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Effects of Natural Resource Abundance on Institutions: Which, Where and When?

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Abstract

Much research has gone into the effects of oil and other natural resources on growth in which political institutions are often seen as the link between the two. Since institutions are difficult to measure and change very slowly over time, the analysis has largely been confined to cross-country comparisons, most frequently investigating the effects on levels of democracy. This paper builds on recent analyses of the effects of oil endowments, prices and exports on democracy to examine the effects on several different types of institutional change, making use of panel data on over 100 countries between 1975 and 2005 wherever possible. The results distinguish between three characteristics of oil endowments which may also serve as channels through which their effects on the different institutions are realized. These include wealth, experience in the industry, and rents per unit of the resource exploited and reveal some findings which seem to depart sharply from conventional ones. Above all, they indicate the diversity in effects of oil on institutional change from one institution to another as well as according to the timing of the industry's development and the magnitude of the endowment in each individual country.

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I. Introduction

The popular proposition that a large natural resource endowment constitutes a "curse" on growth and development or more broadly on human welfare has been examined rather extensively both theoretically and empirically. Some remarkably robust empirical results were presented by Sachs and Warner (1997, 2001) in defense of the proposition and by numerous others since then (e.g., among the most notable Mehlum, Moene and Torvik, 2006 and Ross,1991, 2012). Yet, others have pointed out that the effects of the resource endowments may differ depending on the type of natural resource, the way it is measured, the time period, according to their location-specificity or other factors (Mavrotas et al 2006; Pessoa, 2010) and the extent to which endogeneity, omitted variables, measurement error and other sources of estimation bias have been satisfactorily treated (Brunnschweiler and Bulte,2008; van der Ploeg and Poelhekke, 2010; Tsui 2011; van der Ploeg, 2011).

A further complication is that the relation may not be a very direct one, but rather one that accrues indirectly through a number of different but potentially important links. In his comprehensive review of the subject, van der Ploeg (2011) identified seven different links, at least six of which were clearly institutional in nature. These were property rights, the incentives or disincentives to accumulate human and physical capital, the ability to control volatility in economic activity, quality of governance, the ability to ward off conflicts, and corruption.[1]

As explained in Section II below, in view of the extremely slow pace of change typical of most institutions[2], the vast majority of studies on these links have concentrated on a single link,

[1] The seventh link was composed of the relative price effects emanating from oil or other natural resource booms that have been examined in the Dutch disease literature. Even in this case, one could think of institutions such as immigration policy, tax and expenditure policies and institutional arrangements which might be used to diminish or offset this effect (Corden 1984).

[2] Note for example the several centuries that it has taken even the more highly developed countries of the world to make the transition from autocracy or closed order to a democratic or open order according to North, Wallis and Weingast (2009).

namely, democratic governance, and have relied on international cross section analysis, relating oil or other natural resource endowments to the quality of institutions (usually a democracy index) at a point in time. Some exceptions to this generalization will be discussed below.

Meanwhile, the institutions and development literature has made numerous demonstrations about how success and failure in economic growth can be explained in terms of differences in the quality of prior and predetermined institutions (e.g., Acemoglu, Johnson and Robinson, 2001, Nunn 2005 and in this context Perroa, 2008). Our objective therefore, is to examine whether or not oil can raise or lower institutional quality indicators of the type that may serve as important links between resource endowments and growth and development. Thus, instead of examining the relationship between levels of resource endowments and levels of institutional quality or the way in which the quality of institutions affect the effect of the resources on growth, we wish to test for effects of oil on institutional change. Because of the multiplicity of important links such as those identified above, we deem it important to examine effects on changes in a number of institutional characteristics going well beyond democracy that has been quite frequently investigated in the past. In particular, we aim to examine the effects of oil on bureaucratic quality, corruption, law and order, resistance to ethnic tension, internal and external conflicts, government stability, property rights and various other political institutions. Second, in that connection, we wish to examine the sensitivity of these institutional outcomes to alternative measures of resource dependence, the magnitude of oil endowments, the amount of time the country has had (a) since independence, (b) since first discovering oil and (c) since its peak discovery of oil, and to possible interactions among these considerations. These are all factors that have been suggested as being relevant either to institutional change or more properly measuring oil and other resource endowments.

The remainder of the paper is organized as follows: Section II reviews the relevant literature. Section III develops our empirical model, estimation strategy and identifies the data. Section IV presents our results and Section V provides our conclusion including suggestions for further research.

II. Literature Review

Our review of literature is divided into three subsections. Section A discusses each of the alleged links between natural resource endowments and the alleged "growth curse", pointing to role of institutional factors and possible complementarities between them in either re-enforcing or undermining these links. Section B identifies and critiques of some existing empirical studies along these lines. Section C identifies some remaining question of relevance to the issues to be addressed in our empirical analysis.

A. The Links and Complementary Institutions

The seven most commonly identified links between natural resource endowments and allegedly adverse growth outcomes were identified in Section I above. Seldom if ever, however, do any of these links from natural resources to growth occur necessarily and indeed almost every analyst has recognized the existence of important, even if relatively rare, cases of countries well-endowed with oil and other natural resources that have been very successful in growth and development. Among these were the United States and a few European countries in the last century or two (Libecap 1976) and more recently Canada and Norway among developed countries and Botswana, Chile and the United Arab Emirates among developing countries (Fasano 2002, van der Ploeg 2011).

In some cases, ways of escaping the curse are identified in the theoretical models themselves. For example, in the Dutch disease model of Corden and Neary (1982) considerable attention was given to how the model might work differently in different environmental conditions. The key idea is that with a fixed labor force, a booming resource sector will pull some labor away from the other tradable goods sector (agriculture or industry) which, together with the demand effect from the boom, raise output and employment in the non-traded goods sector as well as the price of non-tradables and hence the real exchange rate. This causes (among other things) de-industrialization and lack of competitiveness. Most notably, however, it was shown by Corden (1984) that in a variant of the model in which the assumption of a fixed labor supply was relaxed by allowing for substantial immigration of labor (as characteristic of Dubai and several other countries of the Persian Gulf in recent years), this Dutch disease effect could be entirely avoided.[3]

Similarly, when economies of scale, technological changes, linkages and other externalities are allowed for in more dynamic models of natural resource industries, it becomes even easier to generate cases in which the effects of natural resource endowments on growth and development might vary considerably across countries, with favorable outcomes in some of them (Maloney, 2007; Wright and Czelutsta, 2004; and Blomstrom and Kokko, 2007). Often whether or not the curse can be avoided depends on the character of complementary institutions. For example, in countries where autocrats are in power, oil revenues might well allow these autocrats to remain in power longer than they otherwise would without having to invest in important infrastructure and education to raise incomes and welfare of the citizens. The continued empowerment of the existing autocrats would further contribute to rent-seeking activities within

[3] Labor inflows were often important historically in the US, Australia and some Latin American countries in the wake of the discovery of gold, silver or other minerals.

their narrow elites (e.g., Acemoglu, 1995, Acemoglu and Robinson, 2006a, 2006b). Indeed, a very popular theme has been to show that the effects of resource dependence on development are more adverse in countries with less democracy or weaker governance in general (e.g., Elbadawi and Soto, 2012).

So, too, many if not all of the other links giving rise to adverse effects on growth can be nullified or at least mitigated by some other offsetting favorable institution. For example, the volatility effect of natural resource dependence can be eliminated with appropriate institutions related to fiscal and monetary policies such as strict controls on government spending during booms and contractionary monetary policy as might be obtained with central bank independence or the strict application of monetary rules.

Similarly, Libecap (1976) and Wright and Czelusta (2004) showed how in the US governments did not declare property rights in minerals and oil for themselves or even public ownership. More recently, Norway in oil, and Botswana in diamonds, have invested in, or teamed up with, private firms making efficient use of these resources. Norway has even become a pioneer in the development of schemes like sovereign wealth funds designed to save substantial shares of resource revenues and invest them for diversification as well as stabilization purposes elsewhere at home or abroad in line with investment opportunities.

Still another example of complementarity among these various institutional links is that pointed out by Aslaksen (2010) between non-democracy and conflict links. Since Hegre et al. (2001) and others have shown that civil conflict is more likely to arise in countries that are semi-democratic (presumably because they are less stable than either autocracies or democracies), the fairly well documented link between oil and lack of democracy is complementary to the conflict link, in this case leading to fulfillment of the curse.

Whereas it may be true that corruption and rent-seeking are commonly correlated with natural resource endowments, sometimes appropriate institutions have developed and that would help natural resource countries mitigate these problems. For example, internally, a strong well-disciplined bureaucracy may develop so as to assure the efficient delivery of needed government services without corruption and regardless of adverse external shocks as has occurred in Malaysia. Resource-rich Indonesia has gradually improved the quality of its governance and with that it has improved the effectiveness of government and managed to avoid both the volatility and exchange rate appreciation (and de-industrialization) effects. Chile has managed to decrease its vulnerability to volatility and under-saving through careful management of its copper revenues and generally good governance. Peru is reported to have recently been strengthening the protection of private property rights with respect to its natural resources with favorable consequences (van der Ploeg, 2011, p.369.)

In recent years especially, external organizations and institutions have also come to play a positive role in mitigating some of the adverse effects of natural resources that operate through one or more of the links identified above in the countries hosting these resources. Indeed, various NGOs have fostered treaties to which resource countries can sign onto to increase transparency in the origin of natural resource exports and make it possible to prohibit trade of those resources coming to markets from illicit sources. For example the NGO Global Witness has fostered the "Publish What You Pay" protocol to encourage both the firms using or exploiting these resources to make public how much they pay to governments and governments and other suppliers to report exactly what they receive from the resource users. The quite new Extractive Industry Transparency Initiative scheme goes beyond encouraging firms to disclose such information to actually forcing them to do so as a condition for membership. Financial markets in some

countries are also considering whether or not and how to force full disclosure of this sort by firms marketing or processing such resources for the right to have their shares traded in these financial centers.[4] If successful, these efforts could reduce the abilities and incentives for rebel groups to both contribute to the plundering of these resources and to conduct military campaigns against legitimate governments, and to reduce the ability of government leaders of oil exporting countries to siphon off oil revenues to private bank accounts abroad.

These examples would seem to suggest that each and every one of the links from natural resource endowments to the growth curse could be offset by, favorable institutions designed to deal with the problems identified. Among these would be a strong and effective bureaucracy to implement policies in the face of adverse shocks, an independent and strong judiciary to enforce contracts, even those between the private sector and government agencies, the strengthening of governance in ways that might encourage government leaders to control corruption or increase the credibility of policy pronouncements.

B. Relevant Empirical Studies and their Methodological Shortcomings

Some of the earliest studies on the resource curse are still some of the most relevant, with different authors producing empirical results differing sharply on the existence of an institutional link between oil and other natural resources and growth. Sachs and Warner (1997), e.g., dismissed the connection to growth via institutions by showing that there was little or no effect of resource endowment on institutional quality (in level terms), whereas the results obtained by Mehlum et al (2006a,b) led them to conclude that "institutions are decisive for the resource curse". Specifically, they found that, thanks to a positive and relatively large interaction term

[4] For example, this is one of the objectives of the Dodd-Frank Wall Street Reform and Consumer Protection Act signed into law in the U.S. in July, 2010 but not yet fully implemented.

between oil and good institutions, natural resources can have positive impacts on growth when institutions are "good" (i.e., producer-friendly) but negative ones when they are "bad" (grabber-friendly). Since those authors used an aggregate measure (the unweighted average of the same numerous and widely varying International Country Risk Guide indexes that we use in this study), that approach makes it impossible to identify the specific institution that matters (*for them*) most for growth or *for us* the ones that are most affected by natural resources.

Another set of empirical studies has investigated the aforementioned alleged link that occurs by way of relative prices and intersectoral factor movements that would favor non-traded goods and thereby shift resources out of the traded goods sector (either agriculture or manufacturing) into non-traded goods as in the theoretical models of Corden and Neary, 1982; and Corden, 1984). In particular, Harding and Venables (2010), Ismail (2010), and Brahmbatt et al. (2010) have recently provided results supporting this link, suggesting that resource booms divert resources from their areas of comparative advantage into the non-traded goods sectors.

But the results of these and many other studies on these links may also be open to challenge on methodological grounds. One of these bases of challenge is the omitted variable bias since many of these studies are based on international cross section analysis where one cannot control for that bias, even at the very least by including country fixed effects. Indeed, Manzano and Rigobon (2001) show that, because resource dependence may be correlated with unobserved country characteristics, when one uses panel data and allows for country fixed effects, the negative effects of natural resources on growth of resource dependence disappear. Another basis of challenge is endogeneity of the natural resource dependence measures used in such studies that derives from the fact that the exploitation of such resources requires income and investment that in many cases may be touched off by local consumption or use. As a result,

natural resource exploitation and use can be the result of income, consumption and investment and hence is by no means exogenous to the examination of resource dependence effects on income, investment and growth.

There are some studies that avoid some of these problems by taking advantage of natural or other experiments. For example, Caselli and Michaels (2009) make use of Brazilian data at the municipality level wherein the decision to drill for oil in that municipality is made strictly by a single decision maker, namely, the national oil company Petrobras and where the municipality has provided a substantial share of the oil revenues generated by the production in that municipality. The strength of this test was attributable to the fact that the revenues generated at the municipality level were very large for those municipalities in which offshore oil was discovered. Yet, the study found remarkably little effect of these revenue transfers, a result that was attributable to corruption on the part of the mayors of the municipalities. But, one could easily suspect that, in an institutional context with much greater transparency and informational access, the extent of corruption could be much less serious..

The early empirical studies on corruption making use of international cross-section data, e.g., Mauro (1995) and Ades and di Tella (1999), provided support for this link in the form of more natural resources, more corruption. With their panel data set, however, Bhattacharyya and Hodler (2010) showed that corruption is increased only in countries that have seldom experienced democratic government over the period under consideration. But, Haber and Menaldo (2008) pointed out that such results may not be valid unless there is sufficient variation over time not only in corruption but also in governance. Nevertheless, using municipality data on oil revenue windfalls in Brazil, Brollo et al (2010) showed that oil windfalls at the municipality level were followed by increases in both corruption and the ability of incumbents to

remain in office longer (an outcome they attributed in part to discouragement of high quality opposition candidates). Caselli and Cunningham (2009) demonstrate that, even so, a variety of outcomes may be forthcoming depending on the farsightedness and other preference characteristics of the autocrat. This might be more likely when individuals or firms may obtain private property rights in these resources. Hence, the character and strength of property rights may be a key institution for distinguishing good and bad outcomes of natural resources.

Two other links between natural resource dependence and growth (or the lack thereof) that have been frequently suggested and at least partially supported empirically are: (1) those arising from the undermining of social capital and leading to gangs, armed conflict, and costly civil and international wars (Collier and Hoeffler, 2004, 2005; Fearon, 2005; Fearon and Laitin, 2003; Humphreys, 2005; and Miguel et al, 2004), and (2) those coming through the greater volatility of income, exchange rates and other macroeconomic variables that occurs in countries with high natural resource dependence (Knack and Keefer, 1995; Gylfason et al, 1999; Aghion et al, 2009). Considerable empirical support is provided for one or the other of these links (El Anshasy 2012).

Another issue that has increasingly been identified in critiques of empirical studies on the effects of natural resources like oil on institutions is that some of the most common measures of resource dependence are potentially endogenous. This issue is deemed to be especially relevant in trying to answer the following question which is the primary objective of this paper: Can a country's initial resource endowment have an effect on its subsequent institutional indicators? In particular, can a country that starts out with weak institutions but large endowments of natural resources close the institutional gap between themselves and countries with initially superior institutions or will that gap grow even wider over time?

As suggested above, the few studies that have attempted to answer this question, e.g., Barro (1999), Ross (2001, 2012), and Aslaksen (2011), have attempted to answer it for but one institutional indicator, namely democracy. Most of these studies have demonstrated a negative and statistically significant relationship between oil or natural resource exports and democracy. But Herb (2005), Alexeev and Conrad (2009), and Haber and Menaldo (2007) have criticized these results on the grounds of possible endogeneity of the exports measure of natural resource dependence. They argue (1) that such exports are dependent on consumption and income which may also be correlated with democracy and, (2) since the initial income variable would normally be for a date subsequent to the discovery of oil, this too would contribute to endogeneity. Using oil production per capita (instead of as a share of GDP) as the measure of oil dependence, they found that the deleterious effect on democracy was no longer significant. Natural resource rent per capita is clearly a better measure because it subtracts out production costs, thus more properly reflecting the luck of having higher quality resources or resources that can be extracted at lower cost. Hence this measure eliminates much of the effort needed to take advantage of the resource which is the endogenous element (see especially Collier and Hoeffler (2005) and Elbadawi and Soto (2012)).

But as Tsui (2011) pointed out, because of geological and pumping capacity constraints, even oil production per capita is unlikely to be either exogenous or to provide sufficient variation over time. The stock of natural resources per capita may be more exogenous than production or exports but since that stock would represent the present value of resources that have been explored and identified and at least partly exploited, even these are not entirely exogenous. Notably, Cotet and Tsui (2010) and Ross (2012) pointed out that natural resource countries had higher population growth than other countries, implying that the resource curse on

per capita growth would look worse than that on total growth and would also be affected by whether or not resources are measured on a per capita basis. Tsui (2011) uses a still more exogenous measure- economically recoverable reserves - as an instrument for the present value of natural resource rents and, when he does so, he finds that the otherwise negative effect on growth via the volatility link disappears.

In a further effort to reduce endogeneity concerns, because of the inherent riskiness of the outcome of oil field exploration, Tsui (2011) makes use of the timing of peak discovery, the characteristics of the oil discovered and the costs of extracting in his measure of oil dependence.[5] He uses two stock measures of oil wealth- the amount of oil discovered to date (Discovered), and the amount originally in place (Endowment). Discovered is found to be positively related to Endowment (hardly a surprising finding), but not related to the preceding change in democracy. Then, the change in democracy after the peak discovery is regressed on Discovered, the level of democracy before the peak year of discovery and the interaction between these two variables. While the estimation is limited to a pure cross-section of 132 countries, the results showed that Discovered had a significant negative effect on the change in the democracy index, as did the level of democracy before the peak. On the other hand, the interaction term between the two had a positive and significant effect. These findings, moreover, survived a whole series of robustness tests. Nevertheless, despite the ingenuity of the approach in dealing with endogeneity, because of the relatively limited number of controls, many unmeasured influences, and without the use of country fixed effects, as the author himself stated, the results are subject to qualifications.

[5] The emphasis on peak discovery and exploitation builds on earlier work by Hubbert (1982), and Cambell (2005) on the geological approach to oil production and pricing from the technological one of Deffeyes (2005). Indeed, Benes et al (2012) show that increases in production after the peak are likely to be smaller than before the peak and at the world level the ability to satisfy growing demand is likely to come at the cost of increasing price. These authors model production, demand and price in the world oil market over time and argue that the geological approach in which peak production plays a role explains the time path of oil and gas production more accurately than the more technology and economics based models.

In any case, these recent studies by Tsui and others make clear that empirical estimates of the effects of oil and other natural resources on growth or institutions may be rather sensitive to the measure of natural resource used.

C. Remaining Questions

As should be clear from the above review, given the alleged importance of the institutional link between natural resources and growth and the multiplicity of the institutions that may be relevant to whether or not any such link results in curse effects, it would seem important to investigate the effects on a wide variety of institutions not simply democracy as in most existing studies. It should also be clear that for the long run, it is insufficient to examine the effects on the levels of the various institutional measures. The main question that we address in this paper, therefore, is (1) "To what extent do natural resource endowments affect *changes* in the institutional measures?" The secondary questions are: (2) "To what extent these effects differ from one type of institution to another?" and in view of the aforementioned potential endogeneity of the commonly used measures of natural resources, (3) "To what extent do the answers to the above questions differ according to the particular measure of natural resources? In answering question (3) we wish to take advantage of some of the newer and possibly more exogenous measures of natural resources proposed by Tsui (2011) and others.

While the preceding literature review has referred to that on all kinds of natural resources, several studies have identified oil as the natural resource with the potentially most deleterious effects on institutions: property rights, internal and external conflicts, corruption,

volatility and especially democracy.[6] For this reason in the following sections our focus will be strictly on oil.

III. Methodology and Data

To study the long run effect of oil on institutions, we use the following model specification for our baseline estimations

$$d(Institution_{i,t}) = \beta_o + \beta_1 Institution_{i,t-9} + \beta_2 \ln(Oil_{i,t-9}) + \beta_3 \ln(Years\_Since\_Independence_{i,t-9}) + \alpha_i + \tau_t + \varepsilon_{i,t} \quad (1)$$

The dependent variable is the change (difference) of the institutional indicator during each 10 year period (1986-95 and 1996- 2005, and in some cases consider 1976-1985). Among the explanatory variables we include the initial value of the institutional indicator, a particular measure of oil production or rent, $\ln(oil_{i,t-9})$, years since independence at the beginning of the period, $\ln(yr\_sinceindependence_{i,t-9})$, and for country ($\alpha_i$) and time fixed effects (τ_t).[7] $\varepsilon_{i,t}$ represents the error term for country *i* in period *t*. Our model will be estimated as an unbalanced panel using available observations from 140 countries (of which about 115 countries are included in most estimations). We estimate the model using Ordinary Least Squares (OLS) with robust standard errors.

Our measures for each of the aforementioned dependent variables are taken from two main datasets, the International Country Risk Guide (ICRG) from the Political Risk Group (2010) and Polity IV (Marshall et al., 2010). The institutional indicators taken from the ICRG dataset are those for: 1) composite risk, 2) bureaucratic quality, 3) corruption, 4) law and order,

[6] See, e.g., Bulte et al (2005) and Pessoa (2009)
[7] Where the lag (initial value) is designed to mitigate endogeneity. Coefficients and standard errors for country and time dummies are not included in tables for the purpose of brevity.

5) democracy, 6) ethnic tension, 7) external conflict, 8) internal conflict, 9) government stability, 10) investment profile, and 11) socio-economic conditions. Since this source of data goes back only to 1985, for these dependent variables we are able to estimate equation (1) for only two periods, 1985-95 and 1995-2005.. The institutional indicators taken from the Polity IV dataset are: 1) democracy (polity), 2) regulations on the recruitment of the executive (xrreg), and 3) constraints on the executive (xconst). Since the Polity IV measures date back further than those of the ICRG, for them we can estimate equation (1) for three ten year periods. For comparability purposes, each of these measures of the dependent variables is re-scaled so as to provide values in the 0-100 range and then used to compute both the changes and initial values).[8] All institutional indicators are constructed in such a way that higher values represent higher quality institutions.

For our measures of the natural resource oil, we explore three different indicators: 1) oil exports as a share of GDP, 2) oil rents, and 3) oil net exports per worker. Oil exports as a share of GDP is the most commonly used indicator when looking at the impact of resource abundance (e.g., Sachs and Warner, 2001). Net exports of oil per worker is the alternative indicator of resource abundance proposed by Lederman and Maloney (2007) who argued that this indicator better portrays resource dependence because some countries both import and export oil and puts it on a per worker basis. Oil exports as a share of GDP and net exports of oil per worker were constructed by the authors using data from the World Development Indicators (WDI, World Bank, 2011) and the United Nations Commodity Trade Statistics Database (UNCOMTRADE, 2011).[9] Our other measure, oil rents as a percentage of GDP, has become a popular indicator of resource dependence since it is estimated by subtracting off production cost, which better reflect

[8] We rescale all dependent variables so that the range between 1 and 100, with the exception of the composite risk which is already in the 100 scale. Then the change of the rescaled variable is estimated for our dependent variable.
[9] See Blanco and Grier (2012) for further explanation on how these indicators were constructed.

the profits earned from the resource (Collier and Hoeffler, 2005). This indicator was available from World Development Indicators (2011). The initial values of all the variables related to oil production are entered as natural logs in our model specification.[10]

Subsequent to the baseline model, we also make use of measures for 1) years since oil discovery, and in subsequent specifications, 2) years since the peak oil discovery, and 3) endowment. For years since oil discovery, the authors collected information about the year in which oil was discovered in the country, largely based on The World History of Oil and Gas (Geo-Help Inc, 2011).[11] We take the natural log of the years since oil was discovered and use the number of years at the beginning of the period. Years since discovery peak (again measured in natural logs) relates to the number of years since that in which the country had its biggest oil discovery, and it is constructed using data provided by Tsui (2011).[12] Data on endowment of oil was again provided by Tsui (2011). Because years since oil discovery and years since oil discovery peak are time variant, we enter them in the model by themselves separately. Subsequently, however, we also examine the effects of interactions of these time- varying indicators with each of our three oil production measures. Because endowment is time invariant, we only consider it only in interactive form, i.e., interacted with the relevant oil measure.[13]

The final term in our baseline model is a control for years since independence (natural log, initial value), which was collected by the authors from the Central Intelligence Agency World

[10] When getting the natural log for non-positive numbers in this analysis, we truncate the series by getting the natural log of a number close to zero (natural log of 1E-10).
[11] www.geohelp.net/world.html
[12] To clarify about the initial value of the number of years since oil was discovered, we use the number of years since oil was discovered in 1986 for the observation that has as a dependent variable the change of the institutional indicator between 1986 and 1995. For example, if a country discovered oil in 1950, then the value for the number of years since oil was discovered for the observation that considers the change of an institutional variable between 1986 and 1995 will be equal to 36 (1986-1950). The same applies for years since discovery peak and years since independence, which are mentioned next.
[13] Because of the inclusion of country fixed effects, it will not be appropriate to include time invariant variables in the right hand side.

Factbook (2011). Summary statistics on all these variables are shown in Table 1 and Table 2 disaggregates some of the relevant variables into those for oil countries and non-oil countries.

IV. Results

Baseline

Table 2 presents the coefficients and robust standard errors for the estimation of the baseline model using the different institutional indicators discussed above and the three different oil production indicators (one at a time). Recall that higher values of the dependent variable represent the percentage improvement in the quality of the institution in question. Thus, a positive sign for a coefficient of the independent variables in the model that uses bureaucratic quality as dependent variable means that the variable leads to greater bureaucratic quality. For the variable labeled as corruption, a positive sign could be interpreted as an improvement on the corruption front, i.e., as a reduction of corruption or an improvement in control of corruption.

The rather consistently negative sign of the initial value of the level of the dependent variable shows that there is institutional convergence, where those countries with higher institutional quality tend to reflect smaller improvements in institutional quality. On the other hand, the coefficient of years since independence has a positive sign for the models that consider bureaucratic quality, corruption, law and order, and democracy as dependent variables. The positive sign of years since independence is as expected because countries that have more experience as autonomous entities are likely to develop institutions with higher quality.

When looking at the sign and significance of the coefficient of the oil indicators, oil does not seem to have consistent and statistically significant effects on all institutions. Indeed, oil exports as share of GDP is only statistically significant at the 5 percent level when ethnic tension

is the dependent variable, and it has a positive sign. Oil rent has a negative and significant effect at the 5 percent level on bureaucratic quality, and a marginally significant effect (at the 10 percent level) on corruption and democracy. On the other hand, oil rent has a positive and significant effect at the 5 percent level on internal conflict. Oil net exports per worker has significant negative effects on both the regulation of recruitment of the executive and on executive constraints at the 10 and 5 percent levels, respectively.

Years since oil was discovered

We explore whether other factors associated with oil have a relevant effect on institutions, and include years since oil was discovered (Table 3). In the estimations that include oil exports as a share of GDP, oil exports continue to have a positive effect on (control of) ethnic tension (implying that oil exports lead to a decrease in ethnic tension) but has no significant effect on other institutional indicators. Interestingly, the years since oil discovery has a positive and significant effect at the 1 percent level on corruption (implying that with time since oil discovery, the control of corruption improves). On the other hand, years since oil was discovered has a negative significant effect at least at the 5 percent level on law and order, ethnic tension, and external conflict.

In the estimations in Table 3, we observe that oil rents continues to have a negative significant effect at the 5 percent level on bureaucratic quality, and a marginally significant effect at the 10 percent level on democracy. Oil rents now also has a significant negative effect at the 5 percent on corruption. Years since oil discovery also has a significant negative effect on law and order and ethnic tension at the 5 percent level, and a marginally significant positive effect on regulation of recruitment of the executive.

Estimates in Table 3 also show that oil net exports per worker has a negative and statistically significant effect at the 5 percent level on constraints on the executive, and marginally significant negative effects at the 10 percent level on both polity and regulation of the recruitment of the executive. In these estimations, we also observe that years since oil discovery has a significant negative effect on law and order and ethnic tension at the 5 percent level, which was observed when we used the other alternative indicators of oil. Years since oil discovery has a positive significant effect on government stability at the 1 percent level.

From these estimations, it is important to note that years since oil discovery seems to have a robust significant negative effect on law and order and ethnic tension. This is an interesting finding, suggesting that the longer the country has experience producing oil, rent-seeking is likely to be ingrained in society, and will result in weaker law and order, and greater ethnic tensions. Note that this is a finding akin to that of Ross (2012) referred to in Section II and consistent with some of the theoretical models.

In Table 4 we present our estimates for a model that includes an interaction term between years since oil discovery with each of the oil production variables. When we interact oil exports as share of GDP and years since oil discovery, we seldom find significant effects of the interaction term (it being only marginally significant at the 10 percent level when using the variables from the Polity IV database). Oil exports as a share of GDP has once again a significant positive effect on ethnic tensions and now a negative effect on government stability at the 5 percent level. The significance and sign of the years since discovery is very similar to those shown in Table 3, where it has a significant negative effect at the 5 percent level on both law and order and external conflict. The only difference is that years since oil discovery has a negative

significant effect on ethnic tension now only at the 10 percent, instead of as before at the 5 percent level.

Again in Table 4 one can see that the effect of the interaction term of oil rents and years since oil discovery is significant at the 5 percent level and negative when bureaucratic quality and government stability are the dependent variables, and significant at the 10 percent level when composite risk, corruption, polity, regulation recruitment of the executive, and constraints on the executive are used. In this set of estimations, years since oil discovery also has negative and significant effects on law and order and ethnic tension at the 5 percent level.

Estimates in Table 4 show that the interaction term of net oil exports per worker and years since oil discovery has a significant negative effect at least at the 5 percent level on democracy, ethnic tension, and internal conflict. This interaction term also has a positive significant effect on external conflict. The significance of net oil exports per worker is similar to those shown in Table 3, where the only difference is that it has a positive significant effect on internal conflict at the 5 percent level. For the years since oil discovery variable, the earlier results hold, wherein it has a significant negative effect at the 5 percent level on law and order and ethnic tension, and a positive significant effect on government stability. Years since oil discovery has now a significant negative effect on democracy at the 5 percent level.

From the estimations that include the interaction term between the oil production indicators and years since oil discovery, we might conclude that there is not a robust effect of the interactive term, but that the effect of years since oil discovery on law and order is robust. Thus, it is not per se the levels of oil exports and rents that matter, but the number of years that the oil sector has been a part of the economy of a country, but this effect seems to be robust only when using law and order as dependent variable. Results are also robust to some degree when using

ethnic tension as dependent variable, where the effect of years since discovery is negative and significant at the 5 percent level in 5 out of 6 cases (significant at the 10 percent level for the one of the cases). It is important to emphasize from these results that the differences in the effects of all the variables from one dependent variable to another and even from one measure of resource dependence to another vary significantly. The effect of years since discovery also varies considerably from one institutional measure to another.

Years since oil discovery peak

Next we explore the effects of years since the peak oil discovery on changes in the different institutional indicators. From the results in Table 5, we note that when using oil exports as a share of GDP, we find that oil exports only has a positive and significant effect on ethnic tension (5 percent level), while years since oil discovery peak has negative and significant effects at least at the 5 percent level on composite risk, bureaucratic quality, law and order, external conflict, investment profile, and socioeconomic conditions. Years since discovery peak also has a marginally significant negative effect on government stability at the 10 percent level.

When using oil rents (Table 5), we find that oil rents has a significant negative effect on corruption and bureaucratic quality at the 5 and 10 percent level, respectively. Interestingly, oil rents has a positive significant effect at the 5 percent level on composite risk, external conflict, and internal conflict. Years since oil discovery peak also has a significant negative effect at least at the 5 percent level on composite risk, bureaucratic quality, law and order, external conflict, and socioeconomic conditions.

Net oil exports per worker has a significant negative effect at the 5 percent level on constraints on the executive and regulation of the recruitment of the executive, and a significant

negative effect at the 5 percent level on polity . Years since oil discovery peak also has a significant negative effect at least at the 5 percent level on composite risk, bureaucratic quality, law and order, external conflict, investment profile, and socioeconomic conditions. Years since discovery peak also has a negative and significant effect at the 10 percent level on government stability, but a positive and significant effect at the 10 percent level on regulation of the recruitment of the executive. From the set of estimations in Table 5, we conclude that years since oil discovery peak has a robust negative and significant effects at least at the 5 percent level on composite risk, bureaucratic quality, law and order, external conflict, investment profile, and socioeconomic conditions.

In Table 6 we explore the effects when the interaction between the years since the oil discovery peak and each of the respective oil production measures. When using oil exports as a share of GDP, the interaction term is not statistically significant in any case. When using oil rents, however, that same interaction term has a statistically significant negative at the 5 percent level effect on bureaucratic quality and a positive and significant one on corruption. When using corruption as dependent variable, the effect of years since peak oil discovery is also positive and significant, but the effect of oil rents by itself is negative and significant (at the 5 percent level). The interaction term of years since peak oil discovery and net oil exports per worker has a statistically significant negative effect on internal conflict, but a positive significant effect on corruption, ethnic tension, and government stability (at least at the 5 percent level). We observe that for years since oil discovery peak and its interaction with the oil production variables there does not seem to be a robust effect since it is positive and negative in other cases.

Endowment

Estimates of the model in which the interaction of oil endowment with our indicators of oil production is included are shown in Table 7. When we interact oil endowment with oil exports as a share of GDP, we observe that the interaction term has a positive significant effect at least at the 5 percent level on corruption, external conflict, and socioeconomic conditions. It also has a marginally significant positive effect at the 10 percent level on composite risk, law and order, ethnic tension, and investment profile. The interaction term has a negative and significant effect at the 5 percent level on democracy.

The interaction term of oil endowment and rents has a positive significant effect at the 5 percent level on composite risk and polity, but a negative significant effect on bureaucratic quality and investment profile at the 5 and 10 percent level, respectively. The interaction term of oil endowment and net exports per worker has a positive significant effect at least at the 5 percent level on bureaucratic quality, corruption, law and order, external conflict, investment profile, and socioeconomic conditions. This interaction term also has a positive significant effect at the 10 percent level on ethnic tension. We interpret the positive significant effect of the interaction term between oil endowment and oil production indicators as a wealth effect that has a positive effect on institutional quality. This is in contrast to the time oriented oil interaction effects years since discovery and years since peak that exert negative effects on many of the institutional change variables.

V. Conclusion

Our analysis contributes to the literature by doing a comprehensive study of the impact of oil on several indicators of institutional change and controlling for country and time effects for a

large set of countries. There are several interesting findings from our analysis. First, we do not find that oil has an effect on any of the institutional changes that is fully robust across the three different indicators of oil production. The analysis suggests that the impacts vary in magnitude, statistical significance and direction from one measure of institutional change to another. Indeed, depending on other aspects of the specification, the effects on reduction of ethnic tensions are frequently positive while those on democracy and polity are frequently negative.

Second, our results suggest that the timing of discovery, the evolution of the industry and the magnitude of the oil endowment in our analysis are equally if not more important than the more commonly used oil export measures. In particular, years since oil discovery has an effect on some of the institutional variables, but not all. It seems to have a relatively robust significant negative effect on law and order, where the coefficient for years since oil discovery was significant in all 6 out of the 6 cases. It also seems to have a significant and fairly robust negative effect on ethnic tension since the coefficient was significant at least at the 5 percent level in 5 out of 6 cases (and significant at the 10 percent level for the remaining case). Given the aforementioned finding that oil exports by itself often has a positive effect on ethnic tension (reduction), these findings of negative effects of experience in the industry seem to show that the rent-seeking and other adverse effects may grow over time. This is in contrast to the general finding that the effects of years since independence of the country are generally positive on these and other institutional change variables. This negative effect of years since discovery on law and order is particularly striking.

We find that years since oil discovery peak has a robust significant negative on composite risk, bureaucratic quality, law and order, external conflict, and socioeconomic conditions (significant at least at the 5 percent level is 6 out of 6 cases for each dependent variable

mentioned here). This finding is similar to what we found when using years since oil was discovered in the country.

We find that the interaction of the magnitude of the oil endowment with the oil export or rent variable has some especially strong and diverse effects. This term may be more reflective of oil wealth rather than mere experience with production and exports. It sometimes further augments the direct effect of oil (as in the case when oil rent is the oil measure) and it has a negative effect on bureaucratic quality or a positive effect on polity, but in other cases (such as when the measure of oil is net exports per capita in its effect on external conflict) it offsets those effects.

For further research, we would like to explore the impact of years since oil was discovered on other institutional indicators that relate to law and order such as property rights and individual freedom. We would like to explore the extent to which some of these influences could be picked up even within shorter periods of time like 5 year periods that would allow for more observations. Another extension would be to include other measure of the quality of the resource endowments available in the Peak Oil data set of Tsui. We could also explore the use of other estimators such as Seemingly Unrelated Regressions (SUR), where we control for the possibility of correlation in the error terms.

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Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Composite risk growth	247	6.2613	9.9162	-19.0833	34.4167
Bureaucratic quality growth	249	1.0835	19.2865	-75.0000	55.2083
Corruption growth	249	-5.7926	18.4470	-55.5556	66.6667
Law and order growth	249	4.4344	22.4914	-41.6667	66.6667
Democracy growth	249	5.0535	19.7093	-54.1667	58.3333
Ethnic tension growth	249	4.0942	22.0243	-48.6111	83.3333
External conflict growth	249	9.0687	23.4814	-50.0000	83.3333
Internal conflict growth	249	8.5393	25.7482	-64.5833	84.7222
Government stability growth	249	5.6225	17.8737	-53.4722	48.6111
Investment profile growth	249	12.0092	21.0076	-33.3333	54.1667
Socio-economic cond. growth	249	0.0669	15.9308	-41.6667	45.8333
Polity growth	355	9.8028	24.4393	-70.0000	85.0000
Regulation executive recruit growth	338	3.9448	16.7669	-66.6667	66.6667
Executive constraint growth	338	7.0161	22.8539	-85.7143	85.7143
Composite risk initial	247	62.5251	15.8242	25.2500	93.7917
Bureaucratic quality initial	249	54.0663	30.5949	0.0000	100.0000
Corruption initial	249	55.8958	23.4063	0.0000	100.0000
Law and order initial	249	62.2490	26.3371	16.6667	100.0000
Democracy initial	249	60.0234	25.7438	0.0000	100.0000
Ethnic tension initial	249	66.5718	25.5240	0.0000	100.0000
External conflict initial	249	77.3799	22.7462	0.0000	100.0000
Internal conflict initial	249	72.4035	25.5140	0.0000	100.0000
Government stability initial	249	56.5177	15.9316	8.3333	91.6667
Investment profile initial	249	48.5553	14.4442	8.3333	91.6667
Socio-economic conditions initial	249	48.5274	14.4760	8.3333	91.6600
Polity initial	357	51.1205	38.3948	0.0000	100.0000
Regulation executive recruit initial	348	79.5977	20.4519	33.3333	100.0000
Executive constraint initial	348	57.2660	34.2536	14.2857	100.0000
Years since independence initial*	420	1.3971	7.9083	-23.0259	6.7488
Oil exports as GDP share initial*	326	-1.6047	4.8460	-23.0259	6.0928
Oil rents as GDP share initial*	359	-10.1787	11.6797	-23.0259	4.2168
Oil net exports per worker initial*	341	-15.5526	12.6561	-23.0259	9.8250
Years since oil discovery*	420	-9.4251	13.3787	-23.0259	5.0106
Years since oil discovery peak*	420	-0.8190	9.1932	-23.0259	4.9345
Endowment	390	0.1750	0.4997	0.0000	3.3300

Summary statistics for 140 countries in the years of 1985, 1995, and 2005. Growth denotes difference of the variable in the 10 year period (X1995 = X1995-X1986, X2005 = X2005-X1996). Initial denotes initial value in the 10 year period (X1986 for observation in 1995, 1996 for observation in 2005). "*" denotes natural logarithm. When getting natural log of negative values, we truncate variables to a number close to zero, ln(1E-10).

Table 2. Baseline Estimations

Dependent variable	Comp.risk	Bur.qua.	Corrupt.	Law&ord.	Democ.	Eth. ten.	Ext. con.	Int. con.	Gov. sta.	Inv.prof.	Socio.cond.	Polity	Xrreg	Xconst
Dependent variable	-1.170***	-0.875***	-1.100***	-1.119***	-0.969***	-1.159***	-1.114***	-1.361***	-1.136***	-1.441***	-1.514***	-0.832***	-1.009***	-0.899***
initial level	(0.067)	(0.102)	(0.088)	(0.067)	(0.124)	(0.073)	(0.060)	(0.099)	(0.093)	(0.093)	(0.114)	(0.091)	(0.094)	(0.094)
Oil exports	0.0756	-0.224	-0.436	-0.181	-0.337	0.434**	0.0451	-0.213	-0.474	0.0682	-0.272	0.227	0.399	0.093
GDP share initial	(0.112)	(0.342)	(0.346)	(0.298)	(0.484)	(0.168)	(0.240)	(0.300)	(0.317)	(0.364)	(0.389)	(0.476)	(0.325)	(0.441)
Years since	0.0028	0.388**	0.430***	0.771***	0.354**	-0.965***	-1.162***	-0.0572	-0.339**	0.527*	-0.412*	12.73*	-0.347	7.071
indep. initial	(0.041)	(0.156)	(0.149)	(0.095)	(0.166)	(0.135)	(0.130)	(0.165)	(0.140)	(0.286)	(0.229)	(7.649)	(3.486)	(6.293)
Constant	76.21***	73.82***	45.14***	63.96***	55.50***	23.37***	51.25***	77.96***	48.57***	84.39***	73.67***	66.53***	41.22**	-13.84
	(4.590)	(10.700)	(3.667)	(5.021)	(9.829)	(2.984)	(3.948)	(6.551)	(7.961)	(10.280)	(9.841)	(10.330)	(19.590)	(33.130)
Observations	216	217	217	217	217	217	217	217	217	217	217	300	293	293
R-squared	0.908	0.742	0.847	0.928	0.726	0.902	0.930	0.908	0.861	0.871	0.727	0.662	0.733	0.684
Dependent variable	-1.176***	-0.895***	-1.111***	-1.123***	-1.013***	-1.152***	-1.086***	-1.331***	-1.153***	-1.444***	-1.398***	-0.845***	-0.957***	-0.900***
initial level	(0.060)	(0.095)	(0.090)	(0.066)	(0.115)	(0.067)	(0.054)	(0.093)	(0.091)	(0.086)	(0.103)	(0.082)	(0.099)	(0.090)
Oil rents	0.271	-0.686**	-0.323*	0.146	-0.617*	0.182	0.272	0.714**	-0.0757	-0.192	-0.442	0.345	-0.0547	0.306
initial	(0.172)	(0.268)	(0.165)	(0.215)	(0.370)	(0.348)	(0.288)	(0.356)	(0.412)	(0.211)	(0.299)	(0.292)	(0.209)	(0.257)
Years since	-0.008	0.376**	0.451***	0.797***	0.431***	-1.009***	-1.195***	-0.0826	-0.306*	0.534*	-0.470**	-1.219**	-0.115	-0.966**
indep. initial	(0.042)	(0.153)	(0.154)	(0.106)	(0.159)	(0.133)	(0.132)	(0.169)	(0.162)	(0.272)	(0.217)	(0.499)	(0.229)	(0.440)
Constant	82.76***	-17.77***	31.76***	71.34***	17.59***	89.75***	94.45***	116.4***	97.08***	99.99***	56.84***	9.873***	64.29***	85.67***
	(6.004)	(6.146)	(6.392)	(4.386)	(3.638)	(4.671)	(4.071)	(7.329)	(4.702)	(3.785)	(3.879)	(2.636)	(6.195)	(10.630)
Observations	238	239	239	239	239	239	239	239	239	239	239	327	313	313
R-squared	0.904	0.755	0.834	0.919	0.735	0.900	0.931	0.910	0.855	0.877	0.737	0.672	0.718	0.693
Dependent variable	-1.150***	-0.898***	-1.086***	-1.114***	-1.001***	-1.142***	-1.104***	-1.356***	-1.118***	-1.422***	-1.537***	-0.817***	-0.997***	-0.890***
initial level	(0.067)	(0.101)	(0.096)	(0.066)	(0.115)	(0.070)	(0.059)	(0.094)	(0.081)	(0.089)	(0.110)	(0.088)	(0.093)	(0.091)
Oil net exports	0.051	-0.141	0.093	-0.113	-0.337	0.166	0.0265	0.162	0.243	0.0565	0.132	-0.294	-0.165*	-0.425**
per worker initial	(0.080)	(0.301)	(0.172)	(0.115)	(0.272)	(0.203)	(0.216)	(0.108)	(0.223)	(0.133)	(0.293)	(0.190)	(0.096)	(0.195)
Years since	-0.0144	0.423***	0.500***	0.774***	0.408**	-1.000***	-1.182***	-0.0735	-0.332***	0.475	-0.373	11.97*	-0.17	6.141
indep. initial	(0.041)	(0.144)	(0.158)	(0.099)	(0.163)	(0.119)	(0.127)	(0.154)	(0.117)	(0.287)	(0.230)	(6.420)	(3.060)	(5.045)
Constant	67.47***	18.39***	83.48***	51.99***	61.41***	56.01***	91.69***	91.39***	69.20***	84.12***	65.84***	49.49***	96.78***	-28.68
	(4.556)	(4.146)	(9.605)	(2.273)	(8.820)	(6.084)	(6.412)	(8.418)	(5.288)	(3.649)	(5.967)	(9.071)	(18.360)	(26.220)
Observations	220	222	222	222	222	222	222	222	222	222	222	310	303	303
R-squared	0.908	0.740	0.834	0.931	0.731	0.909	0.931	0.914	0.863	0.874	0.735	0.661	0.719	0.689

Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1. All estimations include country and time fixed effects. Unbalanced panel estimation with available observations for 140 countries between the period 1985-2005. Dependent variable is the 10 year growth rate (difference). All estimations include the initial value of the dependent variable (in levels).

Table 3. Estimations with years since oil was discovered

Dependent variable	Comp.risk	Bur.qua.	Corrupt.	Law&ord.	Democ.	Eth. ten.	Ext. con.	Int. con.	Gov. sta.	Inv.prof	Socio.cond	Polity	Xrreg	Xconst
Dependent variable	-1.170***	-0.876***	-1.107***	-1.116***	-0.973***	-1.156***	-1.115***	-1.361***	-1.125***	-1.434***	-1.522***	-0.840***	-1.013***	-0.903***
initial level	(0.068)	(0.103)	(0.089)	(0.068)	(0.125)	(0.074)	(0.060)	(0.099)	(0.097)	(0.095)	(0.123)	(0.090)	(0.092)	(0.094)
Oil exports	0.076	-0.222	-0.41	-0.186	-0.321	0.429**	0.0352	-0.212	-0.467	0.0696	-0.273	0.23	0.414	0.11
GDP share initial	(0.113)	(0.344)	(0.351)	(0.300)	(0.484)	(0.169)	(0.238)	(0.301)	(0.319)	(0.367)	(0.390)	(0.480)	(0.327)	(0.446)
Years since	0.0282	0.124	1.431***	-0.252**	0.623	-0.301**	-0.574***	0.0477	0.431	0.276	-0.177	0.527	0.43	0.392
oil discovery	(0.106)	(0.260)	(0.125)	(0.111)	(0.418)	(0.148)	(0.208)	(0.187)	(0.269)	(0.217)	(0.284)	(0.370)	(0.401)	(0.411)
Years since	0.00338	0.391**	0.461***	0.763***	0.373**	-0.974***	-1.175***	-0.0556	-0.336**	0.525*	-0.410*	12.78*	-0.575	6.801
indep. initial	(0.042)	(0.159)	(0.142)	(0.096)	(0.169)	(0.134)	(0.128)	(0.168)	(0.142)	(0.286)	(0.232)	(7.656)	(3.421)	(6.265)
Constant	76.85***	76.82***	79.11***	57.91***	70.53***	16.31***	37.71***	79.09***	57.96***	90.36***	70.02***	65.11***	52.12**	-3.569
	(4.458)	(13.360)	(5.211)	(6.353)	(14.960)	(5.017)	(6.407)	(8.109)	(7.940)	(9.894)	(8.610)	(10.280)	(20.790)	(34.870)
Observations	216	217	217	217	217	217	217	217	217	217	217	300	293	293
R-squared	0.908	0.742	0.854	0.928	0.728	0.902	0.930	0.908	0.862	0.871	0.728	0.665	0.737	0.686
Dependent variable	-1.178***	-0.901***	-1.125***	-1.115***	-1.014***	-1.138***	-1.086***	-1.325***	-1.151***	-1.442***	-1.395***	-0.856***	-0.984***	-0.909***
initial level	(0.060)	(0.095)	(0.093)	(0.067)	(0.115)	(0.068)	(0.054)	(0.095)	(0.091)	(0.087)	(0.105)	(0.082)	(0.091)	(0.090)
Oil rents	0.255	-0.769***	-0.474**	0.219	-0.559*	0.317	0.295	0.772**	-0.162	-0.222	-0.471	0.192	-0.257	0.175
initial	(0.189)	(0.241)	(0.216)	(0.219)	(0.331)	(0.323)	(0.320)	(0.370)	(0.444)	(0.244)	(0.336)	(0.295)	(0.248)	(0.275)
Years since	0.077	0.416	0.736	-0.340**	-0.29	-0.652**	-0.115	-0.274	0.429	0.144	0.139	0.562	0.751*	0.503
oil discovery	(0.121)	(0.349)	(0.463)	(0.151)	(0.529)	(0.296)	(0.291)	(0.390)	(0.281)	(0.194)	(0.225)	(0.356)	(0.407)	(0.378)
Years since	-0.00475	0.394**	0.464***	0.781***	0.422**	-1.034***	-1.198***	-0.101	-0.293*	0.536*	-0.468**	-1.212**	-0.143	-0.979**
indep. initial	(0.043)	(0.154)	(0.148)	(0.106)	(0.162)	(0.127)	(0.132)	(0.174)	(0.166)	(0.271)	(0.217)	(0.490)	(0.193)	(0.428)
Constant	84.29***	82.90***	79.43***	93.69***	90.38***	61.17***	100.2***	121.2***	65.15***	96.16***	83.48***	99.26***	82.51***	79.37***
	(4.982)	(9.137)	(8.894)	(6.220)	(10.740)	(3.342)	(5.783)	(8.606)	(6.929)	(4.347)	(7.081)	(11.490)	(8.511)	(10.250)
Observations	238	239	239	239	239	239	239	239	239	239	239	327	313	313
R-squared	0.905	0.756	0.837	0.919	0.735	0.902	0.931	0.910	0.856	0.878	0.737	0.677	0.731	0.696
Dependent variable	-1.152***	-0.899***	-1.095***	-1.109***	-1.001***	-1.134***	-1.104***	-1.357***	-1.116***	-1.422***	-1.541***	-0.823***	-0.998***	-0.892***
initial level	(0.067)	(0.102)	(0.097)	(0.067)	(0.116)	(0.071)	(0.059)	(0.095)	(0.081)	(0.089)	(0.112)	(0.087)	(0.091)	(0.091)
Oil net exports	0.0493	-0.142	0.0876	-0.11	-0.332	0.168	0.0263	0.161	0.24	0.0564	0.134	-0.334*	-0.198*	-0.460**
per worker initial	(0.081)	(0.302)	(0.173)	(0.114)	(0.274)	(0.202)	(0.217)	(0.109)	(0.223)	(0.133)	(0.295)	(0.192)	(0.105)	(0.203)
Years since	0.212	0.0875	0.538	-0.254***	-0.573	-0.489***	0.0337	0.0939	0.397***	0.0331	-0.166	0.472	0.364	0.387
oil discovery	(0.155)	(0.131)	(0.649)	(0.077)	(0.724)	(0.145)	(0.370)	(0.110)	(0.109)	(0.223)	(0.128)	(0.323)	(0.329)	(0.312)
Years since	-0.00623	0.427***	0.512***	0.762***	0.388**	-1.019***	-1.181***	-0.0682	-0.320***	0.475	-0.375	12.10*	-0.273	6.000
indep. initial	(0.041)	(0.147)	(0.155)	(0.100)	(0.166)	(0.117)	(0.128)	(0.159)	(0.119)	(0.288)	(0.232)	(6.397)	(3.043)	(5.025)
Constant	80.75***	18.07***	33.07***	52.71***	63.80***	54.38***	87.98***	91.11***	67.40***	94.48***	66.72***	-18.02**	105.1***	-19.81
	(5.996)	(4.185)	(4.962)	(2.212)	(9.257)	(5.297)	(5.834)	(8.384)	(5.427)	(4.626)	(6.398)	(8.162)	(18.910)	(27.260)
Observations	220	222	222	222	222	222	222	222	222	222	222	310	303	303
R-squared	0.910	0.740	0.836	0.932	0.734	0.910	0.931	0.914	0.864	0.874	0.735	0.664	0.722	0.691

Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1. All estimations include country and time fixed effects. Unbalanced panel estimation with available observations for 140 countries between the period 1985-2005. Dependent variable is the 10 year growth rate (difference). All estimations include the initial value of the dependent variable (in levels).

Table 4. Estimations with years since oil was discovered and interaction term of years since oil discovery and oil

Dependent variable	Comp.risk	Bur.qua.	Corrupt.	Law&ord.	Democ.	Eth. ten.	Ext. con.	Int. con.	Gov. sta.	Inv.prof	Socio.cond	Polity	Xrreg	Xconst
Dependent variable	-1.173***	-0.881***	-1.103***	-1.116***	-0.978***	-1.157***	-1.108***	-1.360***	-1.118***	-1.438***	-1.530***	-0.835***	-1.013***	-0.902***
initial level	(0.070)	(0.106)	(0.091)	(0.068)	(0.127)	(0.074)	(0.061)	(0.102)	(0.097)	(0.096)	(0.123)	(0.090)	(0.092)	(0.094)
Years since	0.0283	0.129	1.425***	-0.254**	0.63	-0.298*	-0.577***	0.0466	0.436	0.277	-0.186	0.469	0.41	0.359
oil discovery	(0.103)	(0.254)	(0.136)	(0.116)	(0.404)	(0.153)	(0.193)	(0.188)	(0.273)	(0.235)	(0.291)	(0.369)	(0.403)	(0.409)
Oil exports	0.13	-0.0145	-0.769*	-0.315	-0.0173	0.628**	-0.281	-0.263	-0.826***	0.444	0.0536	-0.841	-0.0809	-0.722
GDP share initial	(0.193)	(0.584)	(0.457)	(0.330)	(0.595)	(0.301)	(0.316)	(0.255)	(0.265)	(0.386)	(0.484)	(0.575)	(0.231)	(0.518)
Interaction	0.0035	0.0135	-0.0237	-0.0085	0.0196	0.0131	-0.0207	-0.00336	-0.0236	0.0245	0.0214	-0.0579*	-0.0272*	-0.0457*
(year disc.*oil)	(0.009)	(0.028)	(0.022)	(0.019)	(0.031)	(0.013)	(0.016)	(0.019)	(0.017)	(0.021)	(0.027)	(0.030)	(0.015)	(0.028)
Years since	0.0046	0.394**	0.465***	0.763***	0.378**	-0.974***	-1.183***	-0.0568	-0.340**	0.529*	-0.403*	13.08*	-0.515	6.93
indep. initial	(0.042)	(0.162)	(0.140)	(0.098)	(0.172)	(0.133)	(0.132)	(0.172)	(0.146)	(0.292)	(0.238)	(6.918)	(3.351)	(5.732)
Observations	216	217	217	217	217	217	217	217	217	217	217	300	293	293
R-squared	0.908	0.742	0.855	0.928	0.728	0.902	0.931	0.908	0.863	0.872	0.729	0.670	0.739	0.689
Dependent variable	-1.188***	-0.912***	-1.131***	-1.119***	-1.015***	-1.136***	-1.084***	-1.326***	-1.187***	-1.442***	-1.387***	-0.858***	-0.978***	-0.906***
initial level	(0.060)	(0.095)	(0.094)	(0.068)	(0.117)	(0.067)	(0.055)	(0.096)	(0.091)	(0.087)	(0.105)	(0.081)	(0.091)	(0.090)
Years since	-0.0784	0.11	0.569	-0.436**	-0.324	-0.890**	-0.326	-0.398	-0.065	0.25	0.375*	0.151	0.318	0.118
oil discovery	(0.144)	(0.301)	(0.532)	(0.195)	(0.596)	(0.377)	(0.200)	(0.534)	(0.209)	(0.240)	(0.220)	(0.415)	(0.464)	(0.408)
Oil rents	0.0383	-1.195***	-0.708***	0.0785	-0.605*	-0.00225	0.00636	0.600***	-0.831*	-0.0768	-0.157	-0.178	-0.568**	-0.103
initial	(0.066)	(0.311)	(0.158)	(0.236)	(0.322)	(0.366)	(0.484)	(0.202)	(0.448)	(0.265)	(0.522)	(0.281)	(0.278)	(0.312)
Interaction	-0.0203*	-0.0401**	-0.0218*	-0.0129	-0.00432	-0.0302	-0.0272	-0.0162	-0.0630**	0.0136	0.0298	-0.0404*	-0.0363*	-0.0324*
(year disc.*oil)	(0.011)	(0.020)	(0.011)	(0.015)	(0.026)	(0.021)	(0.023)	(0.028)	(0.024)	(0.019)	(0.027)	(0.022)	(0.019)	(0.019)
Years since	-0.00037	0.401**	0.460***	0.783***	0.423**	-1.035***	-1.201***	-0.0997	-0.268	0.536*	-0.475**	-1.214**	-0.125	-0.964**
indep. initial	(0.043)	(0.153)	(0.149)	(0.107)	(0.163)	(0.127)	(0.133)	(0.175)	(0.168)	(0.273)	(0.218)	(0.492)	(0.199)	(0.432)
Observations	238	239	239	239	239	239	239	239	239	239	239	327	313	313
R-squared	0.908	0.759	0.838	0.919	0.735	0.903	0.932	0.910	0.865	0.878	0.740	0.680	0.737	0.698
Dependent variable	-1.154***	-0.900***	-1.097***	-1.107***	-1.005***	-1.137***	-1.102***	-1.358***	-1.116***	-1.418***	-1.538***	-0.823***	-0.998***	-0.893***
initial level	(0.068)	(0.103)	(0.098)	(0.068)	(0.117)	(0.071)	(0.059)	(0.095)	(0.081)	(0.090)	(0.113)	(0.087)	(0.091)	(0.091)
Years since	0.185	0.0433	0.359	-0.205**	-1.028**	-0.701***	0.23	-0.0702	0.377***	0.168	0.00534	0.299	0.132	0.145
oil discovery	(0.177)	(0.162)	(0.533)	(0.091)	(0.425)	(0.139)	(0.252)	(0.200)	(0.130)	(0.334)	(0.228)	(0.327)	(0.290)	(0.304)
Oil net exports	0.05	-0.141	0.0917	-0.111	-0.319	0.174	0.0206	0.166**	0.241	0.054	0.129	-0.327*	-0.188*	-0.450**
per worker initial	(0.078)	(0.303)	(0.192)	(0.110)	(0.264)	(0.185)	(0.216)	(0.077)	(0.222)	(0.101)	(0.279)	(0.188)	(0.104)	(0.198)
Interaction	-0.0026	-0.0043	-0.0176	0.0049	-0.0443**	-0.0210***	0.0191*	-0.0161**	-0.0019	0.013	0.0166	-0.0083	-0.0114	-0.012
(year disc.*oil)	(0.007)	(0.010)	(0.019)	(0.005)	(0.018)	(0.006)	(0.011)	(0.006)	(0.008)	(0.012)	(0.011)	(0.011)	(0.008)	(0.011)
Years since	-0.006	0.427***	0.507***	0.762***	0.383**	-1.022***	-1.179***	-0.0697	-0.321***	0.472	-0.374	12.11*	-0.276	5.988
indep. initial	(0.041)	(0.148)	(0.156)	(0.100)	(0.166)	(0.119)	(0.128)	(0.160)	(0.121)	(0.290)	(0.234)	(6.393)	(3.059)	(5.019)
Observations	220	222	222	222	222	222	222	222	222	222	222	310	303	303
R-squared	0.910	0.740	0.837	0.932	0.741	0.911	0.932	0.914	0.864	0.875	0.737	0.664	0.723	0.691

Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1. All estimations include country and time fixed effects. Unbalanced panel estimation with available observations for 140 countries between the period 1985-2005. Dependent variable is the 10 year growth rate (difference). All estimations include the initial value of the dependent variable (in levels). Coefficients and standard errors for constant not included for purpose of brevity.

Table 5. Estimations with years since oil discovery peak

Dependent variable	Comp.risk	Bur.qua.	Corrupt.	Law&ord.	Democ.	Eth. ten.	Ext. con.	Int. con.	Gov. sta.	Inv.prof	Socio.cond	Polity	Xrreg	Xconst
Dependent variable	-1.181***	-0.885***	-1.101***	-1.126***	-0.974***	-1.166***	-1.122***	-1.361***	-1.156***	-1.438***	-1.508***	-0.834***	-1.017***	-0.896***
initial level	(0.068)	(0.102)	(0.089)	(0.069)	(0.126)	(0.075)	(0.059)	(0.099)	(0.099)	(0.094)	(0.113)	(0.092)	(0.092)	(0.092)
Oil exports	0.088	-0.188	-0.434	-0.17	-0.322	0.442***	0.0751	-0.215	-0.464	0.0733	-0.248	0.219	0.376	0.0608
GDP share initial	(0.113)	(0.337)	(0.347)	(0.297)	(0.487)	(0.167)	(0.233)	(0.301)	(0.317)	(0.365)	(0.389)	(0.481)	(0.331)	(0.435)
Years since	-0.253**	-0.964***	-0.0614	-0.315***	-0.3	-0.28	-0.865***	0.058	-0.320*	-0.207**	-0.786***	0.134	0.229	0.239
oil discovery peak	(0.110)	(0.133)	(0.480)	(0.097)	(0.287)	(0.254)	(0.159)	(0.305)	(0.166)	(0.100)	(0.136)	(0.265)	(0.162)	(0.254)
Years since	0.004	0.378**	0.429***	0.771***	0.353**	-0.968***	-1.168***	-0.0567	-0.330**	0.520*	-0.431*	13.06	0.223	7.76
indep. initial	(0.042)	(0.155)	(0.150)	(0.096)	(0.166)	(0.138)	(0.134)	(0.166)	(0.143)	(0.286)	(0.225)	(7.958)	(3.582)	(6.654)
Constant	71.30***	52.28***	43.73***	57.43***	48.83***	17.25***	31.49***	79.24***	42.59***	79.34***	54.89***	66.00***	36.64*	-18.55
	(4.521)	(10.870)	(11.700)	(3.697)	(9.914)	(6.075)	(5.313)	(8.699)	(6.833)	(11.070)	(10.430)	(11.920)	(19.930)	(36.340)
Observations	216	217	217	217	217	217	217	217	217	217	217	300	293	293
R-squared	0.910	0.749	0.847	0.928	0.727	0.902	0.933	0.908	0.862	0.871	0.734	0.662	0.737	0.687
Dependent variable	-1.188***	-0.902***	-1.110***	-1.130***	-1.013***	-1.160***	-1.095***	-1.330***	-1.175***	-1.443***	-1.395***	-0.844***	-0.966***	-0.901***
initial level	(0.060)	(0.095)	(0.091)	(0.066)	(0.116)	(0.068)	(0.053)	(0.094)	(0.100)	(0.087)	(0.104)	(0.084)	(0.100)	(0.089)
Oil rents	0.383**	-0.510*	-0.349**	0.259	-0.619	0.278	0.554***	0.803**	0.0199	-0.165	-0.287	0.351	-0.101	0.277
initial	(0.149)	(0.283)	(0.176)	(0.208)	(0.427)	(0.363)	(0.134)	(0.398)	(0.457)	(0.237)	(0.330)	(0.298)	(0.222)	(0.270)
Years since	-0.467***	-0.718***	0.107	-0.475***	0.00614	-0.403	-1.153***	-0.364	-0.394	-0.112	-0.638**	-0.0266	0.189	0.134
oil discovery peak	(0.098)	(0.267)	(0.378)	(0.172)	(0.275)	(0.386)	(0.133)	(0.223)	(0.318)	(0.181)	(0.256)	(0.258)	(0.163)	(0.253)
Years since	-0.011	0.368**	0.454***	0.793***	0.431***	-1.014***	-1.204***	-0.0891	-0.297*	0.530*	-0.483**	-1.226**	-0.0685	-0.924**
indep. initial	(0.043)	(0.153)	(0.155)	(0.106)	(0.160)	(0.136)	(0.134)	(0.170)	(0.164)	(0.273)	(0.217)	(0.497)	(0.228)	(0.443)
Constant	75.55***	24.74***	-1.105	102.5***	52.74***	43.69***	103.3***	48.94***	53.86***	43.80***	6.593	15.79**	62.89***	35.16***
	(4.088)	(2.522)	(7.985)	(7.889)	(15.270)	(11.190)	(5.721)	(11.070)	(13.330)	(6.254)	(8.452)	(7.195)	(6.361)	(9.009)
Observations	238	239	239	239	239	239	239	239	239	239	239	327	313	313
R-squared	0.909	0.758	0.834	0.920	0.735	0.900	0.936	0.910	0.856	0.878	0.741	0.672	0.720	0.693
Dependent variable	-1.162***	-0.904***	-1.087***	-1.120***	-1.003***	-1.152***	-1.121***	-1.356***	-1.147***	-1.417***	-1.531***	-0.823***	-1.005***	-0.889***
initial level	(0.068)	(0.102)	(0.096)	(0.068)	(0.117)	(0.072)	(0.057)	(0.095)	(0.088)	(0.090)	(0.111)	(0.089)	(0.090)	(0.088)
Oil net exports	0.092	-0.00723	0.105	-0.0731	-0.316	0.219	0.17	0.171	0.309	0.0949	0.262	-0.326*	-0.209**	-0.477**
per worker initial	(0.081)	(0.290)	(0.155)	(0.117)	(0.296)	(0.200)	(0.197)	(0.123)	(0.215)	(0.142)	(0.275)	(0.191)	(0.100)	(0.201)
Years since	-0.298***	-0.984***	-0.0896	-0.294**	-0.141	-0.377	-0.972***	-0.0684	-0.527*	-0.270**	-0.944***	0.234	0.316*	0.369
oil discovery peak	(0.098)	(0.218)	(0.552)	(0.128)	(0.260)	(0.346)	(0.162)	(0.257)	(0.316)	(0.130)	(0.198)	(0.266)	(0.160)	(0.253)
Years since	-0.017	0.402***	0.497***	0.770***	0.406**	-1.007***	-1.189***	-0.0741	-0.325***	0.46	-0.402*	12.53*	0.592	7.084
indep. initial	(0.041)	(0.146)	(0.160)	(0.099)	(0.163)	(0.121)	(0.125)	(0.154)	(0.118)	(0.290)	(0.233)	(6.729)	(3.051)	(5.308)
Constant	98.62***	23.66***	84.21***	97.87***	79.20***	84.26***	117.8***	127.8***	81.88***	83.00***	82.06***	49.65***	99.88***	-26.24
	(6.351)	(7.856)	(9.961)	(5.998)	(13.420)	(9.649)	(8.189)	(11.120)	(9.798)	(3.522)	(8.337)	(9.149)	(19.040)	(27.850)
Observations	220	222	222	222	222	222	222	222	222	222	222	310	303	303
R-squared	0.911	0.747	0.834	0.932	0.731	0.910	0.935	0.914	0.865	0.875	0.743	0.663	0.726	0.694

Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1. All estimations include country and time fixed effects. Unbalanced panel estimation with available observations for 140 countries between the period 1985-2005. Dependent variable is the 10 year growth rate (difference). All estimations include the initial value of the dependent variable (in levels).

Table 6. Estimations with years since oil discovery peak and interaction term of oil discovery peak and oil

Dependent variable	Comp.risk	Bur.qua.	Corrupt.	Law&ord.	Democ.	Eth. ten.	Ext. con.	Int. con.	Gov. sta.	Inv.prof	Socio.cond	Polity	Xrreg	Xconst
Dependent variable	-1.181***	-0.873***	-1.096***	-1.126***	-0.959***	-1.166***	-1.124***	-1.359***	-1.156***	-1.437***	-1.507***	-0.833***	-1.016***	-0.896***
initial level	(0.069)	(0.103)	(0.092)	(0.069)	(0.131)	(0.075)	(0.060)	(0.100)	(0.099)	(0.094)	(0.112)	(0.093)	(0.092)	(0.093)
Years since	-0.253**	-0.972***	-0.0618	-0.318***	-0.301	-0.276	-0.864***	0.0555	-0.315*	-0.209**	-0.799***	0.0718	0.268	0.112
oil discovery peak	(0.111)	(0.130)	(0.487)	(0.096)	(0.300)	(0.250)	(0.162)	(0.302)	(0.160)	(0.100)	(0.117)	(0.284)	(0.173)	(0.252)
Oil exports	0.0858	-0.363	-0.467	-0.219	-0.443	0.489***	0.0905	-0.259	-0.386	0.0473	-0.425	0.16	0.412	-0.0618
GDP share initial	(0.130)	(0.364)	(0.386)	(0.325)	(0.576)	(0.183)	(0.255)	(0.350)	(0.369)	(0.393)	(0.328)	(0.484)	(0.334)	(0.432)
Interaction	-0.0005	-0.0379	-0.0071	-0.011	-0.0232	0.0107	0.00333	-0.0089	0.0176	-0.0058	-0.0399	-0.0186	0.0119	-0.0389
(peak*oil)	(0.009)	(0.024)	(0.026)	(0.021)	(0.035)	(0.013)	(0.020)	(0.016)	(0.021)	(0.028)	(0.025)	(0.046)	(0.017)	(0.046)
Years since	0.00326	0.360**	0.431***	0.767***	0.333**	-0.965***	-1.165***	-0.0624	-0.325**	0.517*	-0.443*	13.41	0.00717	8.491
indep. initial	(0.043)	(0.155)	(0.152)	(0.097)	(0.168)	(0.139)	(0.135)	(0.167)	(0.145)	(0.288)	(0.226)	(8.206)	(3.586)	(7.028)
Observations	216	217	217	217	217	217	217	217	217	217	217	300	293	293
R-squared	0.910	0.751	0.847	0.928	0.728	0.903	0.933	0.908	0.862	0.871	0.739	0.663	0.738	0.690
Dependent variable	-1.187***	-0.901***	-1.099***	-1.131***	-1.015***	-1.158***	-1.093***	-1.331***	-1.163***	-1.446***	-1.396***	-0.844***	-0.972***	-0.908***
initial level	(0.060)	(0.096)	(0.092)	(0.067)	(0.117)	(0.069)	(0.054)	(0.094)	(0.101)	(0.088)	(0.104)	(0.084)	(0.100)	(0.090)
Years since	-0.426***	-1.227***	0.556***	-0.389***	-0.26	-0.162	-1.050***	-0.498**	-0.12	-0.255**	-0.767***	-0.0186	0.056	-0.0367
oil discovery peak	(0.063)	(0.418)	(0.126)	(0.119)	(0.449)	(0.257)	(0.115)	(0.192)	(0.286)	(0.106)	(0.151)	(0.285)	(0.190)	(0.276)
Oil rents	0.386**	-0.543*	-0.319**	0.264	-0.636	0.294	0.560***	0.794*	0.032	-0.174	-0.295	0.352	-0.105	0.272
initial	(0.154)	(0.311)	(0.137)	(0.215)	(0.442)	(0.370)	(0.134)	(0.409)	(0.467)	(0.249)	(0.340)	(0.299)	(0.228)	(0.283)
Interaction	0.0042	-0.052**	0.0457***	0.0089	-0.0272	0.0245	0.0105	-0.0137	0.0261	-0.0148	-0.0132	0.0006	-0.0104	-0.0132
(peak*oil)	(0.007)	(0.025)	(0.009)	(0.011)	(0.029)	(0.019)	(0.009)	(0.020)	(0.023)	(0.014)	(0.019)	(0.019)	(0.011)	(0.018)
Years since	-0.009	0.343**	0.483***	0.799***	0.420**	-1.003***	-1.201***	-0.095	-0.293*	0.527*	-0.489**	-1.225**	-0.090	-0.960**
indep. initial	(0.043)	(0.160)	(0.149)	(0.109)	(0.161)	(0.141)	(0.136)	(0.168)	(0.170)	(0.277)	(0.221)	(0.500)	(0.228)	(0.444)
Observations	238	239	239	239	239	239	239	239	239	239	239	327	313	313
R-squared	0.909	0.760	0.836	0.920	0.735	0.901	0.936	0.911	0.857	0.878	0.741	0.672	0.722	0.694
Dependent variable	-1.163***	-0.905***	-1.077***	-1.121***	-1.003***	-1.150***	-1.121***	-1.353***	-1.130***	-1.418***	-1.530***	-0.819***	-1.009***	-0.891***
initial level	(0.068)	(0.102)	(0.097)	(0.069)	(0.118)	(0.073)	(0.058)	(0.096)	(0.088)	(0.092)	(0.112)	(0.090)	(0.090)	(0.088)
Years since	-0.346***	-1.142***	0.451***	-0.284***	-0.234	-0.127	-1.021***	-0.368**	-0.176	-0.284***	-0.886***	0.438	0.196	0.267
oil discovery peak	(0.070)	(0.331)	(0.122)	(0.103)	(0.384)	(0.206)	(0.107)	(0.142)	(0.213)	(0.104)	(0.153)	(0.328)	(0.216)	(0.251)
Oil net exports	0.100	0.0201	0.0131	-0.0749	-0.300	0.176	0.179	0.222**	0.253	0.0973	0.252	-0.359*	-0.190*	-0.461**
per worker initial	(0.074)	(0.274)	(0.123)	(0.110)	(0.276)	(0.186)	(0.180)	(0.110)	(0.201)	(0.135)	(0.257)	(0.191)	(0.100)	(0.197)
Interaction	-0.0048	-0.0156	0.0529***	0.0010	-0.0092	0.0244**	-0.0048	-0.0297***	0.0322**	-0.0015	0.0057	0.0116	-0.0071	-0.0059
(peak*oil)	(0.005)	(0.021)	(0.009)	(0.008)	(0.024)	(0.011)	(0.012)	(0.008)	(0.013)	(0.008)	(0.014)	(0.016)	(0.011)	(0.014)
Years since	-0.0185	0.398***	0.520***	0.770***	0.404**	-1.001***	-1.190***	-0.0871	-0.328***	0.461	-0.401*	12.61*	0.547	7.03
indep. initial	(0.041)	(0.148)	(0.154)	(0.100)	(0.165)	(0.126)	(0.124)	(0.154)	(0.123)	(0.292)	(0.233)	(6.643)	(3.093)	(5.368)
Observations	220	222	222	222	222	222	222	222	222	222	222	310	303	303
R-squared	0.911	0.747	0.838	0.932	0.731	0.910	0.935	0.914	0.866	0.875	0.744	0.664	0.727	0.695

Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1. All estimations include country and time fixed effects. Unbalanced panel estimation with available observations for 140 countries between the period 1985-2005. Dependent variable is the 10 year growth rate (difference). All estimations include the initial value of the dependent variable (in levels). Coefficients and standard errors for constant not included for purpose of brevity.

Table 7. Estimations with interaction term of oil endowment and oil

Dependent variable	Comp.risk	Bur.qua.	Corrupt.	Law&ord.	Democ.	Eth. ten.	Ext. con.	Int. con.	Gov. sta.	Inv.prof	Socio.cond	Polity	Xrreg	Xconst
Dependent variable	-1.170***	-0.845***	-1.129***	-1.109***	-0.966***	-1.190***	-1.108***	-1.364***	-1.124***	-1.407***	-1.482***	-0.832***	-1.011***	-0.899***
initial level	(0.070)	(0.104)	(0.096)	(0.073)	(0.132)	(0.072)	(0.061)	(0.102)	(0.099)	(0.094)	(0.111)	(0.092)	(0.094)	(0.094)
Oil exports	0.0286	-0.676	-0.617	-0.337	-0.377	0.359**	-0.0345	-0.221	-0.4	-0.0872	-0.764**	0.247	0.428	0.107
GDP share initial	(0.147)	(0.436)	(0.458)	(0.370)	(0.663)	(0.149)	(0.299)	(0.426)	(0.433)	(0.449)	(0.313)	(0.496)	(0.338)	(0.459)
Interaction	0.760*	3.052	2.751**	1.136*	-2.435**	3.496*	2.541***	-0.539	0.468	1.785*	3.907***	-0.452	-0.62	-0.312
(endowment*oil)	(0.400)	(1.997)	(1.239)	(0.577)	(1.191)	(1.906)	(0.676)	(1.112)	(0.688)	(0.973)	(1.438)	(0.999)	(0.523)	(1.065)
Years since	0.00252	0.361**	0.436***	0.777***	0.348**	-0.978***	-1.167***	-0.0669	-0.320*	0.549**	-0.436*	12.65	-0.458	7.014
indep. initial	(0.042)	(0.159)	(0.140)	(0.096)	(0.163)	(0.090)	(0.097)	(0.168)	(0.162)	(0.239)	(0.242)	(7.684)	(3.510)	(6.327)
Constant	67.43***	18.23***	34.57***	91.01***	63.34***	57.29***	71.99***	92.13***	73.62***	73.67***	33.43***	66.64***	97.66***	81.96***
	(4.344)	(3.310)	(3.972)	(6.200)	(6.951)	(4.821)	(5.497)	(8.277)	(7.069)	(5.140)	(5.690)	(10.390)	(10.210)	(9.988)
Observations	203	204	204	204	204	204	204	204	204	204	204	300	293	293
R-squared	0.909	0.752	0.840	0.926	0.740	0.903	0.941	0.905	0.860	0.872	0.739	0.662	0.733	0.684
Dependent variable	-1.191***	-0.882***	-1.180***	-1.109***	-1.030***	-1.169***	-1.079***	-1.331***	-1.148***	-1.431***	-1.365***	-0.847***	-0.962***	-0.900***
initial level	(0.061)	(0.095)	(0.087)	(0.072)	(0.116)	(0.069)	(0.058)	(0.100)	(0.096)	(0.087)	(0.105)	(0.083)	(0.100)	(0.090)
Oil rents	0.224	-0.575*	-0.317*	0.149	-0.598	0.19	0.243	0.748**	-0.101	-0.112	-0.443	0.278	-0.083	0.253
initial	(0.164)	(0.296)	(0.177)	(0.220)	(0.368)	(0.350)	(0.287)	(0.363)	(0.411)	(0.220)	(0.310)	(0.304)	(0.220)	(0.267)
Interaction	2.372**	-7.674***	-1.133	-0.145	-2.427	-0.39	3.318	-2.181	1.612	-4.682*	0.472	3.581**	1.384	2.853
(endowment*oil)	(1.178)	(2.402)	(3.141)	(1.426)	(5.636)	(6.346)	(2.368)	(4.407)	(2.241)	(2.739)	(4.938)	(1.652)	(1.036)	(2.044)
Years since	0.00728	0.351**	0.422***	0.809***	0.436***	-1.023***	-1.189***	-0.107	-0.288	0.570**	-0.473**	-1.247**	-0.133	-0.986**
indep. initial	(0.044)	(0.155)	(0.140)	(0.115)	(0.158)	(0.100)	(0.104)	(0.176)	(0.189)	(0.223)	(0.219)	(0.499)	(0.230)	(0.438)
Constant	98.88***	83.31***	88.94***	71.75***	70.09***	77.13***	104.6***	120.6***	72.08***	96.28***	64.56***	-34.75*	75.76***	-28.05
	(5.189)	(9.253)	(8.460)	(5.778)	(5.720)	(5.704)	(5.376)	(9.227)	(6.297)	(4.051)	(4.378)	(18.470)	(14.690)	(24.940)
Observations	222	223	223	223	223	223	223	223	223	223	223	327	313	313
R-squared	0.906	0.763	0.823	0.916	0.741	0.895	0.939	0.906	0.855	0.879	0.735	0.674	0.718	0.694
Dependent variable	-1.149***	-0.884***	-1.186***	-1.122***	-1.015***	-1.196***	-1.089***	-1.365***	-1.084***	-1.410***	-1.552***	-0.817***	-0.997***	-0.890***
initial level	(0.071)	(0.102)	(0.087)	(0.072)	(0.118)	(0.073)	(0.060)	(0.102)	(0.084)	(0.093)	(0.106)	(0.088)	(0.092)	(0.091)
Oil net exports	-0.0365	-0.822***	-0.294*	-0.388***	-0.431	-0.136	-0.397*	0.286	0.515	-0.225	-0.521***	-0.399	-0.228	-0.609**
per worker initial	(0.124)	(0.254)	(0.159)	(0.088)	(0.413)	(0.280)	(0.237)	(0.177)	(0.441)	(0.160)	(0.088)	(0.291)	(0.144)	(0.285)
Interaction	0.206	1.607***	0.878***	0.646***	0.236	0.734*	0.979***	-0.281	-0.622	0.668***	1.537***	0.377	0.228	0.663
(endowment*oil)	(0.169)	(0.530)	(0.306)	(0.156)	(0.632)	(0.436)	(0.296)	(0.255)	(0.546)	(0.236)	(0.270)	(0.431)	(0.208)	(0.423)
Years since	-0.0106	0.473***	0.455***	0.815***	0.433***	-0.980***	-1.173***	-0.0774	-0.354***	0.549**	-0.303	12.05*	-0.123	6.26
indep. initial	(0.042)	(0.139)	(0.134)	(0.109)	(0.162)	(0.094)	(0.101)	(0.169)	(0.133)	(0.236)	(0.224)	(6.334)	(3.080)	(4.991)
Constant	106.4***	161.0***	134.3***	125.6***	106.5***	146.4***	134.5***	115.2***	54.56**	152.5***	183.3***	24.08	86.32***	57.36***
	(13.260)	(29.670)	(19.140)	(13.780)	(34.930)	(23.820)	(16.460)	(20.080)	(24.410)	(12.990)	(17.930)	(39.660)	(9.643)	(10.330)
Observations	205	207	207	207	207	207	207	207	207	207	207	309	303	303
R-squared	0.907	0.761	0.837	0.931	0.735	0.904	0.941	0.907	0.866	0.876	0.747	0.661	0.719	0.691

Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1. All estimations include country and time fixed effects. Unbalanced panel estimation with available observations for 140 countries between the period 1985-2005. Dependent variable is the 10 year growth rate (difference). All estimations include the initial value of the dependent variable (in levels).