Taxes on emissions

Tax *h* per unit of emissions *E:* firms pay *hE*

Firms' problem: abatement (A)

(a) → paying less taxes

(b) → abatement costs

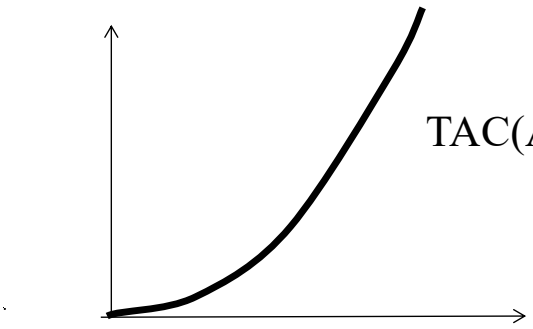
TAC(A)≡ total abatement cost

Firms minimize [$TAC(A) + hE$].
E = Final emissions
E=:($E^{\circ} - A$), initial emissions minus abatement →
Min **[*TAC*(*A*)+*h*x(*E*° - *A*)]**
Condizione primo ordine: $MAC(A) - h = 0$ →
optimal A^* such that

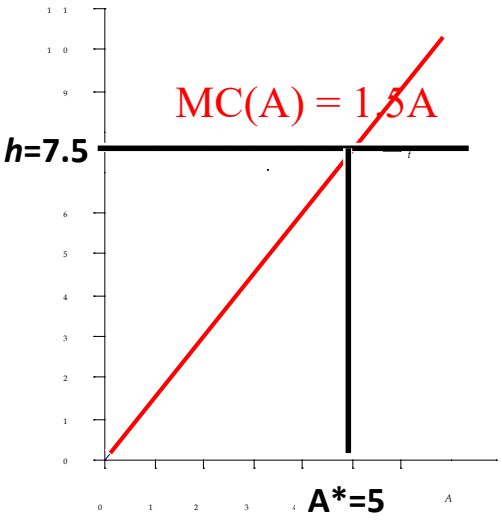
MAC = *h*

The higher h, the higher the abatement

An example:



TAC(A) = (3/4)xA^2



When h= 7.5

→optimal abatment A*=5

Firms heterogeneity

Cost effectiveness

E^{max} := target of the government →
abatement to get the target:

$$A^{min} = A_1 + A_2 \qquad (1)$$

How can we minimize the total cost of getting the target?

$$\min [\, TAC_1(A_1) + TAC_2\,(A_2)] \qquad (2)$$

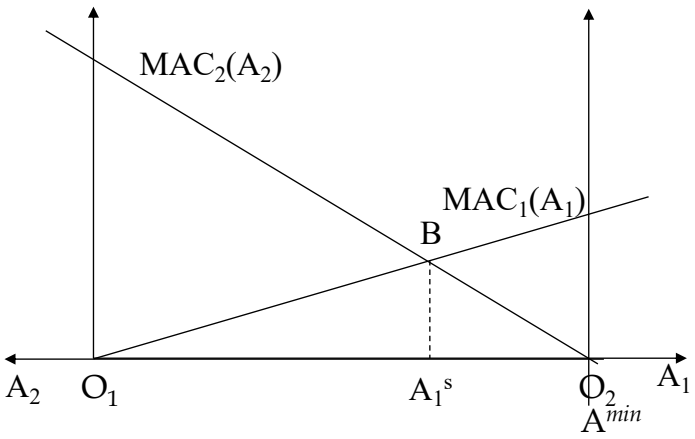
Combining (1) and (2):

$$\min_{A_1} [\, TAC_1(A_1) + TAC_2\,(A^{min} - A_1)] \qquad (3)$$

From which:

$$MAC_1(A_1) = MAC_2(A_2) \qquad (4)$$

Two firms …



Cost-effectiveness: taxex vs standard

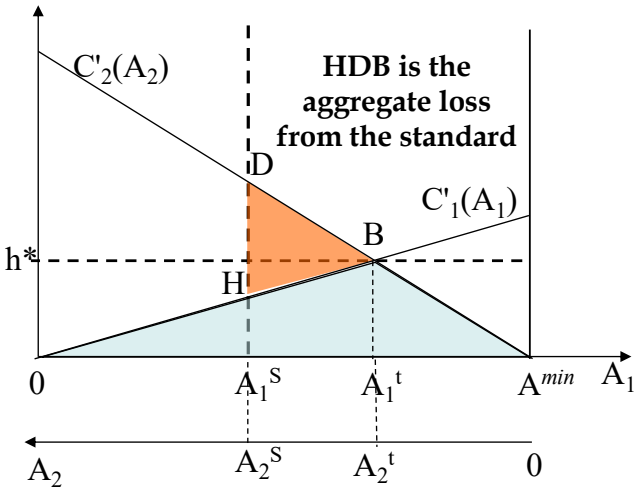
MAC = emission tax

2) Taxation is *cost-effective,* standard is not:

The sum of the abatement costs (**blue area**) is minimized by *h**.

Suppose a STANDARD such that $A_1=A_1^S$ e $A_2=A_2^S$ →

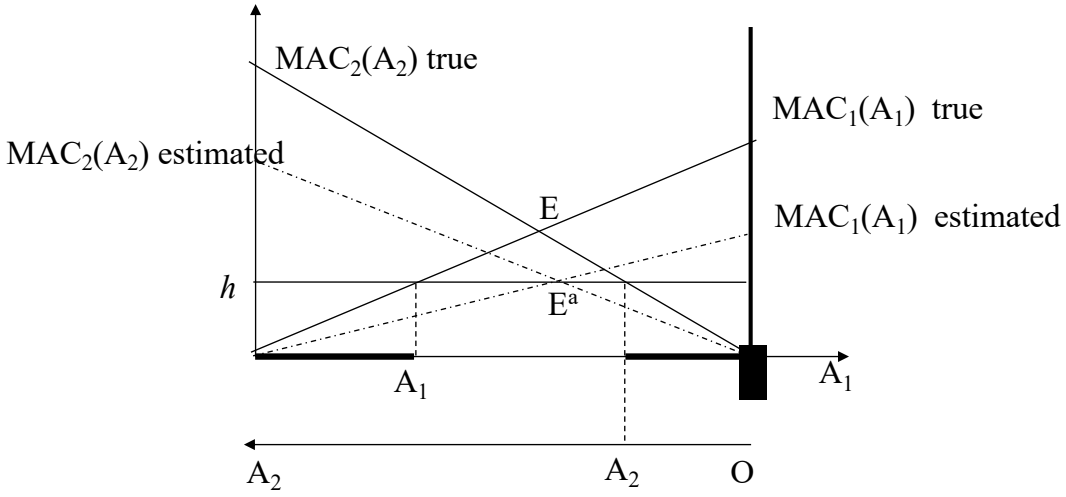
Ab costs under tax= $0BA^{min}$ < ab costs under standard = $OHA_1^S+A_1^SDA^{min}$



In case of imperfect information

If the authority does not know MACs …
Suppose that estimated MACs < actual MACs.

→ tax is lower than needed and
the actual abatement (bold segment) is lower than
the target



Tradable permits: firms' demand for permits

Firm needs permits to pollute, ***E***,

Permits can be traderd on the market.

Firms: will minimize

Min $_A$ [TCA(A) + pE]

E=(E^0-A)

E^0= emissions befor the policy
→
Min: [TCA(A) + $p(E^0-A)$]

Form which MCA(A) – p = 0
ossia p = MCA(A)

As for tor the emission tax!

Problems with tradable permits

A) Initial allowance?

free or auctioned?

Usually:

Free as a proportion of the existing emissions!!!

Advantge for existing firms (and for the more polluting!)

Problems with tradable permits

.

B) Creating a new market is difficult!

The owner can decide not to sell it

Why?

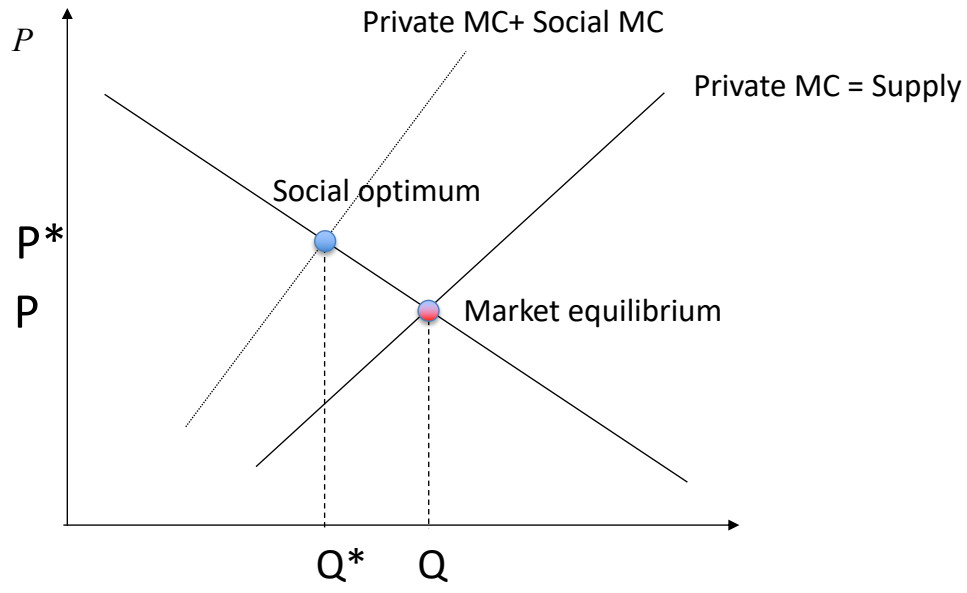
to harm potential competitors

To sell it in the future at higher price

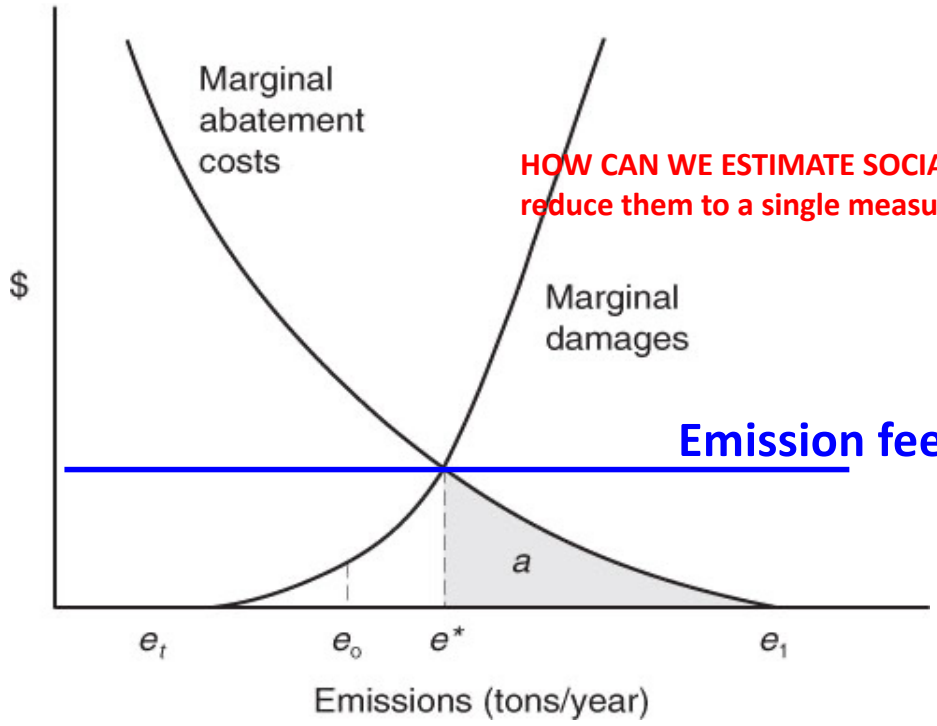
→ Permits: low price, barriers to entry windfall profits

See web site by CLIVE SPASH

TRADITIONAL ECONOMIC VIEW:
market FAILS
EXTERNALITIES (Pigou 1920)



SOLUTION to HOW MUCH:
balancing social damages with abatement costs



In an ideal economic system, goods worth more than they cost to produce get produced,
goods worth less than they cost to produce do not;
this is part of what economists mean by economic **efficiency**.

In a perfectly competitive private property system,
producers pay the value of the inputs they use when they buy them from their owners (wages to workers in exchange for their labor, rent to land owners for the use of their land, etc.)
and receive the value of what they produce when they sell it.

If a good is worth more than it costs to produce,
the producer receives more than he pays and makes a profit;
if the good is worth less than it costs to produce he takes a loss.
So goods that should be produced are and
goods that should not be produced are not.

This only works if producers pay all of the costs associated with production.
Suppose that is not the case. Suppose, for example, that a steel producer, in addition to using iron ore, coal, etc., **also "uses" clean air.**

In the process of producing a ton of steel
he puts ten pounds of sulfur dioxide into the air, **imposing (say) $100 worth of bad smells, sore throats, and corrosion on people down wind**.

Since he does not pay for that cost, he does not include it in his profit and loss calculations. As long as the price he sells his steel for at least covers his costs it is worth making steel.

The result is inefficient:
Some goods may be produced even though their cost, including the resulting pollution, is greater than their value.

It is inefficient in another respect as well.
The steel producer may be able to reduce the amount of pollution by various control devices--air filters, low sulfur coal, high smokestacks--at a cost.

Calculated in terms of the net effect on everyone concerned, it is worth eliminating pollution as long as the cost is less than the pollution damage prevented--in our example, as long as it costs less than $10 to prevent a pound of sulfur dioxide emission.

But the steel producer, **in figuring out how to maximize his profit, includes in his calculations only the costs he must pay.**
So long as he does not bear the cost of the pollution, **he has no incentive to prevent it.**
So the fact that air pollution is an external cost results in both an inefficiently high level of steel production (it may be produced even when it is not worth producing) and **an inefficiently low level of pollution control.**

4 TOOLS

1) **direct regulation-**--the government tells the steel company how much it is allowed to pollute.
COMMAND AND CONTROL

2) **emission fees**--referred to by economists as Pigouvian taxes (named after A. C. Pigou)

3) Better definition of **Property rights** (Coase)

4) Voluntary schemes (CRS, Ecolabeling to tell consumers how products were made or harvested, …)

Under a system of **Pigouvian taxes**, the government charges the steel company for the damage done by its pollution--$10 per pound in this example.

By doing so it converts the **external** cost into an internal cost--internalizes the externality.

In deciding how much steel to produce and what price to sell it at, the company will now include the cost of its pollution--paid as an emission fee--along with other costs.

A different approach for internalising

Government's FAILURE … individuals have the information and the knowledge

→

Environmental inefficiency from

ill- defined property rights

Assigning Property rights

The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 1991

Ronald H. Coase

Nobel per

The nature of the firm (1937)

Born: 29 December 1910, Willesden, United Kingdom

Died: 2 September 2013, Chicago, IL, USA

Affiliation at the time of the award: University of **Chicago**, Chicago, IL, USA

Prize motivation:

"for his discovery and clarification of the significance of transaction costs and property rights for the institutional structure and functioning of the economy"

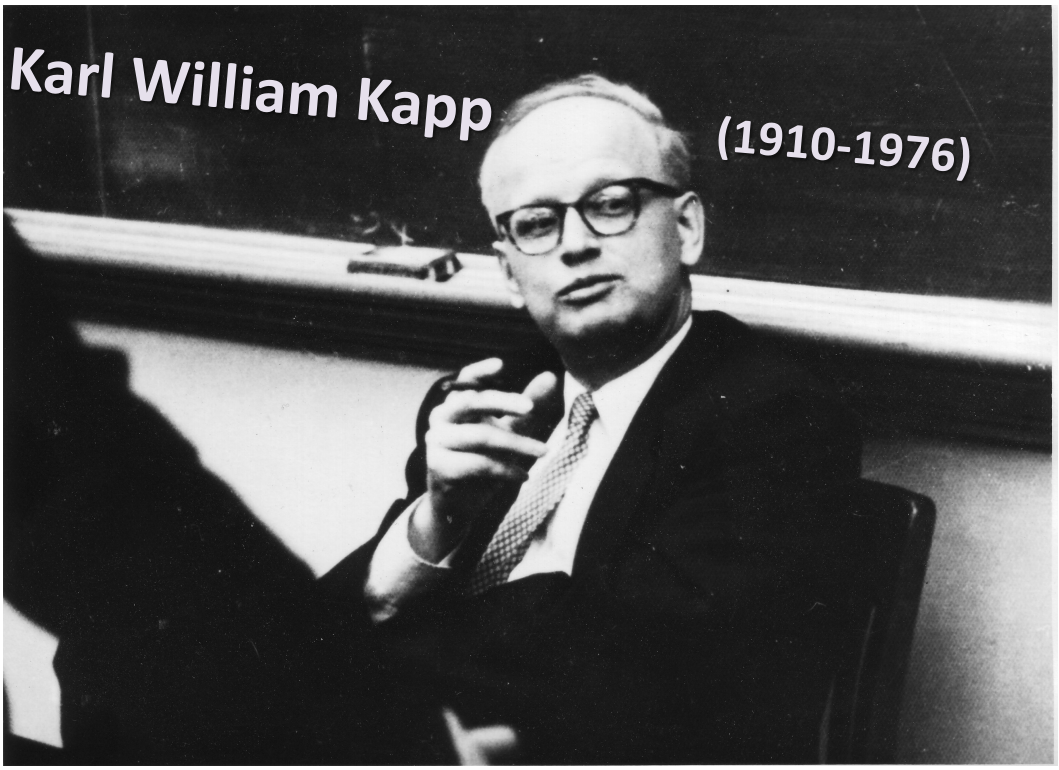
Field: theory of market institutions

Contribution: Important contributions on the borderline between economics, law and organization.

Voluntary schemes

Corporate Social Responsibility
Ecolabeling
Certifications

criticism towards choosing the target
via monetary evaluation



incommensurability

To give a reasonable monetary value to SOCIAL DAMAGES is MEANLINGLESS:

The **heterogeneous character** of the disrupting flows of damages and the **complex interdependencie**s to which we have referred above preclude any measurement and evaluation in terms of a **common denominator** (unless a common denominator be formulated in substantive terms, e.g. in terms of objectively safety limits...)

It is this heterogeneous charachter of the **disruptive extra-market flows**

[…]

which constitute the greatest challenge to economic theory.

To meet this challenge **it will not be sufficient to assign monetary values** or shadow-prices to human beings, their health or their lives

(KAPP 1970, 846)

SISTEMIC NATURE OF EXTERNALITIES: PERVASIVE, EVERYWHERE

DUE TO COMPETITION!!!

KAPP's (and others' view)

"Any attempt to adjust the concept of social costs in such a manner as **to incorporate it into the existing body of formal economic theory**

can only have the effect of narrowing and thereby neutralizing the critical implications of the concept by depriving it of its central content and aim:

namely to call attention to highly relevant and potentially destructive side-effects of productive activities not recorded in traditional cost accounts"(346)

“Optimal” level of pollution? POLITICAL DECISION!!!

As military expenses and many others …

FROM interaction of

ETHICS & POLITICS & SCIENCE

PS: Market based assessment tools of social damages:

The poor and the future generation cannot express their preferences

(Georgescu Roegen also along these lines)