

Principles of Microeconomics 3

Alexander Mack

Chapter 5

(State Interventions – Public Goods)

The economics of innovation in the bio-medical
industry – MGT 403

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State interventions on the markets

Many of the state interventions seek to influence directly or indirectly the price fixation in the markets.

- **Coercive measures:** Force economic actors to respect a legal constraint (e.g., fixation of prices), or
- **Incentive measures:** Influence the behavior of buyers and/or sellers while letting them freely interact on the market (e.g., subsidization and taxation).

Price fixation

The state may set

- a **maximum price** (to protect consumers) or
- a **minimum price** (to favor producers).

Maximum price:

- State determines that the market price is too high: It sets a max. above which the price cannot rise (**price ceiling**).
- E.g., practiced in times of crisis (e.g., during war time) on markets for basic foodstuffs; roaming charges for mobile phone users in the EU.

(Cf. **graphical representation.**)

$P_{max} < P_e \Rightarrow$ **Excess demand**

- Demanders who are not served try to obtain the good by other means.
- Suppliers are encouraged to sell their goods on the **black market** where the price is higher than the maximum set.
- To protect consumers: Often necessary to **requisition** goods and to proceed to their **rationing** to ensure that not only part of the consumers appropriates the entire supply.

Minimum price:

- State wishes to favor producers: It sets a minimum below which the price cannot fall (**price floor**).
- Form of intervention used primarily for agricultural goods; other example: hospitality industry (e.g., minimum price that licensed establishments must charge for alcoholic beverages in an effort to prevent over consumption).

(Cf. **graphical representation.**)

$P_{min} > P_e \Rightarrow$ **Excess supply**

- Necessary to find a solution to eliminate the excesses because producers who have not sold their goods will be tempted to sell at a lower price.

Solve excess problem: Increase demand or reduce supply.

- **Valorization:** Find new markets for the product: State buys the excess, then exports it (often at loss), stores it or destroys it.
- **Contingent:** Assign to each producer a quantity that it shall not exceed.

Supply and demand orientation

- Instead of acting directly on the prices, state action may be **indirect** and based on **incentives**.
- Without forcing them, the state seeks to obtain from the producers and consumers behaviors consistent with the objectives of its policy.

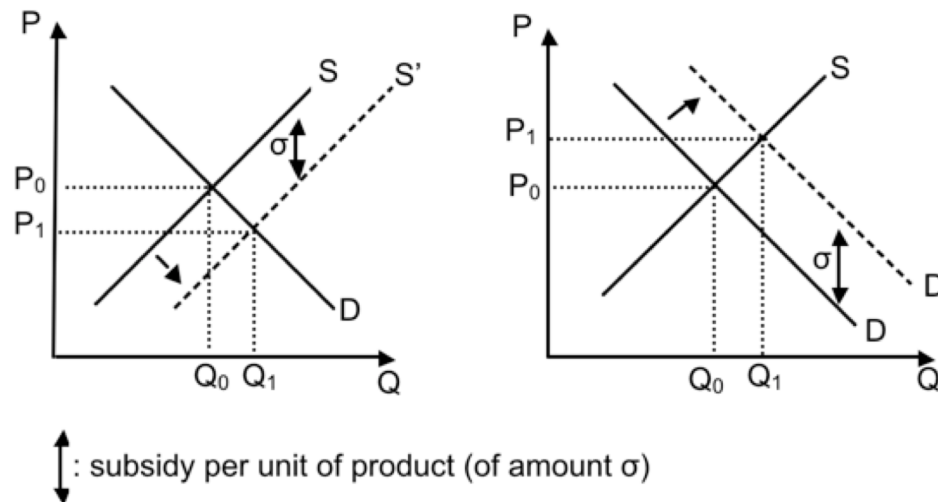
Subsidization:

- Contribution to the producer's production costs or
- Assistance to the consumer for the purchase of a good

=> The state favors the production & consumption of the considered good.

Analytically, this measure can be represented either

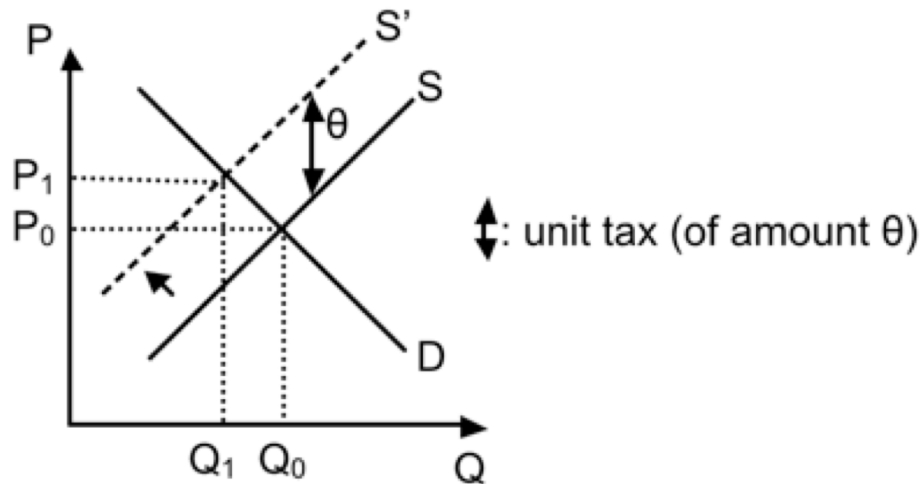
- by a downward (rightward) shift of the supply function or
- by an upward (rightward) shift of the demand function.
- Subsidy to the **producer**: P_1 is the price paid by the consumer, the producer receives $P_1 + \sigma$.
- Subsidy to the **consumer**: P_1 is the price received by the producer, the consumer pays only $P_1 - \sigma$.
- In both cases: Qty. exchanged increases ($Q_0 \rightarrow Q_1$).



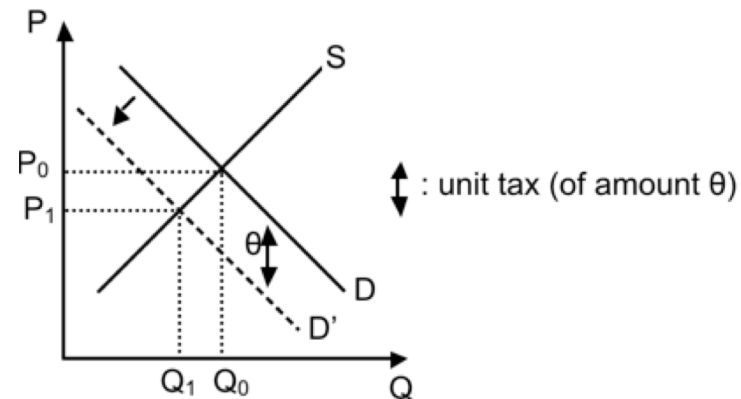
Taxation:

The state may intervene on the supply or demand through consumption taxes:

- **Unit tax:** Fixed amount levied on each unit sold independently of its price
- **Ad valorem tax:** Proportional to the value (usually expressed in percentage of the value)
- Tax levied **on producers:** Seen as an increase in production costs.
- In the case of a unit tax: Producers see their marginal costs increase by the same amount.
=> Parallel upward (leftward) shift of the supply function.



- The taxation results in an increase in price ($P_0 \rightarrow P_1$, where P_1 : price tax included), and a decrease of the quantity exchanged ($Q_0 \rightarrow Q_1$).
- Note: The **price increase is less than the amount of the unit tax**. \Rightarrow Net price received by the producers decreases ($P_1 - \theta$: price excluding tax).



- Unit tax levied **on consumers** => Parallel downward (leftward) shift of the demand function.
- The taxation results in a decrease in price ($P_0 \rightarrow P_1$, where P_1 : price tax excluded) and in the quantity exchanged ($Q_0 \rightarrow Q_1$).
- Note: The **price decrease is less than the amount of the unit tax**, the price paid by consumers increases ($P_1 + \theta$: price tax included).
- => **Same effects** in case of levying the tax on producers.

- The magnitude of price changes and the distribution of the **fiscal charge (tax burden)** between producers and consumers depends on the price elasticity of supply and/or the price elasticity of demand.

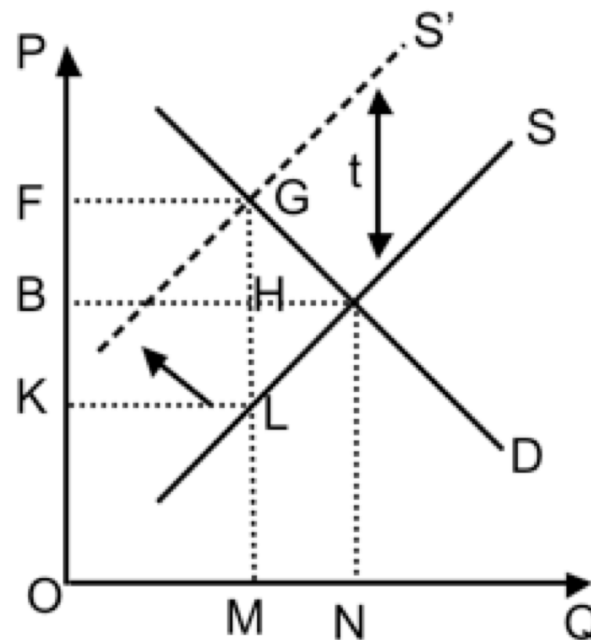
Example: Unit tax levied on producers

- 1) **Perfectly elastic demand:** The price remains unchanged, and the burden of the tax falls exclusively on the producers (cf. [graphic](#)).
- 2) **Perfectly inelastic demand:** The price increases by the amount of the tax, and the burden of the tax falls exclusively on the consumers (cf. [graphic](#)).
- 3) **Perfectly elastic supply:** The price increases by the amount of the tax, and the burden of the tax falls exclusively on the consumers (cf. [graphic](#)).
- 4) **Perfectly inelastic supply:** The price remains unchanged, and the burden of the tax falls exclusively on the producers (cf. [graphic](#)).

More generally: The **tax burden** (*FGLK*) is **shared** between producers and consumers.

It is supported by reason of:

- *BHLK* by the producers,
- *FGHB* by the consumers.



Distribution of the burden: Accordingly to the ratio FB/BK which turns into the ratio between price elasticity of supply (η) and price elasticity of demand (ε) in absolute value:

- $\eta < |\varepsilon|$: The burden falls more on the producers than on the consumers.
- $\eta > |\varepsilon|$: The burden falls more on the consumers than on the producers.
- $\eta = |\varepsilon|$: The burden is equally shared by the two groups.

Note: Same conclusions if we assume that the tax is levied on the consumers (downward shift of the demand function).

The measure of the change of welfare of the community

- Concepts of consumer & producer surplus: Can be used to **analyze the change of net welfare of the community** resulting of some event occurring in the market of a good.

Initially, we assume that the net welfare of the community consists of

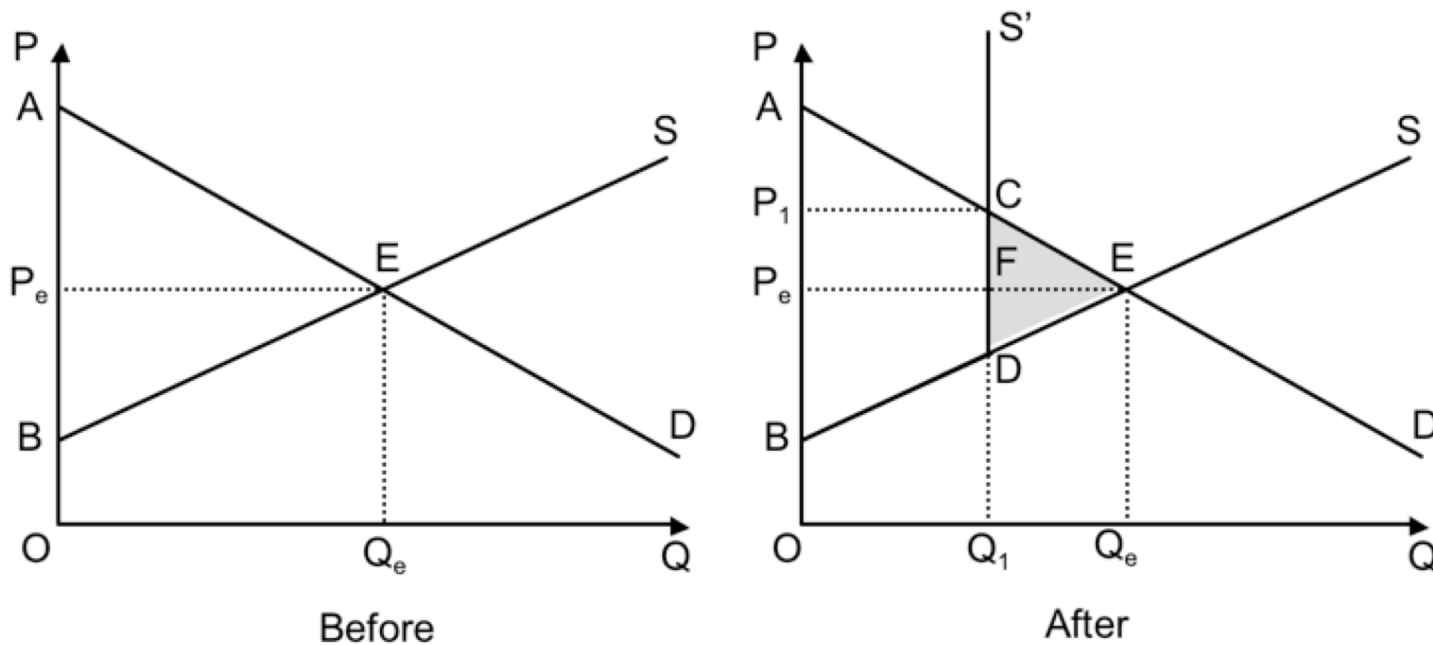
- the **net welfare of the consumers** of this good (whose monetary equivalent is the consumer surplus), and
- the **net welfare of the producers** of this same good (whose monetary equivalent is the producer surplus).

Objective:

- Compare the sum of the surplus of the consumers and the surplus of the producers **before and after the event** to deduce the impact of this event on the net welfare of the community.
- In what follows, we study – by using this method – the **impact on the net welfare of the community** of different measures of state intervention.

1) Authoritarian restrictions on the quantity produced (e.g., in the agricultural market)

- Assumption: The state limits the quantity produced in a market at Q_1 ($Q_1 < Q_e$).
 - => Supply curve becomes vertical above Q_1 (bold S' curve).
 - => Higher price and smaller quantity exchanged.



Initial situation:

- Producer surplus: P_eEB
- Consumer surplus: AEP_e
- => Total surplus: AEB .

Final situation:

- Producer surplus: P_1CDB
- Consumer surplus: ACP_1
- => Total surplus: $ACDB$.

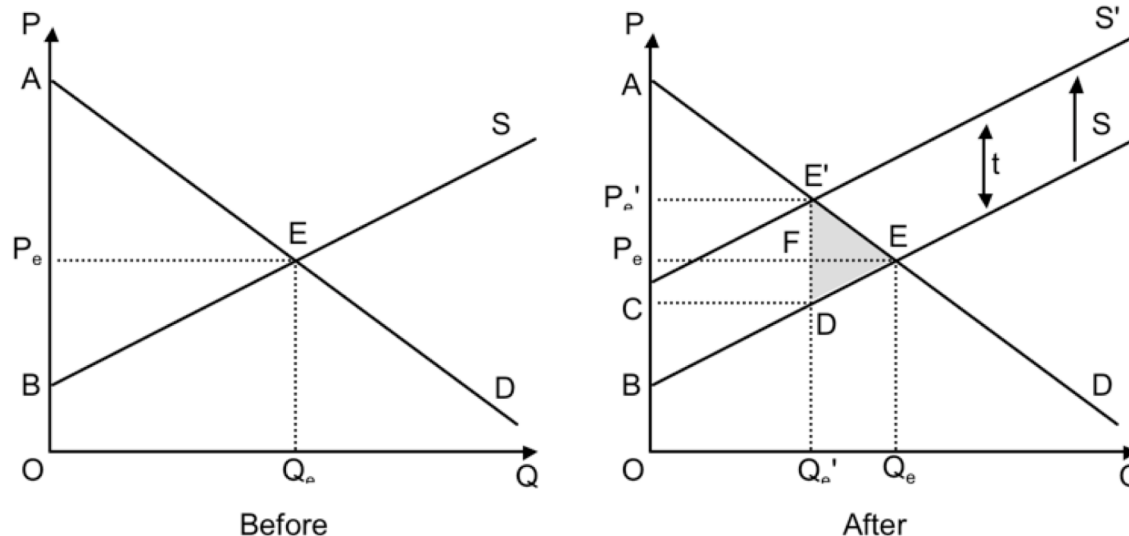
=> Total surplus **decrease** equivalent to the area CED .

We note that:

- Consumers lose P_1CEP_e ($P_1CFP_e + CEF$) in consumer surplus.
- Producers win P_1CFP_e and lose FED in producer surplus. But: Area P_1CFP_e is a simple “transfer” of the consumers to the producers. \Rightarrow Neither a gain nor a loss for the whole community.
- Therefore: CEF and FED represent “**deadweight losses**” in terms of welfare for the community.
- **Deadweight loss**: Loss of net welfare by one group that is not compensated by a net welfare gain by another group.

2) Introduction of a unit tax on the consumption of a good

- Introduction of a unit tax of **amount t** on the consumption of a good => **Parallel upward move of the supply curve**, the vertical distance between the new (S') and old supply curve (S) is equal to t .
- Here (unlike the previous case), we must also address the fate of a third group of the community, i.e., those who benefit from the **taxes levied**.



Initial situation (before tax):

- Producer surplus: $P_e EB$
 - Consumer surplus: AEP_e
- => Total surplus: AEB .

Final situation (after tax):

- Producer surplus: CDB
 - Consumer surplus: $AE'P_e'$
 - Tax revenues: $P_e'E'DC$
- => Total surplus: $AE'DB$.

=> Net welfare **loss** for the community equivalent to the area $E'ED$.

We note that:

- Consumers lose $P_e'E'EP_e$ among which $P_e'E'Fp_e$ for the benefit of the state (transfer) \Rightarrow Deadweight loss equal to $E'EF$.
- Producers lose P_eEDC among which P_eFDC for the benefit of the state (transfer) \Rightarrow Deadweight loss equal to FED .
- The state wins area $P_e'E'DC$ in fiscal revenues; however, this is just a simple transfer of the consumers and producers to the state.

\Rightarrow Total deadweight loss is equal to $E'ED$ ($E'EF + FED$). This deadweight loss is called the **excess tax burden**.

Public goods

Market failures

Main reason for the intervention of the state through the exercise of the “allocation function”:

Existence of **market failures** (or **imperfections**):

1) Public goods/services that are not produced (at least not in sufficient quantity) by the private sector because of their specific technique.

=> Support for partial or full delivery of these services by the state.

E.g., national defense, police.

2) **Positive/negative external effects (externalities):**

Generated by private activities of production or consumption, but not reflected in the market price.

The existence of externalities may give rise to a state intervention of regulatory or incentive type.

E.g., tax on emissions of pollutants.

3) Natural monopoly:

Arising from increasing returns to scale (decreasing average cost) in production; in this case, there is room for only one firm in the market.

=> State production support or regulation of the activity of the private monopolist.

E.g., national railway company.

4) **Imperfect competition** (monopoly, cartel, etc.):

Does not guarantee a maximum volume of trade and optimal pricing of the product from the point of view of the community.

May justify state interventions in the form of regulation.

E.g., anti-trust laws.

5) Other **market imperfections** – can lead to state interventions in the form of production support or regulation – which are:

- **Information asymmetry** between the producer and consumer.

E.g., regulation of medical practice.

- **Poor assessment of risk** in situations of uncertainty.

E.g., obligation to insure against fire.

Public goods / public services

Characteristics of public goods/services:

Before defining **public goods/services**, we first specify the **particularities** of goods and services referred to as “**private**”:

- **Rivalry in consumption**

The consumption of the good or service in question by a person removes the possibility of consumption of the same good or service to any other individual. E.g., a pen.

- **Possibility of exclusion**

Possible to prohibit access to the good or service in question to those who do not pay the price charged for consumption of that good or service. E.g., overnight in a hotel.

“**Pure**” public goods/services are characterized by:

- **Non-rivalry in consumption**

Consumption of the service by an individual does not exclude the possibility of consumption of the same service by other individuals.

E.g., national defense.

- **Difficulty (or impossibility) of exclusion**

Very difficult (or impossible) to deny access to the service in question to one who refuses to pay the price demanded for consumption of this service.

E.g., public lighting.

- We can not classify all the services found in the economy in one or other of these two categories.
- There are also goods/services that can be described as **mixed public goods/services**.

Two types of mixed public goods/services:

- Goods/services characterized by **non-rivalry in consumption** and the **possibility of exclusion**.

E.g., a toll road.

- Goods/services characterized by **rivalry** in consumption and the **difficulty (or impossibility) of exclusion**.

E.g., marine resources located outside territorial waters.

Remark 1:

- Non-rivalry is rarely absolute and is valid to a certain **level (threshold)** of capacity.

Service quality can be affected if the number of users exceeds the threshold.

E.g., traffic on a highway.

Remark 2:

- The difficulty (or impossibility) of exclusion may be **technical** or **economic**.

E.g., **technically impossible** to know who are the beneficiaries of a public provision, and the intensity with which they have recourse to this provision (e.g., coastal lighthouse).

Or: Technically possible to limit access to a provision to those who are willing to pay the price, but this exclusion would be **too costly** (e.g., differential taxation of vehicles based on mileage).

Support by the state:

The problem with **pure public goods/services** is as follows:

- It suffices that such a good/service is produced so that a certain number of individuals **benefits automatically**.
- But: Production of these goods/services involves a **cost** that must be paid by users.

- However: Users, under the principles of non-rivalry in consumption and the difficulty (or impossibility) of exclusion, are encouraged **not to reveal their true preferences** (behavior of “**free rider**”) to avoid paying for the cost of production or creation of the public service.
- => The state is required to **support the production** of this type of good/service and to charge users directly or indirectly by using its power of coercion (taxes, fees, etc.).

External effects

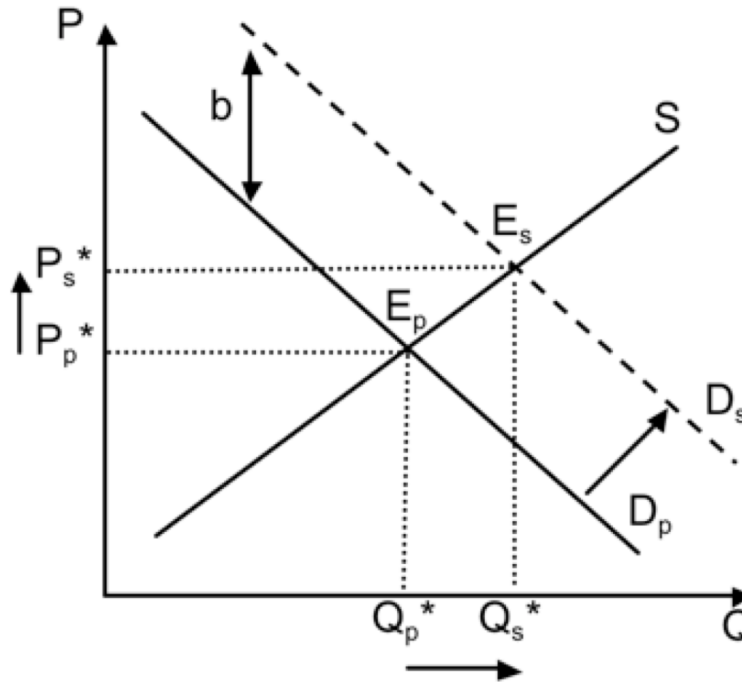
We can define **positive external effects** (**externalities**) as **benefits** in addition to the proper benefits of an activity, and affecting **economic third parties** – besides producers and consumers of a product – that are not required to pay for these benefits.

Conversely, we define **negative external effects** (**externalities**) as a **cost** in addition to the specific costs of an activity, and affecting economic third parties – besides producers and consumers of a product – that are not compensated for these costs.

=> **Externalities are not reflected in market prices.**

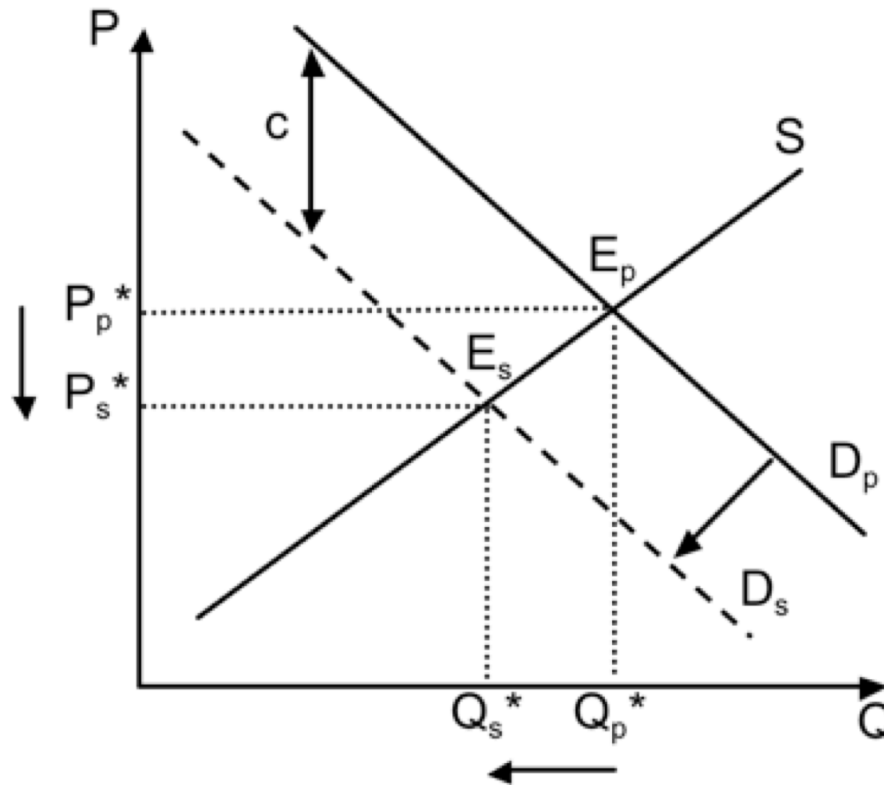
- The existence of externalities creates a gap between the so-called “**social**” **benefits** (respectively costs) and the so-called “**private**” **benefits** (costs).
- Negative externalities (**external costs**) lead to a too large volume of production and consumption, while positive externalities (**external benefits**) produce the opposite effect.

- Suppose: The **consumption** of a good generates **external benefits** of amount ' b ' per unit consumed.
- Without taking into account these benefits, the demand function is derived from the consumers of the considered good (D_p).
- => The market equilibrium follows from the intersection between this "**private**" **demand** and supply.

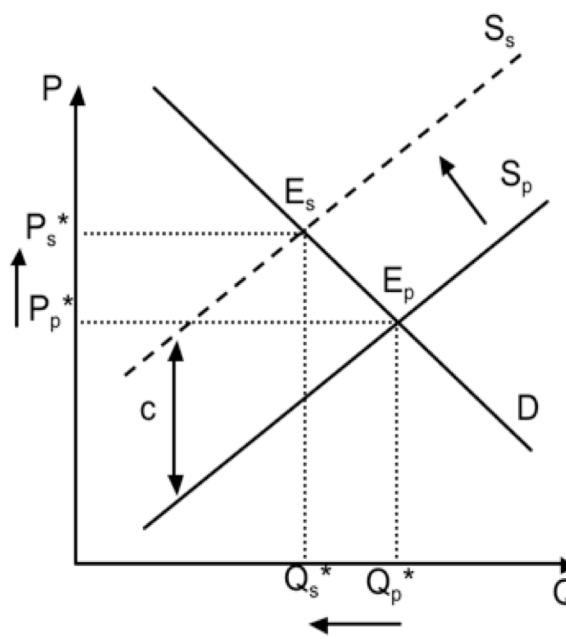
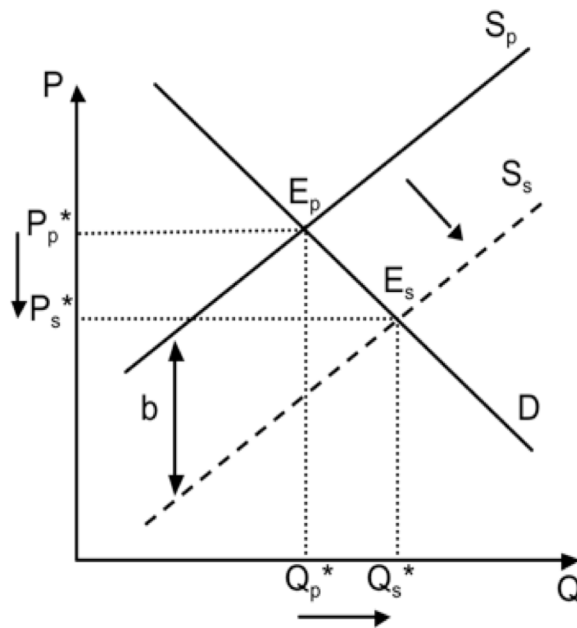


- Taking into account the **external benefits** => Intersection between the so-called "**social**" demand function (D_s) and the supply function that would determine the price and quantity exchanged.
- => Taking into account (**internalization**) of a **positive externality** would lead to a greater quantity exchanged and a higher price for the good in question.

- Conversely: The inclusion of a nuisance (**negative externality**) related to a **consumption** activity of amount ' c ' per unit consumed would lead to a smaller production volume and lower prices.

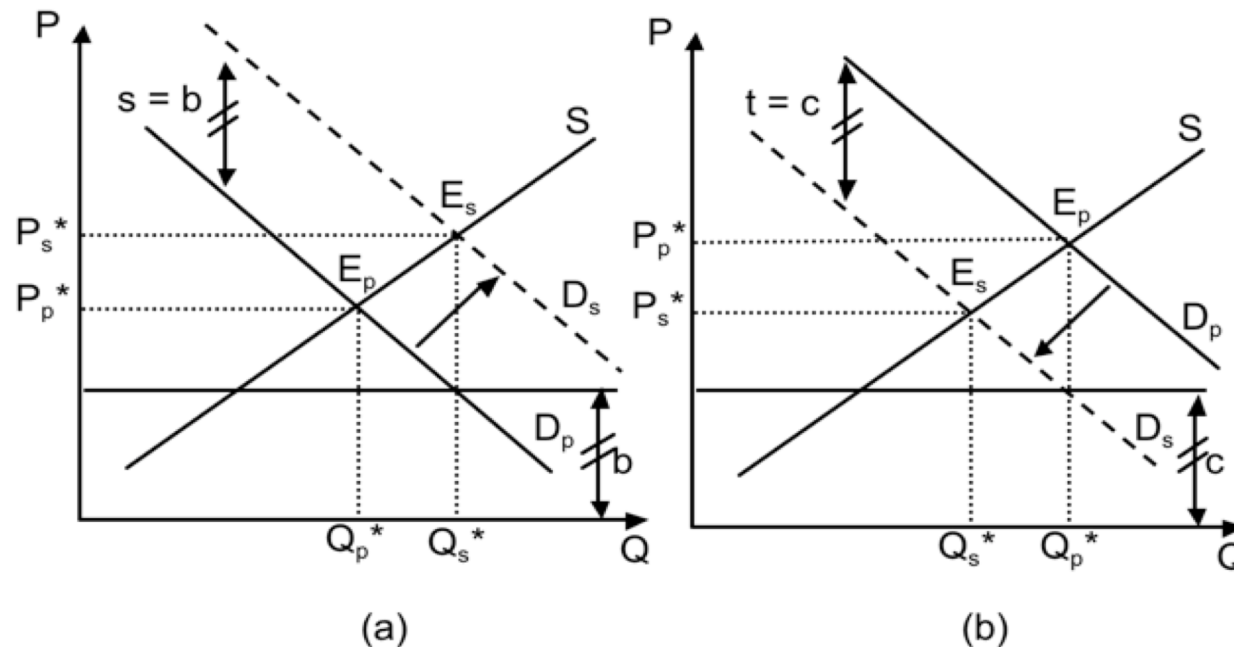


- The inclusion of an externality associated with a **production activity** would lead to a shift of the supply function.
- The internalization of a **positive externality** would then lead to higher production volumes and lower prices, and vice versa for a **negative externality**.

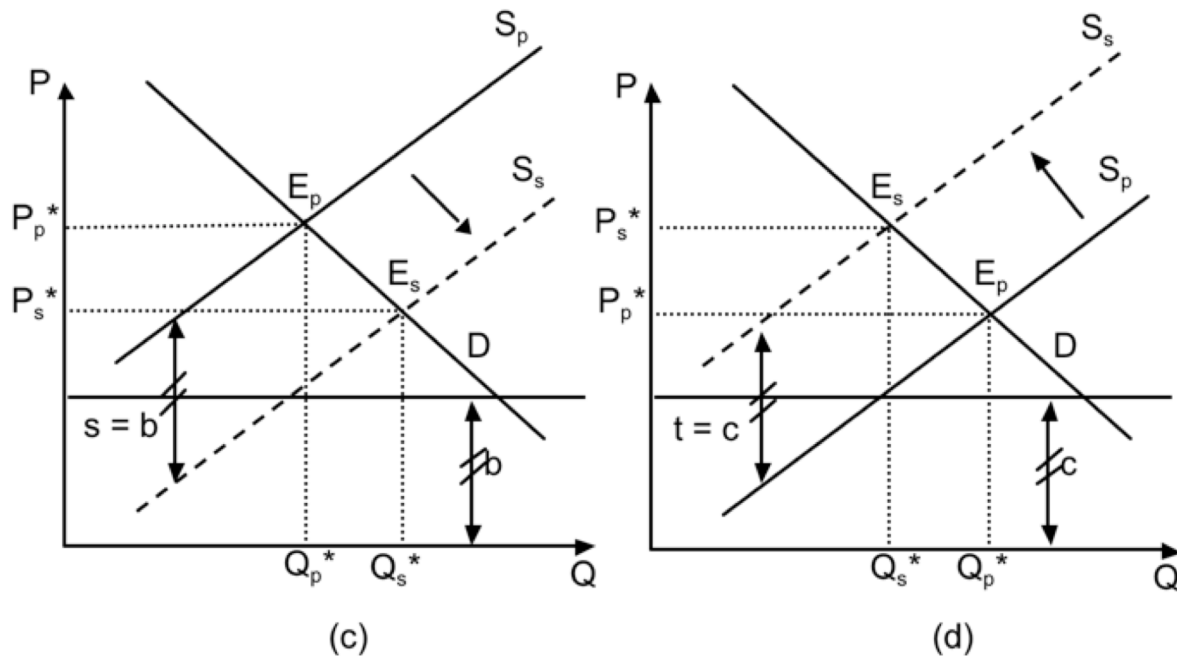


The state can help:

- to **internalize** positive (respectively negative) **externalities**,
- by providing a **subsidy (tax)**,
- whose amount reflects the **external benefit (cost)**.



- (a) Internalization of a **positive externality** associated with a **consumption** activity: The state pays a unit **subsidy** of amount s to the consumers (equal to the external marginal benefit b assumed constant).
- (b) Internalization of a **negative externality** associated with a **consumption** activity: The state levies a unit **tax** of amount t on the consumers (equal to the external marginal cost c assumed constant).

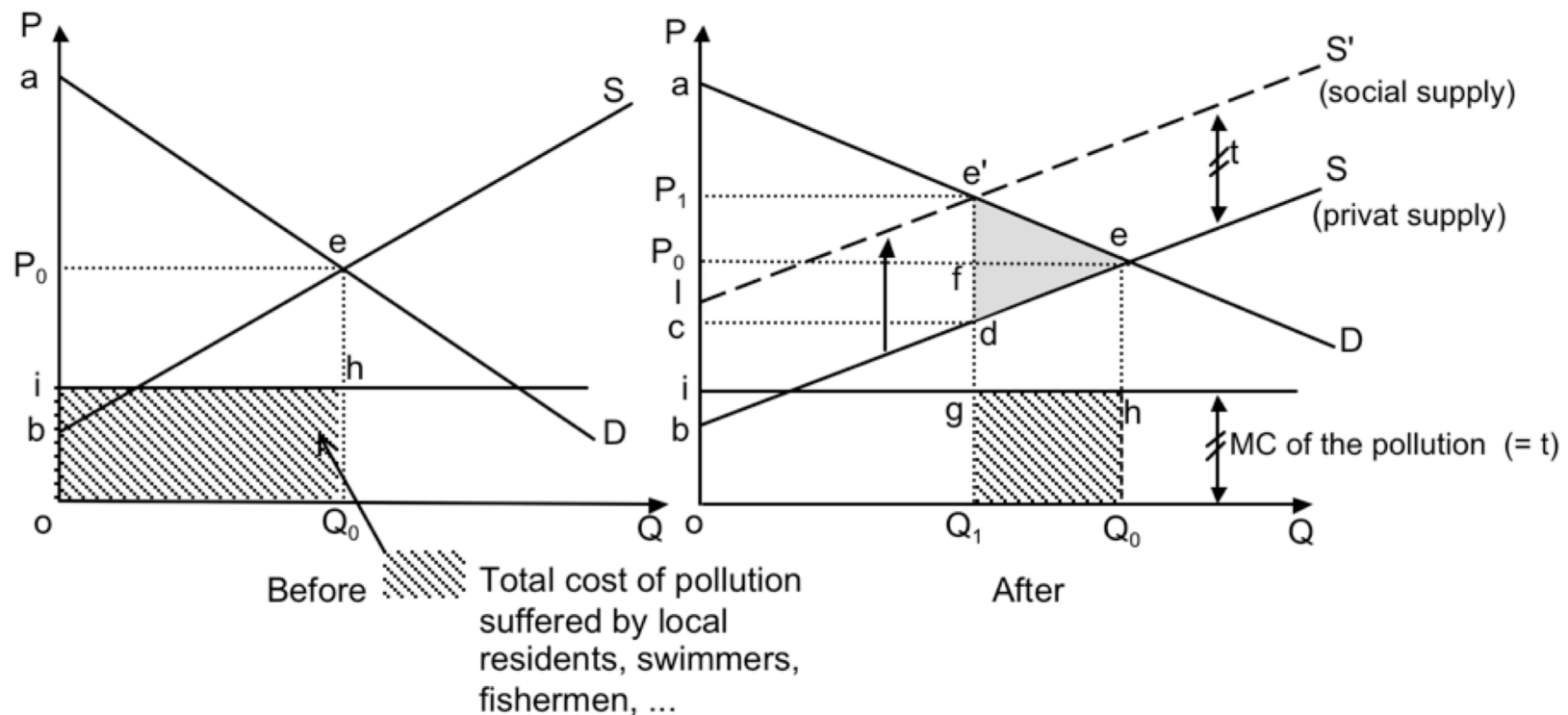


- (c) Internalization of a **positive externality** associated with a **production** activity: The state pays a unit **subsidy** of amount s to the producers (equal to the external marginal benefit b assumed constant).
- (d) Internalization of a **negative externality** associated with a **production** activity: The state levies a unit **tax** of amount t on the producers (equal to the external marginal cost c assumed constant).

Example: Establishment of an environmental tax

- Consider the market for a good whose production is source of negative externalities (e.g., a chemical substance whose manufacture creates toxic waste dumped in a river).
- However: The costs inflicted on the community (residents, swimmers, fishermen, hikers, etc.) due to the pollution are not included in the private production costs of this good.
- => These **costs are not reflected by the market supply function.**
- => Too low price, and too large production and consumption, compared to the social optimum.

- The state may seek to correct this market failure by introducing a **unit tax on production** whose amount t reflects the marginal cost of pollution.
- => The external costs are *de facto* integrated with the private costs (**internalization of externalities**).



- The graphics (above) show the impact of this measure on the market equilibrium.
- Assume for simplicity that:
 - the supply and demand functions are linear, and
 - the marginal cost of pollution is constant.
- Following the introduction of the unit tax: Supply moves parallel upward, the vertical distance between the new (S') and old supply (S) is equal to amount t .
- At the new equilibrium: Higher price and lower quantity exchanged.
- The decrease in the quantity produced leads to a **decrease in pollution.**

(i) **Initial situation :**

- Producer surplus: P_0eb
- Consumer surplus: aeP_0
- Nuisance due to pollution: ihQ_0o

(ii) **Final situation (after tax):**

- Producer surplus: $cdb (= P_1e'l)$
- Consumer surplus: $ae'P_1$
- Nuisance due to pollution : igQ_1o
- Tax revenues: $P_1e'dc$

We note that:

- Consumers lose area $P_1e'eP_0$ with $P_1e'fP_0$ for the benefit of the state (transfer); thus, they suffer a **deadweight loss** of $e'ef$.
- Producers lose area P_0edc with P_0fdc for the benefit of the state (transfer); thus, they suffer a **deadweight loss** of fed .
- The state wins area $P_1e'dc$ in environmental **tax revenues**, but this is just a **transfer** from the consumers and producers to the state.
- Local residents, swimmers, fishermen, etc., suffer **less inconvenience** for an amount equivalent to the area ghQ_0Q_1 .

Finding:

- The gain of local residents, swimmers, fishermen, etc., is 2x higher than the sum of the deadweight losses of the producers and consumers. => **Net welfare gain for the community** equivalent to half the area ghQ_0Q_1 .

Notes:

1. Internalization of externalities: **Does not necessarily lead to the total elimination** of the externality (i.e., the social optimum does not require the total absence of the pollution).
1. The state could pay the tax amount (area $P_1e'dc$) to local residents, swimmers, fishermen, etc., to **fully compensate** them because $P_1e'dc = igQ_1o$.
=> The burden of this compensation would be borne by consumers and producers in accordance with the "**polluter pays principle**".