Chapter 10

Externalities and Public Goods

1. Identifying Externalities
2. The Externality Problem
3. Solving Externality Problems
4. Public Goods and the Tragedy of the Commons

Choices with side effects

The increase in greenhouse gas emissions over the past 150 years is causing **dramatic changes in the earth's climate**. These emissions are mostly due to the **burning of fossil fuels.**

Whenever one of us decides to burn fossil fuels, the resulting pollution **affects us all**. Because people **fail to fully account for the harm they do** to the well-being of their fellow citizens, more fossil fuel is burned than is in our collective best interest.

This **tension** between **private interest** and **society's interest** can lead markets, communities, and corporations to make **bad choices.**

Vadim Petrakov/Shutterstock

Chapter 10 (1 of 5)

Define and identify externalities and their consequences:

- Negative externalities
- Positive externalities

1. Identifying Externalities
2. The Externality Problem
3. Solving Externality Problems
4. Public Goods and the Tragedy of the Commons

Key Definition

Externality: A **side effect** of an activity that **affects bystanders** whose **interests are *not* taken into account.**

In other words, the **bystanders' interests** are **ignored** or **underweighted** in the decision-making process.

Externalities lead to *market failure*

- Inefficient outcomes that are **not** in society's best interest.

Diving into the Definition

Driving example: Your decision to drive to work or school affects other people.

Associated externalities:

- Emits pollution
- Adds to traffic/road congestion
- Wear and tear on the roads
- Hazard to others (car accidents)

Key Insight: When people make decisions without facing the full consequences of their actions (when externalities are involved), bad outcomes can result.

Negative Externality

A side effect that **harms bystanders**.

- Choices that impose costs on others.

<u>Examples:</u>

If I park my car on the line, taking up two spaces, then you may not be able to park your car in the lot.

If I smoke near you, my secondhand smoke might cause you to get cancer.

If I am scrolling through

Positive Externality

A side effect that **benefits bystanders**.

- Choices that generate benefits for others.

<u>Examples:</u>

When you exercise regularly, you'll become healthier, which benefits your health insurer.

When you prepare before your study group, your friends will benefit from your insights.

If you plant a flower garden in your front yard, all your neighbors will get to enjoy its beauty.

Other examples?

Externalities and Market Failure

Negative externality activities:

Too Much: People do more of these activities than is in society's best interest (market failure!).

- If people were **forced to pay for the costs** they imposed on others, then they might **do less of this annoying or harmful activity.**

Positive externality activities:

Too Little: People do less of these activities than is in society's best interest (market failure!).

- If people **took into account the benefits** their action generated for others, then they might **do more of this beneficial activity**, and we would get an even better outcome!

Image: DON EMMERT/AFP/Getty Images

Positive externalities: Covid vaccine

Applying the cost-benefit principle…

Costs: Price $0, time spent going to the doctor, short-term side effects.

Benefits: Reduces the chances you'll get sick

<u>People who chose NOT to get the shot thought…</u>

- they were unlikely to get a bad case of Covid.
- the benefit of the shot *to them* was smaller than the cost.

But *their* best choice may not be the best choice for *their community*.

Ignoring the benefits that accrue **to bystanders** leads people to do **fewer** of those activities associated with positive externalities **than is in society's best interest.**

Addressing a Potential Misunderstanding

A price change is not an externality.

Externalities are about side effects on bystanders whose interests are **NOT taken into account or mediated by the market.**

- Hence, the resulting market failure.

Neither potential **buyers nor** potential **sellers are bystanders** — they are the decision makers, which make up the market.

- Price changes aren’t a side effect of their actions, rather the focus of their negotiations.
- When prices rise and fall in response to the actions of buyers and sellers, you are simply seeing the market at work!

Private Interests versus Social Interests

Private interest: Costs and benefits that **you** personally incur.

Society's interest: Includes **ALL** costs and benefits (whether they accrue to you or to others).

If your choices do NOT affect others…

- Your private interests will **correspond** to society's interests.

If your choices do affect bystanders…

- There will be a **conflict** between your private interest and society's interest.
- An **externality is creating tension** between you and the bystanders.
  - Leads to market failure

Let's explore these concepts more by introducing some helpful terminology.

Digging into and illustrating negative externalities (1 of 3)

Marginal Private Cost: The extra costs **paid by the seller** from producing one extra unit.

- **Gas Example:** Money spent on extra labor, electricity, etc., needed to produce another gallon of gas.
- This is the firm's **supply curve**!

Marginal External Cost: The **extra cost** imposed **on bystanders** from producing one extra unit.

- These are costs for which the seller is *not* on the hook.
  - **Gas Example**: The additional pollution from this extra gallon of gas.

Marginal Social Cost: All marginal costs, no matter who pays them.

- Marginal Social Costs = Marginal Private Costs + Marginal External Costs

Digging into and illustrating negative externalities (2 of 3)

Marginal Private Cost (sellers' extra costs)

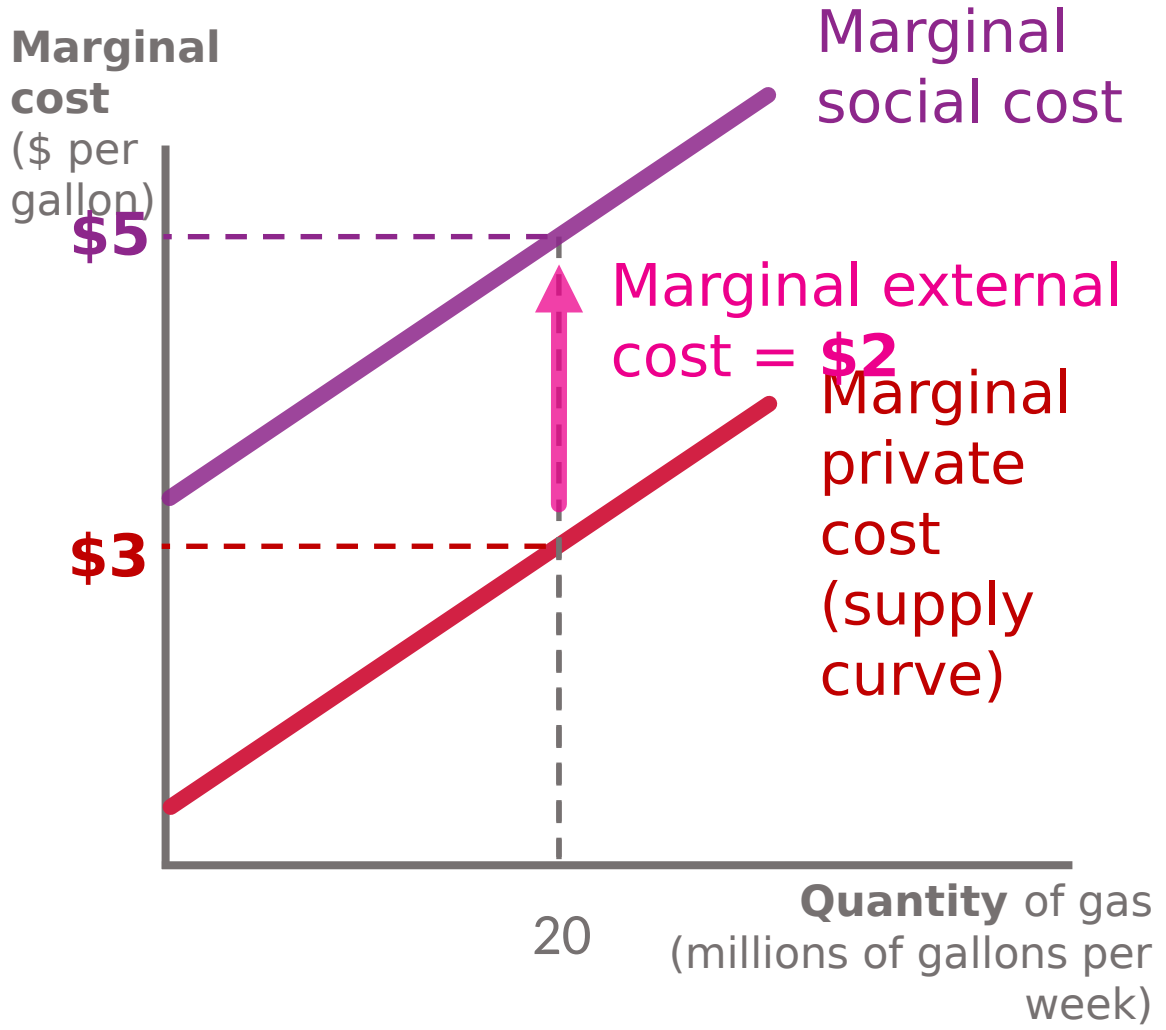
- **Gas Example:** Suppose the MPC associated with the 20th million gallon of gas is **$3** per gallon.

Marginal External Cost (extra costs on bystanders)

- **Gas Example:** Suppose the MEC associated with the 20th million gallon of gas is **$2** per gallon.

Marginal Social Cost = MPC + MEC

- **Gas Example: MSC** = **$3** + **$2** = **$5** per gallon



Digging into and illustrating positive externalities (3 of 3)

Marginal Private Benefit: The **extra enjoyment by the buyer** from purchasing one extra unit.

- **Vaccine Example:** The value of protecting your own health, plus the value of being able to do activities that require a vaccination.
- This is the buyer's **demand curve**!

Marginal External Benefit: The **extra benefit** accruing **to bystanders** from one extra unit.

- **Vaccine Example**: The additional vaccine further reduces the risk that the virus is passed on to other members of society.

Marginal Social Benefit: All marginal benefits, no matter who gets them.

- Marginal Social Benefit = Marginal Private Benefit + Marginal External Benefit

Digging into and illustrating positive externalities

Marginal Private Benefit (buyers' extra enjoyment)

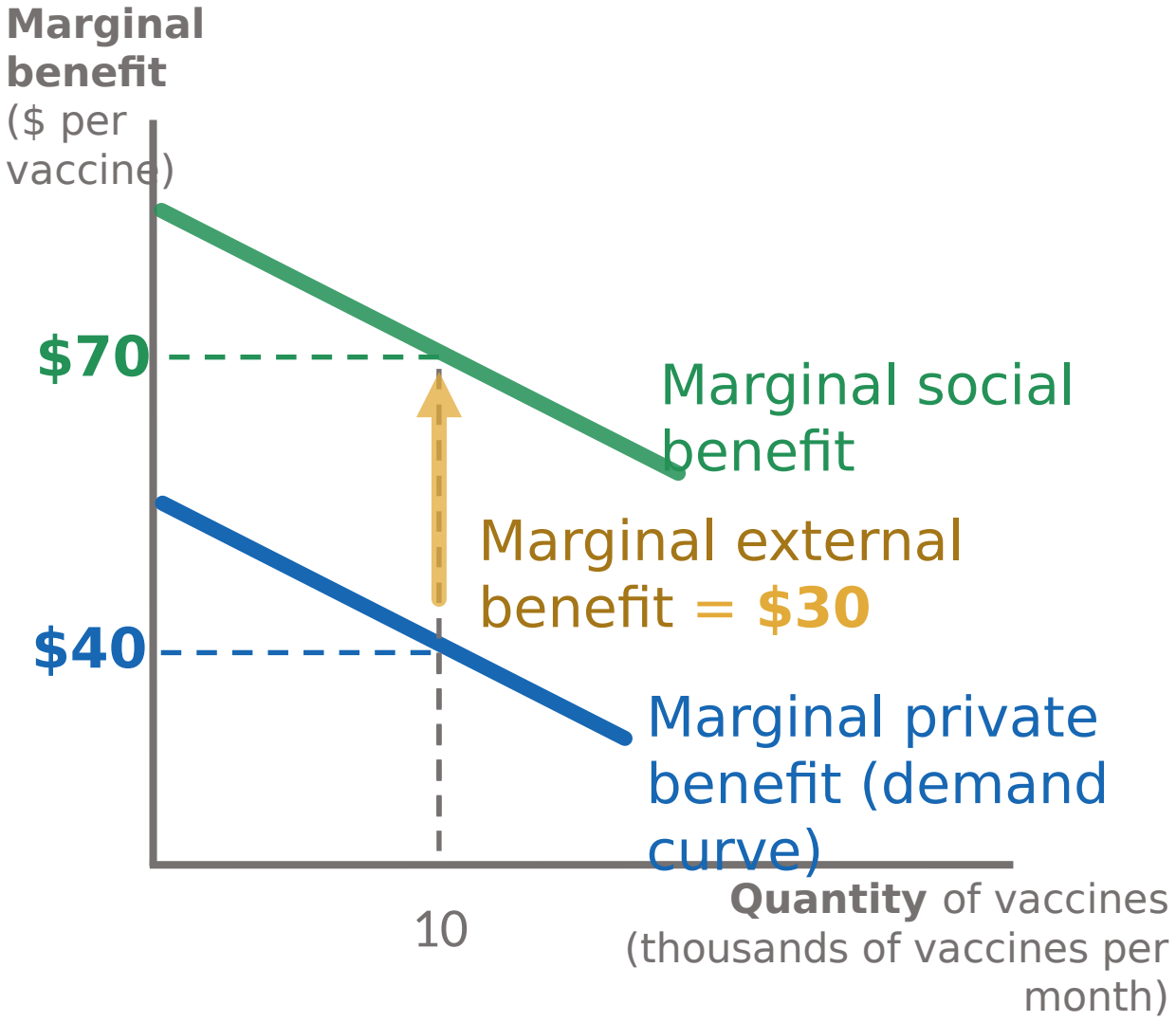
- **Vaccine Example:** Suppose the MPB associated with the 10 thousandth vaccine is **$40**.

Marginal External Benefit (extra benefits for bystanders)

- **Vaccine Example:** Suppose the MEC associated with the 10 thousandth vaccines is **$30.**

Marginal Social Benefit = MPB + MEB

- **Vaccine Example: MSC = $40 +**



Key take-aways: Identifying externalities

Externalities: When your choices have side effects on others.

- Create a **wedge** between what's in **society**'s best interest and what's in the best interest of **sellers and buyers**.

Negative externalities harm bystanders

- Market failure: There is **too much** of this activity taking place.
- **Marginal Social Costs** exceed the **Marginal Private Costs**
  - separated by **Marginal External Costs.**

Positive externalities benefit bystanders

- Market failure: There is **too little** of this activity taking place.

Chapter 10 (2 of 5)

Analyze how externalities lead markets to produce inefficient outcomes:

- Socially optimal quantity
- Negative externalities are overproduced
- Positive externalities are underproduced

1. Identifying Externalities
2. The Externality Problem
3. Solving Externality Problems
4. Public Goods and the Tragedy of the Commons

The Externality Problem

Major theme in economics: Markets are efficient

- Forces of supply and demand yield **good outcomes for buyers and sellers.**

BUT what if…

- **you are neither** a buyer nor a seller in the market.
- but your well-being is **still impacted** by that market's outcome.

Market outcomes **ignore** the interests of **bystanders.**

- **Result:** The **market often fails** to find the most efficient outcome in the presence of externalities.

Let's try to find the best outcome for society (since the market can't).

Finding the socially optimal quantity

Socially optimal quantity: The quantity that is **most efficient for society as a whole**, including the interests of buyers, sellers, and bystanders.

- Accounts for **all** the costs and **all** the benefits, regardless of who they fall on.

Gas Example: From *society's* perspective, how many gallons of gas should we produce?

- **Marginal principle:** Will society be better off if it produces **one more gallon of gas?**
- **Cost-benefit principle:** Compare the **marginal social benefit** and the **marginal social cost.**

Rational Rule for Society: Produce more of an item as long as its marginal social benefit is at least as large as the marginal social cost.

- Socially optimal quantity is located where **marginal social benefit = marginal social cost**

Four-step recipe for analyzing externalities

1. Predict the **equilibrium quantity** to forecast what you think will happen.
   - find where supply equals demand.
2. Assess what **externalities** are involved.
   - positive or negative?
3. Find the **socially optimal quantity** that is in society's best interest.
   - where marginal social benefit equals marginal social cost.

4. **Compare** your forecast of the equilibrium quantity with the socially optimal quantity.

Negative externalities in the market for gasoline (1 of 4)

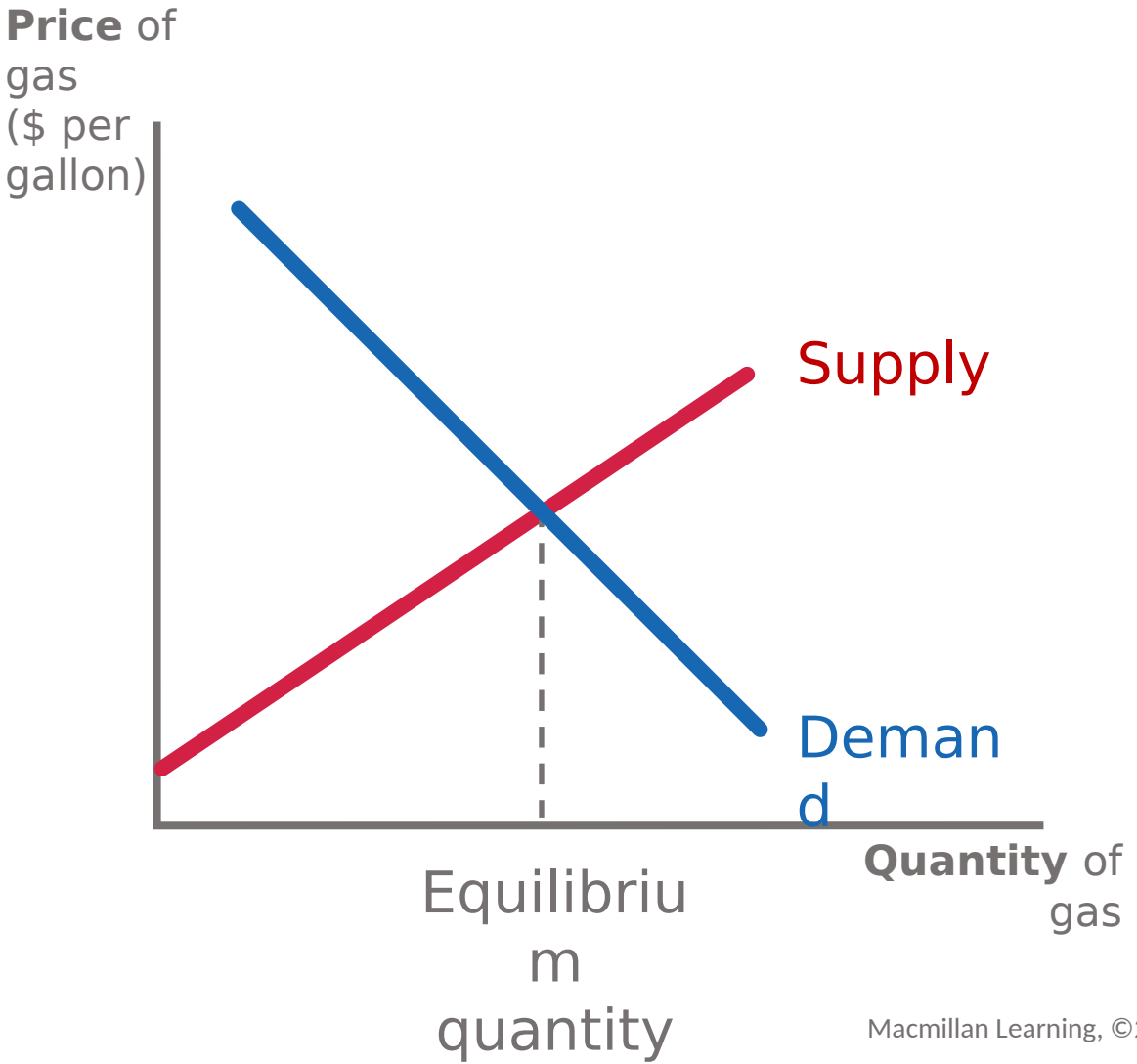
Step 1: Predict the **equilibrium quantity**.

- Supply-equals-demand equilibrium

This quantity reflects the decisions of...

- **Buyers**, via the demand curve (i.e., their marginal private benefit).
- **Sellers**, via the supply curve (i.e., their marginal private cost).

Bystanders play no role in



Negative externalities in the market for gasoline (2 of 4)

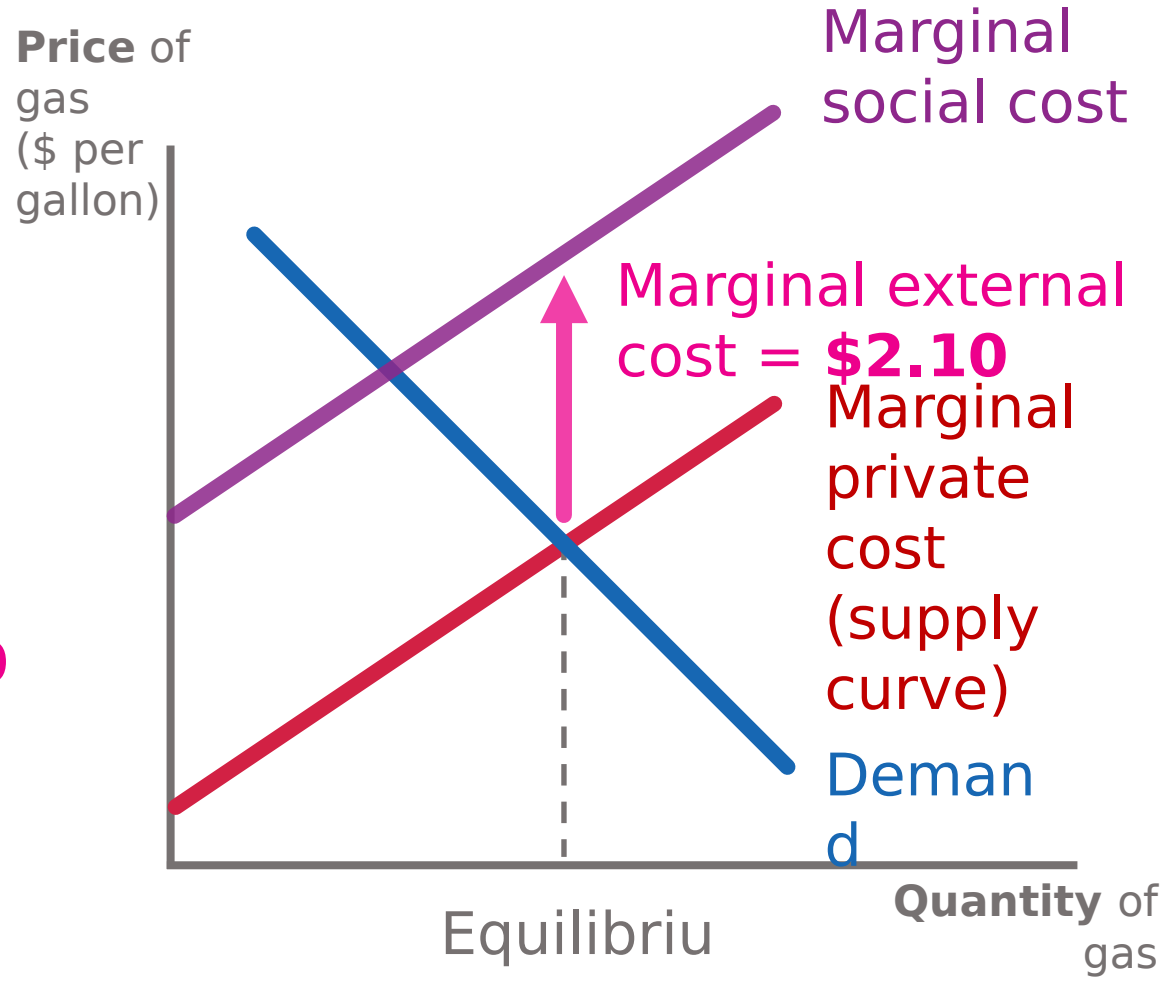
Step 2: Assess the **externalities**.

- positive or negative externality?

Does gasoline **help or hurt** bystanders?

- Producing and burning gasoline **harms** others.
  - **Marginal external cost** is **$2.10** per gallon.

The **marginal social cost** of each gallon of gas produced is **$2.10** per gallon **higher** than the **marginal private cost** (given by the supply



Negative externalities in the market for gasoline (3 of 4)

Step 3: Find the **socially optimal quantity**.

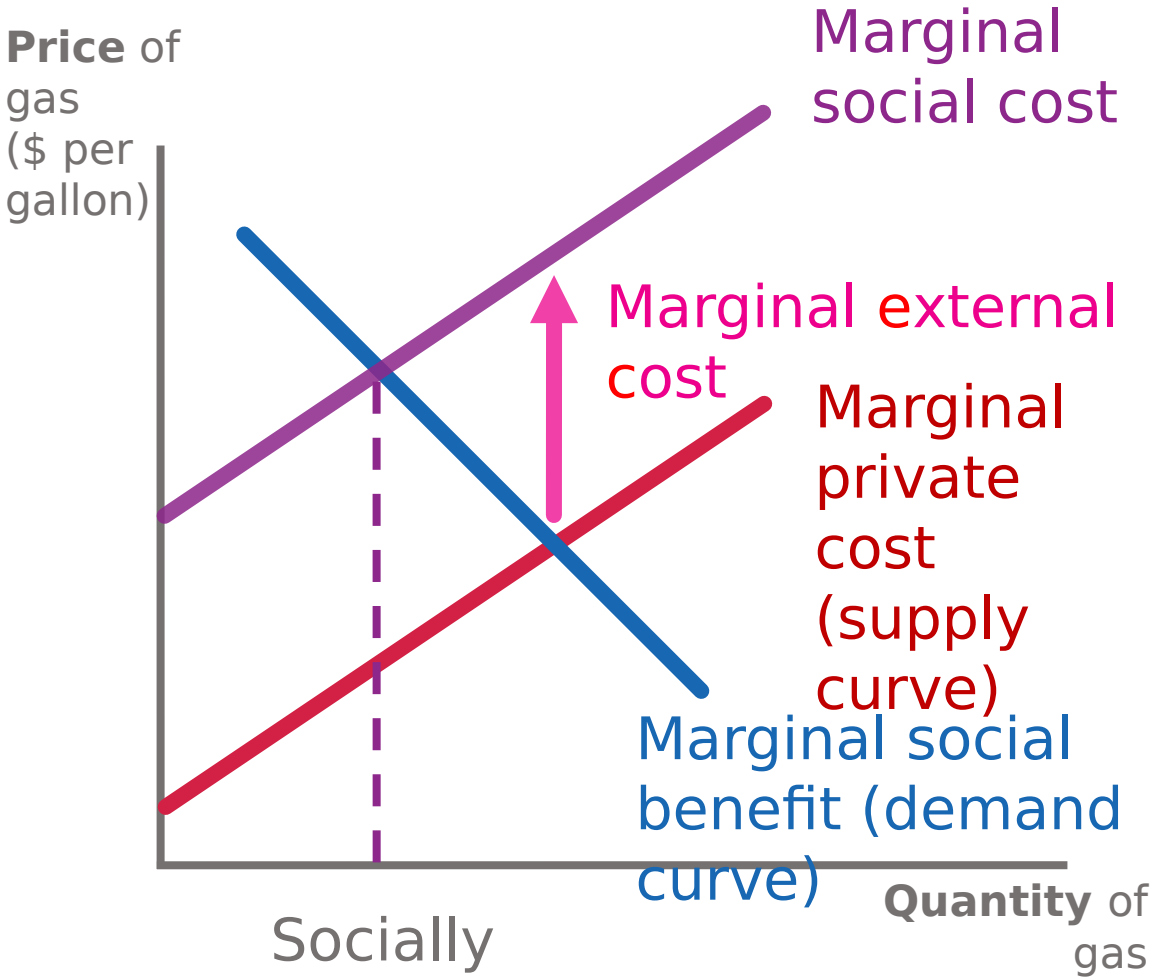
- Marginal social benefit = Marginal social cost

Since there are no positive externalities….

- The **demand** curve is also the **marginal social benefit** curve.

We already graphed the **marginal social cost curve.**

Simply look where the two **“social”**



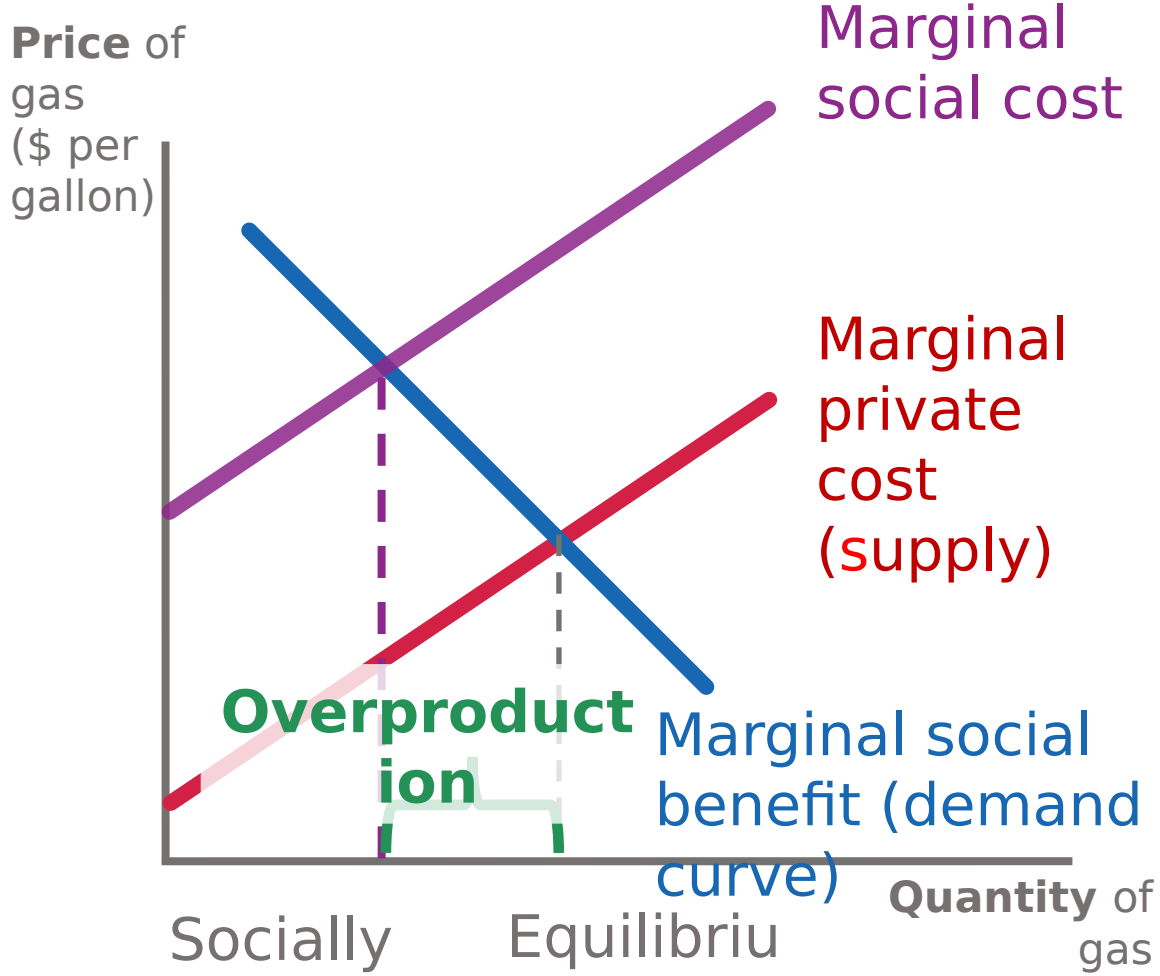
Negative externalities in the market for gasoline (4 of 4)

Step 4: Compare the equilibrium and the socially optimal quantity.

In the face of a negative externality…

- The **equilibrium quantity** of gas produced in the market will be **higher** than is **socially optimal.**
- Market failure: **overproduction** of gas.

Take-away: When businesses don't account for the full costs of the pollution they emit, they do **too much** relative to what's in society's



The Socially Optimal Quantity of Pollution

Given our analysis, it is **not** socially optimal for there to be **ZERO** pollution.

Just because pollution is bad doesn't mean the best outcome is to eliminate it.

Fossil fuels trade-off:

- **Cost:** Burning fossil fuels emits harmful **pollution.**
- **Benefit**: They make life more **convenient.**

Socially optimal quantity seeks to **find the right balance** upon consideration of all the costs and benefits.

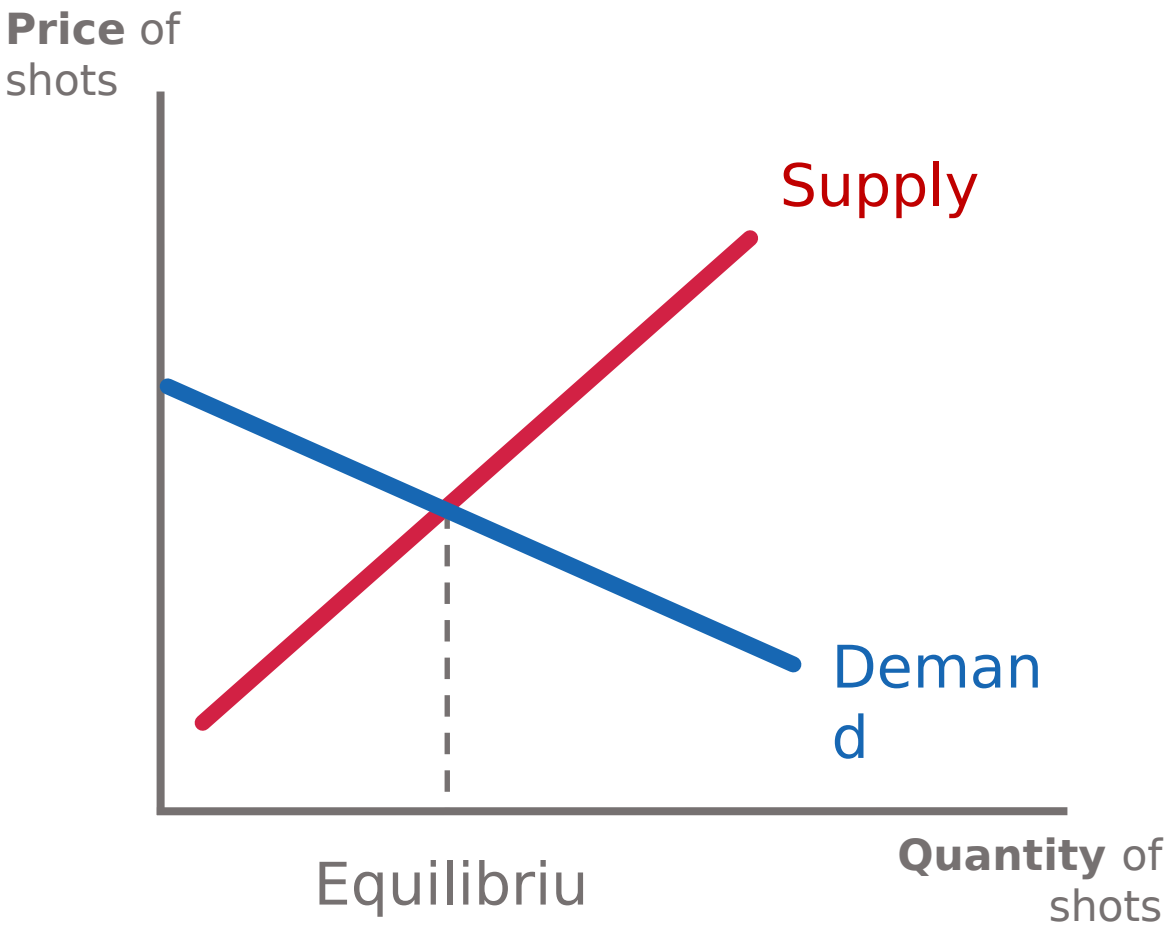
Positive externalities in the market for flu shots (1 of 4)

Step 1: Predict the **equilibrium quantity**.

- Supply-equals-demand equilibrium

This quantity reflects the decisions of...

- **Buyers**, via the demand curve (i.e., their marginal private benefit).
- **Sellers**, via the supply curve (i.e., their marginal private cost).



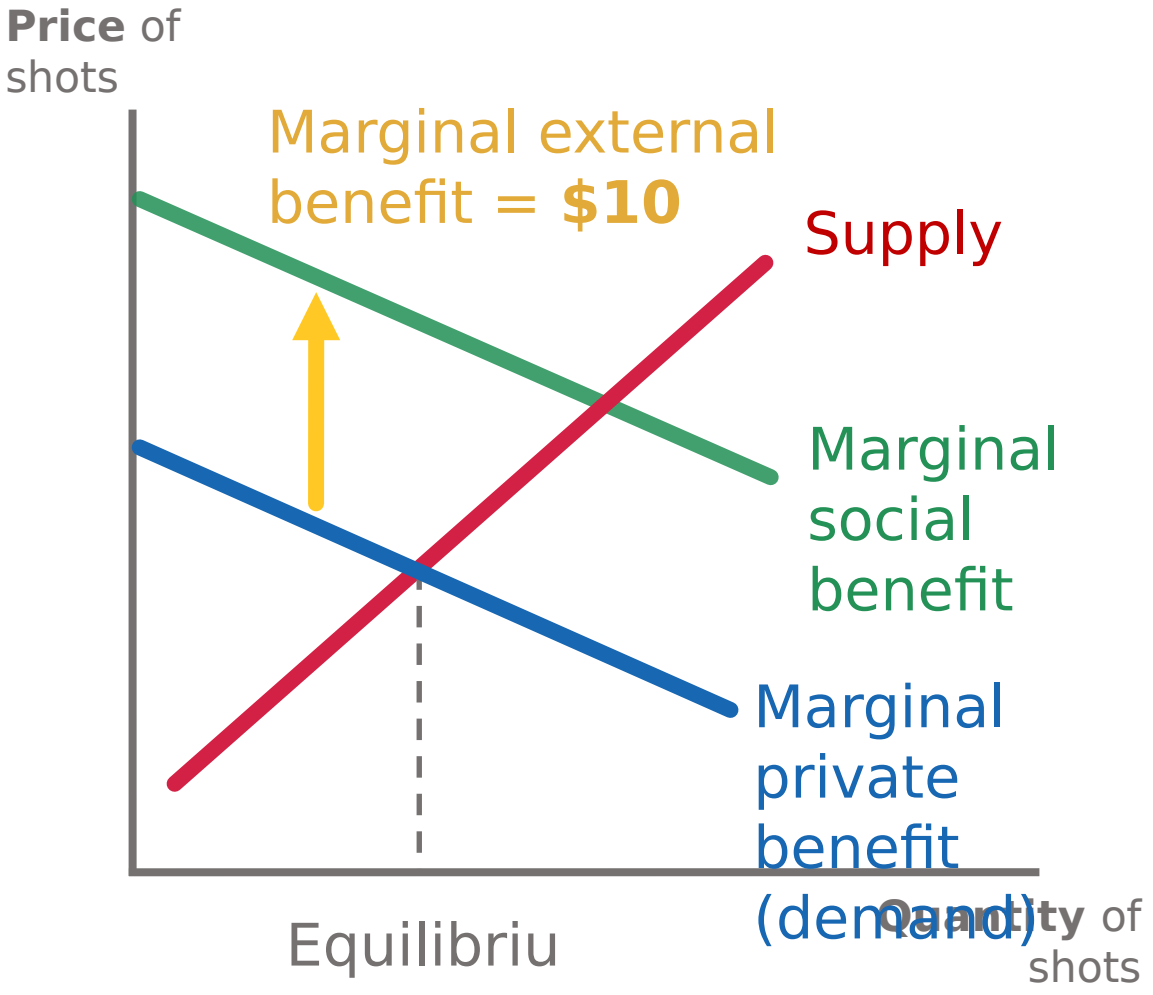
Positive externalities in the market for flu shots (2 of 4)

Step 2: Assess the **externalities**.

- positive or negative externality?

Do flu shots **help or hurt** bystanders?

- When you get your flu shot, you **help** others.
  - Now they won't catch the flu from you!
  - **Marginal external benefit** is **$10.**



The **marginal social benefit** of

Positive externalities in the market for flu shots (3 of 4)

Step 3: Find the **socially optimal quantity**.

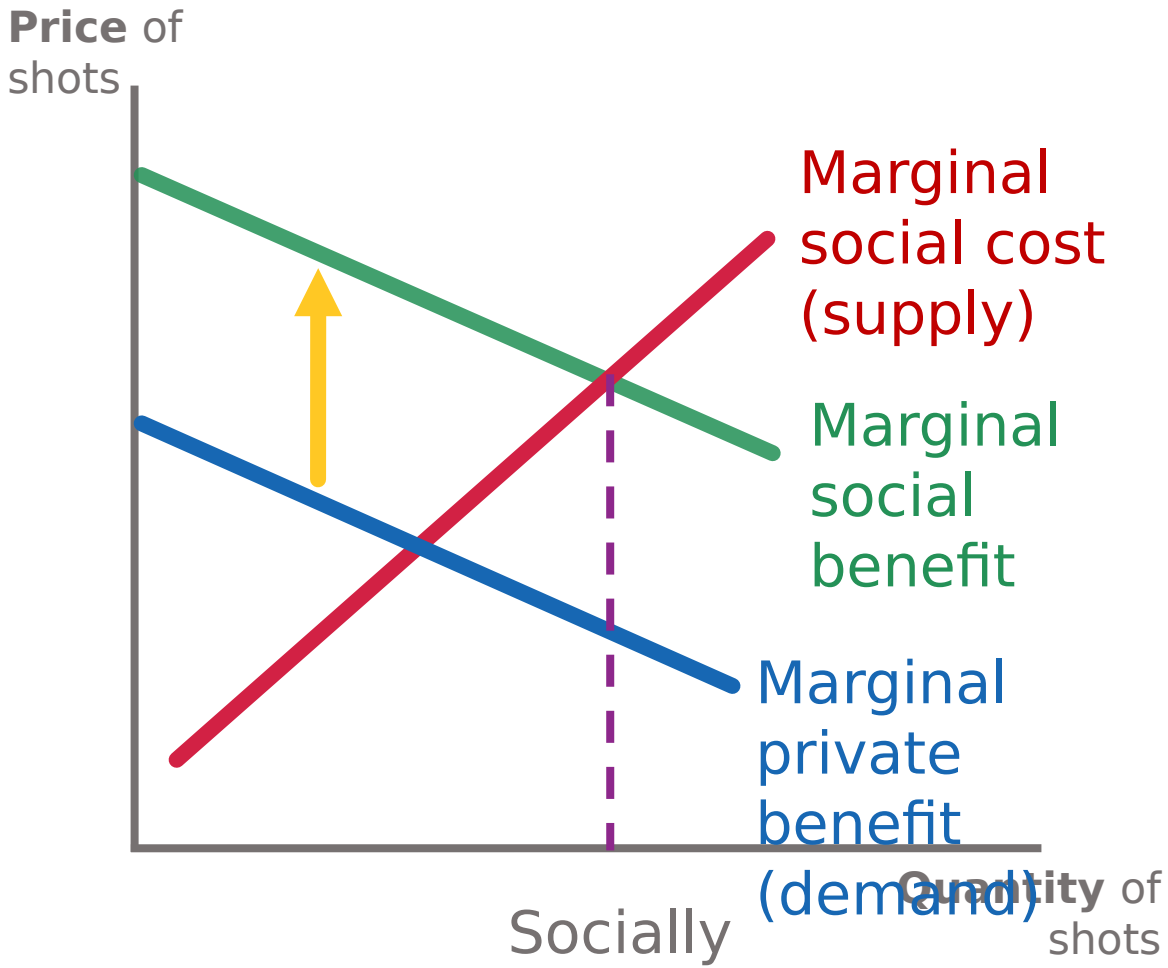
- Marginal social benefit = Marginal social cost

We already graphed the **marginal social benefit** curve.

Since there are no negative externalities…

- The **supply** curve is also the **marginal social cost** curve.

Simply look where the two **"social" curves intersect** to find the **socially**



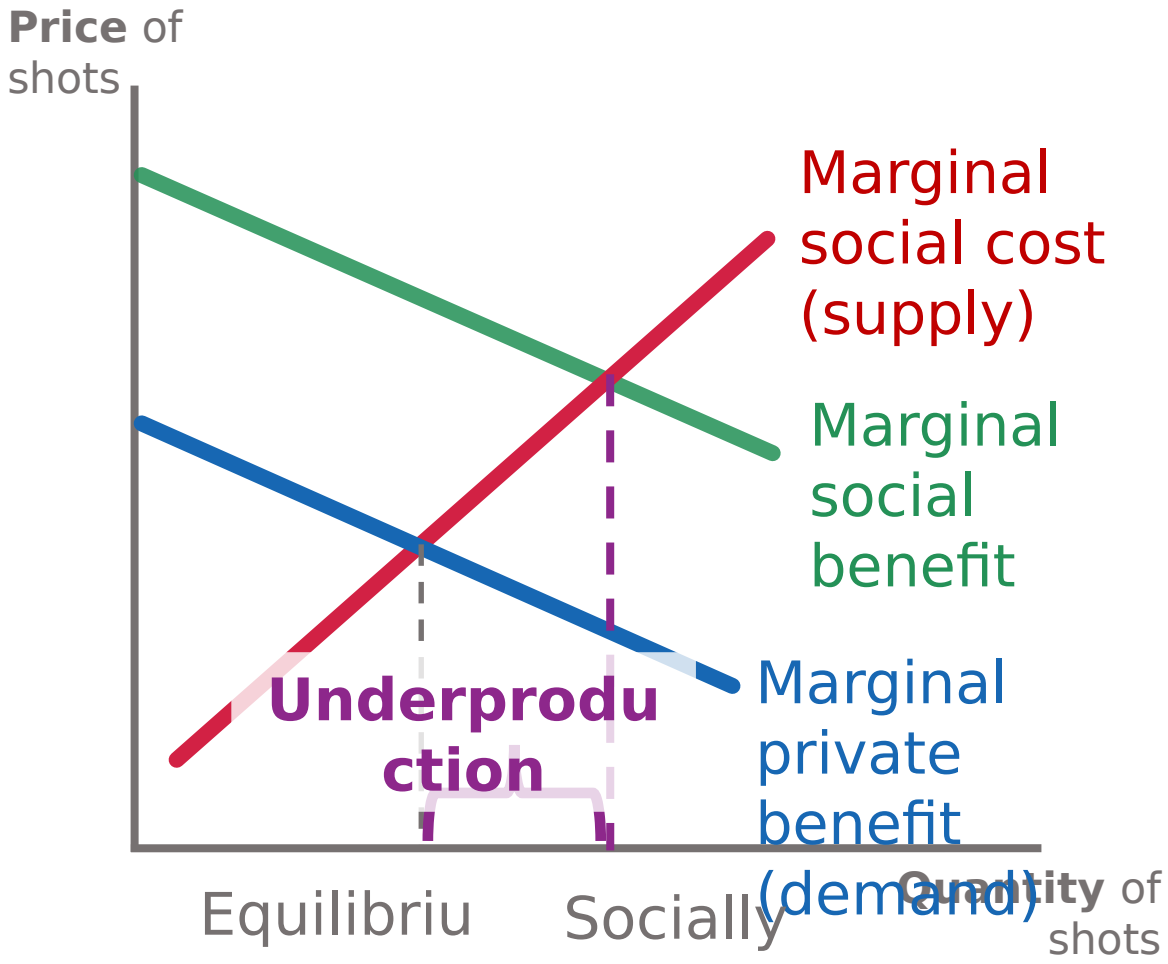
Positive externalities in the market for flu shots (4 of 4)

Step 4: Compare the equilibrium and the socially optimal quantity.

In the face of a positive externality…

- The **equilibrium quantity** of flu shots bought in the market will be **smaller** than is **socially optimal.**
- Market failure: **underproduction** of flu shots.

Take-away: When people don't account for the full benefits of the activity they do, they do **too little** relative to what's in society's



Key take-aways: The externality problem

Negative externalities

- **Harms** bystanders
- Marginal private costs **underestimate marginal social costs.**
- Market failure: **overproduction** (too much!)

Positive externalities

- **Helps** bystanders
- Marginal private benefits **underestimate marginal social benefit.**
- Market failure: **underproduction** (too little!)

Chapter 10 (3 of 5)

Understand the various ways you can solve externality problems:

- Private bargaining
- Tax and subsidy
- Cap and trade
- Laws, rules, regulations

1. Identifying Externalities
2. The Externality Problem
3. Solving Externality Problems
4. Public Goods and the Tragedy of the Commons

Solving Externality Problems

Find a way to **internalize the externality**

- Ensure people take account of the effects of their actions on bystanders.

Solution Options:

1. Private bargaining (the Coase theorem)
2. Corrective taxes and subsidies
3. Cap and trade
4. Laws, rules, regulations
5. Government support for public goods
6. Assign ownership rights for common resource problems

Discuss solutions 1–4 now

Solutions 5 and 6 are for dealing with externalities in a **specific context** (discussed in the

The Coase Theorem

Coase Theorem: If **bargaining is costless** and **property rights are clearly established and enforced**, then externality problems can be **solved by private bargains.**

- **Clarification:** "Bargaining is costless" doesn't mean money won't exchange hands.
  - Rather, it means it is **easy to strike a deal** — no need to hire lawyers or go through a time-consuming legal procedure.

Coase theorem says private bargaining can restore the socially optimal outcome!

- Two examples of private bargaining:
  1. **Neighbor's loud music** (negative externality issue)
  2. **Humana Health Insurance** (positive externality issue)

Solution 1: Private bargaining (1 of 2)

Get all interested parties in a room and give them an opportunity to negotiate with each other.

- Look for a creative bargain that will make everyone better off.

Side payments: If someone else's actions harm you, you can pay them to do something else instead.

Loud Music Example: Your neighbor is playing loud music that is preventing you from sleeping.

- You offer them $5 to turn it down.
  - **You are better off:** You only offer $5 if you value the quiet at least as much as $5 (maybe you would be willing to pay up to $30 for some quiet and a good night's rest).
  - **They are better off:** They only accept $5 if they value that $5 more than continuing to listen to their music at a loud volume.

Solution 1: Private bargaining (2 of 2)

Side payments: If someone else's actions **help** you, you can **pay them to do more** of that activity.

Humana Example: When you exercise, your health insurance company ends up spending less on medical care for you.

- Humana started **Go365**, a new program that **paid clients to work out.**
  - **You are better off:** You are not only getting healthier but also getting a side payment from your insurance company!
  - **Humana is better off:** This side payment is relatively small compared to their overall savings (now that they likely won't have to spend as much money on medical care for you).

Take-away: The possibility of losing that side payment leads you to internalize (account for) that positive externality when weighing your costs

Image: Arthimedes/Shutterstock

When private bargaining is costly

It’s nearly impossible to get all of the people affected by climate change together toward a solution.

There are millions of polluters located in many different countries. There are billions of people impacted, not counting those who are yet to be born and won’t be able to bargain to protect their future Earth.

Private bargaining is not going to solve the climate change problem.

Time to discuss other solutions!

Solution 2: Corrective Taxes and Subsidies

Problem: People ignore the external costs (or benefits) of their choices.

Solution: Introduce something these people cannot ignore.

- Use a tax (or subsidy) to correct the market price such that people now internalize the externality.

Negative externality solution: Set the corrective tax **equal to the marginal external cost.**

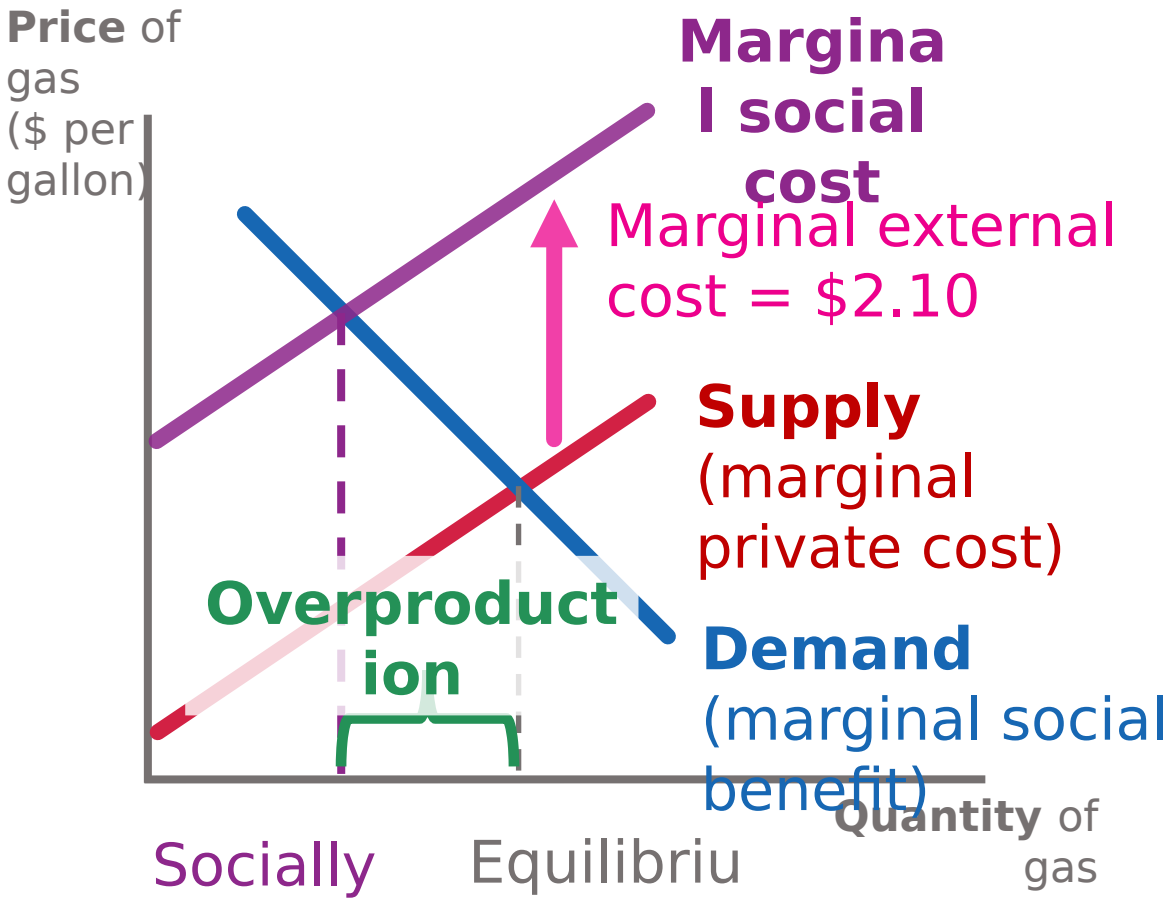
- **Corrective tax:** A tax designed to induce people to take account of the negative externality they cause.
- This tax incentivizes people to do **less** of the activity.

Positive externality solution: Set the corrective subsidy **equal to the marginal external benefit.**

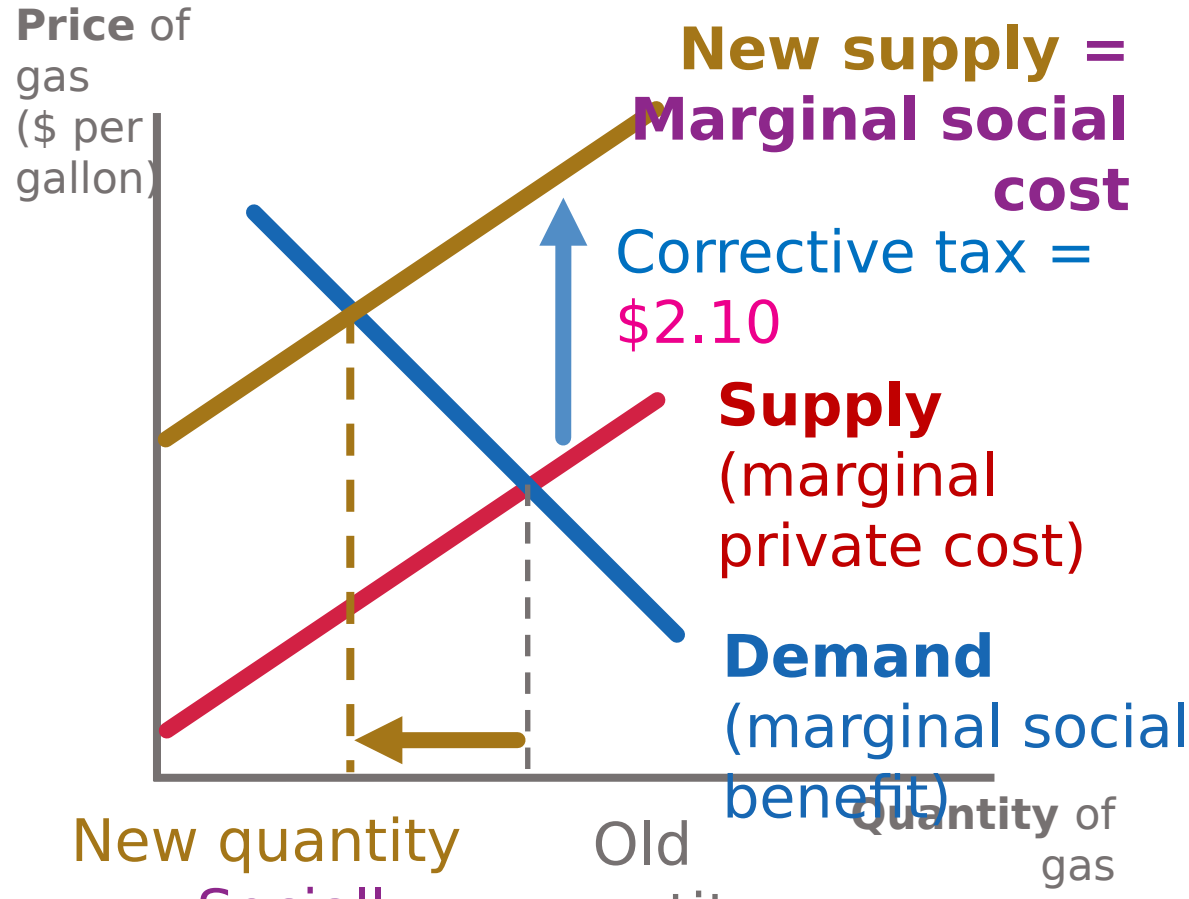
- **Corrective subsidy:** A subsidy designed to induce people to take account of the positive externalities they cause.

Negative externalities in the market for gasoline

The problem: **overproduction**



Corrective tax solution: Set tax = MEC of $2.10



Solution 2: Corrective tax

Summary: How the corrective tax worked in the gasoline market

Oil refinery company's perspective:

- Focused on what affects the company's bottom line (their marginal private costs)
- Ignore the marginal external cost of increased pollution ($2.10 per gallon)
  - Result: **overproduction**

Introducing a **tax equal to** the $2.10-per-gallon **marginal external cost**…

- The company responds to that $2.10 (as if they were responding to the marginal external cost!).
- The **new quantity** in the market now **corresponds** to the **socially optimal quantity.**
  - Corrected the overproduction issue.

Solution 2: Corrective subsidy

Corrective subsidy: Lead people to consider the positive externalities that their actions generate.

- Set the corrective **subsidy equal to the marginal external benefit.**

Examples:

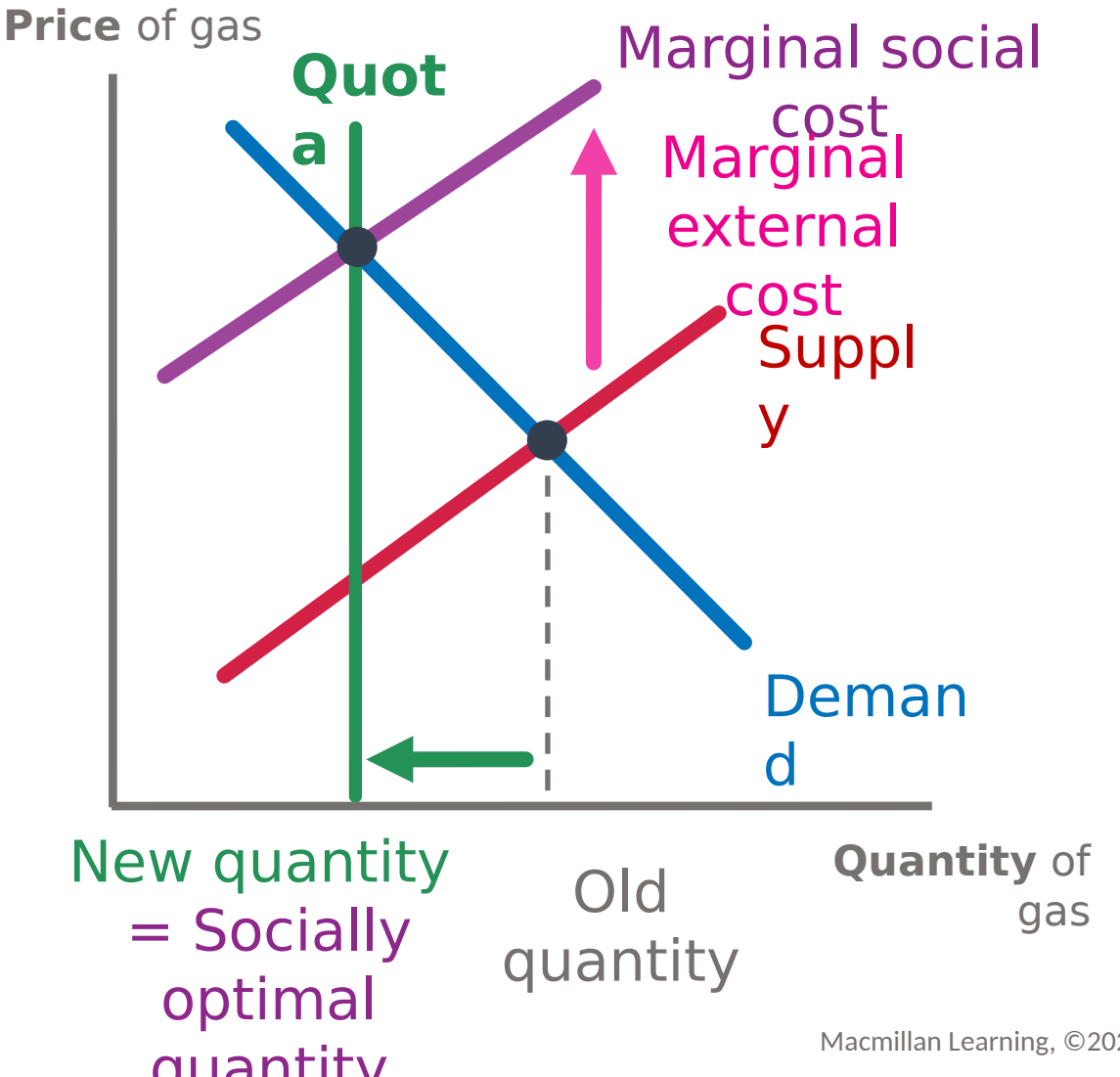
1. Insurance companies subsidize your purchase of an **alarm system** for your house in the form of cheaper insurance rates.
   - The insurer benefits from the alarm because it reduces the chance that you will file a claim.
2. Your local government may have offered gift cards to people who chose to get a **COVID-19 vaccine.**
   - Your local community benefits from your decision to get vaccinated because it reduces the chance you will get sick and spread the disease to others.
3. The federal government subsidizes people's pursuit of **higher education**

Solution 3: Cap and trade

RECALL: A **quota** is a limit on the maximum quantity of a good or service that can be sold.

Negative externality solution:

- Set the **quantity cap** equal to the **socially optimal quantity.**
- The quota corrects the overproduction issue.



Solution 3: Using Cap and Trade to Limit Pollution (1 of 2)

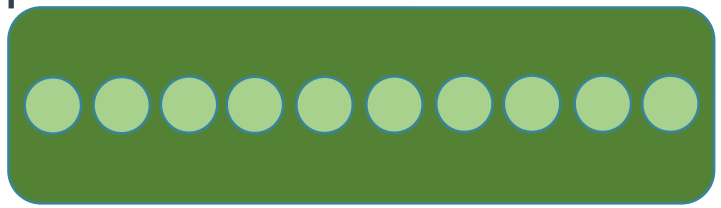
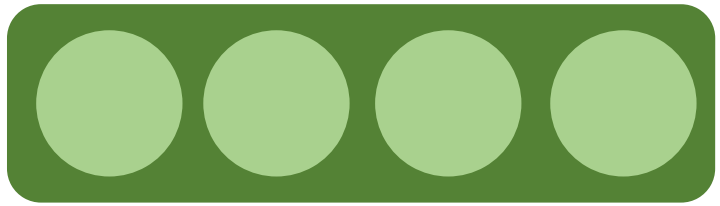
Cap and trade: A quantity regulation implemented by allocating a fixed number of permits, which can then be traded.

Each permit allows its holder to emit a specific quantity of pollution.

- **Cap:** Reduces pollution by setting a maximum cap on the total amount of pollution that can be emitted.
- **Trade:** Efficient firms buy permits from inefficient firms.
  - concentrates production among business that use more efficient, cleaner technology.

Let's explore how cap and trade redistributes production toward more efficient producers.

Solution 3: Using Cap and Trade to Limit Pollution (2 of 2)

	How much can the firm produce before hitting the permit's regulatory pollution limit?	How efficient is the firm?	How much revenue does this level of production translate to?
Firm 1 (clean)		Relatively efficient	$$$$$$
Firm 2 (dirty)		Relatively inefficient	$ $

Firm 1 has an incentive to buy an additional permit from Firm 2.

- Firm 1 offers **$$$** to Firm 2 for their permit.

Firm 2: What brings me the most money: using my permit (**$**), or selling my permit (**$$$**)?

Result: Firm 1 buys the permit from Firm 2.

Solution 4: Laws, Rules, and Regulations

Many of our laws, rules, and regulations exist to help solve problems caused by negative externalities:

- Noise restrictions: deter noisy neighbors.
- Speeding laws: reduce the endangerment of fellow citizens on the road.
- Automaker fuel efficiency regulations: reduce gas usage and, thus, pollution.
- Safety laws: reduce endangerment of workers.

Workplace rules:

- No intra-office dating: save everyone from dealing with the fall out of a messy breakup.
- Required antivirus software: reduces the chances of a network hack.

Key take-aways: Solving externality problems

Big Picture: Ways of getting others to internalize their externalities.

Private bargaining: Side payments can motivate people to change their behavior in a manner that is aligned with the socially optimal outcome.

Corrective taxes and subsidies:

- Taxes correct negative externalities by inducing a person to feel the full cost of their actions.
- Subsidies correct positive externalities by getting a person to feel the full benefits of their actions.

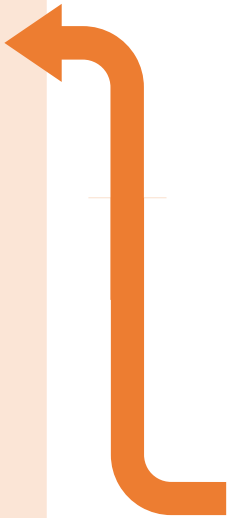
Cap and trade: Concentrates production among efficient businesses.

Laws, rules, and regulations: Reduce or prohibit behavior that generates negative externalities.

Chapter 10 (4 of 5)

Solve externality problems that arise when people can't be excluded from using something:

- Public goods
- Common resources



1. Identifying Externalities
2. The Externality Problem
3. Solving Externality Problems
4. Public Goods and the Tragedy of the Commons

Externality problems linked to *nonexcludable* products

RECAP: The **presence of externalities** means **markets often fail** to provide the socially optimal quantity, instead resulting in either **too much** or **too little** of that product.

Now…

- examine **specific externality problems** that arise because a product is **nonexcludable**.
- Again, there will be either **too much** or **too little** in the market.
  - examine solutions that can help correct the market failure.

Let's start by looking at some terminology so we can better understand what "nonexcludable" means.

Characteristics of goods (1 of 2)

Excludable: When someone can be easily excluded from using something.

Example: I can exclude you from using my car by not giving you the keys.

Rival: When your use of something doesn’t allow someone else to use it.

Example: If I buy a cupcake, then there is one fewer cupcake available for you to buy and enjoy.

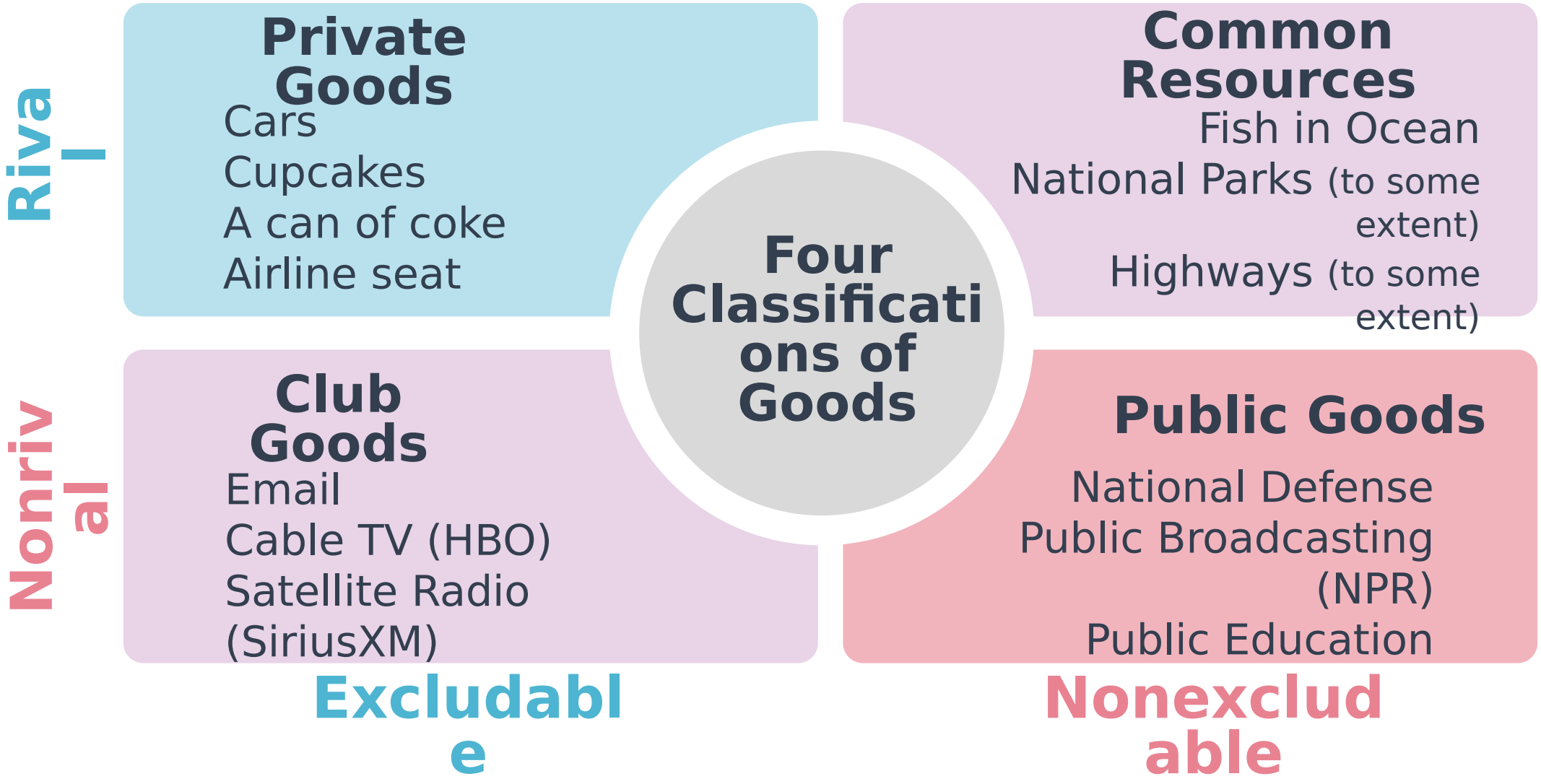
Nonexcludable: When someone *cannot* be easily excluded from using something.

Example: You can’t stop your neighbors from also enjoying the fireworks you set off in your backyard.

Nonrival: When one person’s use doesn’t subtract from another’s.

Example: Just because I am watching something on one TV doesn’t mean you can’t also watch that same show on another TV.

Characteristics of goods (2 of 2)



Issues with nonexcludable goods

Whenever you **can't exclude** nonpayers from using a good, there will be **externalities.**

- The **type of externality** (and, thus, the market result of either *too much* or *too little*) **depends** on whether the good is **nonrival** or **rival:**
  - **Nonrival** & Nonexcludable ☾ Public Goods
    - The externality issue stems from the presence of **free riders.**
      - Result: **Too little** of a public good is produced by the market.
  - **Rival** & Nonexcludable ☾ Common Resource
    - The externality issue creates a "**tragedy of the commons."**
      - Result: People use **too much** of a common resource.

Let's dive into these concepts in more detail now.

Public goods and free riders

Free-rider problem: When someone can enjoy the benefits of a good **without bearing the costs.**

Free riders don’t pay for the benefits they receive because the good is nonexcludable.

- Free riders are **bystanders** enjoying **positive externalities**.

The market **ignores the bystanders:**

- Market does not account for all the benefits accruing to all members of society.
- Result: The market **underproduces** or may entirely **fail to provide** the good.

Free riders’ viewpoint: Why would I pay for something that I can enjoy for free?

The Problem: If no one will pay for the good, no business is going to produce that good.

Result: Underproduction!

Solution 5: Government support for public goods

The problem: Free riders prevent businesses from effectively getting all the people who enjoy the good to pay for the good.

- **Result:** The private sector will not provide public goods.

Solution: The **government** can help provide public goods!

- Government can **directly provide** the public good using tax money.
  - Military, public parks, public education
- Government can **purchase** public goods from businesses.
  - Government purchases Covid vaccines from private manufacturers rather than manufacture the vaccines themselves using government employees.

Tragedy of the Commons

Common resource: A good that is rival and also nonexcludable.

- Private gains but shared costs.

Tragedy of the commons: The tendency to overconsume a common resource.

Fishing example:

- Private gain: You catch a fish that you yourself can eat and enjoy.
- Shared cost: You have reduced the number of fish left for everyone else and contributed toward the disruption of the lake's ecosystem.
  - Your fishing causes a negative externality!

Large-scale overfishing can lead to serious damage of the ocean's ecosystem.

Tragedy of the commons: Origin story

The name “tragedy of the commons” dates back to when most towns had a **central grassy area** called **the commons.**

Shepherds would **bring their sheep to graze** the free grass in the field. Since it cost the shepherds nothing, each one grazed their flock on the commons **too often**, resulting in a **dead, overgrazed field.**

They overconsumed a common resource. Everyone would have been **better off** if they had **agreed to limit consumption** of the common resource.

Matthais Naumann/Almay

Solution 6: Assign ownership rights

The problem: People do not pay the full social cost of their actions when using common resources.

- **Result:** The common resource will be overused.

Solution: Assign ownership rights so that someone now owns the common resource.

- The owner has an incentive to ensure it is not overused so they can continue to profit from it year after year.
  - The costs and benefits of grazing on the commons become the owner's costs and benefits.

Chapter 10 (5 of 5)

1. Positive or negative?
2. The market either produces too much or too little.
3. The best solution depends on the situation.
4. Government support and ownership rights

1. Identifying Externalities
2. The Externality Problem
3. Solving Externality Problems
4. Public Goods and the Tragedy of the Commons