
**MANAGING NATURAL
RESOURCE REVENUES FOR
ECONOMIC DEVELOPMENT:
TEN KEY ISSUES**

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1. Keep oil in ground or take it out?

- Will oil revenue be successfully transformed into productive assets?
- Will it accrue to the people?
- Will natural resources benefit future generations?
- What happens in fragile, corrupt states?
- Perhaps, better to leave it in the ground than waste it.
- Check if resource curse can be avoided.

2. How to take it out of the ground?

- Private or public? Efficiency versus control.
- Beauty contest or auction?
- Incentive compatible contracts? What kind of stakes (loans, equity, convertible bonds?)
- How to share upside and downside risks?
- How much to tax the resource? Ex ante or ex post?
- How to overcome the hold-up problem.
- Chronic under-investment – Davis & Wright.

3. How fast to take it out of ground?

- Hotelling principle: marginal rents should grow at rate of interest.
- But new fields found all the time.
- Rapacious depletion in fragmented societies with ineffective property rights.
- Elections and rent seeking, so too fast.
- Rebels and threat of war: take it out before rebels steal it. Voracious depletion.

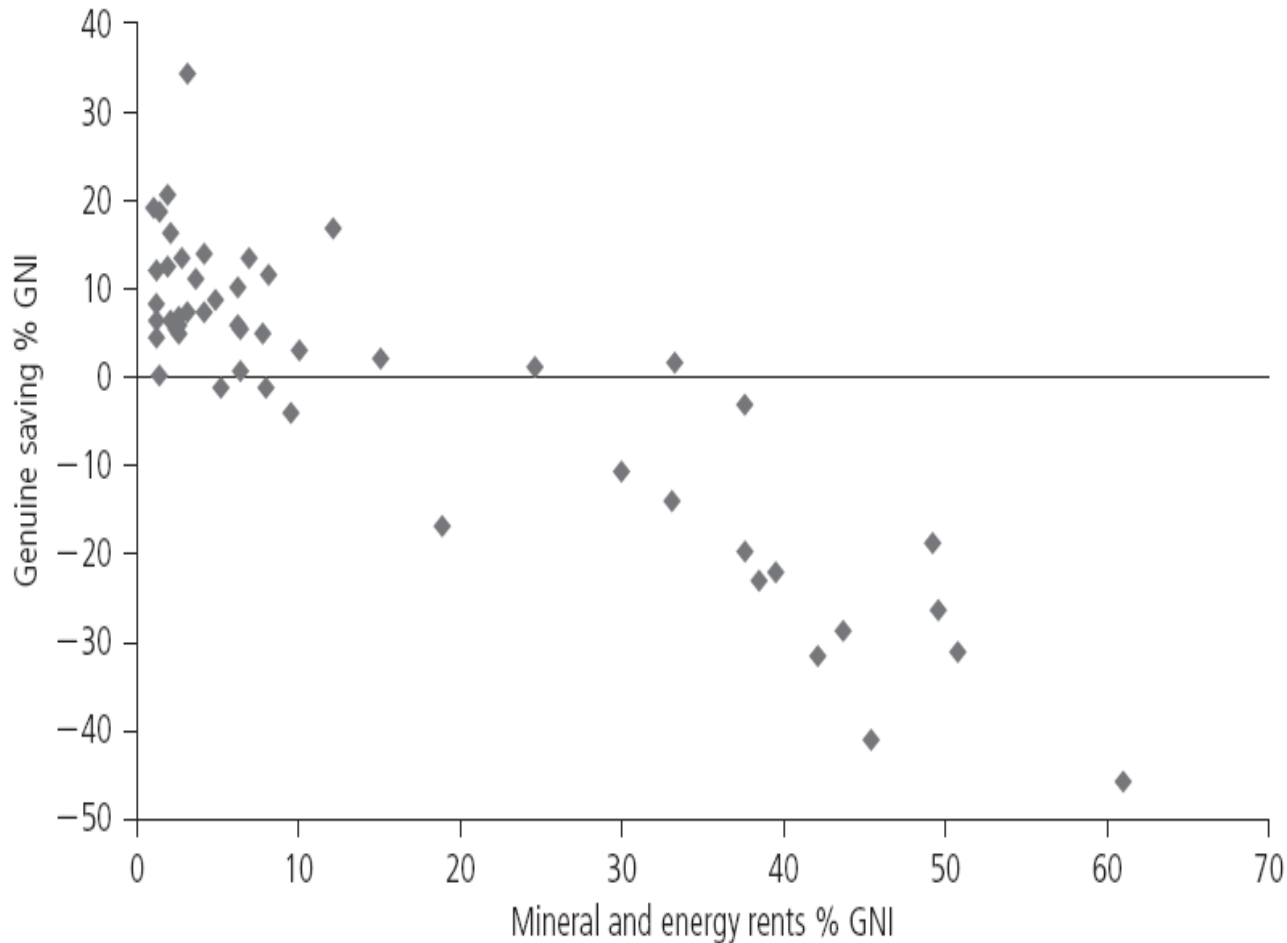
4. Natural resources and war

- Collier/Hoeffler: natural resources fuel conflict and war.
- But conflict/war affect resource FDI and thus affect natural resource dependence. Endogeneity problem.
- More fighting/rent seeking if oil stakes are high and wage is low.
- Difference between L- and K-intensive resources. Higher rice/coffee price lead to peace, but higher oil price leads to conflict.

5. Once oil out of soil, what happens to revenue?

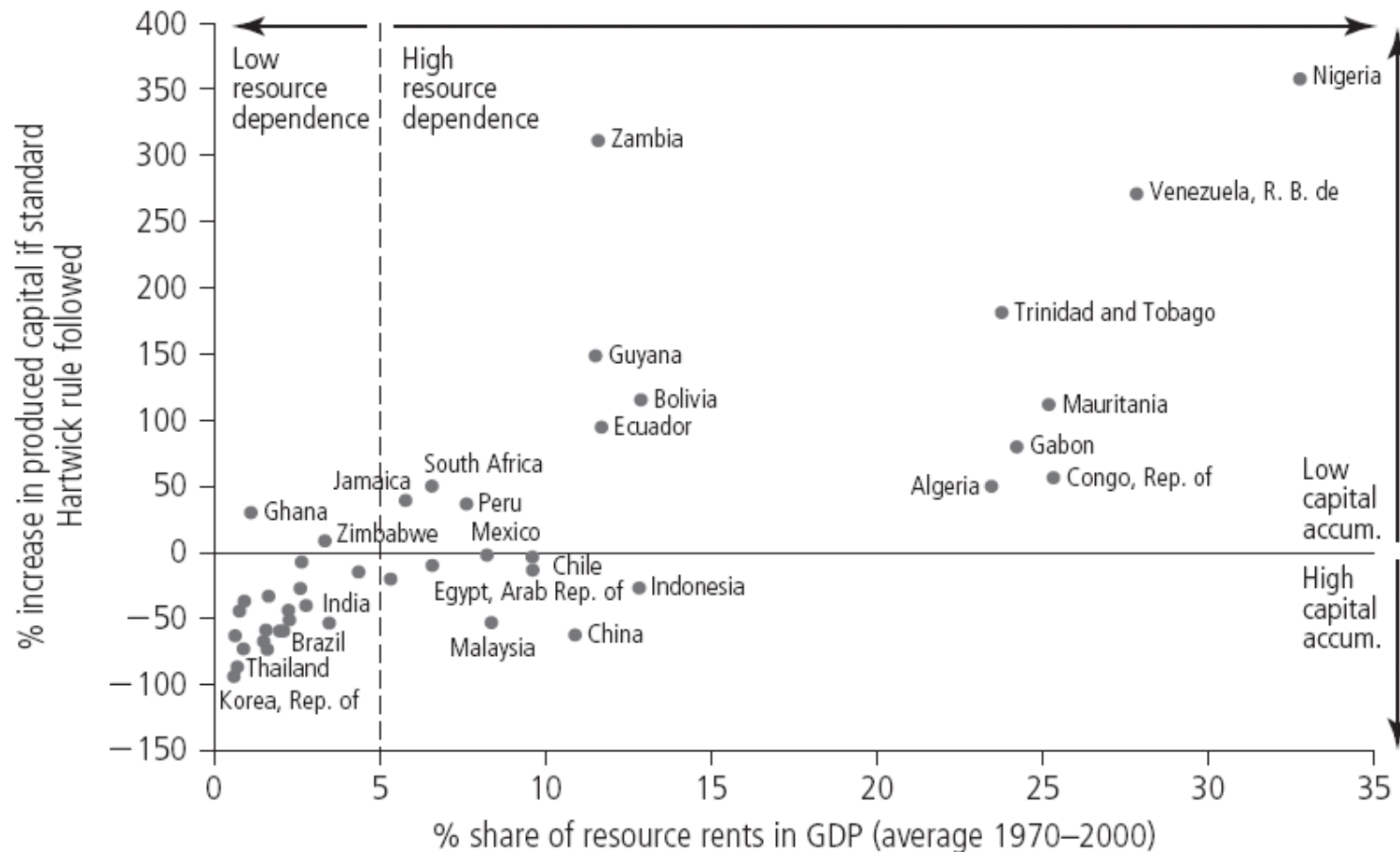
- Is it accumulated or is it consumed?
- Hartwick rule for sustainable consumption: reinvest all proceeds from natural resources in productive capital (infrastructure, education, physical capital, health, etc.). Big transformation challenge.
- What if country is poor? Should we consume more today as future generations will be richer due to technical and other progress?

GENUINE SAVING AND EXHAUSTIBLE RESOURCE RENTS



Source: World Bank (2006, Figure 3.4)

RESOURCE ABUNDANCE AND CAPITAL ACCUMULATION (HARTWICK RULE)



Source: World Bank (2006, Figure 4.1).

Note

- Hartwick rule does not mean that it is efficient: both rates of depletion of resources and re-investment may be too fast in fragmented societies leading to too levels of sustainable consumption.
- Resource importers tell resource exporters to save and reinvest their oil. But what if oil prices are expected to rise and costs to fall in future? Should oil importers then not save to provide for that?

6. Is revenue invested in human capital, infrastructure, private capital or saved in a sovereign wealth fund?

- Human capital especially as in much of CAREC region problem of not enough labour skills. (Africa: Lowers population growth and boosts development).
 - Invest in health and productivity.
 - Infrastructure is good, but beware of white elephants and rent seeking.
 - Boost private investment via tax incentives.
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6. Continued

- Returns on these types of domestic capital is often higher than returns on foreign capital.
- Use resource revenue to eliminate debt and debt burden. Lower interest rates, boost investment, unleash economy.
- Invest remainder in a SWF, but make sure it is properly diversified. Usually, it is not. Realize that there are $N+1$ assets (including oil under the ground) and look at oil beta.

TURNING OIL WINDFALLS INTO A SWF

- Small open economy: price taker in world markets
- Households are credit rationed: $C = Y + T$
- Current Account/GBC:

$$r^*F + G + T - N = r^*F + G + C - Y - N$$

- Social welfare is discounted value of private consumption Q and government consumption G :

$$PV(N) \geq PV(G+T) + F_0.$$

$$\int_0^{\infty} \left(\frac{C^{1-1/\sigma} + \psi G^{1-1/\sigma}}{1 - 1/\sigma} \right) \exp(-\rho t) dt.$$

- Maximize welfare subject to intertemporal GBC/CA
- Assume $r^* = \rho$

IF IN DOUBT, SMOOTH IT OUT

- Intertemporal smoothing:
- Intratemporal smoothing: $\dot{G} = \dot{C} = 0$
- Optimal Response: $G = \psi^\sigma C$

$$C = \left(\frac{1}{1 + \psi^\sigma} \right) (N^P + Y - r^* F), \quad G = \left(\frac{\psi^\sigma}{1 + \psi^\sigma} \right) (N^P + Y - r^* F),$$

$$T = \left(\frac{1}{1 + \psi^\sigma} \right) (N^P - \psi^\sigma Y - r^* F), \quad T + G = N^P - r^* F \quad \text{and} \quad \dot{K} = N^P - N.$$

- Return on Oil: $N^P(t) \equiv r^* \int_t^\infty \exp(-r^*(z-t)) N(z) dz$

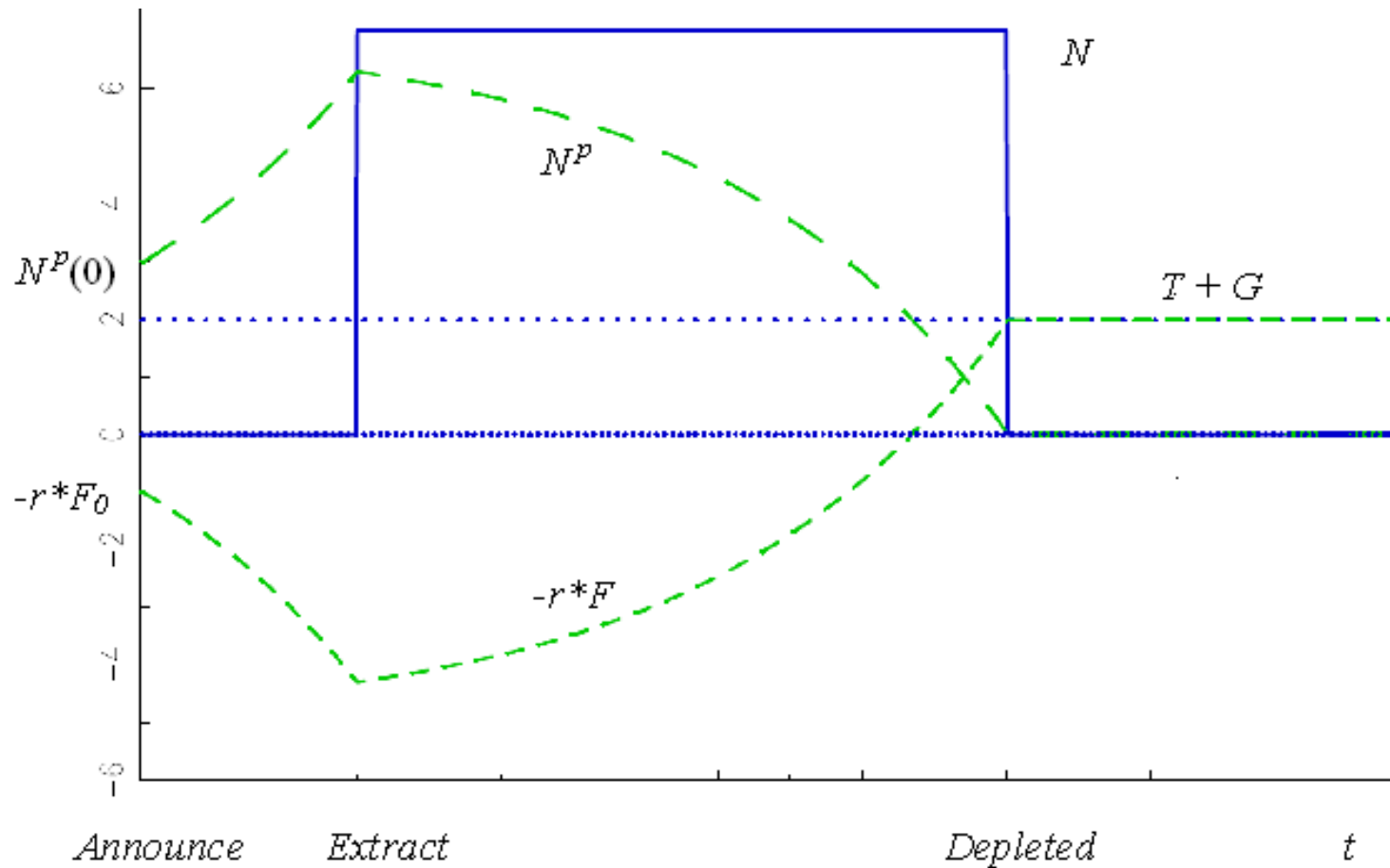
PERMANENT INCOME HYPOTHESIS

- Assume: $r^* = \rho$
- Optimal consumption path involves full intertemporal smoothing:
 - Consumption jumps at date of discovery and then constant
 - As resources depleted F falls (debt reduced/ assets acquired) to hold total stock of wealth constant

$$C = Y + T = Y + r^* [PV(N) - F]$$

- Once resource exhausted, permanently higher income from interest on SWF ($-r^* F$).

HOW TO HARNESS A WINDFALL?



OTHER APPROACHES

Permanent Income

Hypothesis:

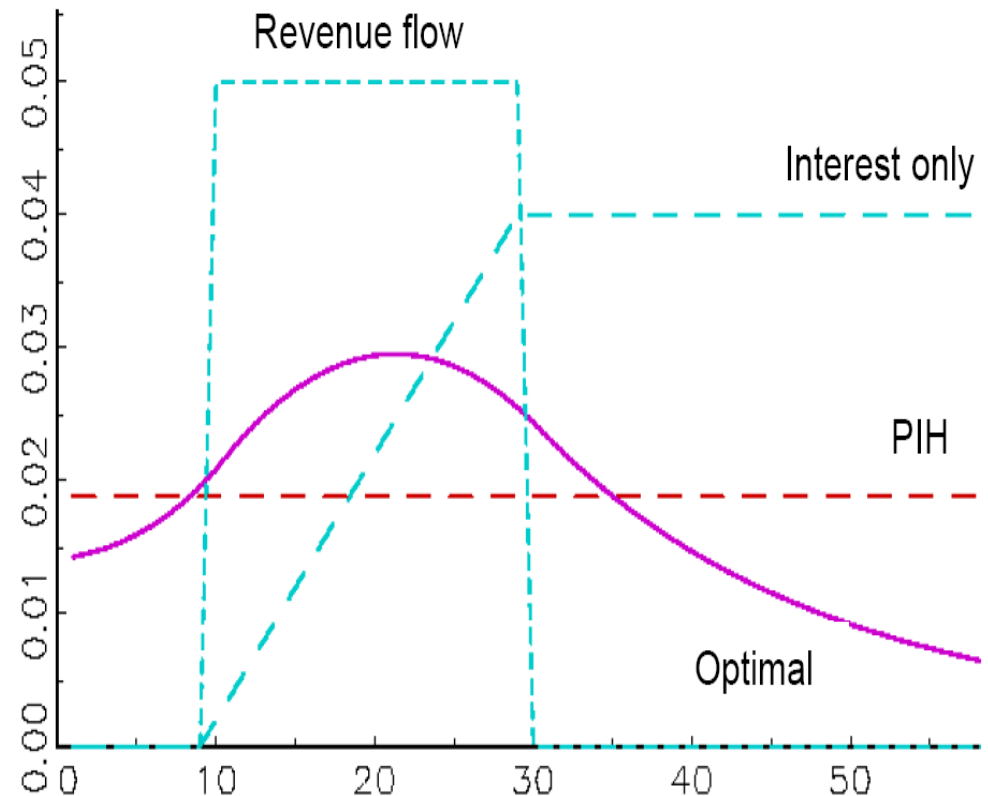
- ❖ Use of Sovereign Wealth Funds
- ❖ Optimal if $r = r^*$

Bird-in-hand.

- ❖ PIH ignoring resource wealth until extracted

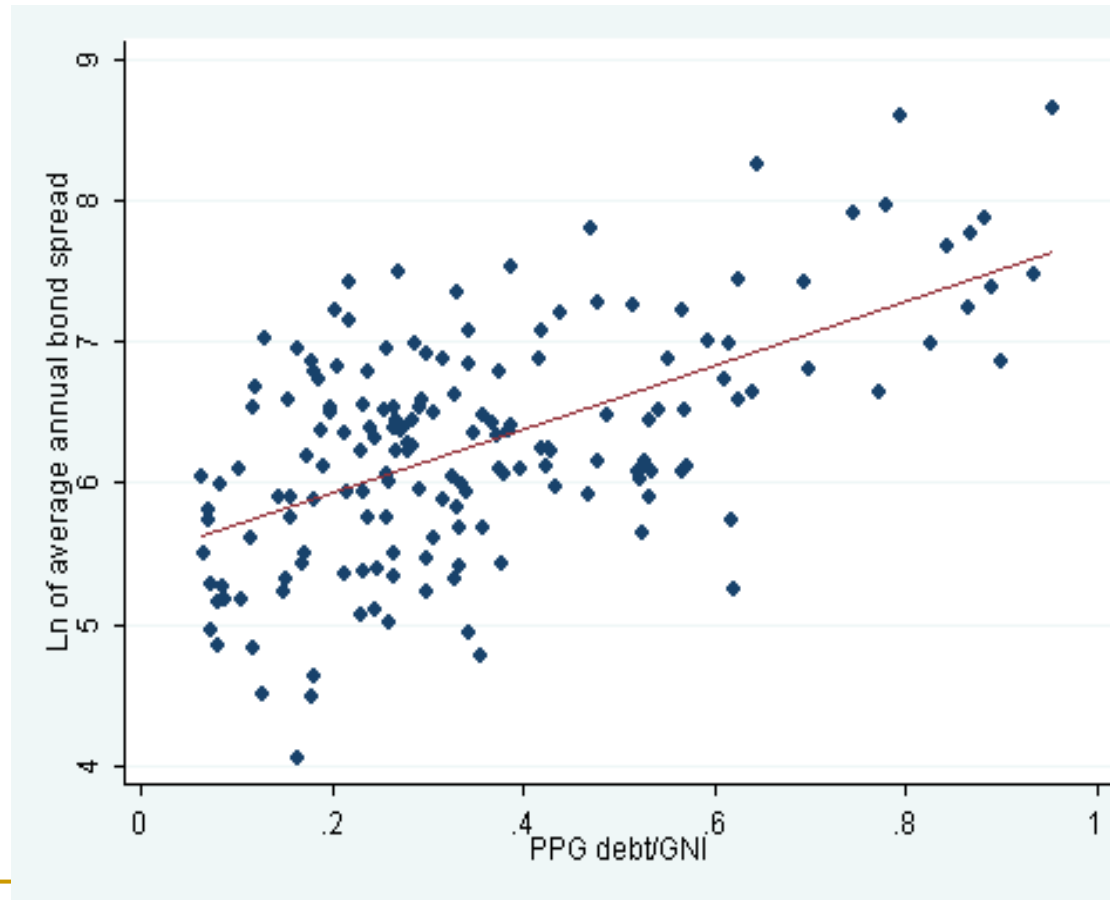
Optimal: capital scarcity

Figure 1a: Profiles of incremental consumption



DEVELOPING COUNTRY PERSPECTIVE

- Capital scarcity and low income
- High return to immediate consumption & to domestic investment (?).
- Empirical evidence: interest premium if foreign debt is high and foreign reserves low



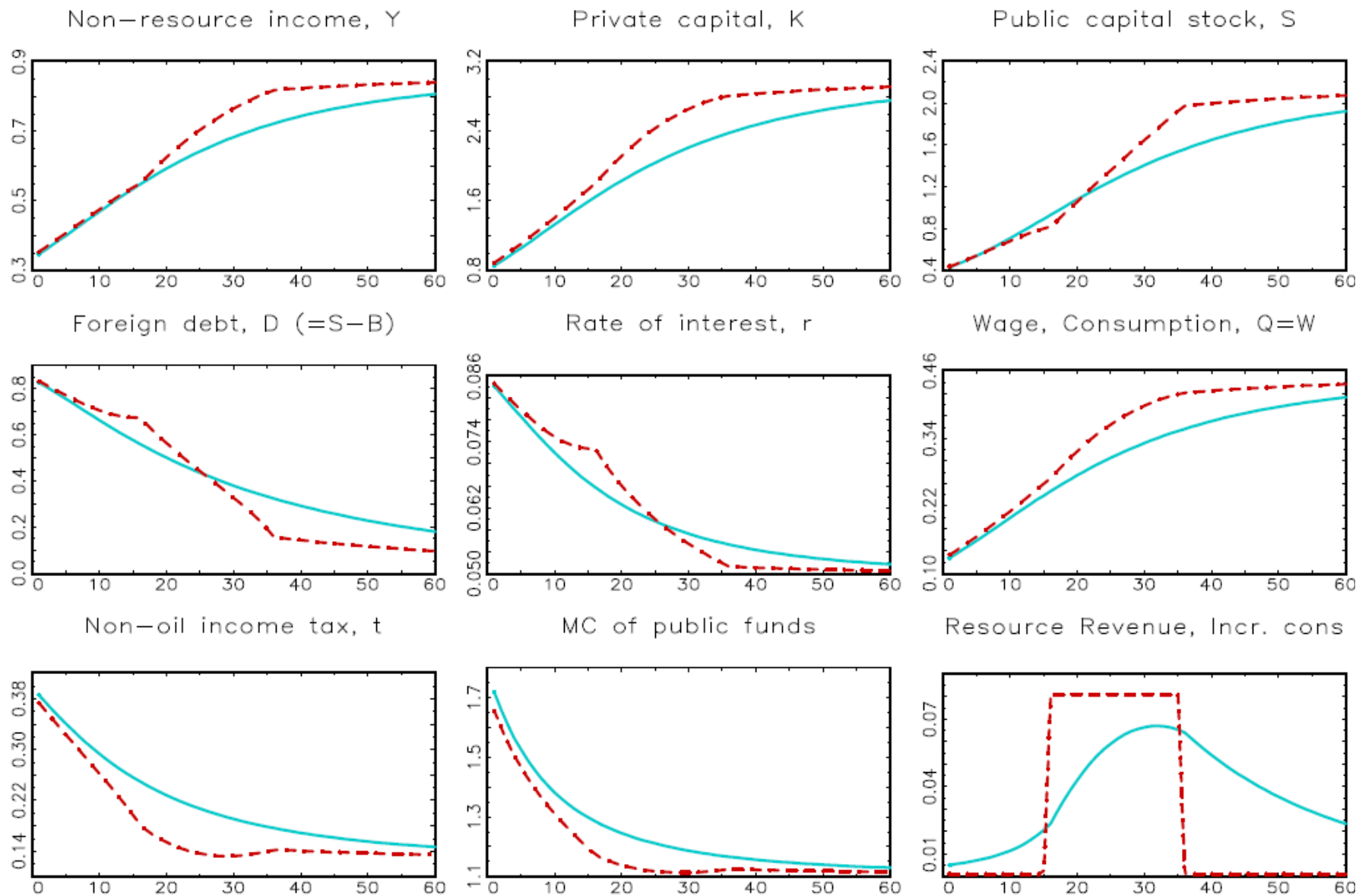
7. Is there capital scarcity?

- Benchmark is the permanent income hypothesis: save proceeds and put it in a SWF. Borrow ahead of windfall. Ensure higher level of consumption forever by financing it out of interest on SWF long after windfall has ceased.
- With capital scarcity, use windfall to bring down debt and interest rates in order to unleash economic activity. Consumption jumps up less initially.

EFFECT OF OIL WINDFALL

	Consumption, C	Debt, F
After announcement	Consumption path jumps up	Borrowing, increasing level of debt
During extraction	Steep increase in consumption	Rapid pay down debt
<i>Small windfall case:</i>		
After depletion	Resume growth path but 'further along' the development path	
<i>Large windfall case:</i>		
During extraction	Run debt down to \bar{F} during extraction. Start building SWF	
After depletion	Support permanent increase in consumption from interest on SWF	

Optimal paths with distortionary income taxation



SUMMING UP

- Objective is to increase consumption.
 - Instruments
 - Transfer T : (if available)
 - Higher wages -- by cutting tax τ &/or increase infrastructure S .
 - Between discovery and revenue flow:
 - Use T or τ , but cost is higher debt, higher r , lower K , lower S .
 - Once revenue is flowing:
 - Use T , τ , and S , and also have rapid pay-down of debt
 - Once depleted:
 - Have brought forward development path
 - No SWF if 'small' windfall.
-

SUMMING UP ctd.

- No smoothing of public and private consumption.
 - A small windfall makes it possible to give the economy a leg-up by lowering debt and thus interest rates and making economic development more rapid than without the windfall, but only temporary boost to citizen dividends and private and public consumption. No increase in consumption after windfall.
 - Only if the windfall is large and protracted enough and debt is fully paid off, can the country afford to build a sovereign wealth fund and thus a permanent increase in dividends and private and public consumption even after the windfall has ceased.
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KEY MESSAGE

- Public and private consumption should increase ahead of the windfall, less so than under the PIH, but still leading to higher interest rates and lower growth in capital stock and production during the announcement period.
 - During the windfall, rapid debt reduction, private and public investment booms, causing wages to rise thus necessitating much lower transfers.
 - The investments bring forward the asymptotic growth path when windfall ceases and – if windfall is large and protected enough – allows build-up of SWF and sustaining permanent higher levels of consumption.
 - Most important source of higher welfare is to use windfall to increase investment, both private and public, and thus wages.
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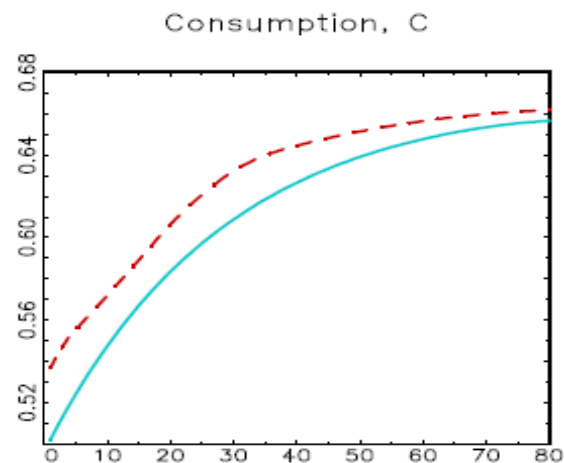
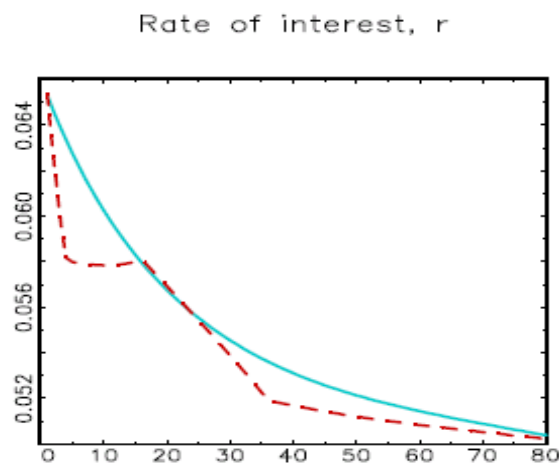
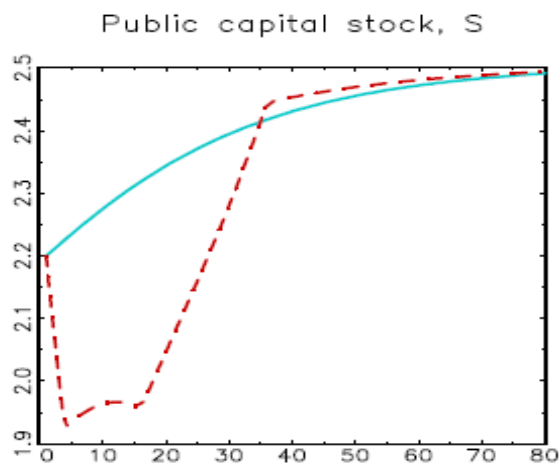
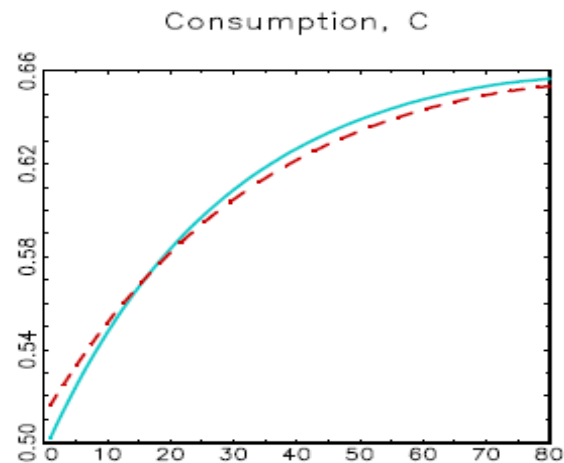
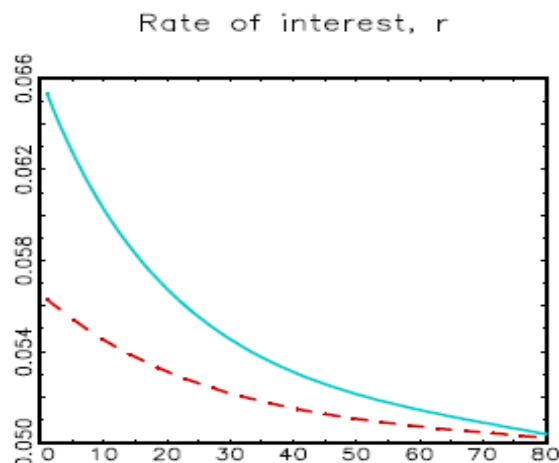
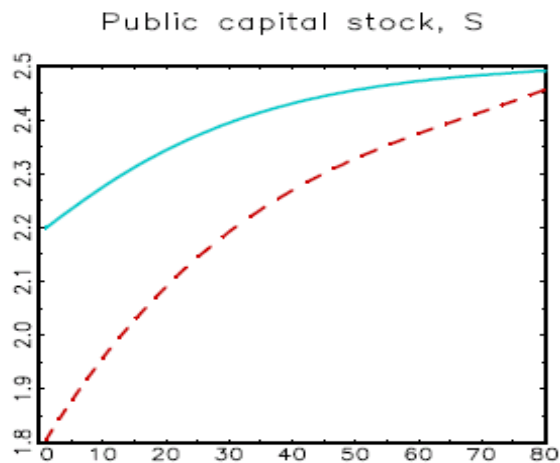
RICARDIAN CONSUMERS

- Households no longer credit constrained, but can save and borrow.
- Physical assets in economy $K+S$ are owned by foreigners F , government B or households A .
- Interest premium depends on asset position of private sector and government $\Pi(F)=\Pi(K+S-A-B)$, so investors in capital now face r not r^* .
- Households do not internalize interest spread externality, so under-save. Hence, optimal to have asset holding subsidy. Otherwise, consumption profile too flat.

Counteracting the Ricardian Curse:

Top Panel No Windfall (dashed with asset subsidy, solid without)

Bottom Panel No Asset Subsidy (dashed with windfall, solid without)



Lessons:

- Ricardian consumers:
 - Consumers under-save (do not internalise impact on r)
 - Private consumption boom will undermine government policy
 - Optimal policy response: 'over'-invest in infrastructure – credible commitment that revenue is not available for private consumption.
- Extension I: Absorptive capacity.
 - Macro-level; Dutch disease and crowding out
 - Micro-level: Project selection
- Extension II: Volatility - what variables adjust to price volatility?
 - Foreign assets
 - Consumption
 - Domestic investment

8. Are there absorption constraints?

- Dutch disease: appreciation of the real exchange rate, decline of traded sectors, boom of non-traded sectors.
- Need to produce home-grown capital in order to relax bottlenecks in the non-traded sectors, but this takes time.
- First park windfall abroad and slowly invest in home-grown capital (education, construction etc.) until consumption can grow.

Extension I: Absorptive capacity

- Scandinavian model: T- and NT- sectors use labour and capital.
- If capital must be home grown (produced by the NT- sector), we have absorption constraints especially if NT-sector needs home-grown capital (infrastructure, education, health) to develop.
- Windfall induces sharp appreciation and modest increase in consumption; factors shift to NT-sector to produce home grown capital.
- As economy develops, appreciation goes.

Effects windfall: depend on factor intensity

- If non-traded sector is more capital intensive than traded sector, temporary bottlenecks and appreciation of real exchange rate until the required amount of home-grown capital is accumulated. Less sovereign wealth in long run than under the PIH.
 - If traded sector is more capital intensive, real exchange rate does not adjust. Traded sector gradually gets rid of capital and relies more on imports in order to make room for non-traded sector to gradually expand and make room for higher consumption of non-traded goods. More sovereign wealth in long run than under the PIH.
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9. How to cope with volatility of commodity prices?

- Hedging – see recent profit of 8 billion US \$ of Mexico's hedge against the fall of the 2009 oil price. Problem is political! And lack of financial development.
- Liquidity fund: piggy bank in good times when commodity prices are high and take money out of the fund when prices are low. Problem is again political?
- Precautionary buffers.

10. Is there a curse and, if so, can it be turned into a blessing?

- Growth in income per capita high in countries that have low initial income per capita, trade openness, good transport links, high degrees of schooling, high investment rates, low population growth, effective institutions and developed financial systems.
- Growth is hampered by volatility.
- But volatility is high in resource dependent countries, so volatility quintessence of curse.

10. Continued

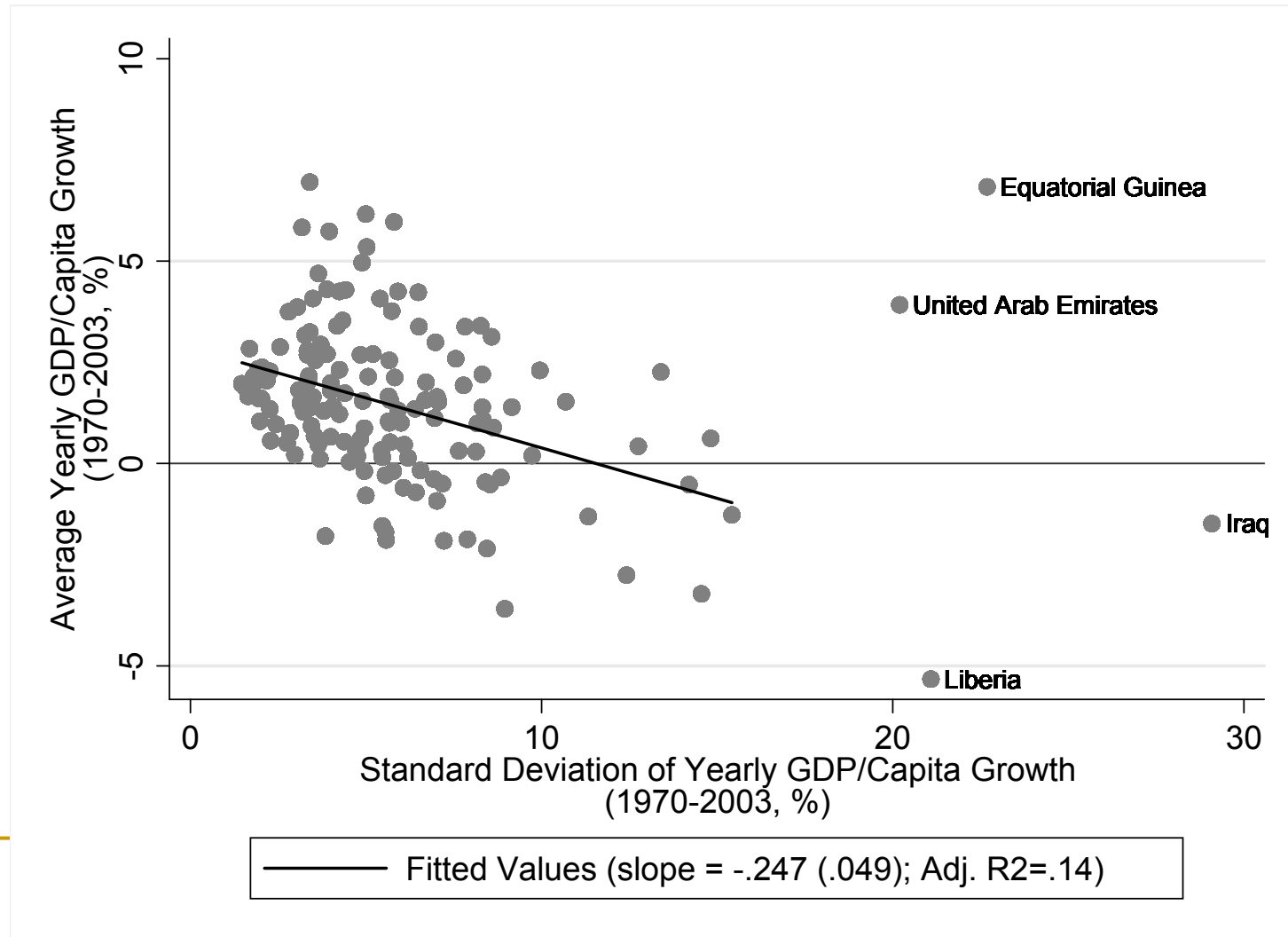
- Resource abundance is instrument for resource dependence.
- Volatility curse is higher in landlocked, ethnically fragmented countries with open capital markets and restrictions on current account.
- Curse can be turned into a blessing in countries that have good institutions and well developed financial systems.

Marginal effects of different types of natural resources on growth for different levels of institutional quality

	Primary exports share of GDP	Ores and metals exports as share of GDP	Mineral production as share of GNP	Prod of gold, silver and diamonds as share of GDP
Worst institutions	-0.548	-0.946	-1.127	-1.145
Average institutions	-0.378	0.425	0.304	0.279
Average + one s.d. institutions	-0.288	1.152	1.062	1.183
Best institutions	-0.228	1.629	1.560	1.776

Disturbing facts

1. Volatile countries have lower growth (Figure 1)



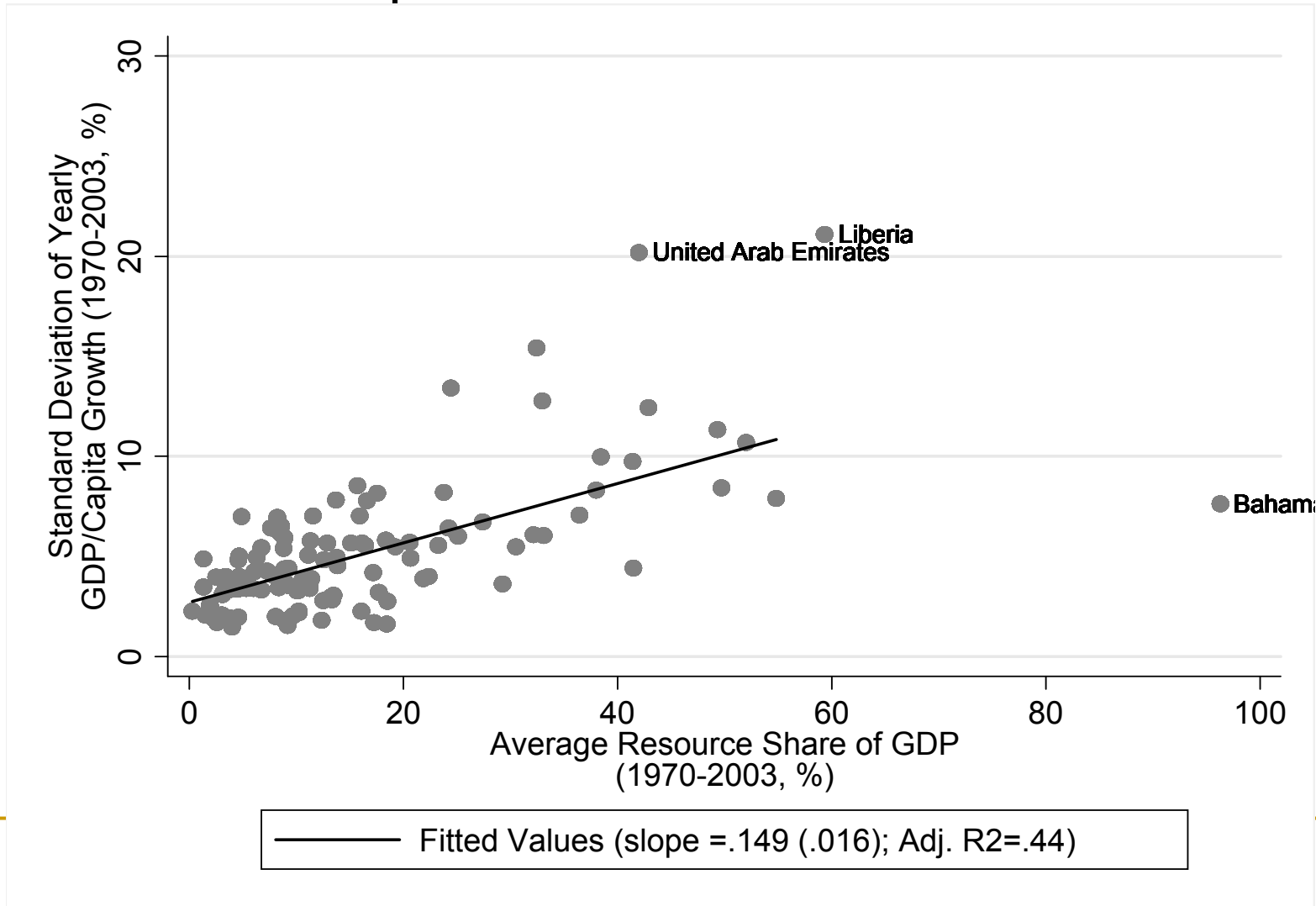
The Facts: s.d. real GDP growth (Table 1)

2. Developing countries are more volatile
Sub-Saharan Africa: 6.52 Western Europe: 2.33
Middle East/North Africa: 8.12! North America: 1.90

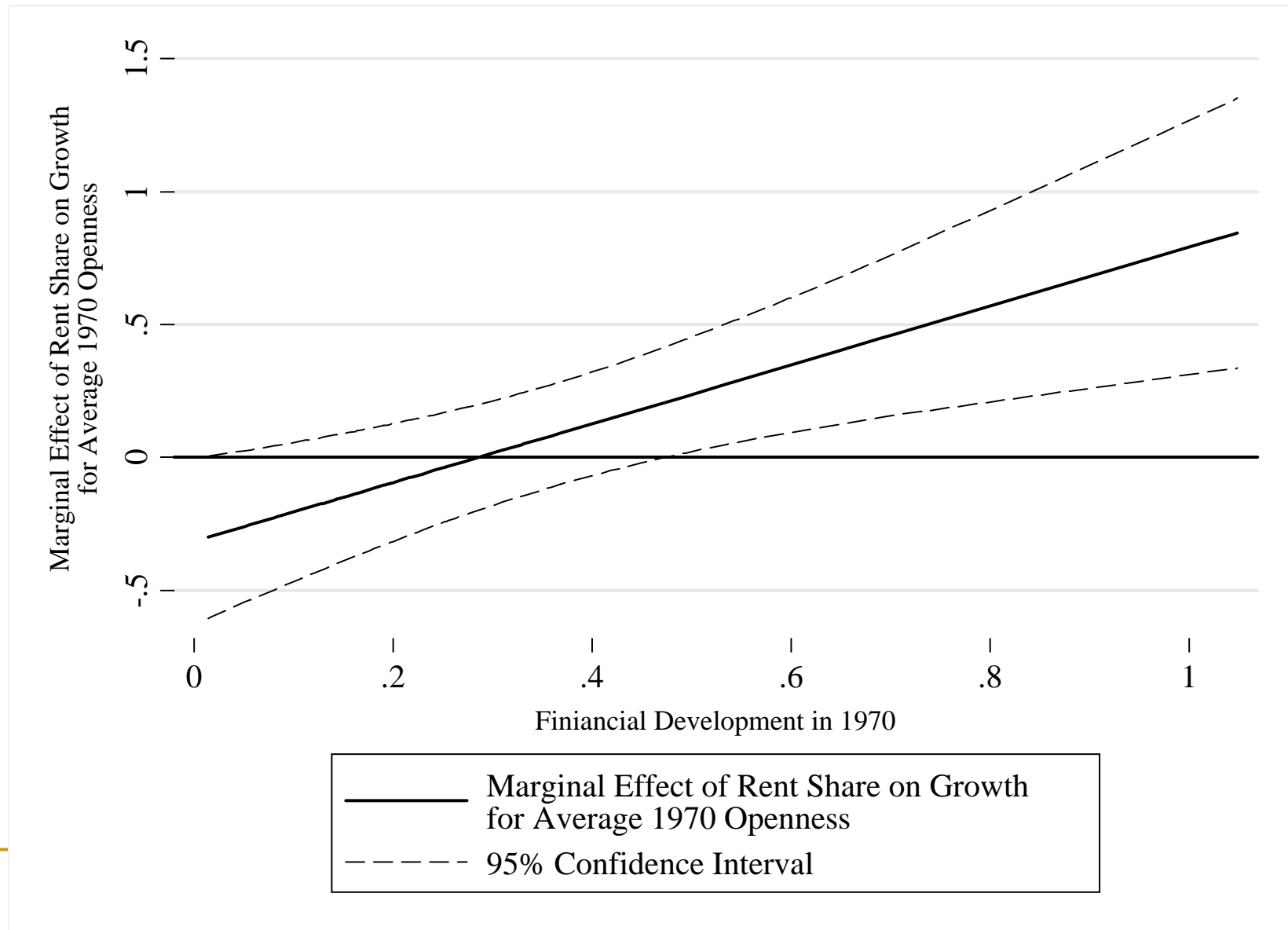
2. Countries with poorly developed financial systems are more volatile
1th Q (<16.2%): 6.40 4th Q (>52.9%): 4.40

3. Remote (distance from waterway) countries are more volatile
1th Q (<49km): 6.52 4th Q (>359km): 8.12

5. Resource dependent countries are more volatile

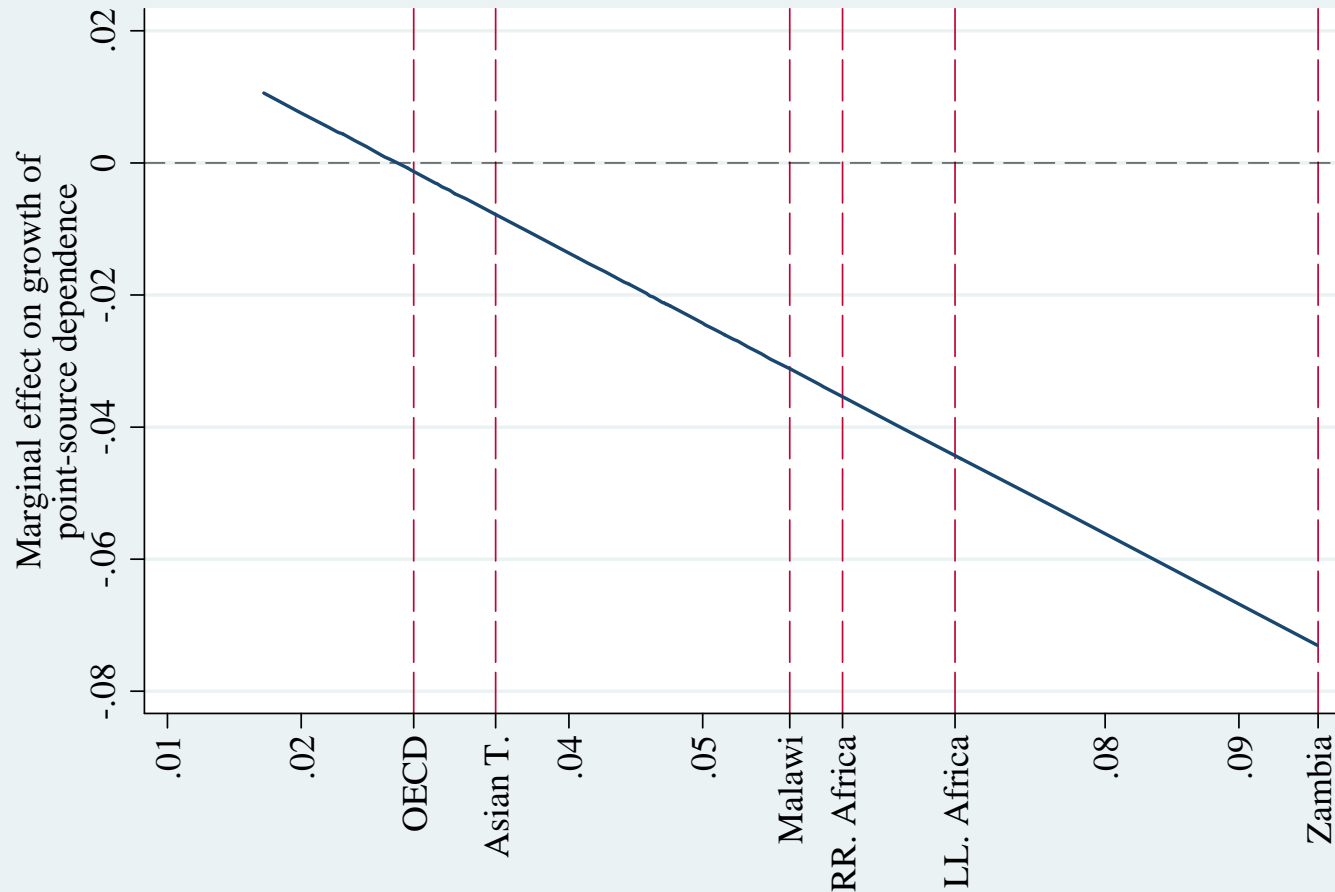


Blessing for some



Direct and Indirect Effect

- Direct resource effect on growth + indirectly through volatility (abstracting from interactions)



Volatility of unanticipated output growth, estimated 1970-2003

Volatility and finance

- Volatility of unanticipated output growth is quintessential feature of the natural resource curse!
- *Positive direct* effect of the *level* of natural resource exports on growth is swamped by *negative indirect* effect of volatility on growth performance.
- Countries with high degrees of financial development can turn resource wealth into blessing and boon for growth.
- Point-base impact stronger than diffuse resources.

Volatility and finance ..

- High levels of investment rates, human capital and openness boost growth performance. Countries with low initial GDP per capita catch up, but countries with high population growth rates grow more slowly.
- Volatility increases with distance to waterways, volatility of government share, ethnic polarization, current account restrictions & surrender of export receipts.
- Volatility decreases with openness, multiple exchange practices, capital account restrictions financial development.

10. Continued

- Curse may also manifest itself in resource FDI (coalition of corrupt government and mining companies against the people). Determinants of resource FDI are very different from those of non-resource FDI.
- Curse may also manifest itself in lack of diversification. So how can one get a more diversified, less fragile economy?
- Or via erosion of critical faculties? Keeping in place unsustainable policy (e.g., import substitution) & excessive borrowing.

Resource Charter

- Together with earned income transparency initiatives crucial.
- But realize that each resource-rich country is different, so not top down commandments.
- But engage in a policy dialogue with politicians, bureaucracy and civic society asking the right questions.

POLICY

- Temporary subsidy/tax relief for non-resource exposed sectors if learning by doing. Danger: policy addiction.
- Staple trap view suggests gradual dual-track reform by creating a dynamic market sector in early-reform enclaves with post-reform benefits may work with sustained rents from natural resources. Rapid expansion of enclaves can pull the more backward sectors up as well. Big push: works if IRTS in NT-sector.
- Put resource revenues into Fund to spread benefits to future generations by investing in education, infrastructure, etc. Fund also helps to cope with volatile resource prices.
- If rapacious rent seeking, better to keep oil in ground than deplete it and put revenues in fund.

POLICY ctd.

- Use revenues to reduce debt or invest in education & infrastructure with market return.
- Privatisation of state-owned oil and mining industries & tendering exploitation rights to private companies. Not clear that this works.
- Improve institutions, rule of law, etc. Easier said than done in presence of vested interests.
- Exit caused by corruption does not necessarily reduce welfare, so more competition not necessarily good either.
- Distribute revenues as citizen dividends. Government must then make better case for its pet projects, since it has to tax its people.
- Get exploitation companies at the peace negotiation table to secure re-employment of ex-combatants.

Transparency is a must

- Highest standards of public and corporate accountability, PSR/CSR and transparency: publish what you earn from exports and publish what you do with the revenues.
- Exploitation companies should publish their payments to all governments and encourage mandatory disclosure mechanism.
- Make debt relief etc. contingent on transparency, free press and anti-corruption efforts – role IMF, World Bank and UNDP. Establish global information office.
- Western banks should be punished for allowing tainted money to be deposited.