

# Resource Economics

## Lecture 5

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The resource curse (or blessing?)

# Overview

- The previous lectures have been analyzing some models and mechanisms that determine aggregate (world) extraction and price.
- This lecture is about
  - The effect on a single country of having resources.
  - No general equilibrium, resource wealth and international prices are usually exogenous.

# Why resource income should be good

- Resource income (for a single country) can be looked upon as a gift which simply expands the budget constraint:

Without resources:  $c_t = F(k_t, h_t)$

With resources:  $c_t = F(k_t, h_t) + R_t$

# Why resource income should be good - a basic theory of wealth

$$\max_{c_t} \sum \beta^t u(c_t)$$

BC without resources:

$$A_t + c_t = A_{t-1}r_t + F(k_t, h_t)$$

BC with resources:

$$A_t + c_t = A_{t-1}r_t + F(k_t, h_t) + R_t$$

Avoid infinite borrowing

$$A_t \geq \bar{A}$$

# Results

- Consumption smoothing
- A poor country which is growing should consume all of its current income (also the resource) and additionally borrow to expand consumption today. Pay back what it borrowed with the help of future resource income.
- A middle income country which is growing should consume its resource initially but not borrow. Eventually start saving the resource income.
- A high income country (which is not growing rapidly) should save most of its resource income and thereby expand future consumption.

# An additional benefit

With borrowing constraints:  $A_t \geq \bar{A} = 0 \rightarrow$

$$\max_{c_t} \sum \beta^t u(c_t) = \max_{c_t} \sum \beta^t u(F_t)$$

I.e., a poor growing country would like to borrow but cannot and hence cannot smooth consumption.

Marginal utility is very high and hence adding resources allows for very large increases in utility.

$$\sum \beta^t u(F_t + R)$$

# And another benefit

Ignore assets for a second and focus on production. Poor countries are often capital scarce and hence produce very little. While this should imply that international investors should invest in the country, this often does not happen.

$$\max_{c_t} \sum \beta^t u(c_t)$$

BC without resources:

$$k_{t+1} + c_t = F(k_t, h_t)$$

Very slow convergence to higher income.

BC with resources:

$$k_{t+1} + c_t = F(k_t, h_t) + R$$

Can spur capital accumulation in poor countries and hence leap-frog to a higher income level.

# The total result from basic theories

- All countries should gain from having resource income.
- But poor countries should gain the most since they are the most helped by consumption smoothing – i.e. high growth in the short run.



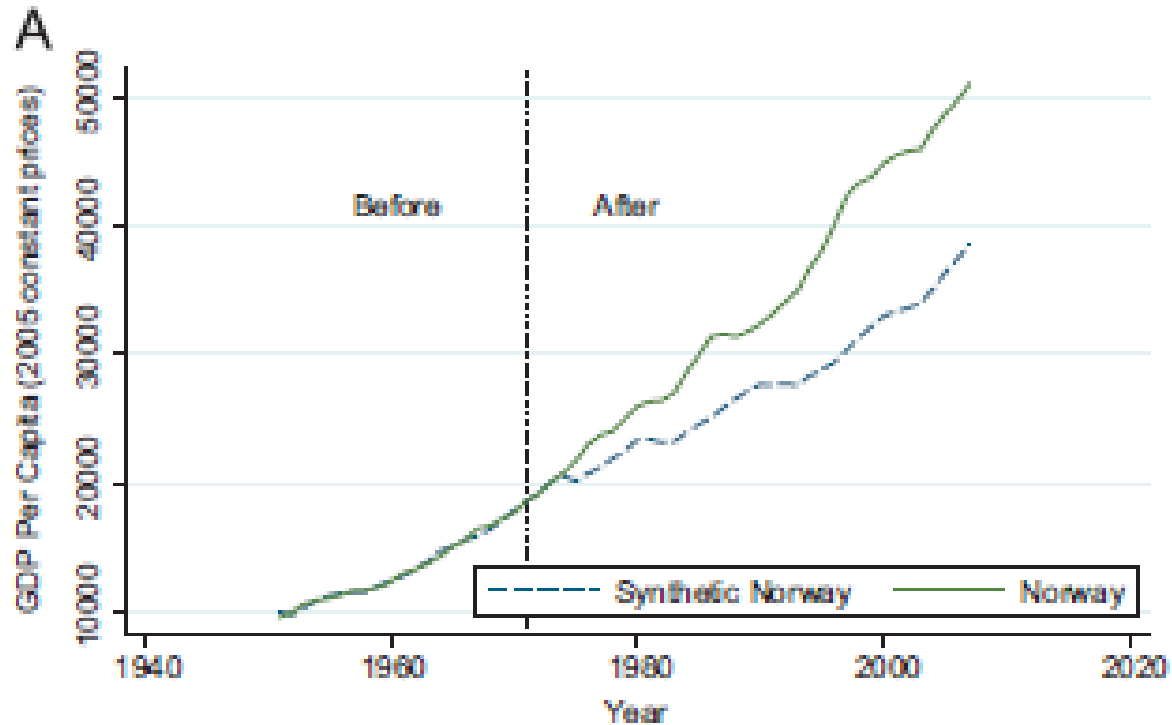
# Case 1 - Nigeria

- Oil revenues per capita increased from US\$33 in 1965 to US\$325 in 2000.
- Income per capita has stagnated at around US\$1100 (real ppp) since 1960
- Nigeria among the fifteen poorest in world
- 26% had <1\$/day in 1970 and 70% in 2000
- Dramatic increases in inequality.
- Capital increases but low utilization (suggesting most investment were “White elephant” projects)
- Rampant corruption and political instability.
- Many poor and resource rich countries show a similar picture.

# Case 2 - Norway

- No increases in inequality
- Institutional stability.
- Economic growth from a poor/middle OECD country to (almost) the richest.
- HDI, life satisfaction... are top of the world.

# Case 2 - Norway



Source: Mideksa, 2012

# Economic growth

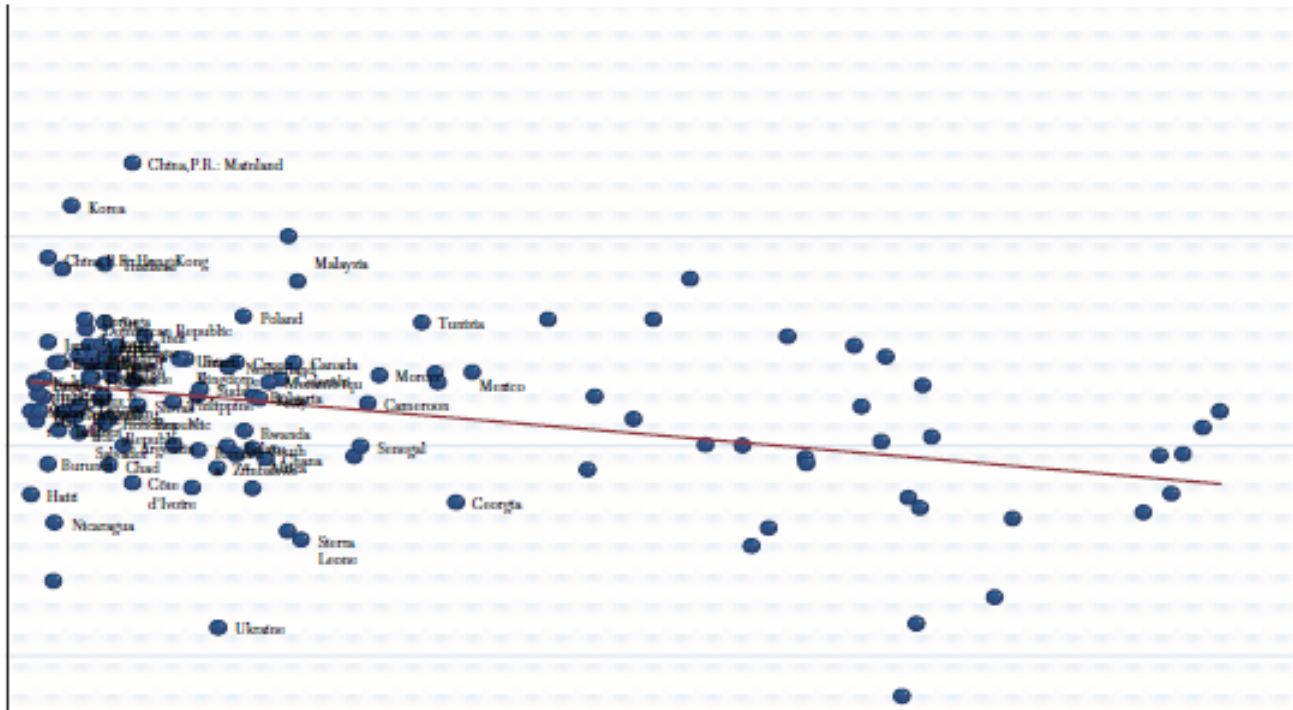


Figure 1. Growth and Natural Resource Dependence

Source: vd Ploeg, 2011

# Industry structure

TABLE 1  
TOTAL, NATURAL, PRODUCED AND INTANGIBLE CAPITAL, 2000  
(*\$ per Capita and Percentage Shares*)

Income group	Natural capital	Produced capital	Intangible capital	Total wealth	Natural capital share	Produced capital share	Intangible capital share
Low-income countries	1,925	1,174	4,434	7,532	26%	16%	59%
Middle-income countries	3,496	5,347	18,773	27,616	13%	19%	68%
High-income OECD countries	9,531	76,193	353,339	439,063	2%	17%	80%
World	4,011	16,850	74,998	95,860	4%	18%	78%

*Note:* All dollars at nominal exchange rates. Oil states excluded.

*Source:* World Bank 2006, table 2.1.

Source: vd Ploeg, 2011

# General picture

- Poor countries do badly after discovering resources
- Rich countries do well.
- Some exceptions:
  - Botswana – poor initially but economic improvements after discovering diamonds, also maintained institutional stability and low inequality.
  - Chile

# Theories

1. Deindustrialization and currency appreciation
2. Negative growth effects
  - a) Accounting explanation
  - b) Learning by doing
3. Institutions
  - a) Grabber or producer friendly
  - b) Presidential systems
  - c) Effect of resources on institutions and corruption
4. Volatility of resource prices
5. Conflicts
6. Unsustainability of gov policies

# Industry structure - theory

- The “Dutch disease”.
- Suppose two sectors. Hairdressers and shoe manufacturers.
- Resource revenues lead to
- ...higher demand for both shoes and haircuts.
- Haircuts cannot be bought from abroad hence prices rise and wages rise.
- Wages need to be equal in all industries hence wages rise also in shoe production.
- Becomes expensive to produce shoes while world prices of shoes are fixed. Hence imports of shoes increase.
- This is coupled with exchange rate appreciation since everything produced in the country is more expensive.



# Industry structure - conclusions

- In itself this mechanism is not a problem. It only implies that there is an efficient reallocation of jobs within the country.
- Country is still better off but cannot fully utilize the resource income since there are spill over effects.
- This should therefore not be called a disease.

# Industry structure - empirics

- Mixed evidence
- But later studies show:
  - Resource income leads to lowering of non-resource exports (by 35-70%) and increase in imports (by 0-35%).
  - Resource rich countries (>30% of GDP) have a 15% smaller tradable (“shoe”) sector.

# Growth effects – accounting explanation

- Resource rich countries experience lower growth.
- Suppose:

$$\frac{F_{t+1}}{F_t} = g > 1$$

Then

$$\frac{F_{t+1} + R}{F_t + R} < \frac{F_{t+1}}{F_t}$$

while

$$\frac{F_1 + R}{F_0} > \frac{F_{t+1}}{F_t}$$

i.e. an initial boost to the economy but then lower growth.

This has no negative welfare effects.

# Growth effects – learning by doing

- The theory about industry reallocation implies less people in manufacturing of traded goods.
- Suppose there is learning by doing – i.e. a positive externality where technology and human capital is improved in the sector people are working in.
- Then, *if* there is more scope for technology improvement in the traded manufacturing sector (shoes) than in the non-traded sector (barbers) and in the resource sector (mineral)...
- ...the country will grow slower and be lagging once it runs out of resources.
- Possibility net welfare losses from resources.

# Growth effects – empirics

- Learning by doing may possibly be greater in manufacturing than in services.
- But less clearly that more learning by doing in manufacturing than in resource industry.

# Growth effects - empirics

TABLE 4  
EFFECTS OF RESOURCE DEPENDENCE AND INSTITUTIONAL QUALITY ON ECONOMIC GROWTH

Annual growth in real GDP per capita	Sachs and Warner (1997a)	Based on data in Sachs and Warner (1997b)	Mehlum, Moene, and Torvik (2006b)
Initial income	-1.76 (8.56)	-1.28 (6.65)	-1.26 (6.70)
Openness	1.33 (3.35)	1.45 (3.36)	1.66 (3.87)
Resource dependence	-10.57 (7.01)	-6.69 (5.43)	-14.34 (4.21)
Rule of law	0.36 (3.54)	—	—
Institutional quality	—	0.6 (0.64)	-1.3 (1.13)
Investments	1.02 (3.45)	0.15 (6.73)	0.16 (7.15)
Interaction term	—	—	15.40 (2.40)
Number of countries	71	87	87
Adjusted $R^2$	0.72	0.69	0.71

Source: vd Ploeg, 2011, replication from other articles

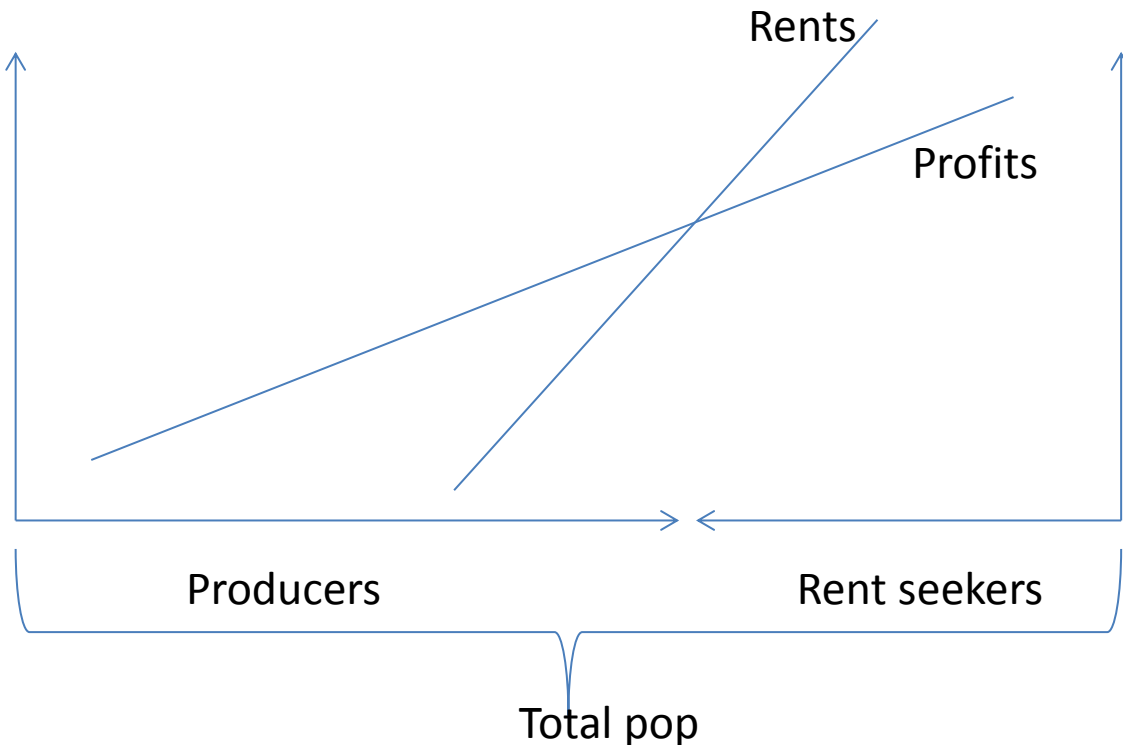
- Sachs & Warner (1995) show negative correlation resource dependence  $\leftrightarrow$  growth
- They control for initial income.
- Econometric issues, e.g. GDP on left side of regression since resource dependence=resource/GDP.
- Also, this does not prove that learning by doing is the mechanism.

# Institutions

- How countries evolve after discovering resource depends largely on the political and economic institutions in place before the discovery.

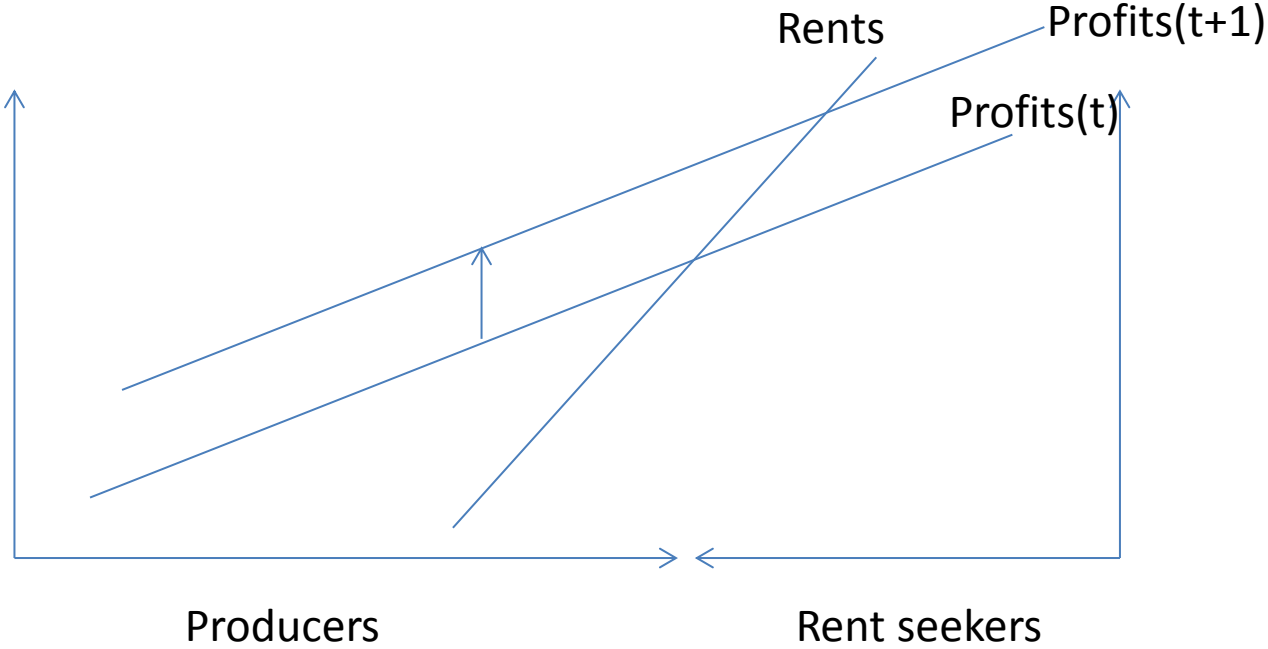
# Institutions - grabbing

- Mehlum et al (2006)
- Suppose an individual chooses between rent seeking (grabbing) or producing something.
- The more producers the more lucrative to seek rents.
- The more producers the more lucrative to produce (but less so than effect on rent seeking)

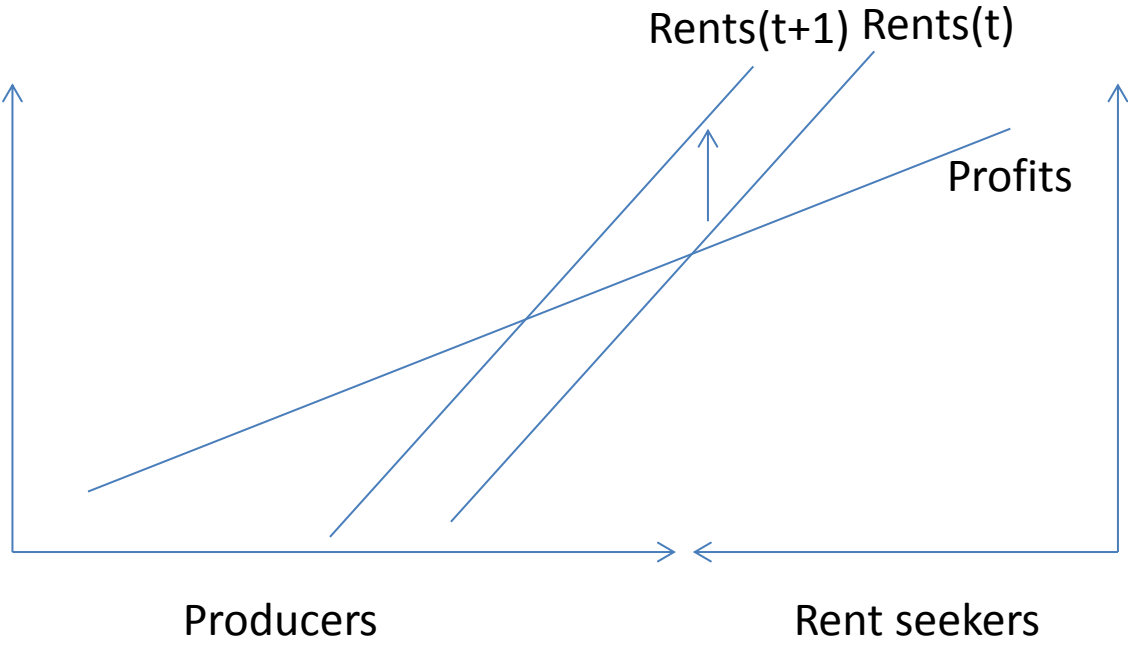




# Resource effect if production friendly institutions



# Resource effect if grabber friendly institutions



# Institutions - data

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- Resources negatively correlated with growth
- Institutions negatively correlated with growth (since rich, slowly growing, countries have good inst)
- Resource\*Institutions positively correlated with growth.
- → Sufficiently good institutions reverse the resource curse.
- Additional data (Boschini et al, 2007) – Interaction between easily appropriable resources and bad institutions

# Institutions - Presidential systems

- Presidential systems are less accountable and less representative → easier to extract rents.
- President + elites take the income

# Effect of resources on institutions

- Resources tend to lead to:
  - Easier buying of opposition, less dissent and questioning of policy.
  - Corrupts bureaucrats
  - Less accountability
  - Less schooling.
- All these problem hamper growth.
- Examples:
  - 10% higher corruption in Sao Tome compared to Cap Verde (Vicente, 2010).
  - Brazilian municipalities: 10% increase of oil → 20% increase in corruption.
  - These results are convincing since they don't suffer from problems of cross-country data.

# Volatility

- Resource prices can be very volatile – increases by several hundred percent between years.
- Suppose gov budget is 50 units from resources on average and 50 from labor tax. Then the budget will fluctuate with hundreds of percent from year to year.
- Additional effects on exchange rates make investment riskier.
- Demand shifts due to fluctuating income leads to bankruptcies.
- Well documented that budget and exchange rate volatility lead to slower growth, potentially decline.

# Resources and conflict

- There is more to fight over when resources are there.
- Coffee price negatively correlated with conflict in Colombian municipalities (DalBo & DalBo, 2011).
- Why? Coffee labor intensive, increase in price → higher wages → less conflict
- Price falls in capital intensive resources (oil, minerals) will have the opposite effect since then the game is about gaining control over the resource.
- Resource dependency is a problem in both cases:
  - A country dependent on renewable resources can suffer conflict if prices fall
  - A country dependent on point source resources can suffer if prices increase.
- Diamond desources prolong conflicts (western Africa).
- Resources especially problematic in countries with many groups.

# Unsustainability of government policies

- Resource discoveries often lead to optimism → Borrowing too much with resource as collateral.
- Also effect if government does not care about future generations.
- Critique by opposition falls (since everyone is so well off) which leads to unsustainable policies...
- ... and investment in unproductive projects.
- Or keeping taxes low which erodes taxation capacity.
- Investing in investment capacity is important but is often neglected in poor countries when they find resources.