Economics of the Resource Curse

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Background & Motivation

Expectation: Increased endowments should promote economic development and translate into more production.

View in 1950s (Vines, Lewis, Sprengler): Developing countries suffer from imbalance between labor and capital.

Resource abundance: export primary commodities or attract foreign investment, collect rents + provide public goods.

Some quotes…

- "*The possession of a sizable and diversified natural resource base is a major advantage to any country embarking on a period of rapid economic growth*" (Ginsburg, 1950)
- "*… natural resource endowments would enable developing countries to make the transition from underdevelopment to industrial 'take of*…" (Rostow 1961)
- "*Natural resources could facilitate a country's economic development by providing domestic markets and investible funds*" (Krueger 1980)

→ mainstream view: natural resources are a blessing.

This can be tested… regress average growth rates (1970-1990) on a number of explanatory variables…

variables	
Log GDP 1970	-1.8 (8.9)
Resource abundance	**-9.9** **(6.5)**
openness	1.3 (3.2)
Log investment	0.8 (2.4)
rule of law (!)	0.4 (3.8)
terms of trade change	0.1 (2.1)
prior growth	0.02 (0.2)
R^2	0.76
N	69

But…

Sachs & Warner (1995, 1997, 2001): Resource-abundant countries grow *slower* than resource-poor ones (casual inspection and regression analysis) → **resource curse rather than a blessing**

If resource endowment rises by one standard deviation → one percent fall in economic growth… A paradox!

Immensely popular research topic. Extremely influential: picked up by World Bank, IMF, many NGOs (e.g. Save the Children, Oxfam). Good story.

Many underdeveloped countries are resource-rich … Should they turn their backs to their resource base, or implement specific policies to turn the curse into a blessing?

"… *the conventional wisdom now is arguably the exact opposite of what it was prior to the late 1980s*" (Rosser 2006)

Organization of the talks

- Manifestations of the curse
  - Economics, conflict and politics
- Economic outcomes: some key empirical results
- Overview of the "economic mechanisms"
  - Story telling and model building
- Towards a consensus? A focus on the institutional angle
  - Fit within emerging literature on "endogenous institutions" (~ Acemoglu)
- Application: Resources and development indicators
- Policy recommendations
- Some exciting new results… re-examining robustness of the curse
- Conclusions and suggestions

Manifestations of the Curse

1. Conflict and civil war.

   Resources affect the onset and duration of (civil) wars. Greed and grievances (Collier and Hoeffler). Non-monotonous relation between resources and war.

2. Political regimes.

   Resources are associated with low levels of (and slow transition to) democracy. 1% more resource abundant, probability of authoritarian rule goes up by 8% (Wantchekon). Special role for oil? (Ross)

3. Slow economic growth and underdevelopment – rest of the talk

Do these manifestations hang together? Probably.
Do we understand the nature of the causality? Not really.
Is there a potential role for omitted variables? Perhaps (IQ)

Empirics of the resource curse

- Mostly "Barrow-type-growth regressions" with (primary exports)/GDP as key regressor, and in-depth case studies of political scientists (Karl on Venezuela, Ross on Indonesia, etc.)
- Vary abundance variable? Mixed results. Reserves and production data (Stijns; Norman), rents/government revenue (Herb), reserves/capita (de Soyza), labor in primary sector (Gylfason), resource rents
- Change in genuine income as dependent variable? Evidence of a curse (Neumayer)
- Development proxies as dependent variables? Mixed evidence (Davis; Bulte et al; Ross)
- Resource abundance and net savings: evidence of a curse (Atkinson & Hamilton)
- Panel structure? Much weaker results (Murshed; Manzano & Rigobon) (?)
- Distinguish between different types of resources: *point* vs *diffuse*. Relevant for all three dimensions of the curse (oil and diamonds versus arable land).

Example: point resources (Wick & Bulte 2006, Public choice)

- Point resources associated with conflict and poor development.
- Model with 2 rebel tribes, contesting a "prize"
- Rebels allocate time to working *W* and fighting *F*
- The opportunity cost of conflict can be endogenous (affected by the intensity of conflict)
- Contest function: $p_1 = (F_1)^m/[(F_1)^m+(F_2)^m]$, and $p_2=(1-p_1)$
- We interpret *m* as a pointiness parameter… as it captures how close the contest is to a winner-takes-all event.
- m=0: you always get half the prize, m $\rightarrow\infty$: step function

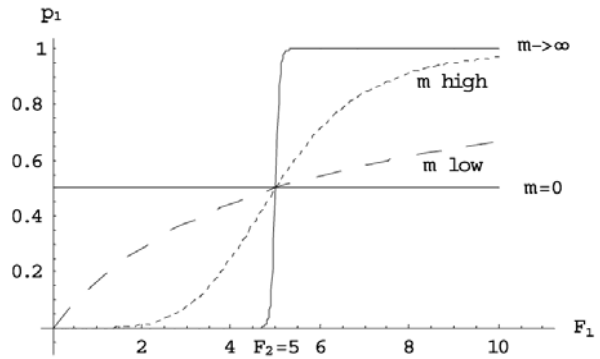


Figure 1. Contest success function for $F_2 = 5$.

Pointiness example

- Two stage game:
  - Rebel leader decides to enter contest, or not.
  - If enter: decide about allocation of effort.
- If both groups enter: Cournot game.
- 2nd stage Max $\Pi_i=\Pi_{iW}+\Pi_{iF}=A_cW_i+p_i(F_i,F_j)R$

$$\frac{\partial f(W_i)}{\partial W_i} = \frac{\partial p_i(F_i, F_j)}{\partial F_i} \cdot R. \quad \longrightarrow \quad F_1^* = F_2^* = \frac{mR}{4A_C}$$

Pointiness

- Note: contest intensity depends on pointiness…
- If *R* is not too great, a coordination game emerges, where different outcomes are possible:
  - 2 coordinated outcomes: contest-acquiesce, and a-c
  - Mixed strategy with 4 possible outcomes: aa, ac, ca, cc
- For sufficiently pointy resources, *m*>2, tribes can get caught in a "contest trap" where the value of resources lost due to rent seeking exceed than value of the resource rent…
- Increasing *m* may be bad or good for development
  - If there is conflict, high *m* is always bad (more fighting)
  - But high *m* can also deter conflict (as the costs are perceived as high). [Consistent with evidence presented by Ross]

Causes of the curse

- Inevitable structural problems associated with exports of primary products (declining terms of trade, price fluctuations, lack-of-linkages ('enclaves'), unavoidable-Dutch-disease-like-problems (exchange rate appreciation, allocation of talent and IRS at sector level?)? There is very little evidence for this.
- Instead it seems that the immediate cause of the resource curse is the mis-management of resource rents. Political scientists and economists agree. But then…
- … why do we observe wasteful treatment of resource rents? What is the underlying cause? At least 5 different stories can be told…

1. Behavioral perspective

- Resource riches result in emotional and irrational behavior of policy makers.
- Not all that popular among economists…

2. Historical-structural perspective

- Resource rents benefit certain social groups in society, affecting power distribution.
- E.g. Latin America: resource rents benefit business elite with interests in import substitution industrialization (preventing the emergence of a competitive industry).

3. Radical perspective

- Natural resource riches make a country a target for forced incorporation into the global capitalist system.
- Dominant countries will politically and militarily intervene to protect oil interests, say.
- Corruption and oppression of certain governments is tolerated by international community (Mbutu, Suharto, Hussein, etc.) if international business can extract the resources.

4. State-centered perspective

- Resource rents will result in "rentier states" where politicians can "buy" peace or oppress the people.
- No taxing of the people, hence limited accountability of actions (limited knowledge about what the people want)
- More geared towards distribution than towards production and/or regulation.
- Frequent use of protectionist policies (because of Dutch disease arguments).

5. Rational actor perspective

- This is where economists have contributed most
- Resources invite rent seeking, slowing growth
  - Corrupt governments (rent seizing, corruption). Permanent or temporary "booms"? Influence elections? (Robinson et al)
  - Allocation of talent across sectors (Torvik).
- Two approaches:
  - Take institutional context as given (5A)
  - Treat institutional context as endogenous (5B).

5A: Basic rent seeking models

Resource booms → bribery, rent seeking and policy distortions.

Torvik (2002): resource abundance increases the payoffs from unproductive rent seeking → induces more rent seeking → lowers overall growth

Problem: Deterministic models with blunt predictions

→ all resource rich countries should suffer from the "curse". But there are many notable exceptions: Malaysia, Australia, Norway, Botswana and Canada.

Need to explain resource successes and the resource failures…

5A: Rent seeking with multiple equilibria

- Based on Mehlum et al (EJ, 2006).
- Empirical observation: if we divide set of countries into 2 sub-samples, the "curse" only exists for countries with "bad" institutions.
- How are resource rents distributed? (institutions)
  - producer friendly institutions (rent seeking and production are complementary activities)
  - grabber friendly institutions (rent seeking and production are competing activities)

  → Key mechanism: allocation of people/talent across sectors; specialize in unproductive rent seeking, or not?

A grabbing-*vs*-production-model

- $N = N_p + N_g$ (entrepreneurs = prod + grabbers)
- Institutional quality, λ, determines returns to grabbing ~ fixed and exogenous in what follows.
  - $\lambda = 0$: grabbers grab unconstrained, $\pi_g = R/N_g$.
  - $\lambda = 1$: grabbers earn nothing extra, $\pi_g = R/N$.
- General:
  - $\pi_g = sR/N_g$ and $\pi_p = \pi + s\lambda R/N_g$
  - $(1-\alpha)s + \alpha\lambda s = 1$ (no waste: division of rents, $\alpha=N_p/N$): so that we get the contest function $s = 1/[(1-\alpha)+\alpha\lambda]$.
  - Production in the big push tradition (complementarities between industries)

Model cont'd

- *L* workers, *M* goods (which can be produced by a modern firm or competitive fringe with CRS)
- Wage = price = 1
- IRS in modern firm, requires *F* units of labor (fixed cost), each extra worker produces $\beta>1$ (MC=$1/\beta$)
- Equal expenditure shares in consumption, inelastic demand, Bertrand competition:
  - All *M* goods are produced in equal quantities *y* (total production=*My*)
  - Each good is produced by one modern firm or the fringe (depending on the size of the market).
  - Modern production: $\pi = (1 - \beta^{-1})y - F$.
  - Income in the economy $Y = My + R = N[\alpha\pi_p+(1-\alpha)\pi_g] + L$
    - No modern firms: $Y = L+R$
    - Full modernization: $Y = \beta(L-MF)+R$ (which we assume > $L+R$)

Solving the model

- Note: $\pi_p=\pi(\alpha N)+\lambda\pi_g$, profits of producers are increasing in the number of producers (as the size of the market increased with α).
- Profits of grabbers are also increasing in α (rents have to be shared with fewer other grabbers)
- Assume $R/N < \pi(0)$: some modern production.
- Figure (π_p and π_g against α)
  - All entrepreneurs are producers (α=1, good institutions) $Y = N\pi(N) + R + L$
  - Grabber equilibrium (stable): mixed outcome ($1<\alpha<1$, bad institutions) $\pi_p = \pi_g$ so that $Y = N\pi(N)/(1-\lambda) + L$
  - There is a critical level of institutional quality that determines where the system ends up. This critical level is endogenous, depending on the magnitude of the rents (*R*).

key proposition

- Resources are a blessing in a production equilibrium (raising incomes). Resources are a curse in a grabber equilibrium (lowering incomes). [π_g shifts up, α falls]
- Testing the theory by a Sachs-Warner sort of regression that includes a new interaction term: (resources) × (institutions).
  - This variable is significant and positive, confirming the theory. Institutional context matters

5b: Towards a consensus…

- Institutions matter for the curse, but can we take the institutional setting as given?
- The "political regimes" and "conflict" literatures suggest we cannot.
- The three dimensions of the curse seem to come together …

5B. Preliminary support…

Ongoing empirical work (Leite and Weidman 2002, Sala-i-Martin and Subramanian 2003, Isham et al 2003, Murshed 2003).

LW: the adverse effect of resources seems to be **indirect** through the level of corruption, the resource curse disappears…

SS and I: use more proxies of institutional quality, and confirm the LW results.

[→ fits in wider literature: *Sokoloff & Engerman, Acemoglu et al, Easterly & Levine, Rodrik: "Institutions Fundamentalism"*]

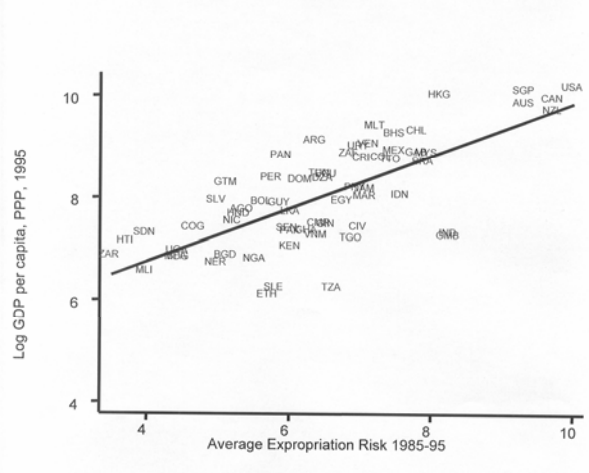
Endogenous institutions?

Historical approach (Acemoglu et al. AER 2001): use data on settler mortality in 17th and 18th century as an instrument for 'institutions' (Engerman & Sokoloff JEP 1997)

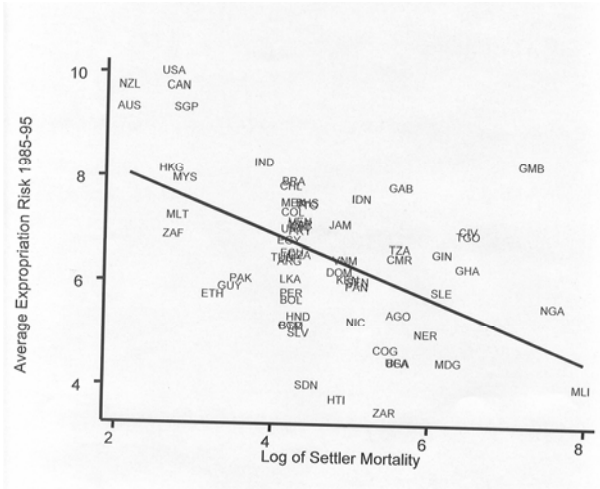
Main idea: in places where Europeans did not want to settle they were more likely to set up extractive systems. Such systems are perpetuated because they serve powerful interests…

Mortality → settlements → early institutions → current institutions → current economic performance

Linking institutions to income… Causality?



Linking mortality to institutions… IV



Endogenous institutions…

- Institutions dominate geography as a direct explanatory variable (but multiple channels exist).
- Follow up work (e.g. Easterly & Levine JME 2003) on explaining growth confirms this – "*institutions rule*".
- Colonial history also affected institutional development of the 'colonizers' (Acemoglu et al, AER 2005): Atlantic trade as a 'driver,' but power of the king matters (UK, NL versus Spain, Portugal)
- The resource curse literature seems to fit right into this! (~another dimension of "geography")

Why do resources erode institutions?

- Acemoglu's view on the origins and development of institutions:
  - Efficient institutions view (Coase)
  - Ideology/beliefs view (Bush)
  - Incidental institutions view (luck, monkey testicles)
  - *Social conflict view*: institutions are developed because they serve the interests (=maximize rents) of the elite, and they are perpetuated for the same reason.

Incidental view: example (monkey-testicle approach)

- Some primate species have huge testicles, and other species have very muscular males.
- This is a product of evolution through natural selection…
- Does a similar "story" hold for human societies?

species	Male / Female weight	Testicle / body weight	Socio-sexual system
Gibbon	1.0	0.6	M F
Orang utan	1.7	0.4	M FFF
Gorilla	1.9	0.2	M FFF
Chimp	1.2	2.7	MMM FFF
Bonobo	1.1	3.1	MMM FFF
Humans	1.2	0.3	?

Thought experiment…

Analogy: assume the ruler is the male and groups of female primates are a pointy resource (that rulers can defend against other males)…

… and that willingness to purchase and use arms is analogous to the propensity to develop powerful muscles …

… then, would it not be true that, in an evolutionary game context, aggressive/oppressive rulers emerge in societies characterized by pointy resources, and different rulers in societies characterized by diffuse resources?

Social conflict view: example political economy appoach

- Model with two sectors: manufacturing and resource harvesting.
- Government provides sector-specific public good B_x.
- Firms in sector x lobby (pay bribes) to receive more B_x.

→ Grossman – Helpman 'policy for sale' model (but augmented with a 'challenger' for the policy maker)

Results…

- **Result 1.** In non-democratic regimes – no challenger – a resource boom / discovery induces a curse. This is because the boom results in extra bribing by the resource sector. (through wages)
- **Result 2:** When the political constraint binds, the effects of a resource boom / discovery are ambiguous. Slower of faster growth. (the challenger disciplines the incumbent).
- **Empirical results:** (1) LW: more bribing/corruption in resource rich countries. (2) The curse disappears in S-W regressions when introducing a democracy variable. Consistent with the theory.

Taking stock…

- Resource abundance is associated with conflict, bad institutions and slow growth.
- These things seem to hang together
- The exact nature of the linkages is as yet ill understood (but there are several candidate theories)
- We need more modeling and empirical testing, and collaboration between economists and other social scientists, to enhance our understanding…

Consensus…

- There are still opposing views on the origins of the curse, but the following quote from a World Bank publication captures the mainstream view:

"*Natural resource exports can damage institutions (including governance and the legal system) indirectly—by removing incentives to reform, improve infrastructure, or even establish a well-functioning tax bureaucrcay—as well as indirectly—by provoking a fight to control resource rents. … There is growing evidence that [this] effect is the most problematic*."

Harford and Klein (2005)

Application of the mainstream view: The curse and development

- I was a believer, too. (Bulte et al, 2005, *World Dev*.)
- Used development indicators vs income growth
  - Life expectancy, access to clean water, HDI, food
- From Δlevel to level;
  - Closer to welfare than GDP?
  - Also captures distribution (basic needs)
- Especially point resources are "bad" for institutions

Approach

- We estimated 3 equations:
  - Development indicators (DI) as a function of the usual suspects + resource abundance NR (not controlling for IQ);
  - IQ as a function of several variables, including NR;
  - DI as a function of IQ and NR (and control variables)

	HDI	Undernourished population	No Water	Life expectancy
Point resources				
Constant	-0.54**	136.05**	99.3**	-8.82
	(-5.29)	(5.62)	(4.01)	(-0.99)
GDP/cap 1970	0.16**	-16.31**	-10.46**	9.28**
	(12.67)	(-5.01)	(-3.21)	(8.73)
Investment price 1970	-0.13**	14.43**	11.28**	-8.18**
	(6.97)	(4.42)	(3.22)	(-5.09)
Point resources	-0.001**	0.14**	0.14**	-0.05*
	(-2.48)	(2.12)	(2.15)	(-1.83)
% Eur. language	0.03	12.01*	-4.16	3.35
	(0.99)	(1.90)	(-0.67)	(1.45)
% English	-0.02	-4.87	-8.66	-3.86
	(-0.58)	(-0.48)	(-0.81)	(-1.14)
	R^2=0.84	R^2=0.46	R^2=0.41	R^2=0.73
Diffuse resources				
Constant	-0.67**	140.62**	93.32**	-23.35**
	(-5.14)	(5.33)	(3.26)	(-2.13)
GDP/cap 1970	0.17**	-15.46**	-8.67**	10.56**
	(11.45)	(-4.90)	(-2.58)	(8.68)
Investment price 1970	-0.12**	13.42**	9.69**	-7.47**
	(-6.13)	(4.11)	(2.76)	(-4.68)
Diffuse resources	0.0005	-0.11*	-0.026	0.05*
	(1.36)	(-1.84)	(-0.37)	(1.77)
% Eur. Language	0.03	10.32*	-9.43	3.05
	(0.96)	(1.68)	(-1.46)	(1.29)
% English	-0.03	-4.68	-4.34	-4.26
	(-0.71)	(0.46)	(-0.38)	(-1.22)
	R^2=0.82	R^2=0.44	R^2=0.38	R^2=0.73

Result 1:

We obtained similar results as Sachs & Warner for our alternative measure of economic performance (development indicators as opposed to average economic growth). At least: this is true when we considered "point resources."

Now turn to step 2…

	RL	RL	GE	GE
GDP/cap 1970	0.41**	0.52**	0.35**	0.49**
	(3.01)	(3.78)	(2.22)	(3.07)
Enrollment	0.03**	0.02**	0.03**	0.02**
	(5.17)	(3.03)	(4.57)	(2.67)
Investment price	-0.25	-0.36**	-0.20	-0.27
	(-1.68)	(-2.31)	(-1.14)	(-1.49)
% English	-0.07	0.19	-0.20	0.05
	(-0.23)	(0.56)	(-0.52)	(0.13)
%Eur. language	-0.15	-0.30	0.02	-0.12
	(-0.68)	(-1.34)	(0.09)	(-0.45)
Constant		-4.26**		-4.02**
		(-4.22)		(-3.42)
Diffuse resources	-0.022		0.03	
	(0.90)		(0.99)	
Point resources		-0.007**		-0.009**
		(-2.68)		(-2.87)
	R^2=	R^2=0.73	R^2=	R^2=0.65

Step 2: We have found a negative association between point resource abundance and institutional quality.

This applies to:

Rule of Law: property right security etc

Government effectiveness: quality of bureaucracy

But also to another IQ variable we have examined:

Voice and Accountability: democracy

Is there a direct effect of NR, in addition to this indirect effect?

(=step 3)

	HDI	Undernourished population	No Water	Life expectancy
Point resources				
Constant	-0.31** (-2.55)	75.24** (3.70)	88.26** (3.64)	2.35 (0.21)
GDP/cap 1970	0.12** (8.33)	-8.07** (-3.16)	-9.37** (-3.08)	7.92** (5.78)
Investment price	-0.11** (-6.14)	7.68** (2.56)	9.91** (2.90)	-7.61** (-4.53)
Point resources	-0.0005* (-1.68)	0.04 (0.79)	0.14** (2.27)	-0.04 (-1.41)
Rule of Law	0.04** (2.92)	-11.38** (-4.42)	-6.00** (-2.05)	1.98* (1.64)
	R^2=0.86	R^2=0.57	R^2=0.43	R^2=0.74
Diffuse resources				
Constant	-0.38** (-2.77)	78.20** (3.71)	85.82** (3.16)	-7.99 (-0.66)
GDP/cap 1970	0.13** (8.13)	-7.94** (-3.31)	-8.11** (-2.61)	8.63** (6.21)
Investment price	-.10** (-5.39)	7.42** (2.65)	8.81** (2.59)	-6.61** (-4.10)
Diffuse resource	-0.0005* (-1.68)	-0.05 (-0.91)	-0.04 (-0.67)	0.06** (2.08)
Rule of Law	0.05** (3.40)	-11.61** (-5.00)	-7.50** (-2.59)	2.75** (2.47)
	R^2=0.85	R^2=0.57	R^2=0.41	R^2=0.73

I was quite satisfied with these findings…

- There appears to be a 'resource curse' for development indicators
- Natural resource abundance is "bad" for institutional quality
- Institutional quality is important for economic performance, hence there is an 'indirect effect' of resource abundance
- Controlling for this indirect effect, there is little evidence of a direct effect (dutch disease etc).
- Premature conclusion: The remaining challenge is to formalize the mechanism (Political economy model, conflict model). Give me a research grant to work on this!

How to overcome the curse: Policy recommendations

- Obviously, recommendations depend on the mechanism that you believe in (will be different for believers in the *radical perspective* than for mainstream economists).
- Stabilisation funds to overcome commodity price instability?
- Believers in '*rentier state'* problems: recycle all revenues to citizens, and then tax them.
- Economists typically suggest petro-funds (Norway), investments abroad (Dutch disease), avoid large debts. Diversify economies?
- A key problem, of course, is that we don't really know how to improve institutions… Nor do we really know which institutions (economic ones, political ones) matter most. See the "development aid" literature on this.

But … have we used the right variable to measure "resource abundance"?

- Most common measure of resource abundance (Sachs & Warner): **exports of primary products/GDP**
- What about domestic consumption of resources?
- What about agricultural output (may dominate "resources")
- Isn't this variable *endogenous* to institutional design as well as actual resource abundance? Can we use this in an O.L.S.?
- Isn't this variable a proxy for the level of resource *dependence* as opposed to resource *abundance*?

➔If we interpret resource exports/GDP as a measure of economic dependence on the primary sector and treat it as an endogenous policy outcome, what are the implications for actual resource *abundance* and economic performance?

•*In a series of empirical estimations, we find the exact opposite chain of influence: weak institutions lead to higher resource abundance – at least as it is commonly defined.*

•*And the resource curse does not exist: when properly measured resource abundance is beneficial for institutional development and economic growth.*

Measuring resource abundance

- Log(resource wealth per capita) World Bank.
  - Natural capital (subsoil, cropland, timber, protected areas, etc.)
  - Subsoil wealth (fuel and non-fuel mineral stocks)
- Estimates based on valuations of the net present value of benefits over a time horizon of 25 years. "*Stock*."
- Others have used resource rents (Metcalfe), natural capital as a share of total capital (Gylfason), physical reserves (Stijns and Norman). Mixed evidence. Mostly unpublished material, and mostly OLS.

Correlations between different proxies for resource abundance

	natxp	minxp	sxp	Lnatcap
Minxp	0.84*			
Sxp	0.66*	0.72*		
Lnatcap	0.40*	0.33*	0.12	
lsubsoil	0.51*	0.51*	0.28*	0.71*

Pearson's correlation coefficients, with Spearman's rank correlations in parentheses. *sxp* is GDP share of primary resource exports in 1970 used by Sachs & Warner (1997).
* denotes significance at 5 percent level or below.

Estimation strategy

- Resource abundance can affect growth directly or indirectly (through RD or I)
- explore the underlying factors that determine resource dependence (exports/GDP) and institutional quality (the volatile type, not the "deep" one).
- analyze the impacts of resource *abundance* as well as *dependence* on economic performance and institutional quality.

(1) $I = b_0 + b_1 * \text{conditioning variables} + b_2 * \overset{(-)(+)}{RA} + \varepsilon_2$

(2) $RD = a_0 + a_1 * \text{conditioning variables} + a_2 * \overset{(+)}{RA} + a_3 * \overset{(+)}{CV} + a_4 * \overset{(-)}{I} + \varepsilon_1$

(3) $G = c_0 + c_1 * \overset{(-)(+)}{RD} + c_2 * \overset{(+)}{I} + c_3 * \overset{(-)(+)}{RA} + c_4 * \text{conditioning variables} + \varepsilon_3$

RD: resource dependence (avg resource exports/GDP 1970-1989; WDI and PWT 6.1)
RA: resource abundance (World Bank data for resource wealth pc 1994)
CV: constitutional var's (presidential system & majoritarian electoral rule in early `70s)
I: institutions (rule of law and gov't effectiveness; World Bank data for 1996).
G: economic growth (GDP pc growth 1970-2000; PWT 6.1)

Estimation results 1: Institutional quality and natural resources

	(1) rule	(2) rule	(3) goveffect	(4) goveffect	(5) rule	(6) rule	(7) goveffect	(8) goveffect
latitude	2.519***	2.972***	2.706***	2.374***	2.631***	2.887***	2.486***	2.171***
	(0.554)	(0.669)	(0.53)	(0.671)	(0.57)	(0.63)	(0.53)	(0.63)
lnnatcap	0.215***		0.209**		0.194*		0.208**	
	(0.081)		(0.082)		(0.100)		(0.093)	
lnsubsoil		0.109**		0.097**		0.110**		0.132**
		(0.041)		(0.045)		(0.051)		(0.052)
natxp					0.150		−0.098	
					(0.67)		(0.66)	
minxp						−0.194		−1.145
						(0.69)		(0.72)
Observations	89	63	89	63	83	61	83	61
F-stat	58.49***	55.24***	56.16***	43.73***	48.54***	49.04***	44.50***	37.61***
R^2	0.71	0.77	0.76	0.76	0.72	0.78	0.76	0.77

All regressions OLS; regional dummy variables included. Robust standard errors in parentheses. *, **, *** statistically significant at 10, 5 and 1 % levels, resp.

In words…

- There is a positive correlation between resource abundance and institutional quality.
  - Income effect of resource wealth?
- If we control for resource abundance, resource dependence is not significant.
- Next: look at the determinants of resource dependence (is this a proper exogenous variable?).

Estimation results: Resource dependence, constitutions and institutions

	(1) natxp	(2) natxp	(3) agrixp	(4) agrixp	(5) minxp	(6) minxp	(7) minxp	(8) minxp
pres70s	0.043**	0.060***	−0.004	0.004	0.063***	0.059***	0.05**	0.052**
	(0.020)	(0.020)	0.005	(0.0044)	(0.022)	(0.018)	(0.024)	(0.024)
maj70s	0.024	0.034*	0.005	−0.005	0.027		0.023	0.021
	(0.017)	(0.018)	(0.005)	(0.005)	(0.019)		(0.025)	(0.025)
lsubsoil		0.016***			0.016***	0.016***	0.021***	0.022***
		(0.004)			(0.005)	(0.004)	(0.006)	(0.006)
lnatcap	0.038***		0.007*	0.006*				
	(0.01)		(0.004)	(0.0031)				
open5060s	0.205***	0.272***	0.014	0.023	0.247***	0.241***	0.250***	0.257***
	(0.064)	(0.057)	(0.015)	(0.018)	(0.067)	(0.059)	(0.070)	(0.068)
rule			−0.004				−0.035**	
			(0.003)				(0.014)	
goveffect								−0.038**
								(0.016)
Obs	66	52	66	66	52	59	52	52
Estimation meth.	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Regional controls	no	no	no	yes	no	no	yes	yes
F-stat	4.16***	9.06***	0.87	0.93	6.66***	9.81***	3.37***	3.48***
R^2	0.37	0.59	0.09	0.18	0.53	0.53	0.58	0.58

Robust standard errors in parentheses. *, **, *** statistically significant at 10, 5 and 1 % levels, resp.

In words…

- Significant differences between agricultural and mineral exports (point vs diffuse resources)
- Resource dependence is endogenous, affected by (deep) institutional variables and resource abundance. We should use 2SLS approaches…
  - Conventional reasoning should be reverse: weak institutions lead to low investments (little manufacturing etc.) and, hence, to dependence on the primary sector. But this is hardly a paradox…
  - Resource abundance affects dependence directly (comparative advantage) and indirectly (through IQ). Former dominates.
- Instrumenting for IQ (see earlier results) does not matter.
- Very similar results when looking at democracies only

Here are a set of 2SLS results…

TABLE 5. MINERAL DEPENDENCE, INSTITUTIONAL DESIGN, AND GROWTH IMPACTS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
minxp	−2.862**	−2.003	−1.550	−1.718	−1.274	−1.417	0.219	−1.357	−1.779
	(1.460)	(1.72)	(1.72)	(1.57)	(1.56)	(1.56)	(1.74)	(1.78)	(2.61)
lsubsoil		0.153***	0.138**	0.086*	0.077*	0.136**	0.07	0.113*	0.141
		(0.058)	(0.055)	(0.051)	(0.046)	(0.057)	(0.086)	(0.068)	(0.18)
rule		0.671***		0.659***		0.871*		−0.170	
		(0.18)		(0.24)		(0.44)		(0.70)	
goveffect			0.506***		0.497**		1.579		-0.452
			(0.18)		(0.23)		(0.98)		(2.04)
lgdp70	0.055	−0.879***	−0.705***	−0.787***	−0.609**	−1.036***	−1.491**	−0.0846	0.115
	(0.093)	(0.18)	(0.18)	(0.24)	(0.25)	(0.36)	(0.68)	(0.59)	(1.55)
Sample	all	all	all	dems	dems	all	all	dems	dems
Endog. var.		minxp	minxp	minxp	minxp	rule	goveffect	rule	goveffect
Obs	59	58	58	40	40	59	59	41	41
F-stat 1st stage	6.47***	4.00***	4.84***	3.05**	5.22***	108.08***	96.65***	144.6***	89.24***
Excl. F-stat		6.54***	8.16***	6.08***	10.00***				
Hansen J *p*-value		0.22	0.42	0.79	0.76				
Shea partial R^2		0.43	0.46	0.48	0.56				
R^2 1st stage	0.27	0.61	0.65	0.62	0.7	0.9	0.88	0.93	0.91

In words…

- We can produce the curse with our data if we regress growth on minxp (OLS), but…
- This result disappears in a 2SLS setting, when corrected for m.e., omitted variables and reverse causality. *There is no "curse" result for RD.*
- Resource abundance is *good* for growth (direct effect in addition to indirect effect through institutions).
- 2SLS vs 3SLS.
- Similar results for democracies only.
- Similar results when we use different RA variables (per capita hydrocarbon reserves, physical reserves)

Estimation results: Mineral dependence, constitutions and institutions, and their growth impact (3SLS)

	(1)	(2)	(3)	(4)
Economic growth	*g7000*	*g7000*	*g7000*	*g7000*
minxp	−2.261	−1.652	−1.973	−1.430
	(1.39)	(1.72)	(1.54)	(1.51)
lsubsoil	0.118**	0.057	0.130**	0.110*
	(0.055)	(0.061)	(0.061)	(0.062)
rule	0.559		0.287	
	(0.39)		(0.56)	
goveffect		0.881		0.226
		(0.79)		(0.69)
lgdp70	−0.820**	−0.828	−0.632	−0.513
	(0.34)	(0.64)	(0.49)	(0.56)
R^2	0.59	0.50	0.50	0.50
Sample	all	all	dems	dems
Obs	51	51	40	40
Wald test *lsubsoil*	26.55***	22.81***	20.33***	18.88***

All regressions 3SLS; only growth results shown. Regional dummy variables included in all specifications. Wald statistics refer to hypothesis that sum of effects of lsubsoil is insignificantly different from zero. Standard errors in parentheses. *, **, *** statistically significant at 10, 5 and 1 % levels, resp.

Conclusions

The curse of natural resource abundance has been a popular topic in economics, and seems most robust for mineral resources. Common explanations for the curse cite negative effects of resource wealth on institutions and therefore on economic development

Majority of empirical work has used a measure of resource *dependence* – resource exports/GDP – as a proxy for resource *abundance*. Treating this measure as endogenous, we find that it is associated with institutional quality, but not in conventional sense.

In particular:

• weaker institutions and presidential systems are linked to higher resource dependence;

• (mineral) resource dependence has no significant growth effect;

• resource abundance (especially mineral abundance) has a positive effect on institutional quality and growth.

•*The curse could be a red herring and a scientific "hype".*