Part I: Introduction to Economics

1. The Principles and Practice of Economics
2. Economic Methods and Economic Questions
3. Optimization: Doing the Best You Can
4. Demand, Supply, and Equilibrium

Chapter 3
Optimization: Doing the Best You Can

2015.9.25.

Outline

- When an economic agent chooses the best feasible option, she is optimizing.
- Optimization in levels calculates the total net benefit of different alternatives and then chooses the best alternative.

- Optimization in differences calculates the change in net benefits when a person switches from one alternative to another, and then uses these marginal (邊際) comparisons to choose the best alternative.
- Optimization in levels and optimization in differences give identical answers.

Evidence-Based Economics

How does location affect the rental cost of housing?

3.1 Two Kinds of Optimization: A Matter of Focus

- Economists believe that people usually make choices by trying to select best feasible option, given the available information. That is, people optimize.
- To an economist, seemingly unrelated decisions are all connected by the unifying principle of optimization.
- Economists believe that people's behavior is *approximated* by optimization.

Sometimes it is difficult to make choices because

- You have limited information.
- Sorting through information can be complicated.
- You are inexperienced in dealing with a given situation.

Optimization can be implemented using either of two techniques of cost-benefit analysis.

- **Optimization in levels** calculates the *total* net benefit (total benefit minus total cost) of different alternatives, then chooses the best alternative.
- **Optimization in differences** calculates the *change* in net benefit when a person switches from one alternative to another, then uses these marginal comparison to choose the best alternative.

Which bag to choose?

- How much would you enjoy eating the contents of each of the two bags?

Which bag to choose?

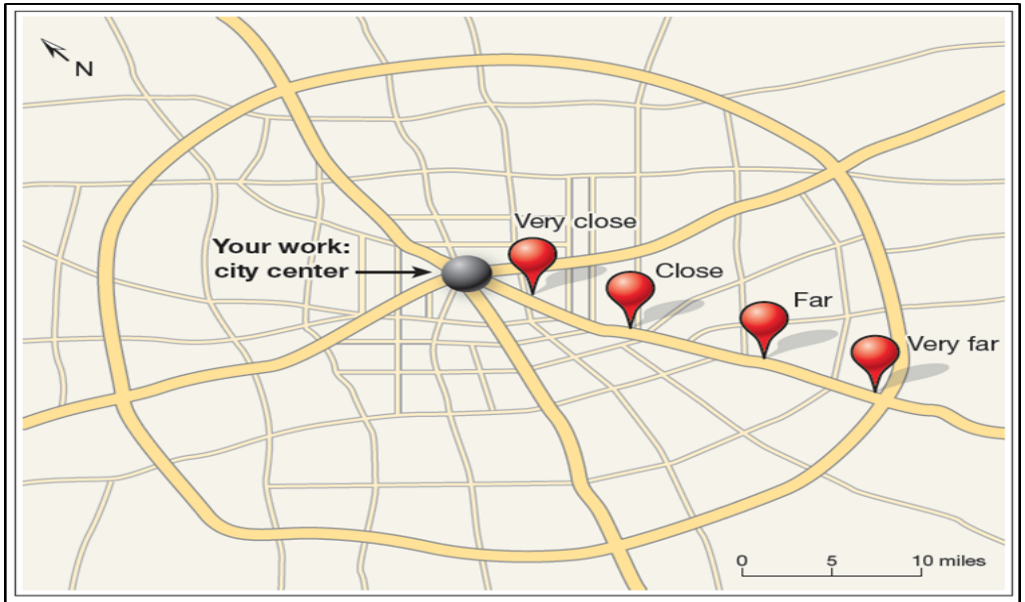
- Which candy bar— MilkyWay or 3 Musketeers— increases the value of the bag to you?

Do People Really Optimize?

- Research has broadly concluded that optimization is a good model of economic behavior in most, though not all, situations.
- One field of economics—**behavior economics**—identifies the specific situations in which people fail to optimize.
- When people have self control problems— like procrastination, or addiction— optimization is not a good description of behavior.
- People also tend to fail as optimizers when they are new to a task.

3.2 Optimization in Levels

Where should I live?



Apartment	Commuting Time (hours per month)	Rent ($ per month)
Very Close	5 hours	$1,180
Close	10 hours	$1,090
Far	15 hours	$1,030
Very Far	20 hours	$1,000

Exhibit 3.1 Apartments on Your Short List, Which Differ Only on Commuting Time and Rent and Are Otherwise Identical

What does it cost to commute?

- Availability of public transportation
- Gasoline
- Parking
- Wear and tear on car
- Opportunity cost of time

Apartment Options

Apartment	Commuting Time (hours per month)	Rent ($ per month)
Very Close	5 hours	$1,180
Close	10 hours	$1,090
Far	15 hours	$1,030
Very Far	20 hours	$1,000

- You need to combine the cost of rent and the cost of commuting time.
- Suppose the opportunity cost of commuting time is $10 per hour.
- 20 hours of commuting time (Apartment Very Far) cost $\$10 \times 20 = \$200$ per month.
- Total cost of the Apartment Very Far is $1,200 per month.

Apartment Options

Apartment	Commuting Time (hours per month)	Commuting Cost ($ per month)	Rent ($ per month)	Total Cost: Rent + Commuting ($ per month)
Very Close	5 hours	$50	$1,180	$1,230
Close	10 hours	$100	$1,090	$1,190
Far	**15 hours**	**$150**	**$1,030**	**$1,180**
Very Far	20 hours	$200	$1,000	$1,200

Exhibit 3.2 Commuting Cost and Rental Cost Expressed in Common Units, Assuming an Opportunity Cost of Time of $10/hour

- What is the answer to our optimization problem?

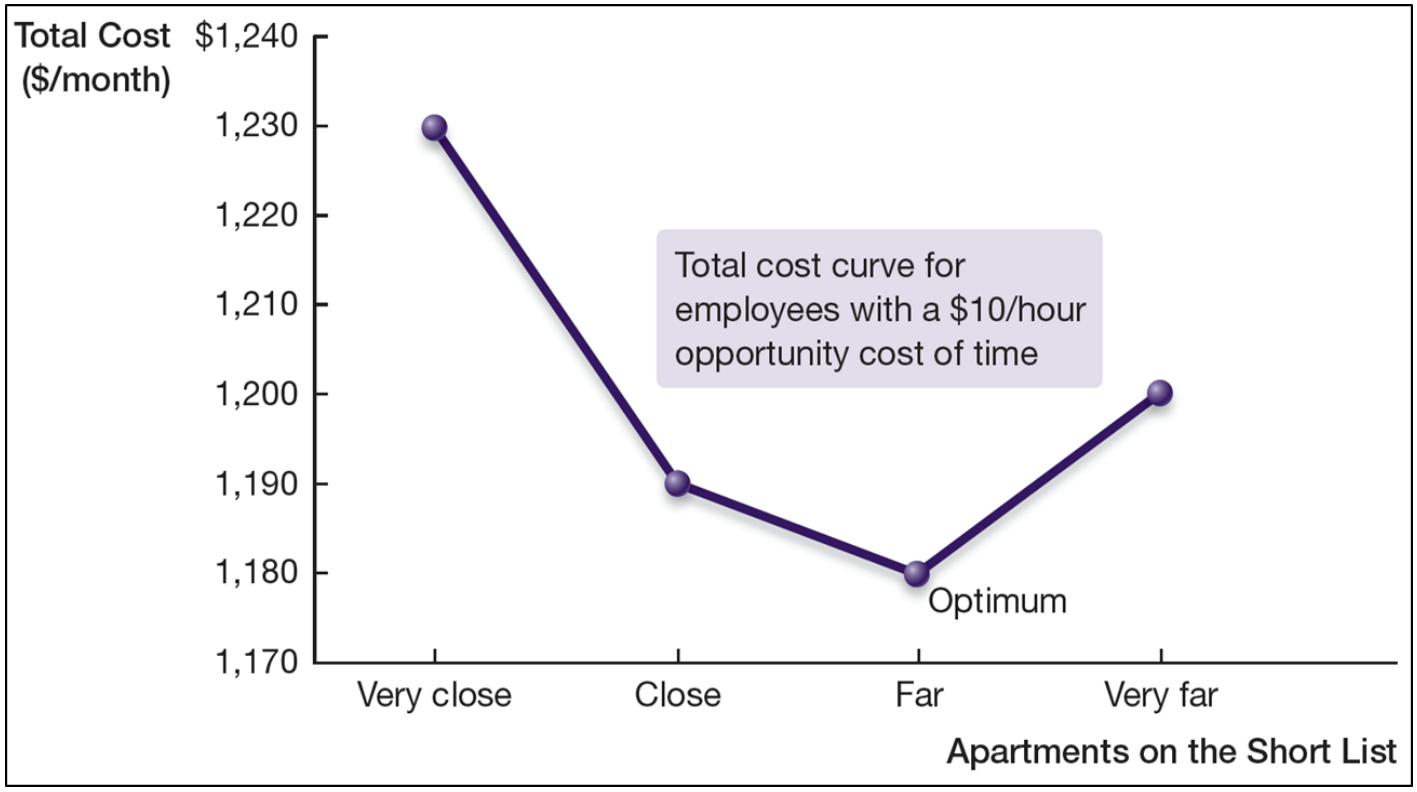


Exhibit 3.3 Total Cost Including Both Rent and Commuting Cost, Assuming an Opportunity Cost of Time of $10/hour

Comparative Statics (比較静態分析)

- Comparative Statics is the comparison of economic outcomes before and after some economic variable is changed.
- What happens if the opportunity cost of commuting time is $15 per hour.

Apartment Options

Apartment	Commuting Time (hours per month)	Commuting Cost ($ per month)	Rent ($ per month)	Total Cost: Rent + Commuting ($ per month)
Very Close	5 hours	$75	$1,180	$1,255
Close	**10 hours**	**$150**	**$1,090**	**$1,240**
Far	15 hours	$225	$1,030	$1,255
Very Far	20 hours	$300	$1,000	$1,300

Exhibit 3.4 Commuting Cost and Rental Cost Expressed in Common Units, Assuming an Opportunity Cost of Time of $15/hour

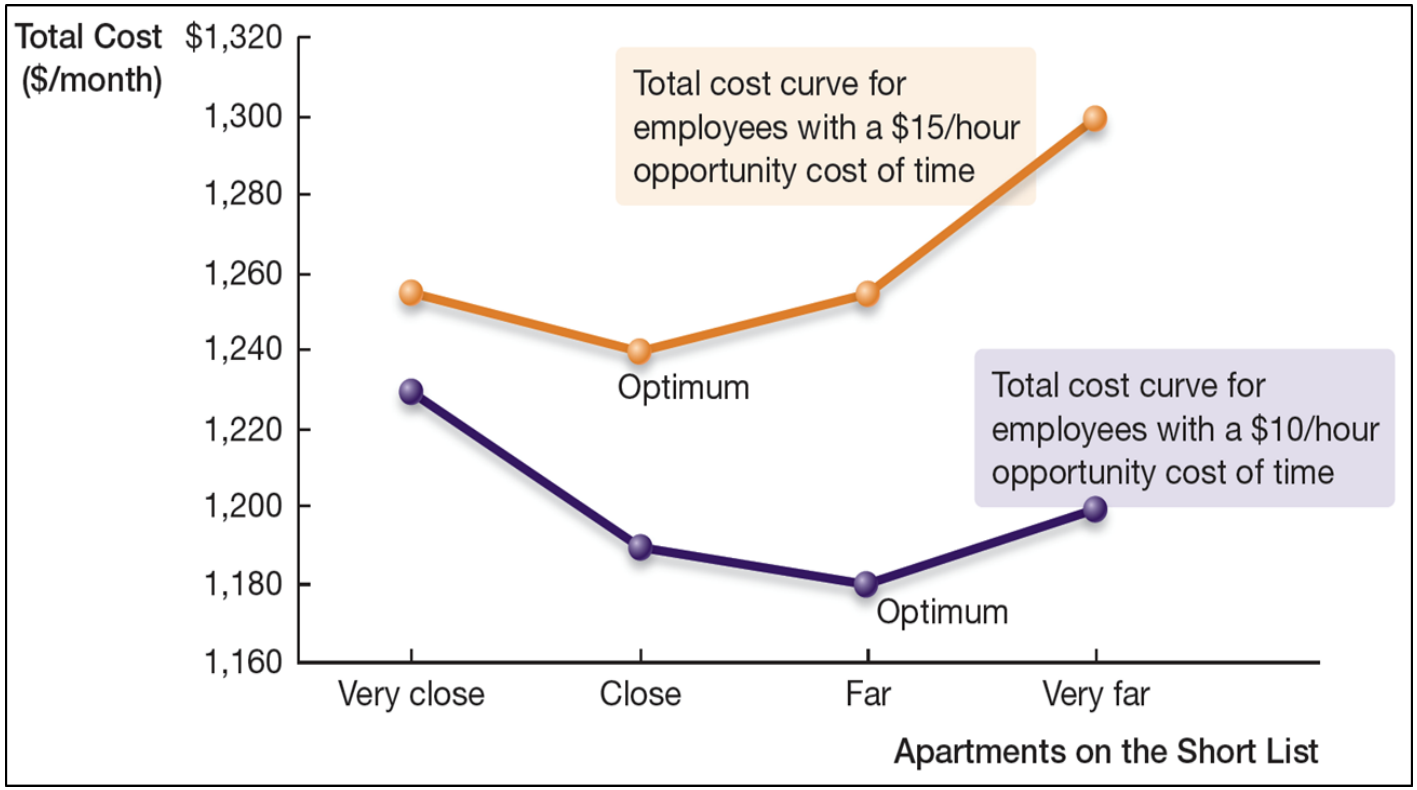


Exhibit 3.6 Total Cost Curves with the Opportunity Cost of Time Equal to $10/hour and $15/hour

Optimization in levels has three steps.

1. Translate all costs and benefits into common unit, like dollars per month.
2. Calculate the total net benefit of each alternative.
3. Pick the alternative with the highest net benefit.

3.3 Optimization in Differences: Marginal Analysis

- A cost-benefit calculation that focuses on the difference between a feasible alternative and the next feasible alternative is called marginal analysis.
- Marginal analysis will never change the ultimate answer to the question "what is optimal?" but it will change the way that you think about optimizing.

A Comparison of the Apartments:

Apartment	Commuting Cost	Marginal Commuting Cost	Rent Cost	Marginal Rent Cost	Total Cost	Marginal Total Cost
Very Close	$50		$1,180		$1,230	
		$50		−$90		−$40
Close	$100		$1,090		$1,190	
		$50		−$60		−$10
Far	$150		$1,030		$1,180	
		$50		−$30		$20
Very Far	$200		$1,000		$1,200	

Exhibit 3.7 Relationship Between Levels and Differences (Margins), Assuming a $10/hour Opportunity Cost of Time

- Marginal cost is the extra cost generated by moving from one feasible alternative to the next feasible alternative.

- **Principle of Optimization at the Margin**
  If an option is the best choice, you will be made better off as you move toward it, and worse off as you move away from it.
- Apartment Far is the optimum.

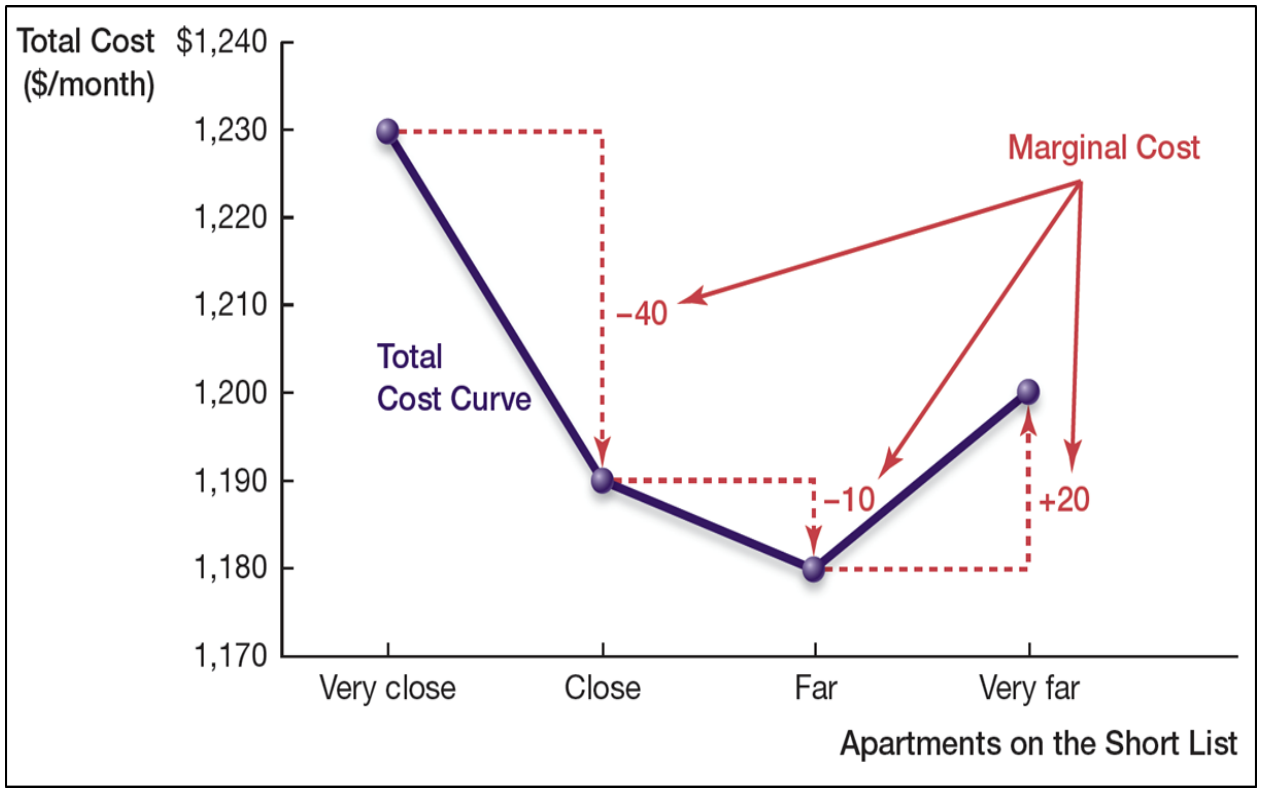
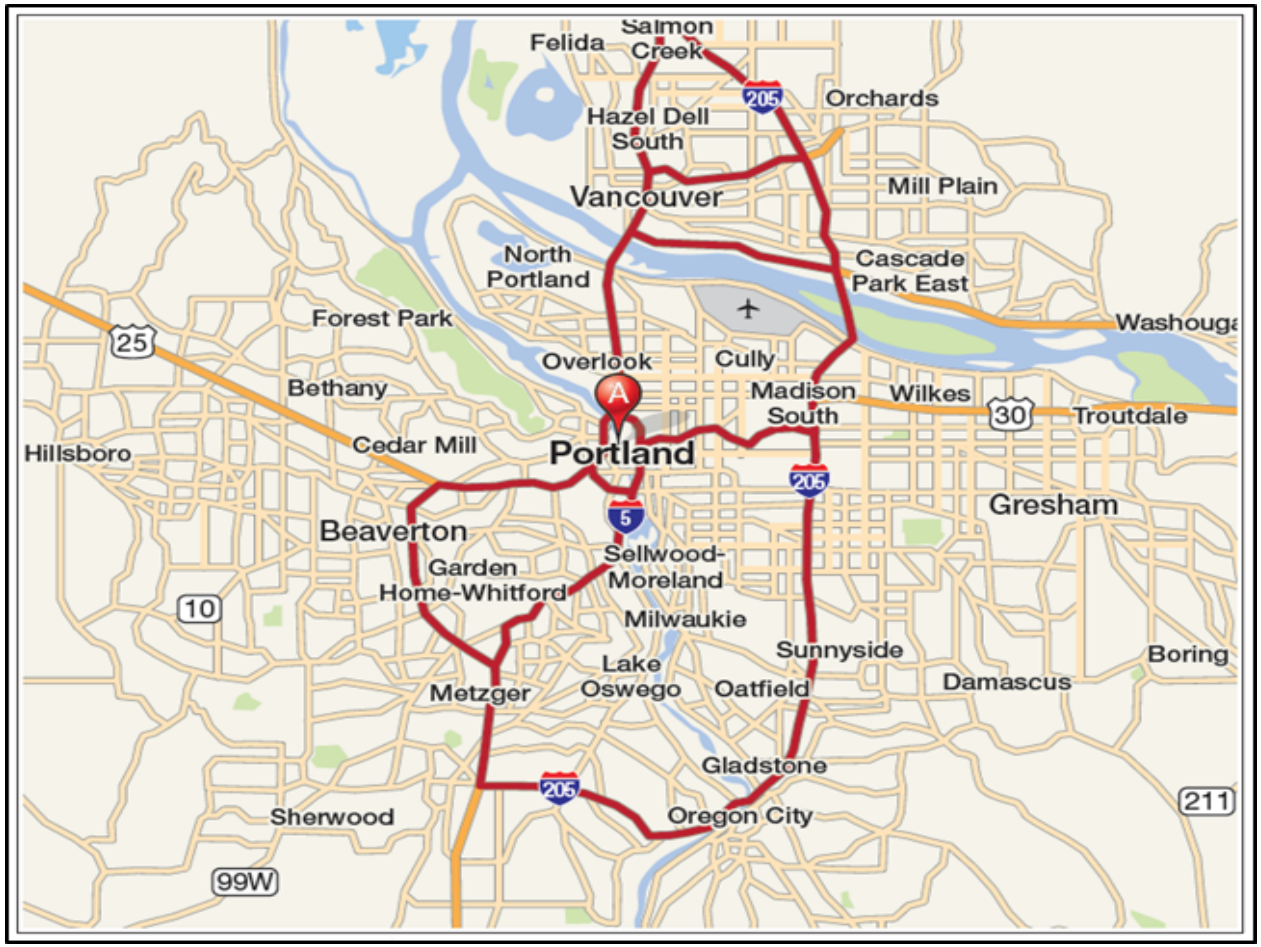


Exhibit 3.8 Total Cost of Each Apartment and the Marginal Cost of Moving Between Apartments, Assuming an Opportunity Cost of $10/hour

Optimization in differences has three steps.

1. Translate all costs and benefits into common units, like dollars per month.
2. Calculate the marginal consequences of moving between alternatives.
3. Apply the Principle of Optimization at the Margin by choosing the best alternative with the property that moving to it makes you better off and moving away from it makes you worse off.

Evidence-Based Economics



Q: How does location affect the rental cost of housing?

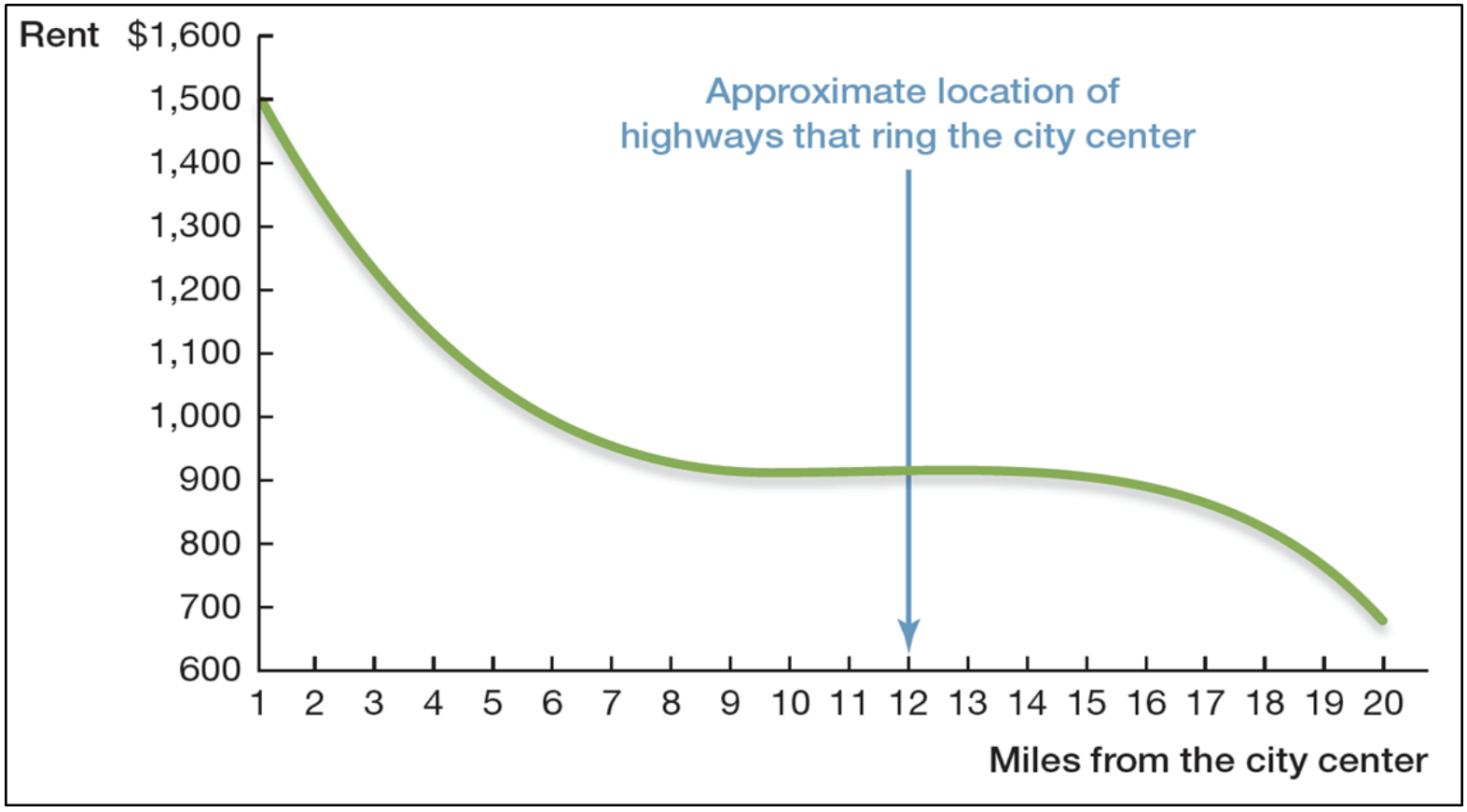


Exhibit 3.9 Apartment Rent in Portland, Oregon, Depends on Distance from the City Center

- A study by Economists Beth Wilson and James Frew on the housing market in Portland, Oregan.
- Holding all other features of the apartments constant *except* for the distance to the city center.

- Why do rental prices fall as you move farther away from the city center?
- The optimizers with the highest opportunity cost of time push up the rental price of apartments with the shortest commutes.
- Market prices have the effect of allocating the downtown apartments to the people who are willing to pay the most for them.

- How society should determine the price of scarce resources, like downtown apartments.
- Should we have a system that allows optimizing landlords and optimizing renters to negotiate freely to determine rental prices for apartment?
- What if this produces a system in which the highest-paid workers are the only ones who can afford to live in the most convenient apartments?
- Is that inequitable ?
- Can you think of a better way to allocate apartments?