

# ZEW Lectures

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# The Regulation is Everything Hypothesis

- Less developed countries with poorly regulated resource industries, or weak property rights, will have a comparative advantage in resource products and therefore will, via the resource overuse hypothesis, be made worse off by trade.

# Some Suggestive Evidence

**INSTITUTIONAL DIFFERENCES BETWEEN DEVELOPED AND DEVELOPING COUNTRIES:  
TEST OF DIFFERENCES BETWEEN MEANS**

	Government Repudiation	Risk of Expropriation	Corruption	Rule of Law	Quality of the Bureaucracy
<b>Countries in Table 1</b>					
Mean for developed	8.9959	9.3667	5.0682	5.2557	5.1547
Mean for developing	6.3848	6.7547	2.5074	2.4879	2.6957
<i>t</i> -statistic	7.2090	8.1115	7.7028	8.1407	6.0966
<b>Complete Sample</b>					
Mean for developed	9.2530	9.5625	5.3419	5.5375	5.5249
Mean for developing	5.7172	6.4740	2.8794	2.9005	2.6693
<i>t</i> -statistic	18.1649	17.1912	14.9642	14.4691	14.9814

*Note:* The *t*-statistic is constructed to conduct a test of the difference between means ( $z_{0.01} = 2.33$ ).

**CORRELATION COEFFICIENTS OPENNESS—FOREST COVER (1961—1994)**

Developing		Developed	
Algeria	-0.2660	Austria	0.4974*
Bangladesh	-0.8410*	Finland	0.8600*
Colombia	-0.4240**	France	0.9206*
Costa Rica	-0.7889*	Greece	0.5533*
Côte d'Ivoire	-0.7747*	Israel	0.9009*
El Salvador	0.1236	Italy	0.9384*
Gabon	-0.8001*	Netherlands	0.7587*
Guatemala	0.3738**	Portugal	0.5681*
Indonesia	-0.0678	Spain	0.9491*
Korea Republic	-0.8312*	Sweden	0.9555*
Mauritius	-0.5120*	United Kingdom	0.9801*
Mexico	-0.4826*	United States	-0.8120*
Pakistan	-0.8398*		
Paraguay	-0.9022*		
Philippines	-0.3889**		
Sri Lanka	0.2089		
Thailand	-0.6986*		

*Note:* \* and \*\* denote significance at the 1% and 5% levels, respectively.

# Skeptics View

- Regulation is important but costs reflect more than just entry costs or harvest taxes.
- Better regulation can create productivity gains, lowering costs.
- Productivity gains come from healthier stocks, and/or complimentary investments that raise productivity.

# Research Questions

- Do countries with weak property rights have a comparative advantage in resource intensive products?
- Under what conditions do they have a comparative advantage?
- How would we go about testing this hypothesis?

# Method

- Create two archetypes of good and bad resource management.
- Let resource management be the only difference across the countries.
- Examine comparative advantage and trade patterns.

# The Consumer Country

- No regulation at all: open access, which implies:

$$p = wa_{LH} = \frac{w}{\alpha S}$$

- Focus on steady states that are diversified

# Construct Relative Supply and Demand

$$\frac{H^D}{M^D} = \frac{\beta}{(1-\beta)p}$$

$$\dot{S} = 0 \Rightarrow H^P = rS \left( 1 - \frac{S}{K} \right)$$

$$M = L - L_H = L - H^P / \alpha S$$

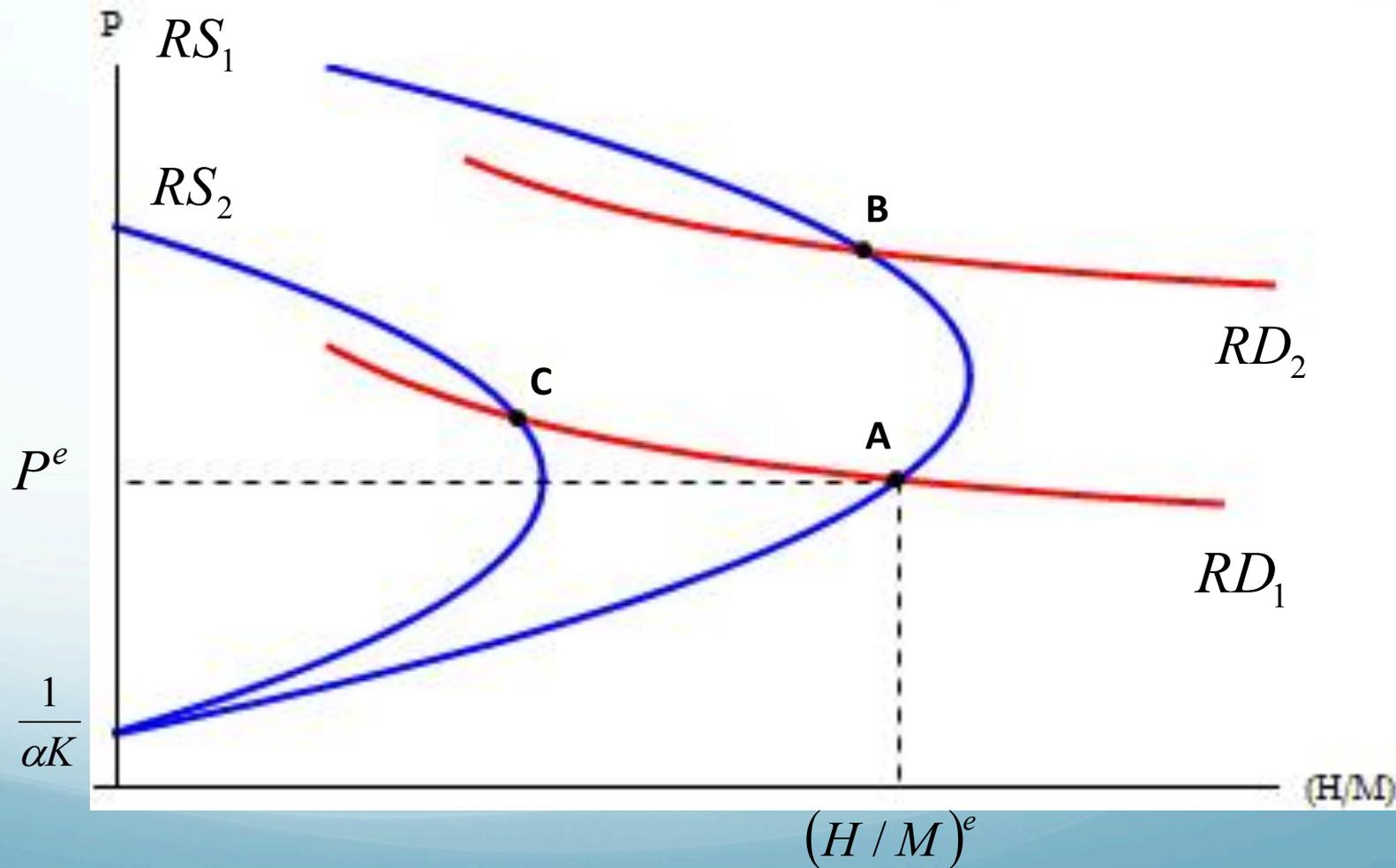
$$\frac{H^P}{M^P} = \frac{rS(1 - S/K)}{L - (r/\alpha)(1 - S/K)}$$

# Relative Supply

$$\frac{H^P}{M^P} = \frac{rS(1 - S/K)}{L - (r/\alpha)(1 - S/K)}$$

$$p = wa_{LH} = \frac{w}{\alpha S} = \frac{1}{\alpha S}$$

# Autarky: The Consumer Country



**Proposition 1.** The consumer country's relative supply of the harvest good to manufactures is backward bending. Moreover,

for  $p \leq 1/(\alpha K)$ , the relative supply  $H/M$  is zero, while for any finite price  $p > 1/(\alpha K)$ , the relative supply  $H/M$  is positive;

there exists a price  $p^C$  such that for  $p < p^C$ , the relative supply ( $H/M$ ) is increasing in  $p$ , and for any  $p > p^C$ , the relative supply ( $H/M$ ) is decreasing in  $p$ .

□ the critical price,  $p^C$ , is given by  $p^C = 1/(\alpha S^C)$  where  $S^C$  is the stock level where Eq. 14 is at a maximum.

the critical stock  $S^C$  is an increasing function of  $L$ , and a decreasing function of  $r$ .

# The Conservationist Country

- Absolutely perfect regulation
- Most conservative of all resource plans
- Construct relative supply and demand again

# Tastes and Technologies

$$W = \int_0^{\infty} u(I / \beta(p)) e^{-\delta t} dt$$

$$I = pH + M$$

$$H = \alpha L_h S$$

$$M = L_m$$

$$\dot{S} = rS[1 - S / K]$$

# When Infinitely Patient Equivalent to Max Steady State Rents

$$\text{Max } \Pi = [pH - wL_h]$$

*subject to*

$$H = G(S)$$

$$H = \alpha L_h S$$

# Rewrite in terms of effort

$$\Pi = [pH - wL_h]$$

$$\Pi = [p\alpha L_h S - wL_h]$$

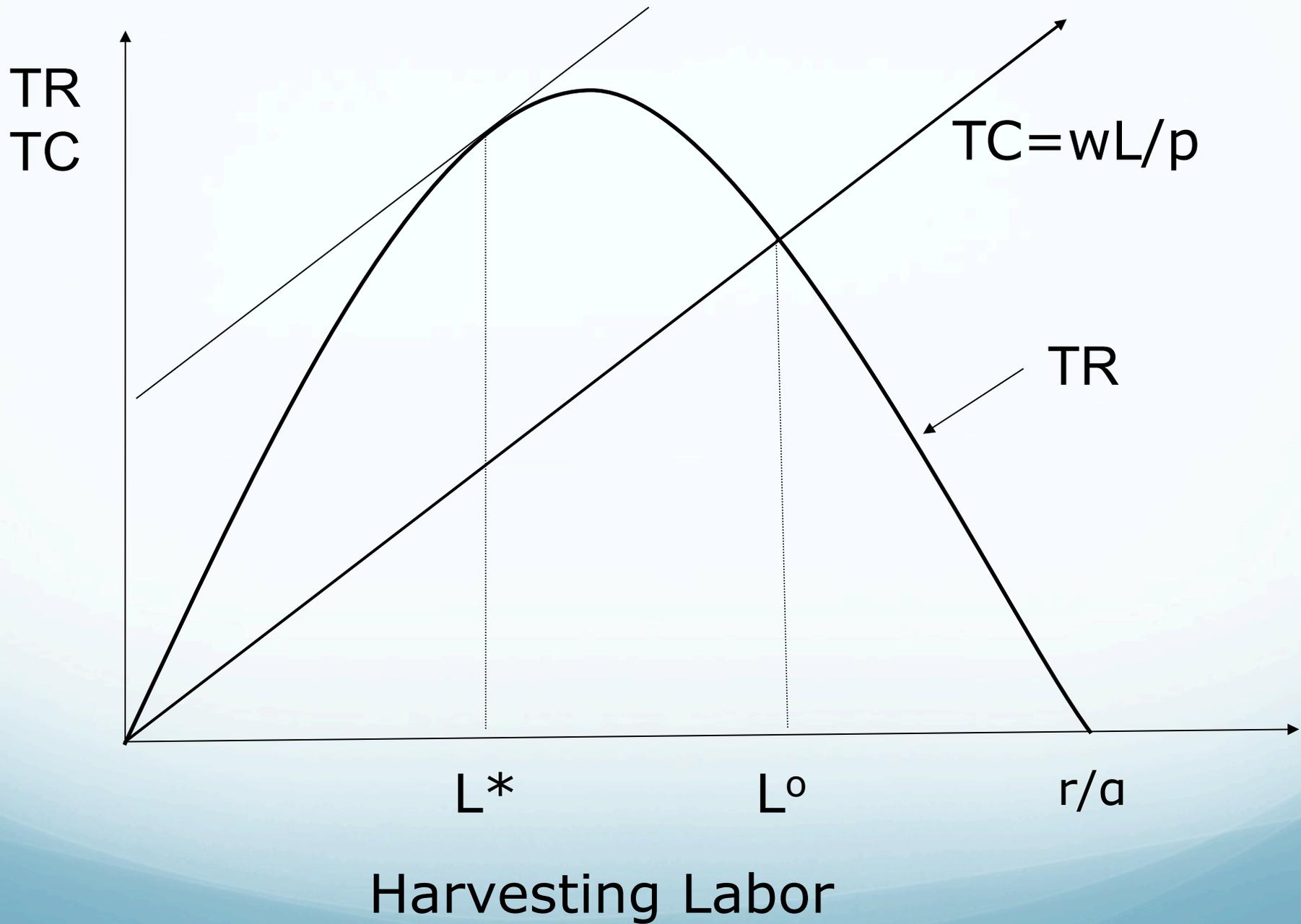
*in SS*

$$\alpha L_h S = rS(1 - S / K)$$

$$\Rightarrow S = K(1 - \alpha L_h / r)$$

$$\Pi = [p\alpha L_h [K(1 - \alpha L_h / r)] - wL_h]$$

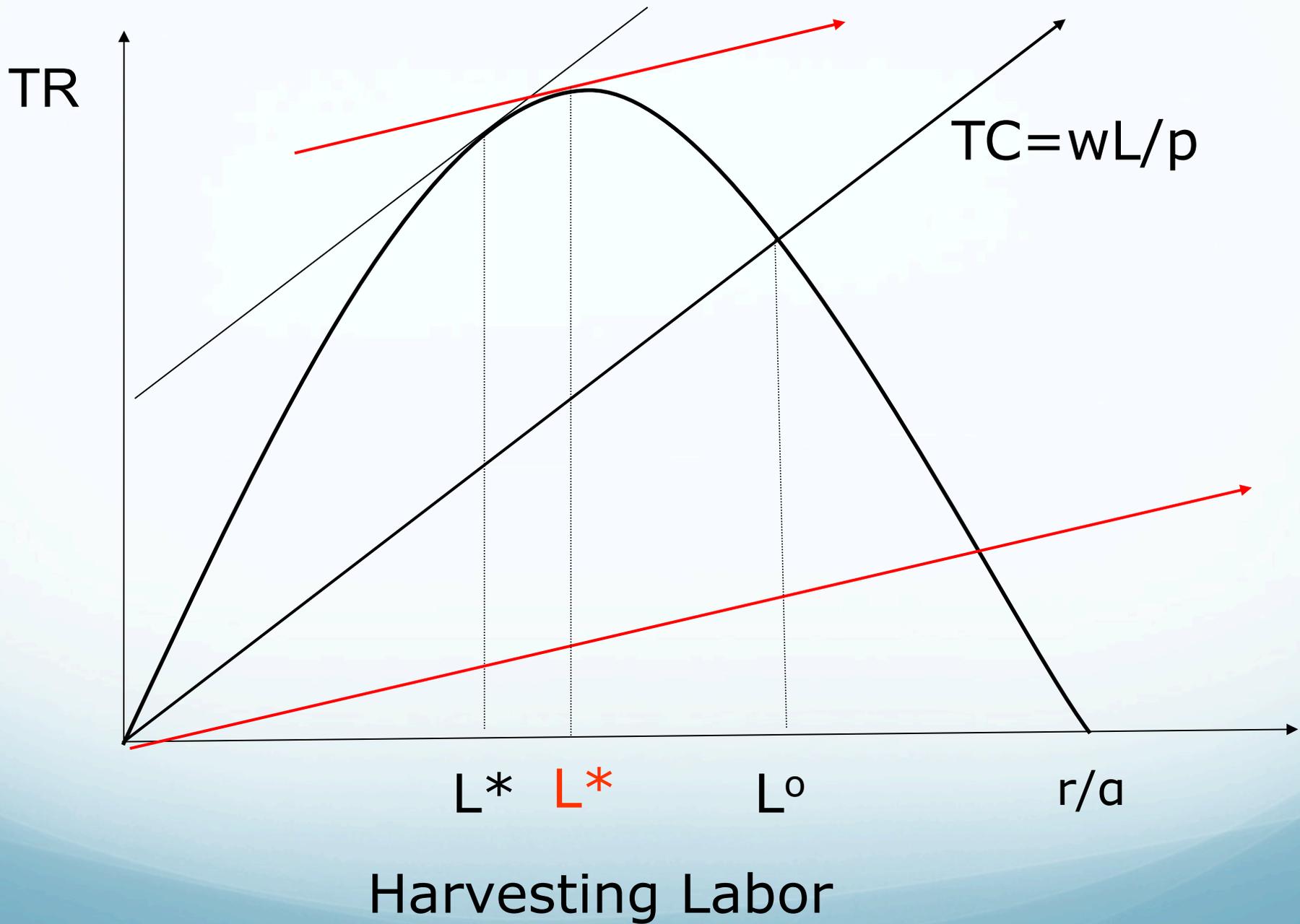
$$\Pi' / p = [\alpha L_h [K(1 - \alpha L_h / r)] - wL_h / p]$$



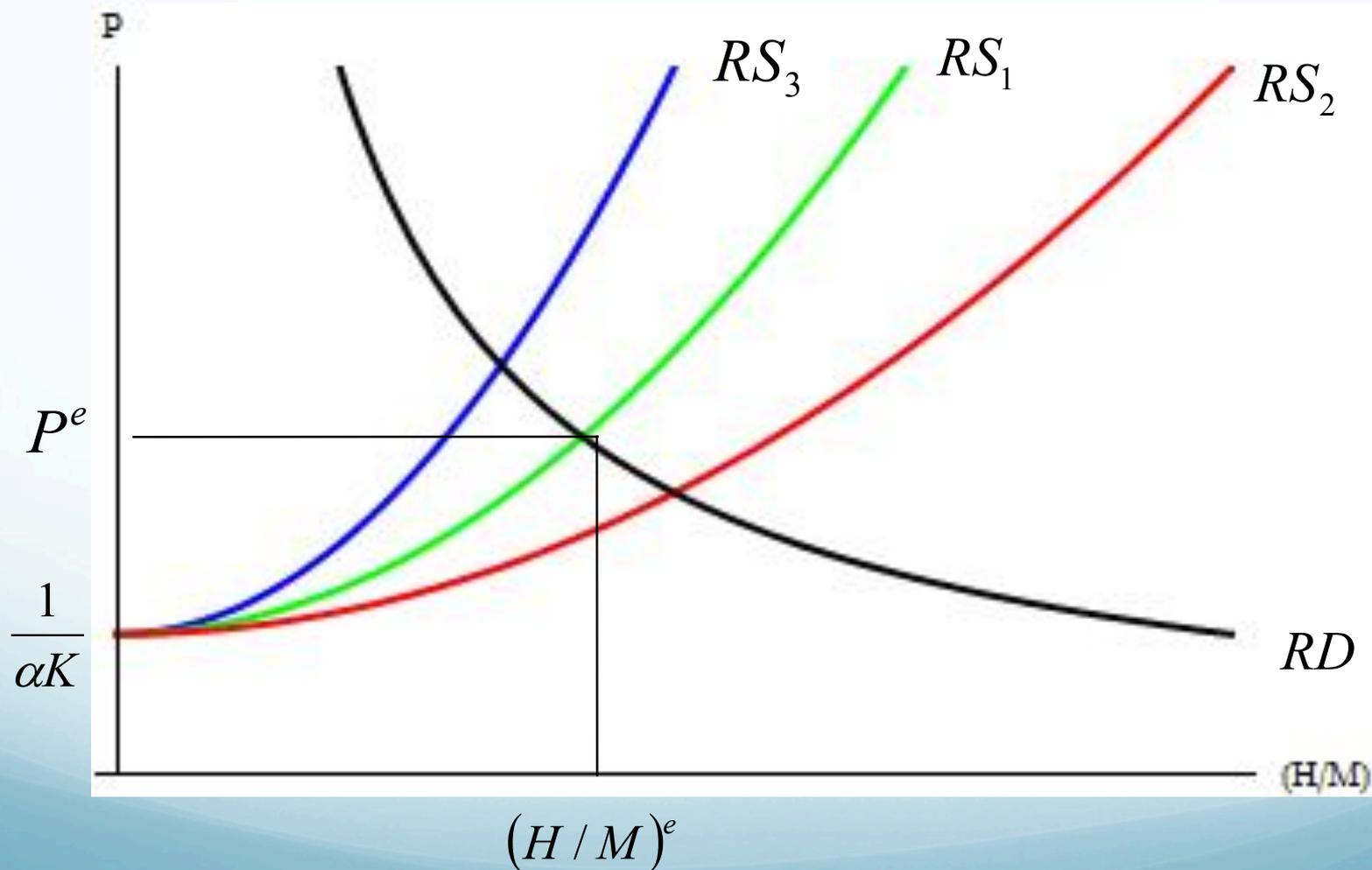
# Conservationist Country

$$S^* = \frac{K}{2} + \frac{1}{2\alpha p}$$

$$\frac{H^P}{M^P} = \frac{rS^*(1 - S^*/K)}{L - (r/\alpha)(1 - S^*/K)}$$



# Autarky with Full Property Rights: The Conservationist Country



**Proposition 2.** For the conservationist country, the relative supply of the resource harvest to manufactures is always increasing in the relative price of the harvest good.

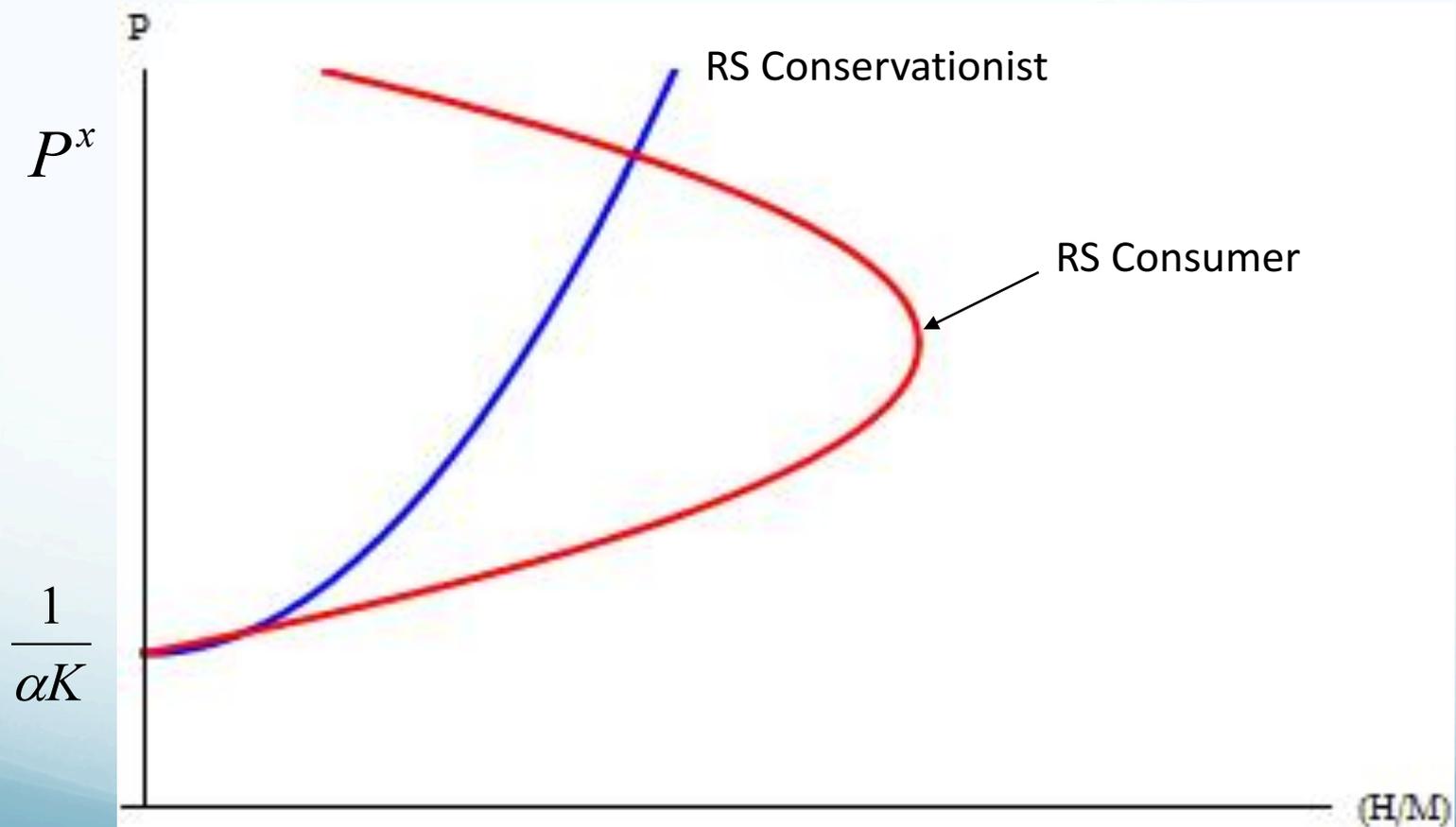
(i) For  $p < 1/(\alpha K)$ , relative supply is zero.

□ For  $p > 1/(\alpha K)$ , relative supply is given by Eq. 28:

(i) Relative supply cannot exceed  $H/M = [rK/4]/[L-(r/2\alpha)] > 0$ .

(ii) The conservationist relative supply curve is strictly upward sloping for all  $p > 1/(\alpha K)$ .

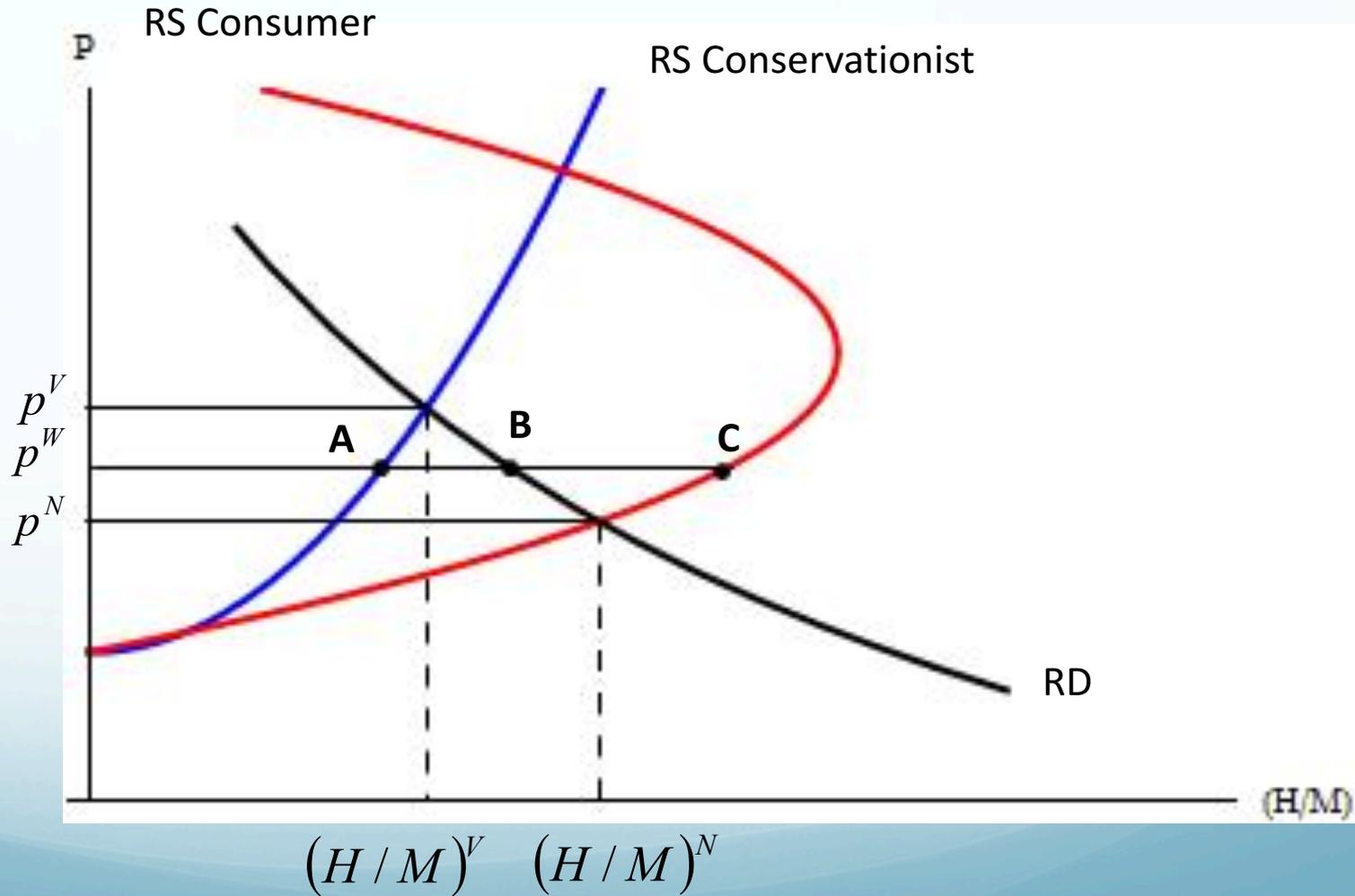
# Consumer and Conservationist Supply Curves



**Proposition 3.** The consumer and conservationist relative supply curves intersect only once. The associated price,  $p^x$ , exceeds  $1/(\alpha K)$ . Moreover;

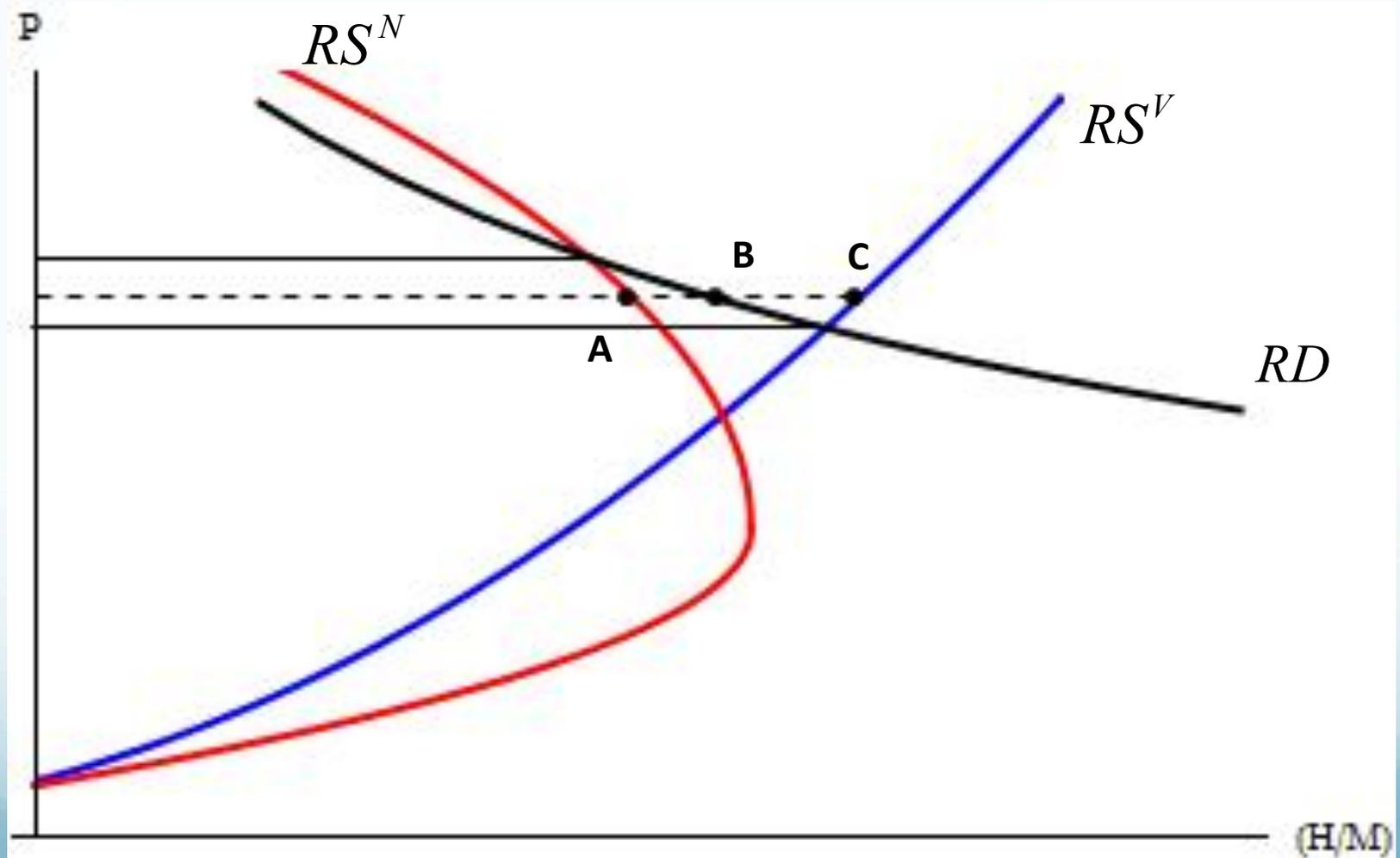
- For  $p < p^x$ , the relative supply of the consumer country exceeds that of the conservationist country.
- For  $p > p^x$ , the relative supply of the conservationist country exceeds that of the consumer country.
- For  $p > 1/(\alpha K)$ , the resource stock in the consumer country is smaller than in the conservationist country.
- For  $p > 1/(\alpha K)$ , the amount of labor employed in the consumer country's resource sector exceeds that in the resource sector for the conservationist country.

# Mild Overuse



***Proposition 4.*** In the mild overuse case, the consumer country has a lower relative price of the harvest good in autarky, exports the harvest good in free trade, reduces its resource stock in free trade, and has lower steady state utility in free trade. The conservationist country exports manufactures, raises its resource stock in free trade, and gains from trade.

# Severe Overuse



***Proposition 5.*** In the severe overuse case, the conservationist country has a lower relative price of the harvest good, exports the harvest in free trade, and gains from trade. The consumer country exports manufactures, imports the resource good, and has higher steady state utility in free trade.

Which Case is Most Likely?

# Three Types of Evidence

- Evidence on Resource Use: do countries with weak property rights tend to over-exploit their resources?
- Evidence from Case Studies: When countries liberalize does resource use go up or down?
- Evidence using Trade Flows: taking into account other determinants of trade, do countries with weak property rights tend to export resource intensive goods?

# Bohn & Deacon AER (2000)

- Estimate the impact of political uncertainty on resource use.
- Step 1: Develop a measure of political risk from first stage regression on investment.
- Step 2: Use measure as independent variable in resource use regression.

- Resource use measured by oil production, oil drilling, and deforestation.
- Limitations: endogeneity of risk measure.
- Does greater instability cause overuse of resources or does the presence of resources cause instability?

# Drilling Model

Dependent variable	Log(wells/year)	
	Coefficient	<i>t</i> -statistic
Ownership security	0.1377	(8.82)
Geologic abundance (fixed effect)	5.2052	(11.74)
Log(price)	0.6380	(6.36)
OPEC 1974–1985	−0.4594	(−2.56)
Log(API gravity)	−1.4822	(−5.70)
Log(depth)	−1.0770	(−7.53)
Log(land area)	0.7585	(21.30)
Year	−0.0226	(2.95)
Constant	50.7324	(3.41)
<i>N</i>	632	
<i>R</i> <sup>2</sup> adjusted	0.54	

# Oil Production Model

Dependent variable	Log(output/reserve)	
	Coefficient	<i>t</i> -statistic
Ownership security	0.0647	(9.12)
Log(price)	0.1129	(2.01)
OPEC dummies (1974–1985)		
Algeria	−0.2370	(−1.20)
Ecuador	0.4542	(2.35)
Indonesia	−0.2124	(−1.11)
Iran	−0.7128	(−3.66)
Iraq	−0.9357	(−4.92)
Saudi Arabia	−0.8157	(−4.08)
Log(API gravity)	0.0375	(0.27)
Log(depth)	−0.1640	(−2.06)
Year	−0.0052	(−1.19)
Constant	7.5388	(0.88)
<i>N</i>	636	
<i>R</i> <sup>2</sup> adjusted	0.22	

# Forest-Cover Model

Dependent variable	Proportionate change in forested area	
	Coefficient	<i>t</i> -statistic
Ownership security	0.0089	(5.68)
Initial forest biomass	0.1105	(4.22)
Water resources/land area	0.3003	(0.54)
Coastline/land area	-0.0291	(-1.81)
Population density	0.0053	(0.87)
Constant	-0.2147	(-7.88)
<i>N</i>	62	
<i>R</i> <sup>2</sup> adjusted	0.42	

# Summary

- Poor governance structures seem to lower investment in long-lived assets like capital.
- If capital is critical for resource overuse (i.e. oil), then insecurity lowers use. If capital is not critical (i.e. deforestation), then insecurity raises use.
- The effects of insecurity are very large.

# Empirical Evidence II

- Lopez (1997): impact of trade liberalization on biomass and agriculture in Ghana. Lopez (2000) similar but for Cote d'Ivoire.
- Village level data 1988-1989, biomass measures, land under cultivation, uses survey of villages plus satellite imagery.
- Estimates an agricultural production function with biomass productivity effects.

# Findings: Ghana

- Estimates from constant elasticity estimation plus some additional assumptions imply: biomass is overused by 20-40%; not complete open access.
- Agricultural equivalent export tax of about 17%. Removing it lowers real income by less than .1%, but biomass falls 3%.

# Findings: Cote d'Ivoire

- Finds almost complete open access use of biomass.
- 3 crop model of agriculture: tree crops, cereals, tubers & root vegetables. Each differ in their land use.
- Complete trade liberalization, lowers cereal production, raises fallow, national income rises 9% in the long run!!

# Great, but ...

- These are not results from an actual trade liberalization- they are simulations not case studies.
- Trade liberalization exercise is subject to the Lucas Critique.
- Some tension between theory and empirics.

# Conclusion

- It is not that obvious that poor property rights convey a comparative advantage in resource intensive industries.
- Other factors matter; productivity can be higher in well managed resource sectors; and industry specific capital may not invest and this lowers harvesting.
- Empirical work tells us the details matter; not only industry differences, but crop level differences too.

# References

- S. Ferreira, Land Economics, 2004.
- R. Lopez, Journal of Development Economics, 1997.
- R. Lopez, Environment and Development economics, 2000.
- Brander and Taylor, Resource and Energy Economics, 1997.