COMPLICATIONS FOR ENVIRONMENTAL REGULATIONS

Ch 11, Kolstad (part 2) - Economic Incentives

ECONOMIC INCENTIVES

- Reward given to firms for reducing pollution - In CC, fines were imposed for not adhering to the pollution limits specified by the regulator
- Three types are common

1. Pollution fees -
2. Marketable permit
3. Liability

POLLUTION FEES

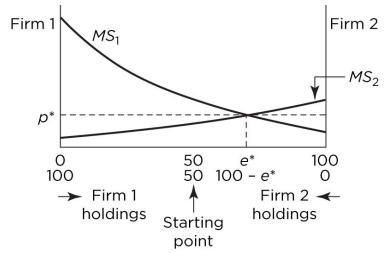
- payment of a fee per unit of pollution emitted. Same as Pigouvian taxes if the fee is determined by the socially optimal level of pollution (X*)
- Its an economic incentive because - When a firm pays for each unit of pollution caused, it essentially increases its Private Marginal cost thereby incentivising the firm to reduce emission.

MARKETABLE PERMITS

- Allows the polluter to buy/sell the right to pollute - a permit to pollute (essentially a CC policy) is turned into economic incentive by allowing trading.
- Why? - With trading now, there will be an opportunity cost of emitting*. Higher the opportunity cost of emitting (foregone saving/revenue from sale of permits) -> Lower the emission
- The process is explained in the next diagram through marginal savings.
- Marginal savings (MS) = additional savings from reducing pollution

* if a firm emits less then it can sell its rights to pollute to another firm and earn money. Thus, the less a firm emits, the more it can sells its pollution rights -> incentive to reduce pollution

MARKETABLE PERMIT



Marginal savings (MS) = - f(e),where e = emission by firm . Higher e-> lower MS -> Incentive to cut down emission so that MS can increase

Note: Only total permit (100) is divided by the Regulator - rest is determined by the market

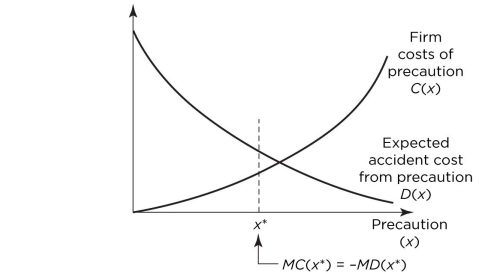
There exist two firms On x axis - total permits allowed by the state (say 100)
On left y-axis - emission by firm 1 (e*) and on right y-axis - emission done by firm 2 (100-e*)

Assume that total e permissible (fixed) = 100 and each firm is given 50 units each.Equilibrium will occur when MS1 = MS2. Firm 1 emits e* and firm 100-e*

LIABILITY

- If a polluter harms someone, they should compensate them for the damage -> a firm while deciding how much to pollute should take into account the potential damage from activity
- Higher the pollution -> higher the potential damage by a firm
- Consequently, firm undertakes several precautions to reduce the potential damage - lets call it X.
- High precautions (X) -> Lower expected accident cost (D(x))-> downward sloping curve
- Higher precautions (X) -> Higher cost of precaution (C(X) -> upward sloping curve

LIABILITY



X = socially desirable level of precaution determined by the regulator. If X< X* and an accident occurs -> firm will have to pay for all environmental damage.*

Thus, there is an incentive for a firm to take at least X level of precaution to escape liability issues*

x axis - precautions taken; y-axis - cost of precautions and expected accident cost.

X* = socially desirable level of precaution where MC(x*) = -MD(X*)
Liability states that firm can do as it pleases but if an accident occurs then the Regulator will find x* and if the firm is not taking that level of precaution, it will be liable to pay for all environmental damage. The threat of being held accountable for accidental damages -> incentive for firm to undertake at least X* level of precaution

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ADVANTAGES (READ WITH PROS OF COMMAND-CONTROL)

- Informational requirements are less relative to CC - no need to know production processes of firm to put a pollution fee.
- Provide an incentive to innovate and fins cheaper ways of controlling pollution (firm is a profit maximiser or cost minimiser)
- Involve the pollutant to pay for not only pollution control (as in CC) but also of residual pollution damage*

*The residual damage is reflected in the Product's price because the pollution fee will apply per unit of emission. Also, It doesn't just specify a permit limit (unlike CC) but also allows for trading permits- the cost of acquiring trading permits will also increase MC of pollution thereby increasing the price of product

DISADVANTAGES

- Unlike CC, it can't accommodate complexities of environmental damage - Eg: in urban air pollution, damage from per unit emission will vary considerably across space and time.
- Political problems

1. In case of uncertainty, level of economic incentives will need to be adjusted as information becomes available -> this is difficult to do in real time because economic incentives will have to be approved by regulators and other interest groups which takes time.
2. Instituting say emission taxes (which involve large transfers of wealth from pet firms) may be politically difficult to implement given the political economy of regulation*

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COMPLICATIONS FOR ENVIRONMENTAL REGULATIONS

- Complications may be caused by

1. Space and time issues?
2. Efficiency vs Cost effectiveness issues?
3. Ambient differentiated vs emission-differentiated Regulation?

NOTE

- **Emission does not directly imply damage/ pollution** because there exists a physical environment (say particular location) that determines how much damage a given level of pollution is causing.
- Polluter generates emission -> transformed to ambient* concentration of pollution -> causes pollution and damage.
- Ambient concentrations have to be targeted but not emissions per se because the relationship between them is imperfect and complex
- Conversion of emission to ambient level of pollution is called environmental transformation (decay, deposition etc)

* ambient means -world around us - water we drink or air we breathe

SPACE AND TIME ISSUES

- **Space is an imp variable for environmental transformation**. For eg: for pollution levels in Gurgaon, sources nearby will generate more damage than those located in UP.

But, difficult to make appropriate changes in regulation if space is to be considered.

- **Time is imp too** - Urban smog involves sunlight and a mix of NOs and volatile organic compounds -> Less sunlight means less severity.
  - Winters may be less damaging than summers (seasonal variation)
  - Emissions in evening/night less damaging than that in morning

But, its difficult to make hour-tohour, season-to-season variations in regulation policy.

EFFICIENCY VS COST EFFECTIVENESS ISSUES

- For efficiency, Cost of emission control = damage from *ambient* pollution -> efficient level of pollution
- We assume that the complex relationship between emission and damage is known - not practical.
- So targets are set as per desired level of ambient concentrations/emissions which may not be perfectly related to efficient level of pollution which vary with time and space.
- Establishing emission targets or ambient targets is then a compromise on efficiency because efficient pollution level is very difficult to estimate.

Ambient concentrations have to be targeted and not emissions because only former causes damage and environmental transformation. This is difficult for regulators.

- Thus focus shift to cost effectiveness instead of efficient - if a set of environmental regulations achieves target at least cost.
- Different polluters have diff cost of pollution control and out of all these, the least cost one is chosen for achieving emission targets
- Even though efficiency may be very difficult to attain but cost effectiveness can be attained.
- However, cost effectiveness also creates problems of inequality. For eg: Cost effectiveness may call for most damages being borne by a few firms

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AMBIENT- VS EMISSION-DIFFERENTIATED REGULATION

- Regulations can be applied to polluters based on emission (**emission-differentiated)** while those applied on the basis of their ambient concentration (**ambient-differentiated**)
- Ambient-differentiated regulation allows for controlling different polluters differently while considering their individual contributions to environmental damage *
- Emission differentiated regulations ignores differences between the polluters but only focusses on controlling the overall level of emission so as to achieve ambient target.

* A unit of pollution from firm 1 will have a different level of ambient concentration than a unit from form 2 - depending on space, time and other factors. This can be true, even if we assume that level of emissions is the same

Thus, an ambient-differentiated regulation will look at the differences and will control them differently. Say ambient concentration for firm 1 > that of firm 2, then controls imposed will be different because it will recognise that firm 1 needs to cut back more to achieve the ambient target.