Principles of Microeconomics 3

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Chapter 6
(State Interventions – Public Goods)

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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.)

\[ P_{\text{max}} < P_e \implies \text{Excess demand} \]

• 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).
\( P_{\text{min}} > P_e \Rightarrow \text{Excess supply} \)

- 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.
  \[\Rightarrow\] 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 \(\Rightarrow\) 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).

• \(\Rightarrow\) **Same effects** in case of levying the tax on producers (this result remains valid as long as the economy is in autarky: **law of Dalton**).
• 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 ($\eta$) and price elasticity of demand ($\varepsilon$) 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 $Q_1 (Q_1 < Q_e)$.
  - $\Rightarrow$ Supply curve becomes vertical above $Q_1$ (bold $S'$ curve).
  - $\Rightarrow$ Higher price and smaller quantity exchanged.

![Graph showing supply and demand before and after restrictions](image-url)
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 $P_1 CEP_e (P_1 CFP_e + CEF)$ in consumer surplus.

- Producers win $P_1 CFP_e$ and lose $FED$ in producer surplus. But: Area $P_1 CFP_e$ is a simple “transfer” of the consumers to the producers. => 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: \( P_eEB \)
- 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) => Deadweight loss equal to $E'EF$.

- Producers lose $P_eEDC$ among which $P_eFDC$ for the benefit of the state (transfer) => 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 \( (D_p) \).

• \( \Rightarrow \) 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 \textbf{production activity} would lead to a shift of the supply function.

• The internalization of a \textbf{positive externality} would then lead to higher production volumes and lower prices, and vice versa for a \textbf{negative externality}.

\begin{itemize}
  \item \textit{Diagram showing equilibrium points before and after internalization of externalities.}
\end{itemize}
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: $cdb (= P_1e'I)$  
- 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).

2. 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**”.