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Abstract

The objective of this paper is to revisit the resource curse hypothesis both within and between countries of different democratic footprint, based on a dynamic model that properly accounts for endogeneity issues. To achieve that, we apply a panel Vector Auto-Regressive (PVAR) approach along with panel impulse response functions to data on oil abundance variables, economic growth and several political institutional variables in 76 countries classified by different income groupings, level of development and oil importing or exporting status, over the period 1980-2012. Our results suggest that controlling for the quality of political institutions is important in rendering the resource course hypothesis significant. Doing so, the resource curse hypothesis is documented mainly for developing economies, net oil-exporters and medium-high income countries. Specifically, when economies from the aforementioned groups are characterised by weak quality of political institutions, then oil abundance is not growth-enhancing.

Keywords: Resource curse, Oil abundance, Economic growth, Institutions, Panel VAR

JEL codes: C33, O47, Q32, Q33

1 Introduction

In their 1995 influential study titled "Natural resource abundance and economic growth", Sachs and Warner started a well-known line of research focusing on natural resources. They obtained a negative conditional relationship between economic growth and resource dependence using a cross section of international data, in line with the resource curse hypothesis. More specifically, they report that economies with abundant natural resources tend to experience lower economic growth compared to economies with scarce natural resources. Sachs and Warner (1999, 2001), Gylfason et al. (1999) and Rodriguez and Sachs (1999), among many others, also find a negative relationship between growth and resource abundance.[1] However, the evidence in favour of the resource curse hypothesis is by no means conclusive (see, for example, Raddatz, 2007; Brunnschweiler and Bulte, 2008; Alexeev and Conrad, 2009; Van der Ploeg and Poelhekke, 2010, among others).[2] Alexeev and Conrad (2009), for example, demonstrate that high endowments of oil have a positive effect on per capita Gross Domestic Product (GDP), contradicting most of the empirical literature on the resource curse, while Brunnschweiler and Bulte (2008) find that resource dependence does not negatively affect growth and they define the resource curse as a red herring. However, Van der Ploeg and Poelhekke (2010) challenge the results of Brunnschweiler and Bulte (2008) by raising the issues of endogeneity along with other mispesification issues.

In this study we revisit the resource curse hypothesis in an attempt to shed more light into that field. The resource curse hypothesis literature reveals the following empirical regularities.

First, natural resource abundance is associated with various negative development outcomes (Sachs and Warner, 1995, 1999, 2001), although the opposite evidence is still present (Alexeev and Conrad, 2009).

Second, existing explanations for the resource curse do not adequately account for the role of social forces or external political and economic environments in shaping development outcomes in resource abundant countries, nor for the fact that, while most resource abundant countries have performed poorly in developmental terms (i.e., the cases of Angola and Congo, rich in oil, or the group of OPEC countries) a few have done quite well (i.e., Norway).

Third, recommendations for overcoming the resource curse have not generally taken into account the issue of political feasibility. More generally, it is argued that the basic problem with the literature is that researchers have been too reductionist they have tended to explain development performance solely in terms of the size and nature of countries natural resource

[1] Previously, Gelb (1988) and Auty (2002) also documented this relationship.
[2] See, for example, Frankel (2010) and van der Ploeg (2011) for recent surveys.

endowments. A consensus is emerging that various political and social variables mediate the relationship between natural resource wealth and development outcomes (i.e., Isham et al., 2005; Mehlum et al., 2006a,b; Andersen and Aslaksen, 2008; Bhattacharyya and Hodler, 2010; Bjorvatn et al., 2012; Collier and Goderis, 2012; El Anshasy and Katsaiti, 2013). Even more, most of the studies have not fully addressed the issue of endogeneity and reverse causality between the variables of interest (Collier and Goderis, 2012). In this paper, we address all the above issues when analyzing the resource curse hypothesis.

Thus, the objective of this paper is to re-examine the dynamic links of the resource curse hypothesis both within and between countries of different democratic footprint. To achieve this, we apply a panel Vector Auto-Regressive (PVAR) approach along with panel impulse response functions to data on oil abundance (approximated by oil rents as a percentage of GDP, oil share as a percentage of GDP and oil revenue per capita), economic growth and several political institutional variables (i.e., polity IV index and its sub-indices and the political rights index), together with additional control variables. We consider 76 countries classified by different income groupings, level of development, oil importing/exporting status, as well as, their level of democracy over the period 1980-2012, making this study the most comprehensive and most up-to-date on the resource curse hypothesis.

Two are the main contributions of the paper to previous existing economic literature. First, as far as the methodology is concerned, instead of using previous methodological approaches such as cross-section (Sachs and Warner, 1995, and many others), panel data (Bhattacharyya and Hodler, 2010; Boyce and Emery, 2011; Cavalcanti et al., 2011; Bjorvatn et al., 2012), panel error correction models (Collier and Goderis, 2012) or time-varying cointegration (Apergis and Payne, 2014) models, in this paper we estimate different panel VAR models. To our knowledge, this is the first paper that adopts a panel VAR approach and panel impulse response analysis to study the dynamic impact among oil abundance, the quality of political institutions, and economic growth by taking into account the endogeneity of these variables, as well as controlling for commonly used variables in the endogenous economic growth theory.

The advantages of using a panel VAR methodology relative to methods previously discussed so as to examine the resource curse hypothesis are several. First, and in contrast to cross-country, panel data models allow us to control for unobservable time-invariant country characteristics, reducing concerns of omitted variable bias. Second, time fixed effects can also be added to account for any global (macroeconomic) shocks that may affect all countries in the same way. Third, the inclusion of lags of the variables helps to analyze the dynamic relationship between

the different variables. Thus, impulse response functions based on PVARs can account for any delayed effects on and of the variables under consideration and thus determine whether the effects between the variables of interest are short-lived, long-lived or both. Such dynamic effects would not have been captured by panel regressions. Fourth, and most importantly, (P)VARs are explicitly designed to address the endogeneity problem, which is one of the most serious challenges of the empirical research on the resource curse hypothesis, by treating all variables as potentially endogenous.[3] Last but not least, PVARs can be effectively employed with relative short-time series due to the efficiency gained from the cross-sectional dimension.

Our second contribution concerns the variables that are employed in this study. More specifically, we include three key variables, namely, oil abundance (proxied by three alternative indicators discussed in detail in the Section 3.1.), economic growth and institutional quality, together with other commonly used control variables that can potentially affect economic growth (i.e., labor force participation, gross fixed capital formation, foreign direct investment and openness). The inclusion of all these variables, together with their interactions (please see Section 3.1. for details), will allow us to account for the interdependencies among the quality of political institutions, economic growth and oil abundance. In order to better characterize the relationship between these variables, we also estimate the PVAR for different sub-groups of countries based on different characteristics, such as, income level, developing stage and their oil exporting or importing status, so as to check whether the impact of institutional quality and oil abundance variables on economic growth potentially differs among each of these sub-groups of countries.

The results of our empirical analysis, which remain sound to several robustness checks, reveal the following empirical regularities. A positive relationship between resource abundance and economic growth is documented for the overall sample. Put differently, the resource course hypothesis is not present in the above case. However, controlling for the quality of political institutions seems important in rendering the resource course hypothesis significant. Doing so, we find evidence of the resource curse hypothesis, mainly for developing economies, net oil-exporters and medium-high income countries. Specifically, when economies from the aforementioned groups are characterised by weak quality of political institutions, then oil abundance

[3]The endogeneity problem in cross-country and panel data models has been previously addressed by the inclusion of different instrumental variables (Alexeev and Conrad, 2009; Cotet and Tsui, 2013), and by estimating the model using 2 or 3 Step Least Squares models (Brunnschweiler and Bulte, 2008; Van der Ploeg and Poelhekke, 2010; Busse and Gröning, 2013), Generalized Method of Moments (Lederman and Maloney, 2003; Maloney and Lederman, 2008) or Arellano-Bond Generalized Method of Moments (Yaduma et al., 2013). The difficulty in measuring good instruments of the variables included in these types of studies, such as oil abundance and quality of institutions, better justifies the use of panel VAR models, which help to alleviate the endogeneity problem by treating all variables as potentially endogenous.

is not growth-enhancing.

The remainder of the paper is structured as follows. Section 2 reviews the existing literature on oil abundance, economic growth and democracy. Section 3 presents the PVAR methodology and the data set. Empirical results based on alternative estimations are presented in Section 4. Finally, Section 5 concludes.

2 Resource abundance, economic growth and the quality of institutions: A brief review

The importance of the quality of institutions in the relationship between natural resource abundance and economic growth has already been addressed in the literature (Frankel, 2010). In addition, the positive impact of the quality of the institutions and democracy on economic growth has also been documented in many papers (Acemoglu et al., 2001, 2002; Barro, 1999; Epstein et al., 2006; Glaeser et al., 2007; Acemoglu et al., 2008).

Furthermore, the interaction between natural resources and economic growth, taking into account the role of institutions has been previously studied by Isham et al. (2005), Mehlum et al. (2006a), Mehlum et al. (2006b), Hodler (2006), Andersen and Aslaksen (2008), Bhattacharyya and Hodler (2010), Bjorvatn et al. (2012), Brückner et al. (2012), Collier and Goderis (2012) and El Anshasy and Katsaiti (2013), among many others.

Isham et al. (2005), for example, found that not only institutional quality has a significant effect on economic growth, but it is also determined by the resource abundance of each of the countries. According to their results, and in contrast to Sachs and Warner (1995), natural abundance affects a countrys growth rate solely by influencing its political institutions. That is, according to these authors, resource abundance has no significant effect on economic growth once political institutions are taken into account. Hodler (2006), on the other hand, developed a model in which natural resources cause fighting activities between rivalling groups, while fighting reduces productive activities and weakens property rights, and thus, production activities. According to this author, apart from the natural resources' direct positive income effect, natural resources have an indirect effect on income through property rights, which depends on how fractionalized a country is. Mehlum et al. (2006a,b) used the same dataset as Sachs and Warner (1995), including an interaction effect between quality of institutions and resource abundance, and obtain that institutional quality is the key to understand the resource curse: when institutions are bad, resource abundance is a curse, while it is a blessing when institutions

are good.

All these papers suggest the inclusion of resource abundance and quality of institutions variables, together with an interaction term between these two variables. This is the approach that we also take in our proposed PVAR model. Furthermore, based on the probable effect of economic growth on both resource abundance and quality of institutions, this paper assumes all the above three variables are endogenous.

Andersen and Aslaksen (2008) analyzed how public income shocks from natural resources have different long run economic effects dependent on constitutional designs. Using data from 90 economies divided into democratic and nondemocratic countries, they find that the form of government matters more than the democratic rule. Thus, this paper suggests the use of different variables in order to account for the quality of the institutions, so we include, as well, different proxies and interaction terms for this variable in our study.

Finally, Bhattacharyya and Hodler (2010) also analyse both theoretically and empirically whether and how the quality of the democratic institutions affects the relationship between natural resources and corruption. Using data for 124 economies that covers the period 1980-2004, they confirm that the relationship between resource rents and corruption also depends on the quality of institutions.

3 Data set and methodology

3.1 Data set

We consider an unbalanced panel of annual data from 76 countries that covers the period 1980-2012. In total we have 1471 country-year observations. The countries included in our dataset are listed in Table 1. Table 1 also divides our sample countries into the following subgroups that we also examine below: developed and developing, oil-importers and oil-exporters and by different income groups. The variables used in this paper are obtained from the World Bank, International Monetary Fund (IMF), US Energy Information Administration (EIA), Polity IV project and Freedom House (see Table 2 for a detailed description of our dataset and their sources).

[Insert Table 1 about here]

[Insert Table 2 about here]

Following previous empirical related studies on natural resources that also use panel models (see, for example, Bhattacharyya and Hodler, 2010; Boyce and Emery, 2011; Cavalcanti et al., 2011; Bjorvatn et al., 2012, among others), we propose different specifications of PVAR models. We collect the following data:

a. Economic growth. Following most of the papers, we use the annual real growth of per capita GDP as one of our endogenous variables in the analysis, which approximates the degree of the countries economic development.

b. Oil abundance. We use the following three alternative endogenous variables (for robustness purposes) as proxies of oil abundance: (i) oil share as a percentage of GDP, (ii) oil rents as a percentage of GDP and (iii) oil revenues per capita.

c. Quality of political institutions. Again, for robustness purposes, we use two alternative measures of political institutional quality: (i) Polity IV index from the Polity IV project (Marshall Monty et al., 2009) and (ii) Political Rights index (from the Freedom House). The Polity IV index is a commonly used proxy for institutional quality in several studies (see, for example Bhattacharyya and Hodler, 2010; Arezki and Brückner, 2011; Bjorvatn et al., 2012; Brückner et al., 2012; El Anshasy and Katsaiti, 2013; Boschini et al., 2013; Caselli and Tesei, 2016). The Political Rights index also approximates the quality of institutions, although it is constructed based on the responses to different questions related to the electoral process, political pluralism and participation and functioning of government, and it has also been used in the literature (see, e.g., Arezki and Brückner, 2011).

d. Interaction terms. Economic and political science literature tend to include an interactive term between the quality of institutions and natural resource abundance or share. In particular, we use the following two interaction terms: (i) between the level of democracy and oil abundance and (ii) among the level of democracy, constraints to the executive and oil abundance, so as to account for the interdependencies among the quality of political institutions, economic growth and oil abundance. Previous studies that used similar proxies are Andersen and Aslaksen (2008), Alexeev and Conrad (2009), Bhattacharyya and Hodler (2010), Bjorvatn et al. (2012), El Anshasy and Katsaiti (2013) and Boschini et al. (2013). This is the third endogenous variable that we use in the extended PVAR model version, as discussed below.

e. Exogenous control variables. In order to avoid any potential omitted variable bias, we also control for several exogenous variables typically used in the endogenous growth theory, namely, labour force participation, gross fixed capital formation and openness.

3.2 PVAR

This paper uses data from 76 economies for the period 1980-2012. The PVAR methodology we employ, originally developed by Holtz-Eakin et al. (1988), extends the traditional VAR model introduced by Sims (1980), which treats all the variables in the system as endogenous, with the panel-data approach, which allows for unobserved individual heterogeneity. In its general form, the PVAR model can be expressed as follows:

$$Y_{it} = A_0 + A_1 Y_{it-1} + A_2 Y_{it-2} + ... + A_j Y_{it-j} + BX_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where Y_{it} is a vector of our endogenous variables, namely real per capita economic growth and oil abundance (proxied by either oil share as a % of GDP, oil rents or oil revenue per capita). The autoregressive structure allows all endogenous variables to enter the model with a number of j lags. X_{it} is a vector of the exogenous variables (commonly used in endogenous growth models) comprising: (i) gross fixed capital formation as a % of GDP, measuring capital input, (ii) imports plus exports as a % of GDP, capturing the degree of openness, and (iii) labour force participation, capturing human capital. μ_i accounts for the unobservable country characteristics (country fixed-effects) and λ_t accounts for any global shocks that may affect all countries in the same way (time fixed-effects). Finally, ε_{it} denotes the error term.

As indicated above, our benchmark specification is a bivariate PVAR that contains the real per capita GDP growth rate and a proxy of oil abundance, as well as exogenous variables and country- and time-fixed-effects. However, we also extend this model to a trivariate PVAR with the inclusion of an interaction term (either INTER_1 or INTER_2; as defined in Table 2) so as to capture the effects of the quality of political institutions on the resource course hypothesis. Thus, we allow for all these variables to be endogenous, addressing one of the main empirical problems of the related literature.

In fact, as a first step, and in order to justify the methodology used in this paper, we pursued Block exogeneity tests, as a test for the endogeneity/exogeneity of the key variables in the study. A variable is said to Granger cause another variable if there is enough evidence to reject the null hypothesis that the coefficients on the lags of the vector of variables Y_{kt-j} in the PVAR equation of Y_{it}, where $i \neq k$, are all equal to zero. The results of this test reported in Table 3, provide evidence of causality among the three variables (i.e., economic growth, oil abundance and quality of institutions), suggesting that these variables should be treated as endogenous.[4]

[4]The Granger-causality results for the subsample groups, which are qualitatively similar, are available from

This is the approach that we follow in this study.

[Insert Table 3 about here]

In order to get a more complete picture of the dynamic interactions among oil abundance, economic growth and political institutions, we perform a panel generalised impulse-response function (PGIRF) analysis, in order to assess the speed of adjustments to shocks originating in our aforementioned variables. The panel generalised impulse response function analysis employed, which is based on Koop et al. (1996) and Pesaran and Shin (1998), provides a natural solution when theory does not provide a clear cut guidance on the identification of the aforementioned endogenous variables, as discussed above. Moreover, the PGIRFs are also decomposed into the responses of shocks to specific variables by taking out from the PGIRFs the effects of shocks to all other variables (Koop et al., 1996), which gives us further insights into the mechanisms at work.

4 Empirical results

4.1 Descriptive statistics and causality tests

In Table 4, we present the descriptive statistics of our main variables for the full data sample (i.e., 76 countries between 1980 and 2012). It is evident from this table that, real GDP per capita growth averaged at 1.67% and the oil abundance variables averaged between 8.40%-10.09%. Compared to real GDP per capita growth, the oil abundance variables are more volatile. On average, the countries in the sample are characterised by high degree of openness (72.04%), abundant human capital (59.87%) and moderate capital input (21.91%). According to the panel unit root test, all series are stationary, indicating the appropriateness of using them in the PVAR analysis.[5]

[Insert Table 4 about here]

4.2 Panel Generalised Impulse Response Functions: Full sample analysis

Based on the estimation of Equation (1), with a lag order of 4 determined by the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC), we first calculate the generalised

the authors upon request.

[5]The results for the subgroups of countries and proxies of oil abundance and institutional quality, point towards similar conclusions. Thus, for the sake of brevity, these are not presented but are available upon request from the authors.

panel impulse response functions tracing out the reaction of real per capita GDP growth to a shock on oil share and vice versa.

Figure 1 (Panel A) depicts the dynamic path of adjustment to a shock on oil share in year 1 and in subsequent periods (up to 15 years) based on a PVAR model with only these two endogenous variables, as well as the exogenous variables (i.e., labour force participation, openness and gross fixed capital formation).

[Insert Figure 1 about here]

Our results indicate that oil share tends to have a positive effect on per capita real GDP growth in the long-run (up to 15 years). Specifically, the effect is marginally significant from the 9th year onwards. Furthermore, we observe that a positive shock to the per capita real GDP growth triggers a positive response from the oil share, yet only short-lived (up to 2 years), as it becomes insignificant thereafter. This is suggestive of the fact that, based on the full sample estimation, higher levels of oil share lead to higher economic growth, contrary to the empirical evidence of the resource curse hypothesis (as in Raddatz, 2007; Alexeev and Conrad, 2009; Brunnschweiler and Bulte, 2008). In addition, we report for the first time that there is a feedback mechanism from economic growth to the oil share, which might suggest that economic growth could lead to better exploitation of oil resources and thus increase the oil share for a country, which points again to the endogeneity of the oil abundance variables in this type of studies (Collier and Goderis, 2012).

In order to analyse the role of the institutions, we estimate the previous PVAR model distinguishing between democratic and autocratic countries, with the use of the first interaction term (INTER_1; as defined in Table 2), and the results are displayed in Panel B of Figure 2. Interestingly enough, the response of per capita real GDP growth to a positive shock to oil share, considering only the autocracies, is still positive, however, only in the short-run. This fact suggests that oil share has a higher positive effect on economic growth in democratic rather than in autocratic countries. Similarly, a positive shock to economic growth is not translated into a positive response from the oil share of the autocracies, as evident by the insignificant response of INTER_1 to a per capita real GDP growth shock. Even though we do not report a negative relationship between oil share and economic growth for the non-democratic countries (as in Sachs and Warner, 1999, 2001; Gylfason et al., 1999; Rodriguez and Sachs, 1999), this finding allows us to confirm the resource curse hypothesis and the role of the institutions in explaining the oil dependence and economic growth relationship (as in Isham et al., 2005; Mehlum et al., 2006a,b).

Although the findings for the resource curse hypothesis have been previously reported, we also show for the first time that the reverse causality is still evident, yet only for democracies. Thus, the role of institutions in explaining the positive significant relationship from economic growth to oil rents adds a new channel through which institutions should be considered when analysing the resource curse hypothesis.

Next, we assess whether the results are different when we take into consideration the degree of constraints on the executive (as approximated by the xrreg variable; as defined in Table 2). This is rather important as there are cases where countries are autocratic, yet with strong constraints on the executive, which reduces the powers of the autocrat and thus, these economies may be closer to be democracies. An example of such country is Indonesia, where during the mid-60s Suharto overruled Sukarno with *coups d'état*, yet he was committed to maintain the property rights and investments of the business sector. During Suhartos era the country experienced significant growth with heavy investments in public goods and numerous reforms in the banking sector, as well as, in import trade monopolies (Hadiz and Robison, 2005).

To capture the effects of these constraints we employ our second interaction term (INTER_2; as defined in Table 2). The results are reported in Panel C of Figure 1. We notice, that the response of the economic growth to a positive shock to oil share, given an autocracy with high constraints on the executive (INTER_2), is of higher magnitude compared to the response to INTER_1. However, the effect is of lower magnitude (and limited to a shorter time period) than the obtained in Panel A, suggesting again that the positive relationship between oil share and economic growth is higher for democratic countries and countries with constraints to the executive. This result justifies again the inclusion of quality of institutions as a channel through which oil rents may influence economic growth (Mehlum et al., 2006a,b). In addition, the oil share for those autocracies with high constraints to the executive responds positively to an economic shock, as evident by the right PGIRF of Panel C.

4.3 Panel Generalised Impulse Response Functions: Subgroup analysis

In this section we analyse the robustness of our results by means of estimating previous specifications of the PVAR for different subgroups of countries (as classified in Table 1).

First, we estimate the PVAR model for net oil-importing and net oil-exporting countries and display the results in Figures 2 and 3, respectively. The results from Panels A of Figures 2 and 3 suggest that oil share is growth-enhancing especially for net oil-exporting countries.

[Insert Figure 2 about here]

[Insert Figure 3 about here]

When we include the first interaction term (INTER_1) in the PVAR specification, we again find that for net oil-importing countries, oil share does not have any effects on economic growth in non-democratic countries and the same holds even if we account for the constraints to the executive (INTER_2) (see Panels B and C in Figure 2). Furthermore, as expected we do not find any response from interaction terms to economic growth shocks.

Turning our attention to the net oil-exporter countries (see Panels B and C in Figure 3) we uncover the following empirical regularities. First, shocks to oil share are growth-enhancing for autocracies, only if constraints to the executive exist. Nevertheless, the positive response observed in Panel C is still short-lived (i.e., lasts for about 4 years). Thus, the long-run effects of oil share to economic growth are mainly observed for democratic net oil-exporters. To conclude our analysis for the net oil-exporters and oil-importers, we document a positive response of the oil share to economic growth shocks only for the case of net oil-exporters and only when we consider the second interaction term (INTER_2). This is also suggestive of the fact that autocratic regimes are not capable in boosting oil shares even if they experience economic growth.

We also analyse the resource curse hypothesis by distinguishing between developing and developed countries, and display the results in Figures 4 and 5, respectively. As shown in the Panels A of Figures 4 and 5, oil share leads to higher growth in both developing and developed countries, although this effect is of a lower magnitude for the developed countries (see left PGIRFs of Panels A of Figures 4 and 5). This is rather expected given that the oil sector in the developed countries may not be a key sector for the economic, whereas the reverse is true for the developing economics. Indicatively, the oil revenues in Venezuela account for about 25% of the countrys GDP and 95% of its exports, whereas for the UK, the same ratios are about 1.2

[Insert Figure 4 about here]

[Insert Figure 5 about here]

Again, when we include the interaction terms, INTER_1 and INTER_2, in the PVAR specification, we find that oil share has a low positive (zero) effect on the economic growth of autocracies (see left PGIRFs in Panels B and C of Figures 4 and 5). In addition, we observe no significant response from the oil share in the autocratic countries to positive economic shocks (this holds

for both developed and developing countries). The only exemption is the positive response of the oil share to economic growth shocks for the autocracies with high levels of constraints.

Finally, we control for the income group (low/medium-low, medium-high and high income countries) when analysing the resource curse hypothesis. The results are shown in Figures 6, 7 and 8.

[Insert Figure 6 about here]

[Insert Figure 7 about here]

[Insert Figure 8 about here]

We find evidence of heterogeneous responses among the different income groups. In particular, there is no significant relationship between oil share and economic growth in the low/medium-low income group and this finding is robust even when we consider the two alternative interaction terms (see Figure 6).

Turning to the medium-high income group of countries we document that the positive long run effects of oil share are mainly driven by democratic countries (left PGIRFs in Panels A and B in Figure 7) or by autocracies that have in place significant constraints to the executive (see left PGIRF in Panel C of Figure 7). The reverse causality (i.e. from the economic growth to oil share) does not exist for this income group.

More importantly, we find bidirectional relationship between oil share and economic growth for the high-income countries group, although these effects are short-lived. This finding holds true for all specifications.

Overall, our results suggest that controlling for the quality of political institutions is important in rendering the resource course hypothesis significant. Doing so, the resource curse hypothesis is documented mainly for developing economies, net oil-exporters and medium-high income countries. Specifically, when economies from the aforementioned groups are characterised by weak quality of political institutions (autocracies with limited constraints to the executive), oil abundance is not growth-enhancing. This might suggest that these autocrats or the political elite exploit the benefits of the countrys oil resources to accommodate their own rent-seeking behaviour, without considering the potential positive long-run benefits to the wider economy.[6]

[6]Last but not least, our main results are robust to different proxies of oil abundance, economic growth (growth rates, GDP per capita growth, 5-year period growth rates) and quality of political institutions (polity index and the freedom house political rights index). For the sake of brevity we do not report these results, which are, however, available upon request from the authors.

Gylfason (2001), for example, argues that nations that consider their natural resources to be their most important asset may neglect the development of other resources, such as education. However, the existence of high-quality institutions (those able to create positive incentives for entrepreneurial growth) is crucial to translate the benefits from oil to productive activities (Mehlum et al., 2006a,b).

5 Conclusions

In this paper we shed more light to the contested literature on the resource curse hypothesis, by estimating a panel VAR approach along with panel generalised impulse response functions (PGIRFs) to data on oil abundance, economic growth and several political institutional variables for 76 countries grouped under different income groupings, level of development and oil importing or exporting status, over the period 1980-2012. To our knowledge, this is the first paper that adopts a PVAR and PGIRFs analyses, to study the impact of oil abundance on economic growth taking into account the endogeneity of institutional quality, as well as controlling for commonly used indicators in the growth literature in order to shed more light into the natural resource curse hypothesis. The use of this methodology allow us to control for cross-country unobservable heterogeneity, account for time fixed-effects, analyse the dynamic relationship between the different variables, and most importantly, to address the endogeneity problem often found in these type of studies.

The results of our empirical analysis reveal the following regularities. First, we document the need of considering per capita real GDP growth, oil abundance and quality institutions as endogenous variables, which justifies the use of panel VAR models in analyzing the relationship between these variables. Second, we find significant evidence that positive oil share shocks are growth-enhancing, when we do not account for institutional quality, suggesting thus, evidence against the resource curse hypothesis in that case. Third, controlling for the quality of political institutions seems important in rendering the resource course hypothesis significant. Doing so, the resource curse hypothesis is documented mainly for developing economies, net oil-exporters and medium-high income countries. Specifically, when economies from the aforementioned groups are characterised by weak quality of political institutions, then oil abundance is not growth-enhancing.

These results are robust to different proxies of oil abundance, economic growth (overall GDP growth, 5-year period growth rates) and quality of political institutions (polity index and the

freedom house political rights index).

Overall, our findings, based on the suggested dynamic approach that deals with a number of issues in the estimation process, provide new insights in the resource curse hypothesis. Moreover, our analysis shows that the resource curse hypothesis is mainly driven by the quality of political institutions, as well as, the constraints imposed to the executives. This suggests that the natural resource hypothesis hold true for autocracies with limited constraints to the executive.

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Table 1: Countries included in the sample

Panel A: Income Groups			
Low and Medium-Low Income			
Bangladesh	Bolivia	Cameroon	Congo Brazzaville
Congo (Dem Rep)	Egypt	Ghana	Guatemala
India	Indonesia	Nigeria	Pakistan
Paraguay	Philippines	Syria	Vietnam
Yemen			
Medium-High Income			
Albania	Algeria	Angola	Argentina
Bulgaria	China	Colombia	Cuba
Dominican Rep	Ecuador	Gabon	Hungary
Iran	Iraq	Jordan	Libya
Malaysia	Mexico	Peru	Romania
Thailand	Trinidad and Tobago	Tunisia	Turkey
Venezuela			
High Income			
Australia	Austria	Bahrain	Belgium
Brazil	Canada	Chile	Denmark
Finland	France	Germany	Greece
Ireland	Israel	Italy	Japan
Kuwait	New Zealand	Norway	Netherlands
Oman	Poland	Portugal	Qatar
Korea South	Russia	Saudi Arabia	Singapore
Spain	Sweden	Switzerland	United Arab Emirates
United Kingdom	United States		
Panel B: Level of Development			
Developed			
Australia	Austria	Bahrain	Belgium
Canada	Chile	Denmark	Finland
France	Germany	Greece	Ireland
Israel	Italy	Japan	Kuwait
New Zealand	Norway	Netherlands	Oman
Poland	Portugal	Qatar	Korea South
Russia	Saudi Arabia	Singapore	Spain
Sweden	Switzerland	Trinidad and Tobago	United Arab Emirates
United Kingdom	United States		
Developing			
Albania	Algeria	Angola	Argentina
Bangladesh	Bolivia	Brazil	Bulgaria
Cameroon	China	Colombia	Congo Brazzaville
Congo (Dem Rep)	Cuba	Dominican Rep	Ecuador
Egypt	Gabon	Ghana	Guatemala
Hungary	India	Indonesia	Iran
Iraq	Jordan	Libya	Malaysia
Mexico	Nigeria	Pakistan	Paraguay
Peru	Philippines	Romania	Syria
Thailand	Tunisia	Turkey	Venezuela
Vietnam	Yemen		

Table 1: Countries included in the sample (cont.)

Panel C: Level of Democracy			
	Democracies		
Albania	Algeria	Argentina	Australia
Austria	Belgium	Bangladesh	Bolivia
Brazil	Bulgaria	Canada	Chile
Colombia	Congo (Dem Rep)	Denmark	Dominican Rep
Ecuador	Finland	France	Gabon
Germany	Ghana	Greece	Guatemala
Hungary	India	Indonesia	Ireland
Iraq	Israel	Italy	Japan
Malaysia	Mexico	New Zealand	Nigeria
Norway	Netherlands	Pakistan	Paraguay
Peru	Philippines	Poland	Portugal
Korea South	Romania	Russia	Spain
Sweden	Switzerland	Thailand	Trinidad and Tobago
Turkey	United Kingdom	United States	
	Non-Democracies		
Angola	Bahrain	Cameroon	China
Congo Brazzaville	Cuba	Egypt	Iran
Jordan	Kuwait	Libya	Oman
Qatar	Saudi Arabia	Singapore	Syria
Tunisia	United Arab Emirates	Venezuela	Vietnam
Yemen			
Panel D: Oil Importers and Oil Exporters			
	Net Oil-Importers		
Albania	Australia	Austria	Belgium
Bangladesh	Brazil	Bulgaria	Chile
China	Cuba	Denmark	Dominican Rep
Finland	France	Germany	Ghana
Greece	Guatemala	Hungary	India
Indonesia	Ireland	Israel	Italy
Jordan	Japan	New Zealand	Netherlands
Pakistan	Paraguay	Peru	Philippines
Poland	Portugal	Korea South	Romania
Singapore	Spain	Sweden	Switzerland
Thailand	Trinidad and Tobago	Tunisia	Turkey
United Kingdom	United States	Vietnam	
	Net Oil-Exporters		
Algeria	Angola	Argentina	Bahrain
Bolivia	Canada	Cameroon	Colombia
Congo Brazzaville	Congo (Dem Rep)	Ecuador	Egypt
Gabon	Iran	Iraq	Kuwait
Libya	Malaysia	Mexico	Nigeria
Norway	Oman	Qatar	Russia
Saudi Arabia	Syria	United Arab Emirates	Venezuela
Yemen			

Table 2: Variable description and sources

Name	Description	Source	Notes
Economic Growth	Growth rate of real per capita GDP (GDPPCGR)	IMF	Log difference of per capita GDP (in PPP, constant 2005 intnl $)
Oil rents	Oil rents (as % of GDP)	World Bank	Difference between the value of crude oil production at world prices and total costs of production
Oil share	Oil share (as % of GDP)	IMF, EIA	Value of crude oil exports as % of GDP.
Oil revenue	Oil revenue per capita	IMF, EIA	Value of crude oil exports per capita
Polity IV	Rating based on a +10 (strongly democratic) to -10 (strongly autocratic) scale	Polity IV project	Substracting the AUTOC score from the DEMOC score in the Polity IV database
Xrreg	Rating based on a 1 to 3 scale	Polity IV project	It is a component of the Polity IV index, and measures the "Regulation of Chief Executive Recruitment" mechanism
Political rights	Rating based on a 1 to 7 scale	Freedom House	The ratings process is based on a checklist of 10political rights questions related to the electoral process, political pluralism and participation and functioning of government
Democracy status	Dummy variable	Polity IV project	Countries are classified according to the Polity IV index in democracies (Polity IV scores between 6 and 10), and anocracies/ autocracies (Polity IV scores between -10 and 5)
Democracy status × Oil share	Interactive term (INTER_1)	IMF, EIA, Polity IV	Calculated as the product of Democracy status and Oil share
Political rights × Oil share	Interactive term (INTER_1a)	IMF, EIA, Freedom House	Calculated as the product of Political rights and Oil share
Democracy status × Oil rents	Interactive term (INTER_1b)	World Bank, Polity IV	Calculated as the product of Democracy status and Oil rents
Political rights × Oil rents	Interactive term (INTER_1c)	World Bank, Freedom House	Calculated as the product of Political rights and Oil rents
Democracy status × Oil revenue	Interactive term (INTER_1d)	IMF, EIA, Polity IV	Calculated as the product of Democracy status and Oil revenue

Note: Annual data from 76 countries for the period 1980-2012.

Table 2: Variable description and sources (cont.)

Name	Description	Source	Notes
Political rights × Oil revenue	Interactive term (INTER_1e)	IMF, EIA, Freedom House	Calculated as the product of Political rights and Oil revenue
Democracy status × Oil share × xrreg	Interactive term (INTER_2)	IMF, EIA, Polity IV	Calculated as the product of Democracy status, Oil share and xrreg
Political rights × Oil share × xrreg	Interactive term (INTER_2a)	IMF, EIA, Freedom House	Calculated as the product of Political rights, Oil share and xrreg
Democracy status × Oil rents × xrreg	Interactive term (INTER_2b)	World Bank, Polity IV	Calculated as the product of Democracy status, Oil rents and xrreg
Political rights × Oil rents × xrreg	Interactive term (INTER_2c)	World Bank, Freedom House	Calculated as the product of Political rights, Oil rents and xrreg
Democracy status × Oil revenue × xrreg	Interactive term (INTER_2d)	IMF, EIA, Polity IV	Calculated as the product of Democracy status, Oil revenue and xrreg
Political rights × Oil revenue × xrreg	Interactive term (INTER_2e)	IMF, EIA, Freedom House	Calculated as the product of Political rights, Oil revenue and xrreg
Developing	Category	World Bank	Countries are classified according to their degree of development, based on World Bank data
Oil importer/ Exporter	Category	World Bank	Countries are classified according to their net oil importer or exporter status, based on World Bank data
GFCF	Gross fixed capital formation	World Bank	Expressed as percentage of GDP
Trade openness	Trade openness	World Bank	The sum of exports and imports as a percentage of GDP
LPFR	Labour force participation rate	World Bank	Expressed as a percentage of total population of ages 15+

Note: Annual data from 76 countries for the period 1980-2012.

Table 3: Block exogeneity/Granger-causality tests

	Dependent variable		
	Economic growth rate	Oil share	INTER_1
Economic growth rate (excluded)		11.55**	3.40
Oil share (excluded)	16.38***		13.55***
INTER_1 (excluded)	10.04**	6.19	
All variables	28.34***	17.44**	15.17*
	Economic growth rate	Oil share	INTER_2
Economic growth rate (excluded)		10.87**	1.71
Oil share (excluded)	13.83***		13.21**
INTER_2 (excluded)	8.55*	2.93	
All variables	24.53***	14.57*	14.27*

Note: The numbers in the table are the Chi-square block exogeneity Wald tests. Under the null hypothesis, the excluded variables do not Granger-cause the dependent variable. *, ** and *** denotes significance at the 10%, 5% and 1% level.

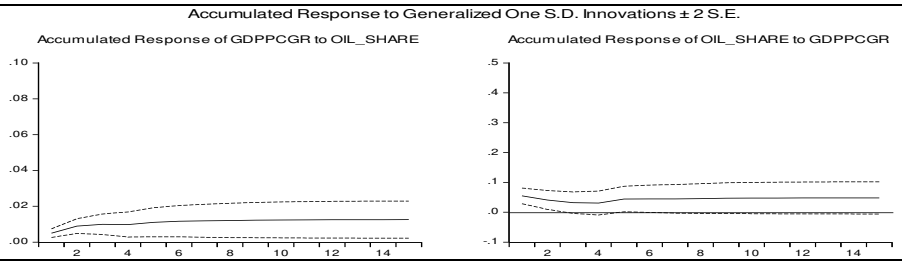
Table 4: Descriptive statistics

	Mean	Minimum	Maximum	Std.Dev.	Skewness	Kurtosis	J-B	LLC
GDPPCGR	1.6688	-43.0161	40.5673	4.5809	-1.2640	14.4295	13194.21*	-20.93*
OIL_SHARE	8.4982	0.0000	98.8086	14.4599	3.0219	14.0225	9685.52*	-28.07*
OIL_RENT	10.0863	0.0000	80.2375	14.9963	1.8375	5.8979	1852.66*	-24.53*
OIL_REVENUE	8.4171	0.0001	245.0232	20.1332	5.8563	50.3884	154090.8*	-27.17*
GFCF	21.9134	2.1000	59.7324	6.1869	0.5755	5.2960	618.13*	-4.80*
OPENESS	72.0425	6.3203	439.6567	49.4087	3.1378	18.3525	26877.76*	-39.86*
LPFR	59.8670	15 86.7	9.5022	-0.2659	3.3369	41.4322*	-5.61*	

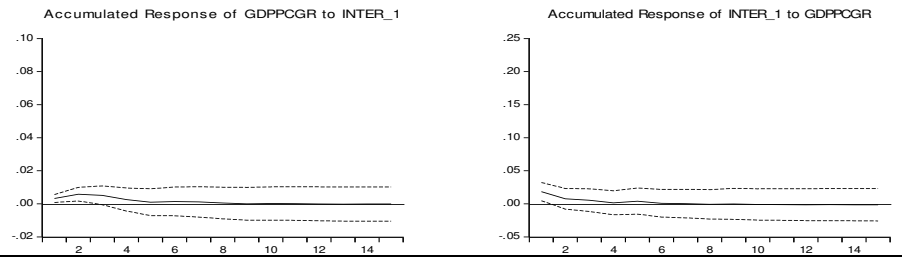
Note: * denotes significance at the 1% level. J-B denotes the Jarque-Bera test for normality. LLC is the panel unit root test (with just a constant) of Levin, Lin and Chu (2002), which test the null hypothesis of a unit root, against the alternative that the panel is stationary.

Figure 1: Impulse response functions: Full sample

Panel A: No interaction term



Panel B: Interaction between level of democracy and oil share (INTER_1)



Panel C: Interaction between level of democracy, oil share and xrreg (INTER_2)

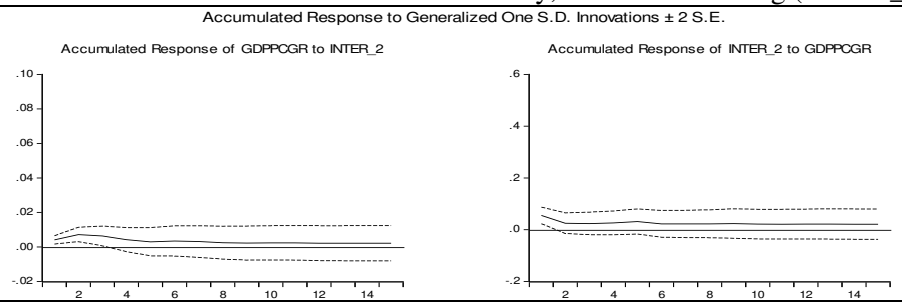
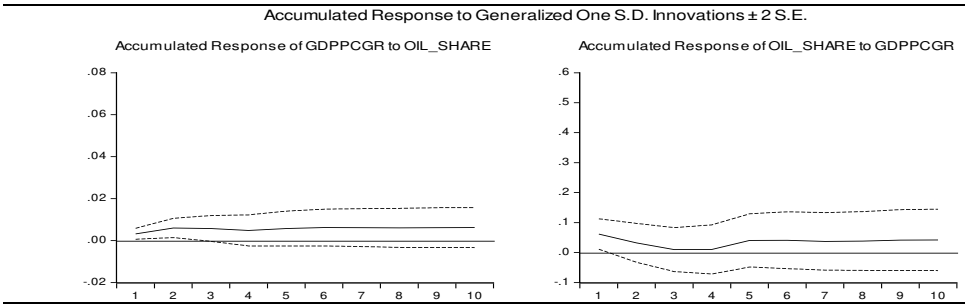
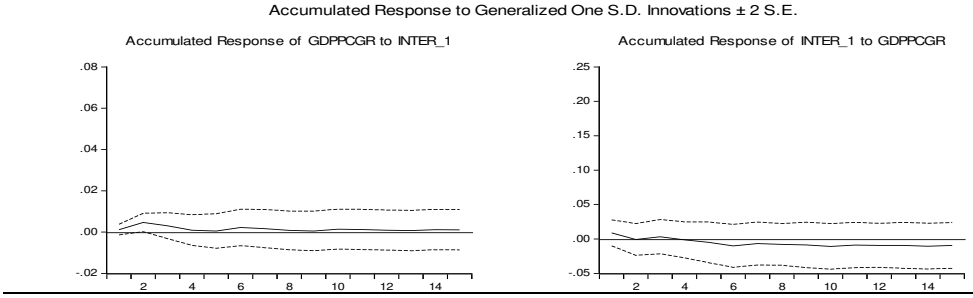


Figure 2: Impulse response functions: Net oil-importers

Panel A: No interaction term



Panel B: Interaction between level of democracy and oil share (INTER_1)



Panel C: Interaction between level of democracy, oil share and xrreg (INTER_2)

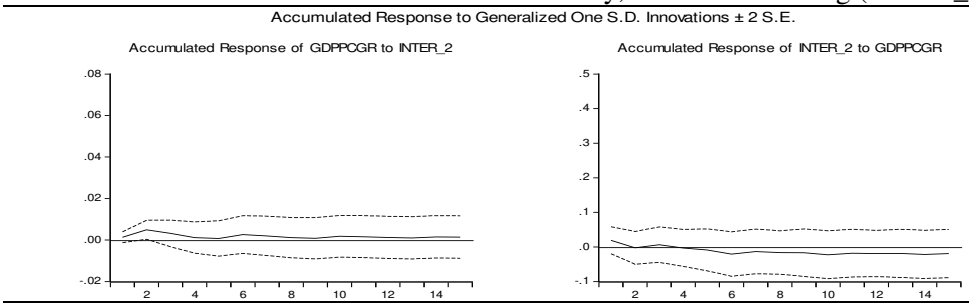
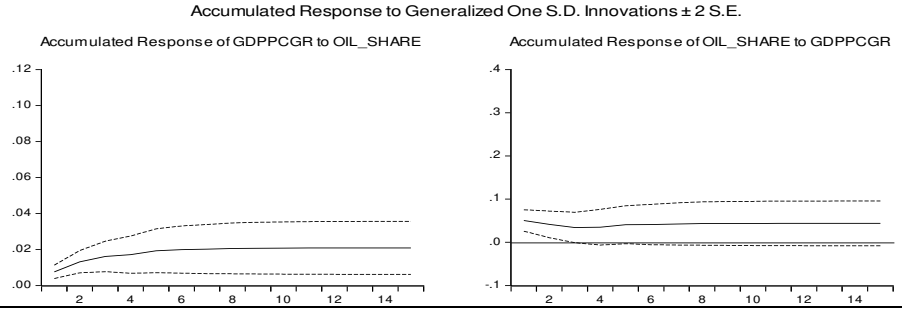
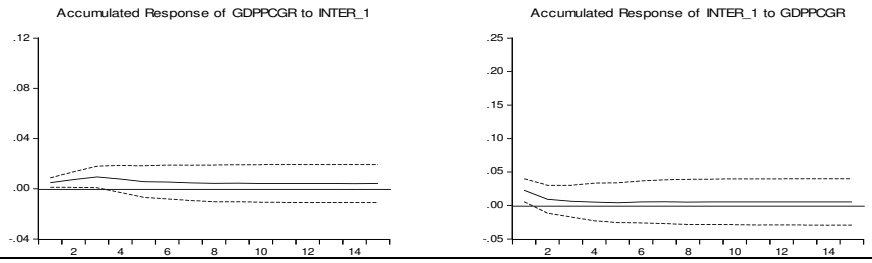


Figure 3: Impulse response functions: Net oil-exporters

Panel A: No interaction term



Panel B: Interaction between level of democracy and oil share (INTER_1)



Panel C: Interaction between level of democracy, oil share and xrreg (INTER_2)

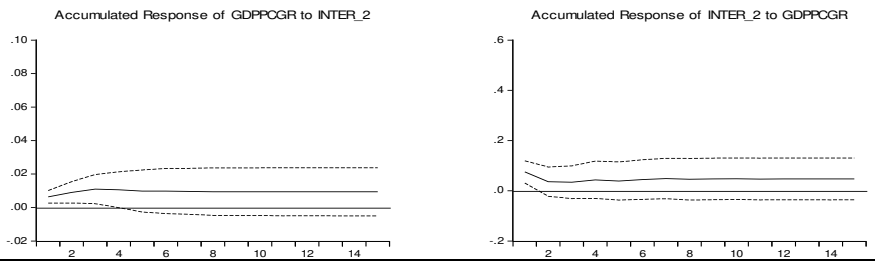
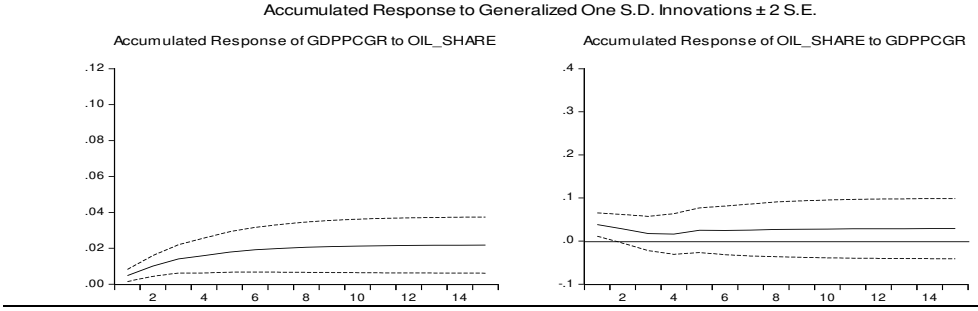
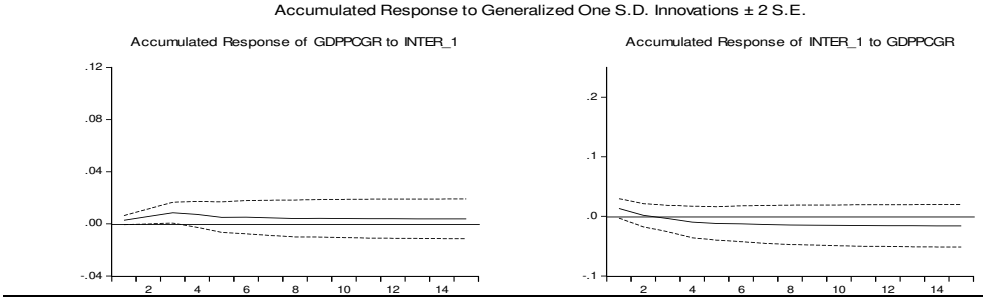


Figure 4: Impulse response functions: Developing

Panel A: No interaction term



Panel B: Interaction between level of democracy and oil share (INTER_1)



Panel C: Interaction between level of democracy, oil share and xrreg (INTER_2)

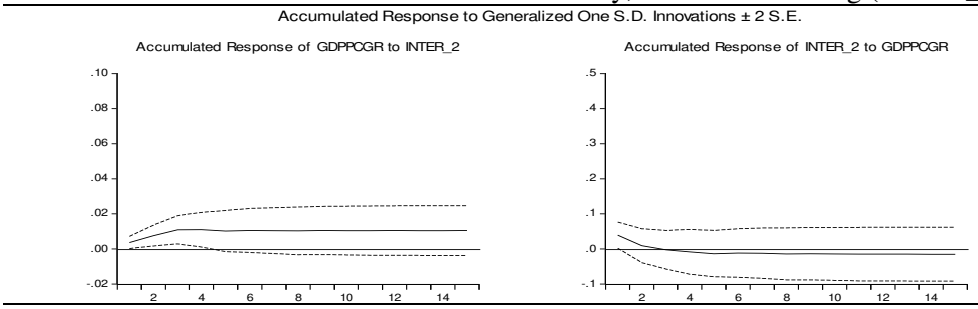
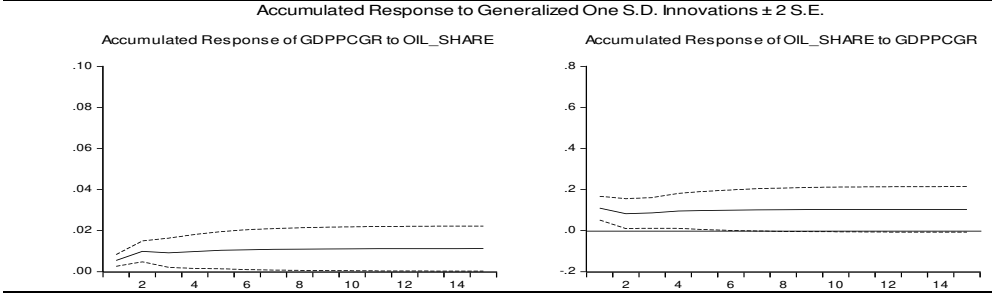
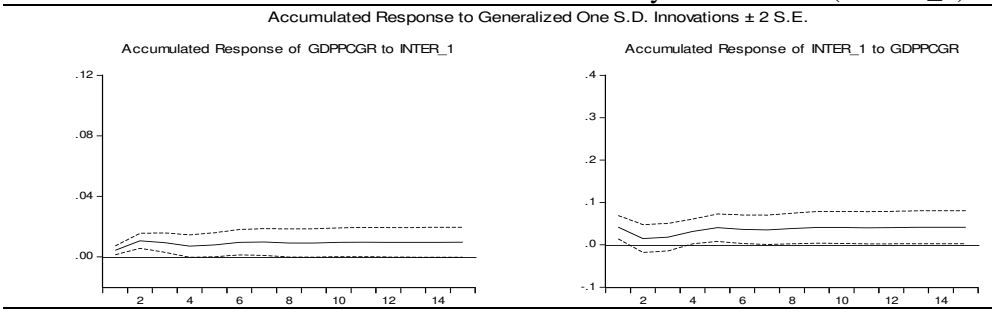


Figure 5: Impulse response functions: Developed

Panel A: No interaction term



Panel B: Interaction between level of democracy and oil share (INTER_1)



Panel C: Interaction between level of democracy, oil share and xrreg (INTER_2)

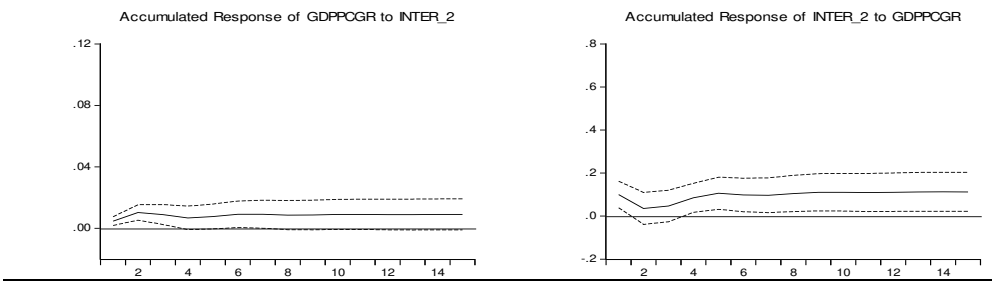
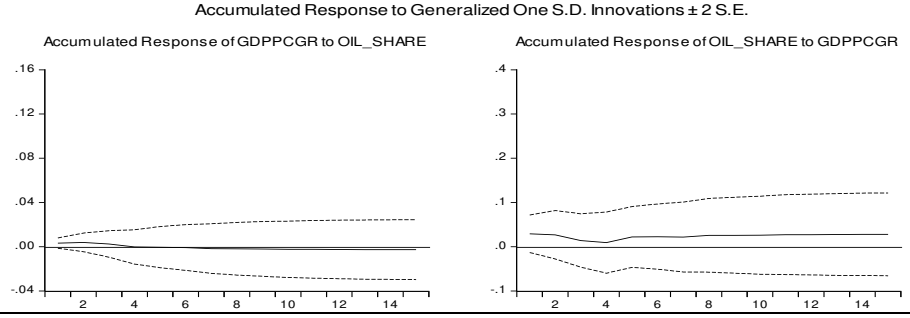
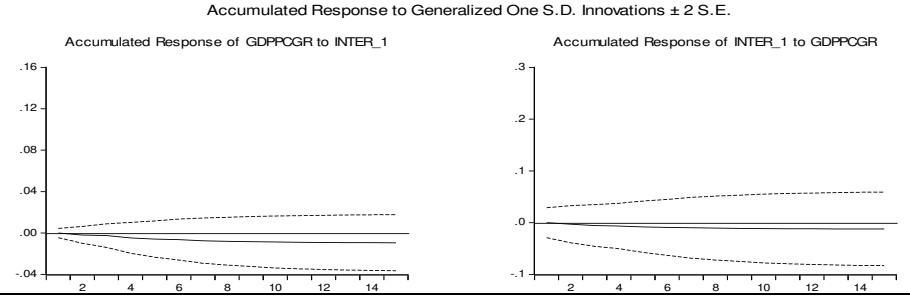


Figure 6: Impulse response functions: Low and Medium-Low Income group

Panel A: No interaction term



Panel B: Interaction between level of democracy and oil share (INTER_1)



Panel C: Interaction between level of democracy, oil share and xrreg (INTER_2)

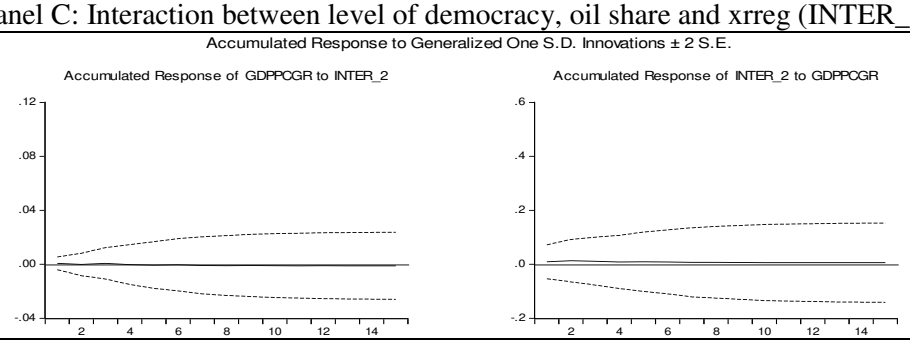
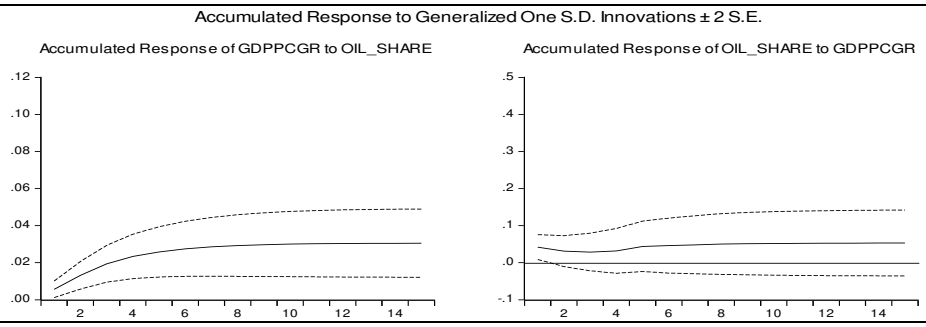
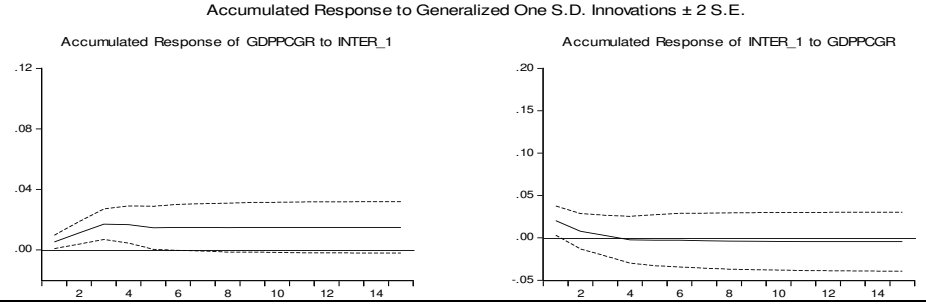


Figure 7: Impulse response functions: Medium-High Income group

Panel A: No interaction term



Panel B: Interaction between level of democracy and oil share (INTER_1)



Panel C: Interaction between level of democracy, oil share and xrreg (INTER_2)

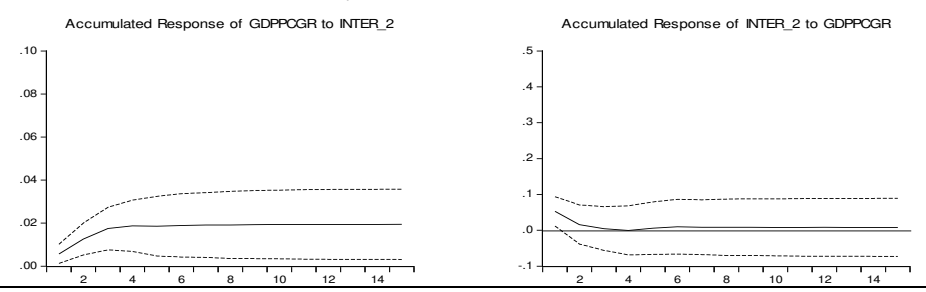
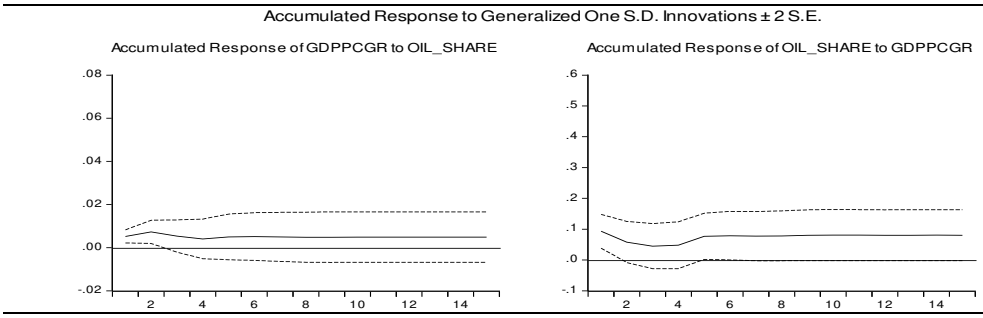
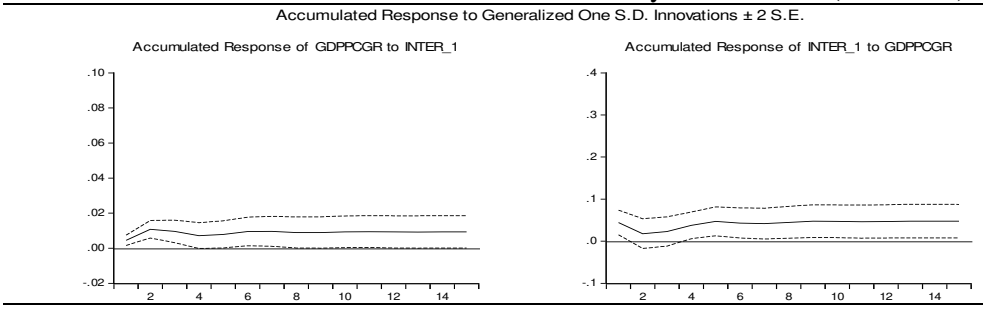


Figure 8: Impulse response functions: High Income group

Panel A: No interaction term



Panel B: Interaction between level of democracy and oil share (INTER_1)



Panel C: Interaction between level of democracy, oil share and xrreg (INTER_2)