

Econ 330: Urban Economics

Lecture 03

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Lecture 03: Existence of Cities

Schedule

Today:

- (i). Data and history
- (ii). Why do cities exist
- (iii). Introduction to clustering

Upcoming:

- **Problem set 01 due next Thursday**
- **Reading:** intro + ch. 1, 2

Housekeeping:

PS01 was posted

- Due on **Tuesday, October 19th** on canvas

PS01 is going to be the easiest of the quarter

- Some questions you may not be able to start yet

Important:

- Use the space provided on the pdfs
- Use scratch paper! **Points will be deducted for messy work**
- Submit on Canvas by **midnight**

Why do cities exist? Some data

Data: Global urban trends (1960-2017)

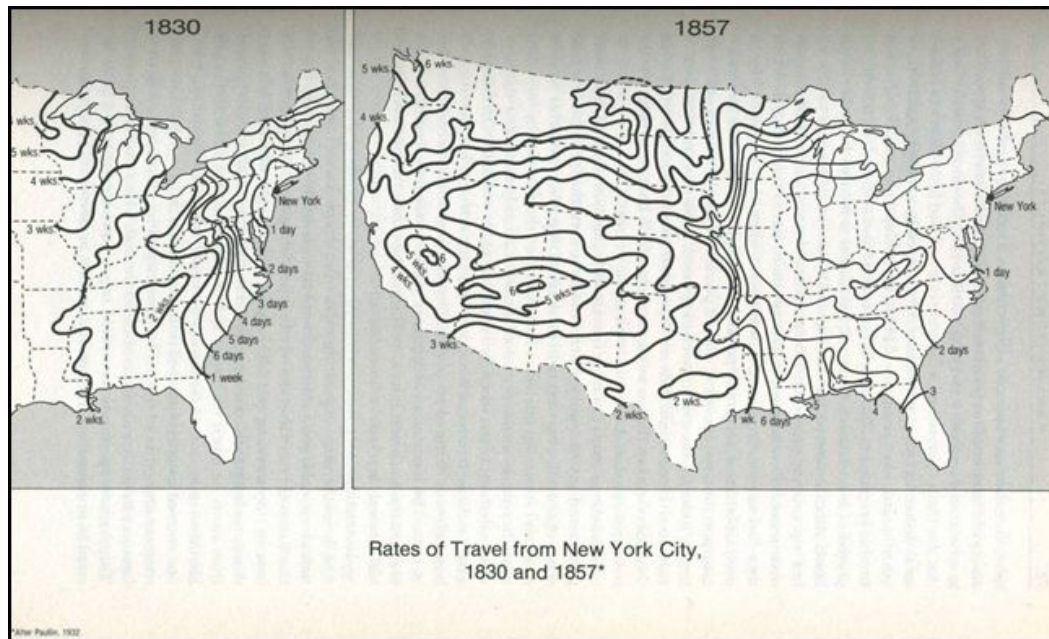
Data: Global urban trends (1960-2017)

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Technological shifts

Claim: Over the last few hundred years the world *has become flat*

- **1840s: Rail freight** becomes ubiquitous
 - Transportation costs ↓



Source: Cronon's *Natures Metropolis: Chicago and the Great West*




Technological shifts

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- **1840s: Telegraph** is invented
 - Informational distance 

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- **1870's: Telephone** is invented
 - Informational distance 

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- 1840s: Rail becomes ubiquitous
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- 1840s: Telegraph is invented
 - Informational distance ↓
- 1870's: Telephone is invented
 - Informational distance ↓
- **1908: Model T** production starts
 - Transportation costs ↓

Technological shifts

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 - Transportation costs ↓
- 1840s: Telegraph is invented
 - Informational distance ↓
- 1870's: Telephone is invented
 - Informational distance ↓
- 1908: Model T production starts
 - Transportation costs ↓
- **1914:** First commercial **airline flight**
 - Transportation costs ↓

Technological shifts

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- 1908: Model T production starts
 - Transportation costs ↓
- 1914: First commercial airline flight
 - Transportation costs ↓
- **1980s:** Airline deregulation
 - Transportation costs ↓

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- 1980s: Airline deregulation
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- **1990's:** The internet
 - Information costs ↓

Technological shifts

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- 1908: Model T production starts
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- 1914: First commercial airline flight
 - Transportation costs ↓
- 1980s: Airline deregulation
 - Transportation costs ↓
- 1990's: The internet
 - Information costs ↓
- **2020s:** Post COVID
 - Transportation costs ↓
 - Information costs ↓
- Among many other technological changes

Why do cities exist?

Paradox: Why do cities exist?

Considering the urban population trends and technological shifts, **there seems to be a paradox**

Q: If the world is getting "smaller", why are urban populations booming?

This paradox motivates the question:

Why do cities exist in the first place?

Why have some cities succeeded?

Why have some cities failed?

Let's use insights from economic models to answer these questions from an economic perspective

Paradox: Why do cities exist?

What do you think?

There is a pretty simple, one-word answer. **Any guesses?**

Trade

Cities exist because individuals are not self-sufficient

First, suppose there was **no trade**

- What would we need for this to be true?
- *Would this lead to no cities?*
- Even with trade, *possible* that households trade amongst themselves

EC 201 Review 016: Trade

Definitions:

- **Absolute Advantage** (AA): An economic agent or entity has **AA** in exchange if they can produce more of the good in the same amount of time
- **Comparative Advantage** (CA) : An economic agent or entity has **CA** in exchange if they can produce the good at a lower *oppurtunity cost*
- **Production Possibilities Frontier** (PPF): All possible combinations of goods that an economic agent or entity can produce

EC 201 Review 017: Trade - example

Example: Suppose we have two countries A & B- producing guns and oil

Each countries PPF is given by:

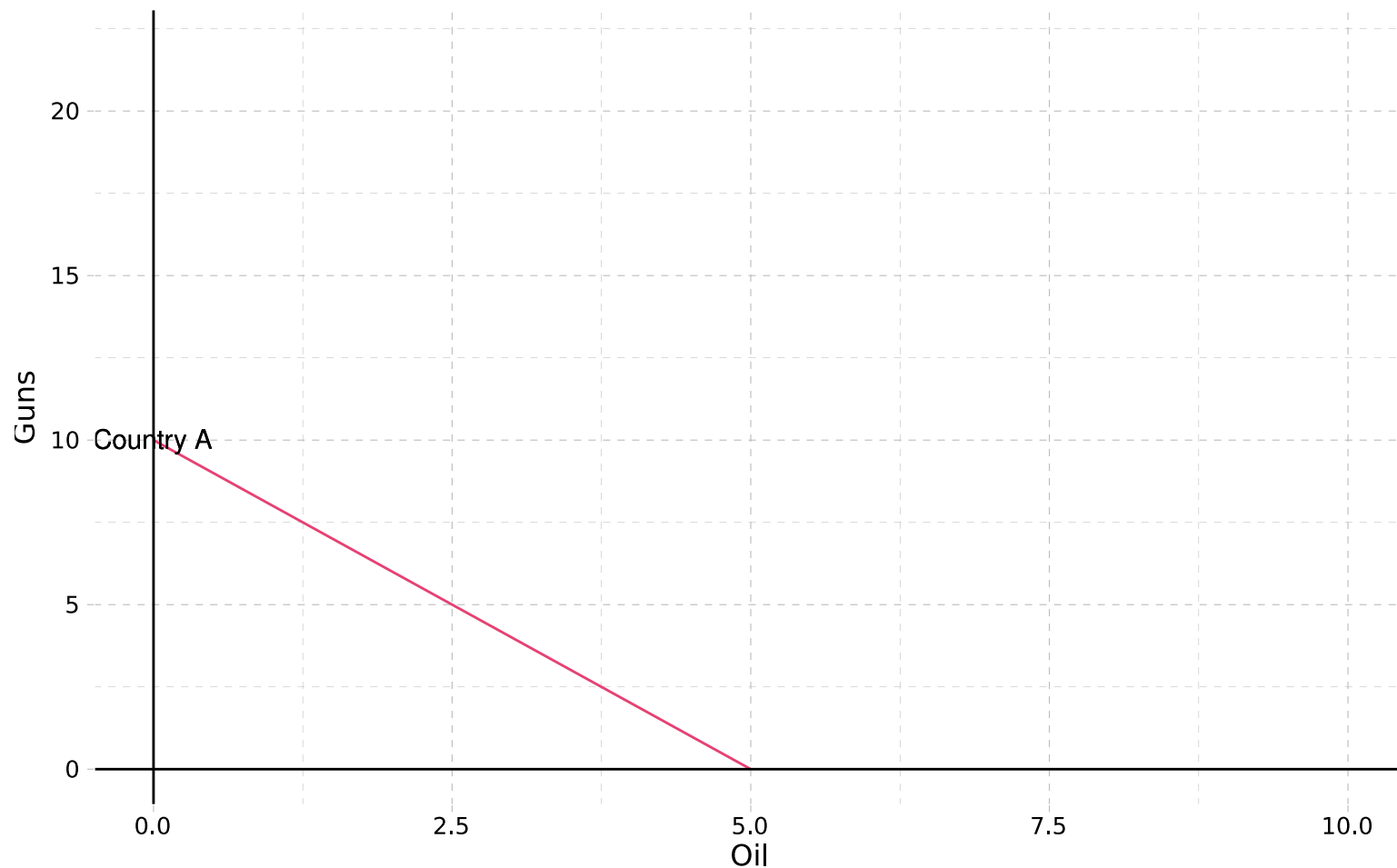
- **Country A:** $Guns_A = 10 - 2 * Oil_A$
- **Country B:** $Guns_B = 20 - 5 * Oil_B$

1) Graph each countries PPF

2) Determine who has the AA in each good and who has the CA in each good

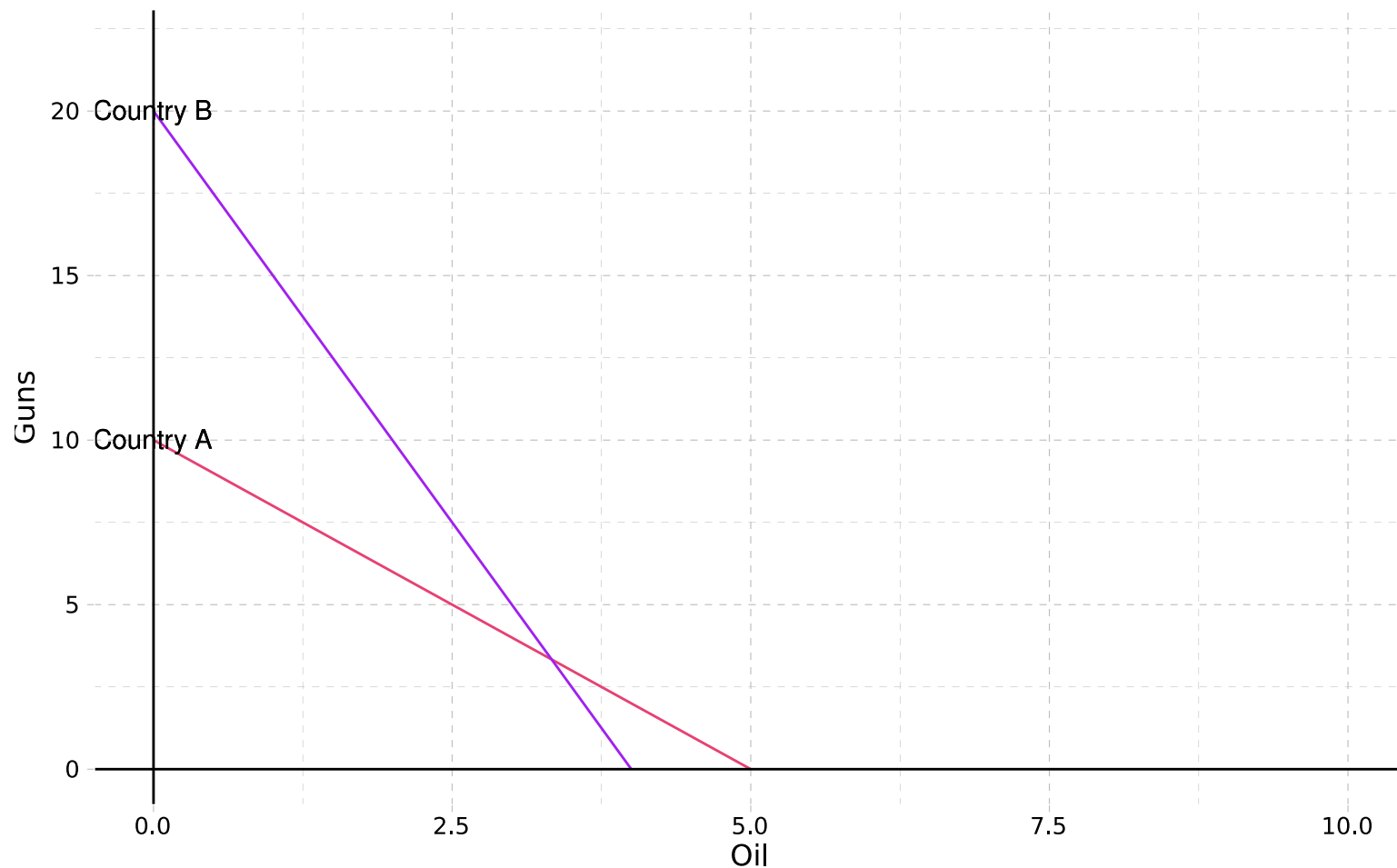
EC 201 Review 017: Trade - example

PPFs



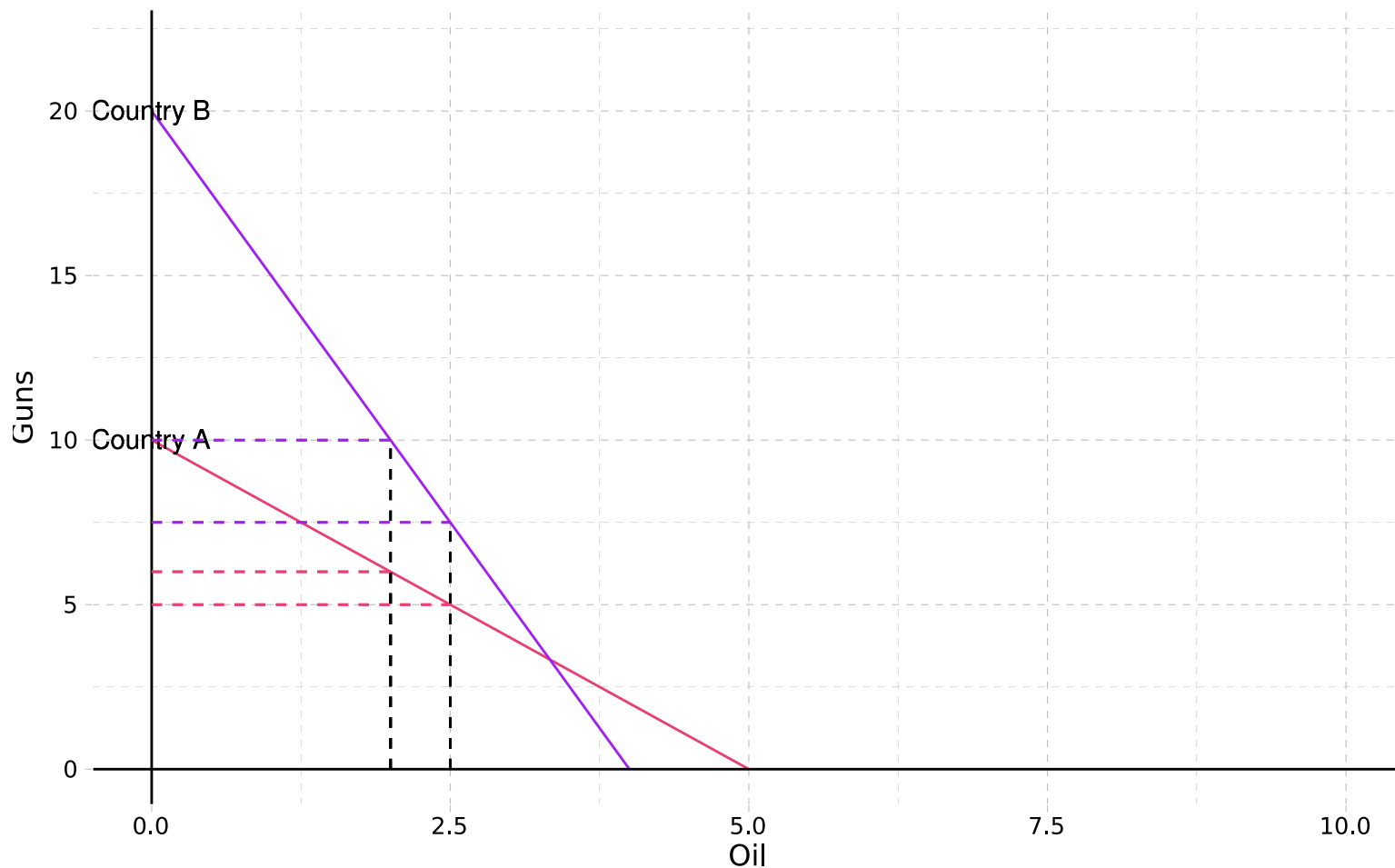
EC 201 Review 017: Trade - example

PPFs



EC 201 Review 017: Trade - example

Idea Whomever *gives up less* to produce the same amount extra has the comparative advantage. Check:



PPF Heuristics

When looking at PPFs, to determine:

1) **AA**: Check **intercepts**

- Whoever has higher valued **intercept** has the **AA** in production

2) **CA**: Check **slopes**

- A **steeper slope** indicates **CA** on the vertical axis
- A **shallower slope** indicates **CA** on the horizontal axis

Why do cities exist?

We need land to produce food and resources; dense cities don't provide

Cities exist because of human **technology** has created systems of production and trade that defy the natural order

Three conditions must be satisfied:

(i). Agricultural surplus: People outside cities must produce enough food to feed themselves and city dwellers

(ii). Urban production: City dwellers must produce goods or services to exchange for food grown by rural workers

(iii). Transportation for exchange: Efficient transportation system to facilitate the exchange of food and urban products must exist

The technology in this case is what we call **trade**

Backyard production model

A simple economic model to understand the economic incentives of cities

Consider a region that produces and consumers two products:

- **Bread**
- **Shirts**

Let's make three assumptions that would eliminate any incentives for households to geographically cluster

- Relaxing each assumption will give us **intuition** about the formation of cities

Backyard production model

Model assumptions:

A01: There exist no differences in the productivity of land nor labor

- No comparative advantages

A02: Constant Returns to Scale (CRS) in **exchange** and **transportation**

- Per unit price to **trade** goods *is the same* no matter how much is traded
- No need for middle man firms to help with distribution

A03: CRS in **production**

- The per unit price of production is constant
- No economies of scale \rightarrow households productivity = firm productivity

Backyard production model

These three assumptions would eliminate exchange and ensure each household is self sufficient:

A01: Equal productivity

- There is no incentive to specialization due to transaction costs[†]

A02: CRS in exchange and transportation

- Locational equilibrium would be uniformly distributed population

A03: CRS in production

A1: Prices adjust to ensure locational equilibrium^{††}

[†]transaction cost is the opportunity cost of the time required to exchange products ^{††} Axiom 5 of urban economics

Backyard production model: Relax A01

Q: Is all land and labor equally productive?

A: Nope. Let's relax that assumption **Ex:**

- Soil may be more productive in certain regions; better climate
- One region specializes in bread while the other in shirts

Relaxing A01 will lead to differences in productivity across cities:

⇒ **comparative advantages**

⇒ specialization + trade

However, specialization and trade will not alone lead to urban growth

- HH trade directly with one another

Relax A02

In absence of scale economies, households trade directly[†]

- **CRS in Exchange:** \implies households are just as efficient at executing trades as firms (no cost benefits to scaling)
- No reason to pay a firm to do so (and thus no reason to pay for density)

A4: Production is subject to economies of scale

A trading firm will use productive inputs such as:

- Large truck for transportation
- Specialized workers

[†] Scale economies: *bigger* \rightarrow *cheaper per unit*

Relax A02

To take full advantage of scale economies firms locate s.t. they minimize costs of distribution

ie. Build near river junctions, crossroads, ports

⇒ higher prices of land ⇒ density

Result: Trading cities

- **The growth of trading cities is implied by A04**

These represent the cities that existed before the industrial revolution

- Most city workers did not produce goods but distributed them
- Trade was risky; insurance, credit, banking and legal services sprouted

Relax A03

Now relax the final assumption A03

Suppose factory workers can produce at a cheaper per-unit cost than HH

Example:

Consider the shirt making factory:

- **Home** production: 20 p shirt
- **Factory:** 12 p shirt (economies of scale)

The factory locates in a town with 50 miles to east and west of villages

- 50 cents/mile to ship west.
- 20 cents/mile to ship east

Factory Towns

Market area: Area over which factories underprice home production

Under what condition will a consumer purchase the shirt from a factory?

$$\underbrace{p_f}_{\text{factory price}} + \underbrace{t \times d}_{\text{transit cost} = \text{cost p mile} \times \text{miles}} \leq \underbrace{p_h}_{\text{Home Price}}$$

Questions:

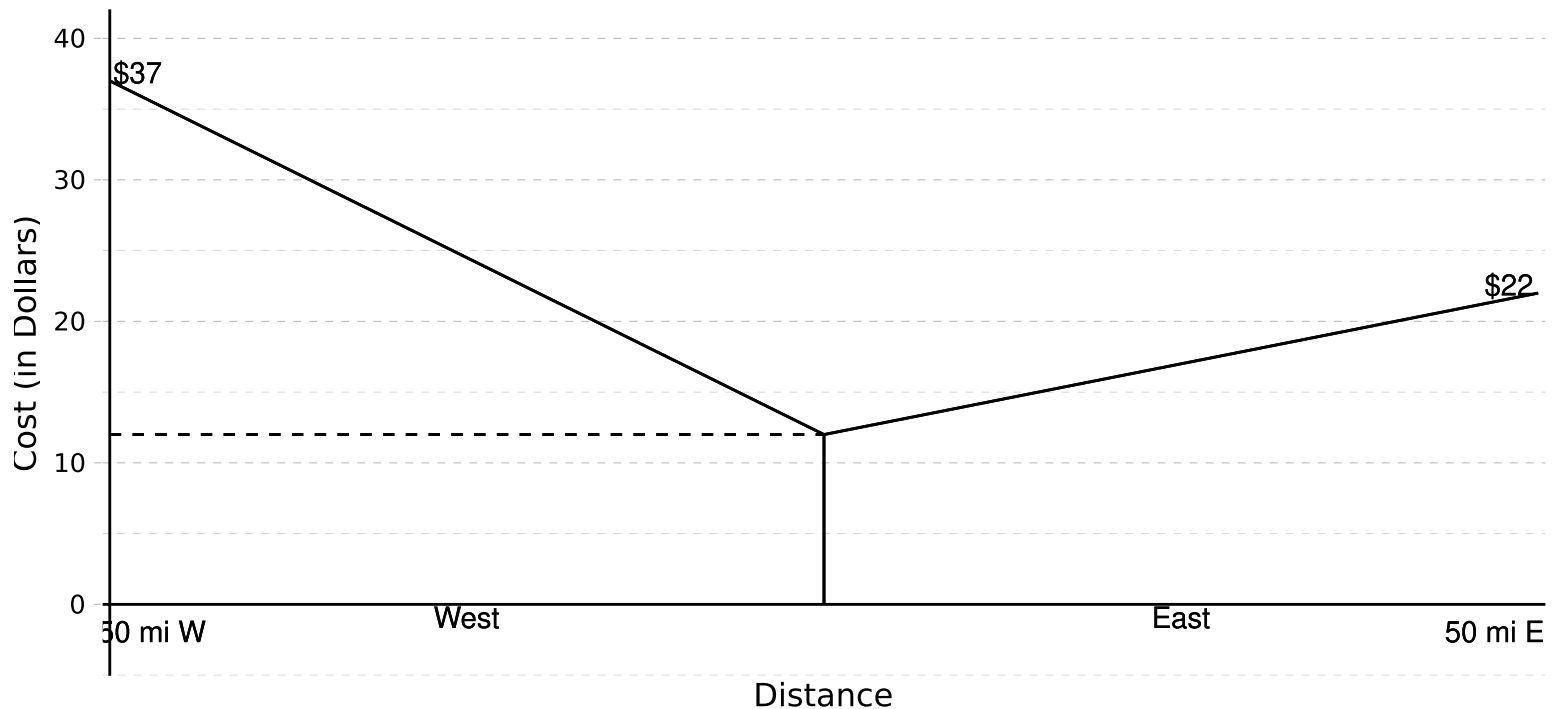
1. Graph the cost of shirts throughout the entire region
2. Find the **market area** of the town
 - Find the sum of the **maximum distances** to the east and west that consumers will purchase the shirt from the factory

Regional Costs

Home production: 20 per shirt **Factory production:** 12 per shirt

Transportation costs: 50 cents/mile to ship west; 20 cents/mile east

Factory Town Graph



Market Area Calculation

Market area depends on which side we are looking at. Let m denote miles

West: Consumers buy from factory if

$$12 + .5 * m_{west} \leq 20 \implies m_{west} \leq 16$$

East: Consumers buy from factory if

$$12 + .2 * m_{east} \leq 20 \implies m_{east} \leq 40$$

Market area:

$$40 + 16 = 56$$

Factory Towns

1. Would workers rather live **closer** or **further** from the factory?
 - **Closer!**
2. What happens to land-prices **close** to the factory?
 - They **increase**
3. What happens to **density**?
 - It will **increase**

Introduction to Clustering

Clustering

So we explained **why** cities exist..

Can we explain why there might be more than one firm?

Where to start? **Axiom 5**

A5: Competition generates zero economic profit

Suppose a firm makes a positive economic profit.

⇒ additional firms enter the market

⇒ $\Pi \rightarrow 0$

Example

How many firms are in the cluster?

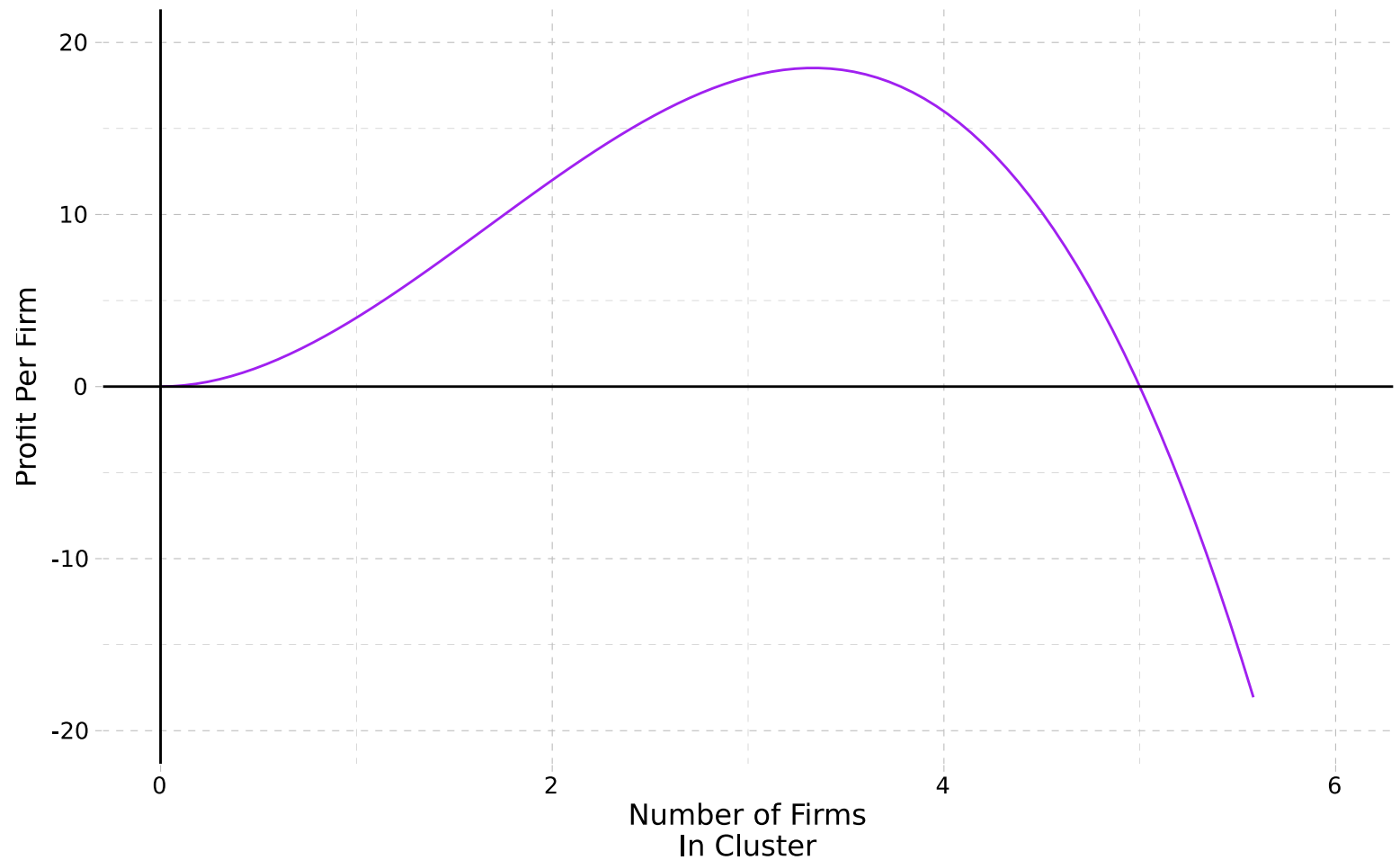


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Existence

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Clustering

1. Zero Profit