

Another look at the Resource Curse

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The last half of the nineteenth century presented several illustrations of countries with vast amounts of mineral and fuel wealth that failed to raise the standards of living of their people much and of resource poor countries that managed, without any manna from nature to do just that. How such a regular irregularity can exist became the subject of a large theoretical and empirical literature. Sachs and Warner (1997) gave a measure of the size of the curse when they estimated that countries that started with a one standard deviation (0.16) higher share of primary exports in 1971, would see a reduction in annual average growth between 1.51 to 0.65 percentage points over the next 20 years. Theoretical literature has identified several potential channels through which an abundance of natural resources, particularly mineral and fuel resources can curse the country to a slower growth path. The prominent ones are:

- 1) Dutch Disease: The exports surge in oil/resource exports turn the terms of trade against the non-resource tradable sector and lead to an expansion of non-tradable sector at the cost of the latter. This hypothesis implies a negative relation between resource dependence and non-resource growth but not necessarily overall growth.
- 2) Voracity Effect: Presence of resource rents encourages rent-seeking behavior at the cost of productive activity. Tendency to over-borrow, overspend.
- 3) Over-borrowing may also result because an increase in oil price is not only an increase in current revenues but also in the value of your collateral. And it is hard to differentiate temporary from permanent increases, ex-ante. A fall in oil prices then leads to contraction of expenditure more than the fall in revenues because of drying up of ongoing lending. This is the Debt-Overhang problem.
- 4) Volatility of resource prices transmits into total GDP when resource sector is an important component of GDP. Hausman and Rigobon (2002) build a model whereby volatility of the resource sector feeds leads to the resource curse through interaction between specialization and financial market imperfections.

On the empirical side, Sachs and Warner (1995, 1997) found a direct detrimental effect of abundance of natural resources, particularly fuel and mineral resources on long run growth, even after controlling for institutions (voracity effect), volatility of terms of trade (dutch disease and the volatility hypothesis), suggesting that the above explanations do not cover all possible channels through which resources can curse. Other studies,

however have found support for the institutions hypothesis (Sala-i-Martin and Subramanian (2003)), debt overhang (Manzano Rigobon (2001)) or export concentration (Lederman and Maloney (2003)), and also found that that is where the story ends. Bulte, Damania and Deacon (2005) find that there is also a significant negative relationship between resource abundance and human development, which again operates through institutional quality.

This paper does two things: One, it looks closely at the stylized facts and the premises on which the various theories explaining resource curse are based. We ask the question of whether or not the oil and mineral rich countries (henceforth OMRCs) as a whole have increased their overall and non-mining GDP per capita faster or slower than the non oil or mineral rich countries (henceforth NOMRCs), whether their growth rates have been more volatile on average and whether there is evidence of debt overhang or voracity effect in the expenditure patterns of ORC governments. Two, we ask the question of whether the resource rich countries have done better or worse in terms of per capita GDP and per capita GDP excluding the growth in mining sector (which only reflects faster depletion of an exhaustible resource), relative to where they started, and to countries with similar institutions, policies and other factors that influence long-run growth. In doing so, we also test how well the various channels identified in theory, to link resource richness with economic growth fit the data. The sample period in the study is 1970-2004.

Section II presents a review of the empirical literature on resource curse. Section III looks tests for difference in growth rates and volatility between different groups of countries. Section IV looks for evidence of debt overhang and voracity in the expenditure patterns of governments of oil rich countries. Section V presents the analysis based on growth regressions, Section VI concludes.

II. Literature Review:

On the empirics of resource curse, Sachs and Warner (1995, 1995) was an influential study on the resource curse, in which the authors showed that in cross-country growth regressions for the period 1970-1990, countries with higher primary exports to GNI ratios (where primary exports include agricultural exports) grew more slowly than

others with the same initial income, level of investment in physical and human capital, quality of institutions, volatility of terms of trade and openness to trade. They also found that this effect was present even in the 1970's, when resource sectors were booming; and that the primary exports had a significant negative effect on manufacturing and services sectors. However, they use cross country data and including initial GDP as an explanatory variable introduces endogeneity problems, leading to inconsistent estimates. This point has been raised by Manzano and Rigobon (2001) and Lederman and Maloney (2002) who also challenge Sachs and Warner's specification on other counts, namely the time period used and omitted variables. Manzano and Rigobon (2001) suggest that the primary exports indicator could just be capturing the debt overhang. The resource rich countries borrowed a lot in the 1970's when the resource prices and therefore values of their collaterals were high and ran into problems in the next decade when the resource prices collapsed. They find that controlling for different measures of institutions except Bureaucracy score still leaves the mineral and fuel exports (as differentiated from agricultural exports) indicator with a significant and negative coefficient – a result which disappears when a credit constraint variable is introduced for the period 1980-1990. Data availability does not allow them to explore their credit constraint hypothesis in a panel context. Lederman and Maloney (2002) use a difference GMM estimator in panel data to explore the effect of primary exports on total GDP growth for the time period 1975-99. They find that once concentration of exports is controlled for, primary exports do not significantly influence GDP growth. They leave open the question of whether resource poor countries, especially when resources are defined to include agricultural resources have as high export concentration ratios as resource rich countries. If not, then their export concentration index is just a proxy for resource richness. Moreover, when the dependent variable is a persistent series, like GDP, then a system estimator like the one used in this paper considerably increases efficiency.

Sala-i-Martin and Subramanian (2003) also use cross-sectional regressions, but control for endogeneity of institutions by using fraction of populations speaking English and other European Languages and mortality of colonial settlers as instruments. Their first stage regressions for institutions find a significant negative impact of fuel and mineral resources, particularly oil, on institutional quality. In the second stage growth

regressions, the resource richness variable is insignificant, implying that its only impact is through poorer institutions. Bulte, Damania and Deacon (2005) do a similar study to explain human development outcomes and find that through institutions, resource richness does have a significant negative effect on these outcomes.

III. Stylized Facts and Assumptions of Resource Curse Literature:

(a) Growth

Saying that natural resources are in some way a curse for economic growth leads one to the question of whether an average person in a country that is resource rich would have seen his/her income to grow slower and be more volatile than if (s)he had relocated to a comparable² non-resource rich country. Resources here are defined to include only exhaustible resources (or ‘point’ resources) and Oil and mineral rich countries were selected on the basis of their export dependence on exhaustible resources. Tables 1 and 2 below compare the annualized average growth rates and standard deviations of growth rates of 6 groups of countries:

- i. ORCs: Oil rich countries
- ii. MRCs: Mineral rich countries (other than oil rich countries)
- iii. OMRCs: Oil and Mineral Rich countries
- iv. NOMRCs: Non-Oil or Mineral rich countries
- v. Non-Oil rich countries (this group includes MRCs)

The annual average growth rate for each group i is constructed as the arithmetic mean of $\log(1+g_{it})$ where:

$$g_{it} = gr_t \left(\frac{\sum_{j=1}^N GDP_j}{\sum_{j=1}^N POP_j} \right)$$

² Comparable countries include all those that were not high income countries in 1970, the beginning of the sample period (or the first year for which data for that country was available). Since World Bank did not have a criterion to classify countries as low, mid or high income in 1970, and since the cut-offs now remain more or less constant in constant US\$ terms, the year 2000 cut-off for high income countries was used on GDPs per capita in constant 2000 US\$.

Table 1 presents the growth rate of overall GDP per capita for a balanced panel of countries. Table 2 presents the same statistics for non-mining GDP per capita growth (constructed as GDP in constant US\$ *less* Value Added in Mining sector in constant US\$ for the period 1973 to 2003³. For NOMRCs, VAmMining is set to 0. See Appendix A. Data description for more details). If the Dutch disease hypothesis is correct, presence of resource wealth would be associated with lower growth rates of the non-resource tradable sectors. The bottom panels in both tables present the tests of significance of difference in means and standard deviations between the two groups. The first row for each test is the t-statistic (F statistic in the case of tests for standard deviations) and the second row the p-value. Total GDP in both ORCs and MRCs seem to have grown at a rate that is significantly slower than that achieved by non- oil or mineral rich countries, and oil does not seem to be any different than any other exhaustible resource as far as total GDP per capita growth is concerned. MRCs though have a lower median growth rate than the ORCs. In terms of non-mining GDP too, the OMRCs saw a significantly lower growth rate than NOMRCs, but this result is driven by the poor performance of the MRCs.

Although the preceding analysis helps motivate the research, it needs to be kept in mind that it by itself is insufficient to confirm or deny the presence of a resource curse. There are several other factors that shape economic performance and a resource curse can be said to be present only if two countries that start as similar in all respects but resource wealth see the richer country end up growing more slowly/ poorer in terms of GDP per capita (a slower GDP growth would eventually lead to a lower GDP, if the countries continued to follow the same paths, even if at the end of the sample period, the GDP level remains higher in the resource rich country). Even though our sample included only non-high income countries to begin with, that these were not at the same income level is clear from the Figures (1) through (10) which plot the per capita GDP and per capita non-mining GDPs in the different groups of countries. We address this question later in the paper.

(b) Volatility

³ Sample period was shortened from 1970-2004 to keep in as many countries as possible in the balanced panel.

As is clear from Tables 1 and 2, the resource rich countries also experienced more volatile growth in the sample period than NOMRCs, which confirms the premise of the volatility hypothesis to explaining resource curse.

(c) Debt Overhang or Voracity Effect?

Contrary to what one would expect of a country rich in a resource the world can't buy enough of, a large number of ORCS have had debt problems in the past. 22 out of the 29 ORCs (and 13 out of 15 MRCs) in the sample had at least one distress episode, prompting the debt overhang hypothesis⁴. The debt-overhang hypothesis implies that in periods of downturns in oil revenues, government expenditures fall more than the fall in oil revenues because ongoing lending dries up too. Voracity effect would be reflected in a coefficient on oil revenues that is greater than 1 in the equation:

$$GovtExp = \alpha + \beta_1 Oil Rev + \beta_2 D * Oil Rev + \beta_3 X + \varepsilon \quad (1)$$

Where D is a dummy which is 1 in periods of falling oil revenues and 0 otherwise. Debt overhang would be reflected in a negative and significant β_2 .

One may expect voracity effect β_1 to increase with worsening institutions – greater voracity effect. This can be incorporated by way of: $\beta_1 = \delta_1 + \delta_2 Insttns$, so that our regression equation becomes:

$$GovtExp = \alpha + \delta_1 Oil Rev + \beta_2 D * Oil Rev + \delta_2 Insttns * Oil Rev + \beta_3 Insttns + \chi X + \varepsilon \quad (2)$$

Where government expenditures and oil revenues are measured in 2000 US\$. Equation (2) was estimated for the oil rich countries for the period 1984 through 2004 using data from the WEO. Tables (3) – (6) summarize the results of the fixed effects

⁴ as defined in Kraay and Nehru (2004) as periods in which one or more of the following hold: (i) sum of interest and principal arrears more than 5% of total debt outstanding (ii) receipt of a debt relief in the form of rescheduling and/or debt reduction from Paris Club of bilateral creditors (iii) receipt of substantial balance of payments support (exceeding 50% of IMF Quota) from the IMF. When a more stringent criteria is used (eliminating all distress episodes lasting less than 3 years), 18 ORCs and 9 MRCs witnessed at least one episode of prolonged debt distress.

regressions. The dependant variable in Table (1) is the total general government expenditure, in Table (2) current expenditures and Table (3) capital expenditures of the government. Bureaucratic quality, Corruption and Democratic Accountability are institutional indicators from ICRG, with a higher value implying lower risk (better institutions). [Adding the institutional variable as well as its interaction with Oil Exports in the same equation leads to some collinearity - in the equations with total government expenditure, bureaucratic quality had the least correlation with its interaction with oilx]. To test for spurious regression, a Fisher test of panel data unit root was performed⁵ on the residuals of estimated equations – and in all of the tests, the null of all series being non-stationary was strongly rejected. While one would have liked to test the null against the alternative that at least one of the series is non-stationary, such a test couldn't be performed because the panel isn't balanced.

The Tables show some evidence of voracity effect but a stronger one of debt overhang. Moreover, it is the capital expenditures of the government that bear the brunt of the overhang. All the interaction terms of the dummy variable with oil revenues are positive and significant in Tables 3 and 5.

In sum, the resource rich countries experienced significantly higher volatility in their growth rates during 1973-2003, more so in their non-mining sectors, (the ORCs) do show evidence of debt overhang and had a lower measured average and median growth rate, both in overall GDP and in non-mining GDP although the latter difference is not always statistically significant.

IV. Is there a Resource Curse?

Having prepared the groundwork, the next step is to look at whether controlling for other factors that influence growth, resource richness has in the recent past, condemned countries to a slower growth path and if so, which of the channels identified in theory best fit the data. The voracity effect would suggest a link between non-resource growth and natural resource abundance through poorer institutions/ corruption. Debt overhang hypothesis would predict no direct effect but one that operates through debt

⁵ Results available on request.

overhang, i.e. A negative coefficient on debt indicator and a negative coefficient of the interaction term involving the resource richness indicator and debt overhang indicator. And the Dutch disease would suggest a direct negative effect of resource richness indicator on non-oil growth.

We test these hypotheses through regressions of the form:

$$y_{it} - y_{it-s} = \alpha y_{it-s} + \beta X_{it} + \eta_i + \varepsilon_{it}$$

Where y_{it} is the relevant measure of output, X_{it} are the conditioning variables, η_i are the country specific effects, s is taken to be 5 years. Following Caselli et. al (1996), one can rewrite this equation as:

$$y_{it} = (1 + \alpha)y_{it-s} + \beta X_{it} + \eta_i + \varepsilon \quad (3)$$

and estimate it consistently using the dynamic panel data estimator developed by Arellano and Bover (1995) and Bover and Bond (1998). This estimator, called the systems GMM estimator is an extension of the Arellano-Bond difference GMM estimator and is more efficient in data where the dependent variable is highly persistent. The procedure works by first differencing equation (3) to eliminate the country specific fixed effects. Doing this introduces serial correlation between errors and endogeneity – because the correlation of the differenced term $y_{it-s} - y_{it-2s}$ and the differenced error term, $v_{it} = \varepsilon_{it} - \varepsilon_{it-s}$ (assuming the errors in levels are serially uncorrelated) will by construction be non-zero. Moreover, if a variable in X was pre-determined in the levels equation, it is endogenous in the differenced equation. Assuming the following moment conditions:

$$E[y_{it-s-h}v_{it}] = 0 \quad \text{for } h \geq 2; t = 3, \dots, T$$

$$E[X_{it-h}v_{it}] = 0 \quad \text{for } h \geq 2; t = 3, \dots, T$$

Allows us to use the lagged values of explanatory and dependent variables as instruments in the differenced equation, stack the observations and use GMM. The systems GMM estimator, adds to the stack, the equation in levels, where a lagged difference of the corresponding variables are used as instruments. The moment restrictions here are:

$$E[(y_{it-s}y_{it-2s}).(\eta_i + \varepsilon_{it})] = 0$$

$$E[(X_{it-s}X_{it-2s}).(\eta_i + \varepsilon_{it})] = 0$$

An important issue with growth regressions is the sample selection, as pointed out by Solow (2001). In the neo-classical model on which these are based, all RHS variables

except factor inputs, initial conditions and savings and depreciation rates, can only be interpreted as proxies for differences in TFP across countries, and therefore, the appropriate variable on the LHS should be TFP, when the dataset consists of countries that are dissimilar (i.e. includes developed as well as developing countries, as do most growth regressions). To address this concern, we use in our dataset, only countries that were not high income in the start of our sample period, 1970 (or the first year at which the data for that country becomes available). Since World Bank did not have a criterion to classify countries as low, mid or high income in 1970, and since the cut-offs now remain more or less constant in constant US\$ terms, the year 2000 cut-off for high income countries was used on GDPs per capita in constant 2000 US\$.

Another issue is the relevant measure of output. For mineral rich countries, an increase in total GDP could reflect merely an increase in extraction of exhaustible resource wealth. To measure the non-resource component, we use GDP net of value added in mining (Non-Mining GDP) and GDP net of fuel or ores exports⁶. The latter series is available for many countries with gaps, not as a continuous time series so is not used for analysis in Section III, but can be used here since we only need observations at 5 year intervals. For countries identified as NOMRCs, we measure only total GDP.

The regression results are shown in Table 6 below⁷. The last six rows of the table present various tests for consistency of our estimates. The Sargan test of over-identifying restrictions tests the null that the instruments used are uncorrelated with the errors. In all our equations, we fail to reject this null. The AR(1) test is a test for autocorrelation in errors from the first differenced equation. Because errors in the differenced equation are first differences of serially uncorrelated errors (of the levels equation), autocorrelation of the first order in the former errors is expected, but for our results to be consistent, it is important that there be no second order autocorrelation in these error terms. The last two rows of both tables test the null of no serial correlation of second order in the errors from the differenced equation and fail to reject it. The table confirms some earlier findings but also throws up some surprises. There is evidence of conditional convergence – the coefficient of lagged dependent variable is less than one and significant in all cases. From

⁶ It is important to note that WDI data excludes gold and precious stones as mineral resources.

⁷ We tried adding the coefficient of variation of government expenditures in the regressions, but missing data meant too few observations were left per panel unit for valid inference.

equation (3), this coefficient is one plus the coefficient on the initial GDP term in the growth regression, which implies that the estimate of the latter coefficient is negative. Also, openness shows up as significant and positive in all the regressions. There is evidence of debt overhang as the coefficient on external debt is negative and significant in all regressions and some evidence that institutions matter. A higher value of the governance indicator implies better governance and in our estimates, this implies a higher growth path. The surprise is in the coefficient on fuel exports/GDP, which shows up as significant in both the regressions with non-resource GDP. Even if the resource intensity works through poorer institutions and higher external indebtedness, the size of the relative coefficients says that fuel exporting countries would still have shown a better non-resource sector growth than countries with the same level of other indicators but lacking in fuel wealth (or that which is currently being extracted). Why this should be so is a question that remains unanswered.

V. Conclusion

Our analysis allows us to conclude that while oil and mineral rich countries saw greater volatility in growth over the past 3 decades, there is little evidence that they suffered a lower long term growth than countries that were comparable to begin with, especially where their non-mining sectors were concerned. There is evidence of debt overhang in the expenditure patterns of government of ORCs, but data constraints do not allow us to control for this factor in our growth regressions.

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Table 1: Growth of GDP per capita, constant (2000) US \$

Group	No. of Countries	Annual Average Growth Rate log (1+g)	Std.Dev	Median
All Developing	71			
ORCs	19	0.012	0.026	0.015
NORCs	52	0.025	0.014	0.027
OMRCs	31	0.010	0.023	0.014
NOMRCs	40	0.027	0.014	0.029
MRCs	12	0.002	0.021	0.005
Tests of Sig:				
(1) ORCs vs NORCs		-2.430	1.494	
		0.018	0.285	
(2) OMRCs vs NOMRCs		-3.470	2.836	
		0.001	0.007	
(3) ORCs vs NOMRCs		-2.770	3.615	
		0.008	0.001	
(4) ORCs vs. MRCs		1.660	1.494	
		0.101	0.285	
(5) MRCs vs. NOMRCs		-5.47	0.429	
		0.000	.026	

Notes:

1) Tests of Sig test the difference of the relevant variable between ORCs and non-ORCs. The test statistic is a t-statistic for difference in means and an F- stat for difference in standard deviations. The test of difference in standard deviation has the alternative H_a : The two standard deviations are not equal.

2) Average annual growth rate is a gross rate, computed as the arithmetic mean of log (1+ annual growth rates), which is equivalent to the log of geometric mean of gross annual growth rates.

3) The standard deviations and medians are of actual net annual growth rates

Table 2: Growth of Non-Mining GDP per capita, constant (2000) US \$

Group	No. of Countries	Annual Average Growth Rate log (1+g)	Std.Dev	Median
All Developing	62			
ORCs	14	0.015	0.043	0.010
NORCs	48	0.027	0.014	0.029
MRCs	7	0.009	0.019	0.011
NOMRCs	41	0.028	0.014	0.030
OMRCs	21	0.014	0.037	0.014
Tests of Sig:				
(1) ORCs vs NORCs		-1.46	3.346	
		0.15	0.00	
(2) OMRCs vs NOMRCs		-1.96	6.611	
		0.06	0.00	
(3) ORCs vs NOMRCs		-1.57	9.120	
		0.12	0.00	
(4) ORCs vs. MRCs		0.71	5.15	
		0.48	0.00	
(5) MRCs vs. NMRCs		-3.79	1.62	
		0.00	0.22	
(6) MRCs vs. NOMRCs		-4.33	0.484	
		0.00	0.06	

Notes:

1) Tests of Sig test the difference of the relevant variable between ORCs and non-ORCs. The test statistic is a t-statistic for difference in means and an F- stat for difference in standard deviations. The test of difference in standard deviation has the alternative H_a : The two standard deviations are not equal.

2) Average annual growth rate is a gross rate, computed as the arithmetic mean of log (1+ annual growth rates), which is equivalent to the log of geometric mean of gross annual growth rates.

3) The standard deviations and medians are of actual net annual growth rates

Table 3: ORCs
Dependent Variable: General Government Total Expenditure
(billions of 2000 US\$)

	(1)	(2)	(3)	(4)	(5)	(6)
oilx	0.756 (7.07)**	0.395 (3.30)**	0.668 (10.59)**	0.489 (8.64)**	0.487 (8.62)**	0.486 (8.61)**
Dummy*oilx	0.084 (2.00)*	0.080 (1.85)	0.105 (2.55)*	0.085 (2.01)*	0.084 (1.98)*	0.084 (1.97)*
Bureaucracy Quality (L)	1.256 (1.57)			-0.039 (0.06)		
bureauoilx	-0.116 (2.94)**					
gdpnonoil	0.186 (34.79)**	0.188 (34.88)**	0.192 (36.55)**	0.188 (34.87)**	0.188 (34.89)**	0.187 (34.90)**
Corruption (F)		-0.816 (1.02)			-0.391 (0.61)	
corrupoilx		0.040 (0.88)				
Democratic Accountability (K)			0.972 (1.86)			-0.527 (1.12)
Constant	4.570 (2.67)**	9.187 (4.34)**	5.576 (3.48)**	7.256 (4.97)**	8.172 (4.61)**	8.731 (5.60)**
democoilx			-0.122 (5.75)**			
Observations	481	481	481	481	481	481
Number of Country Code	21	21	21	21	21	21
R-squared	0.77	0.76	0.78	0.76	0.76	0.76

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

Table 4: ORCs
Dependent Variable: Current Public Expenditures
(billions of 2000 US\$)

	(1)	(2)	(3)	(4)	(5)	(6)
oilx	0.021 (0.48)	-0.021 (0.43)	0.101 (4.61)**	0.065 (3.33)**	0.066 (3.34)**	0.065 (3.29)**
Dummy*oilx	-0.020 (1.15)	-0.024 (1.44)	-0.028 (1.67)	-0.022 (1.33)	-0.022 (1.33)	-0.023 (1.39)
Bureaucracy Quality	-0.211 (0.56)			0.032 (0.10)		
bureauoilx	0.021 (1.15)					
gdpnoil	0.168 (65.18)**	0.167 (65.41)**	0.169 (65.85)**	0.167 (65.21)**	0.167 (65.25)**	0.167 (65.27)**
Corruption		-0.287 (0.78)			0.168 (0.59)	
corrupoilx		0.040 (1.93)				
Democratic Accountability			0.235 (0.95)			-0.217 (1.01)
Constant	-0.159 (0.20)	0.036 (0.04)	-0.776 (1.04)	-0.639 (0.95)	-1.008 (1.27)	0.069 (0.10)
democoilx			-0.034 (3.59)**			
Observations	510	510	510	510	510	510
Number of Country Code	22	22	22	22	22	22
R-squared	0.90	0.90	0.90	0.90	0.90	0.90

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

Table 5: ORCs
Dependent Variable: Public Capital Expenditures
(billions of 2000 US\$)

	(1)	(2)	(3)	(4)	(5)	(6)
	kpub	kpub	kpub	kpub	kpub	kpub
oilx	1.131	0.721	0.556	0.467	0.460	0.459
	(8.14)**	(4.56)**	(6.53)**	(6.32)**	(6.21)**	(6.21)**
Dummy*oilx	0.277	0.290	0.284	0.273	0.274	0.272
	(5.22)**	(5.23)**	(5.17)**	(4.98)**	(4.98)**	(4.96)**
Bureaucracy Quality (L)	1.463			-1.640		
	(1.38)			(1.76)		
bureauoilx	-0.285					
	(5.58)**					
gdpnoil	0.227	0.230	0.233	0.230	0.230	0.230
	(32.96)**	(32.52)**	(32.62)**	(32.57)**	(32.47)**	(32.49)**
Corruption		1.446			0.175	
		(1.32)			(0.20)	
corrupoilx		-0.112				
		(1.87)				
Democratic Accountablity			0.134			-0.694
			(0.19)			(1.14)
Constant	-15.481	-15.527	-11.684	-8.878	-12.442	-9.919
	(6.79)**	(5.28)**	(5.34)**	(4.42)**	(5.11)**	(4.83)**
democoilx			-0.064			
			(2.27)*			
Observations	476	476	476	476	476	476
Number of	22	22	22	22	22	22
Country Code						
R-squared	0.75	0.73	0.73	0.73	0.73	0.73

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

Table 6: System GMM Estimators

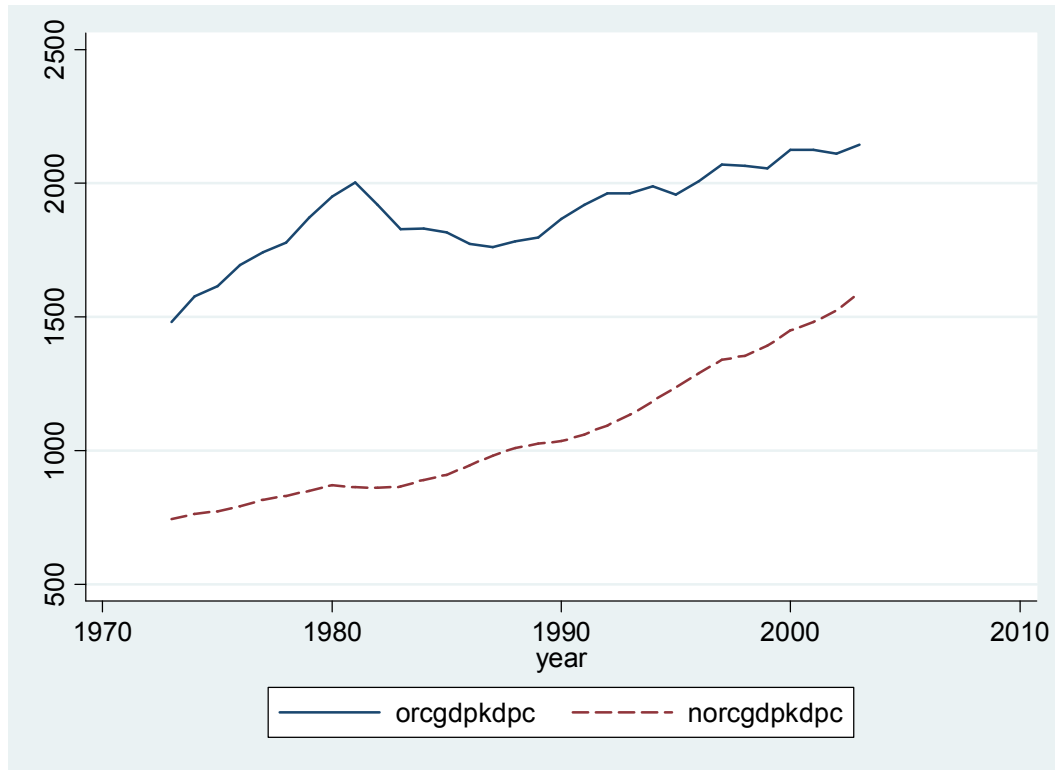
	(1)	(2)	(3)
	GDPkdpc	NMGDPkdpc	NPGDPkdpc
Lagged Dep. Var	0.957 (0.019)***	0.944 (0.020)***	0.921 (0.018)***
Pop Growth	-0.738 (0.284)***	-0.896 (0.291)***	-1.132 (0.282)***
Investment	0.840 (0.200)***	0.951 (0.215)***	1.028 (0.228)***
Governance	0.023 (0.010)**	0.022 (0.011)*	0.015 (0.011)
Fuel Exports/GDP	0.104 (0.109)	0.159 (0.069)**	0.312 (0.054)***
External Debt/Exports	-0.009 (0.004)***	-0.009 (0.004)**	-0.008 (0.004)**
Ore Exports/GDP	0.128 (0.305)	0.177 (0.284)	0.099 (0.281)
Secondary Enrollment	-0.079 (0.082)	-0.064 (0.086)	-0.069 (0.084)
SOPEN	0.083 (0.024)***	0.082 (0.027)***	0.086 (0.028)***
Phone mainlines	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Constant	0.289 (0.132)**	0.367 (0.139)***	0.517 (0.139)***
Observations	150	139	151
Number of Countries	36	33	36
Sargan Test Chi_2	113.39	108.73	136.03
Prob. > Chi_2	0.19	0.22	0.11
AR(1) Test	-3.08	-3.15	-2.92
Pr > z	0.00	0.00	0.00
AR(2) Test	-1.30	-0.21	-0.55
Pr > z	0.19	0.83	0.58

Standard errors in parentheses.

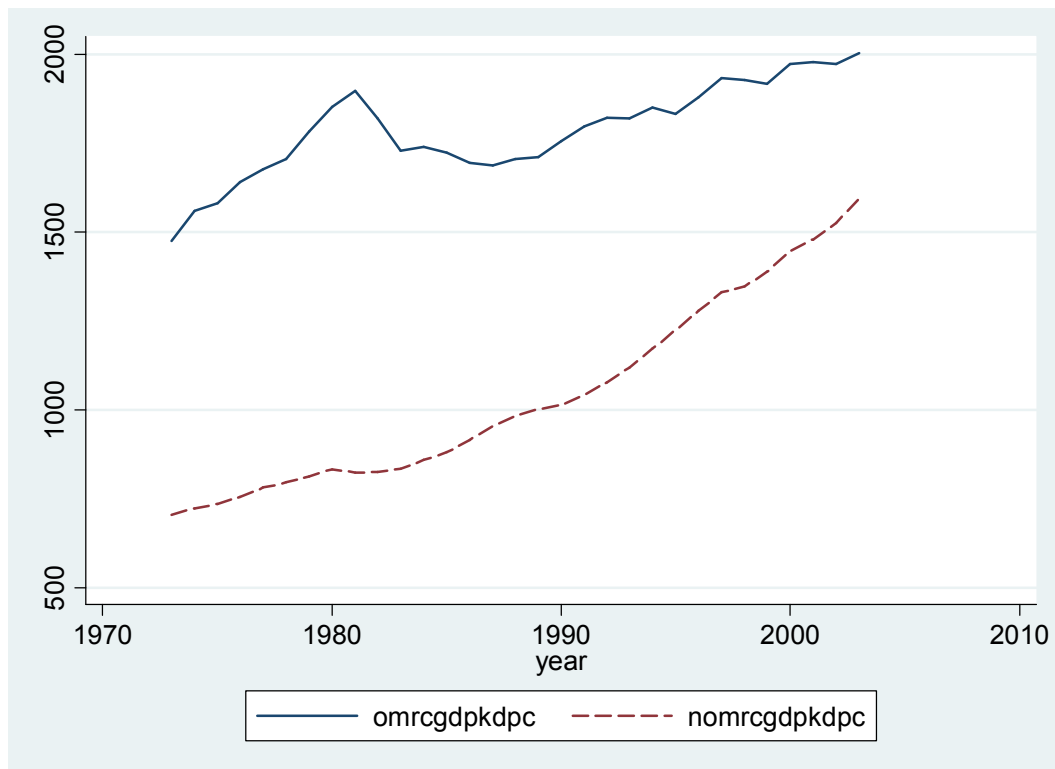
* significant at 10%; ** significant at 5%; *** significant at 1%

GDP per Capita in Constant (2000) US\$

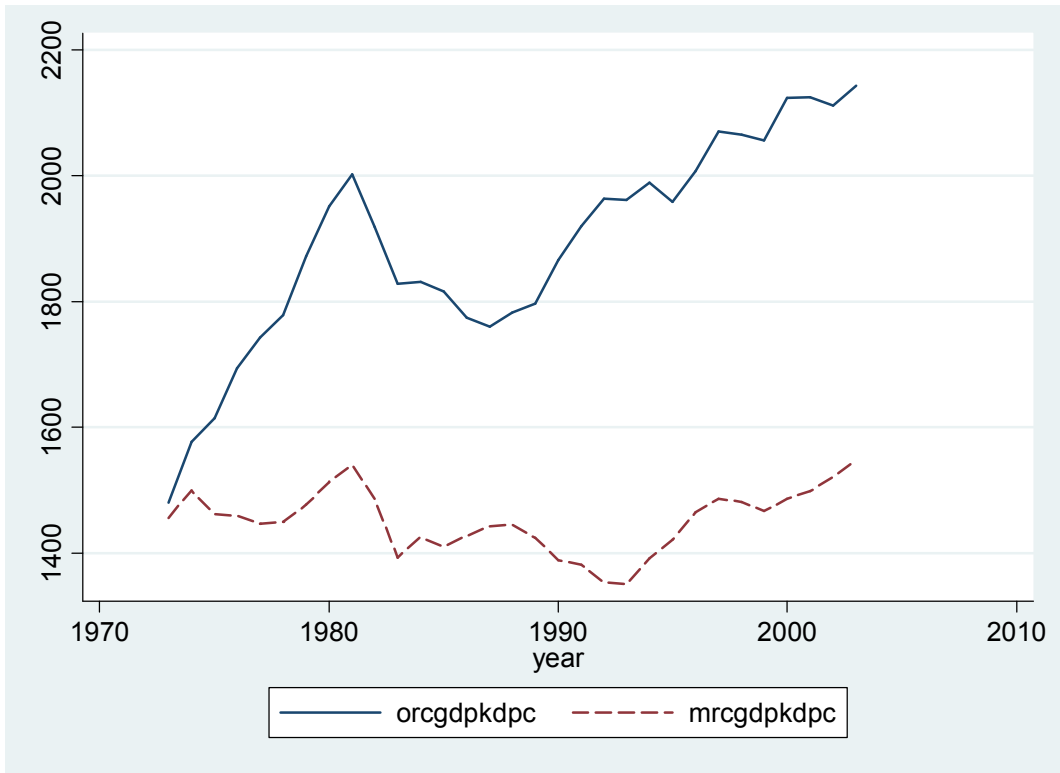
(1) ORCs vs. Non-ORCs



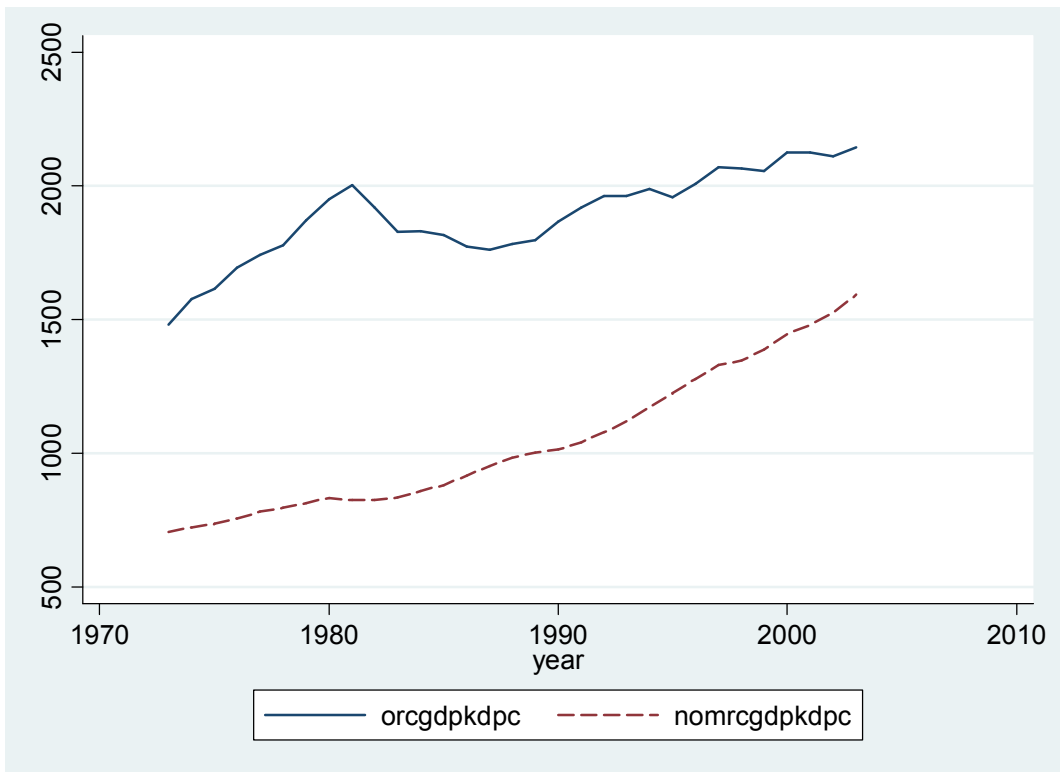
(2) OMRCs vs. NOMRCs



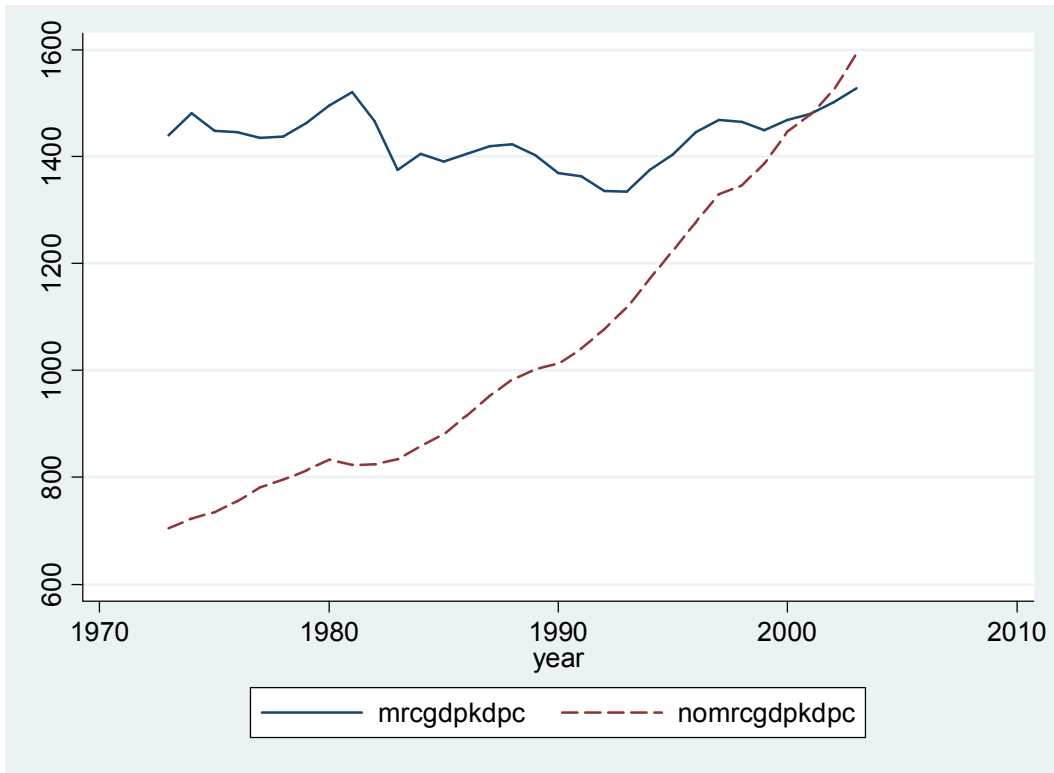
(3) ORCs vs. MRCs



(4) ORCs vs. NOMRCs

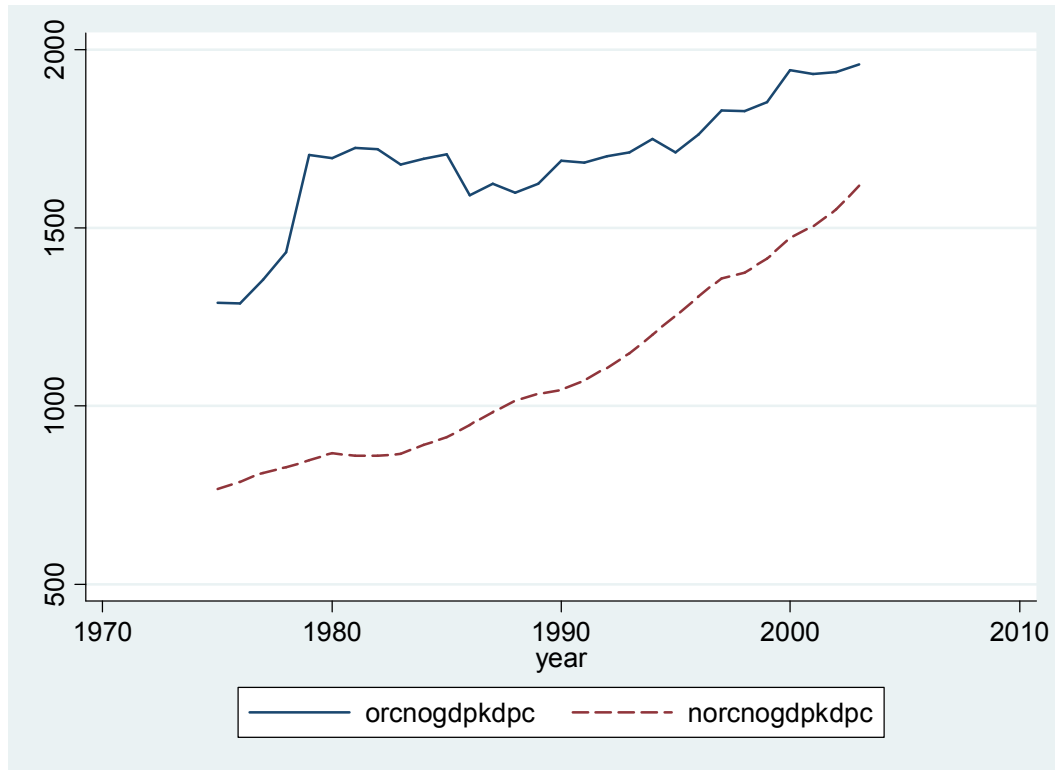


(5) MRCs vs. NOMRCs

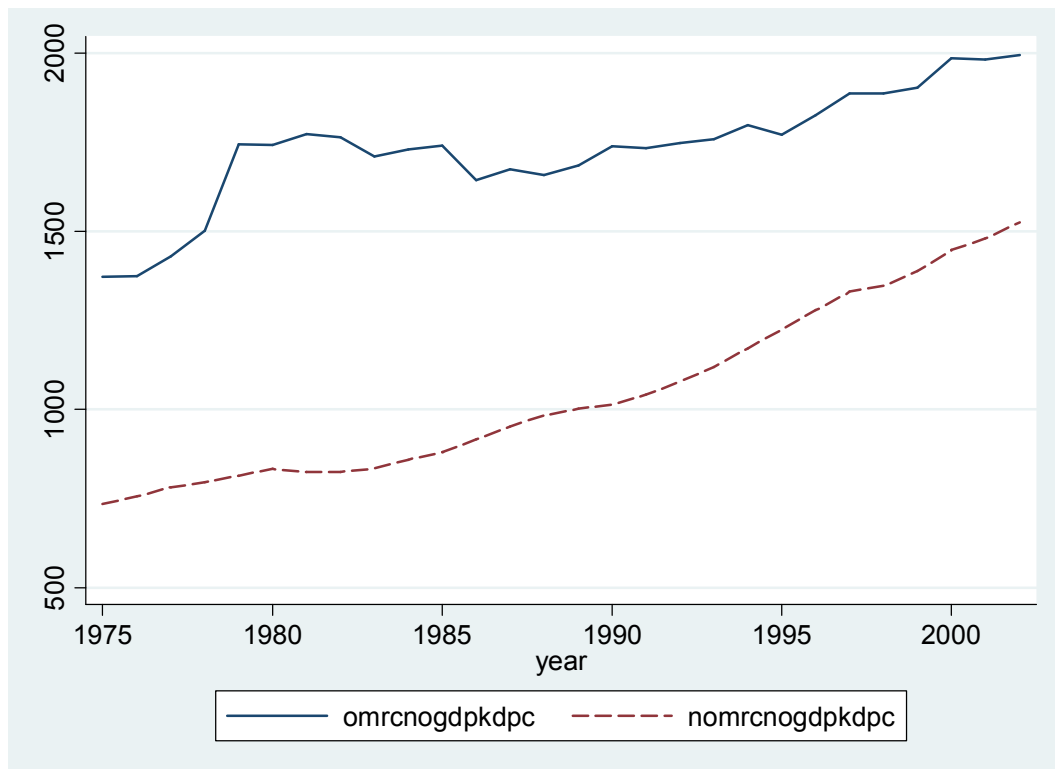


Non-Mining GDP per capita in constant (2000) US\$

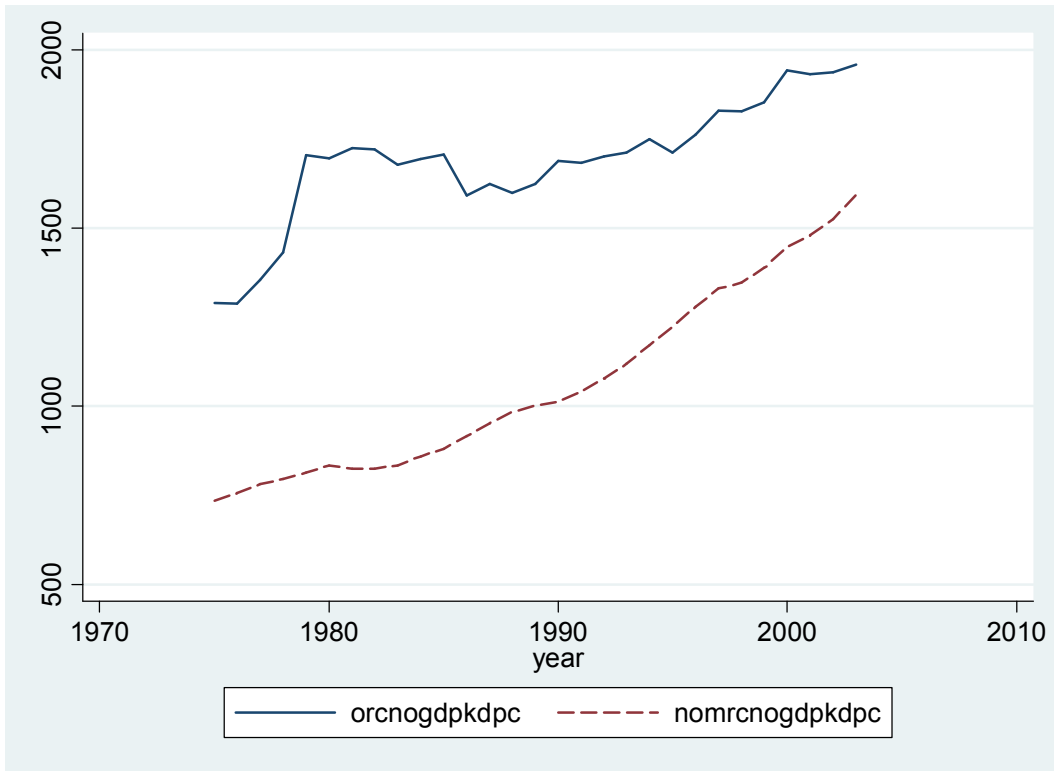
(1) ORCs vs. Non-ORCs



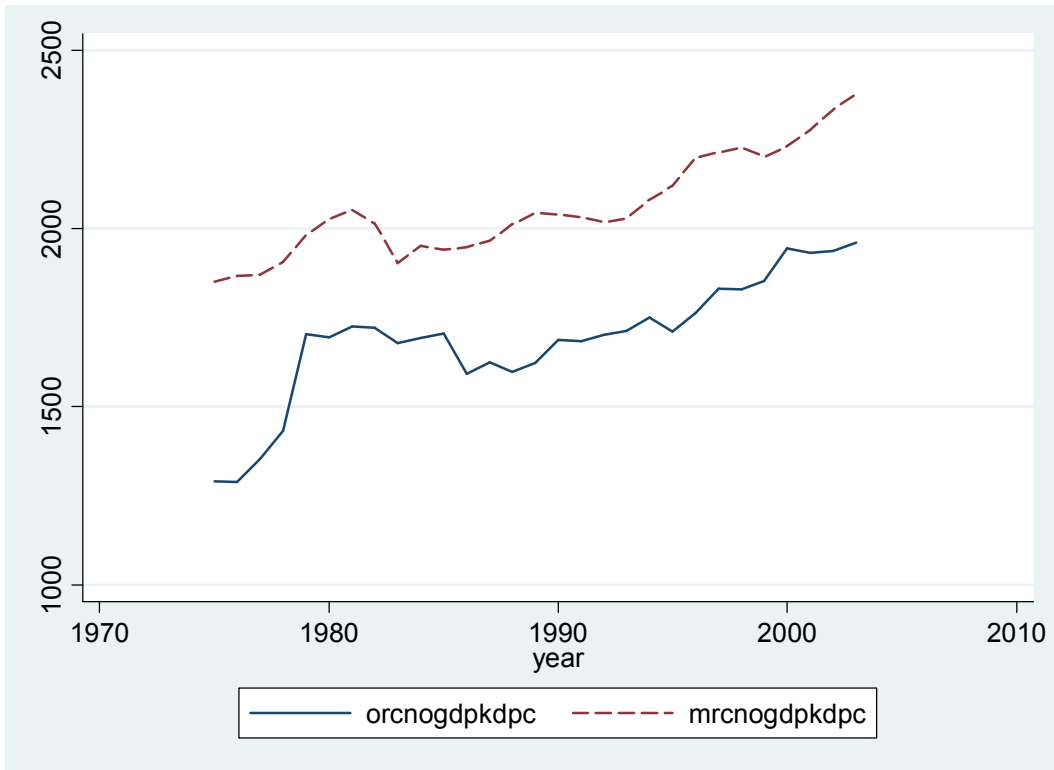
(2) OMRCs vs. NOMRCs



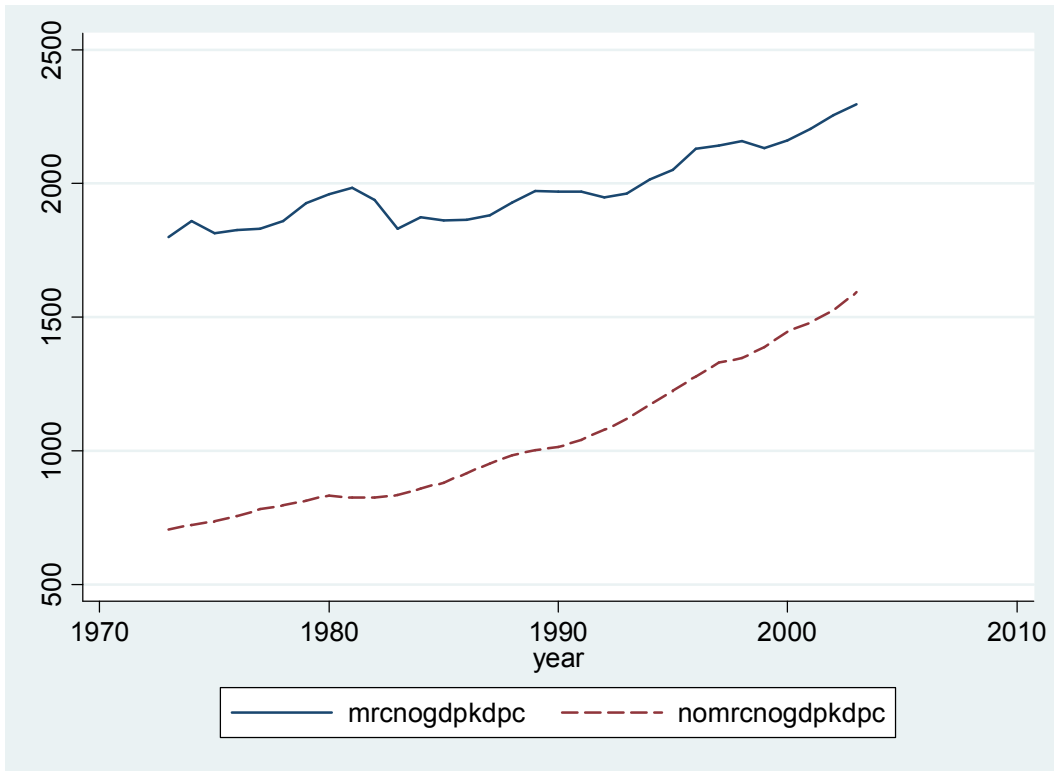
(3) ORCs vs. NOMRCs



(4) ORCs vs. MRCs



(5) MRCs vs. NOMRCs



Appendix: Data Sources

The data used covers the period 1970-2005. For countries that did not have data for 2005, 2004 observations were used.

Tables 3-5:

- General Government Total Expenditures, Current and Capital Expenditures in billions of US\$ from World Economic Outlook, IMF.
- Oilx: Oil Exports, in billions of constant US\$, from World Economic Outlook, IMF
- Dummy: Dummy variable, equals 1 in periods of falling oil revenues.
- Bureaucracy, Corruption and Democratic Accountability are indicators of Bureaucratic Quality, lack of corruption and accountability of public officials from International Country Risk Guide, PRS group. A larger value implies lower risk.
- Bureauoilx, Democoilx, corrupoilx are interactions of the governance indicators with oil exports.
- Gdpnoil is GDP – oil exports, both from World Economic Outlook, IMF

Table 6:

Averages in the regressions correspond to 1971-75, 1976-80, 1981-85, 1986-90, 1991-1995, 1996-2000 and 2001-2004/05. The GDPs and initial values are measured at 1970, 1975 etc.

- GDPkdpc: GDP per capita in 2000 US\$ From WDI, World Bank
- NMGDPkdpc: Non-Mining GDP per capita in 2000 US\$/population
= (GDP constant US\$-Value Added in mining, constant US\$)/population for OMRCs
= GDPkd per capita for NOMRCs
VAmMining was deflated using the price of the largest mineral export. For ORCs, this is the price of crude oil. Prices were taken from IFS, IMF and data on value added in mining, GDP and population from WDI.
- NPGDPkdpc: Non-Primary GDP per capita in 2000 US\$
- Population growth: Total growth in period 1970-75, etc. Source: WDI
- Investment: Gross capital formation/GDP, average for the period. Source: WDI
- Governance: First principal component of the following for ICRG indicators: Law and Order, Corruption, Bureaucracy Quality, Democratic Accountability. The

1984 value was used for the three years 1970, 1975 and 1980. Source: ICRG, PRS group

- External Debt/Exports: External debt as ratio to exports of goods and services. Source: WDI
- Fuel Exports/GDP: Fuel Exports as percentage of merchandise exports, and level of merchandise exports are available from WDI. This indicator was constructed by multiplying fuel exports as percentage of merchandise exports with merchandise exports in current dollars/GDP in current dollars.
- Ore Exports/GDP: Ore Exports as percentage of merchandise exports, and level of merchandise exports are available from WDI. This indicator was constructed by multiplying ore exports as percentage of merchandise exports with merchandise exports in current dollars/GDP in current dollars. For a few mineral rich countries, the values were missing for every fifth year (1970, 1975 etc) were replaced by the nearest available ones.
- Secondary enrollment: From Ianchovichina, E. and P. Kacker (2005) “Education is measured as the ratio of total secondary enrollment, regardless of age, to the population of the age group that officially corresponds to that level of education. The main data sources are the WDI and the GDN dataset. For countries missing information, a procedure similar to the case of infrastructure was followed, i.e. a regression of (log of) education on income, and time and fixed effects was estimated. Finally, for those countries lacking information, the assigned value was the average for countries belonging to the same income group.”
- SOPEN: Share of the period under consideration that the country was classified as open according to Sachs Warner Criteria, updated in Wacziarg and Welch (2003).
- Phone mainlines: From Ianchovichina, E. and P. Kacker (2005). “Infrastructure is proxied with the number of telephone mainlines per 1,000 people for the entire country, where telephone mainlines are the lines connecting a customer's equipment to the public switched telephone network. The data sources are WDI (for the 1975-2002) and the GDN dataset for (1960-1975). Coverage on infrastructure for the post-1975 period is almost complete, but coverage for the pre-1975 period is incomplete. To fill in this gap, a regression of (log of) infrastructure on (log of) income, and fixed and time effects for countries with information was used. If this imputation procedure was not applicable (because of lack of income data), the assigned value was the average of the variable for the same income group in the relevant year.”