

EE475: Natural Resource Economics

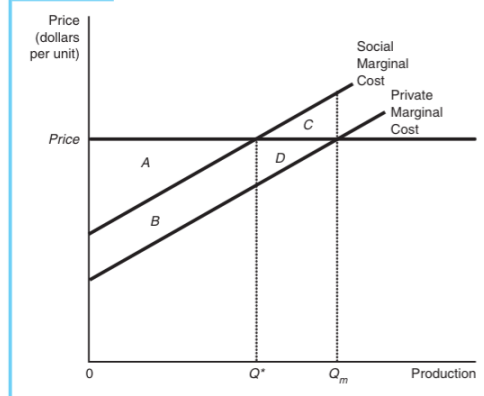
## Market Efficiency and Property Rights (2)

30th January 2015  
by  
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## Outline

- Continue from last time: The pursuit of efficiency
- Dynamic Efficiency: A Two-period Model
- Intertemporal Fairness
- Applying the Sustainability Criterion

FIGURE 2.10 Efficient Output with Pollution Damage



Source: Tietenberg & Lewis (2012), p.39

### Private Resolution through negotiation

- Small number of affected party

- This is the case of the steel factory and the resort.
- Because the steel factory is at the water source, it controls the quality of water at the end of the river.
- What would the resort owner do if the goal is to motivate the steel factory to reduce its production from  $Q_m$  to  $Q^*$ , thus, less water pollution?

## The Pursuit of Efficiency

- Question
- Is it always the case that the affected party has to convince the other to reduce the externalities?

# The Pursuit of Efficiency

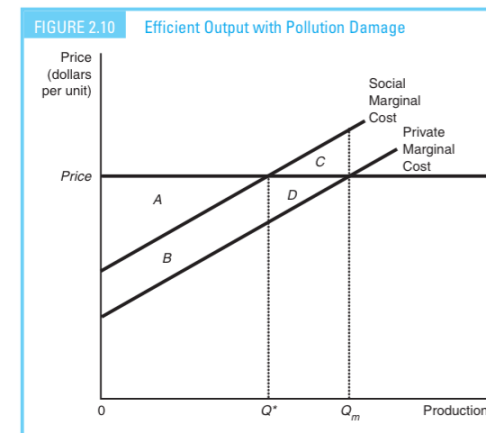
- The Courts: Property rules and Liability Rules
- The property rules
  - specify the initial allocation of the entitlement.
  - *In our case*: Conflicting entitlements - the right to add waste products to the river and the right to have an attractive river.
  - The court merely decides which right is preeminent and places an injunction against violating that right.
- In the absence of a court decision, the entitlement is naturally allocated to the party that can most easily seize it.

# The Pursuit of Efficiency

- Coase Theorem - Ronald Coase (1960)
  - As long as negotiation costs are negligible and affected consumers can negotiate freely with each other (when the number of affected parties is small), the court could allocate the entitlement to *either* party, and an efficient allocation would result.
  - The only effect of the court's decision would be to change the distribution of surplus among the affected parties.

# The Pursuit of Efficiency

- If the court decides that the entitlement of the resort, i.e. the right to attractive river, is preeminent, that means it is the factory that violates the right and has to negotiate with the resort in order to avoid injunction.
- What would happen if the factory negotiates with the resort?



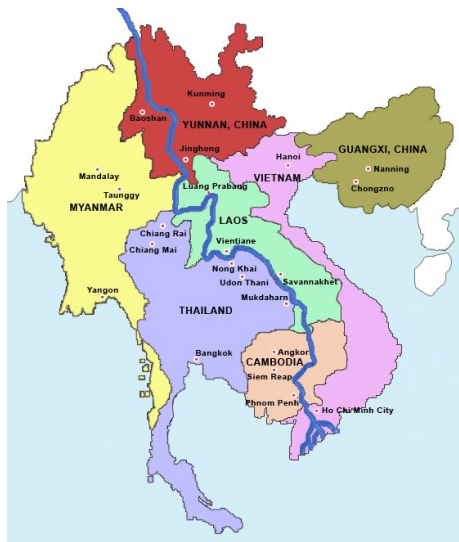
Source: Tietenberg & Lewis (2012), p.39

# The Pursuit of Efficiency

- If the negotiation does work, then the 'Liability Rules'
  - The liability rules award monetary damages, after the fact, to the injured party.
  - The steel factory has to compensate the resort for all damages incurred: the area between two marginal cost curves from the origin to the chosen level of output.
- Internalization of Externalities
- Limitation: High transaction costs

# The Pursuit of Efficiency

- In your opinion, what are the limitations of options we have discussed?



# Question

- Do you think the options to the pursuit of efficiency we discussed earlier are applicable to the case of Greater Mekong Subregion?

# Dynamic Efficiency

- Suitable for circumstances where time is crucial.
- What are the circumstances where time is crucial?
- Not only efficiency but also fairness or justice

## Concept of Present Value

- *Future value at present period of time*
- Suppose we have 100 baht in our pocket. We want to invest. The interest rate is 10% per year.
  - After one year: 110 baht (our money 100 baht + interest 10 baht)
- Therefore, present value of 110 baht (which will be received next year) is 100 baht.

## Concept of Present Value

- *Present Value of a one-time net benefit received  $n$  years from now is:*

$$PV[B_n] = \frac{B_n}{(1 + r)^n}$$

- $B_n$  = net benefit received in year  $n$  th
- $r$  = Discounting rate (= interest rate)

## Concept of Present Value

- Present Value of a stream of net benefit  $[B_0, \dots, B_n]$  received over a period of  $n$  year

$$PV[B_0, \dots, B_n] = \sum_{i=0}^n \frac{B_i}{(1 + r)^i}$$

## Concept of Present Value

- $r = 0.06$

Year	1	2	3	4	5	รวม
Annual Amounts	3,000	5,000	6,000	10,000	12,000	36,000
Present Value						

# Concept of Present Value

- $r = 0.06$

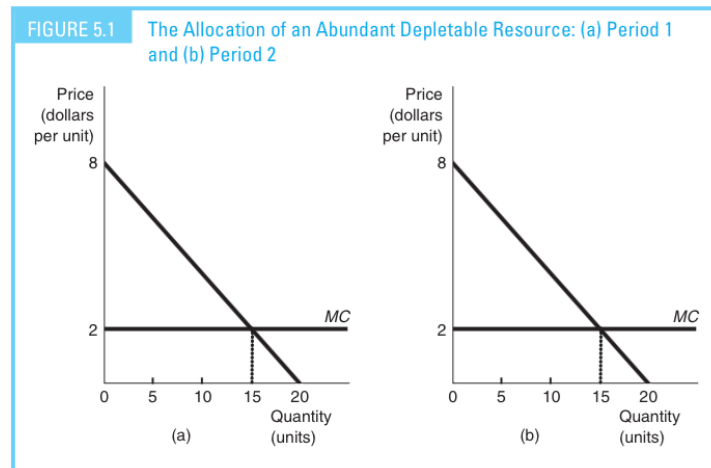
Year	1	2	3	4	5	รวม
Annual Amounts	3,000	5,000	6,000	10,000	12,000	36,000
Present Value	2,830.19	4,449.98	5,037.72	7,920.94	8,967.10	29,205.92

# Dynamic Efficiency

- An allocation of resources across  $n$  time periods satisfies the dynamic efficiency criterion if it maximizes the present value of net benefits that could be received from all the possible ways of allocating those resources over the  $n$  periods.

## Dynamic Efficiency: Two-period model

- The case of depletable resource
  - Assumptions
    - Fixed supply of a deplorable resource to allocate between two periods
    - Demand function is constant in the two periods
    - the marginal willingness to pay:
      - $P = 8 - 0.4q$
    - Marginal cost is constant = \$2 per unit.



Source: Tietenberg & Lewis (2012), p.103

## Dynamic Efficiency: Two-period model

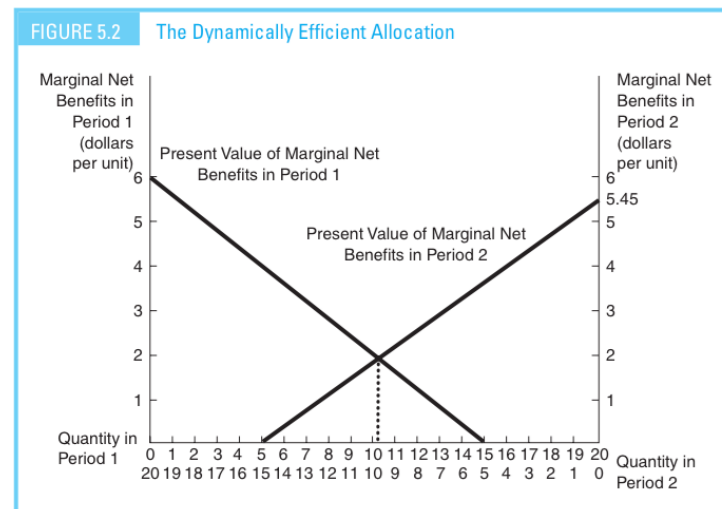
- *Regardless of the discount rate*
- If the total supply was 30 or greater, an efficient allocation would produce 15 units in each period.
- The consumption in period 1 does not reduce consumption in period 2
- In this case static efficient is sufficient because the allocations are not inter dependent.

## Dynamic Efficiency: Two-period model

- Suppose the supply is less than 30, suppose it equals 20.
- With the same function of marginal willingness to pay, the resource available is not enough for each period to consume as much as their quantities at static efficiency.
- If the first period is allocated 15 units, and the second period, 5 units, what is the present value of this allocation?

## Dynamic Efficiency: Two-period model

- How do we determine the efficient allocation?
- Dynamic efficiency criterion -> Maximizes the present value of net benefit of both periods
- Condition that satisfies Dynamically efficient allocation:
  - *Present value of the marginal net benefit from the last unit in Period 1 equals the present value of the marginal net benefit in Period 2.*



Source: Tietenberg & Lewis (2012), p. 105

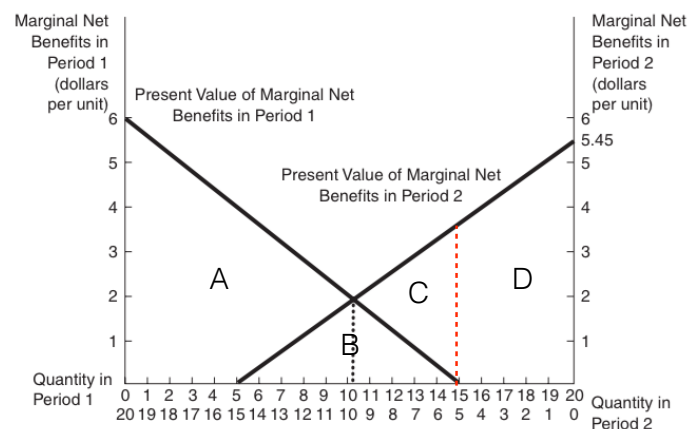
## Dynamic Efficiency: Two-period model

- Why does the marginal benefit curve of period 1 intersect the vertical axis at 6 instead of 8?
- Why does the marginal benefit curve of period 2 intersect the vertical axis at a different point than does the curve in period 1?
- Which area represents the total present value of net benefits?

## Dynamic Efficiency: Two-period model

- Intertemporal scarcity imposes additional cost to the allocation in each period.
  - *Marginal User Cost (MUC)* :
    - When resources are scarce, greater current use diminishes future opportunities. The marginal user cost is the present value of these forgone opportunities at the margin
- MUC = the Vertical distance between the quantity axis and the intersection of the two present-value curves.
- Without considering the marginal user cost, the inter temporal allocation will not be efficient.

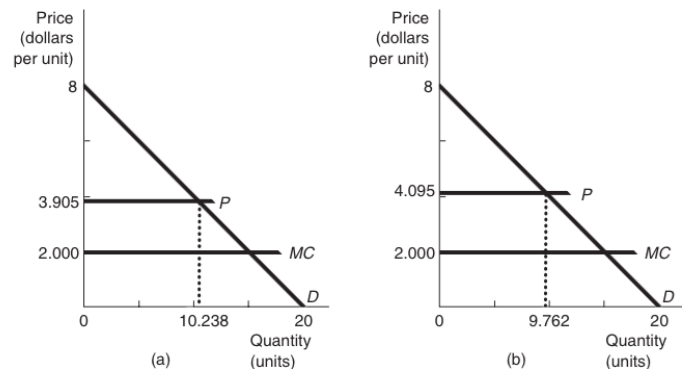
FIGURE 5.2 The Dynamically Efficient Allocation



## Dynamic Efficiency: Two-period model

- At the efficient quantities, are the *actual* MUCs in the two periods identical, and why?
- At the efficient quantities, are the *actual* prices in the two periods identical, and why?

FIGURE 5.3 The Efficient Market Allocation of a Depletable Resource: The Constant-Marginal-Cost Case: (a) Period 1 and (b) Period 2



Source: Tietenberg & Lewis (2012), p.107

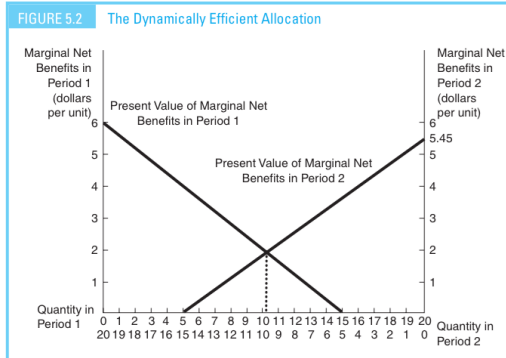
## Defining Intertemporal Fairness

- John Rawls - *A Theory of Justice*
- **“Veil of Ignorance”**
  - A method of determining the morality of certain issue based upon a thought experiment
  - Initially no one knows their abilities, tastes, position within the social order, or role they will be playing in the issue.
  - Choices will be based on moral considerations.

## Defining Intertemporal Fairness

- How should a limited depletable resource be allocated intertemporally between present and future generation, so that the allocation is fair for both generations?

## Are Efficient Allocations Fair?



- Is this example of efficient allocations fair?
- In practice, what can we do to make the efficient allocation fair?
- Is it weak or strong sustainability?