ZEW Lectures

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Regulation is Rigid Hypothesis

- Conditions of open access or poor regulation have nothing to do with trade policy, market outcomes or national incomes.
- If true, trade policy advice is simple.

Is Regulation Rigid?

- The Demsetz Hypothesis.
- The degree to which economic agents protect resources depends on their value.
- As their value rises, agents will have an incentive to protect them more completely.
- Property rights become more complete when resources rise in value.

Elinor Ostrom

- Open access and the first best solution are not the only “solutions” to resource management.
- Ostrom’s evidence. Many common property resources are neither government regulated nor privatized nor open access. They have communal and informal regulation that often works but often fails too.

Demsetz & Ostrom

- Need to develop a theory of resource regulation where the value of the resource and other economic determinants interact to determine the success or failure of resource management.

The Research Questions

- Under what conditions, if any, can we expect management of renewable resource industries to be successful?
- How are these conditions affected by changes in prices, technologies, or the number of agents harvesting.

Related literature

- Case study literature using examples from history or examining contemporary policy experiments in developing countries.
- Theoretical literature focusing on models of non cooperative behavior, often with agents interacting over time.
- Formal empirical literature evaluating resource use and linking it to trade, population growth or property rights security.

What is missing?

- Simple characterization of the conditions when management is likely to succeed.
- Bridge to existing theoretical models of perfect property rights and open access.
- Something useful as a basis for empirical work.

The Model

Assumptions I

- Dynamic general equilibrium small open economy
- Many agents with the right to harvest
- Many generations of agents
- Regulator is benevolent

Assumptions II

- Harvesting is not observed by regulator
- Regulator uses limits on harvests
- Regulator‘s ability to punish is limited
- There is overcapacity

Tastes & Technologies

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

$$I = ph + m$$

$$h = \alpha L_h S$$

$$m = L_m$$

Definitions

- Capacity
- Enforcement Power
- Incentive to Extinguish

Agent’s Decision

- Every instant you can cheat or not cheat.
- If you cheat - you are caught with some probability and fined.
- If you are not caught, tomorrow you can cheat or not cheat again.

Agent’s Decision

- Cheat
- Don’t Cheat
- Deterring Fine

The Fine

- You want the largest possible fine.
- Fines have to be bounded by something
- Maximum we can take from you is the right to harvest from the resource
- In this case fine is: $F = [V^R(t) - V^M(t)]$

in terms of parameters: $F = [\pi + \dot{V}^R]/[\delta + \theta]$

Expected Cheating Cost

- ρF – punishment fits the crime
- Expected cost rises as the resource becomes more valuable.
- Our method does this in a simple automatic way.

Enforcement Power Revisited

Depends on how agents value the future losses, plus the government's ability to catch, successfully prosecute, and effectively punish the cheaters.

Regulator's Problem

- Max SW by choice of effort, subject to incentive constraint, resource growth, technologies.

$$SW = N \int_0^\infty U(R(t))e^{-\delta t}dt$$

The Solution

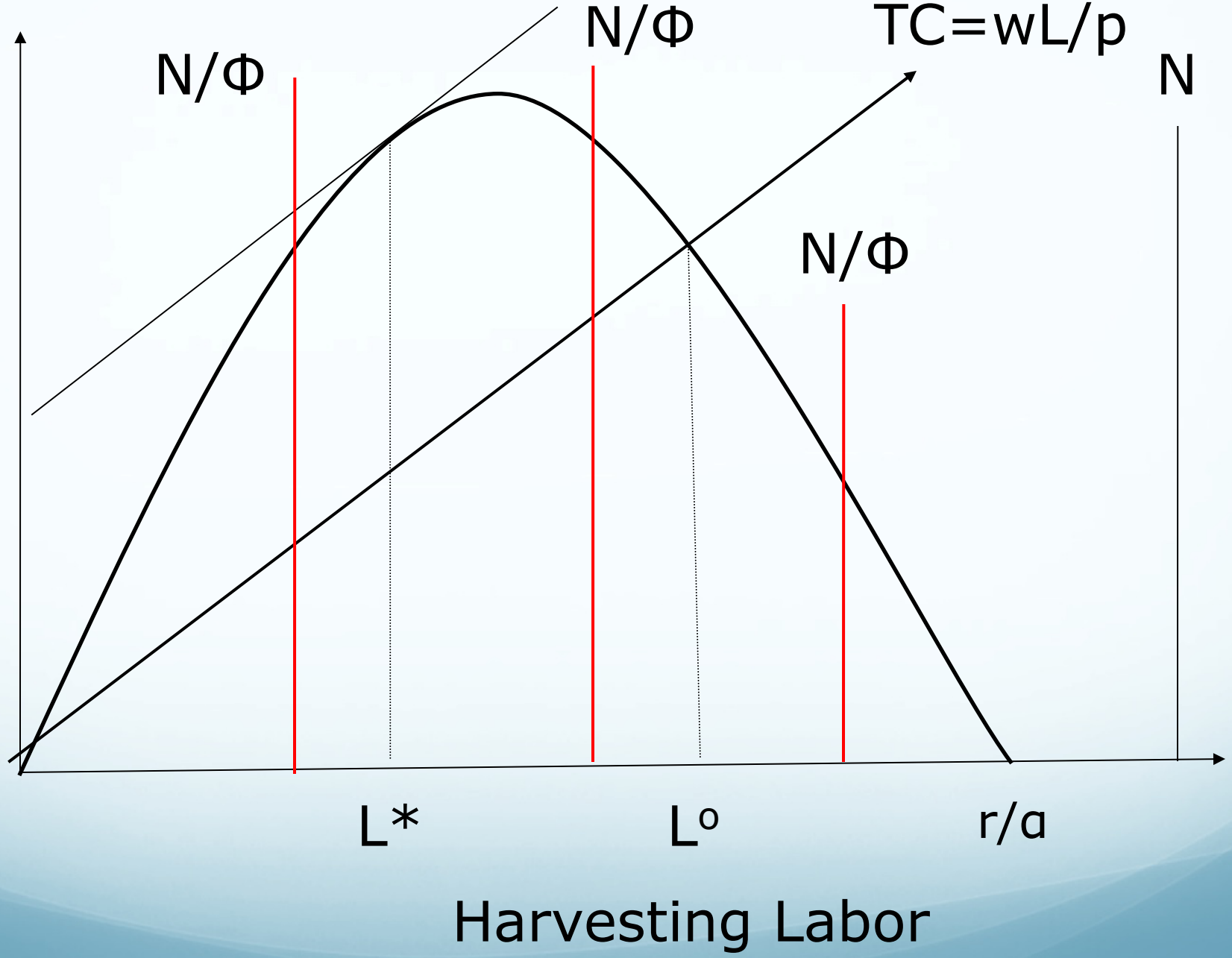
The unique steady-state solution:

$$L^O = (r/\alpha)[1 - w/p\alpha K]$$

$$S^O = K\left(1 - \frac{\alpha L^O}{r}\right)$$

Incentive Constraint in SS

$$L \geq \min\left[L^{O}, L^{T}\right]$$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N/Φ
TC=wL/p
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r/a
Harvesting Labor

Proposition 1. The steady state is unique. It exhibits either *de facto* open access, limited harvesting restrictions, or and outcome equivalent to that of the unconstrained first best.

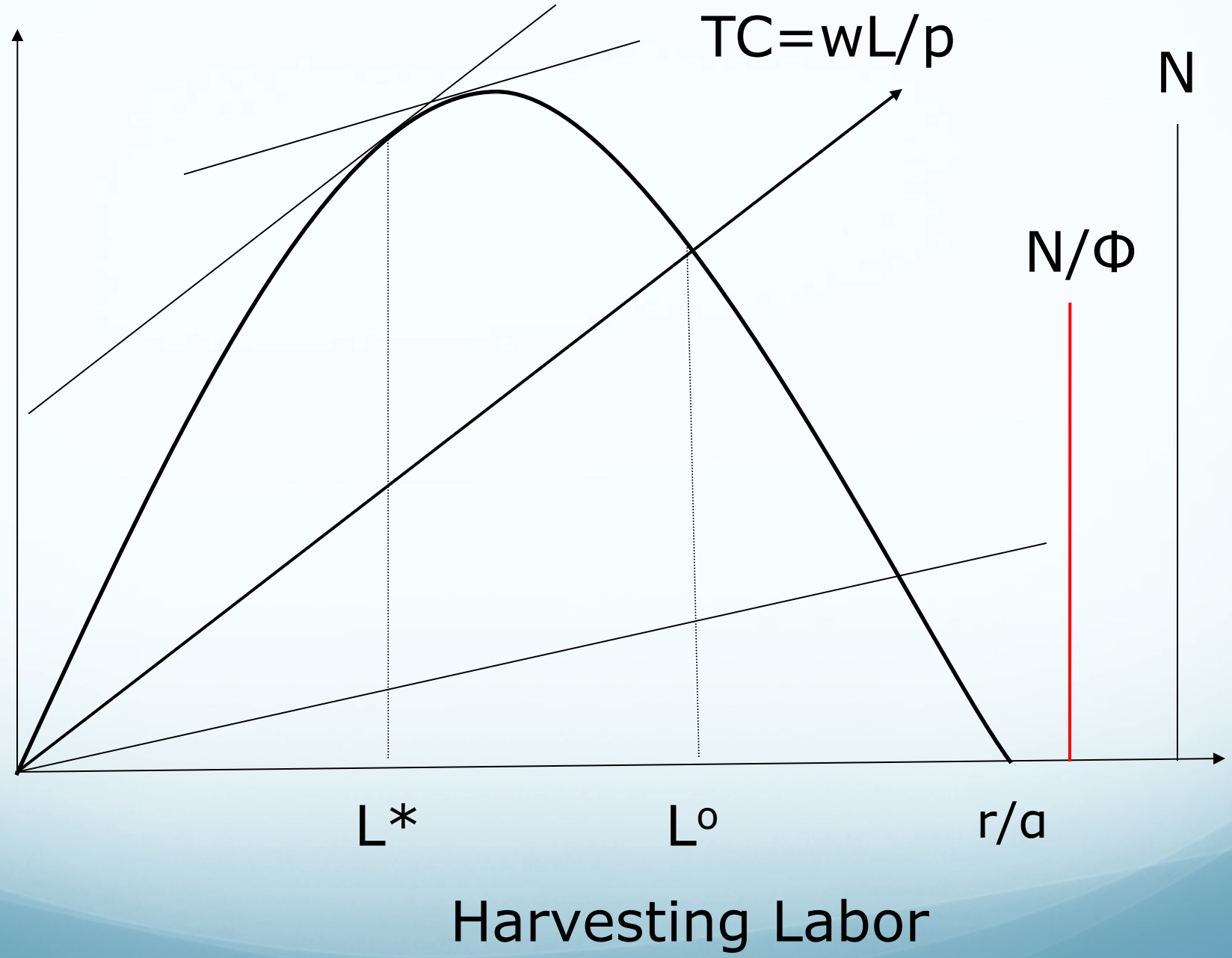
Nice, but how do things vary when we change

- Prices the SOE faces
- Technologies for harvesting or monitoring
- Population size that affects overcapacity

Hardin Economies

Proposition 2. Hardin economies will always exhibit *de facto* open access in steady state. For any finite relative price p of the harvest good, we have $L = L^{o}(p)$ and no rents are earned in the resource sector.

Countries are more likely to fall into this category if their resources are slow to replenish (low r), if agents are impatient (high $\delta + \theta$), if cheating is hard to detect (low ρ), if harvesting technology is more productive (high α), and if a large number of agents have access to the resource (high N).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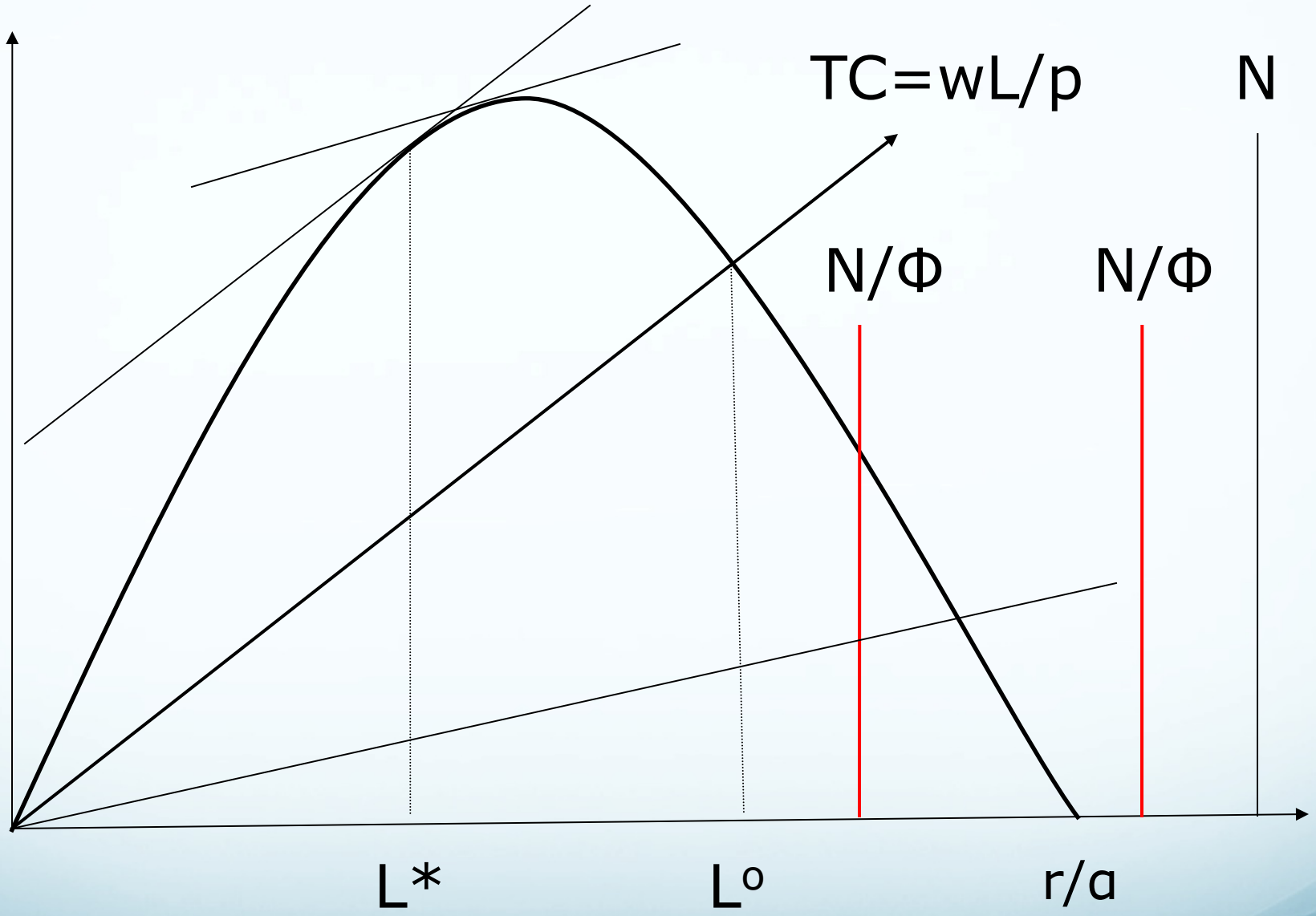
Harvesting Labor

At low prices, all economies look like Hardin Economies

Proposition 3. Whenever rents are positive at some stock, and there is overcapacity in the resource sector, all economies will exhibit open access and zero rents at low resource prices.

Ostrom Economies

Ostrom economies exhibit *de facto* open access in the steady state when $p \leq p^{+}$ (where p^{+} depends on country characteristics); but for $p > p^{+}$ harvesting restrictions are successfully implemented and the resource generates rents.



Harvesting Labor

First Best in General

$$\pi\delta = \pi G'(S) - \hat{c}\,H$$

$$\pi\delta = \pi G'(S) \Rightarrow if\ \delta > r, then\ \ S = 0.$$

$$0 = \pi G'(S) - \hat{c}\,H \Rightarrow if\ \delta = 0, then\ \ S > K/2.$$

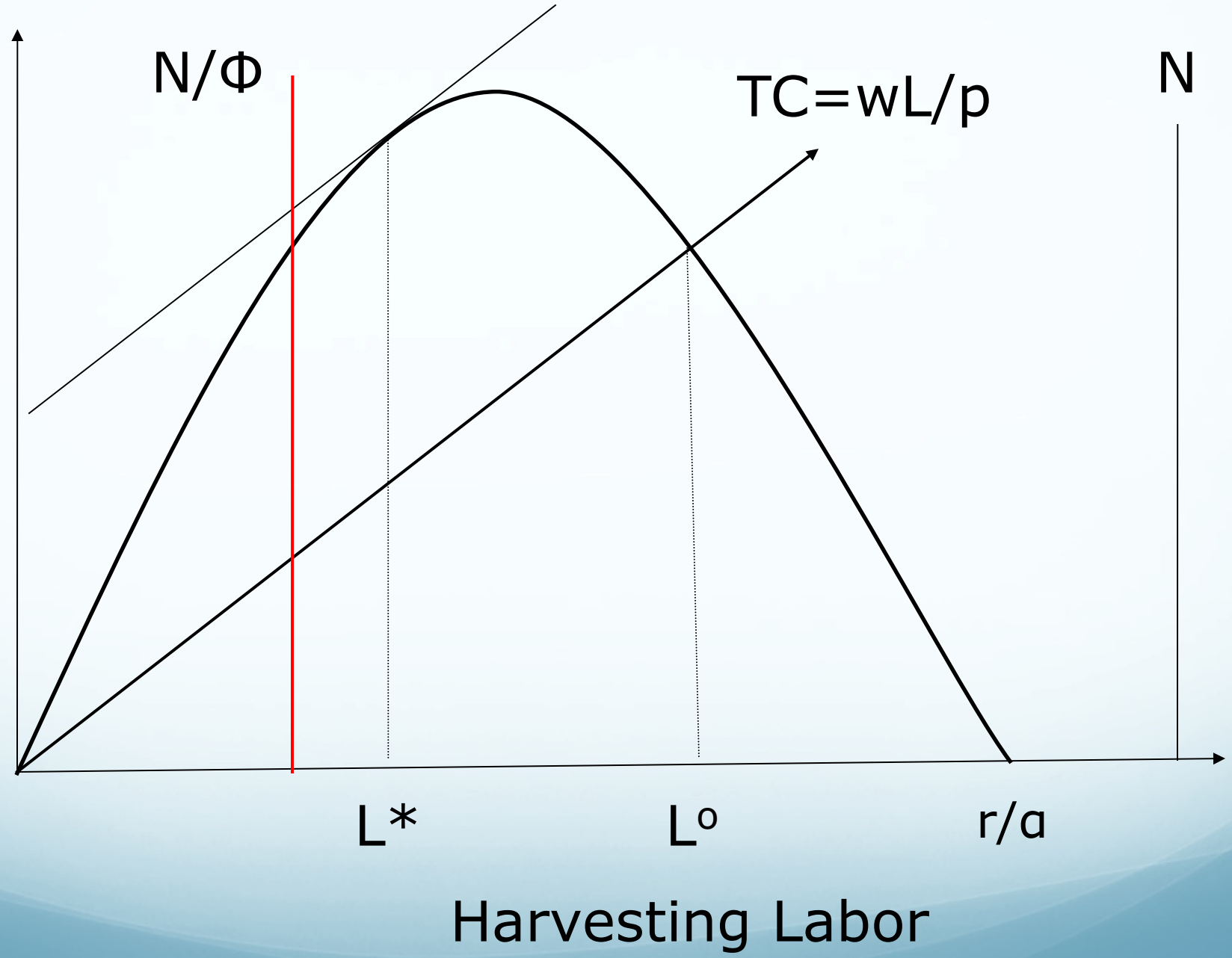
Incentive to Extinguish

$$\Gamma = (\delta + r)/r$$

$$= 1 + \delta / r$$

Clark Economies

Clark economies are those where (all else equal) there is strong enforcement power, not much overcapacity, and a strong incentive to extinguish.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Heterogeneity

Proposition 4. Assume a group of Hardin, Ostrom and Clark economies exist, and let them share the same minimum price $p^{min} = w/\alpha k$ at which rents in the resource sector are zero. Then there exists a $p^{low} > p^{min}$ such that for any $p < p^{low}$, all countries exhibit *de facto* open access. There also exists a finite $p^{high} > p^{low}$ such for $p > p^{high}$, there is heterogeneity in the world's resource management with some countries at open access, others with limited management, and some with perfect property rights protection and full rent maximization.

Applications

- Trade Liberalization
- Technological Progress
- Population growth

Trade Liberalization

Proposition 5. Suppose the planner's discount rate approaches zero and the country exports the resource good, then a marginal fall in trade frictions will

(i) Reduce steady state real income in a Hardin economy

(ii) Increase steady state real income for a Clark or Ostrom economy, if $Yp \geq p^{+}$

(iii) Decrease steady state real income for a Clark or Ostrom economy if $Yp < p^{+}$; but there exists a $\underline{p}$ such that if $p > \underline{p}$, then an elimination of trade frictions leads to the emergence of a management regime and increases the steady state real income.

(iv) For a Clark economy, if $Yp < p^{+}$, and $p \geq p^{++}$ then the elimination of trade frictions results in a transition from *de facto* open access to fully efficient management. Steady state real income rises.

Technological Change

- New technologies raises capacity and necessitates regulation.
- Technological progress in harvesting can make all economies Hardin economies.
- Even neutral technological progress is not a panacea. Rich and poor countries will struggle with over use.

Population Growth

Proposition 6. Starting from an open access steady state with zero rents at p^+, a marginal increase in population, N, will lead to a new steady state with higher prices, positive rents, partially effective controls on harvesting, and higher incomes if the demand for the resource good is inelastic.

Summing Up

Resource Overuse Hypothesis

- Logically tight, and empirical examples exist.
- Making regulation endogenous does not eliminate this possibility.
- Set of relevant countries are Hardin economies with slow growing resources, efficient technologies, limited life spans, and weak government.

Policy for Hardin Economies

- Reform of environmental policy should precede reform of trade policy.
- Usual prescription that trade policy shouldn’t be used for environmental ends remains true. Export bans miss the point.
- Production taxes, harvest quotas etc. are in order. Instrument choice is not a solution.

Regulation is Everything Hypothesis

- Logically possible, but other things matter. Other factors, complementary investments, stock productivity effects.
- Theory of Endogenous Regulation reinforces these concerns
- Correlated attributes: Ostrom and Clark economies have attributes working towards comparative advantage in those industries. This may make severe overuse case more likely than we thought.

Regulation is Rigid Hypothesis

- Useful theoretical device, but not a good working assumption for the real world.
- Belief in rigid regulation works two ways by ruling out enforcement improvements, but also enforcement collapses.
- Globalization does more than just alter relative prices, it affects migration and alters technological possibilities.

Country Classification