0.010)	(0.009)	(0.006)
$lnPOR_{t-1}*CAP_{t-1}$	0.0011			0.0031		
	(0.003)			(0.003)		
$lnTURN_{t-1}$		0.010**			0.009	
		(0.005)			(0.006)	
$lnGOR_{t-1}*TURN_{t-1}$		0.004*			0.004	
		(0.002)			(0.003)	
$lnPOR_{t-1}*TURN_{t-1}$		−0.002			−0.001	
		(0.003)			(0.003)	
$lnSTMVT_{t-1}$			0.004			0.004
			(0.003)			(0.004)
$lnGOR_{t-1}*STMVT_{t-1}$			0.002			0.001
			(0.001)			(0.002)
$lnPOR_{t-1}*STMVT_{t-1}$			−0.002			−0.0004
			(0.002)			(0.002)
Constant	0.160*	0.277***	0.226**	0.088	0.065	0.115
	(0.084)	(0.077)	(0.103)	(0.125)	(0.122)	(0.141)
Total Effect (GOR)	−0.0104(0.116)	0.176*(0.103)	0.0428(0.028)	0.006(0.115)	0.136(0.110)	0.019(0.022)
Total Effect (POR)	0.047(0.131)	−0.076(0.129)	−0.038(0.042)	0.107(0.112)	−0.021(0.094)	−0.004(0.027)
Observations	939	953	967	681	678	690
Groups	59	60	60	43	44	44
Instruments	40	60	58	40	40	40
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
F-Test	17198.43	22450.25	55248.35	49554.01	123747.43	115044
AR (1)	0.003	0.002	0.003	0.004	0.004	0.004
AR (2)	0.269	0.345	0.239	0.313	0.480	0.339
Hansen Test	0.189	0.282	0.586	0.247	0.168	0.251

Note: The robust standard errors are in parenthesis with ***, ** and * denoting significance at 1%, 5% and 10% respectively. Details of variables are; $lnGDPPC_{t-1}$ is the log of Gross Domestic Product per capita, $lnGOR_{t-1}$ is the log of government oil revenue investment, $lnPOR_{t-1}$ is the log of private oil revenue investment, $lnCAP_{t-1}$is the log of stock market capitalization as a percentage of GDP, $lnTURN_{t-1}$ is the log of stock market turnover ratio as a percentage of GDP, $lnSTMVT_{t-1}$is the log of stock market total value traded as a percentage of GDP. Where $lnGOR_{t-1}*CAP_{t-1}$ is the interaction between government oil revenue investment and stock market capitalization; $lnPOR_{t-1}*CAP_{t-1}$ the interaction between private oil revenue investment and stock market capitalization; $lnGOR_{t-1}*TURN_{t-1}$ is the interaction between GOR and stock market turnover ratio; $lnPOR_{t-1}*TURN_{t-1,}$ is the interaction between POR and stock market turnover ratio; $lnGOR_{t-1}*STMVT_{t-1}$is the interaction between GOR and stock market total value traded and $lnPOR_{t-1}*STMVT_{t-1}$ between POR and stock market total value traded. We controlled for schooling, democracy, government expenditure, inflation, financial openness and population. See appendix A6 for results.

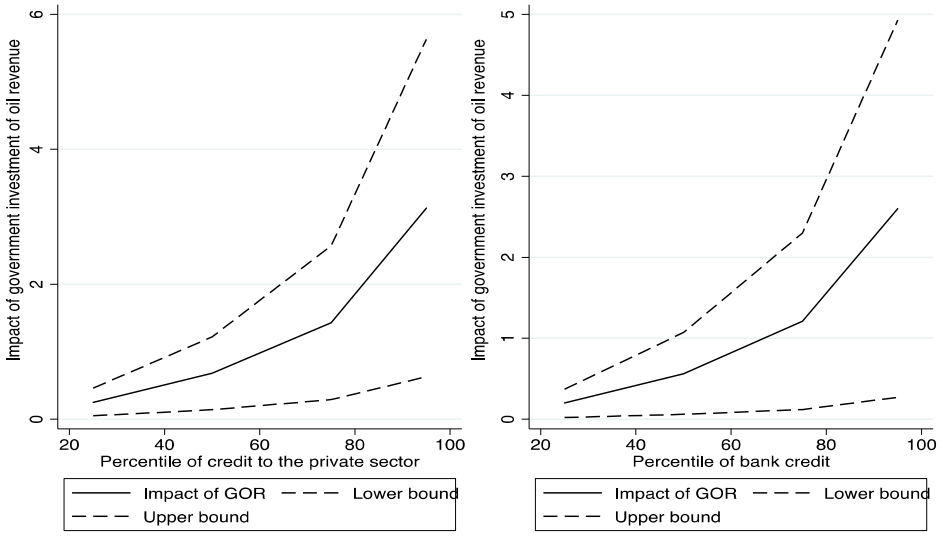

Fig. 1. Estimated impact of government investment of oil revenue on growth evaluated at different percentiles of credit to the private sector and bank credit.

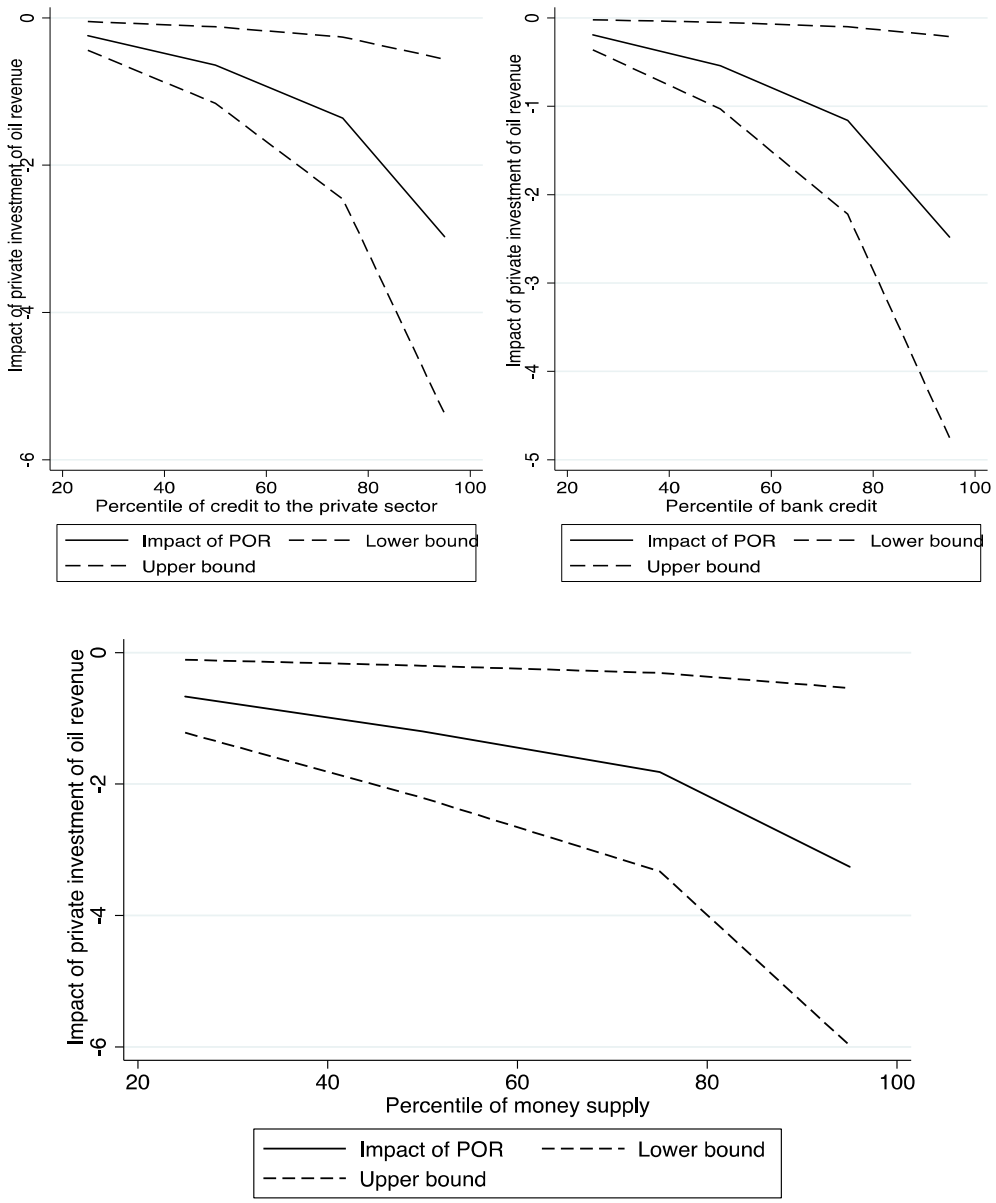

Fig. 2. Estimated impact of private investment of oil revenue on growth evaluated at different percentiles of credit to the private sector, bank credit and Money Supply.

the oil industry where having several oil wells located in different locations and countries reduces significantly the risk exposures of the oil drilling firms. This among other things suggest that most of the oil revenues will be repatriated to enable additional prospecting for wells in other jurisdictions to minimise risk, especially if the sector is dominated by foreign oil firms. In such a case a well-developed financial system promotes efficient intermediation to enable such huge transfers to be made by IOCs.

5. Discussion

First, our results suggest that the impact of the share of government oil revenue investment on growth is negative. This finding could be attributed to the rent-seeking behaviour of political actors who may award a contract to political cronies whose activities may not be growth-enhancing. This finding is supported by Aregbeyen and Kolawole (2015) and Fuinhas et al. (2015) who collectively argue that government spending due to oil rent does not lead to economic growth. However, its total effect is positive and significant via the development of the banking sector. This, in turn, leads to economic growth all other things being equal. This finding is consistent with (Moradbeigi and Law, 2017; Jarrett et al., 2019).

Secondly, the results suggest a positive and significant relationship between the share of private oil revenues investment and economic growth. This means that private investment of the oil revenues may improve citizens' welfare due to direct provisions of jobs. However, our interest is on the total effects. We find a negative but significant relationship between the shares of private oil revenues investment conditional on banking sector development across the three proxies. This means that banking sector development has a direct damping effect on economic growth in the spirit of private sector oil revenue investment (Nili and Rastad, 2007). This means that repatriation of oil rent by IOCs to parent companies might be prevalent even in the face of banking sector development. This may be surprising but it is in line with the

structure of the extractive industry, which is generally capital intensive and relied heavily on skill labour, which most oil abundant countries lack. Suggesting that the needed capital and technical labour has to be imported and therefore their rewards will be sent back to their home countries. With a well-developed and efficient banking sector, it rather facilitates this process rather than inhibit it. This finding is supported by Nili and Rastad (2007) who noted that the activities of private sector investment in oil-producing countries are not beneficial to economic growth in the presence of financial development.

Thirdly, the impact of government investment of oil revenues on economic growth conditional on stock market development is insignificant for all the proxies for stock market development except the case of stock market turnover ratio. Similarly, we find the private investment of oil revenues to be insignificant for all proxies including the total effects. What this means is that the stock market does not play a major role in the economic growth of oil-producing countries. It could probably be that oil firms are not listed in oil-producing countries local bourse. Additionally, if they are listed, citizens may not be participating in the stock market and as such it does not improve their welfare. However, the provision of liquidity by the stock market can marginally translate into economic growth via turnover ratio. This is because businesses and individual citizens who participate in the stock market can have access to their funds if they want to sell their shares and undertake other productive activities within the economy.

6. Conclusion and policy implications

In this study, we revisit the oil revenues-economic growth nexus literature. We contribute to the literate by moving away from studying the direct relationship between oil revenues and economic growth to include sustainable management of oil revenues by government and the private sector and how that contributes to economic growth. We also assess the potential influence of financial market development and how that influences the effect of oil revenue management on economic growth.

Our study sourced data from Global Financial Development Database, International Monetary Fund, World Development Indicators, Polity IV index and others from the period 1990–2015. Using the PVAR framework, we determine the relative contribution of government investment of oil rent and private investment of oil rent in the domestic economy in which we call oil revenue management in this study. We also compute alternative measures by taking the ratio of government and private investments to the oil rent respectively. We then use these shares to estimate the causal effect of oil revenue management on economic growth via the channel of the banking sector and stock markets development using a two-step system GMM model. However, our reported results and discussion are based on the predicted outcome of the PVAR because it is fitted as a causal model for investment that allows for a dynamic structure in the estimation process as suggested by investment theory.

We arrive at interesting findings, first, the share of oil revenue invested by the government and the private sector and the interaction term with banking sector development are significant factors for economic growth, where the total government investment on growth is positive conditional on the level of banking sector development. The positive effect increase as banking sector development improves. In the case of private sector investment, the total effect is negative conditional on the level of banking sector development. The magnitude of the negative effect increases as the level of banking sector development improves.

The second important finding is that the impact of government investment of oil revenue on economic growth, conditional on the level of stock market development is generally insignificant and not different from zero for all except in the case of turnover ratio, where it is significant at the 10 percent for government investment of oil revenues. Suggesting that, in general, the influence of stock market development on the effectiveness of private sector investment of oil revenue in the domestic economy is at best minimal.

The findings of this study have some implications for policy. We observe that a strong banking sector is a necessary and sufficient condition for economic growth in oil-producing countries via government investment of its share of oil revenue. Oil-producing countries should focus on developing their banking sector. Also, there is the need for strong monitoring procedures for International Oil Companies (OICs) who work in the upstream oil-producing countries regarding the way they move their funds in and out of the host country since it does not contribute much to the economy of the host country. Finally, oil-producing countries should pay more attention to developing their stock markets since its development can have a potential effect on economic growth both in the medium to the long-term growth trajectory of their countries' economies.

CRediT authorship contribution statement

Jabir Ibrahim Mohammed: Conceptualization, Writing - original draft, Writing - review & editing. **Amin Karimu:** Methodology. **Vera Ogeh Fiador:** Writing - review & editing. **Joshua Yindenaba Abor:** Conceptualization.

Declaration of competing interest

There is no conflict of interest arising from this study.

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Appendix C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.resourpol.2020.101832.

APPENDIX A

Table A1
PVAR Estimates to predict the shares of government and private investment

	lnPIP	lnOilrent	lnGIP
$lnPIP_{t-1}$	0.952***	−0.365**	0.022
	(0.049)	(0.128)	(0.050)
$lnOilrent_{t-1}$	0.032**	0.598***	0.031*
	(0.016)	(0.050)	(0.017)
$lnGIP_{t-1}$	0.044	−0.591***	0.837***
	(0.028)	(0.082)	(0.042)
lngdpcap	−0.070**	-.334**	−0.059
	(0.034)	(0.095)	(0.043)
Inflation	−0.005	−0.182**	−0.031**
	(0.070)	(0.026)	(0.012)
Observations	1681	1681	1681
J-Stats	279.820		
P-value	0.000		

Table A2
Eigenvalue for Stability Test of the PVAR model

Real	Imaginary	Modulus
0.917	0.000	0.916
0.735	0.085	0.740
0.735	−0.085	0.740

Table A3
Oil Revenue, Banking Sector Development and Economic Growth- Ratio

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Full Sample			Developing Countries		
$lnGDPPC_{t-1}$	0.948***	0.948***	0.965***	0.952***	0.926***	0.950***
	(0.024)	(0.023)	(0.023)	(0.028)	(0.039)	(0.041)
$lnGOR_{t-1}$	−0.089**	−0.073**	−0.114**	−0.082**	−0.076	−0.130*
	(0.036)	(0.035)	(0.055)	(0.036)	(0.058)	(0.075)
$lnPC_{t-1}$	0.038***			0.036***		
	(0.013)			(0.013)		
$lnGOR_{t-1}$*$lnPC_{t-1}$	0.0227**			0.020*		
	(0.009)			(0.010)		
$lnPOR_{t-1}$	0.0817**	0.067*	0.118**	0.077**	0.073	0.134*
	(0.035)	(0.034)	(0.053)	(0.034)	(0.056)	(0.072)
$lnPOR_{t-1}$*$lnPC_{t-1}$	−0.022**			−0.020**		
	(0.009)			(0.009)		
$lnBC_{t-1}$		0.036***			0.046**	
		(0.014)			(0.020)	
$lnGOR_{t-1}$*$lnBC_{t-1}$		0.019**			0.018	
		(0.009)			(0.017)	
$lnPOR_{t-1}$*$lnBC_{t-1}$		−0.018**			−0.020	
		(0.009)			(0.015)	
$lnM2_{t-1}$			0.034**			0.034*
			(0.016)			(0.019)
$lnGOR_{t-1}$*$lnM2_{t-1}$			0.028**			0.032*
			(0.013)			(0.019)
$lnPOR_{t-1}$*$lnM2_{t-1}$			−0.029**			−0.033*
			(0.012)			(0.017)
Constant	0.288*	0.334**	0.143	0.287	0.472*	0.220
	(0.169)	(0.164)	(0.164)	(0.208)	(0.265)	(0.288)
Total Effects (GOR)	1.004**(0.410)	0.834**(0.381)	1.328**(0.611)	0.606*(0.310)	0.539(0.497)	1.323*(0.780)
Total Effects (POR)	−0.955**(0.395)	−0.798**(0.371)	−1.382**(0.586)	−0.606**(0.279)	−0.580(0.460)	−1.386*(0.720)
Observations	1226	1207	1084	957	946	925
Groups	78	78	71	62	62	61
Instruments	60	60	59	60	60	59
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
F-Test	3833.07	4737.2	5761.03	4794.4	3560.95	6447.59
AR (1)	0.006	0.011	0.004	0.009	0.018	0.008
AR (2)	0.286	0.513	0.328	0.331	0.592	0.415
Hansen Test	0.390	0.620	0.220	0.353	0.252	0.202

Note: The robust standard errors are in parenthesis with ***, ** and * denoting significance at 1%, 5% and 10% respectively. Details of variables are; $lnGDPPC_{t-1}$ is the log of Gross Domestic Product per capita, $lnGOR_{t-1}$ is the log of government oil revenue investment, $lnPOR_{t-1}$ is the log private oil revenue investment, $lnPC_{t-1}$is domestic credit to the private sector as a percentage of GDP, $lnBC_{t-1}$is bank credit to the private sector as percentage of GDP, $lnM2_{t-1}$ is the log of money supply. Where $lnGOR_{t-1}$*$lnPC_{t-1}$is the interaction between government oil revenue investment and private credit; $lnPOR_{t-1}$*$lnPC_{t-1}$ is the interaction between private oil revenue investment and private credit; $lnGOR_{t-1}$*$lnBC_{t-1}$ is the interaction between GOR and bank credit; $lnPOR_{t-1}$*$lnBC_{t-1,}$ is the interaction between POR and bank credit; $lnGOR_{t-1}$*$lnM2_{t-1}$ is the interaction between GOR and money supply and $lnPOR_{t-1}$*$lnM2_{t-1}$ between POR and money supply. We controlled for schooling, democracy,

government expenditure, inflation, financial openness and population. See appendix A5 for control results.

Table A4

Oil Revenues, Stock Market Development and Economic Growth-Ratio

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Full Sample			Developing Countries		
$lnGDPPC_{t-1}$	0.980***	0.988***	0.976***	0.991***	0.995***	0.988***
	(0.012)	(0.013)	(0.018)	(0.022)	(0.019)	(0.018)
$lnGOR_{t-1}$	−0.035*	−0.036***	−0.012**	−0.024	−0.025*	−0.007
	(0.019)	(0.013)	(0.005)	(0.015)	(0.014)	(0.006)
$lnCAP_{t-1}$	0.014*			0.007		
	(0.007)			(0.009)		
$lnGOR_{t-1}$*CAP_{t-1}	0.010*			0.007*		
	(0.005)			(0.004)		
$lnPOR_{t-1}$	0.034*	0.032***	0.010**	0.023	0.022**	0.006
	(0.018)	(0.011)	(0.004)	(0.014)	(0.010)	(0.004)
$lnPOR_{t-1}$*CAP_{t-1}	−0.010**			−0.007*		
	(0.005)			(0.004)		
$lnTURN_{t-1}$		0.011***			0.007	
		(0.004)			(0.005)	
$lnGOR_{t-1}$*$TURN_{t-1}$		0.010***			0.008**	
		(0.004)			(0.003)	
$lnPOR_{t-1}$*$TURN_{t-1}$		−0.009***			−0.007**	
		(0.003)			(0.003)	
$lnSTMVT_{t-1}$			0.007*			0.004
			(0.004)			(0.004)
$lnGOR_{t-1}$*$STMVT_{t-1}$			0.004*			0.003
			(0.002)			(0.002)
$lnPOR_{t-1}$*$STMVT_{t-1}$			−0.003**			−0.002
			(0.002)			(0.002)
Constant	0.151	0.153	0.274	0.039	0.057	0.132
	(0.091)	(0.112)	(0.170)	(0.215)	(0.193)	(0.199)
Total Effect (GOR)	0.393*(0.2008)	0.443***(0.162)	0.071(0.044)	0.252*(0.143)	0.289**(0.125)	0.031(0.027)
Total Effect (POR)	−0.390**(0.191)	−0.408***(0.138)	−0.066*(0.037)	−0.238*(0.140)	−0.250**(0.100)	−0.026(0.024)
Observations	938	952	966	680	677	689
Groups	59	60	60	43	44	44
Instruments	40	40	40	40	40	40
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
F-Test	9876.07	24504.45	14667.62	71891.96	67479.05	51554
AR (1)	0.003	0.002	0.003	0.003	0.003	0.004
AR (2)	0.357	0.393	0.27	0.361	0.467	0.345
Hansen Test	0.102	0.145	0.212	0.1	0.168	0.207

Note: The robust standard errors are in parenthesis with ***, ** and * denoting significance at 1%, 5% and 10% respectively. Details of variables are; $lnGDPPC_{t-1}$ is the log of Gross Domestic Product per capita, $lnGOR_{t-1}$ is the log of government oil revenue investment, $lnPOR_{t-1}$ is the log of private oil revenue investment, $lnCAP_{t-1}$is the log of stock market capitalization as a percentage of GDP, $lnTURN_{t-1}$ is the log of stock market turnover ratio as a percentage of GDP, $lnSTMVT_{t-1}$is the log of stock market total value traded as a percentage of GDP. Where $lnGOR_{t-1}$*CAP_{t-1} is the interaction between government oil revenue investment and stock market capitalization; $lnPOR_{t-1}$*CAP_{t-1} the interaction between private oil revenue investment and stock market capitalization; $lnGOR_{t-1}$*$TURN_{t-1}$ is the interaction between GOR and stock market turnover ratio; $lnPOR_{t-1}$*$TURN_{t-1,}$ is the interaction between POR and stock market turnover ratio; $lnGOR_{t-1}$*$STMVT_{t-1}$is the interaction between GOR and stock market total value traded and $lnPOR_{t-1}$*$STMVT_{t-1}$ between POR and stock market total value traded. We controlled for schooling, democracy, government expenditure, inflation, financial openness and population. See Appendix A6 for control results.

Table A5

Controls in the growth model for both the banking sector and stock market development models based on the predictions of the shares

Variable	Full Sample			Developing Countries Sample		
Panel A: Banking Sector Development for the predicted data model						
Schooling	0.002	0.003	−0.005	0.012	0.016	0.011
	(0.008)	(0.007)	(0.010)	(0.014)	(0.014)	(0.012)
Inflation	0.000	0.000	0.000	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Gov't Expend.	0.016	0.023*	0.012	0.007	0.015	0.009
	(0.015)	(0.013)	(0.013)	(0.015)	(0.015)	(0.013)
FINOPEN	0.006	0.007**	0.002	0.004	0.006	0.001
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)
Democracy	−0.005	−0.006	−0.003	−0.007	−0.009	−0.005
	(0.010)	(0.009)	(0.008)	(0.010)	(0.011)	(0.011)
Population	−0.001	−0.001	0.000	−0.002	−0.002	0.000
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Panel B: Stock Market Development for predicted data model						
Schooling	−0.007	−0.004	−0.002	−0.005	−0.004	−0.007
	(0.006)	(0.005)	(0.005)	(0.012)	(0.010)	(0.011)
Inflation	0.000	−0.001	0.001	0.001	0.001	0.002
	(0.002)	(0.002)	(0.001)	(0.003)	()0.002	(0.002)
Gov't Expend.	0.009	0.009	0.003	0.013	0.005	0.009
	(0.013)	(0.011)	(0.010)	(0.012)	(0.013)	(0.012)

(*continued on next page*)

Table A5 (*continued*)

Variable	Full Sample			Developing Countries Sample		
FINOPEN	0.001	0.002	0.002	0.001	−0.001	0.001
	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Democracy	0.005	0.008*	0.004	0.006	0.007*	0.004
	(0.005)	(0.005)	(0.003)	(0.006)	(0.004)	(0.004)
Population	0.001	−0.004	−0.002	0.003	0.001	0.002
	(0.002)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)

Table A6
Controls in the growth model for both the banking sector and stock market development models based on the ratios

Variable	Full Sample			Developing Countries Sample		
Panel C: Banking Sector Development for Ratio Model						
Schooling	0.004	0.001	−0.001	0.008	0.015	0.019
	(0.012)	(0.011)	(0.013)	(0.014)	(0.025)	(0.025)
Inflation	0.001	0.000	0.001	0.002	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Gov't Expend.	0.043**	0.040*	0.032	0.027	0.047	0.035
	(0.021)	(0.020)	(0.020)	(0.021)	(0.028)	(0.032)
FINOPEN	0.011*	0.011**	0.008	0.007	0.011	0.010
	(0.006)	(0.005)	(0.007)	(0.005)	(0.007)	(0.009)
Democracy	0.001	0.001	−0.001	−0.002	−0.007	−0.006
	(0.013)	(0.012)	(0.009)	(0.012)	(0.015)	(0.012)
Population	−0.002	−0.003	0.000	−0.003	−0.006	−0.002
	(0.004)	(0.004)	(0.003)	(0.004)	(0.006)	(0.004)
Panel D: Stock Market Development for Ratio Model						
Schooling	−0.007	−0.006	−0.005	−0.006	−0.006	−0.007
	(0.007)	(0.005)	(0.006)	(0.012)	(0.012)	(0.012)
Inflation	0.000	0.000	0.001	0.001	0.001	0.002
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Gov't Expend.	0.013	0.005	0.012	0.008	0.003	0.007
	(0.014)	(0.012)	(0.015)	(0.019)	(0.016)	(0.013)
FINOPEN	0.002	−0.001	0.003	0.000	−0.002	0.000
	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.003)
Democracy	0.003	0.007**	0.003	0.002	0.006	0.002
	(0.006)	(0.003)	(0.005)	(0.006)	(0.004)	(0.005)
Population	0.001	−0.002	−0.002	0.004	0.001	0.001
	(0.003)	(0.002)	(0.004)	(0.004)	(0.005)	(0.005)

APPENDIX B. Sample Countries

'"Albania"' '"Algeria"' '"Angola"' '"Argentina"' '"Australia"' '"Austria"' '"Azerbaijan"' '"Bahrain"' '"Bangladesh"' '"Belarus"' '"Bolivia"' '"Brazil"' '"Bulgaria"' '"Cameroon"' '"Canada"' '"Chad"' '"Chile"' '"China"' '"Colombia"' '"Congo, Dem. Rep."' '"Congo, Rep."' '"Cote d'Ivoire"' '"Croatia"' '"Czech Republic"' '"Denmark"' '"Ecuador"' '"Egypt, Arab Rep."' '"Equatorial Guinea"' '"France"' '"Gabon"' '"Georgia"' '"Germany"' '"Ghana"' '"Greece"' '"Guatemala"' '"Hungary"' '"India"' '"Indonesia"' '"Iran, Islamic Rep."' '"Iraq"' '"Italy"' '"Japan"' '"Kazakhstan"' '"Kuwait"' '"Kyrgystan"' '"Lithuania"' '"Malaysia"' '"Mauritania"' '"Mexico"' '"Mongolia"' '"Morocco"' '"Myanmar"' '"Netherlands"' '"New Zealand"' '"Nigeria"' '"Norway"' '"Oman"' '"Pakistan"' '"Peru"' '"Philippines"' '"Poland"' '"Qatar"' '"Romania"' '"Russian Federation"' '"Saudi Arabia"' '"South Africa"' '"Spain"' '"Sudan"' '"Suriname"' '"Syrian Arab Republic"' '"Thailand"' '"Trinidad and Tobago"' '"Tunisia"' '"Turkey"' '"Ukraine"' '"United Arab Emirates"' '"United Kingdom"' '"United States"' '"Venezuela, RB"' '"Vietnam"' '"Yemen, Rep."'

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