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RESOURCE RENTS, POLITICAL INSTITUTIONS AND ECONOMIC GROWTH

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Abstract

This paper contributes to the empirical literature on oil and other point-source resource curse. We find that the curse does exist but conditional on bad political governance. Unlike previous studies we estimate a flexible econometric growth model that accounts for long-term country heterogeneity and cross-dependency and retains the virtues of the recent literature, including short-run flexibility, cointegration and error-correction mechanisms. We unpack political institutions into those reflecting the degree of inclusiveness (Polity) and credibility of intertemporal commitments (Political Check and Balances) and find that resource-rich countries with low levels on both scores are likely to experience the curse, while those with high enough levels may turn resource rents into a driver of growth. Countries with high scores on only one dimension may avoid the curse but are not likely to effectively use resource rents to promote growth. This suggests that for the oil-rich Arab world to achieve sustained growth, the Arab spring should not only bring democracy, as badly needed as it is, but should also lay the foundations for strong systems of political checks and balances.

JEL Classification: O13, P16, O43

Keywords: Oil and natural resource curse, economic growth, democracy, political checks and balances

ملخص

تساهم هذه الورقة في الأدبيات التجريبية على النفط وغيرها من المصادر الصغيرة نسبيا والمصابة بلعنة الموارد. نجد أن لعنة الموارد موجودة ولكن مشروط وجودها بالحوكمة السيئة. وعلى عكس الدراسات السابقة نقدر فى هذه الورقة نموذج مرن للنمو الاقتصادي القياسي والذي يلأخذ فى عين الاعتبار عدم التجانس بين البلاد على المدى الطويل والاعتماد المتبادل كما يحتفظ هذا النموذج يحتفظ بقوة الأدبيات الحديثة فى الحديث عن المرونة فى المدى القصير ، التكامل المشترك وآليات تصحيح الخطأ. نقوم بتفريغ المؤسسات السياسية في تلك التي تعكس درجتان: درجة من الشمولية (بوليتي) ودرجة من مصداقية الالتزامات الزمنية (التحقق السياسي والموازين)، ونجد انه من المحتمل للدول الغنية بالموارد الطبيعية مع وجود مستويات منخفضة لكلا الدرجات على حد سواء أن تواجه لعنة ، في حين أن الذين لديهم ما يكفي من موارد قد يستطيعون تحويل عوائد الموارد الى دوافع للنمو. ويمكن للبلدان ذات النسبة العالية لواحدة من الدرجتان تجنب اللعنة ولكن ليس من المرجح أنها ستستخدم عائد الموارد بصورة فعالة لتعزيز النمو. وهذا يشير إلى أنه بالنسبة للدول الغنية بالنفط للعالم العربي ومن أجل تحقيق النمو المستدام، ينبغي أن يجلب الربيع العربي ليس فقط الديمقراطية ، برغم الحاجة ماسة لها، ولكن ينبغي أيضا أن يضع أسس لنظم قوية من الضوابط والتوازنات.

1. Introduction

> "Projects of mining, instead of replacing capital employed in them, together with ordinary profits of stock, commonly absorb both capital and stock.They are the projects, therefore, to which of all others a prudent law-giver, who desired to increase the capital of his nation, would least choose to give any extraordinary encouragement..." (Adam Smith 1776)[1]

As the above quote suggests, the curse associated with oil and other point-source rents is real, though contemporary literature also suggests that it is not destiny. In particular, the recent empirical growth literature finds that the existence of the curse is conditional on bad governance. However, a minority opinion still questions its existence when resource abundance measures (such as net resource exports per capita) are used instead of the resource dependency measures (such as resource exports/GDP), which has been the staple of the cross-country econometric literature on the development impact of oil[2].Indeed, many, though not all, oil-rich countries have managed to successfully transform the rents from oil into substantial gains in terms of higher consumption and other aspects of social welfare for their citizens and investments in useful public goods for their economies (Sachs 2007).A comparison of oil-rich to non-oil developing countries makes clear that the former do in fact outperform the latter in terms of the levels of a wide range of economic and social indicators. Also, as far as the overall development indicators are concerned, the major oil-rich Arab member countries of the GCC obviously belong to a much higher league compared to other countries (Elbadawi and Gelb 2010).

However, other contributions to the literature find that even when measures of resource abundance are used the curse seems to hold against a variety of robustness checks.[3]Oil income is intrinsically temporary because it is derived from non-renewable, depletable stocks. It is also unreliable because oil prices are highly volatile (Collier et al. 2009) and adequate risk coverage is not always available. Therefore, the consequences of failures to properly manage the volatility of oil incomes or to effectively use it to accumulate large and sufficiently diverse stocks of tangible (e.g. infrastructure) and intangible (e.g. human and knowledge capital, good institutions) types of capital are likely to be extremely dire for oil-rich countries.

More recently, Collier and Goderis (2009) use a panel co-integration empirical growth model to analyze two issues that, in our view, constitute the point of departure for further research on the oil-curse question. Firstly, they find robust evidence that the *change* in non-agricultural export prices is positively associated with economic growth but the price *level* has a strong negative effect. This suggests that commodity booms have positive short-term effects on output but adverse long-term effects. Therefore, the curse operates in the long-run.Secondly, these authors also find that, conditional on bad governance, controlling for the real exchange rate, public consumption and private consumption as channels of the resource curse higher commodity prices no longer have a negative long-run effect. The empirical significance of these channels corroborates the recent political economy literature, which predicts that permanent resource booms when government accountability is lacking allows politicians to expand public sector employment or to directly boost private consumption to enhance their popularity (e.g. Robinson and Torvik 2005; Robinson et al. 2006).In addition to these distributional aspects in resource economies, another strand of the literature suggests that bad governance also discourages overall savings and promotes excessive spending,

[1]Quoted in Lederman and Maloney (2008).

[2]See for example Maloney and Lederman (2007), who argue that, unlike the resource dependency measure, the abundance measure is consistent with theory; and that when used as a proxy for resource rents no oil curse is found.Instead, they find a robust positive association between resource wealth and long-term growth.

[3]See, for example, Arezki and van der Ploeg (2008).

which is reflected in appreciated real exchange rates (e.g. Matsen and Torvik 2005).Moreover, the significance of the real exchange rate channel also coheres with the recent literature on its role as an instrument in the development strategy for economic diversification; sophistication and growth (e.g. Elbadawi and Gelb 2010).

This paper contributes to this strand of the growth literature along three dimensions. First, following on Collier and Hoeffler (2009), we unbundle the role of institutions in the resource curse literature by accounting for both democracy and checks and balances. For the latter we use a recently developed index of political checks and balances by Henisz and Zelner (2010).As argued by Barma et al. (2011), democracy accounts for political inclusiveness, which is critical for the long-term stability and growth in rents-dependent societies.However, the electoral competition aspect of the democratic process is likely to be at odds with the "credibility of inter-temporal commitment", another critical ingredient for success in resource-rich societies. These two opposing channels of democracy (inclusiveness versus the short-run politics of electoral competition) might explain the lack of robust association between democracy and long-term growth in the literature. We argue that the presence of a strong system of political checks and balances should augment democracy, because it is likely to be difficult for politicians to tamper with inter-temporal commitments in order to achieve short-term electoral gains.

The second contribution of this paper is in the measurement of the impact of resource rents on economic growth. Our growth model properly accounts for most theoretically and empirically relevant growth fundamentals. Conditional on this encompassing set of growth correlates, we test for the significance of resource rents in addition to democracy and checks and balances as well as the interaction of the latter with rents. We embed such growth model in a novel econometric estimation technique (called the second generation panel-data models) which allows for the derivation of the country-specific growth impact of rents. Our econometric model retains much of the virtues of recent papers (e.g. Collier and Goderis 2009; Arezki et al. 2011), such as short-run flexibility, cointegration and error-correction mechanisms, etc. However, it adds controls for the crucial dimensions of country heterogeneity (differing short and long-run parameters for each economy) and cross-section dependency (arising from common factors). This, we argue, should provide insights toward explaining country-specific growth experiences, such as those of the oil-rich countries of the Arab world.

The cross-country, time series literature on economic growth has been criticized by its reliance on questionable identification assumptions and lack of proper account of endogeneity. Our models belong to a new brand of panel models which account for identification by co-integration and are thus quite resilient to endogeneity biases. By allowing for country-specific estimation it does not force short or long-run structures to be the same across countries and by allowing different speed of adjustment it does not force the dynamics to be the same across economies. We acknowledge, nevertheless, that macroeconomic cross-section time series models based on annual data may be limited in capturing the subtleties of the impact of oil exports on economic activity. However, by pooling the experiences of several economies we aim at unveiling general trends and identifying across the board issues that would otherwise be too difficult to glean by the individual scrutiny of a large number of stories.

Section 2 contains a selective review of the literature to motivate the subsequent empirical growth analysis. This review will focus mainly on the institutional aspects of the resource curse, though we also discuss the economic correlates of the curse from the perspective of their role as channels through which the latter impact growth rather than being the true underlying causes. Section 3 presents the standard growth model and replicates the main

findings of recent literature on the growth impact of rents conditional on political institutions. Section 4 undertakes a critical econometric assessment of the received empirical literature and estimates the resource curse effects in a more flexible econometric model. Section 5 concludes.

2. Understanding the Oil Curse[4]

Explanation of the oil curse has evolved from purely economic theories into the realm of political economy. Economic explanations, most notably the Dutch Disease (e.g. Corden 1982; Corden and Neary 1982; Sachs 2007) and the more recent volatility view (e.g. Gelb and Grasmann 2008), have been questioned in the recent literature (Elbadawi and Gelb 2010).On the contrary, the political economy view of the curse has received ample support in the recent empirical growth literature, which finds that the existence of the curse is conditional on bad governance (e.g. Collier and Goderis 2009; Arezki et al. 2011).

To motivate the empirical framework for analyzing the growth impact of oil and other point-source resource rents, the discussion in this section will, therefore, be substantially focused on the institutional strand of the curse literature. This, nevertheless, does not imply that Dutch Disease and volatility effects cannot be present in badly managed economies as channels through which the curse might operate (e.g. Collier and Goderis 2009).Hence we start with a brief review of these approaches before taking up institutional issues.

Despite the appreciation of the real exchange rate (RER) and the subsequent squeeze on the non-resource tradable sectors, the pure Dutch Disease effect cannot explain the overall collapse of the economy, as evidenced in the collapse of the non-oil GDP associated with the "oil curse" phenomenon. This is because, at the theoretical level, it is not clear as to why the declining share of the non-resource tradable sectors could not be compensated for by the rising share of the non-traded goods. However, the phenomenon might become a "true" disease (i.e. an oil curse) under two very adverse conditions. First, if the squeezed activities assume some special qualities that could not be compensated for by the expanding resource and non-traded goods sectors. Therefore, an extended version of the Dutch Disease thesis also assumes that exporting activities in general entail some dynamic properties, such as learning by exporting, and that manufacturing in particular generates increasing returns to scale (e.g., Matsuyama 1992; Bigsten et al. 2002; Rodrik 2007).Second, it also assumes that the RER appreciation is too extreme, relative to the long-term "sustainable" exchange rate. This, however, might be a plausible assumption because the marginal impact of oil booms on the RER can be quite substantial, with elasticity estimates ranging between 40 to 50% (Korhonen and Juurikkala 2007).Though both premises might be perfectly plausible, there is no systematic evidence that real exchange rate overvaluation, for example, might be a cause of an unconditional resource curse regardless of the quality of political governance.

The volatility view of the curse argues that because oil prices (and hence revenues) tend to be very volatile, oil-dependent economies tend to experience frequent and oftentimes extreme volatility in economic activity. As noted by Hausmann and Rigobon (2003), a one standard deviation shock to the price of oil (estimated at 30–35%) can generate an income shock as high as 6% of GDP in an economy where oil accounts for 20% of GDP. This is a very high volatility effect compared with the median shock for industrial countries (about 2%) or even developing countries (at 4%).The failure to cope with this extreme volatility, it is argued, has been the main factor behind the post-boom economic collapse experienced by most oil-dependent economies. Country experiences show how destructive the oil cycles can be when not properly managed. Gelb and Grasmann (2008) cite three such examples including the

[4]This section draws heavily from Elbadawi and Gelb (2010).

Mexican debt crisis precipitated by the debt-financed spending spree against expectations of a longer oil boom that failed to materialize after 1981.Even more glaring examples are those of Nigeria (Budina and Wijnbergen 2008) and Venezuela, which saw its per capita output reduced to half its real value following the end of the 1974-1980 oil boom (Hausmann 2001).

In an attempt to provide a stronger explanation for the curse, Hausmann and Rigobon (2003) develop a model to motivate their "inefficient specialization" hypothesis, which augments the basic Dutch Disease model by accounting for the impact of the RER volatility on the non-resource tradable sector. They argue that for a resource curse to happen, the non-resource tradable sector must be substantially squeezed beyond a critical size or almost disappear and that the economy must be characterized by financial imperfections. They show that the near disappearance of the tradable sector will be associated with a highly volatile real exchange rate, because with a very squeezed or no non-resource tradable sector, only expenditure switching forces will be at play in response to the shocks from the oil sector. In turn, financial imperfection would cause interest rates to rise with increased volatility of the real exchange rate. In their model, a vicious circle between greater volatility and interest rates, on the one hand, and lower investment in the tradable sector, on the other, will lead to a steady squeeze of the latter until it eventually disappears and the economy specializes "inefficiently" in non-tradables. They show that this economy will exhibit higher interest rates, lower capital and wages and more depreciated exchange rates.

However, as the received empirical literature makes clear, the net growth impact of the Dutch Disease, volatility or inefficient specialization do not seem to have impacted long-term growth in well managed economies. Instead, oil-rich but poorly governed countries are not likely to acquire the knowledge and the institutional capacity to take the right decisions regarding extraction, savings and investments; to adopt the most appropriate macroeconomic framework for avoiding the Dutch Disease; or to better manage the rampant volatility that plague their economies. For example, the recent literature on managing oil economies has called for a strong role for the state in oil-rich countries with regard to dealing with oil corporations (e.g. Stiglitz 2007).To maximize the returns for their oil resources, these countries need to deal effectively with the vastly more knowledgeable multinational oil corporations on relatively complex issues, such as the overall terms of agreements; properly evaluating fiscal terms of contracts; or how best to auction oil rights[5].However, as important as they may be, the most serious drag on these countries' ability to effectively manage the oil rents for development is unlikely to be lack of knowledge or institutional capabilities. Instead, the most devastating aspect of governance deficits in these countries is more probably the lack of accountability associated with the scale and nature of the rents or the lack of inclusive institutions for distributing rents or managing the risks associated with volatility.

On the latter issue Rodrik (1999) links the volatility story to that of governance and argues that the effect of external shocks on growth and economic performance in general is not just the outcome of the failure of adjustment policies in the technical sense; it also reflects the interaction of these shocks with "latent" social conflicts in society on one hand and institutions for conflict management, on the other. In societies with deep social conflicts (for example, societies fractionalized or polarized along ethnic, religious and cultural lines; or economic class) and weak social and political institutions for mediating conflicts among social groups, Rodrik argues, the economic costs of external shocks are magnified by the

[5]In their book on escaping the resource curse, Humphreys et al. (2007) devote considerable attention to these issues.See also Collier et al. (2008) and Collier and Goderis (2009), who strongly advocate auctioning as an instrument for selling oil rights by countries emerging out of conflicts, which tend to lack capable institutions and knowledge and are highly susceptible to corruption.

ensuing growth-retarding distributional conflicts triggered by these shocks.[6] Using a simple empirical proxy to test this hypothesis in a global cross-sectional database, Rodrik finds that the interaction term (shock x social conflict x lack of economic and institutional capacity) is robustly associated with the collapse of growth experienced by many oil-importing developing countries following the oil price hikes in the 1970s.More recently, Elbadawi (2005) analyzes the collapse of growth in the oil-dependent Arab world in 1985-94 (relative to the boom era of 1975–1984) and finds that it can also be explained by Rodrik's framework. Like Rodrik's analysis for the case of growth volatility and long-term sustainability, most of the received literature suggests that political institutions that promote inclusiveness and checks and balances also tend to promote long-term growth and other aspects of development in oil-rich societies. For example, in a theoretical model of patronage politics in the context of resource wealth Robinson et al. (2006) show that good institutions may restrain this dysfunctional behavior. Also Mehlum et al. (2006) present empirical evidence in support of the critical role of good institutions in resource-rich economies.

In a more recent contribution to the growth literature in resource-rich economies, Collier and Hoeffler (2009) draw a distinction between democracy as an instrument for political inclusiveness but also electoral competition, and political checks and balances as an instrument for accountability. In this context they analyze an empirical growth model using global data from 1970 to 2001 and a new measure of resource rents[7].They find that high natural resource rents and open democracy (as measured by Polity IV) interact badly as determinants of growth, but checks and balances offset this adverse effect. Based on their results they conclude that democratization in resource-rich economies needs to emphasize strong checks and balances.

Their empirical framework is motivated by a simple intuitive model that generates uncertain outcome for the growth impact of democracy in resource-rich economies, depending on whether or not democracy entails enough checks and balances that limit embezzlement of funds and hence maximizes provisions for growth-enhancing public goods. Thus the key insight of their paper is modeling the determination of checks and balances. They assume that politicians would like to heavily tax in order to generate patronage but they will be deterred from doing so because high taxation provokes scrutiny. They assume that patronage expenditure, P, is determined by the product of the tax rate, t, and disposable income, Y, and the proportion of revenue which can be embezzled for patronage, e, which is simply given by a linear negative function of the tax rate: $e = \alpha(1-t)$ .The decision problem for the corrupt politician is thus given by:

$$P^{\max} = \max_{wrt\ t} \alpha(1-t).t.Y \tag{2.1}$$

Which solves for the patronage maximizing level of the tax rate: t^*=0.5 and the maximum resources available for patronage (P^*) and public goods (G^*):

$$P^* = Y\alpha / 4 \tag{2.2}$$

$$G^* = (2-\alpha)Y / 4 \tag{2.3}$$

[6]Social conflicts and lack of effective institutions for mediating them could affect the response to external shocks in many ways: by delaying adjustment in fiscal policy and in key relative prices, most notably the real exchange rate; by generating increased uncertainty in the economic environment; and by diverting resources from productive to distributive activities.

[7]They built a new series of resource rents using the following methodology. First, they defined rents as the difference between natural resource price and extraction costs. Second, for each point-source natural resource, they multiplied the estimated rents per unit of output by the volume extracted; then they add up the outcome for such resources (e.g. oil, gas, coal, iron, copper, etc.).Finally, for each year they divided total rents by GDP for the country in question.

Hence in this simple model, equations 2.2 and 2.3 describe the outcome of electoral competition with the restraint of scrutiny endogenized. Now when resource rents are introduced at a rate, r, available revenue becomes:

$$[t(1-r)+r]Y \tag{2.4}$$

Note that the resource rents are not subject to scrutiny. The new optimization problem now becomes:

$$P^{r\,Max} = \max_{wrt\ t} \alpha(1-t).[t(1-r)+r].Y \tag{2.5}$$

The patronage maximizing tax rate is given by:

$$t^{**} = (1-2r)/(2-2r) \tag{2.6}$$

This result suggests that the higher the revenue from resource rent, r, the lower the tax rate. However, though the resource discovery augments income, it is not clear whether or not it will increase the provision of public goods, depending on the scale of resource discovery, r, and the rate of embezzlement α .They show this by analyzing the interesting case of a scale of resource discovery that exactly doubles national income, hence r=0.5, which (by equation 2.6) will also be consistent with t^{**}=0.At this rate both income and government revenue is doubled, because the state previously received half of national income (t^{*}.Y=0.5Y) and now it received all of the previous national income before the resource discovery (because r.2Y=0.5.2Y=Y).Also now with the tax rate driven to zero, and hence dampening the effect of scrutiny, the rate of embezzlement (relative to Y) increases from $\alpha/2$ (equation 2.2) to α . Therefore, the provision for public goods in the presence of resource rents is given by:

$$G^{**} = (1-\alpha)2Y \tag{2.7}$$

Comparing G^{**} with G^{*} (in 2.3 above) suggests that the provision of public goods would worsen in the presence of resource rents if:

$$\alpha > 0.857 \tag{2.8}$$

The above equation is the upshot of these authors' model, which they use to explain some specific country experiences. For example, they argue that in a democracy with strong checks and balances α will be small, hence provision for public goods is likely to increase. This will be the case of Norway, where strong checks and balances limits embezzlements and increased provisions for public goods even with small resource discovery, r. However, for Nigeria the likely high rate of embezzlement (as should be inferred from its ranking across a range of governance indicators) has probably worsened the provision of public goods in the context of its moderate-size rate of resource discovery. Finally, Saudi Arabia would be the polar opposite of Norway, though with the same outcome, in a qualitative sense. Though the rate of embezzlements is likely to be very high in this country, again judging by the low governance ranking and the zero rates of taxation, the sheer size of the resource discovery is likely to improve provision of public goods.

3. Revisiting the Impact of Resource Rents on Economic Growth

The empirical literature on the determinants of economic growth is vast. A recent survey of the literature by Durlauf et al. (2005) indicates that around 150 variables have been found to be statistically correlated to economic growth in some countries and periods of time. We draw from this extensive empirical literature and estimate an encompassing model which seeks to link a country's economic growth rate to economic, political, and social variables using a large sample of countries and time periods. This framework allows for studying the

natural-resources curse, its transmission mechanisms and the role that political/institutional variables such as democracy and checks and balances can play to ameliorate or inhibit the curse altogether.

We estimate the following variation of a traditional growth regression (in levels, for reasons we explain below):

$$y_{it} = \alpha y_{it-1} + \beta' X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (3.1)$$

where $y_{it}$is the log of per capita output, $X_{it}$is a set of variables postulated as growth determinants,λ_t is a period-specific effect, $\mu_i$represents unobserved country-specific factors, and $\varepsilon_{it}$is the regression residual. The subscripts i and t refer to country and time period, respectively. On the right-hand side of equation (3.1), the regression model includes the level of per capita output at the start of the period (to account for transitional convergence or slow adjustment) and a set of explanatory variables measured during the same period. The time-specific effect,λ_t, allows us to control for international conditions that change over time and affect the growth performance of all countries in the sample (e.g., a global recession). The term$\mu_i$accounts for unobserved country specific factors that both drive growth and are potentially correlated with the explanatory variables.

3.1 Growth determinants

We focus on variables that have received the most attention in academic literature and in policy circles. Following Loayza and Soto (2002) these variables are divided into four groups: transitional convergence, structural policies and institutions, stabilization policies, and external conditions (see appendix A for details on definitions and sources).

3.1.1 Transitional convergence

One implication of the modern models is that the growth rate depends on the initial position of the economy. The conditional convergence hypothesis maintains that, ceteris paribus, poor countries should grow faster than rich ones because of decreasing returns to scale in production. We control for the initial position of the economy by including the *lagged level of real per capita GDP* in the set of explanatory variables.

3.1.2 Structural policies and institutions

There is nowadays general consensus that economic growth can be affected by public policies and institutions. We consider explanatory variables representing major categories of public policies. The first area of structural policies is *education and human capital formation* in general. Human capital can counteract the forces of diminishing returns in other factors of production—such as physical capital—to sustain long-run growth. We measure the policies directed toward increasing education and human capital with educational attainment obtained from Barro and Lee's (2011) database. The second policy area is related to *financial integration into world markets*. Well-functioning financial systems promote long-run growth as they facilitate risk diversification, help identify profitable investment projects and mobilize savings to them. Our measure is of an institutional nature—as opposed to the observed outcomes of such financial integration—as we use the index of capital account openness proposed and calculated by Chinn and Ito (2008). The third area is *international trade openness***.** There are several channels through which trade affects economic growth: (a) inducing higher total factor productivity as a result of specialization and the exploitation of comparative advantages, (b) producing market expansion and use of scale economies, (c) helping diffusing technological innovations and improved managerial practices, (d) lessening anticompetitive practices of domestic firms, and (e) reducing incentives for firms to conduct rent-seeking activities that are mostly unproductive. Our measure of openness is the volume of trade (real exports plus imports) over GDP, adjusted for the size (area and population) of the country, for whether it is landlocked, and for whether it is an oil exporter. The fourth area

is related to the *government burden*. Although governments can play a beneficial role in the economy, they can be a heavy burden if they impose high taxes, use this revenue to maintain ineffective public programs and a bloated bureaucracy, distort markets incentives, and interfere negatively in the economy by assuming roles most appropriate for the private sector. We account for the burden of government through the ratio of government consumption to GDP. The fifth important area of policy involves the availability of public services and infrastructure. Whether they are treated as classic public goods or as subject to congestion, public services and infrastructure can affect growth by entering directly as inputs of the production function, by serving to improve total factor productivity, and by encouraging private investment as they help protect property rights. There are a few alternative measures of public services and infrastructure. Among these, the variable with the largest cross-country and time series coverage is telecommunications capacity, measured by the *number of telephone lines per capita.*

3.1.3 Stabilization policies

We include stabilization policies as determinants of economic growth for two reasons. From an economic perspective, stabilization policies affect not only cyclical fluctuations, but also long-run growth. Fiscal, monetary, and financial policies that contribute to a stable macroeconomic environment and avoid financial and balance-of-payments crises are important for long run growth. By reducing uncertainty, they encourage firm investment, reduce disputes for the distribution of ex-post rents, and allow economic agents to concentrate on productive activities (rather than trying to manage high risk). From an econometric viewpoint, including stabilization policies improves the regression's fit and forecasting power increases over horizons that are relevant to economic policy. The first area in this category is related to the *lack of price stability*, which we measure by the average inflation rate. The second area is related to *external imbalances and the risk of balance-of-payments crises*. The occurrence of *systemic banking crises* accounts for the deleterious effect of financial turmoil on economic activity, particularly over short and medium horizons. The occurrence of banking crises is measured by a simple discrete dummy variable.

3.1.4 External conditions

Economic growth is shaped not only by internal factors, but also by external conditions that influence the domestic economy in both the short and long run. We include two additional variables in the growth regression: the *terms-of-trade shocks* affecting each country individually and a *period-specific shift* affecting all countries in the sample. Terms-of-trade shocks capture changes in both the international demand for a country's exports and the cost of production and consumption inputs. The period-specific shifts (or time dummy variables) summarize the prevalent global conditions at a given period of time and reflect worldwide recessions and booms.

3.2 Sample and estimation methodology

We use dynamic panel-data models to study the evolution of real per-capita GDP growth. Contrary to the standard literature we do not conduct our analysis using averages of five-year periods: as discussed above and demonstrated below, the time series properties of the variables suggest the presence of non-stationarity and also of cross-country correlation in errors and non-observable variables. New econometric techniques developed by Pesaran (2006) and extended by Kapetanios et al. (2011) allow for consistent estimation in these less restrictive setups.

Our sample is dictated by data availability, particularly that for oil-dependent economies which have a tradition of poor statistics and information secrecy. It contains 90 countries representing all major world regions (see appendix B for the complete list of countries) and the time span for the econometric estimation is the period 1975-2009. Although we have been

very careful in assembling our data, we acknowledge that some variables are weak in that available quantitative measures are not adjusted for quality. For example, secondary education achievement in developed economies may be of very different quality from what can be achieved in low-income countries. There is a classic trade-off between increasing the generality of the model at the cost of losing fidelity.

Much of the literature focuses on estimating growth models using the generalized method-of moments (GMM) estimator for dynamic models of panel data, which was introduced by Arellano and Bond (1991), and Arellano and Bover (1995). These estimators deal effectively with the three important challenges posed by the growth model. First, the regression equation is dynamic in the sense that it includes a lagged-dependent variable model to account for slow adjustment to long-run equilibrium. Second, the regression equation includes an unobserved country-specific effect, which cannot be accounted for by regular methods (such as the within estimator) given the dynamic nature of the model. Third, the set of explanatory variables includes some that are likely to be jointly endogenously determined with the growth rate. Moreover, the GMM estimator is best suited for the case of panel data models with a large number of cross section units and relatively short time periods.

3.3 Estimation results for the standard model

Table 1 presents the results obtained when estimating the empirical model by GMM techniques. Column (1) in the table corresponds to the basic specification while columns (2) to (5) extends the basic model to test in a candid way the oil-curse and the role of political and institutional variables.

3.3.1 Transitional convergence

The coefficient on the lagged level of per capita GDP is statistically very significant and close to one, suggesting the possible presence of unit roots. In the latter case, the GMM estimator could be averaging over a set of possibly spurious regressions.

Therefore, this simple model provides a nice empirical framework for testing not only the impact of contestable democratic politics on the development of resource-rich societies, but also the specifics features that might make democracy effective in these countries.

3.3.2 Structural policies and institutions

All variables related to structural policies present coefficients with expected signs and statistical significance. Economic growth increases with improvements in education, trade openness, and infrastructure. It decreases when governments apply an excessive burden on the private sector. Financial openness has the expected positive association with economic growth, but it is imprecisely estimated. These results are broadly consistent with a vast empirical literature on endogenous growth, including Barro (1991) on the role of education, trade, and government burden; Dollar (1992) on trade openness; and Levine et al. (2000) on financial depth. Infrastructure—proxied by telephone lines per 1,000 inhabitants— has a positive effect on growth as found by Canning, Fay and Perotti (1994) but is very imprecisely estimated probably because of the small year-to-year changes when using annual data (it is also highly correlated with education levels in our sample).

3.3.3 Stabilization policies

All estimated coefficients for these variables carry the expected signs and are statistically significant. Economic growth generally decreases when governments do not carry out policies conducive to macroeconomic stability, including the absence of financial and external crises. Like Fischer (1993), we find that an increase in the inflation rate leads to a reduction in economic growth. The frequency of systemic banking crises has also a particularly negative effect on economic growth.

3.3.4 External conditions

Positive terms-of-trade shocks foster growth. As noted by Easterly et al. (1993), good luck (for example in the form of favorable commodity price shocks) can be as important as good policies in explaining growth performance over medium-term horizons.

We extend the basic regression to include resource rents and the results are presented in column (2) of Table 1. We use World Bank (2011) data on resource rents as share of GDP. The unit measure of rents is the difference between world prices and the average unit cost of extraction. Total rents are simply the unit measure of rents multiplied by the quantity extracted or harvested. The measure is simple and relatively easy to collect for a large number of countries. It is obviously very limited in that it excludes the non-negligible exploration and development costs, as well as financial, intermediation and marketing costs. As can be seen, the estimated coefficients for the standard controls are not affected by the inclusion of the new variable. Moreover, we obtain a negative, significant estimated parameter for the resource rent variable, consistent with the "natural-resource curse hypothesis" as discussed in Sachs and Warner (1995). According to Gylfason (2011), four main channels of transmission from natural resource abundance or intensity to slow economic growth have been suggested in the literature. First, through Dutch Disease-linked phenomena where the abundance of natural resources lead to currency overvaluation and economic cycles, the latter as a result of fluctuations in the international price of commodities and volatility in the exchange rate. Second, natural resource rents in conjunction with ill-defined property rights, imperfect or missing markets, and lax legal structures may lead to rampant rent-seeking thus diverting resources away from more socially fruitful economic activity (Gelb 1988). Third, natural resource abundance may reduce private and public incentives to accumulate human capital due to a high level of non-wage income—e.g., dividends, social spending, and low taxes. Finally, natural resource abundance may blunt private and public incentives to save and invest, harm the financial sector's development and, thereby, impede economic growth.

Note that we control for an eventual "contagion channel" of the resource curse, whereby non-resource exporting countries are indirectly harmed by the effect of the resource boom of a neighboring country via labor markets. An example is Yemen, which has had significant economic volatility as a result of oil-cycles because of the fluctuations in remittances of Yemeni workers employed in oil-rich countries such as Saudi Arabia and the UAE. In Table 1 we use unrequited workers' remittances to control for this phenomenon, but we are hastened to acknowledge that other forms of contagion are possible (e.g., via asset prices). We also acknowledge that the resource curse may operate only after a certain threshold is surpassed but our model is linear and, even if country specific, it excludes threshold effects. It is nevertheless difficult to identify a criterion to set such country-specific thresholds when working with a large sample of countries. It remains a challenge for future work to develop an econometric technique capable of dealing with threshold effects in a dynamic panel-data context.

Note that the resource curse implicitly requires countries to have institutional and political impediments to enact efficient policies to mitigate the possible negative externalities of natural resource exploitation. Resource rents can be properly allocated to education, research and innovation, building institutions, and the provision of public goods, resulting in higher economic growth. This in turn would require at least the coordination of two elements. First, a mechanism capable of aggregating individual preferences in society and channeling them through the political structure so that the population has an adequate representation in policy decision making. Second, a structure of checks and balances capable of monitoring that those preferences are respected and that those responsible for enacting economic policies actually perform their duty.

We, thus, include in our estimation two additional variables. First, since there is some consensus that democratic regimes tend to allow for more participatory decision making than other political systems, we include the variable Polity2 from the Polity IV: Regime Authority Characteristics and Transitions Datasets which takes the value -10 if the country is non-democratic and 10 when there is a high degree of democracy. Second, while democracy and stability are certainly important for economic development, there is also evidence to suggest that rules are primarily the manifestation of an implicit contract with the electorate, a public signal of the commitment to maintain mutually agreed standards of fiscal discipline (see Debrun and Kumar 2007). Therefore, we include a measure of political risk and checks and balances: we use the Political Constraint Index (POLCON-V) developed originally by Henisz (2006) and later refined and extended by Henisz and Zelner (2010). This index is a quantitative measure of the institutional constraints faced by authorities and evaluates the extent to which any one political actor or the replacement for any one actor (e.g., the executive or a chamber of the legislature) is constrained in his or her choice of future policies. It considers elements such as the number of independent branches of government, veto power over policy changes, the party composition of the executive and legislative branches and the preference heterogeneity within each legislative branch.

When these additional variables are included in our econometric model, the natural-resource curse, however, seems to be unsupported by the data. Columns (3) and (4) present the results of the estimation of the base model when including each institutional/political variable by itself, while column (5) presents the results of the inclusion of both variables in the model. Again, estimated coefficients for the other regressors are not affected by the change in specification, with the only exception of the resource rents that is now statistically insignificant in all models. In conclusion, we confirm in an encompassing growth model and relatively large and updated dataset the recent findings from the received literature on the natural resource curse, which suggests that the curse exists but conditional on bad political governance, such as lack of democracy and political checks and balances.

4. Toward a More Flexible Econometric Model

Standard long-run growth models as the one described above suffer from limitations and, in general, do not guarantee an adequate representation of the determinants of economic growth. Consider, again, equation (3.1). The first important limitation of the above model lies in the implicit restriction that growth rates in all countries are but realizations of the same stochastic process. By pooling all countries in the same regression model, one implicitly assumes that all countries would react in the same way to changes in the fundamental variables (common parameters α, β, μ, and λ), independent of their state of development, existing conditions, or previous history. This, of course, seems an implausible restriction.

For this reason, different econometric techniques have been developed to permit more flexible representations of the data. The inclusion of individual or country effects (μ_i) allows for some heterogeneity in initial conditions, but continues to restrict the other parameters from being the same across countries. Time dummies can be used to capture cross-country shocks affecting all economies in a similar fashion. Embedding the model in equation (3.1) in an error correction structure (see equation 4.1 below) allows for country-specific short-run dynamics and adjustment to equilibrium while restricting only the parameters in the long-run equilibrium model to be the same for all countries. Estimation via pooled-mean group estimators (PMG) provides consistent estimation of the parameters when N and T are large enough.

$$\Delta y_{it} = -\phi_i(y_{it-1} - \beta_i' X_{it-1} - \mu_i - \lambda_{t-1}) + \sum_{j=0}^{q} \theta_{ij} \Delta X_{it-j} + \sum_{j=0}^{q} \delta_{ij} \Delta y_{it-j} + \eta_{it} \quad (4.1)$$

As noted by Islam (1995), among others, the growth regression in equation (4.1) is in fact a levels regression where yit has been subtracted from both sides to investigate out-of-steady state behavior. This approximation is, thus, only valid in proximity to the steady state.

While estimating the growth model using PMG techniques allows for significant heterogeneity in the short-run dynamics, it stills forces all countries to react identically (and linearly) to long-run shocks. Economic intuition indicates that the growth impact of, say, education or opening an economy to foreign trade ought to have diminishing returns; yet, the model in equation (4.1) treats all countries alike in the long run.

A second limitation of the standard growth model is the restriction placed among the regressors themselves for which the model in equation (4.1) assumes to be complete and uncorrelated. However, the multiplicity of studies on growth, each testing new or additional regressors, indicates that most specifications are bound to be incomplete and vulnerable to omitted variable problems. Chiefly among the omitted variables is, of course, total factor productivity (TFP)8. Economic theory provides a number of alternative mechanisms through which TFP in different economies can be correlated, ranging from technology transfer, economic integration, access to information, trade agreements, etc. Westerlund and Edgerton (2008) note that when studying macroeconomic and financial data, cross-sectional dependencies are likely to be the rule rather than the exception, because of strong inter-economy linkages. This type of heterogeneity introduces cross-section correlation or dependence between the regression error terms, which can lead to inconsistency and incorrect inference in standard panel econometric approaches.

Based on the above discussion, a general specification for the growth model is proposed by Eberhardt and Teal (2011) and summarily described in the following set of equations:

$$y_{it} = \beta_i x_{it} + \mu_{it} \quad (4.2)$$

$$\mu_{it} = \alpha_i + \lambda_i f_t + \varepsilon_{it} \quad (4.3)$$

$$f_t = \rho f_{t-1} + \omega_t \quad (4.4)$$

$$x_{it} = \pi_{mi} + \delta_{mi} g_m + \rho_{mi} f_{mi} + \upsilon_{it} \quad (4.5)$$

$$g_t = \kappa g_{t-1} + \eta_t \quad (4.6)$$

Equation (4.2) indicates that the observed output (y_{it})—in our case, per-capita GDP—relates to a set of observed (x_{it}) and unobserved fundamentals (μ_{it}). The unobserved fundamentals μ_{it} in equation (4.3) are represented by a combination of country-specific fixed-variables (α_i)representing initial conditions and country specificities (e.g., being landlocked); a set of common unobservable factors (f_t) with heterogeneous country impacts or factor loadings (λ_i); and a random perturbation. Equation (4.4) allows for persistence in these common factors. Equation (4.5) introduces an empirical representation of the observed inputs in order to indicate the possibility for endogeneity: the input variables (x_{it}) are driven by a set of common factors (g_{mt}) as well as an additional set of factors (f_{mi}), which may also drive output y_{it}. Equation (4.6) indicates that the common factors are persistent over time, which allows for the setup to accommodate non-stationarity in the factors ($\rho = 1, \kappa = 1$) and thus the observables. It further allows for various combinations of cointegration: between output *y* and inputs *x*, between output *y*, inputs *x* and (some of) the unobserved factors f_t, or non-cointegration.

The proposed econometric model for long-run growth—based on the so-called "second generation" panel data techniques—retains much of the virtues of the standard literature

[8] Though some aspects of TFP could be accounted for by institutions, human capital and public policy, others, such as technological change are difficult to control for and remain as unobservable variables.

(short-run flexibility, cointegration and error-correction mechanisms, etc.), but it adds the crucial dimensions of country heterogeneity (itself reflected in differing short and long run parameters for each economy) and cross-dependency (arising from common factors). We thus first test for common factors and later estimate the full model.

4. 1 Testing for cross-country correlations

We use Pesaran's (2006) CD test for cross-dependency. This test employs the correlation coefficients between the time-series for each panel member. In our dataset of N=90 countries, for instance, this would be the 90x89 correlations between country *i* and all other countries, for i=1 to N-1. Referring to these estimated correlation coefficients between the time-series for country *i* and *j* as $\rho_{ij}$the Pesaran CD statistic is then computed as

$$CD = \sqrt{2/N(N-1)} \sum_{i=1}^{N-1} \sum_{j=1}^{N} \sqrt{T_{ij}\rho_{ij}} \qquad (4.7)$$

where T_{ij} is the number of observations for which the correlation coefficient was computed. Under the null hypothesis of cross-section independence, the above statistics are distributed standard normal for $T_{ij}>3$ and N sufficiently large. The test is robust to non-stationarity (the spuriousness would show up in the averaging), parameter heterogeneity or structural breaks and was shown by its author to perform well even in small samples.

It can be seen that for all variables where the index can be computed it is possible to reject the null hypothesis of no cross-country correlation at 99% confidence. Correlation, not surprisingly, is quite high in education (as most countries have engaged in massive human capital formation programs) and in infrastructure (for similar reasons). These results call for the use of common correlated effects estimators.

4.2 Econometric estimation of the common correlated effects model

We estimate the empirical models using Pesaran's (2006) common correlated effects (CCE) estimators. This estimator avoids obtaining explicit estimates for the unobserved common factors (f_t)(as in Bai et al. 2009) and accounts for their presence implicitly by adding cross-section averages for the dependent and independent variables to the regression equation. The specification assures that coefficients on the implied common factors are allowed to differ across countries (equivalent to λ_i differing across *i*).

The Pesaran (2006) Common Correlated Effects Mean Group estimator (CCEMG) allows for the empirical setup as laid out in equations (4.2) to (4.6), which considers cross-section dependence, time-variant unobservable variables with heterogeneous impact across panel members, and problems of identification (note that β_i is unidentified if the regressor contains a non-null λ_i). The CCEMG solves this problem with a simple but powerful augmentation of the group-specific regression equation: apart from the regressors (x_t) and an intercept, this equation now includes the cross-section/panel averages (for the entire panel i=1,..., N) of the dependent and independent variables: $\bar{y}_t$ and $\bar{x}_t$. Together these can account for the unobserved common factor (f_t) and given the group-specific estimation, the heterogeneous impact $(\lambda_i)$is also given. The coefficients (β_i) are again averaged across panel members, where different weights may be applied.

In empirical applications the estimated coefficients on the cross-section averaged variables as well as their average estimates are not interpretable in a meaningful way: they are merely present to blend out the biasing impact of the unobservable common factor. The focus of the estimator is on obtaining consistent estimates of the parameters related to the observable variables. The CCEMG approach is robust to the presence of a limited number of 'strong' factors as well as an infinite number of 'weak' factors—the latter can be associated with local spillover effects, whereas the former represent global shocks. Furthermore, as shown by Kapetanios et al. (2011), these factors may be non-stationary.

The Pesaran (2006) estimator yields consistent and efficient estimates of the parameters and is robust to structural breaks in the data, a feature that is important in the context of long-run growth models for economies that may have engaged in significant reforms. Alternative estimation approaches (Bai 2009; Bai et al. 2009) involve estimation of first the number of 'relevant' factors $\boldsymbol{f}_t$and then the factors themselves, which hinges crucially on the assumption that all factors in the data generating process (DGP) are of the 'strong' type, thus excluding 'weak' factors, e.g. spatial correlations such as neighborhood effects (Pesaran2006). The CCE estimators can account for the presence of strong factors as well as an *infinite* number of weak factors, while no prior knowledge of the cointegrating properties of the observable and/or the unobservable variables is required, since the method is robust to all these scenarios (Eberhardt and Teal2011).

Table 3 presents the estimation results of the economic growth model using the CCE technique for the full sample and also splitting the countries between advanced and emerging economies because, as discussed below, there is evidence of heterogeneous behavior among different countries. Column (1) collects the results for the growth model without controlling for political factors and compares directly with column (2) of Table 1. It can be seen that the country-averaged CCE coefficients partially confirm the results obtained using GMM models. Only in the cases of trade openness, inflation, and capital account openness the new estimates fall within two standard deviations of the GMM estimate. On the contrary, the estimated parameters for government burden and infrastructure are significantly larger than GMM estimates, while those for education, workers' remittances and terms of trade shocks are imprecisely estimated. With respect to our variables of interest, the CCE estimation finds evidence of a resource curse that disappears once political variables are included in the estimation as shown in column (2) of Table 3.

Further inspection of the individual country results suggests that emerging economies behave very differently than more advanced economies and that pooling both types of countries can be potentially misleading when studying the effects of resource rents on economic growth. We split the econometric analysis into two subsamples: one including the 21 advanced economies and the other the 69 emerging countries. In columns (3) and (4) it can be seen that there is no evidence of a resource curse for advanced economies even if political factors are excluded from the analysis. On the contrary, in emerging countries the resource curse shows in the significant parameter found in column (5) of Table 3 which, nevertheless, disappears once political factors are taken into account. The estimated parameters for these political variables appear to be statistically insignificant due to the high co-linearity between them (the sample correlation is 70%) however the notorious reduction in the root mean square error (RMSE) of around 30% (from 0.0186 to 0.0134) justifies their inclusion.

Note also that the asymmetric behavior of advanced and emerging countries does not refer to the resource curse only. When comparing columns (4) and (6) we found that growth in emerging economies seems to be less affected by the government burden (government consumption in emerging economies is 12.9% in our sample vis-à-vis 19% for advanced economies) but far more affected by inflation and infrastructure levels.

4.3 On the heterogeneity of the resource curse

Close examination of the data on democracy and checks and balances reveals the presence of clusters. Figure 1 presents a scatter diagram of the two variables. It can be seen that there is a clear, positive correlation between democracy and political checks and balances. This is not surprising, as in achieving higher levels of democracy societies increasingly value the importance of enacting efficient mechanisms of checks and balances. Note, that the majority of Arab countries are ranked as non-democratic and non-accountable economies. Nevertheless, while no Arab economies are deemed as democratic, some countries display

average levels of political self-control as reflected in the average check and balances levels achieved by Egypt, Kuwait and Morocco.

The positive association between democracy and checks and balances is subject to important deviations. First and foremost, several countries enjoy high levels of democracy but suffer from relative low levels of political checks and balances, as is the case of Greece, Jamaica, or Colombia. On the other hand, some economies—typically in East Asia—enjoy high levels of political responsibility but restrictive levels of democracy. The latter group would include Singapore, Hong-Kong, or Malaysia and, at times, Korea. Finally, the positive correlation in Figure 1 should be taken with care as averages over long periods of time may darken the role of these variables in economic life. For example, it can be seen that Chile and Uruguay rank in a relatively mediocre position, which is explained by their move from an initial period of draconian military regimes in the 1970s and 1980s towards highly democratic regimes in the 1990s and 2000s.

After repeated testing, we decided to split our sample according to the following cluster criteria:

- Countries with *low level of democracy,* if the index is equal or below 6
  Countries with *high level of democracy*, if the index is above 6

- Countries with *low degrees of checks and balances,* if the index is lower than 0.35
  Countries with *high degree of checks and balances,* if the index is above 0.35

We ran a restricted version of our model in Table 3 for each of these subsamples, retaining all fundamentals except for democracy and checks and balances. In Table 4 we report the results, focusing only in the "natural resource curse" parameter. One should bear in mind that these subsamples are of smaller size and might, therefore, be subject to the influence of outliers; we trim the results from outliers using a robust regression technique that uses an initial screening based on Cook's distance>1 to eliminate gross outliers before calculating starting values and then performs Huber iterations followed by bi-weight iterations, as suggested by Li (1985).

Three main conclusions can be derived from Table 4. First, countries failing to achieve high-enough standards of democracy and checks and balances will most likely fail in preventing the resource curse (as implied by the negative and significant rents effect found). Second, countries with above-average democratic standards and in-place checks and balances can avoid the resource curse. It is noteworthy that countries such as Botswana, Chile, and Peru (where natural resources comprise the majority of exports) have been able to use their resource availability to sustain long-run growth. Third, countries achieving high-enough standards of checks and balances but that are not democratic will likely be able to nullify the resource curse (i.e. a statistically insignificant rents effect). However, they will not be able to turn the resource rents into a driver for higher growth, as would have been the case if the estimated parameter were positive. Finally, there are only four countries to conform the group of economies with high democracy levels and low checks and balances to derive statistically and economically significant conclusions. The results clearly indicate that the resource curse operates in countries with low levels of democracy and poor mechanisms of checks and balances.

To assess the political-economy trajectory of specific resource-dependent economies it would be more appropriate to combine the implications of the above econometric results with other more nuanced approaches. For example, Barma et al. (2011) introduce the concepts of the "credibility of intertemporal commitment" and "political inclusiveness":

- **The credibility of intertemporal commitment** or the degree to which policy stability and bargains over time can be enforced and deviations from such agreements are subject to sanction; and
- **The overall political inclusiveness of the prevailing state-society compact**or the extent to which diverse social, economic, and political viewpoints are incorporated into decision-making, and a sense of either collectivist or clientelist welfare is privileged over purely elite interests.

Using the checks and balances (C&B) and polity as approximate proxies for the credibility of intertemporal commitment and political inclusiveness respectively, we construct a typology of four distinct country settings (Table 5). The usefulness of this typology hinges on the fact that though polity and checks and balances are not perfectly orthogonal, they are not perfectly correlated (Figure 2).

If we strictly adhere to the measured polity and checks and balances, all oil-rich Arab countries, for example, will be placed under the "Patrimonial Rule", which is the most vulnerable group to the oil curse. However, in reality the conservative and long-reigning monarchies of the GCC (as well as Morocco and Jordan) are more likely to achieve higher level of intertemporal commitment than would be suggested by the numerical checks and balances index. Using a broad assessment of regime characteristics, Ross et al. (2011) argue that the monarchies in the Arab region appear to be more credible than the so-called "republican" oil-dependent Arab states, such as Algeria, Iraq, Sudan, Syria and Yemen. Therefore, it seems plausible that the GCC countries might make the "Hegemonic Group", while the latter countries remain in the most vulnerable group. Such a typology would augur well with the observed growth experience of the two groups.

Finally, having established that bad political governance is the underlying cause of the resource curse, we now assess the role of certain economic variables as channels for these institutional effects. Confining the analysis to the case of low democracy and low checks and balances (the last column of Table 4), we test for the role of real exchange rate overvaluation and current account, reflecting the Dutch Disease view of the oil curse; and stock of debt to account for the debt overhang influence on growth[9]. To establish such causative links of these variables with growth we must satisfy three conditions:

- First, that these variables are linked to the presence of natural resource rents, which in fact is the essence of the Dutch Disease literature for the case of the real exchange rate overvaluation or the unsustainable domestic absorption (high current-account deficit or high external debt)
- Second, these intervening variables are also likely to be strongly correlated with growth; again these three variables were found to be among the growth fundamentals in the recent empirical growth literature
- Third, the addition of an intervening variable to the growth regression reduces both the size and/or the statistical significance of the estimated effect of the resource rents

Table 6 reports the results, focusing only on the "natural resource curse" parameters and the three intervening economic variables; results for other controls are not critical for this analysis, hence not reported. The results suggest that the current account and stock of debt individually render the resource rents insignificant, while both are negative and highly significant (regressions 2 and 3).However, when both variables are included in the same regression, only the latter remains significant, though the resource rents estimator continues to be insignificant (regression 6).On the other hand, real exchange rate overvaluation enters

[9] These are the same set of variables used in Collier and Goderis (2009), except for that we use the more appropriate measure of real exchange rate overvaluation, while they used the real exchange rate variable.

insignificantly, though it also renders the resource rent insignificant (regression 1). Perhaps this result is due to the fact that the RER overvaluation index used in this regression is based on price comparisons (Rodrik 2008) and is, therefore, more basic than the model-based approach that accounts for the non-traded goods equilibrium and the inter-temporal external balance of an economy[10]. However, when added to the stock of debt (regression 4); to the current account (regression 5); or when all three variables are included (regression 7),the three variables were all negatively and highly significantly associated with growth, while the resource rents becomes insignificant. In comparing the results of these regressions it appears that accounting for all three channels produces the best results in terms of the precision of estimates, degrees of significance as well as the size of the estimated coefficients.

5. Conclusions

There is now a near consensus among scholars and development practitioners alike that, under certain conditions, oil and mineral resource rents can be harmful to development, hence generating the so called natural resource curse. Moreover, that the curse is a long-term phenomenon that is not necessarily incompatible with short-run growth spells during the boom cycle. The recent debate about whether or not and how a curse might happen has been waged in context of the endogenous growth model. The application of modern econometric panel data allows testing the various theories that have been discussed in the literature for explaining the curse. Reasonably robust evidence now exists on the central role of political institutions, where the curse is more likely to happen in non-democratic countries or, especially those that do not have strong-enough systems of political checks and balances.

However, these findings are obtained in highly restrictive econometric models that assume no country heterogeneity, as in panel cointegration, or at best allow for heterogeneity but only in the short run. We argue in this paper that due to the strong cross correlations in growth fundamentals, the received literature might produce biased results. Instead, we apply second generation panel estimators that account for country heterogeneity and correlations in both the short and long runs.

Moreover, we unpack political institutions into those reflecting the degree of inclusiveness (polity) and credibility of intertemporal commitments (political checks and balances).We find that resource-rich countries with low levels on both scores are likely to experience the curse, while those with high-enough levels on both manage to turn resource rents into a driver of growth. However, those countries with low polity but high checks and balances or those with high polity but low checks and balances might be able to avoid the curse but are not likely to effectively use the resource rents to promote growth. These findings suggest that for the oil-rich Arab world to achieve sustained growth, the Arab spring should not only bring democracy, as badly needed as it is in this region, but should also lay the foundations for a strong system of political checks and balances.

Finally a cautionary note as well as a challenge for future research is in order. While the advantages of second generation panel data estimators are promising, one should acknowledge that their limitations are yet to be explored. Consequently we take our results as indicating a path for further research. In particular, we need to better understand the properties of the new second-generation panel data econometrics in terms of the power of the test and the robustness against potential model misspecification. Likewise, at this nascent stage of the econometric literature on common-correlated effects, threshold effects cannot be tested for, although they were found to be present when using first generation panel data econometrics (fixed-effects, GMM …etc.)

[10]See, for example, Aguirre and Calderon (2005), Elbadawi and Soto (2008) and Elbadawi, Kaltani and Soto (2012), among others.

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Figure 1: Scatter of political variables Average 1975-2009

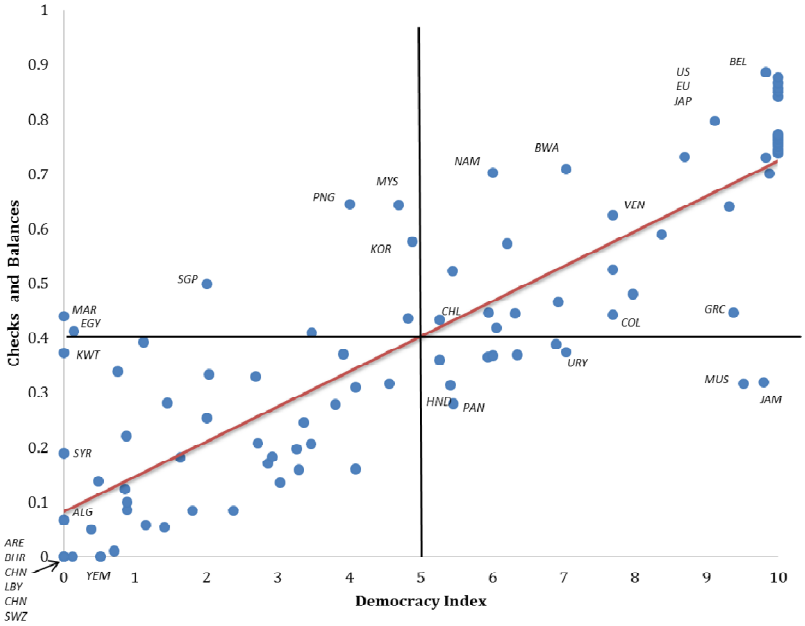

Table 1: Econometric Results: Long-run Growth Determinants Dependent Variable: Real GDP Per Capita

Variable	(1)	(2)	(3)	(4)	(5)
			Standard Controls		
Education	0.062***	0.062***	0.052***	0.057***	0.051***
(attainment, in logs)	(0.011)	(0.011)	(0.011)	(0.010)	(0.011)
Trade Openness	0.035***	0.036***	0.035***	0.035***	0.035***
(% of GDP, in logs)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Capital Account Openness	0.002	0.002	0.001	0.00*	0.002*
(index)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Government Burden	-0.044***	-0.045***	-0.045***	-0.045***	-0.045***
(gov. consumption % of GDP, logs)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Inflation	-0.029***	-0.029***	-0.027***	-0.029***	-0.028***
(log (1+inflation rate))	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Infrastructure	0.002	0.001	0.001	-0.001	0.002
(telephones per capita, in logs)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Workers' Remittances	0.014***	0.014***	0.013***	0.014***	0.013***
(% of GDP)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Systemic Banking Crisis	-0.010**	-0.009*	-0.009*	-0.009*	-0.009*
(dummy)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Terms of Trade Shocks	0.034***	0.036***	0.035***	0.035***	0.035***
(dev. from HP trend)	(0.009)	(0.010)	(0.009)	(0.010)	(0.009)
Lagged Real GDP Per Capita	0.986***	0.985***	0.986***	0.987***	0.986***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
			Resource Rents and Political Institutions		
Resource Rents	-	-0.049*	-0.032	-0.024	-0.026
(as % of GDP)		(0.029)	(0.031)	(0.030)	(0.031)
Checks and Balances	-	-	0.028***	-	0.025***
(polity index)			(0.008)		(0.008)
Democracy	-	-	-	0.010**	0.004
(index)				(0.004)	(0.004)
Constant	0.116***	0.126***	0.129***	0.120***	0.127***
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)

Note: Number of countries=90, number of observations=2,743, maximum number of instruments=605, time and country fixed effects included. (*,**,***) indicate statistical significance at the 90%, 95% and 99%, respectively.

Table 2: Econometric Results: Testing for Cross-Country Correlations

Variable	CD-test	p-value	Correlation	Absolute correlation
Education	308.50	0.000	0.898	0.906
Trade Openness	64.46	0.000	0.190	0.361
Capital Account Openness	n.a.			
Government Burden	7.88	0.000	0.020	0.380
Inflation	70.48	0.000	0.206	0.304
Infrastructure	268.08	0.000	0.782	0.823
Workers' Remittances	117.91	0.000	0.330	0.487
Systemic Banking Crisis	n.a.			
Terms of Trade Shocks	11.81	0.000	0.034	0.239
Resource Rents	58.46	0.000	0.161	0.370

Note: n.a. = not available because there is no within-unit, time variation.

Table 3: Econometric Results: Long-run Growth Determinants Allowing for Common Correlated Effects

Dependent Variable: log of real GDP per capita	**Full sample**	**Full sample**	**Advanced countries**	**Advanced countries**	**Emerging countries**	**Emerging countries**
	(1)	(2)	(3)	(4)	(5)	(6)
Education	0.121	0.237*	0.403	0.206	0.184	0.162
(years of attainment, in logs)	(0.112)	(0.133)	(0.287)	(0.372)	(0.137)	(0.202)
Trade Openness	0.043***	0.035*	0.049*	0.051**	0.045***	0.029*
(% of GDP, in logs)	(0.015)	(0.018)	(0.027)	(0.022)	(0.013)	(0.017)
Capital Account Openness	-0.001	0.009**	0.009*	0.002	0.005	0.004
(index)	(0.004)	(0.004)	(0.005)	(0.011)	(0.004)	(0.006)
Government Burden	-0.113***	-0.119***	-0.357***	-0.406***	-0.040**	-0.056***
(gov. consumption % of GDP, logs)	(0.029)	(0.030)	(0.068)	(0.084)	(0.017)	(0.022)
Inflation	-0.038*	-0.095***	-0.051	-0.006	-0.057***	-0.119***
(log (1+inflation rate))	(0.024)	(0.028)	(0.059)	(0.129)	(0.019)	(0.031)
Infrastructure	0.121***	0.093***	0.072	0.007	0.133***	0.079***
(telephones per capita, in logs)	(0.020)	(0.028)	(0.082)	(0.100)	(0.021)	(0.030)
Workers' Remittances	0.0002	-0.035**	-0.005	-0.003	-0.008	-0.028*
(% of GDP, in logs)	(0.013)	(0.014)	(0.015)	(0.029)	(0.015)	(0.017)
Terms of Trade Shocks	-0.001	-0.002	-0.043	-0.081	-0.010	-0.0002
(log dev. from HP trend)	(0.020)	(0.024)	(0.050)	(0.060)	(0.017)	(0.026)
Systemic Banking Crisis	-	-	-	-	-	-
(dummy)						
Resource Rents	-0.306*	-0.111	0.562	1.247	-0.301*	-0.010
(as % of GDP)	(0.188)	(0.215)	(0.954)	(1.661)	(0.186)	(0.179)
Checks and Balances	-	0.039**	-	-0.007	-	0.021
(index)		(0.019)		(0.404)		(0.015)
Democracy	-	-0.002**	-	0.002	-	-0.002
(Polity IV index)		(0.001)		(0.002)		(0.002)
Constant	6.278***	6.749***	1.287	2.342**	4.810***	6.057***
	(0.666)	(0.829)	(1.015)	(1.169)	(0.674)	(0.92)
Countries	*90*	*90*	*21*	*21*	*69*	*69*
Observations	*2,742*	*2,728*	*632*	*632*	*2,110*	*2,096*
RMSR	*0.0171*	*0.0120*	*0.0066*	*0.0047*	*0.0186*	*0.0134*

Note: Estimated using the common correlated effects mean group estimator proposed by Pesaran (2006). Robust regression methods are used to control for outliers.(*, **, ***) indicate statistical significance at the 90%, 95% and 99%, respectively.

Table 4: Estimated Long-run Effect of Resource Rents on Economic Growth Allowing for Common Correlated Effects

	High Checks and Balances	**Low Checks and Balances**
High Democracy	4.369***	-5.125
	(2.291)	(5.125)
Low Democracy	-0.460	-1.657**
	(0.281)	(0.882)

Note: the estimated parameters of standard controls used in the estimation are excluded to save space.(*,**,***) indicate statistical significance at the 90%, 95% and 99%, respectively.

Table 5: Democracy and Checks and Balances as Indicators of Credibility and Intertemporal Commitments

Polity (Political Inclusiveness)	**Checks and Balances (C&B)** (Credibility of Intertemporal Commitment)	
	Low C&B: Less credible/weaker enforcement	**High C&B**: More credible/stronger enforcement
Low Polity: Less inclusive/less collectively oriented	**Patrimonial Rule** Individualized political authority, built on a hierarchy of cronyism; emphasis on private (elite) goods; exploitation of public resources for private gain	**Hegemonic Government** Institutionalized one-party regime; either predatory or benevolent; emphasis on private (elite) goods with particular and public goods more inclusive /more collectively oriented
High Polity: More inclusive/more collectively oriented	**Clientelist Pluralism** Political competition based on extensive use of clientelism; provision of particular goods; low horizontal accountability	**Programmatic Pluralism** Electoral competition based on programs geared toward collective welfare enhancement; provision of public goods; democratic accountability

Note: adapted from Table 2 of Ross et al. (2011).

Table 6: Econometric Results: Long-run Growth Determinants Allowing for Transmission Channels Low Democracy and Low Checks and Balances

Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Resource Rents	-0.098	-0.139	-0.041	-0.015	0.230	-0.088	0.091
(as % of GDP)	(0.250)	(0.213)	(0.445)	(0.149)	(0.244)	(0.267)	(0.070)
RER Overvaluation	-0.002	-	-	-0.105**	-0.112***	-	-0.166***
(logs)	(0.060)			(0.070)	(0.029)		(0.051)
External Debt Stock	-	-0.184***	-	-0.165**	-	-0.257**	-0.281***
(% of GNI)		(0.090)		(0.072)		(0.100)	(0.096)
Current Account Balance	-	-	-0.191*	-	-0.321**	-0.230	-0.335***
(as % of GDP)			(0.105)		(0.133)	(0.154)	(0.149)
Observations	898	772	767	762	753	679	628
Countries	47	41	43	41	42	39	34

Note: the estimated parameters of traditional controls used in the estimation are excluded to save space.

Appendix A: Definitions and Sources of Variables Used in Regression Analysis

Variable	Definition and Construction	Source
Real per capita GDP	Ratio of total GDP to total population. GDP in US$ of 2000.	World Bank (2011)
Education and human capital formation	Educational attainment, computed as completion rates in 5-year age intervals for 146 countries from 1950 to 2010. Exponential interpolation used to obtain annual data.	Barro and Lee (2011)
Trade openness (% of GDP)	Residual of a regression of the log of the ratio of merchandise trade (% of GDP), on the logs of area and population, as well as dummies for oil-exporting and landlocked countries.	Authors' calculations, based on data from World Bank (2011)
Index of capital account openness	The index is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).	Chinn and Ito (2008).
Government burden	Ratio of government consumption to total GDP.	World Bank (2011)
Inflation	Measured by annual log-change of the consumer price index.	World Bank (2011)
Main telephone lines per 1,000 workers	Telephone lines connecting a customer's equipment to the public switched telephone network.	World Bank (2011)
Remittances	Workers' remittances and compensation of employees, received (% of GDP).	World Bank (2011)
Systemic banking crises	Number of years in which a country underwent a systemic banking crisis, as a fraction of the number of years in the corresponding period.	World Bank (2011)
Terms of trade	Ratio of export unit values to import unit values.	World Bank (2011)
Resource rents	Total natural resources rents (% of GDP) computed as the difference between world prices and the average unit cost of extraction multiplied by the quantity extracted or harvested.	World Bank (2011)
Democracy	Regime Authority Characteristics and Transitions Datasets.	Polity IV Project (2011)
Checks and balances	Political Constraint Index (POLCON-V).	Henisz and Zelner (2010)
Real exchange rate overvaluation	Balassa-Samuelson adjusted measure of the domestic price level.	Rodrik (2008).
Foreign debt	External debt stocks, total (DOD, current US$) as share of GNI.	World Bank (2011)
Current account balance		World Bank (2011)
Period-specific shift	Time dummy variable.	Authors' construction

Appendix B: Sample of Countries

United Arab Emirates	Gabon	Norway
Argentina	United Kingdom	New Zealand
Australia	Ghana	Pakistan
Austria	Gambia, The	Panama
Burundi	Greece	Peru
Belgium	Guatemala	Philippines
Benin	Honduras	Papua New Guinea
Burkina Faso	Hungary	Portugal
Bangladesh	Indonesia	Paraguay
Bahrain	India	Rwanda
Bolivia	Ireland	Saudi Arabia
Brazil	Iran, Islamic Rep.	Sudan
Botswana	Iceland	Senegal
Central African Republic	Israel	Singapore
Canada	Italy	Sierra Leone
Switzerland	Jamaica	El Salvador
Chile	Jordan	Sweden
China	Japan	Swaziland
Cote d'Ivoire	Kenya	Syrian Arab Republic
Cameroon	Korea, Rep.	Togo
Congo, Rep.	Sri Lanka	Thailand
Colombia	Lesotho	Trinidad and Tobago
Costa Rica	Morocco	Tunisia
Germany	Madagascar	Turkey
Denmark	Mexico	Uganda
Dominican Republic	Mongolia	Uruguay
Algeria	Mauritius	United States
Ecuador	Malawi	Venezuela, RB
Egypt, Arab Rep.	Malaysia	South Africa
Spain	Namibia	Congo, Dem. Rep.
Ethiopia	Niger	Zambia
Finland	Nicaragua	Zimbabwe
France	Netherlands	