Econ 330: Urban Economics

Lecture 5

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January 21st, 2020

Lecture V: Rents

Schedule

Today

1) **Intro to Rents**

2) **Rents Across Cities**

3) **Rents Within Cities**

Upcoming

- ‼ **HWI due next class** (thurs, Jan 21) ‼
    - ⚠ **No late homeworks will be accepted**
- **Reading** (Chapter IV *ToTC*)

Taking Stock

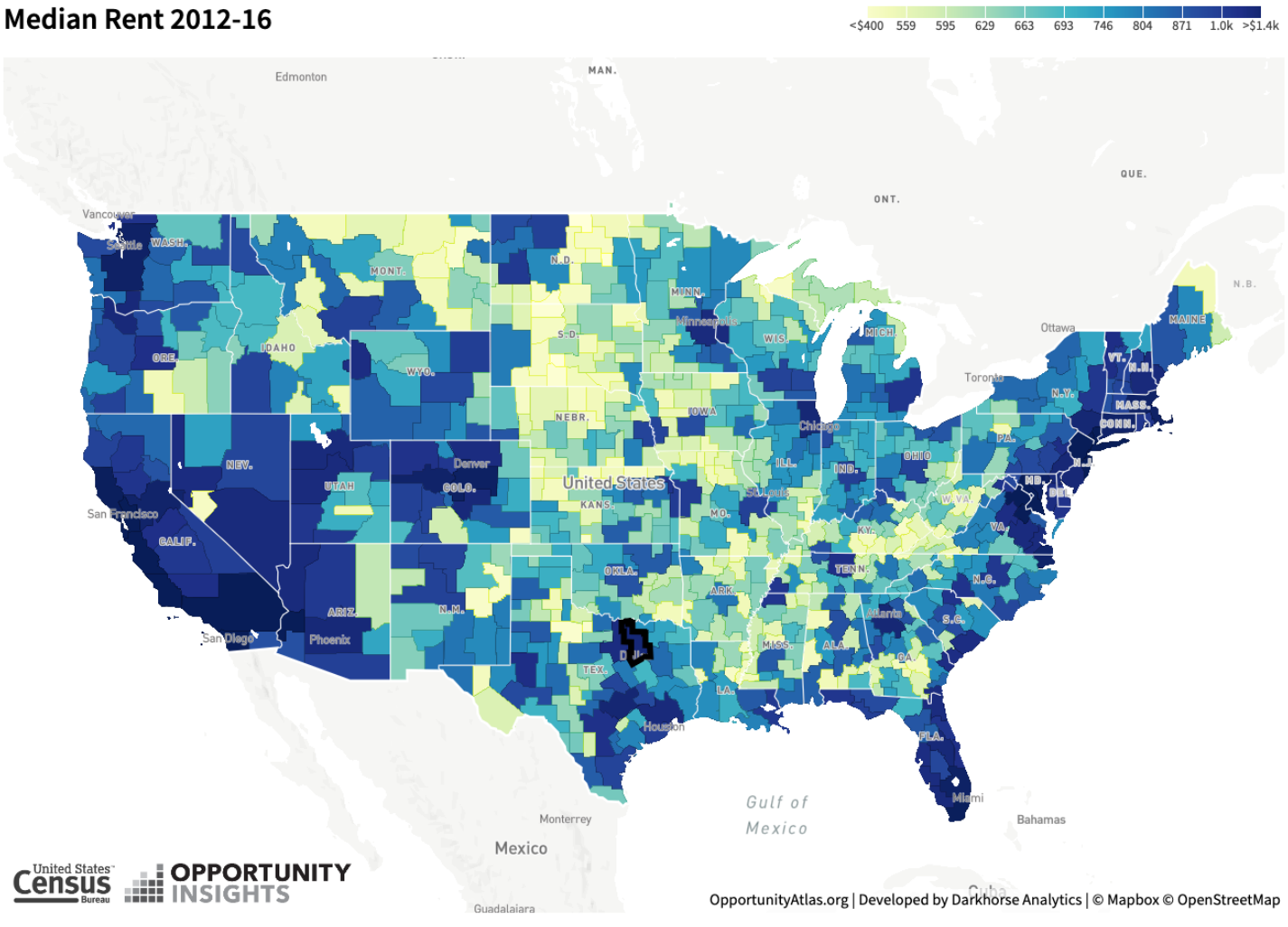
First Two Weeks: Intoduction and **existence, size & growth** (philosophical-ish questions)

Now: fundamentals of location choice theory. Questions

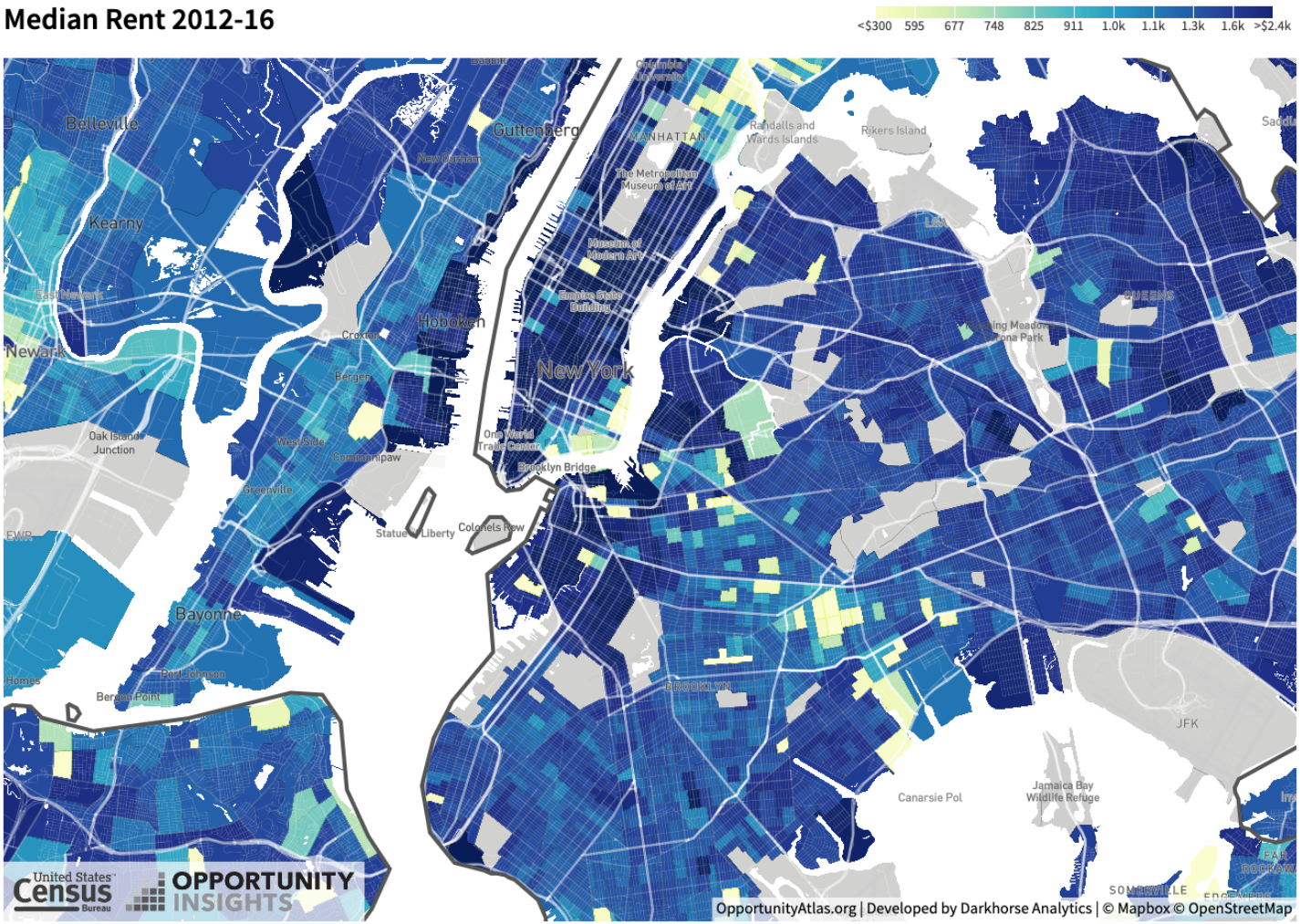
- Why do people choose to live in one place vs another? (SF vs Detroit)
  - **Today**: How do these choices impact rental prices (across cities)
- Conditional on choosing to live Eugene, will individuals **systematically locate** in one neighborhood vs another?
  - **Today**: How do these choices impact rental prices (within city) ?

Later: Formalize this. Learn **basics** of discrete choice modeling

Rents: An Overview

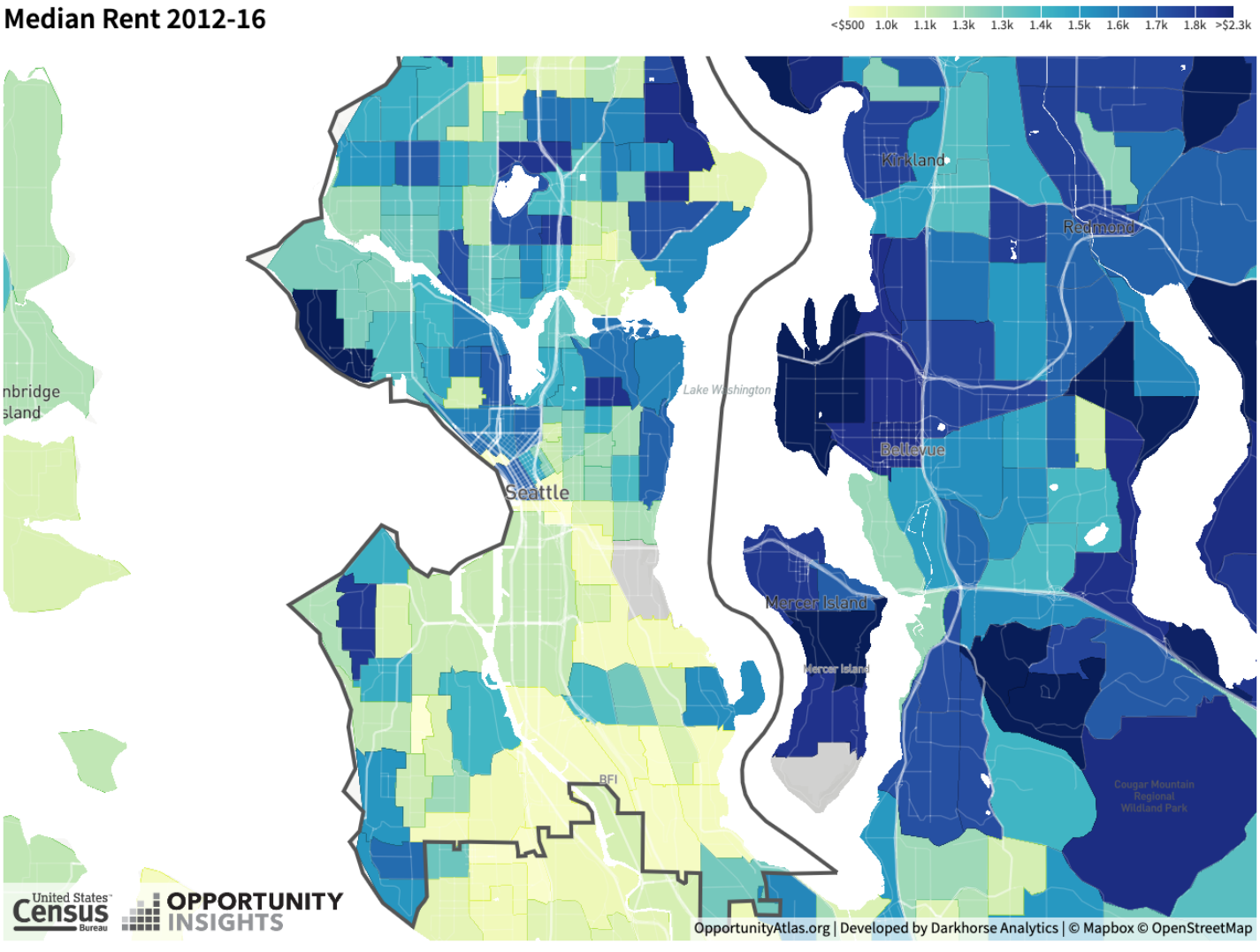


Rents: NY

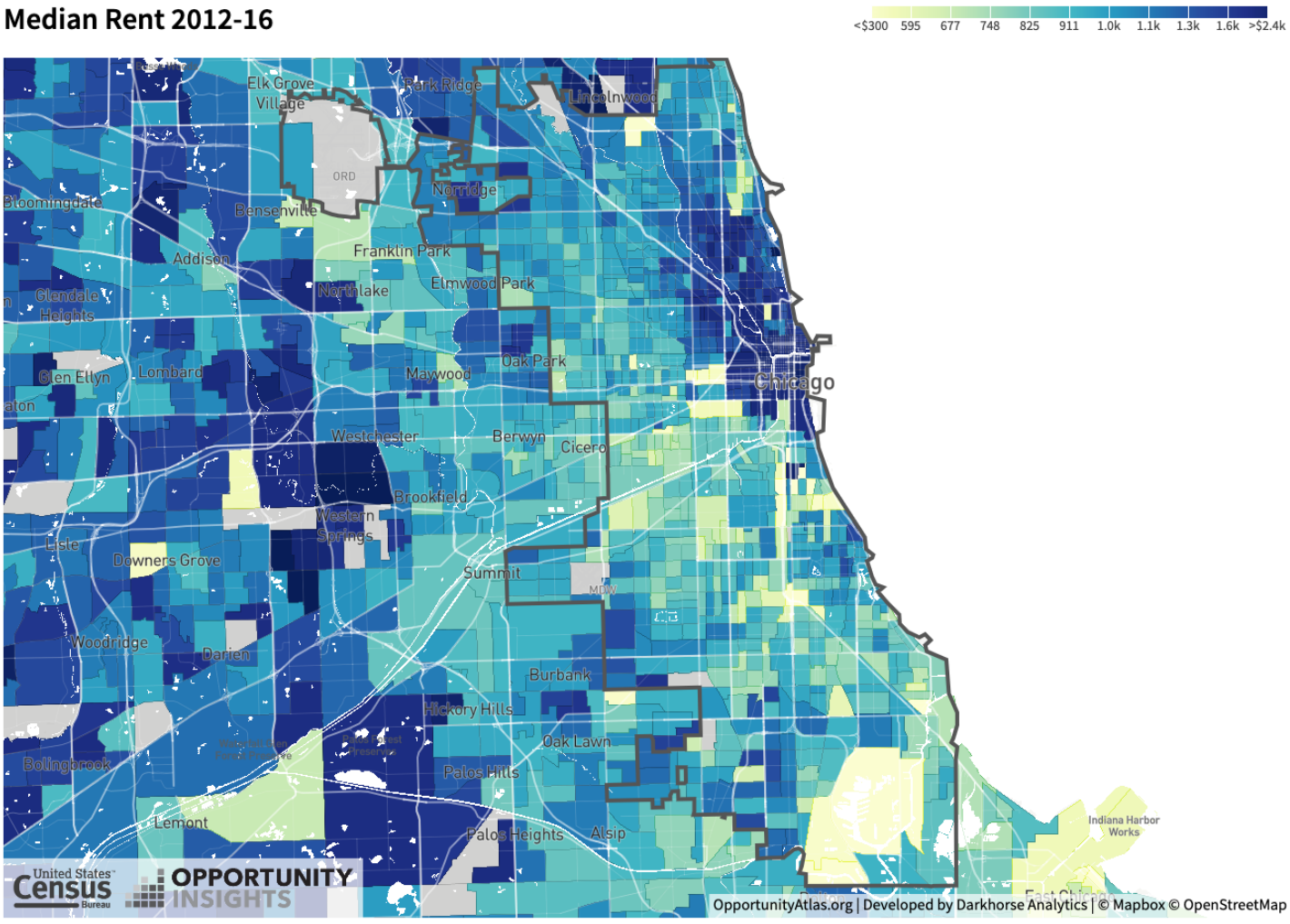


source: Oppurtunity Atlas

Rents: Seattle



Rents: Chicago



Checklist

1) **Intro to Rents** ✅

2) **Rents Across Cities**

3) **Rents Within Cities**

Prices across cities

Easy version Supply and demand curves vary across cities (today)

- Equilibrium will be different across cities (and hence prices are different)

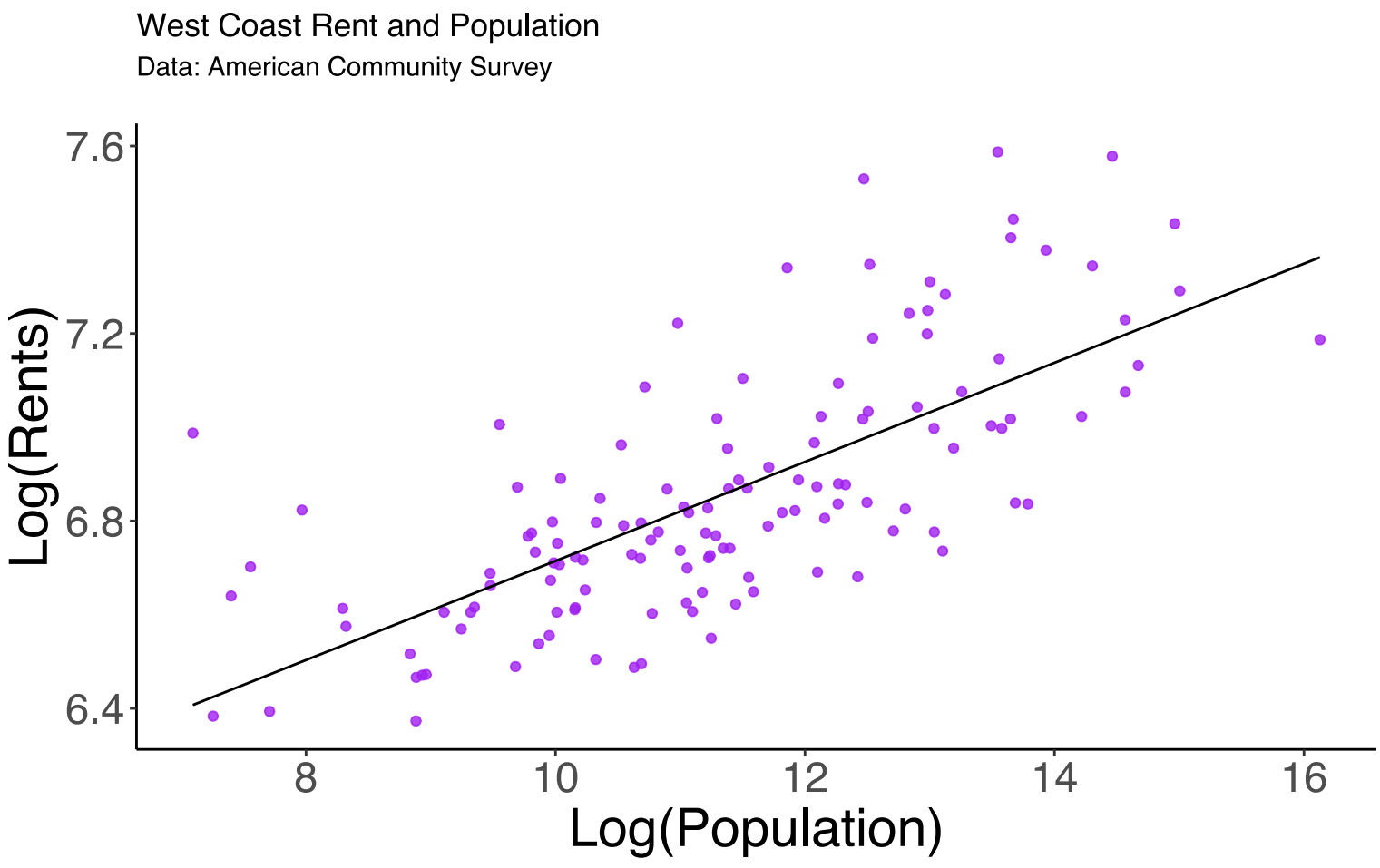
Hard Version Solving for equilibrium when wages respond to population changes as well (not today)

Q: Why would **supply** and **demand** curves **vary across cities?**

A1: **Supply**: variation in local construction costs, land available for development, and land-use regulations

A2: **Demand**: variation in available jobs (income), preference for housing consumption

Rents: An Overview



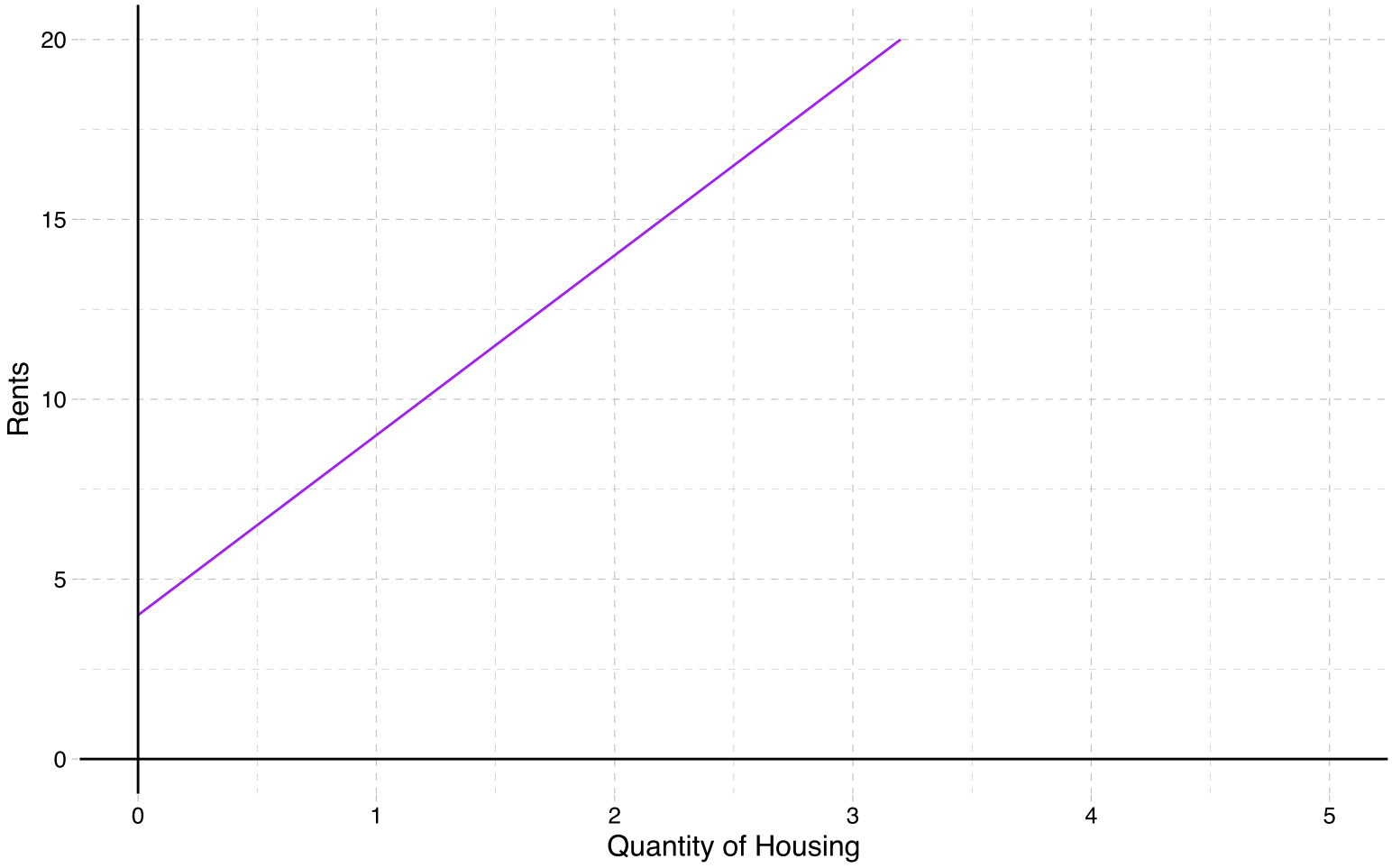
Urban Housing Supply Curves

In general, supply curves across cities are impacted by: local construction costs, land available for development, and land-use regulations

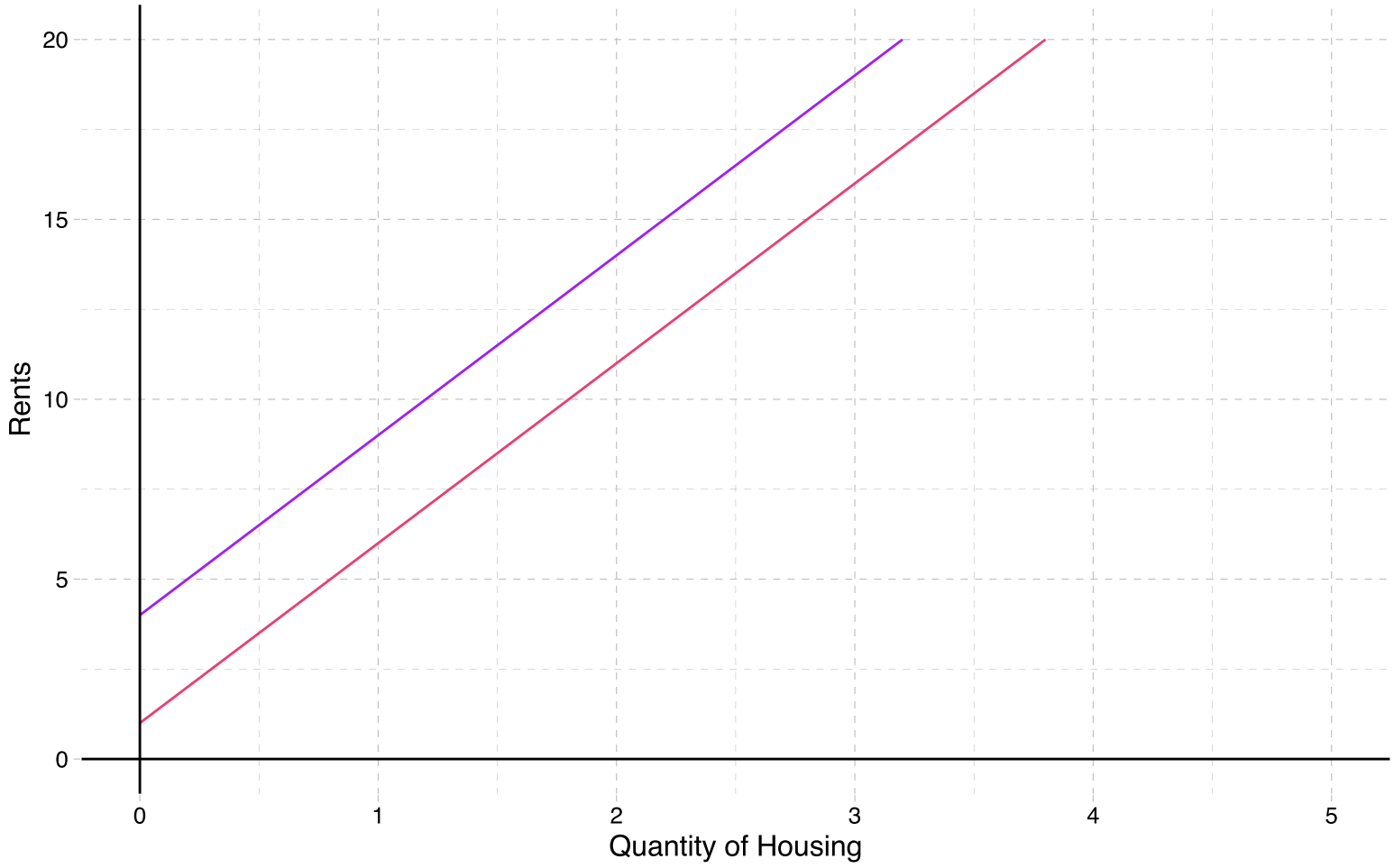
- **Local construction costs**: shifts intercept (labor is more expensive for all firms in one area vs another)
- **Land available for development** and **land use regulations**: slope (changes **marginal cost**) of developing land. Why?

A: Less land available to develop $\rightarrow$ **oppurtunity cost of developing increases** for each next plot of land. Prices get bid up faster. Similar intuition with land use regulations

Urban Housing Supply Curves

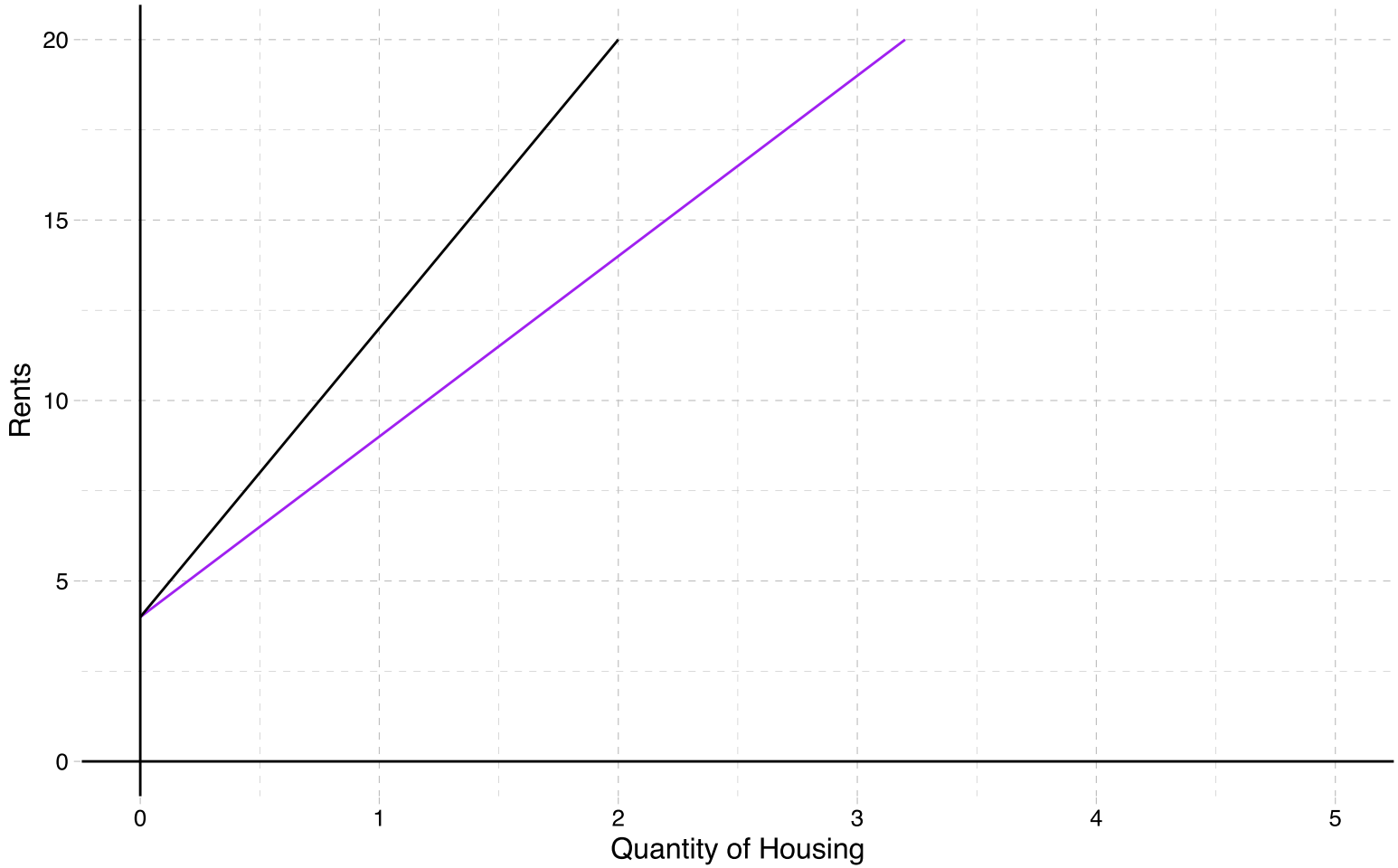


Urban Housing Supply Curves



- **pink**: lower construction cost (lower intercept)

Urban Housing Supply Curves



- **black**: higher land use regs or less available land for development

Example:

- **Seattle**:

$$R_{SEA} = 10 + H_{SEA}$$
$$R_{SEA} = 25 - 2 * H_{SEA}$$

- **SF**:

$$R_{SF} = 10 + 2 * H_{SF}$$
$$R_{SF} = 30 - 3 * H_{SF}$$

Tasks:

1) Solve for equilibrium in both cities

2) Given your answer to 1, and knowledge of the term ***locational equilibrium*** what can you say must be the case about **wages and or amenity values** in one city vs the other?

Example

Tasks:

1) Solve for equilibrium in both cities

$$\text{SEA} : (H^{\star}_{SEA}, R^{\star}_{SEA}) = (5, 15)$$
$$\text{SF} : (H^{\star}_{SF}, R^{\star}_{SF}) = (4, 18)$$

2) Given your answer to 1, and knowledge of the term ***locational equilibrium*** what can you say must be the case about **wages and or amenity values** in one city vs the other?

- Rental prices are higher in SF. **In equilibrium**, utility levels are equalized across cities. Thus, it must be that either wages **and or** amenities are higher in SF than SEA

Stepping Back

One assumption underling the above example:

Perfect competition

Is this reasonable? **Discuss**

- SF has rent control (not **perfectly competitive**). I am not as sure about Seattle rental market
- In the case of **monopoly**, the outcomes here are pretty different. We will do the labor version of this (monopsony) later in the course

Checklist

1) **Intro to Rents** ✅

2) **Rents Across Cities** ✅

- Supply and Demand variation
- Eq computation

3) **Rents Within Cities**

The Bid-Rent Curve

The **Bid - Rent Curve** is the *relationship between housing prices and the distance of land from the city center* †

These curves vary across sectors

- **Consumer Bid rent curve**: commuting costs
- Rural Bid Rent: fertility of land
- Manufacturing: Accessibility to consumers and suppliers
- Tech/info: Accessibility to Information

† It actually does not have to be the city center -- can be a point of attraction. In this class we will always use the city center though.

Housing Prices Model

We now build a simple model of rental/housing prices **within** a city

1) Commuting cost is **only location factor** in decision making

- All locations are otherwise identical

2) Only **one member** of household commutes to employment area

3) Only considers the **monetary (not time) cost of commuting**

4) Noncommuting travel is insignificant

5) Public services, **taxes, amenities** are the same everywhere (implication from 1)

Locational Indifference

Axiom 1: *Housing prices adjusts until there is locational indifference* (and prices in general)

- IE: until an increase in rent for a closer location just offsets the lower commuting costs

In math:

$$\Delta P \cdot h + \Delta x \cdot t = 0$$

- P: **price** of housing (price per square foot)
- h: **amount** of housing (in ft^2)
- x: **distance** to employment area
- t: **commuting cost** per mile

Slope of the Housing Bid-Rent Curve

If there is locational indifference we can derive the slope of the bid-rent curve:

$$\Delta P \cdot h + \Delta x \cdot t = 0$$

Slope of the Housing Bid-Rent Curve

If there is locational indifference we can derive the **slope** of the **bid-rent** curve:

$$\Delta P \cdot h + \Delta x \cdot t = 0$$
$$\Delta P \cdot h = -\Delta x \cdot t$$

Slope of the Housing Bid-Rent Curve

If there is locational indifference we can derive the **slope** of the **bid-rent** curve:

$$\begin{aligned} \Delta P \cdot h + \Delta x \cdot t &= 0 \\ \Delta P \cdot h &= -\Delta x \cdot t \\ \frac{\Delta P}{\Delta x} &= -\frac{t}{h} \end{aligned}$$

Notice: $\frac{\Delta P}{\Delta x}$ is the slope of the bid-rent curve

- price is on the verticle axis, distance is on the horizontal. So this is rise over run

Another Derivation

Suppose you have decided that the optimal amount of money to spend on housing and commuting per month is M^*

- You can allocate this as

$$P \cdot h + x \cdot t = M^*$$

- Since we graph the bid rent curve in the (x,P) space, we solve for p:

$$\begin{aligned} P \cdot h + x \cdot t &= M^* \\ P \cdot h &= M^* - x \cdot t \end{aligned}$$

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$$\begin{aligned} P \cdot h + x \cdot t &= M^* \\ P \cdot h &= M^* - x \cdot t \\ P &= \frac{M^*}{h} - \frac{t}{h} \cdot x \end{aligned}$$

- Slope: $\Delta P = 0 - \frac{t}{h} \cdot \Delta x \implies \frac{\Delta P}{\Delta x} = -\frac{t}{h}$
    - Can also take derivative if p w.r.t to x and get the same thing, if that is easier for you

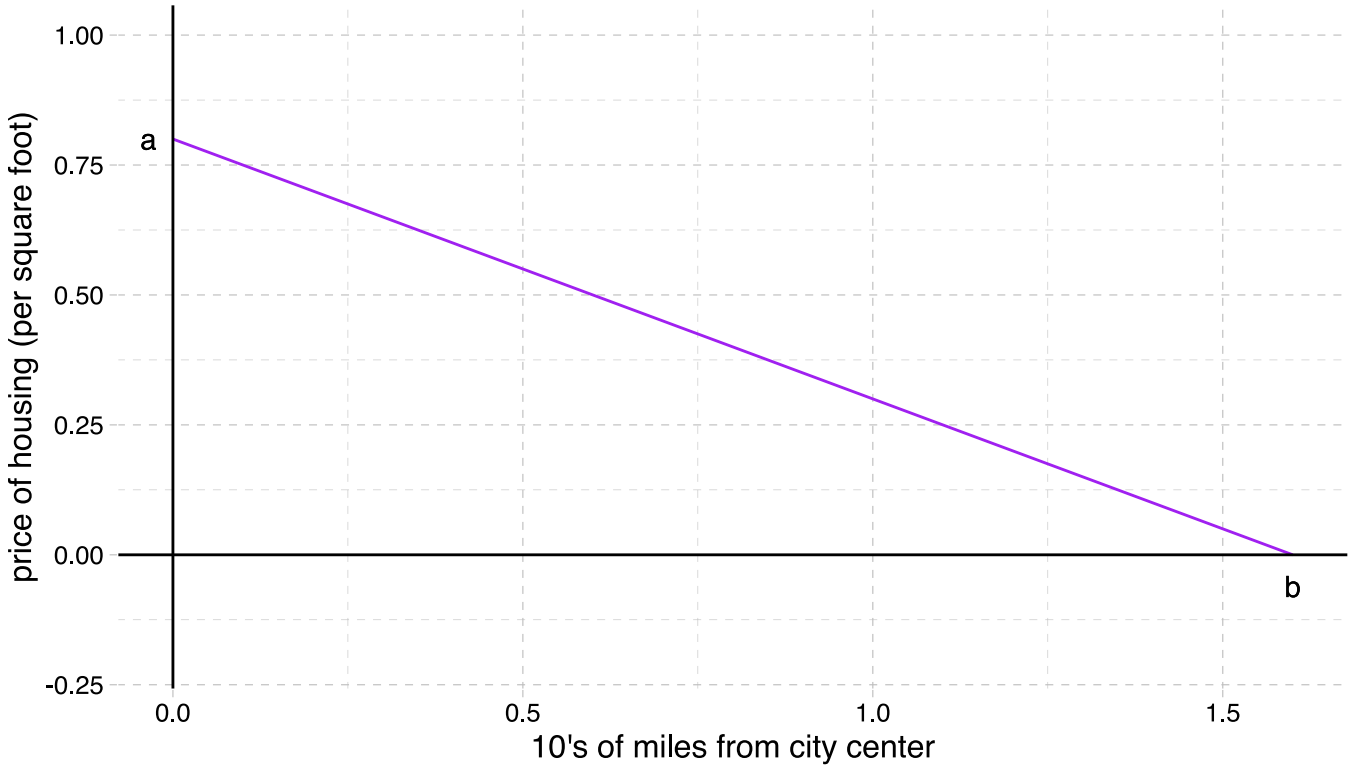
No Substitution

Example Suppose the following:

- Each household has $800 a month to spend on housing and commuting
- All rental units are the same size, with each HH occupying a rental unit that is 1000 sq ft
- Monthly commuting cost is $50 dollars per mile from employment center

Task: Draw the housing - price curve. Put miles from city center on **x axis** and price per square foot on **y axis**

Example: The housing price curve



a: max WTP for a square foot (at center of city)

b: further away from center HH is willing to live

Substitution

Q1: If you really wanted to live closer to campus -- or an exciting downtown in a big city -- would you be willing to live in a smaller apartment to do so?

A1: Most people™ : Yes. You are willing to substitute

Q2: What do I mean by substitute? Substitute what?

A2: Substitute housing consumption for lower commuting cost (and whatever else being close to the center of the city gets you)

Substitution

Let's formalize the mechanism for substitution a bit:

higher prices $\implies$ higher oppurtunity cost per square foot of housing (for the consumer)

- As price of rent increases, consumers are likely to substitute (atleast somewhat) towards other goods, decreasing the square footage of housing demanded
- **Housing units closer to city centers are thus likely to be smaller in size**

Adding substitution to the model

Q3: Did our model of locational indifference accomdate for substitution? Why or Why not?

$$\Delta P \cdot h + \Delta x \cdot t = 0$$

A3: No because h (the quantity of housing consumed) is **independent of distance** from center (x)

If consumers can substitute, our locational indifference condition becomes:

$$\Delta P \cdot h(x) + \Delta x \cdot t = 0$$

- Where $h(x)$ is an *increasing* function of x
- **Ex**: $h(10) > h(5)$ (the quantity of housing demanded 10 miles from the center exceeds that of 5 miles)

Quick Q

Q4 What is the new slope of the bid-rent curve?

$$\frac{\Delta P}{\Delta x} = -\frac{t}{h(x)}$$

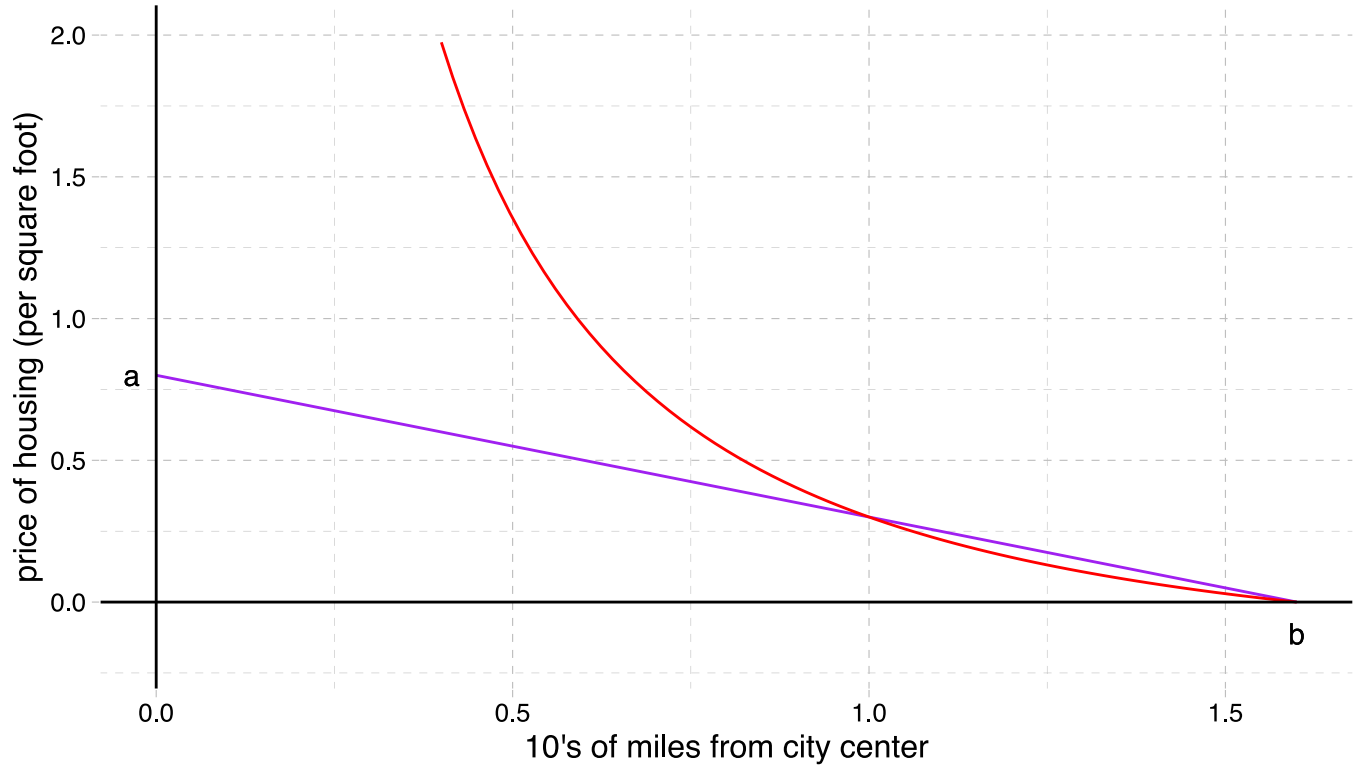
Q5 Using the equation above what happens to the slope of the housing bid-rent curve as x increases. **Why**?

A5: As x increase, we get farther away from the center.

- Since higher value of x $\rightarrow$ higher value of h $\rightarrow$ smaller value of $\frac{1}{h(x)}$. This means $-\frac{1}{h(x)}$ will be *less negative*

Let's graph this, to make sure we get it

Model with Substitution Graph



purple: no substitution

red: substitution

Checklist

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2) **Rents Across Cities** ✅

- Supply and Demand variation across cities
- Eq computation

3) **Rents Within Cities** ✅

- The bid rent curve for consumers
    - Locational Indifference
    - With substitution