An Introduction to Economics

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Interventions: Motivating Example

- You are a policymaker with the ability to affect market outcomes by using various instruments. You have recently noticed that your city has extremely poor air quality due to a high usage of motor vehicles combined with serious congestion along your major roadways. In the same vein, you also find that the quality of your highways and bridges has diminished due to overuse.

Interventions: Motivating Example (2)

- What can you say about the current usage of motor vehicles as compared to the socially optimal level?
- What policy instrument could you use to reduce air pollution, alleviate congestion, and generate revenue that you can allocate to improving transportation infrastructure?
- How would your proposed policy produce the intended affects?
- Are there any drawbacks to your proposed policy?

Why do markets fail?

Definition

A **market failure** is an instance in which a market equilibrium fails to be efficient.

We have already discussed a number of potential culprits for market failure:

- Externalities
- Asymmetric Information
- Market power, collusion, and entry deterrence
- Frictions and costly search
- Free riding problems associated with the provision of public goods

Externalities

Definition

An **externality** is any additional benefit or cost that affects agents other than the one consuming or producing a good.

- Pollution
- Second-hand smoke
- Immunization
- Education and research
- Congestion (of resources)

Efficiency

- When the market equilibrium isn't efficient, we need to find a new benchmark for what we'd like to achieve.

Definition

The **social benefit** is the total benefit to society of the consumption of a good or service. The **private benefits** are the direct benefits obtained by the individuals consuming the good or service.

Definition

The **social cost** is the total cost to society associated with the provision of a good or service. Similarly, the **private costs** are the direct costs of producing the good or service on the supply side.

Social vs. Private

- When the consumption of a good or service leads to a positive externality, then the social benefit exceeds the private benefit.
  - Receiving an immunization
  - Pursuing higher education
- When the consumption of a good or service leads to a negative externality, then the social benefit is lower than the private benefit.
  - Driving a motor vehicle
  - Smoking cigarettes

Social vs. Private (2)

- When the production of a good or service leads to a positive externality, the private costs exceed the social cost.
  - Maintaining a swarm of bees
  - Tourist attractions bringing in business
- When the production of a good or service leads to a negative externality, the private costs are lower than the social cost.
  - Pollution from industrial plants
  - Overuse of antibiotics in livestock

Thinking on the Margin

Definition

The **marginal social benefit** is the incremental benefit to social surplus from producing another unit of a good. The **marginal social cost** is the incremental cost to social surplus from producing another unit of a good.

- Marginal private benefit is given by the demand curve
- Marginal private cost is given by the supply curve
- When there are no externalities: MSB = MPB and MSC = MPC

Efficiency: The Benchmark

When the market for a good has well-defined implications for social surplus, the efficient outcomes have a natural analog to market equilibria:

Definition

When marginal social benefit is downward sloping and marginal social cost is upward sloping, the point at which they intersect is efficient. This is our **efficient benchmark** for problems comparing social surplus and market outcomes.

Example: Positive Consumption Externalities

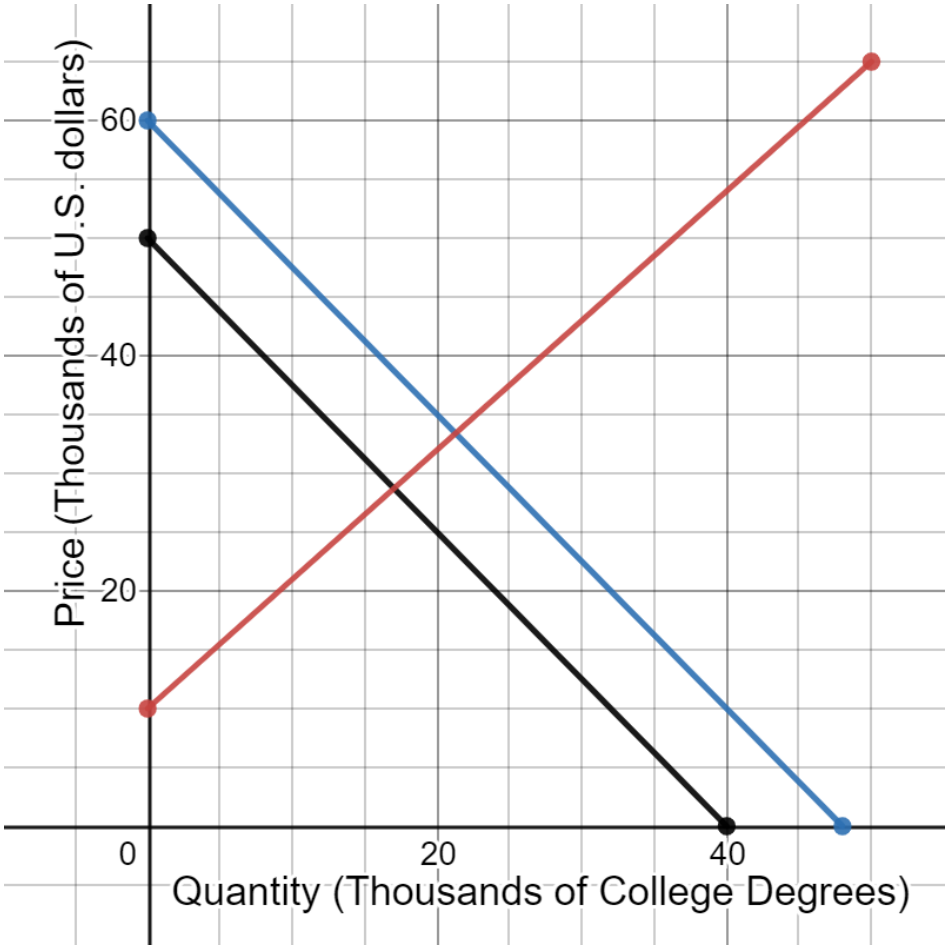

Figure 1: Marginal Private Benefit (black), Marginal Social Benefit (blue), Marginal Social/Private Cost (red)

Positive Externalities

- In the previous example, we saw that agents were not considering the positive effects of their consumption enjoyed by others.
- This resulted in underconsumption as compared to the socially efficient benchmark.
- Failure to consider positive externalities generally leads to a market quantity **lower** than the efficient level.
- Policy Goal: Incentivize more consumption or production.

Example: Negative Production Externalities

See Whiteboard

Negative Externalities

- The previous example demonstrates that when agents fail to consider the negative impact that their activities have on others, then they will in general engage in this activity too frequently.
- Failure to consider negative externalities generally leads a market quantity **higher** than the efficient level.
- Policy Goal: Incentivize less consumption or production.

Solutions?

1. Taxing or subsidizing proportional to the externality
2. Assigning property rights and allowing for private solutions
3. Market solutions such as a cap and trade system
4. Explicit limits on the externality resulting from consumption or production

Solution 1: Taxation and Subsidy

- Agents aren't internalizing the additional impact of their decisions
- Idea: Provide incentives that align their decisions with social surplus
- In the case of a negative externality: Tax
- In the case of a positive externality: Subsidize
- Pigou was among the first to demonstrate the merits of this approach

Taxation and Subsidy: Benefits

- Can serve as an effective way of solving large-scale inefficiencies
- Requires very little cost to implement
- Raises revenue: can be redistributed or used to finance projects
- Enforceable
- Applicable to a wide range of instances

Taxation and Subsidy: Drawbacks

- Estimating the optimal tax can be difficult
- A suboptimal tax may lead to more deadweight loss
- Agents (particularly consumers) may not respond to these incentives
- Avoidance concerns

Taxation: Basic Modeling

- Taxes on one side of the market have the effect of shifting the corresponding curve
- Given an explicit equation, it's possible to calculate this shift directly
- Let τ denote a tax or subsidy on either supply or demand
- $\tau > 0$: tax, $\tau < 0$: subsidy
- If on demand: Price that consumers pay becomes: $P_{market} + \tau$
- If on supply: Producers receive $P_{market} - \tau$ rather than P_{market} on the margin

Taxes on the Demand Side

Consider the following demand curve:

$$P = 70 - \frac{7Q_d}{3}$$

- This specifies a relationship between the *total* amount of money that consumers pay and the quantity demanded.
- Suppose that a tax of $\tau = \$10$ is imposed on the demand side. Consumers pay the market price plus τ for every purchase.
- What is the new relationship between *market price* and quantity demanded?

Taxes on the Demand Side (2)

- The total price is now $P_{market} + \tau$
- The demand curve specifies:

$$P_{market} + \tau = 70 - \frac{7Q_d}{3}$$

- The relationship between the market price and quantity demanded is now:

$$P_{market} = 70 - \tau - \frac{7Q_d}{3}$$

$$P_{market} = 70 - 10 - \frac{7Q_d}{3}$$

Taxes on Demand: Visualization

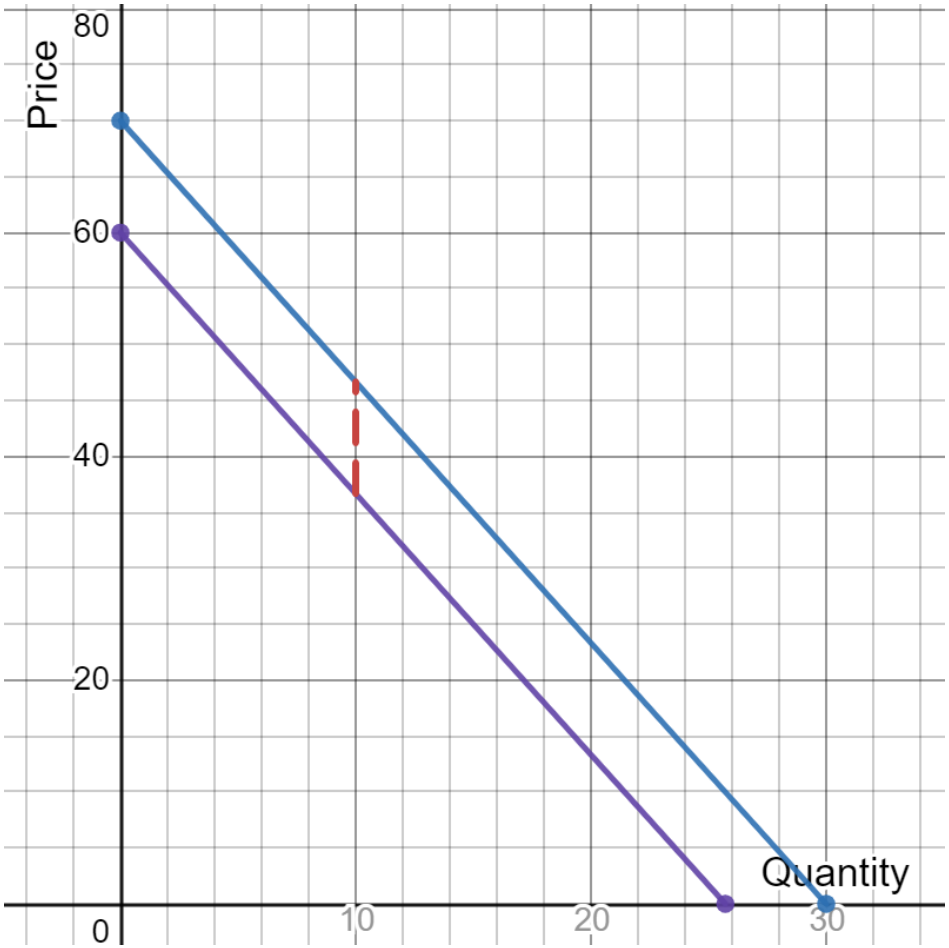

Figure 2: Original demand (blue) vs. new demand (purple). The length of the red line segment is $\tau = 10$

Taxes on the Supply Side

Consider the following supply curve:

$$P = 10 + \frac{5Q_s}{3}$$

- This specifies a relationship between the *total amount* that sellers receive and the quantity supplied in the market.
- When a tax τ is imposed on the supply side, sellers now receive $P_{market} - \tau$

Taxes on the Supply Side (2)

To compare supply after the tax to the market price, we can substitute $P_{market} - \tau$ into the supply equation:

$$P_{market} - \tau = 10 + \frac{5Q_s}{3}$$

$$P_{market} = 10 + \tau + \frac{5Q_s}{3}$$

Taxes on Supply: Visualization

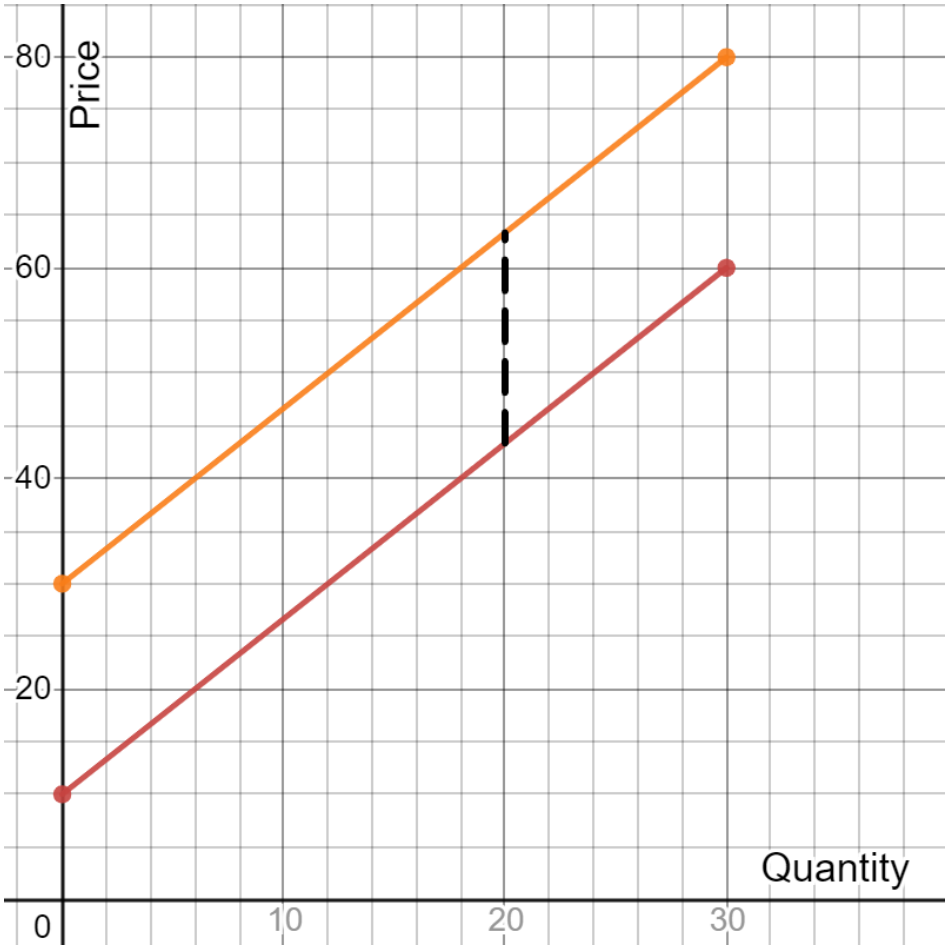

Figure 3: Supply before the tax (red) vs. after (yellow). The length of the black line segment is $\tau = 20$