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Recyclable Resources

- In the market for product from recycled raw material, consumers can play roles in both demand and supply.
- On demand side, the consumers will switch to product from recycled raw material if
 - the one from virgin material is more expensive.
 - the quality of the product from recycled raw material is not adversely affected.
 - This is called the *composition of demand effect*.
- On supply side, if the consumers bear the cost of disposal, they would have incentive to return their used recycled product to collection centers.

Recyclable Resources

- Unlike energy, other minerals can be recycled, under proper conditions, because even after used they maintain some basic physical and chemical properties
- Two main pressures for recycling
 - Extraction cost would eventually increase even with technological progress as new sources become increasingly difficult to extract.
 - Disposing cost would increase as population density increased. Higher level of wealth also supported higher level of waste.

Recyclable Resources

- Purity of the recycled products can strengthen the demands.
- Waste the contains hazardous materials, for example, e-waste, raises additional complexities. This needs additional regulations and proper enforcement mechanism to make sure that the hazardous waste is taken care of properly.

Costs of recycled product

- In most cases recycling is not cheap. It involves several types of costs.
 - Transportation cost
 - Processing cost
 - Labor cost
 - Environmental cost
- If the recycling market operate smoothly, scrap from used products can become a cost-competitive input.

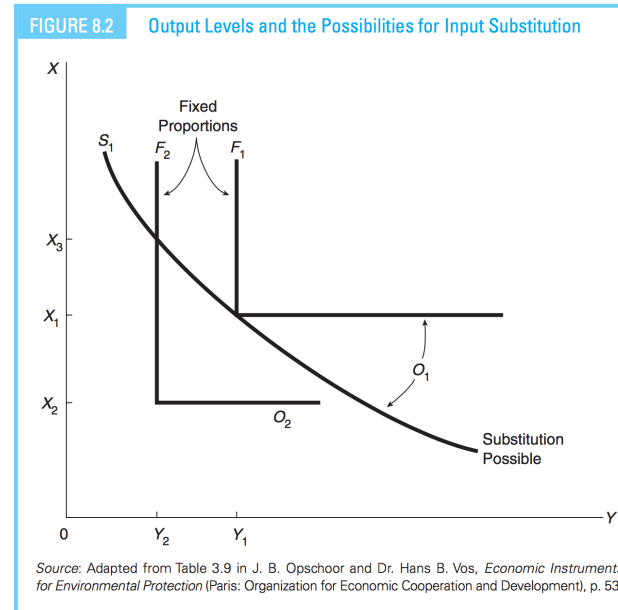
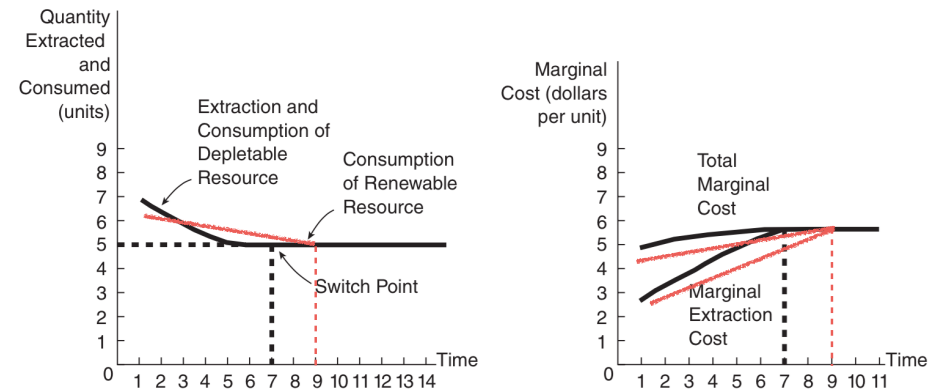


Recycling and Ore Depletion

- How much more of this resource was made available by recycling?
 - $A / (1-a)$; a is recovery rate
 - Ex. If a is 0.9, how much more this resource can be made available by recycling?
- What can we imply from the above formula?
 - $a = 0$?
 - $a = 1$?

Recycling and Ore Depletion

- Comparing two types of materials with identical extraction cost but one is recyclable and the other is not, **how do you think the recycling would affect the timing of switching point to substitutes?**



How substitution possibilities reduce impact of resource scarcity on output?



Disposal cost and efficiency

- Two kinds of scrap
 - New Scrap = the residual materials generated during production
 - Old Scrap = materials recovered from products used by consumers
- In term of costs in recycling process, what do you think is the different between them?



Disposal cost and efficiency

- Market for old scrap works inefficiently because the product users do not bear the full marginal social costs of disposing of their product. —> The market biased away from recycling old scrap.
- Cost of delivering the scrap to a recycling center vs Disposal cost

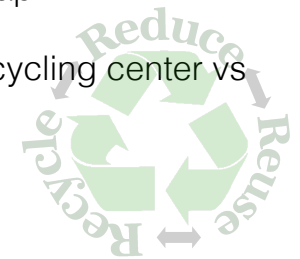
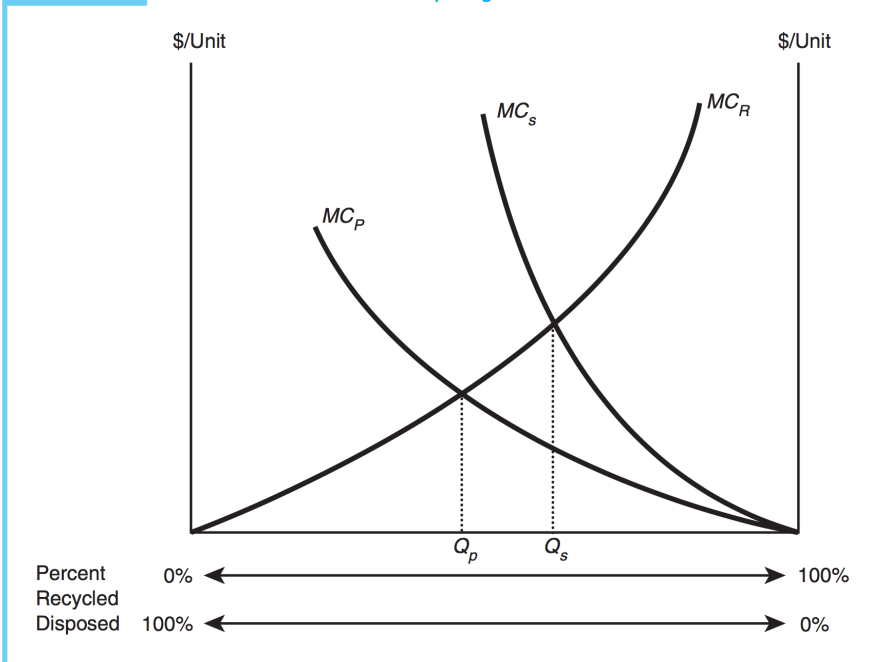


FIGURE 8.3 The Efficient Level of Recycling

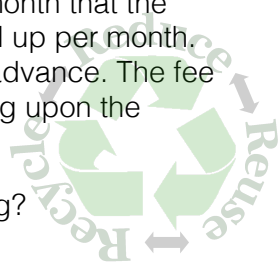


Why recycling rates are so low, especially in Thailand?



Corrective Public Policies

- Disposal charges - Volume pricing
 - Example from Marietta, Georgia
 - Per-bag price on waste (\$0.75 per bag)
 - Monthly fee for pickup that depended on the maximum number of cans per month that the customer wished to have picked up per month. The number was contracted in advance. The fee was \$3 or \$4 per can (depending upon the number)
 - Which plan promote more recycling?



Corrective Public Policies

- Disposal charges - Volume pricing
 - What do you think about this policy?
 - Would it impose a hardship on the poor residents of the area?



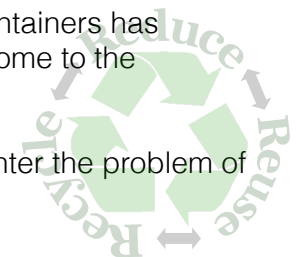
Corrective Public Policies

- Refundable deposit
 - Two purposes
 - the initial charge reflects the cost of disposal and produces the desired composition of demand effect;
 - the refund, attainable upon turning the product in for recycling, helps conserve virgin materials.



Corrective Public Policies

- Refundable deposit
 - Widely accepted for beverage containers
 - Quite a few countries have deposit refund schemes for aluminum beverage cans
 - Scavenging and returning these containers has provided a significant source of income to the homeless.
 - Norway and Sweden used it to counter the problem of abandoned automobiles



Corrective Public Policies

- Tax system
 - **Taxing virgin materials** - Ex. taxing virgin lubricating oil and use the income to subsidize the recycling industry.
 - **Subsidizing recycling activities** - Ex. Subsidize the acquisition of recycling equipment in both public and private sectors



Corrective Public Policies

- Extended producer responsibility approach
 - An example for the take-back principle
 - **Germany** has required producers and retailers (as intermediaries) to accept all packaging associated with products. Consumers are also encouraged to return the packaging by the combination of the policies.
 - A new private nonprofit organization (Duales System Deutschland - DSD) was established by producers to collect the packaging and to recycle the collected materials.
 - Failure - inability to find markets for the recycled materials it collected.



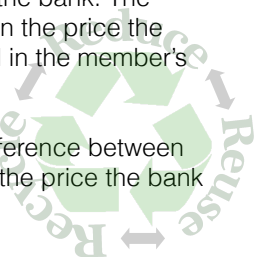
Corrective Public Policies

- Extended producer responsibility approach
 - This approach refers to the policies that
 1. influence producer choices about product design to increase recyclability, product packing, and the use of recycled materials in the production process.
 2. Take-back principle - require producers to take back packaging and even their products at the end of their useful life.



A community initiative

- Garbage Bank
 - In Thailand, it is mostly implemented in a school or a community.
 - It is a cooperation between the host (the schools or communities), a shop that buys old or recyclable stuff, and the members of the school/community.
 - Mechanism - A Member deposits garbage to the bank. The garbage is disintegrated and valued, based on the price the bank can sell to the shop. The money is noted in the member's bank book.
 - The operation of the bank is funded by the difference between the selling price the garbage to the shop and the price the bank giving to the members.



How would you solve the problem of e-waste? Pick 3 policies that you think are the most significant in solving this problem.

