

Review + The 5 Axioms of Urban Economics

EC 330, Set 02

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Fall 2022

Schedule

Today:

- (i) EC201 review
- (ii) The five axioms of urban econ

Upcoming:

- (i) Reading: intro + chapter 1 ([link](#))
- (ii) PS01 (posted later this week)

Road map

(01) - Demand

(02) - Supply

(03) - Equilibrium

(04) - Surplus

(05) - Cost functions

Review: Demand

Review 01: Demand

Demand: Quantity of a good that a **consumers** are willing/able to purchase at a given price

Demand Curve: A **function** that describes the relationship between prices and quantities demanded (**ceteris paribus**)

The Law of Demand

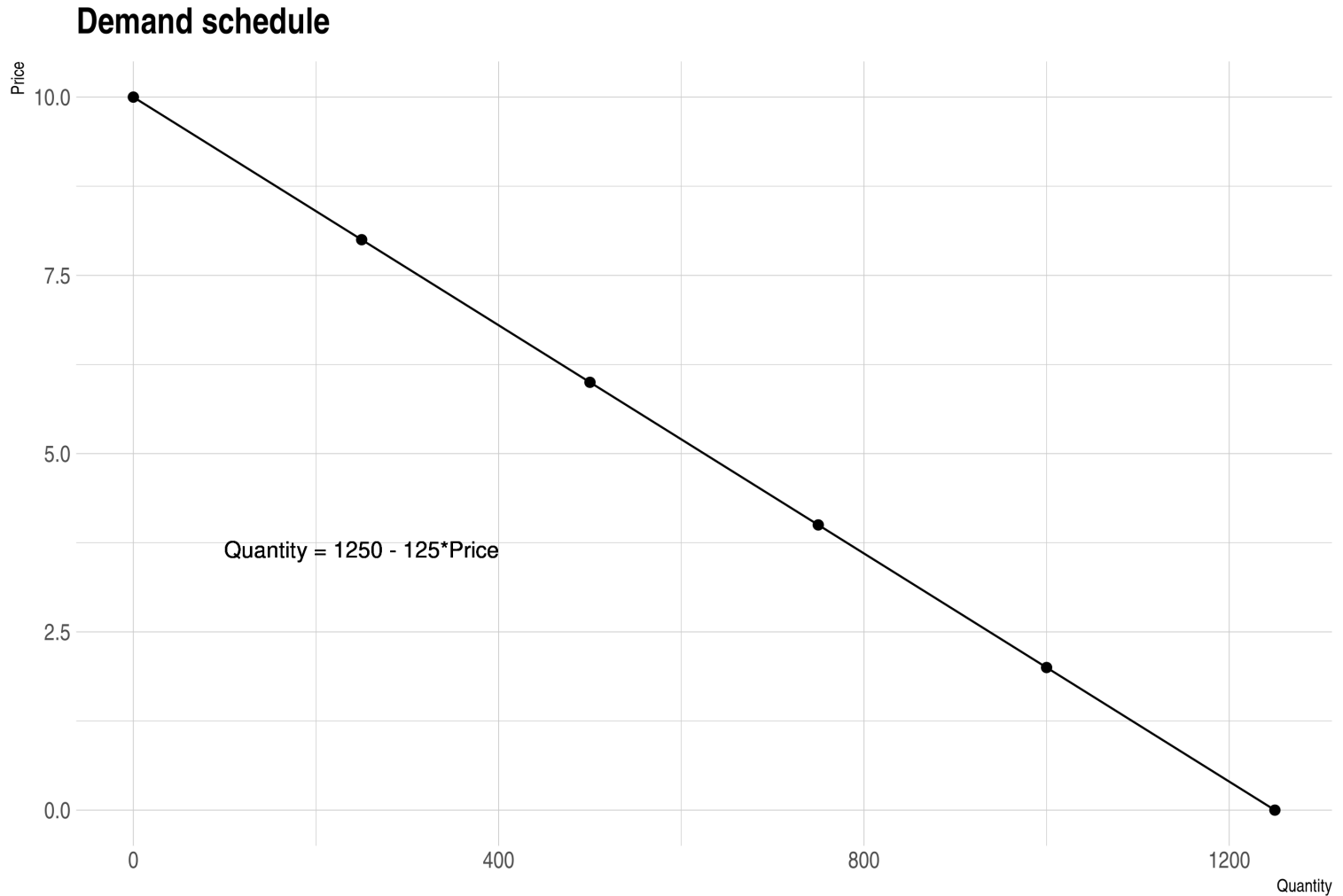
- $P \uparrow \longrightarrow Q_d \downarrow$
- When prices increase, quantity demanded decreases

Example: Demand schedule

Price	Quantity
0	1250
2	1000
4	750
6	500
8	250
10	0

Demand curves are constructed by optimal consumption decisions by **consumers**

Review 01: Demand



Review 01: Demand

Difference between a **movement** vs a **shift** in demand

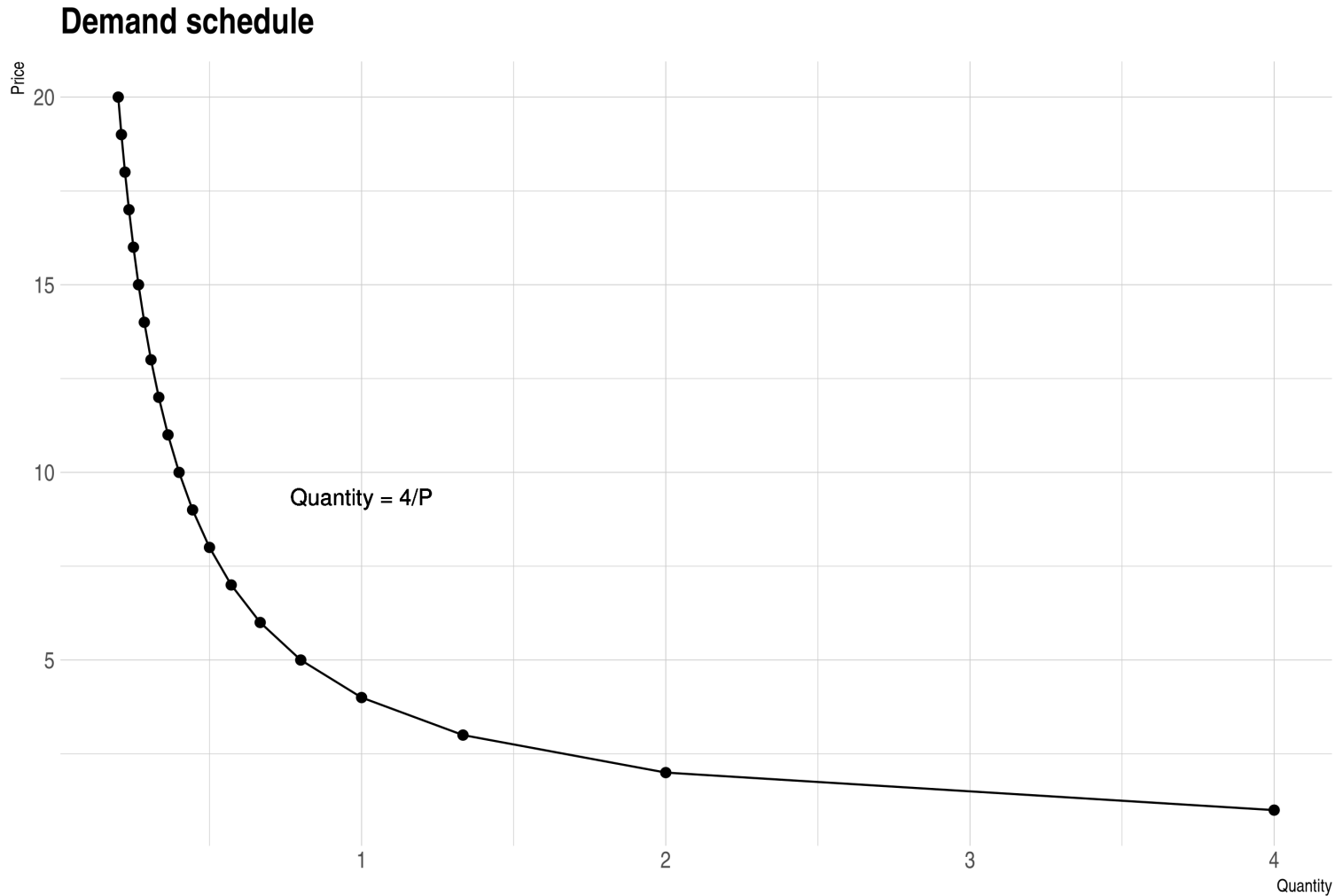
(i) A **movement** along the demand curve

- A change in price causes a movement along a demand curve

(ii) A **shift** in the demand curve

- A shift occurs when the whole curve (function) changes
- Either left or right **NOT** up or down
- Examples of demand shifts
 - Price of a substitute/compliment good changes
 - Rise of incomes (pandemic checks)
 - Seasonal factors
 - Change in tastes/popularity (**chicken**)

Review 01: Demand



Review: Supply

Review 02: Supply

Supply: The quantity of a good that a consumers are willing/able to purchase at a given price

Supply Curve: A function that describes the relationship between prices and quantities supplied (*ceteris paribus*)

The Law of Supply:

- When prices increase, the quantity supplied increases
- $P \uparrow \longrightarrow Q_s \uparrow$

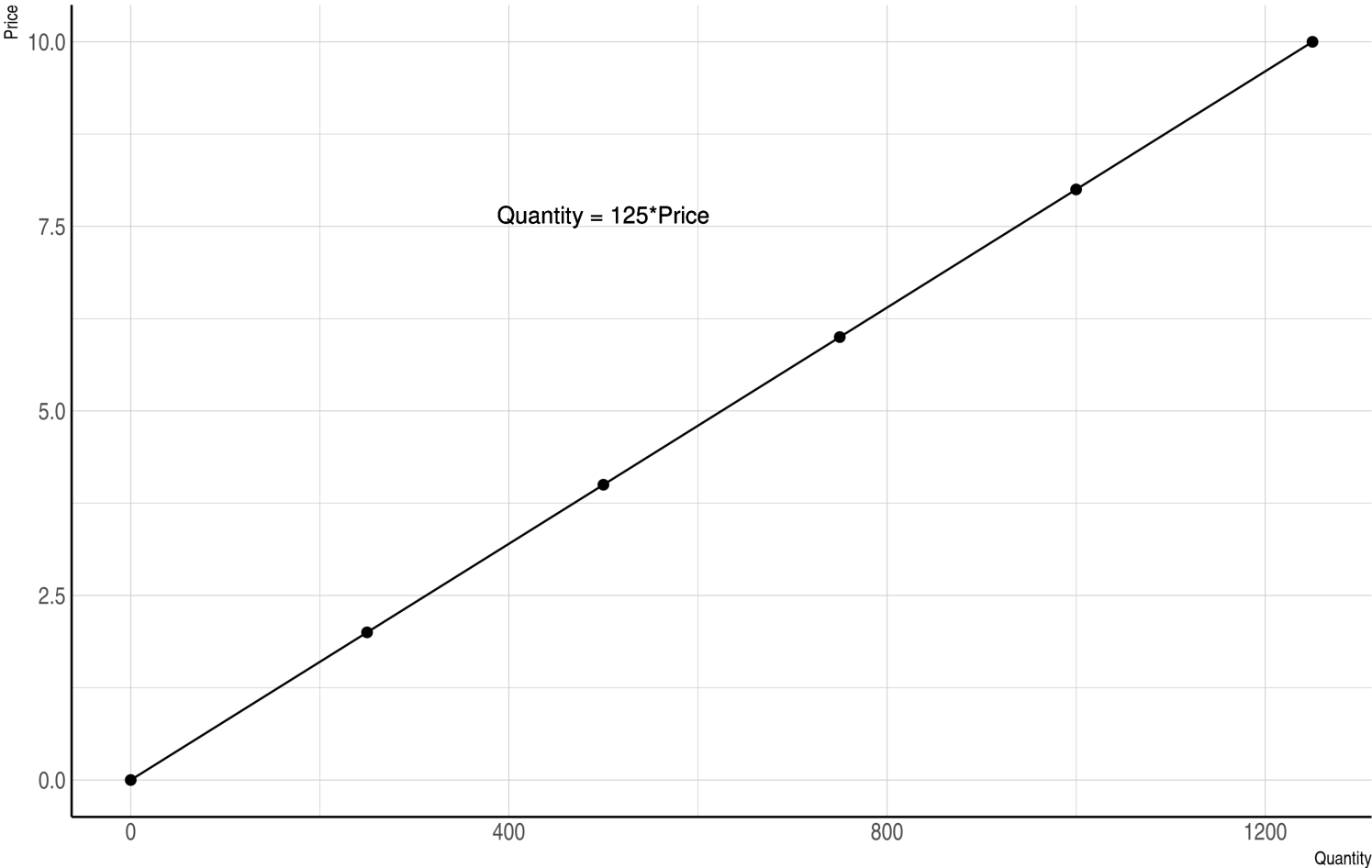
Example: Supply schedule

Price	Quantity
0	0
2	250
4	500
6	750
8	1000
10	1250

Supply curves are constructed by optimal production decisions by **producers**

Review 02: Supply

Supply schedule



Review 02: Supply

Difference between a **movement** vs a **shift** in supply

(i) A **movement** along the supply curve

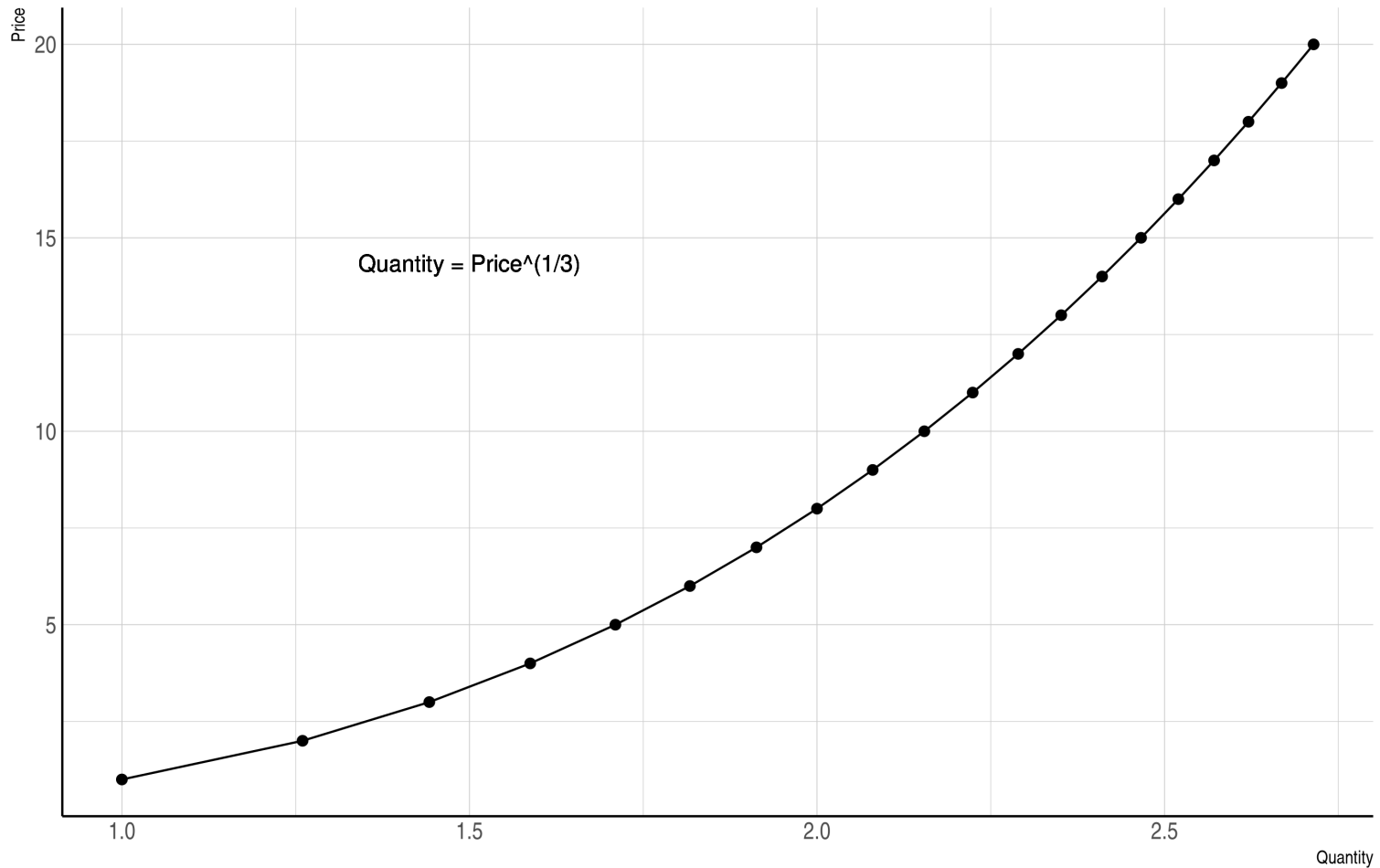
- A change in price causes a movement along a supply curve

(ii) A **shift** in the supply curve

- A shift occurs when the whole curve (function) changes
- Either left or right **NOT** up or down
- Examples of supply shifts
 - Changes in production costs (steel increases → car market)
 - Natural conditions (drought)
 - New technology (conveyor belt)
 - Government policies (**taxes**, **subsidies**, regulations)

Review 02: Supply

Supply schedule



Review: Equilibrium

Note: Drawing

Drawing is important in this class

Your grade will depend on the **clarity** of your drawings on both problem sets and **exams**

To get **full points**, your graphs must include the following

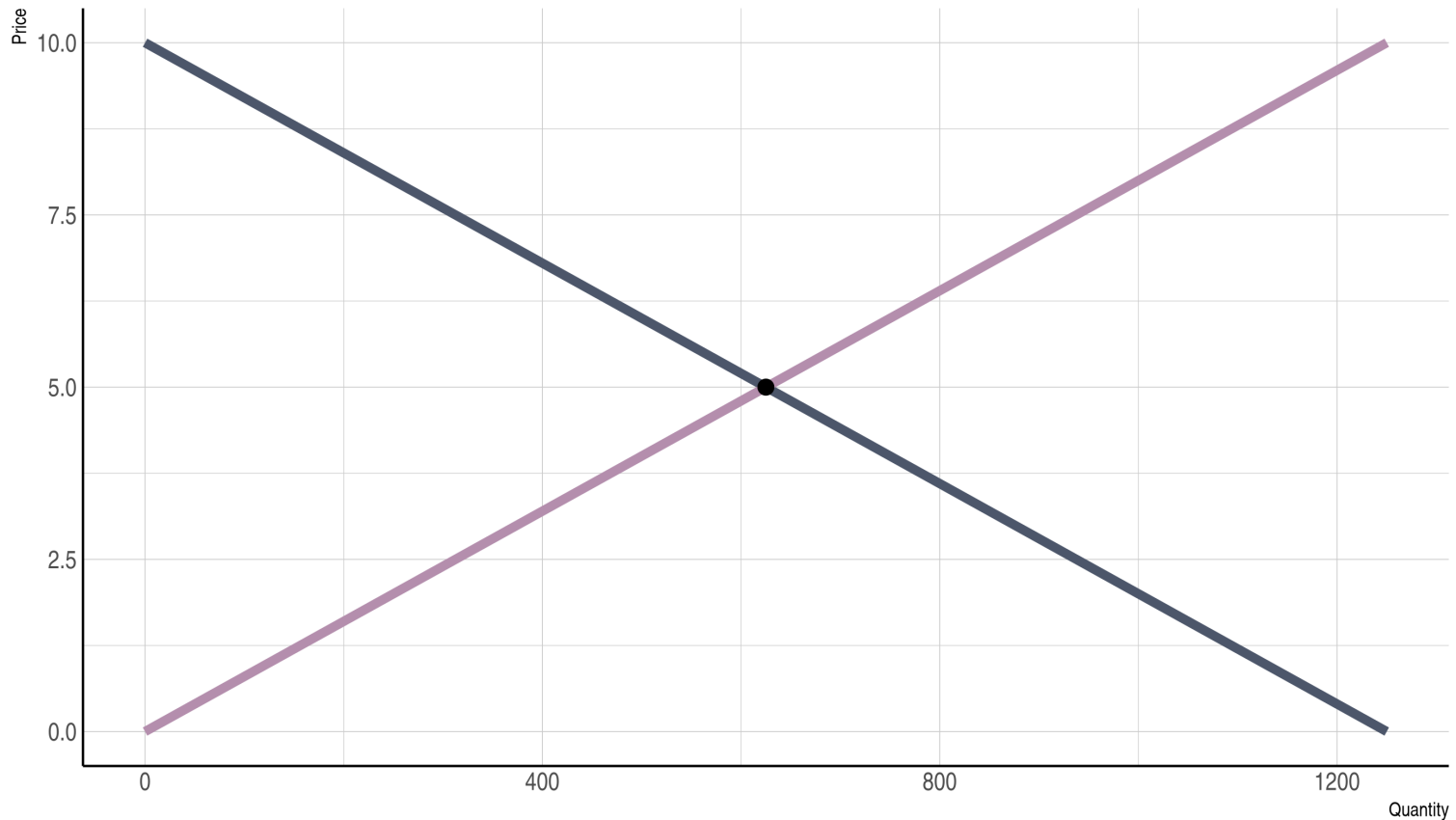
- label your axis
- label your curves (D, D', S, S')
- label your eqs (E, F)
- *dashed* lines from eqs to axis

Do not worry too much about drawing to scale

Review 03: Equilibrium

$$Q_d = 1250 - 125 * P_d$$

$$Q_s = 125 * P_s$$



Review: Surplus

Example: Consumer surplus

Consumer Surplus: The difference between a consumers **maximum** willingness to pay (WTP) and the market price

Producer Surplus: The difference between the price producers **minimum** willingness to sell and the market price

Example: Consumer surplus



Max Auffhammer
@auffhammer



A California Household spends roughly \$2.75 per day on electricity (equal to a [@starbucks](#) latte). The massive whining about a possible two day power outage indicates that marginal willingness to pay is way higher than that. Yes. That pain you are feeling we call consumer surplus.

5:21 PM · Oct 8, 2019 · [Twitter Web App](#)

19 Retweets **130** Likes



Example: Solve for the equilibrium

Example

Suppose we are given the following:

Supply: $P(Q_s) = 10 + Q_s$

Demand: $P(Q_d) = 20 - 4 * Q_d$

Task:

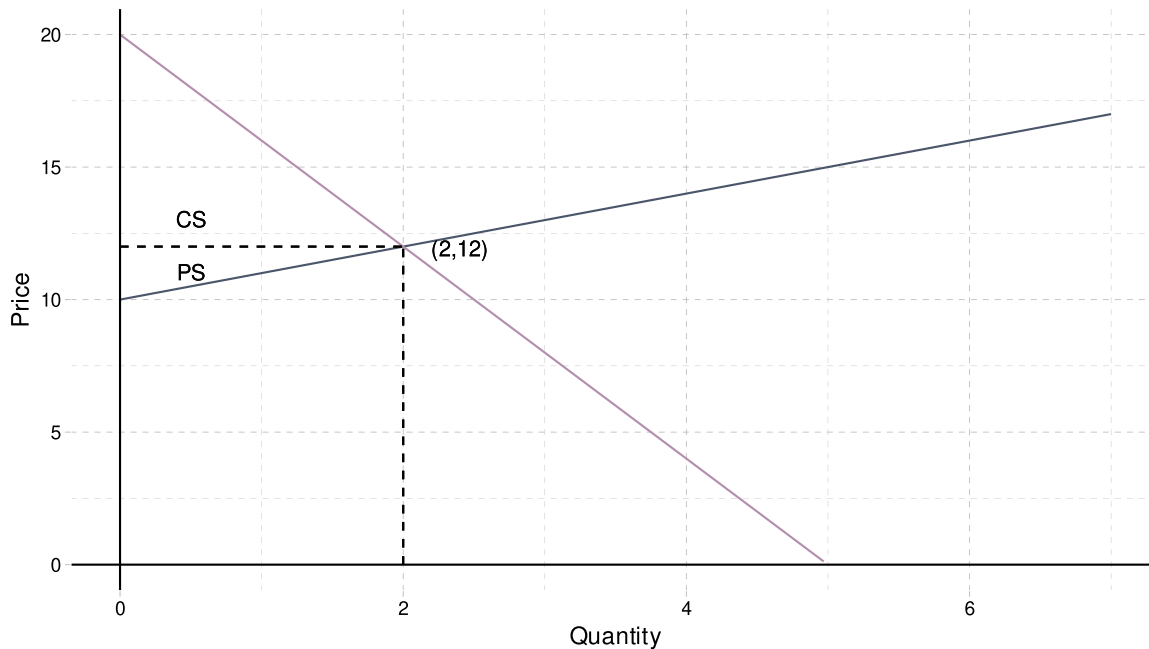
- (i). Carefully graph and label both curves
- (ii). Compute the Equilibrium
- (iii). Compute Consumer and Producer Surplus

Example: Solve for the equilibrium

Suppose we are given the following:

Supply: $P(Q_s) = 10 + Q_s$

Demand: $P(Q_d) = 20 - 4 * Q_d$



Example: Solve for the equilibrium

Equilibrium:

$$10 + Q^* = 20 - 4 * Q^*$$

$$5Q^* = 10$$

$$Q^* = 2$$

Plug this into either supply or demand equation to get:

$$P^* = 10 + 2 = 12$$

Consumer Surplus:

- $CS = \frac{1}{2} * (20 - 12) * (2 - 0) = 8$

Producer Surplus:

- $PS = \frac{1}{2} * (12 - 10)(2 - 0) = 2$

Example:

Using the follow supply + demand functions

Supply: $Q(p_s) = -15 + \frac{3}{5} * p_s$

Demand: $Q(p_d) = 45 - \frac{2}{5} * p_d$

Determine:

- (i) Graph each curve and label carefully
- (ii). Equilibrium prices (p^*) and quantities (q^*)
- (iii). Consumer surplus
- (iv). Producer surplus

Review 04: Elasticities

Elasticity: A measure of responsiveness of one variable to another in **percentage** terms

Common elasticities:

- **Own price elasticity (good x):** Measures how much quantity demanded for **x** will respond to a one percent change in the price of good **x**

- Formula: $\epsilon_{x,P_x} = \frac{\% \Delta Q_x}{\% \Delta P_x}$

- **Cross price elasticity (goods x,y):** Measures how much quantity demanded for **x** will respond to a one percent change in the price of **y**

- Formula: $\epsilon_{x,P_y} = \frac{\% \Delta Q_x}{\% \Delta P_y}$

Review 04: Elasticities

Suppose $\varepsilon_{x,P_x} = -0.5$. What does this mean in words?

A 1% change in the **price of good x** will lead to a .5% change in the *opposite* direction in the **quantity demanded for good x**

The equation can be helpful. If $\varepsilon_{x,P_x} = -0.5$, then:

$$\frac{\% \Delta Q_x}{\% \Delta P_x} = -0.5$$
$$\% \Delta Q_x = -0.5 * \% \Delta P_x$$

Review 04: Elasticities (questions)

Review Questions:

- If $\varepsilon_{x,y} > 0$, are these goods complements or substitutes?
 - Substitutes, an increase in the price of y **increases** demand for x
 - Lame example: cheerios and other cereal
- If $\varepsilon_{x,y} < 0$, are these goods complements or substitutes?
 - Complements, an increase in the price of y **decreases** demand for x
 - Lame example: Left and right shoes; pb and bananas

Review 05: Cost functions

Definitions:

- **Total Revenue (TR):** Total money firm brings in from selling Q units.

- $TR = P * Q$

- **Total Cost (TC):** The cost of producing Q units units

- **Average Cost (AC) = $\frac{TC}{Q}$**

- **Profit** (denoted as Π):

$$\Pi = TR - TC$$

Review 05: Cost functions

Suppose the price of the output good is **3** dollars per unit. Suppose a firm's cost function is $TC(Q) = 1 + Q$. If the firm produces 8 units of the good, calculate:

- TR
- TC
- AC
- Π (profit)

Review 05: Cost functions

Suppose the price of the output good is **3** dollars per unit. Suppose a firm's cost function is $TC(Q) = 1 + Q$. If the firm produces 8 units of the good, calculate:

- $TR = 3 * 8 = 24$
- $TC = 1 + 8 = 9$
- $AC = \frac{9}{8}$
- $\Pi = 24 - 9 = 15$

Review 06: Utility

Definitions:

- **Utility:** Satisfaction one receives from consuming a good or a service
 - Ordinal not cardinal; only know order of preference not how much
- **Utility function:** $U(x)$ A function that describes utility given from x
- **Marginal Utility:** Additional utility received from one additional good
- **The Law of Diminishing Marginal Utility:** Marginal utility decreases as one consumes more and more goods or services

The five axioms of urban economics

The five axioms of urban economics

As discussed in **set 01**, we are after some big questions in this course

- Agree upon a few basics before moving onto more complex problems

Definition

Axiom: Statement which is regarded as being established or evidently true

- Long agreed upon assumptions

Axioms are the building blocks upon which theory is built

The 5 assumptions that we will take *as given* throughout the class

- Almost everything will be tied to one of these assumptions

The five axioms of urban economics

Some lectures will focus on refining our understanding of these axioms

Almost everything we learn ties back to one of the 5 axioms

(A1) Prices adjust to achieve locational equilibrium

(A2) Self-reinforcing effects generate extreme outcomes

(A3) Externalities are inefficient

(A4) Production is subject to economies of scale

(A5) Competition generates zero economic profit

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Axiom 3

A3: Externalities are inefficient

Externality: A **cost** or **benefit** of a transaction experienced by somebody who is not involved in the transaction

Negative Externalities (costs)

- Pollution
- Car noise
- Dilapidated housing
- Second-hand smoke

Positive Externalities (benefits)

- Vaccines
- Public schools
- Remodeling housing
- Beekeepers

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Axiom 5

A5: *Competition generates zero **economic profit***

Degree of competition dictates **number of firms** in the market

- Firms enter (drives price down) until **economic profit** → zero
- Enough firms earn enough to stay in business but no more

Economic profit: Includes **opportunity cost**

- Different from accounting profit; hear on the news/balance sheets

Examples:

- breweries in the **post-homebrew era**
- marijuana dispensaries after legalization

List of the 5 Axioms

(A1) Prices adjust to achieve locational equilibrium

(A2) Self-reinforcing effects generate extreme outcomes

(A3) Externalities are inefficient

(A4) Production is subject to economies of scale

(A5) Competition generates zero economic profit

Schedule

Next Class:

- Determinants of city size

Upcoming:

- Reading: intro + chapter 1

Table of Contents

Econ 201 Review

1. Supply & Demand
2. Elasticities
3. Profit, Revenue, & Cost

5 Axioms of Urban Economics

1. Axiom 1: Prices adjust to achieve locational equilibrium
2. Axiom 2: Self-reinforcing effects generate extreme outcomes
3. Axiom 3: Externalities are Inefficient
4. Axiom 4: Production is subject to economies of scale
5. Axiom 5: Competition generates zero economic profit