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Intenational Monetary Fund

May 2009

WP/09/112

IMF Working Paper

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INTERNATIONAL MONETARY FUND

 WP/09/112

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Western Hemisphere Department and IMF Institute Department

An Alternative Explanation for the Resource Curse: The Income Effect Channel

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Abstract

The paper provides an alternative explanation for the "resource curse" based on the income effect resulting from high government current spending in resource rich economies. Using a simple life cycle framework, we show that private investment in the non-resource sector is adversely affected if private agents expect extra government current spending financed through resource sector revenues in the future. This income channel of the resource curse is stronger for countries with lower degrees of openness and forward altruism. We empirically validate these findings by estimating non-hydrocarbon sector growth regressions using a panel of 25 oil-exporting countries over 1992–2005.

JEL Classification Numbers: C1,C82, O11, O41, Q30

Keywords: resource curse, fiscal policy, investment and growth
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The authors would like to thank Enrica Detragiache, Mohsin Khan, Fuad Hasanov, Rolando Ossowski, Marc Quintyn, Alejandro Santos, Janet Stotsky and Amadou Sy for helpful comments and discussions. All remaining errors are the authors'.

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I. INTRODUCTION

In the present paper, we propose a new explanation for the "resource curse." The resource curse refers to the paradox that countries tend to have lower economic growth the more they are endowed with natural resources (e.g., Sachs and Warner (1997, 2001)). Our explanation is based on the fact that private agents expect to benefit from future government current spending financed through natural resource revenues. This reduces private saving and investment, hampering growth of the private sector in resource rich countries.

There are several existing explanations for the resource curse. The most notable explanation is that the exploitation of natural resources triggers the so-called Dutch disease. Wijnbergen (1984) and Corden (1984), among others, provide theoretical frameworks in which the decline in the competitiveness of the non-resource sector is caused by an appreciation of the real exchange rate due to increased resource revenues spent on non-tradable goods. Another explanation for the resource curse is the institutional channel explanation. Tornell and Lane (1999), and more recently Robinson et al. (2006), provide theoretical frameworks whereby rent-seeking behavior to acquire resource revenues undermines institutional arrangements in place, leading to lower economic growth. Sala-i-Martin and Subramanian (2004) provide empirical evidence for the relevance for the latter explanation.[2]

Despite its conceptual plausibility, the empirical evidence for Dutch disease is mixed and is mostly on a country case basis. For instance, Sala-i-Martin and Subramanian (2003) fail to find evidence of Dutch disease in Nigeria. The most extensive cross-country studies of the Dutch disease are Gelb and al. (1988) and Spatafora and Warner (1995). They find no evidence of Dutch disease in the manufacturing sector using various samples of oil-exporting countries. The existence of price controls, government intervention and labor market flexibility have been suggested as potential explanations for the lack of real exchange rate appreciation following an increase in spending (e.g. IMF (2007a)). For instance, price controls sterilize the inflationary pressure that could have otherwise resulted in a Dutch disease. In turn, price controls shift the burden of the adjustment to the government budget with potential consequences on the level of private investment.

This paper complements the existing literature by providing a novel explanation for the resource curse. We develop a simple theoretical framework that underpins the income effect channel of the resource curse. We also extend the model to show that the income channel of the resource curse is stronger for countries with lower degrees of openness and forward altruism. To the best of our knowledge, no such income effect channel has been put forward as an explanation for the resource curse.[3] We empirically validate the main findings by

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[2] Other explanations based on the volatility of revenues from natural resources and on resource rich countries' excessive borrowing have also been put forward as a possible explanation for the resource curse (e.g. Hausmann and Rigobon (2004)).

[3] A related but distinct literature emphasizes the non-productive nature of certain categories of spending (e.g. Tanzi and Schuknecht (2000)).

estimating non-hydrocarbon sector growth regressions using a panel of 25 oil-exporting countries over 1992–2005.

Table 1 shows that current government spending in oil-exporting countries increased over the past years, amounting to 36 percent of non-hydrocarbon GDP over 1999-2005. It should be noted that a number of oil exporting countries in the recent years have also embarked on large public investment plans in order to boost private investment in the non-hydrocarbon sector, as shown in Table 1. In the present paper, we do not attempt to investigate the impact of public investment on private sector growth.

Table 1. Composition of Government Expenditures in Oil Exporting Countries

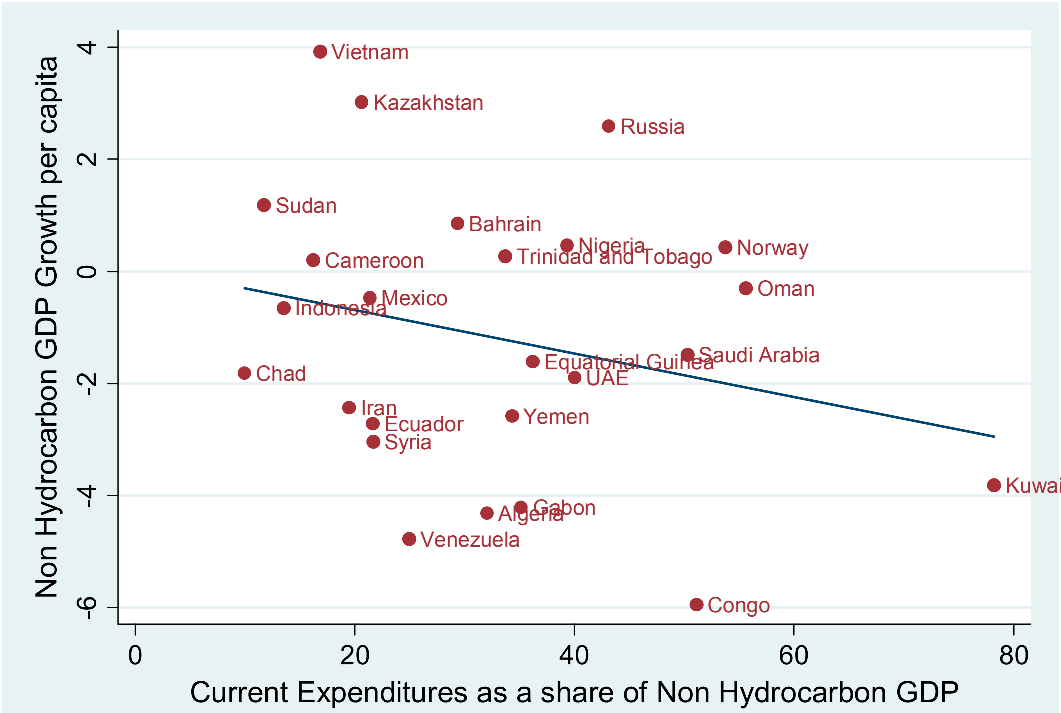
	Averages as share of non-oil GDP 1/			
	1999-2005	1999	2003	2005
Total Expenditures and net Lending	47.2	42.0	47.2	53.0
Current Expenditure	36.0	33.6	36.2	37.6
Wages 2/	13.6	14.0	13.4	13.7
Interest 3/	3.9	4.9	3.2	2.8
Capital Expenditures	10.9	8.2	10.8	15.1
memorandum items				
Total revenue	53.9	38.9	51.6	74.5
Hydrocarbon revenue	34.4	20.0	32.8	53.7

Source: Ossowski and al (2008)

1/ Angola and Equatorial Guinea are two excluded outliers. Due to missing observations, Kazakhstan, Russia and Timor-Leste are excluded to allow for comparibility between years and across items averages.
2/ Due to missing observations. Azerbaijan and Nigeria are excluded to allow for comparability between years averages.
3/ Due to missing observations, Iran and Nigeria are excluded to allow for comparability between years averages.

Figure 1 provides some possible empirical evidence for the income effect channel of the resource curse. It shows that there is a negative relationship between non-hydrocarbon GDP growth per capita and current expenditure as a share of non-hydrocarbon GDP, on average over 1992–2005. This suggests that the income channel explanation is potentially an important explanation for the resource curse given the high level of current spending in oil-exporting countries.

Figure 1. Non-Hydrocarbon GDP Growth and Government Current Spending



Source : Ossowski and al. (2008) and authors ' own calculations

We have organized the paper as follows. Section II presents the theoretical model. Section III reports our empirical results using non-hydrocarbon sector growth regressions. Section IV concludes.

II. A Simple Model

A. Closed Economy

We begin with the standard life cycle model. Suppose that at each period there are two coexisting generations, young and old, each with population of size N. The old do not supply any labor. Each young owns a unit of labor, which she supplies to the market inelastically. Therefore, the total labor supply would be equal to N in each period. There is only one type of good, which can be either consumed or invested.

At time t, denote the wage bill of a young individual by w_t, her consumption by c_{yt}, and her saving by a_t, all in units of the consumption good. In addition, each young individual receives a government transfer of g_{yt} , in units of consumption good.

Each individual who is young at time t becomes old at time $t+1$. This individual is referred to as a member of "generation t." An old individual of generation t invests the entire savings of her young age in time $t+1$. Denote the capital stock due to this investment by k_{t+1}. An old person receives a total interest payment of $r_{t+1}k_{t+1}$, where r_{t+1} is the real interest rate at time $t+1$. In addition, she receives a transfer of g_{ot+1} from the government. She consumes c_{ot+1} at the end of period $t+1$.

The lifetime budget constraint of a generation *t* individual would equate the present values of her lifetime consumption and income. Define g_t as the value of transfer to a generation *t* individual ($g_t = g_{yt} + g_{ot+1}/(1 + r_{t+1})$). Her lifetime budget constraint will be:

$$c_{yt} + c_{ot+1}/(1+r_{t+1}) = w_t + g_t \quad [1]$$

Suppose a generation *t* individual enjoys lifetime utility of $u_t = c_{yt}^{\alpha} c_{ot+1}^{1-\alpha}$, where α is a parameter that captures the marginal propensity to consume (mpc). A higher α implies a stronger taste for consumption when young, which leads to lower saving.

Each individual maximizes her utility subject to her lifetime budget constraint. The solution to this problem for a generation *t* individual would determine c_{yt} and c_{ot+1} as functions of the parameters of the utility function, wage and interest rate, as follows:

$$c_{yt} = \alpha(w_t + g_t) \quad [2]$$

and

$$c_{ot+1} = (1-\alpha)(1 + r_{t+1})w_t + (1-\alpha)g_t \quad [3]$$

The economy has a Cobb-Douglas production function: $Y_t = A_t K_t^{\beta} L_t^{1-\beta}$, where *Y*, *K*, and *L* represent economy's total output, capital and labor respectively, and *A* is the total factor productivity. At market equilibrium, interest rate and wage rate would be equal to marginal products of capital and labor, respectively:

$$r_t = mpk_t = \beta A_t k_t^{\beta-1} \quad [4]$$

$$w_t = mpl_t = (1-\beta)A_t k_t^{\beta} \quad [5]$$

As capital becomes more abundant (relative to labor), the reward to capital decreases and the reward to labor, the wage rate, increases.

All of the assets accumulated in each period will be invested in the following period:

$$k_{t+1} = w_t + g_{yt} - c_{yt} = w_t + g_{yt} - \alpha(w_t + g_t) \quad [6]$$

Replace for w_t from equation [5] above, and write g_t in terms of its components to find the economy's equation for evolution of capital (transition equation) as follows:

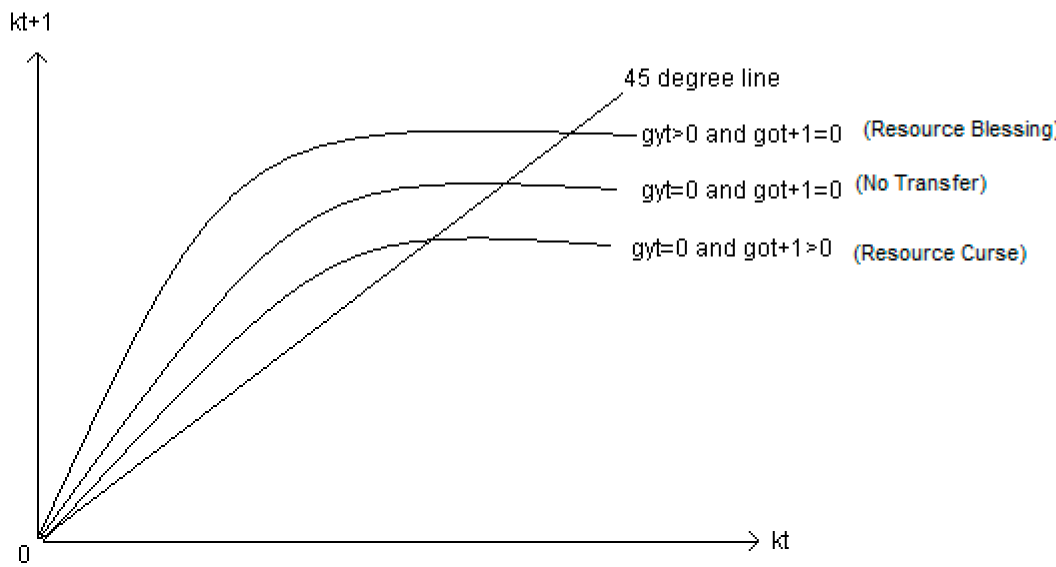
$$k_{t+1} = (1-\alpha)(1-\beta)A_t k_t^{\beta} + (1-\alpha)g_{yt} - \frac{\alpha}{1+r_{t+1}} g_{ot+1} \quad [7]$$

This equation suggests that the transition path of capital will be higher if more transfers are made to the young, and lower if more anticipated transfers are made to the old.[4] This is intuitive, as transfers to savers encourage more (less) capital accumulation (consumption), whereas transfers to spenders encourage more (less) consumption (capital accumulation). In what follows, we study different possibilities for financing transfers and their impact for the capital accumulation in the economy:[5]

- Case 1 (Resource Curse): g_{yt}=0 and g_{ot+1}>0

In this case, natural resources are sold internationally to finance transfers to domestic consumers (the old) only. No transfers are made to the savers (the young). Figure 2 depicts the transition path without transfers and with transfers to the young. In this case, the transition path of the non resource sector of the economy with transfers is lower than without transfers, hence resources have caused a curse.

Figure 2. Transition Paths



[4] The latter claim could be verified by rewriting the transition equation as follows:

$k_{t+1} + \frac{\alpha}{1+\beta A_{t+1}k_{t+1}^{\beta-1}} g_{ot+1} = (1-\alpha)(1-\beta)A_t k_t^{\beta} + (1-\alpha)g_{yt}$. The right-hand-side of this equation is predetermined at time *t+1.* Therefore, noting that *β-1* is negative, an increase in g_{ot+1} can only lead to a decrease in k_{t+1}.

[5] We assume that the old-age transfers are anticipated by the beneficiaries when young. Otherwise there would be no income effect at play.

- Case 2 (Resource Blessing): g_{yt}>0 and g_{ot+1}=0

This case is the opposite of Case 1. Resources are sold to finance transfers to savers (the young) only. No transfers are made to consumers (the old). Figure 2 above illustrates that the transition path with transfers to the young is higher than the transition path without such transfers. In other words, transfers to the young will be a blessing for the economy's growth.

- Case 3 (tax the young and subsidize the old): g_{yt}<0 and g_{ot+1}>0

In this case, the savers (the young) are taxed to finance transfers to the consumers (the old). Similar to case 1, the non resource sector of the economy will have a lower transition path than in the absent of transfers. This holds whether the budget is balanced ($g_{yt} = -g_{ot}$) or not.

- Case 4 (subsidize the young and tax the old): g_{yt}>0 and g_{ot+1}<0

In this case, the consumers (the old) are taxed to make transfers to the savers (the young). This is similar to Case 2, and opposite to case 3; the non resource sector will have a higher transition path than in the absence of transfers.

Cases 1 and 2 show that the natural resource curse (or blessing) could be due to how natural resource revenues are spent potentially generating an income effect. This is different from other explanations for resource curse explained in the literature, such as the Dutch disease. Governments can "reverse the curse" by policies that motivate increased private capital accumulation and decreased current expenditures. It is clear from Cases 3 and 4 above that this policy recommendation is no different from advice on management of revenues from taxation.

B. Openness and Resource Curse

In this subsection, we show that the more open an economy is, the less it would be prone to have a resource curse through the income effect channel.[6] This is shown by studying a small open economy framework with restrictions on the pass-through of foreign capital inflows.[7] Openness is only studied on capital, as our single commodity model is not proper for studying commodity trade. While our main interest is the case of the small open economy, Appendix C provides the model's extension to the larger open economy case, which can be of interest when considering regional integration between countries with similar size, but that are closed to the rest of the world.

Consider the possibility of foreign capital flows to an otherwise closed economy. The transition equation will be modified as below:

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[6] This is also the case for the Dutch disease channel: the smaller the size of the non-tradable sector is (i.e., the more open an economy is) the less prone it is to Dutch disease.

[7] In the case of a small open economy without any capital mobility restrictions, there is no impact of natural resources redistribution on the dynamic of capital.

$$k_{t+1} = (1-\alpha)(1-\beta)A_t k_t^{\ \beta} + (1-\alpha)g_{yt} - \frac{\alpha}{(1+r_{t+1})} g_{ot+1} + k_{t+1}^{f} \quad [8]$$

where, k_{t+1}^{f} is the (per capita) foreign investment. It is a function of domestic interest rates, as follows: $k_{t+1}^{f} = f(r_{t+1}^{closed} - r_{t+1}^{world})$, $\frac{\partial f}{\partial r^{closed}} > 0$. Further assume that capital cannot flow beyond $k_{t+1}^{\max,f} = (1-\tau)\bar{k}$ where, $\tau \in [0,1]$ is the measure of the country's restrictions on cross border capital mobility and $\bar{k}$ is the steady state level of capital in the closed economy. For the case of *de jure* fully closed economy $\tau = 1$, and for the case of *de jure* fully open economy $\tau = 0$.

Next, we will discuss the effect of an increase in current expenditures on capital accumulation. Consider an increase of Δg_{ot+1} in transfers to the old. This leads to an increase in interest rates and immediate capital inflows. If $k_{t+1}^{\max,f} - k_{t+1}^{f} > \frac{\alpha}{1+r_{t+1}} \Delta g_{ot+1}$, i.e. if the amount of foreign capital in the economy is much below the maximum allowed, foreign capital inflows neutralizes the effect of the current expenditure on domestic capital accumulation, leaving growth unchanged.[8] Otherwise, foreign capital will flow into the country up to the maximum level of $k_{t+1}^{\max,f}$, and the capital loss due to this expansion in capital expenditure would be: $Loss = \frac{\alpha}{1+r_{t+1}} \Delta g_{ot} - (k_{t+1}^{\max,f} - k_{t+1}^{f}) > 0$

while *Loss* is positive, it is a decreasing function of $k_{t+1}^{\max,f}$. We can thus conclude that increased openness (higher $k_{t+1}^{\max,f}$) reduces the extent to which the income effect dampen capital accumulation.

C. Altruism and Resource Curse

This subsection shows that a higher degree of forward altruism dampens the income effect channel of the resource curse while backward altruism strengthens it. Two types of altruism are considered: the old individuals transfer part of their resources to the young (forward) and vice versa (backward). [9] Forward altruism strengthens the resource curse results derived in subsection A, but backward altruism weakens them; if resources are sold to finance transfers to the altruistic old, they will consume part of these resources, but transfer the rest to their children, who will save. This will weaken the resource curse through the income effect channel result found above. The opposite happens if resources are transferred to the altruistic young. Below we will formalize this intuitive argument.

[8] Changes in interest rates do not qualitatively change the results of this section because they are more moderate in the open economy than the closed economy, for which we have already offered a formal proof.

[9] Altonji, Ayashi and Kotlikoff (1997) present strong evidence against forward altruism using United States data at the micro level. Nevertheless, this section is presented to justify the robustness and applicability of our model to countries where altruism may be supported by data.

Suppose the old individuals transfer fraction ϕ of their wealth to the young. Assume $\phi \in (-1,1)$, where a positive value represents positive transfers from the old to the young (forward altruism) and a negative value represents the reverse (backward altruism). The transition equation (for the closed economy case) will be as follows:

$$k_{t+1} = (1-\alpha)(1-\beta)A_t k_t^{\beta} + (1-\alpha)g_{yt} + [\phi(1-\alpha) - \frac{(1-\phi)\alpha}{1+r_{t+1}}]g_{ot+1} \quad [9]$$

Ceteris paribus, a positive (negative) ϕ will bring the transition path of capital to a higher (lower) level. Whether resource curse (blessing) happens depends on whether $(1-\alpha)g_{yt} + [\phi(1-\alpha) - \frac{(1-\phi)\alpha}{1+r_{t+1}}]g_{ot}$ is negative (positive). For g_{yt}=0 and g_{ot+1}>0 resource curse (blessing) takes place if $[\phi(1-\alpha) - \frac{(1-\phi)\alpha}{1+r_{t+1}}]$ is negative (positive). We can thus conclude that a higher degree of forward altruism will tend to dampen the income effect. It is interesting to note that with altruistically enough parents (ϕ big enough), transfers to the old through natural resources can also be a blessing to the economy.

III. Empirical Investigation

In this section, we empirically test theoretical results of the above model. First, we test the main result that the anticipation of government current spending financed by resource revenues will dampen non-hydrocarbon sector growth. Second, we test whether fewer restrictions on international goods and capital movements reduce the adverse impact of government current spending on non-hydrocarbon sector growth. Finally, we test if a higher degree of forward altruism dampens the impact of government current spending on non-hydrocarbon sector growth.

A. Empirical Methodology

We use a unique database, consisting of annual data for 25 oil-exporting countries over 1992–2005. Appendix A describes sources of data (Table 4) and their descriptive statistics (Table 5). Due to some missing observations in the early 1990s and the removal of outliers in the estimation, on average, nine observations per country are used in the regressions. The list of countries included in the empirical investigation is also mentioned in Appendix A (Table 6). The resource sector is the hydrocarbon sector, which includes oil/gas and its derivatives. The non-resource sector is the non-hydrocarbon sector. In the baseline empirical model, non-hydrocarbon GDP growth ($NH\text{-}GDPGrowth_{it}$) is the dependent variable, and the following are the explanatory variables (in natural logarithm, unless otherwise indicated):

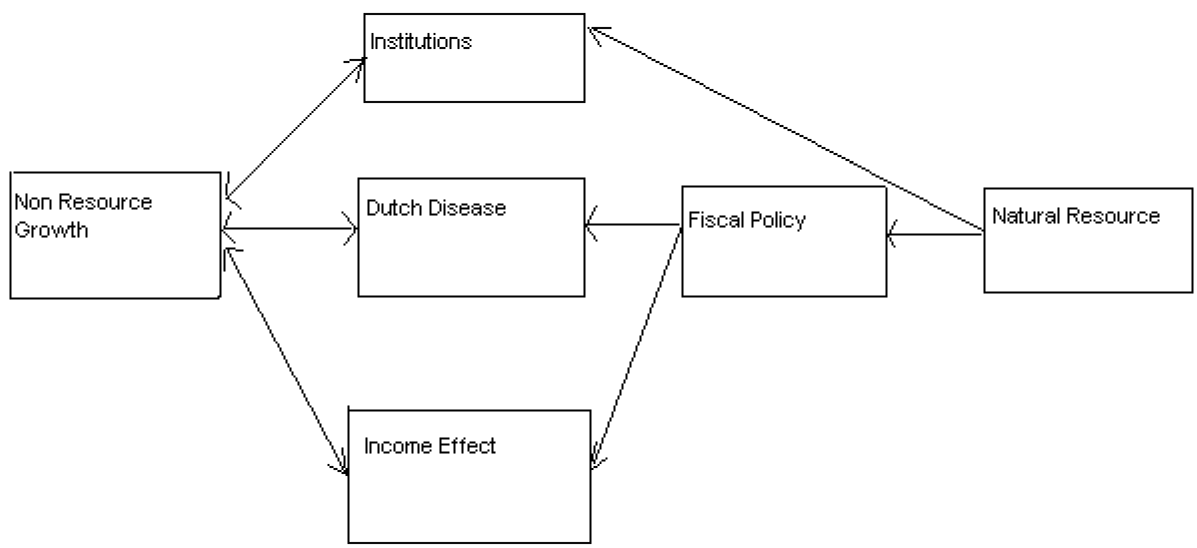
- Lagged GDP per capita (y_{it-1}), which captures the convergence of income per capita to its steady state level.

- Government current spending as a percentage of non-hydrocarbon GDP ($Spending_{it}$), which proxies transfers to private agents and is anticipated at the prior time period (*t-1*), similar to the theoretical model. We have assumed an extension of our two-period model to a 55 period one, à la Auerbach and Kotlikoff (1987). All of the qualitative results derived for the two-period model apply to this extension as well.

- Vector of control variables ($Control_{it}$), which consists of the effects of other resource curse channels that are sketched in Figure 3 and are captured in the following variables: institutional quality index ($Institution_{it}$) measures the undermining of institutions channel and is proxied by political risk index from ICRG (2005); rate of change of real effective exchange rate ($REER_{it}$) proxies the Dutch disease channel. The arrows in Figure 3 indicate the direction of the causality. Thus, a two-sided arrow indicates the potential non-univocal of the causality between two elements.

We also test extensions of our theoretical model by including an additional vector of control variables ($XControl_{it}$). This vector includes restrictions on international goods and capital movements ($Restrictions_{it}$), and interactions of government current spending with other variables (see Appendix A for complete descriptions).

Figure 3. Resource Curse Channels



Our baseline empirical mode is as follows:

$$\Delta y_{it} = \alpha_0 + \alpha_1 y_{it-1} + \alpha_2 Spending_{it} + \alpha_3 Control_{it} + \mu_i + \varepsilon_{it}$$ [10]

and our extension model is as follows:

$$\Delta y_{it} = \alpha_0 + \alpha_1 y_{it-1} + \alpha_1 Spending_{it} + \alpha_3 Control_{it} + \alpha_4 XControl_{it} + \mu_i + \varepsilon_{it}$$

μ_i captures the unobservable invariant effects for country *i*, which among other things can capture the degree of altruism in country *i* in the absence of an explanatory variable for altruism. ε_{it} captures the remaining unobservable effects of country *i* at year *t*, and α's are the estimation coefficients.

B. Results

Table 2 shows the estimation results for our baseline specification, using two estimators that are fixed-effects ordinary least square (OLS) and generalized method of moments (GMM). Hausmann tests supported the choice of the fixed effects OLS model over the random effects model. The results using the fixed-effects OLS estimator with lagged dependent variables are presented in Column (1) in Table 2. A potential issue arising from using fixed-effects OLS estimator to estimate a lagged dependent model is a bias of order *0 (1/T),* with *T* being the length of the time period of the sample. Column (2) presents the results of our preferred specification using Arrellano and Bond (1991) and Blundell and Bond (1998), Generalized Method of Moments (GMM) estimators, which corrects for the bias arising from the use of lagged dependent variables in the fixed effect model. [11] In addition, we used instrumental variables techniques to correct for the endogeneity bias that may arise from the inclusion of some of the endogenous regressors in the specification, using up to three-year lagged variables as instruments. We also used the unit value of hydrocarbon export and time dummies as instruments for government current spending. We assume that movement in the unit value of hydrocarbon exports affects non-hydrocarbon growth only through its impact on fiscal policy. That assumption is supported by the some of the results of the estimation of a VAR model using a selected number of oil-exporting countries, as documented in Husain et al. (2008). The use of instrumental variables technique allows us to assert the causal impact of government current spending on non-hydrocarbon growth. Results presented in columns (1) and (2) in Table 2 are qualitatively similar, albeit the income effect is stronger when correcting for endogeneity.

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[10] We estimate the reduced form of this model as follows: $y_{it} = \alpha_0 + \alpha'_1 y_{it-1} + \alpha_2 Spending_{it} + \alpha_3 Control_{it} + \mu_i + \varepsilon_{it}$, where $\alpha'_1 = 1 + \alpha_1$

[11] First order and second order serial correlation tests and Hansen test relating to the validity of over identifying moment conditions indicate that the estimated models presented in the paper are correctly specified.

Testing for whether government current spending dampens non-hydrocarbon GDP growth

The estimation results reported in column (2) of Table 2 support our main theoretical prediction and can be summarized as follows. It should be noted that these results are robust across different specifications, the use of different proxies for institutional quality and the inclusion of outliers.[12]

- The coefficient associated with lagged non-hydrocarbon GDP is negative (estimated at -0.08). The higher the lagged level of non-hydrocarbon sector GDP is, the lower the contemporaneous non-hydrocarbon sector GDP growth will be.

- The coefficient of current expenditure is estimated at -0.18, implying that an increase in current spending of 1 percent of non-hydrocarbon GDP reduces the non-hydrocarbon sector growth by about 0.2 percent. This result supports the main prediction of our theoretical model. One might argue that not all of government current spending reduces private saving. Fortunately, our dataset includes data on government spending with some degree of disaggregating on wage and interest rate payments, albeit for a shorter sample of countries and periods. Using non-wage government primary spending, we also find that the coefficient associated with that proxy is negative in the non-hydrocarbon sector growth regressions.

- The coefficient associated with institutional quality index is positive (estimated at 0.016) suggesting that an improvement in institutional quality leads to an increase in growth performances in the non-hydrocarbon sector. This result is consistent with the undermining institutions channel, which indicates that the presence of natural resources, through their impact on institutional arrangements, affects non-resource sector development. More generally, this result is consistent with the literature that has emphasized the importance of institutional arrangements in determining economic growth (see for instance Rodrick et al. (2004)).

- The coefficient associated with *REER* is positive (estimated at 0.0001) but is not statistically significant. Thus, we do not find evidence for Dutch disease in our dataset. Government intervention and price controls are likely to "sterilize" the price effect resulting from increased spending directed toward non-tradable goods. In addition, many countries included in the sample (e.g. transition countries) have experienced a sharp decrease in their nominal effective exchange rate during the period covered by sample. In addition, a lot of oil-exporting countries given their peg

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[12] To account for the presence of outliers, observations with excessively high leverage have been excluded from the sample. More precisely, all observations with *DFBETAi,j* statistics, with *i* indicating the country and *j* the time period, that have an absolute value above a cutoff point equal to $2/\sqrt{n}$, with n being the number of observations in the original sample (Davidson and MacKinnon, 1993, pp. 32-39 and Besley, Kuh and Welsch, 1980) were dropped. The results presented in the paper are robust to the use of different values for the cutoff point above which observations are dropped. Table 3 of Appendix A presents the countries included in the study after the removal of outliers.

> vis-à-vis the dollar have experienced a decrease in their nominal effective exchange rate as a result as the weakening of the dollar currency vis-à-vis other trading partners in the time period studied. That decrease in their nominal effective exchange rate coupled with a relative moderate domestic CPI inflation led to a decrease in the REER for many countries included in the sample, as suggested in Table 5 in Appendix A.

In order, to test the robustness of the specification of our core regression, we augmented it with government capital spending to capture its impact on private investment and in turn on economic growth. Our main results are virtually unchanged and the coefficient associated with government capital spending is not statistically significant. Our results are also robust when using a three-year average data frequency instead of a yearly frequency in order to smooth out the business cycle.

Table 2. Growth Regressions

Dependent variable: NH-GDP Growth	OLS Fixed Effects (1)	GMM-SYS (2)
Initial NH-GDP per capita	-0.2434***	-0.0827
	(0.0482)	(0.0536)
Spending	-0.0646**	-0.183**
	(0.0299)	(0.0808)
Institution	0.0036**	0.0156***
	(0.0014)	(0.0037)
REER	0.0004	0.0001
	(0.0005)	(0.0016)
R-squared	0.678	
Hansen test		0.162
Serial correlation test (first order)		0.014
Serial correlation test (second order)		0.178
Number of countries	25	25
Observations	221	221

Country dummies are included in the various specifications but estimates are not shown.
Observations with excessively high leverage have been dropped from the sample.
Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Testing whether more openness dampens the adverse effect of government current spending on non-hydrocarbon GDP growth

We further test the theoretical prediction that a higher degree of openness on international goods and capital movements dampens the reduction in investment in the private non-hydrocarbon sector generated by the expectation of government current spending. To do so, we augment the baseline specification with an interaction term between government current spending and an index of restriction to international capital and goods movements, as discussed previously. $Restrictions_{it}$ is a simple average of four dummies of exchange arrangements and exchange restrictions taken from taken from IMF (2007b) namely the presence of multiple exchange rate practice, current account restrictions, capital account restrictions and surrenders of exports. A value of one for the $Restrictions_{it}$ indicator implies that the country is closed to international movements of goods and capital and zero implies that the country is open to those movements. Other proxies, such as de facto openness to movements of goods and services, non-hydrocarbon openness were considered but not selected. Given the lack of diversification of most oil-exporting economies, that indicator is more likely to capture the lack of diversification than the degree of openness of government policies towards international trade in goods and service. In addition, indicators such as de facto financial integration are likely to capture large accumulation of foreign assets financed through large oil revenues rather than the degree of openness of government policies toward capital movements.

The results, presented in Table 3, support the theoretical predictions that fewer restrictions dampen the negative impact of government current spending on non-hydrocarbon sector development. We focus on column (4) that uses a specification excluding the variable *Institution* from the specification. Indeed, *Restriction* is likely to be collinear with *Institution*. The coefficients associated with *Spending* and its interaction with *Restriction* need now to be considered together to assess the adverse effect of current spending on the performance of the non-hydrocarbon sector. As shown in Appendix A, *Restriction* ranges from zero to one. Thus, the absence of restrictions on goods and capital movements in a given country will lead to a positive impact of current spending on non-hydrocarbon sector development as indicated by the coefficient associated with current expenditure in column (4) in Table 3. In the opposite case where there would be a high degree of restriction to goods and capital international movements in a given country, the implied coefficient associated with the impact of current spending equals 0.29 minus 0.70, which is negative.

Table 3. Growth Regressions using Restrictions on Trade and Capital Flows

Dependent variable: NH-GDP Growth	OLS Fixed Effects (1)	GMM-SYS (2)	OLS Fixed Effects (3)	GMM-SYS (4)
Initial NH-GDP per capita	-0.2544***	-0.1474***	-0.2477***	-0.2154***
	(0.0474)	(0.0535)	(0.0483)	(0.0944)
Spending	-0.0354	-0.0285	-0.0488	0.291**
	(0.0484)	(0.117)	(0.0476)	(0.141)
Institution	0.0035**	0.0121***		
	(0.0014)	(0.0040)		
REER	0.0003	0.0005	0.0005	0.0021
	(0.0005)	(0.0014)	(0.0005)	(0.0020)
Restriction	0.154	0.889	0.217	2.254**
	(0.253)	(0.687)	(0.246)	(0.921)
Spending × Restriction	-0.0590	-0.275	-0.0780	-0.701**
	(0.0802)	(0.210)	(0.0774)	(0.308)
R-squared	0.68		0.67	
Hansen test		0.729		0.510
Serial correlation test (first order)		0.039		0.056
Serial correlation test (second order)		0.147		0.077
Number of countries	25	25	25	25
Observations	221	221	221	221

Country dummies are included in the various specifications but estimates are not shown.
Observations with excessively high leverage have been dropped from the sample.
Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Appendix B presents the empirical results with mixed support for the impact of altruism on the income effect channel of the resource curse.

IV. Conclusion

The paper provides an alternative explanation for the "resource curse" based on the income effect resulting from the high level of government current expenditures in resource rich economies. Using a simple life cycle framework, we show that private investment in the non-resource sector is negatively affected by current transfers financed through natural resource revenues. This happens because expectation of transfers dampens savings within the economy. We show that higher degrees of openness and forward altruism reduce this adverse effect. We find empirical support for the main theoretical predictions by estimating non-hydrocarbon sector growth regressions using panel data for 25 oil-exporting countries over the period 1992 to 2005. Policy implications for dampening this channel of resource curse would be to limit current transfers, further liberalize international goods and capital movements and introduce policies that promote domestic private investment.

This paper studies the resource curse in the standard context of capital accumulation and growth. However, our model is rich enough to study welfare implications of this channel of resource curse.

Our model can be extended in a number of directions. Including human capital accumulation could potentially link lower investment in human capital to the provision of such high transfers in resource-rich countries. Allowing for labor supply endogeneity will enable us to explain lower labor supply in resource rich countries resulting from the expectation of future transfers. Those model extensions will allow for a richer income effect explanation of the resource curse.

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Appendices

Appendix A. Data

Table 4. Data Description

Database	Units	Descriptor	Code
Ossowski and al. (2006) and World Bank (2007)	Percentage	Non-hydrocarbon PPP adjusted GDP annual growth per capita	NH-GDP Growth
Ossowski and al. (2006) and World Bank (2007)	Per capita constant international US$ PPP adjusted	One year lagged non-hydrocarbon GDP	Initial NH-GDP
Ossowski and al. (2006)	Percentage of non-hydrocarbon GDP	Central government current expenditures	Spending
ICRG (2006)	Index number	Institutional quality	Institution
IMF (2007c)	Percentage	lagged value of REER rate of change	REER
IMF (2007b)	Index number	Restrictions on goods and capital movements (average)	Restriction
Ossowski and al. (2006)	Percentage of non-hydrocarbon GDP	Non-hydrocarbon exports plus imports over non-hydrocarbon GDP	NH-openness
Ossowski and al. (2006)	Percentage of non-hydrocarbon GDP	Central government capital expenditures	Capital investment
Ossowski and al. (2006)	US$/barrel	Natural logarithm of crude oil export unit value	Oil price

Table 5. Descriptive Statistics

id	Country	NH-GDP Growth mean	NH-GDP Growth stdv	Spending mean	Spending stdv	Institution mean	Institution stdv	REER mean	REER stdv	Restriction mean	Restriction stdv
1	Algeria	-4.3	8.4	32.0	2.2	2.3	0.3	-2.3	10.3	0.8	0.0
2	Angola	1.9	22.7	97.3	26.4	2.2	0.3	1.0	65.9	0.8	0.1
3	Azerbaijan	10.4	27.2	28.2	6.9	2.8	0.1	-1.6	7.2	0.5	0.2
4	Bahrain	0.9	7.0	29.4	1.4	3.7	0.4	-0.9	4.6	0.0	0.0
5	Brunei	n.a.	n.a.	71.7	9.4	4.4	0.2	-0.7	3.2	0.4	0.1
6	Cameroon	0.2	9.3	16.2	1.8	2.2	0.4	-2.8	12.9	0.7	0.2
7	Chad	-1.8	6.3	10.0	1.5	n.a.	n.a.	-3.0	13.7	0.7	0.1
8	Congo	-6.0	18.0	51.1	7.0	2.5	0.2	-0.1	12.0	0.7	0.1
9	Ecuador	-2.7	9.2	21.6	1.7	3.1	0.2	2.3	15.3	0.4	0.3
10	Equatorial Guine	-1.6	16.7	36.2	14.6	n.a.	n.a.	0.9	13.8	0.7	0.1
11	Gabon	-4.2	13.7	35.2	5.1	2.5	0.3	-3.4	12.1	0.7	0.1
12	Indonesia	-0.7	8.1	13.5	4.6	2.4	0.6	-2.1	25.1	0.1	0.1
13	Iran	-2.4	5.8	19.5	3.4	3.7	0.6	-0.3	17.0	0.8	0.2
14	Kazakhstan	3.0	6.0	20.7	1.9	3.3	0.1	3.5	13.1	0.6	0.2
15	Kuwait	-3.8	14.7	78.2	18.8	3.6	0.3	0.0	4.4	0.0	0.0
16	Libya	n.a.	n.a.	46.6	17.2	n.a.	n.a.	-15.6	30.4	0.8	0.1
17	Mexico	-0.5	3.8	21.4	0.9	3.0	0.3	-0.3	14.5	0.2	0.2
18	Nigeria	0.5	12.5	39.3	16.2	2.1	0.6	3.4	29.6	0.8	0.2
19	Norway	0.4	4.5	53.8	2.7	5.2	0.2	-0.2	3.5	0.1	0.2
20	Oman	-0.3	10.2	55.6	3.9	3.8	0.2	-2.3	4.6	0.1	0.1
21	Qatar	n.a.	n.a.	62.8	4.3	3.8	0.4	1.1	4.2	0.1	0.1
22	Russia	2.6	4.7	43.2	1.9	2.4	0.4	3.2	17.1	0.7	0.2
23	Saudi Arabia	-1.5	7.3	50.3	5.6	3.5	0.2	-1.2	4.6	0.0	0.1
24	Sudan	1.2	3.1	11.7	5.3	1.3	0.3	2.4	13.4	0.6	0.3
25	Syria	-3.0	6.8	21.7	2.9	3.7	0.4	-1.9	5.3	1.0	0.1
26	Timor	n.a.	n.a.	15.9	4.8	n.a.	n.a.	n.a.	n.a.	0.0	0.0
27	Trinidad and Tob	0.3	7.1	33.7	2.6	2.9	0.4	-0.7	4.5	0.1	0.1
28	UAE	-1.9	6.6	40.0	6.6	3.2	0.2	1.1	4.6	0.0	0.0
29	Venezuela	-4.8	8.1	25.0	4.7	3.2	0.4	2.6	16.1	0.4	0.4
30	Vietnam	3.9	2.1	16.8	1.6	3.4	0.3	0.9	5.4	0.7	0.1
31	Yemen	-2.6	9.4	34.3	6.4	2.7	0.5	6.8	9.6	0.3	0.4
	median	-0.7		33.7		3.1		-0.2		0.5	

Table 6. List of Countries Included in the Sample

Asia	*Middle East and Central Asia*	*Sub-Saharan*	*Europe*	*Western Hemisphere*	
Indonesia	Algeria	Angola	Norway	Ecuador	
Vietnam	Azerbaijan	Cameroon	Russia	Mexico	
	Bahrain	Congo		Trinidad and Tobago	
	Iran	Gabon		Venezuela	
	Kazakhstan	Nigeria			
	Kuwait				
	Oman				
	Saudi Arabia				
	Sudan				
	Syria				
	UAE				
	Yemen				
		Number of countries:			Total
2	12	5	2	4	25

Appendix B. Testing for Whether a Higher Degree of Altruism Dampens the Adverse Effect of Government Current Spending on Non-Hydrocarbon GDP Growth

We test the theoretical prediction that a higher degree of forward altruism dampens the adverse impact on saving resulting from current expenditure on non-hydrocarbon sector growth. To do so, we augment the core specification with an interaction term between current spending and regional dummies.[13] Therefore, we proceed to proxy altruism using regional dummies. The results are presented in Table 7. Column (1) indicates that Western Hemisphere followed by Middle East are the most severely affected by the impact of current spending on non-hydrocarbon sector growth even after controlling for institutional quality. Indeed, the coefficient associated with the individual effect of government spending on non-hydrocarbon GDP growth by default corresponds to that effect on the Western Hemisphere. Indeed, in column (1), the coefficient associated with the interaction between government current spending and Middle East dummy is estimated to be 0.20, which is lower than the absolute value of the negative coefficient associated with government current spending, 0.26. However, it should be noted that column (2) in Table 7, which uses GMM techniques and corrects for potential endogeneity bias, does not indicate any significant interactive effect of government spending with regional dummies. Those results should be interpreted with caution, given the small number of countries that we could include in those regional groups (due to data availability) and the questionable adequacy of using dummies to capture the degree of altruism.

[13] Survey data could be used to proxy the degree of forward altruism but such data is not available for many of the countries in our sample.

Table 7. Growth Regressions using Regional Dummies

Dependent variable: NH-GDP Growth	OLS Fixed Effects (1)	GMM-SYS (2)
Initial NH-GDP per capita	-0.2518***	-0.1699**
	(0.0495)	(0.0786)
Spending	-0.260**	-0.0578
	(0.109)	(0.105)
Spending × Africa Dummy	0.188	-0.0697
	(0.115)	(0.0436)
Spending × Asia Dummy	0.274**	0.0002
	(0.107)	(0.0243)
Spending × Middle East Dummy	0.197*	0.0228
	(0.117)	(0.0345)
Spending × Europe Dummy	0.444	-0.0699
	(0.278)	(0.126)
Institution	0.0035**	0.0157***
	(0.0016)	(0.0053)
REER	0.0002	0.0011
	(0.0005)	(0.0013)
R-squared	0.68	
Hansen test		0.949
Serial correlation test (first order)		0.019
Serial correlation test (second order)		0.191
Number of countries	25	25
Observations	221	221

Country dummies are included in the various specifications but estimates are not shown.
Observations with excessively high leverage have been dropped from the sample.
Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Appendix C. Regional integration of two large open economies

Consider a world with only two economies, home and foreign, each similar to the closed economy studied in subsection A. The home economy variables are exactly like before. The foreign variables will be differentiated with "*" superscripts (e.g., l^*, k^* …). The world economy variables will has superscript "w". Assume have different populations, but have are the same in other parameters (α, β, and A_t). In addition, assume that capital markets of the two countries are open to each other. The latter assumption leads to the equalization of interest rates (r_t) in both countries. Capital transition equation of the world economy will be as follows:

$$k_{t+1}^{w} = (1-\alpha)(1-\beta)A_t k_t^{w\beta} + (1-\alpha)g_{yt}^{w} - \frac{\alpha}{1+r_{t+1}} g_{ot}^{w}$$

Where,

$$k_t^{w} = \frac{Nk_t + N^* k_t^*}{N+N^*} \ , \ g_{yt}^{w} = \frac{Ng_{yt} + N^* g_{yt}^*}{N+N^*} \ , \ g_{ot}^{w} = \frac{Ng_{ot} + N^* g_{ot}^*}{N+N^*}$$

The analysis for the effects of changes in spending will be qualitatively similar to the closed economy, with two differences: in the large open economy case, changes in spending in the home country will also affect the foreign country, and have dampened effect for on the home country with a factor of $\frac{N}{N+N^*}$. For example, if g_{ot} increases will cause resource curse in both home and foreign countries, but the magnitude of curse at home will smaller than the case of closed economy.