ECON 002 – Principles of Microeconomics
Drake University, Spring 2024
William M. Boal

Blackboard: http://drake.blackboard.com
Old exams: http://wmboal.com/pmicro
Email: william.boal@drake.edu

BOAL'S ECON 002

SLIDESHOW HANDOUTS

SPRING 2024

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TENTATIVE COURSE SYLLABUS

1. Resources

Description from Course Catalog: Economic analysis of individual markets. Production, comparative advantage, supply and demand, elasticities, price and quantity controls, taxes and subsidies, international trade, consumer choice, business cost curves and profit maximization, consumer and producer surplus, economic efficiency, monopoly, oligopoly, externalities, and public goods. Students are expected to understand graphs, functions, and algebra at the level of tenth-grade high school mathematics.

CBPA Promises: "Our graduates will be equipped with the technical skills, business acumen, empathy, and experience necessary to innovate and lead in a globally complex, diverse, and dynamic world. They will be (1) Proficient in their fields, (2) Data-driven, strategic, and innovative problem solvers, (3) Effective communicators, (4) Socially and ethically responsible leaders, and (5) Global and multicultural citizens." This course addresses all five Promises, but especially Promises (2), (4), and (5).

Class meetings: CRN 4873 meets Mondays and Wednesdays from 9:30 to 10:45 in Aliber 010.

How to contact instructor:

- Electronic mail: william.boal@drake.edu
- Office: 319 Aliber Hall
- Telephone and voice mail: 271-3129

The quickest way to reach me is by email, which I check continually throughout the day. Please do *not* send messages by Blackboard, which I check infrequently.

Office hours: Office hours are a time when you can get help with homework, ask questions about course material, and discuss your grade or anything related to this course or economics in general. Bring your slideshow handouts. My office hours this semester are Monday, Tuesday, and Wednesday, 2 to 4 PM on Zoom. Please make an appointment at least 3 hours in advance on Starfish. Zoom links are posted on Starfish and Blackboard. If these hours are inconvenient due to schedule conflicts, please send email to schedule a special appointment and suggest some alternate times.

Resources to purchase:

- Required: John B. Taylor and Akila Weerapana. *Principles of Microeconomics*, Version **10.0**. Flat World Textbooks (flatworld.com). 2021. ISBN 978-1-4533-4133-9. Buy it from either the University Bookstore or the publisher's website, https://students.flatworldknowledge.com/course/2606775. Do not buy a used copy because it will not allow access to the FlatWorld Homework Assignments (linked from Blackboard). If you lose your access code or have difficulty accessing the FlatWorld Homework Assignments from Blackboard, please go to https://catalog.flatworldknowledge.com/customer_support for help.
- Required: *Boal's Econ 002 Slideshow Handouts,* a packet of photocopies. Available for purchase at **TBA**. Please bring it to class every day.
- Required: A simple calculator (capable of addition, subtraction, multiplication and division) for exams. *Graphing calculators, calculators with alphabetical keyboards, wireless devices and mobile phones are NOT permitted during exams.* If you do not bring a simple calculator, you must take the exam without a calculator.
- Recommended: A three-ring binder and a highlighter for your course packet.

Online resources:

- Drake email. Course announcements will occasionally be sent to this account, so check it daily. Announcements often get diverted to "Junk" or "Clutter" folders, so check them as well as your inbox.
- Blackboard. Required FlatWorld homework, slideshow quizzes, and problem sets are posted here. If you have difficulty accessing Blackboard, please call the ITS HelpDesk at 271-3001.
- Course materials webpage (wmboal.com/pmicro). Old exams are posted here.

Tutoring resources:

- Your instructor should be your first resource for questions and help.
- The Economics Tutoring Lab provides free tutoring by advanced economics students. The Lab opens about the third week of the semester. Hours and location are at www.drake.edu/economics/resources/. Appointments can be made at www.drake.edu/access-success/tutoring/ . To help the tutor help you, read the textbook first, and bring your slideshow handouts to the Lab.
- The Math Tutoring Lab (library.drake.edu/math-tutoring/) can help with purely mathematical questions.

2. Requirements

Course grade: Each exam and assignment is graded on a scale from zero to 100. Your overall course score is calculated as a weighted average, using the following formula:

$$\textit{SCORE} = 70\% \times \textit{average Exam score} + 10\% \times \textit{average FlatWorld Homework score} + 10\% \times \textit{average Slideshow Quiz score} + 10\% \times \textit{average Problem Set score} - \textit{Absences}$$

A SCORE of 97 or above is required for an A+, 93 for an A, 90 for an A-, 87 for a B+, 83 for a B, 80 for a B-, 77 for a C+, 73 for a C, 70 for a C-, 67 for a D+, 63 for a D, and 60 for a D-. SCORES will not be rounded before awarding letter grades. Extra credit work is *not* available. Exams and assignments may *not* be redone for a better grade. Just resolve to do better on the next one!

Exams: There will be four in-class exams and a final examination. All exams are closed-book, closed-notes. Simple calculators are permitted, *but graphing calculators, calculators with alphabetical keyboards, wireless devices and mobile phones are not permitted.* If you do not bring a simple calculator, you must take the exam without a calculator. The nature of the course material is cumulative, so exams may contain material from previous sections of the course. The final exam counts double and is required—students who do not take the final will not pass the course.

FlatWorld Homeworks: These online assignments cover the textbook readings and are accessed from Blackboard. Note that they are due the day *before* the topic is discussed in class. If you have trouble accessing the FlatWorld homework, please contact https://catalog.flatworldknowledge.com/customer_support .

Slideshow Quizzes: These online multiple-choice quizzes cover the slideshows presented in class and are accessed from Blackboard. They consist of 5-10 multiple-choice questions and are due the day after the topic is covered in class. You can take each slideshow quiz up to three times until the due date, but the questions will change. Blackboard records your *average* score, so don't retake a quiz unless you are confident that you can improve.

Problem Sets: These are posted on Blackboard in PDF format. Print them, complete them in pen or pencil (colored pencil welcome!) and submit them as hard-copy. They are due at the next class after the topic is covered in class.

Policy on late work: Early submissions are welcome but *late submissions are not accepted*. If your computer fails, please use a computer in Cowles Library or some other device to complete assignments. Computer problems are *not* an acceptable excuse for late assignments. Students expecting to gone on an athletic trip when an assignment is due should submit that assignment before leaving.

Policy on absences: Attendance is taken at every class. Students may miss up to three classes for any reason without penalty (except when exams are given). Thereafter, one point will be deducted from the course SCORE for each absence. Athletic team trips, documented by an official schedule sheet, will not be counted as absences.

Policy on rescheduling exams: If your own medical emergency, or a serious illness or death in your family requires you to miss an exam, you may be given a makeup exam. However, you must inform me of the emergency before the exam by email, and soon afterward submit a written explanation (including date of absence and documentation if possible).

Certain other circumstances are acceptable reasons for rescheduling an exam. These include religious observance, medical appointment, interview trip, and athletic team trip. Because these circumstances can be predicted, you must send me an email request to reschedule, with an explanation, at least one week before the date of the exam. *Unacceptable* reasons include family vacation, ride leaving early for break, early plane flight, overslept, etc.

Policy on grade corrections: Accurate grading is important. If you find an error, please let me know as soon as possible. The deadline for regrading homework, problem sets, or midterm exams is the day of the final exam.

Policy on computers and phones in class: Computers, tablets, and phones must be turned off during class unless I specifically announce otherwise.

Disability accommodation: Any student who has a disability that substantially limits their ability to perform in this course under normal circumstances should contact Student Disability Services, 271-1835, to request accommodation. Any request must be received from Student Disability Services at least one week before the necessary accommodation. All relevant information will be kept strictly confidential. If your accommodation requires extra time for exams, you should contact me at least a week before each exam to schedule an alternative time and place.

How to succeed in this course:

- Attend every class.
- Work assignments sets carefully. They are designed to help you prepare for exams, which count for most of the course grade. If you simply copy other students' answers, you will not be prepared for exams.
- Further prepare for exams by working old exams, posted at wmboal.com/pmicro. Don't look at the answer key until *after* you have worked each problem, or you will become overconfident.
- If you are doing all this but not doing as well as you would like, please ask for help. Talk to me after class, send email to william.boal@drake.edu, or visit my office hours. I am eager to help!

Policy on academic integrity: The CBPA's Academic Integrity Policy (www.drake.edu/cbpa/about/cbpapolicies) applies to this course. The consequences of violating this policy vary, depending on my evaluation of the severity of the dishonesty. A violation (such as cheating, plagiarism, or fabrication) can result in a grade of zero on the test or assignment, an F for the course grade, or even expulsion from the University. Please read the policy and ask for clarification if necessary.

3. Schedule

If bad weather or an epidemic closes campus, most likely we will have class online using Blackboard Collaborate.

FlatWorld Homeworks on readings are due the day *before* the topic is discussed in class. Slideshow Quizzes are due the day *after* the topic is completed in class. Problem Sets are to be submitted at the next class period *after* the topic is completed in class.

Part 1: Competitive Supply and Demand

Big ideas: People and countries can benefit from trade, even if they are capable of producing every product they need. When they trade with money in competitive markets, we can predict the outcome if we know their demand and supply curves.

Famous quote: "That [the principle of comparative advantage] is not trivial is attested by the thousands of important intelligent men who have never been able to grasp the doctrine for themselves or to believe it after it was explained to them."
--Paul Samuelson, "The Way of an Economist" (1969)

Another famous quote: "We might as reasonably dispute whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper, as whether the [price] is governed by utility [to demanders] or cost of production [to suppliers]." [The price is governed by *both*!]
--Alfred Marshall, *Principles of Economics* (1898)

A. Introduction and math review [Jan 29, Jan 31]

- ☐ Read this entire syllabus and highlight important items.
- ☐ Read Taylor & Weerapana textbook chapter 2 and do FlatWorld homework on Blackboard by 11:59 PM on Feb 2. The rocket ship icon is the link to the FlatWorld homework.
- ☐ Bring the following slideshow handouts to class: *Welcome to "Principles of Microeconomics." The economic approach to human behavior. Economics as a science. Math review: basic concepts and skills. Math review: averages and rates of change. Math review: percent changes.*
- ☐ If you feel rusty at basic algebra, view the helpful videos at www.khanacademy.org/ .
- ☐ Do Slideshow Quiz on Blackboard by 11:59 PM Feb 1. (Do the quiz *after* the slideshows are covered in class.)
- ☐ Submit Problem Set in class by Feb 5.

B. Production and trade [Feb 5, Feb 7, Feb 12]

- ☐ Read textbook by Taylor & Weerapana, chapter 1 and do FlatWorld homework on Blackboard by Feb 4.
- ☐ Bring the following slideshow handouts to class: *Production functions. Production possibilities. Comparative advantage. Gains from trade. Institutions that support trade.*
- ☐ Do Slideshow Quiz on Blackboard by Feb 13.
- ☐ Submit Problem Set in class by Feb 14.

C. Supply and demand [Feb 14, Feb 19]

- ☐ Read textbook by Taylor & Weerapana, chapter 3 and do FlatWorld homework on Blackboard by Feb 13.
- ☐ Bring the following slideshow handouts to class: *Demand. Supply. Equilibrium. Shifts in demand and supply curves. Willingness-to-pay and consumer surplus. Marginal cost and producer surplus.*
- ☐ Do Slideshow Quiz on Blackboard by Feb 20.
- ☐ No problem set. Instead, study for exam.

First exam [Feb 21]

- Prepare by reviewing slideshow handouts and recent problem sets, and by working old exams posted online (wmboal.com/pmicro).
- You may use a simple calculator, but graphing calculators, calculators with alphabetical keyboards, wireless devices and mobile phones are NOT permitted.
- Exam seating is assigned, so please check the projector screen before you sit down.

Part 2: Applications of Supply and Demand

Big ideas: International trade and government intervention in markets create winners and losers in predictable ways. How much they win or lose depends on the shapes of demand and supply curves.

Famous quote: "Every individual ... neither intends to promote the public interest, nor knows how much he is promoting it ...He intends only his own gain, and he is in this ... led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for society that it was no part of it. By pursuing his own interest he frequently promotes that of society more effectually than when he really intends to promote it."
--Adam Smith, *The Wealth of Nations* (1776)

A. Elasticities [Feb 26, Feb 28]

- ☐ Read textbook by Taylor & Weerapana, chapter 4 sections 4.2, 4.3, and 4.4 and do FlatWorld homework on Blackboard by Feb 25.
- ☐ Bring the following slideshow handouts to class: *Measuring sensitivity. The price elasticity of demand. Calculating elasticities. Other demand elasticities. The price elasticity of supply. Using price elasticities. Using the income elasticity of demand.*
- ☐ Do Slideshow Quiz on Blackboard by Feb 29.
- ☐ Submit Problem Set in class by Mar 4.

B. International trade and arbitrage [Mar 4, Mar 6]

- ☐ No textbook reading and no FlatWorld homework on Blackboard.
- ☐ Bring the following slideshow handouts to class: *Effects of international trade. Economic efficiency and welfare analysis. Welfare analysis of international trade. Arbitrage.*
- ☐ Do Slideshow Quiz on Blackboard by Mar 7.
- ☐ Submit Problem Set in class by Mar 18.
- ☐ Enjoy Spring Break, Mar 11-15!

C. Market controls and taxes [Mar 18]

- ☐ Read textbook by Taylor & Weerapana, chapter 4 section 4.1, and chapter 7 sections 7.3, 7.4 and 7.5, and do FlatWorld homework on Blackboard by Mar 17.
- ☐ Bring the following slideshow handouts to class: *Price controls. Quotas. Welfare analysis of price controls and quotas. Taxes. Subsidies. Welfare analysis of taxes and subsidies.*
- ☐ Do Slideshow Quiz on Blackboard by Mar 19.
- ☐ No problem set. Instead, study for exam.

Second exam [Mar 20]

- Prepare by reviewing slideshow handouts and recent problem sets, and by working old exams posted online (wmboal.com/pmicro).
- You may use a simple calculator, but graphing calculators, calculators with alphabetical keyboards, wireless devices and mobile phones are NOT permitted.
- Exam seating is assigned, so please check the projector screen before you sit down.

Part 3: Choices Underlying Supply and Demand

Big ideas: Buyers and sellers must decide whether to participate in markets and how much to buy or sell. Economic theory assumes buyers and sellers make these decisions by doing the best they can with what they have.

Famous quote: "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest."
--Adam Smith, *The Wealth of Nations* (1776)

A. Consumer choices and demand [Mar 25, Mar 27]

- ☐ Read textbook by Taylor & Weerapana, chapter 5 section 5.7 (appendix) only. No FlatWorld homework on Blackboard.
- ☐ Bring the following slideshow handouts to class: *Two kinds of demand curves. The consumer's budget constraint. Indifference curves. Consumer choice. Consumer demand. Rational choice.*
- ☐ Do Slideshow Quiz on Blackboard by Mar 28.
- ☐ Submit Problem Set in class by Apr 1.

B. Business output decisions and supply [Apr 1, Apr 3]

- ☐ Read textbook by Taylor & Weerapana, chapters 6 and 8 and do FlatWorld homework on Blackboard by Mar 31.
- ☐ Bring the following slideshow handouts to class: *Business firms. Profit maximization. Profit maximization when price is taken as given. The firm's costs in the short run. Profit maximization in the short run.*
- ☐ Do Slideshow Quiz on Blackboard by Apr 4.
- ☐ Submit Problem Set in class by April 8.

C. Business entry and exit [Apr 8]

- ☐ Read textbook by Taylor & Weerapana, chapter 9, and chapter 16 section 16.8 (appendix) only, and do FlatWorld homework on Blackboard by Apr 7.
- ☐ Bring the following slideshow handouts to class: *Discounting and the value of the firm. Long-run competitive equilibrium. Horizontal long-run supply curves. Upward-sloping long-run supply curves.*
- ☐ Do Slideshow Quiz on Blackboard by Apr 9.
- ☐ No problem set. Instead, study for exam.

Third exam [Apr 10]

- Prepare by reviewing slideshow handouts and recent problem sets, and by working old exams posted online (wmboal.com/pmicro).
- Bring a straightedge to this exam—a ruler or an extra pencil.
- You may use a simple calculator, but graphing calculators, calculators with alphabetical keyboards, wireless devices and mobile phones are NOT permitted.
- Exam seating is assigned, so please check the projector screen before you sit down.

Part 4: Perfect and Imperfect Competition

Big ideas: Marginal-cost pricing makes competitive markets efficient. But sellers, if they are few in number, try to limit competition and push price above marginal cost. This helps sellers, of course, but hurts society as a whole.

Famous quote: "People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices."
--Adam Smith, *The Wealth of Nations* (1776)

A. Virtues of perfect competition [Apr 15, Apr 17]

- ☐ Read textbook by Taylor & Weerapana, chapter 7 sections 7.1 and 7.2 only, and do FlatWorld homework on Blackboard by April 14.
- ☐ Bring the following slideshow handouts to class: *Perfect competition. Efficiency of perfectly competitive markets. Economy-wide efficiency.*
- ☐ Do Slideshow Quiz on Blackboard by Apr 18.
- ☐ Submit Problem Set in class by Apr 22.

B. Monopoly [Apr 22, Apr 24]

- ☐ Read textbook by Taylor & Weerapana, chapter 10, and do FlatWorld homework on Blackboard by Apr 21.
- ☐ Bring the following slideshow handouts to class: *Monopoly and barriers to entry. Monopoly pricing. Welfare analysis of monopoly. Monopoly price discrimination.*
- ☐ Do Slideshow Quiz on Blackboard by Apr 25.
- ☐ Submit Problem Set in class by Apr 29.

C. Imperfect competition [Apr 29]

- ☐ Read textbook by Taylor & Weerapana, chapter 11 sections 11.1 and 11.2 only, and do FlatWorld homework on Blackboard by Apr 28.
- ☐ Bring the following slideshow handouts to class: *Cartels and antitrust policy. Oligopoly. Monopolistic competition.*
- ☐ Do Slideshow Quiz on Blackboard by Apr 30.
- ☐ No problem set. Instead, study for exam.

Fourth exam [May 1]

- Prepare by reviewing slideshow handouts and recent problem sets, and by working old exams posted online (wmboal.com/pmicro).
- Bring a straightedge to this exam—a ruler or an extra pencil.
- You may use a simple calculator, but graphing calculators, calculators with alphabetical keyboards, wireless devices and mobile phones are NOT permitted.
- Exam seating is assigned, so please check the projector screen before you sit down.

Part 5: Public Goods and Externalities

Big ideas: Markets fail to work efficiently when third parties are affected—pollution is a classic example—or when many people consume the same item simultaneously.

Famous quote: "In general industrialists are interested, not in the social, but only in the private, net product of their operations."
-- Arthur C. Pigou, *The Economics of Welfare* (1920)

A. Public goods [May 6]

- ☐ Read textbook by Taylor & Weerapana, chapter 15 section 15.1 only, and do FlatWorld homework on Blackboard by May 5.
- ☐ Bring the following slideshow handouts to class: *Nonrival goods. Nonexcludable goods and common resources. Pure public goods.*
- ☐ Do Slideshow Quiz on Blackboard by May 7.
- ☐ No problem set. Instead, study for the final exam.

B. Externalities [May 8]

- ☐ Read textbook by Taylor & Weerapana, chapter 15 sections 15.2 and 15.3 only, and do FlatWorld homework on Blackboard by May 9.
- ☐ Bring the following slideshow handouts to class: *External costs and benefits. Regulating products that cause pollution. Promoting products that provide external benefits. Regulating pollution directly.*
- ☐ Do Slideshow Quiz on Blackboard by May 5.
- ☐ No problem set. Instead, study for final exam.

Final Exam

All final exams are scheduled by the Office of the Registrar. The final exam for this course will be given in the regular classroom on TBA. The final exam is comprehensive and includes questions from all parts of the course.

- Prepare by reviewing the exams you have taken already and by working old final exams posted online (wmboal.com/pmicro).
- Bring a straightedge to this exam—a ruler or an extra pencil.
- You may use a simple calculator, but graphing calculators, calculators with alphabetical keyboards, wireless devices and mobile phones are NOT permitted.
- Exam seating is assigned, so please check the projector screen before you sit down.

[end of syllabus]

PART 1

Competitive Supply and Demand

Big ideas: People and countries can benefit from trade, even if they are capable of producing every product they need. When they trade with money in competitive markets, we can predict the outcome if we know their demand and supply curves.

Famous quote: "That [the principle of comparative advantage] is not trivial is attested by the thousands of important intelligent men who have never been able to grasp the doctrine for themselves or to believe it after it was explained to them."
--Paul Samuelson, "The Way of an Economist" (1969)

Another famous quote: "We might as reasonably dispute whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper, as whether the [price] is governed by utility [to demanders] or cost of production [to suppliers]." [The price is governed by *both*!]
--Alfred Marshall, *Principles of Economics* (1898)

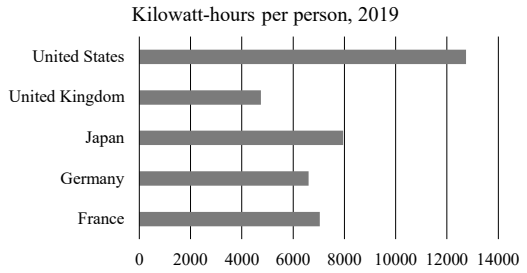
WELCOME TO PRINCIPLES OF MICROECONOMICS

Page 1

WELCOME TO "PRINCIPLES OF MICROECONOMICS"

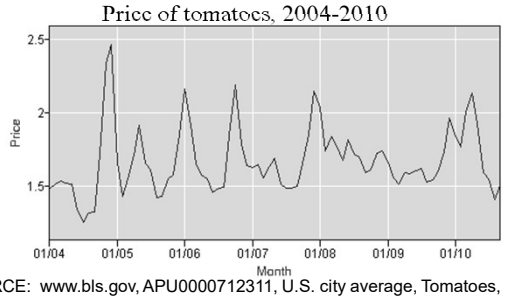
- What kinds of questions are investigated in this course?

Why do Americans consume more electricity than people in other countries?



SOURCE: International Energy Agency, "Key World Energy Statistics, 2021," pp. 53, 63-69.

Why are tomatoes usually more expensive in winter than in summer?



SOURCE: www.bls.gov, APU0000712311, U.S. city average, Tomatoes, field grown, per lb. (453.6 gm)

If the price of something goes up, do people spend more money on it?

- Food?
- Gasoline?
- Blue-ink pens?

Why are there so few lines for most consumer goods?

- In old Soviet Union, many people stood on line for hours *every day*.
- In U.S., there were long lines for gasoline during the energy crisis of the 1970s.
- But normally in U.S., lines for consumer goods are short or non-existent.

Why is a big harvest bad news for farmers?

Bumper harvest will likely mean losses for Iowa farmers

With a corn harvest that's shaping up to be his best ever, Steve Anderson hopes the added grain he puts in his bins means he can break even this year, maybe even put some money in the bank.

A lot depends on whether Anderson can wait out the market until prices rise. So, for now, he's storing nearly three-fourths of his corn and soybeans on his eastern Iowa farm and at a local elevator — making the same high-stakes gamble as so many farmers across the country.

(Photo: Brian Powers/The Register)

"I was certain before harvest that I was going to lose money on this crop," said Anderson, who farms about 3,400 acres near Conrad. "Depending on the market, I now expect to break even or show a small profit if the stars align correctly. … And I'm not totally optimistic of that."

The truth is that the outlook for making a profit this harvest remains grim, and it likely won't be any better in 2016, said Chad Hart, an Iowa State University economist.

Farm income in Iowa fell 38 percent to $5.24 billion last year from 2013. And if Iowa matches the projected national decline for 2015, income would fall another 36 percent to $3.3 billion.

WELCOME TO PRINCIPLES OF MICROECONOMICS

Page 2

Why do you sometimes have to pay "key money" to get an apartment in NYC?

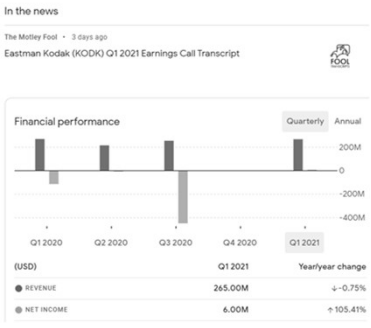
- To get a 5-bedroom luxury apartment, screenwriter and director Nora Efron had to pay $_____ in "key money" to the previous tenant.
- But rent was only $1500 per month.
- Key money is never required in most cities. Why in New York City?

Why do some companies welcome restrictions on how much they can sell?

- Import restrictions were placed on Japanese car companies in the early 1980s.
- The companies' profits *rose* as a result. Why?

Why do businesses sometimes keep operating when they are losing money?

- Are the business owners incompetent?



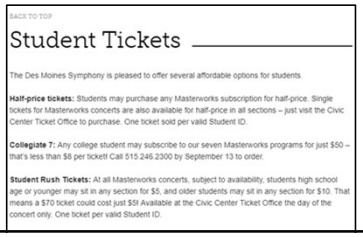
Why do some companies give discounts to students or senior citizens but others do not?

YES

- Apple Computer
- Des Moines Symphony Orchestra
- Many software companies
- Movie theatres

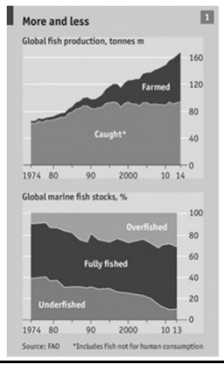
NO

- Grocery stores
- Gas stations
- Electronics stores



Why are some resources overexploited but not others?

- The world is running out of tuna and other species of ocean fish.
- But not chickens or pigs.



Conclusions

- "Principles of Microeconomics" investigates a broad range of questions about how the economy works.
- Emphasis is on _____: interactions of buyers and sellers of particular products.

THE ECONOMIC APPROACH TO HUMAN BEHAVIOR
Page 1

THE ECONOMIC APPROACH TO HUMAN BEHAVIOR

- What basic assumption distinguishes economics from other social sciences?
- What are the implications of that assumption?

Rational behavior

- Economists usually assume that people behave "rationally." This means:
- *People do the* _____

_____.

Rational behavior does not mean people are all alike

- People do the best they can, based on their *own* preferences and information, under the circumstances *they* face.
- People have different preferences, different information, and most importantly, different _____.

Behavior is affected by preferences and information

- Some people like vanilla. Other people like chocolate. Their _____ are different from each other.
- 70 years ago, many more people smoked cigarettes. Their _____ was different from people today.

Most importantly, behavior is affected by circumstances

- "Circumstances" means resources and tradeoffs.
- Resources include
  - _____
  - _____
- But resources only go so far.

Scarcity leads to tradeoffs

- If you do not have enough money to buy everything, you face a problem of _____.
- If you do not have enough time to do everything, you face a problem of _____.
- Choices must be made.

THE ECONOMIC APPROACH TO HUMAN BEHAVIOR
Page 2

Tradeoffs are measured by opportunity cost

- If your income is scarce (limited) then buying one thing means _____ buying another.
- If your time is scarce (limited) then doing one thing means _____ doing another.
- *Opportunity cost* = next best alternative that must be foregone when a choice is made.

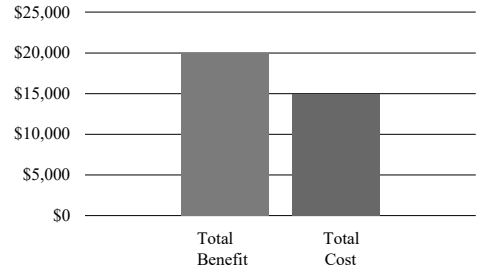
Opportunity cost examples

- Suppose you have time to study or work out at the gym. Then the _____ of studying is that you miss a workout.
- Suppose the local government has enough money to build a playground or fix a street. Then the _____ of fixing the street is not having the playground.

Choosing *whether* to do something

- Rational behavior requires comparing the benefits and opportunity costs of any action.
- People choose to buy a car, or take a job, or go on a vacation if its total benefit _____ its total cost (including opportunity cost).

Example: *whether* to buy a car or not?



Choosing *how much* to do something

- Rational behavior requires comparing the opportunity cost of the _____ unit (the "marginal cost") with the benefit of the _____ unit (the "marginal benefit").
- People buy ice cream, go to the movies, play video games until the marginal cost of the last unit _____ the marginal benefit of the last unit.

Example: marginal cost of ice cream

Scoops	Total cost	Marginal cost per scoop
No ice cream	$0.00	
One scoop	$4.00	
Two scoops	$6.00	
Three scoops	$7.50	

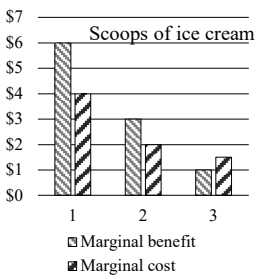
THE ECONOMIC APPROACH TO HUMAN BEHAVIOR
Page 3

Example: marginal benefit of ice cream

Scoops	Total benefit (willing to pay)	Marginal benefit per scoop
No ice cream	$0.00	
One scoop	$6.00	
Two scoops	$9.00	
Three scoops	$10.00	

Example: *how much* ice cream?

Scoops	MC	MB
None		
	$4.00	**$6.00**
One		
	$2.00	**$3.00**
Two		
	$1.50	**$1.00**
Three		



Incentives

- If costs or benefits change, then people often make new choices.
- If the ice cream shop raises prices, you might choose only 1 scoop instead of 2.
- If a job pays more, you might be more likely to take it.
- *Incentives* = changes in costs and benefits that influence _____.

Interaction

- One person's choice can affect other people's incentives.
- If Apple adds more features to its iPhone, that can create an incentive for Samsung to add features to its phone.
- If McDonalds cuts the price of its burger, that can create an incentive for Burger King to cut its price.

Equilibrium

- Where will it all end?
- *Equilibrium* = situation where no one has any incentive to change further.
- If neither McDonalds nor Burger King want to change their prices, then they are in _____.

Conclusions

- Economists assume people are _____: they do the best they can with what they have.
- They do things up to the point where _____ cost begins to exceed _____ benefit.
- One person's choices can change other people's *incentives*.
- _____ is reached when no one has any incentive to change further.

ECONOMICS AS A SCIENCE
Page 1

ECONOMICS AS A SCIENCE

- How is economics similar to natural science?
- What is the difference between micro- and macro-economics?

Is economics a science?

- In both economics and natural science, one must distinguish *positive* and *normative* statements.
- Both economics and natural science advance by developing *models* and gathering *evidence*.

What is a positive statement?

- *Positive statement* = statement of fact, of how the world works.
- Often contains words like _____.
- Can be true or false, depending on logic and evidence.

Examples of positive statements

Economics

- "Prices _____ lower in competitive markets than in monopolistic markets."
- "Free international trade _____ help producers in some industries and hurt producers in other industries."

Other sciences

- "Without changes in policy, global temperatures _____ rise about 2 degrees."
- "If people are not vaccinated, a flu pandemic _____ cost many lives.

What is a normative statement?

- *Normative statement* = value judgment or policy prescription.
- Often contains words like _____.
- Can be true or false, depending partly on a person's values and priorities.

Examples of normative statements

Economics

- "The government _____ promote competition and break up monopolies."
- "All countries _____ to encourage free international trade."

Other sciences

- "Energy taxes and incentives _____ be changed to slow global warming."
- "The government _____ to distribute flu vaccines for free."

ECONOMICS AS A SCIENCE
Page 2

Contrast

- Positive statement: "Taxes tend to slow economic growth and equalize income."
- Normative statement: "Taxes should be _____."
- Whether you say "raised" or "lowered" depends partly on your _____.

Economic science versus economic policy

- Economic science consists of _____ statements.
- Economic policy formulation consists of _____ statements, but is rooted in economic science.

Models and evidence

- Economic science studies the economy two ways:
  - Develops _____ = logical descriptions that match the real world approximately.
  - Gathers _____ = information that shows how closely models fit the facts.
- Good models fit the available evidence well, and can help predict the future.

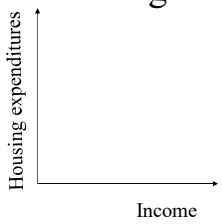
Representing models

- To be useful and understandable, models must be _____ of reality.
- Models can be represented using
  - words.
  - numerical tables (or "schedules").
  - graphs.
  - equations.

Example: A model of expenditures for housing

- "People spend 25% of their income on housing."

Income	Housing Exp.
$ 20,000	$
$ 60,000	$
$100,000	$



H = ____ × I

Branches of economics: microeconomics

- Studies how prices and quantities of particular goods and services are determined in _____.
- Dates from Adam Smith (1776).
- Many key ideas developed by late 19th century.

ECONOMICS AS A SCIENCE
Page 3

Branches of economics: macroeconomics

- Studies how the _____ price level and _____ output of goods and services are determined in an entire country or the world as a whole.
- Dates from J.M. Keynes (1936).
- Recently has been growing closer to microeconomics, emphasizing rational behavior.

Conclusions

- In economics and other fields, one must distinguish between *positive* ("is") and *normative* ("ought") statements.
- Economic science (_____ economics) develops models and gathers evidence.
- _____economics studies particular markets while _____economics studies the economy as a whole.

MATH REVIEW: BASIC CONCEPTS AND SKILLS
Page 1

MATH REVIEW: BASIC CONCEPTS AND SKILLS

- Economics is a quantitative subject.
- What basic quantitative concepts and skills are important?

No scary math requirements!

- All you need to know you probably learned by tenth grade.

Priority order of mathematical operation

(1) Anything in Parentheses.
(2) Exponents.
(3) Multiplication (x, dot, * or nothing) and Division (÷ or /).
(4) Addition and Subtraction.
(5) Left to right.

Priority order: examples

$1 + 2 * 3 =$ _____

$2 \times 3^2 =$ _____

$7 - 3 + 2 =$ _____

Rounding

- How to round a number to *n* significant digits, ignoring leading zeros:
  - Look at the (n+1)st digit.
  - If it is 5 or larger, round up, raising the nth digit by one.
  - If it is 4 or smaller, round down, leaving the nth digit as is.

Rounding: examples

- Round 3.1415927 to four significant digits.
- Answer: _____
- Round 5/11 = 0.454545454545... to 2 significant digits.
- Answer: _____

MATH REVIEW: BASIC CONCEPTS AND SKILLS
Page 2

Caution about rounding

- Often an answer requires a sequence of calculations.
- Rounding errors can grow with each step, so avoid rounding intermediate answers!
- Instead, _____ intermediate answers in your calculator's memory.
- Round only _____ the last calculation.

Caution about rounding: example

Suppose we must evaluate $\frac{100}{\frac{1}{3}-\frac{1}{4}}$.

- Nearest tenth: $\frac{100}{\frac{1}{3}-\frac{1}{4}} \approx \frac{100}{0.3-0.3} =$
- Nearest hundredth: $\frac{100}{\frac{1}{3}-\frac{1}{4}} \approx \frac{100}{0.33-0.25} =$
- Nearest thousandth: $\frac{100}{\frac{1}{3}-\frac{1}{4}} \approx \frac{100}{0.333-\ .250} =$

Caution about rounding: example (cont'd)

- Correct answer: $\frac{100}{\frac{1}{3}-\frac{1}{4}} =$ _____.
- Moral: don't round intermediate calculations!
- Round only after last calculation!

Caution about rounding: example (cont'd)

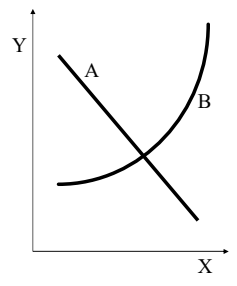
- Correct answer: $\frac{100}{\frac{1}{3}-\frac{1}{4}} =$ 1200 .
- Moral: don't round intermediate calculations!
- Round only after last calculation!

Positive and negative relationships between variables

- *Positive relationship:* when one variable rises or falls, the other variable moves in the _____ direction.
- *Negative relationship:* when one variable rises or falls, the other variable moves in the _____ direction.

Positive and negative relationships: examples

- Line A shows a _____ relation between X and Y: "Y is decreasing in X."
- Curve B shows a _____ relation between X and Y: "Y is increasing in X."



MATH REVIEW: BASIC CONCEPTS AND SKILLS
Page 3

Slopes and intercepts from graphs of lines

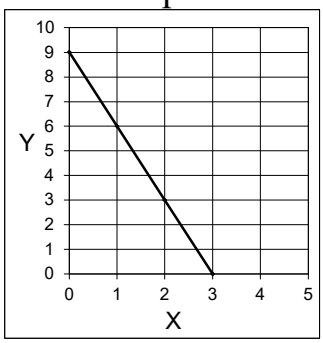
- Intercepts shown by intersection with axes.
- Slopes calculated as *rise divided by run* ($\Delta Y / \Delta X$) over any interval.
- Downward-sloping line has _____ slope.
- Upward-sloping line has _____ slope.
- Size (absolute value) of slope shows steepness.

Slopes and intercepts from graphs of lines: example

X-intercept = _____

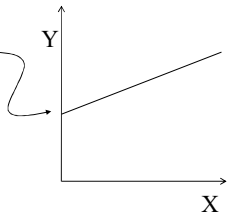
Y-intercept = _____

Slope = $\Delta Y/\Delta X$
= _____



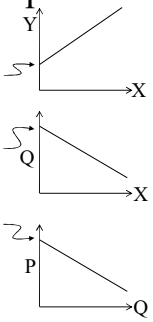
Slopes and intercepts from equations of lines

- Slope-intercept form for a line: $Y = a + bX$
- Slope = _____
- Y-intercept = _____



Slopes and intercepts from equations of lines: examples

- $Y = 3 + 2X$
  - slope = _____ Y-int = _____
- $Q = 5 - 3X$
  - slope = _____ Q-int = _____
- $P = 10 - 2Q$
  - slope = _____ P-int = _____

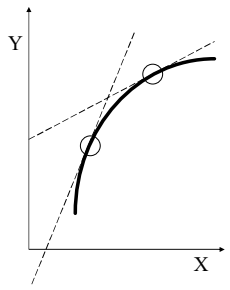


Practical meaning of slope

- Suppose line relating Y to X has slope $\Delta Y/\Delta X = 2$.
- Then if X increases by one unit ($\Delta X=1$), Y _____ units.
- If X increases by five units ($\Delta X=5$), Y _____ units.
- If X decreases by five units ($\Delta X=-5$), Y _____ units.

Slopes of curves

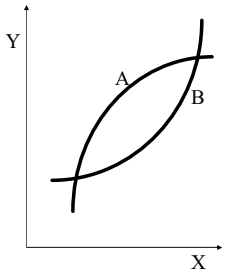
- At any point on the curve, slope = slope of tangent line.
- Curves can have changing slope.
- Slope can either increase or decrease.



MATH REVIEW: BASIC CONCEPTS AND SKILLS
Page 4

Slopes of curves: examples

- Curve A shows _____ slope.
- Curve B shows _____ slope.



Areas

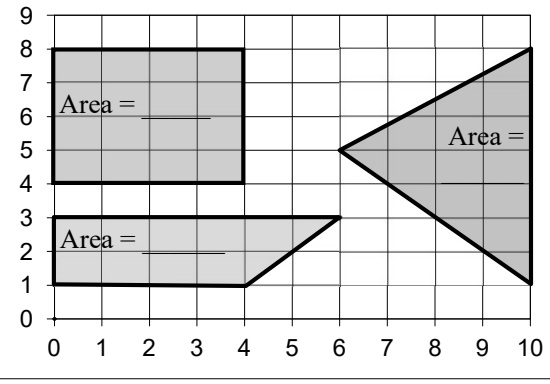
rectangle:
base × height

triangle:
½ × base
× height

trapezoid*:
average of parallel
sides × height

* Called "trapezium" in British English.

Examples



Conclusions

- Math needed:
  - simple algebra and rounding.
  - positive and negative relationships.
  - slopes and intercepts.
  - increasing and decreasing _____.
  - areas of rectangles, triangles, and _____.

MATH REVIEW: AVERAGES AND RATES OF CHANGE
Page 1

MATH REVIEW:
AVERAGES AND
RATES OF CHANGE

- What is the difference between an average value and a marginal value?

Deciding how much

- Many economic decisions take the form, "How much do I want?"
- To analyze these decisions, it is useful to calculate averages and marginal values.
- Average values are familiar to most people.
- But _____ values are usually more important for decision-making.

Average value: definition

- Average value = total value / number of units.
- Example: If you pay $3 for a two-liter bottle of pop, the average cost per liter = $ _____.

Example: pancakes at the cafe

Pancakes	Total cost	Average cost per pancake
No pancakes	$0.00	
1 pancake	$5.00	
2 pancakes	$8.00	
3 pancakes	$9.00	

Marginal value: definition

- Marginal value = rate of change = *change* in value for a one-unit change in quantity.
- "Marginal" literally means "at the edge."
- Example: If a one-liter bottle of pop costs $2 and a two-liter bottle of pop costs $3, the marginal cost of the first liter = $ _____ , and the marginal cost of the second liter = $ _____.

Example: pancakes at the cafe

Pancakes	Total cost	Average cost per pancake	Marginal cost per pancake
No pancakes	$0.00	-	
1 pancake	$5.00	$5.00	
2 pancakes	$8.00	$4.00	
3 pancakes	$9.00	$3.00	

MATH REVIEW: AVERAGES AND RATES OF CHANGE
Page 2

Example: ordering pancakes

- Suppose you are deciding whether to order two pancakes or three pancakes.
- If you chose three pancakes, the average cost per pancake = $ _____.
- But the marginal cost of the third pancake = $ _____.
- How much are you really paying for the third pancake? _____.

Marginal cost for other changes in units

- We can still compute marginal values if the change in the number of units is greater (or less) than one.
- Marginal value = rate of change
  = change in value / change in number of units
  = Δ value / Δ quantity.

Example: cans of sodapop

Sodapop	Total cost	Average cost per can	Marginal cost per can
No cans	$0.00	-	
6 can pack	$6.00		
12 can pack	$9.00		
24 can pack	$12.00		

Conclusions

- Average value
  = total value / number of units.
- Marginal value = rate of change
  = _____ in value / _____ in number of units
  = Δ value / Δ quantity.
- The marginal cost of something is the additional amount you pay for the last unit.

MATH REVIEW: PERCENT CHANGES
Page 1

MATH REVIEW: PERCENT CHANGES

- Percent changes are widely used in economics.
- What key concepts for percent changes are important?

Percent change

- Suppose X takes two different values: X_1 and X_2 .
- Change in X = difference in X = ΔX = $X_1 - X_2$.
- Percent change (or percent difference) = ΔX / *base*.

Percent change: example

- Median value of homes in Des Moines is \$127 thousand.
- Median value in Chicago is \$247 thousand.
- Percent change is $\underline{247 - 127}$

SOURCE: 2019 median housing value, www.census.gov, accessed July 2020.

Percent change: example (cont'd)

- If use Des Moines as base, percent change = $\frac{247-1}{127}$ = _____.
- If use Chicago as base, percent change = $\frac{247-127}{247}$ = _____.
- Problem: which is right?

Solution: **midpoint formula** for percent change

- Let base = midpoint or average of two values.
- Here, average of Des Moines and Chicago = $\frac{127+2}{2}$ = _____.
- Using average as base, percent change = $\frac{247-127}{}$ = _____.

Percent change with multiplication: approximation formula

- Suppose Z = X × Y.
- Then % change in Z = approximately % change in X *plus* % change in Y.
- Example: If X increases by 3% and Y increases by 2%, Z will ___crease by about ___%.
- Example: If X increases by 3% and Y decreases by 4%, then Z will ___crease by about ___%.

MATH REVIEW: PERCENT CHANGES

Page 2

Percent change with multiplication: applications

- Suppose price increases by 3% and quantity decreases by 2%.
  - Then revenue (=price times quantity) will _____ by about _____ %.
- Suppose the number of firms decreases by 2% but the average number of employees at each firm increases by 5%.
  - Then total employment will _____ by about _____ %.

Conclusions

- Percent change (or percent difference) equals the change divided by the base.
- The midpoint formula uses the _____ of the two values as the base.
- The percent change of (X×Y) is roughly the _____ of % changes in X and Y.

PRODUCTION FUNCTIONS
Page 1

PRODUCTION FUNCTIONS

- What do economists mean by "production"?
- What do they mean by "diminishing returns"?

What is production?

- *Production* = transformation of inputs (or resources) into outputs.
- Production takes place in factories, offices, households, etc.
- Kinds of outputs:
  - goods like _____.
  - services like _____.

Inputs (or resources) for production

- Labor = _____
- Capital = _____
  _____
- Land = _____
- Materials (or intermediate inputs) = goods produced elsewhere, and used up here to produce something else.

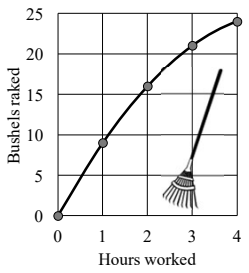
What is a production function?

- *Production function* = relationship between the quantity of inputs and the quantity of outputs.
- Can be represented by:
  - schedule or table.
  - math formula (e.g..: $output = \sqrt{input}$).
  - graph.

Simple example of production function

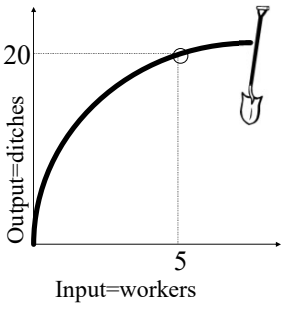
Hours worked	Bushels raked
1 hour	9 bushels
2 hours	16 bushels
3 hours	21 bushels
4 hours	24 bushels

- Graph is sometimes called _____ product curve.



Average product

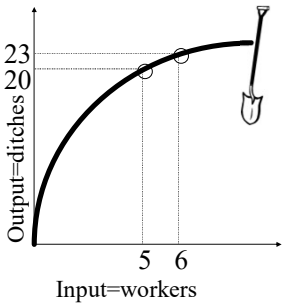
- *Average product* = output / input.
- Example: If 5 workers together can dig 20 ditches per day, their AP = _____ ditches per worker.



PRODUCTION FUNCTIONS
Page 2

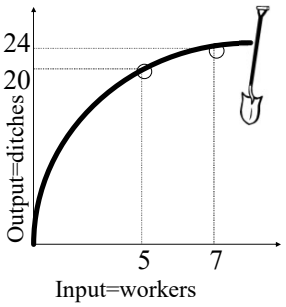
Marginal product

- *Marginal product* = increase in output caused by the "last" unit of input.
- Example: Suppose adding 1 more worker raises output from 20 ditches to 23 ditches.
- MP of 6th worker = __ ditches per worker.



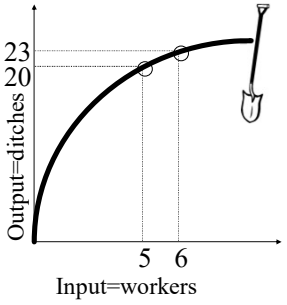
Marginal product = change in output / change in input

- MP = Δ output / Δ input.
- Example: Suppose going from 5 to 7 workers raises output from 20 to 24 ditches.
- MP in this range = _____.



Marginal product = slope of production function

- MP = Δ output / Δ input = slope of secant.
- For very small changes in input, MP = slope of line tangent to production function.
- (Calculus: derivative.)



Raking example (cont'd)

Hours worked	Bushels raked	AP	MP
0	0		
1	9		
2	16		
3	21		
4	24		

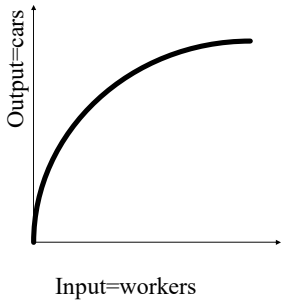
Diminishing returns to an input

- In many real-world production processes, additional units of input yield progressively smaller additional units of output.
- *Diminishing returns to an input* = situation where marginal product _____ as input increases.
- Implies graph of production function gets _____ steep as input increases.

Diminishing returns in the real world

Workers on an assembly line:

- First few workers produce a lot of cars.

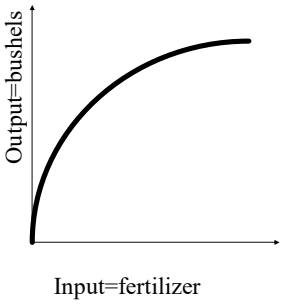


PRODUCTION FUNCTIONS
Page 3

Diminishing returns in the real world (cont'd)

Fertilizer on a field:

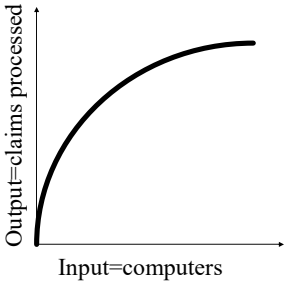
- First application improves crop yield a lot.



Diminishing returns in the real world (cont'd)

Computers in an office:

- The first computer is really useful.



Conclusions

- A production function shows a relationship between inputs and output.
- _____= total output divided by total input.
- _____= the contribution of the last unit of input to output.
  - usually declines as more units of the input are added: "_____."

PRODUCTION POSSIBILITIES
Page 1

PRODUCTION POSSIBILITIES

- Why is there a trade-off between different kinds of output?
- How does production relate to the concept of opportunity costs?

Production possibilities

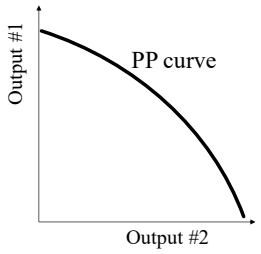
- When the same inputs can be applied to producing different outputs, we have a whole range of *production possibilities* from which to choose.
- Real-world examples:

Tradeoffs

- With a fixed stock of available inputs, we face a *tradeoff* in how these inputs can be used.
- If we use all available inputs, then producing more of one kind of output requires producing less of another.
- Problem of *scarcity* arises.

PP curves

- Can express this tradeoff graphically as a "*production possibilities curve*."
- Axes are different kinds of output.



Example 1: raking v. mowing

- Suppose the same person
  - could alternatively mow lawns, at 2 lawns per hour (no diminishing returns).
  - has 4 hours of time available for work.
- Then: hours spent mowing = 4 - hours spent raking.

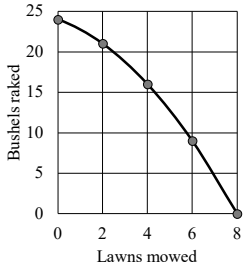
Example 1: raking v. mowing (cont'd)

Raking leaves		Mowing lawns	
Hours	Bushels	Hours	Lawns
0	0	4	
1	9	3	
2	16	2	
3	21	1	
4	24	0	

PRODUCTION POSSIBILITIES
Page 2

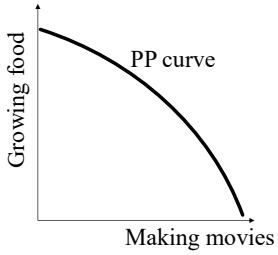
Example 1: graph of PP curve

- Where did this graph come from?
- Vertical axis is 2nd column on previous slide.
- Horizontal axis is 4th column on previous slide



Efficiency in production

- Points on graph represent combinations of outputs.
- Any point is either:
  - infeasible (impossible).
  - technically efficient.
  - inefficient.



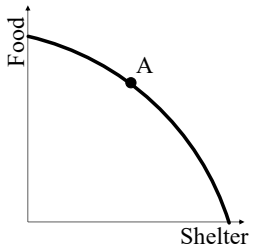
Opportunity cost

- *Opportunity cost of a good* = amount of something that must be given up in order to get something else.
- Usually expressed as a _____ number.

Example 2: Using slope of PP curve to compute opportunity cost

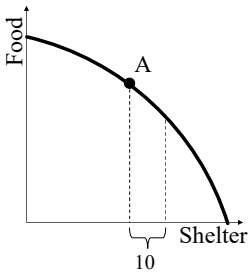
- Suppose we are given that the slope of a production possibility curve at efficient point A is -2:

$$\frac{\Delta \text{Food}}{\Delta \text{Shelter}} = -2$$



Example 2: Using slope of PP curve to compute opportunity cost (cont'd)

- Now suppose we wanted to increase production of shelter by 10 units.
- Clearly, we would have to _____ production of food, but by how much?

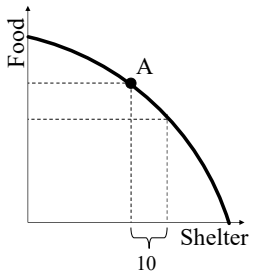


Example 2: Using slope of PP curve to compute opportunity cost (cont'd)

- Substitute Δ Shelter = 10 into slope formula:

$$-2 = \frac{\Delta \text{Food}}{\Delta \text{Shelter}} = \frac{\Delta \text{Food}}{10}$$

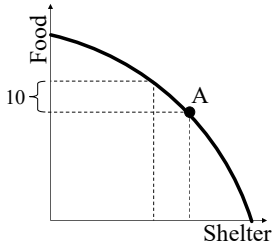
- Solve to get Δ Food = _____.
- Food production would have to decrease by _____ units.



PRODUCTION POSSIBILITIES
Page 3

Example 2: Using slope of PP curve to compute opportunity cost (cont'd)

- Conversely suppose we wanted to increase production of food by 10 units.
- Clearly, we would have to _____ production of shelter, but by how much?

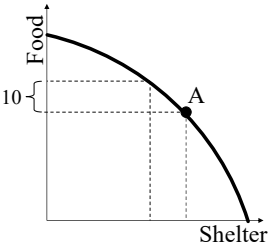


Example 2: Using slope of PP curve to compute opportunity cost of food

- Substitute Δ Food = 10 into slope formula:

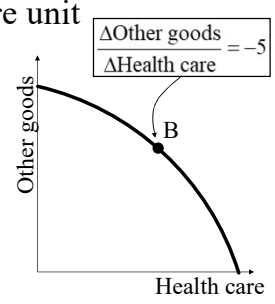
$$-2 = \frac{\Delta \text{Food}}{\Delta \text{Shelter}} = \frac{10}{\Delta \text{Shelter}}$$

- Solve to get Δ Shelter = _____.
- Shelter production would have to decrease by ___ units.



Example 3: opportunity cost of one more unit

- Suppose we are given slope of a production possibility curve at efficient point B is -5.
- What is opp. cost of one more unit of health care at point B?

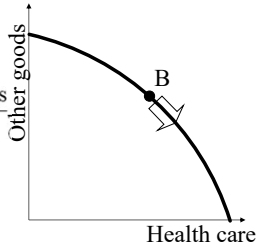


Example 3: opportunity cost of one more unit of health care

- Substitute Δ Health care = 1 into slope formula:

$$-5 = \frac{\Delta \text{Other goods}}{\Delta \text{Health care}} = \frac{\Delta \text{Other goods}}{1}$$

- Δ Other goods = ____
- So opp. cost of a unit of health care is _____ units other goods.

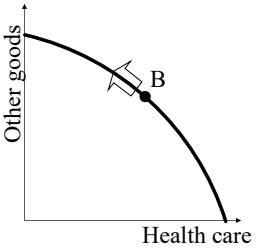


Example 3: opportunity cost of one more unit of other goods

- Substitute Δ Other goods = 1 into slope formula:

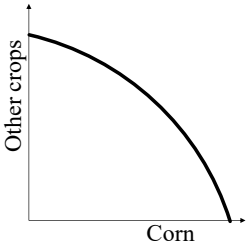
$$-5 = \frac{\Delta \text{Other goods}}{\Delta \text{Health care}} = \frac{1}{\Delta \text{Health care}}$$

- Δ Health care = ____.
- So opp. cost of a unit of other goods is ____ units health care.



Slope = opportunity cost of one more unit

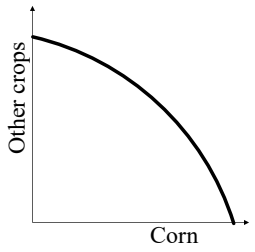
- Thus, |slope| = opp. cost of one more unit of whatever good is on _____ axis.
- In this graph, |slope| of PP curve is opp. cost of one more unit of _____.



PRODUCTION POSSIBILITIES
Page 4

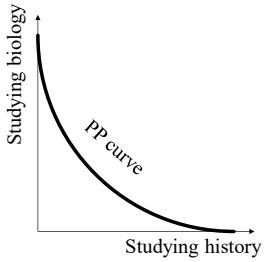
What does reciprocal of slope tell us?

- Conversely, |1/slope| = opp. cost of one more unit of whatever good is on _____ axis.
- In this graph, |1/slope| of PP curve is opp. cost of one more unit of _____.



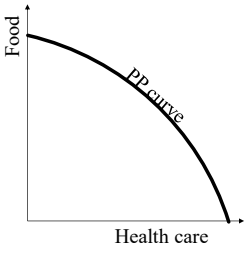
Decreasing |slope| implies decreasing opportunity cost

- If PP curve is "bowed in," opp. cost of one more unit is _____ as more is produced.
- There are gains from _____.
- Possible cause: setup costs.



Increasing |slope| implies increasing opportunity cost

- If PP curve is "bowed out," opp. cost of one more unit is _____ as more is produced.
- There are gains from _____.
- Possible cause: special resources useful for only kind of output.

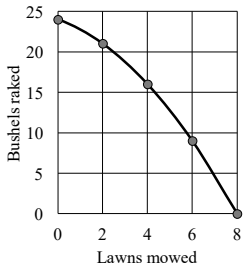


Increasing or decreasing opportunity costs in the real world?

- Decreasing opportunity costs are typical of an *individual person's* PP curve.
  - Example:
- Increasing opportunity costs are typical of a *region or nation's* PP curve.
  - Example:

Example 1: raking v. mowing again

- Does opportunity cost appear to increase or decrease in this example?



Computing opportunity cost per unit along intervals of PP curve

Production possibility curve		Opportunity cost of…	
Bushels raked	Lawns mowed	…a bushel raked	…a lawn mowed
0 bushels	8 lawns		
9 bushels	6 lawns		
16 bushels	4 lawns		
21 bushels	2 lawns		
24 bushels	0 lawns		

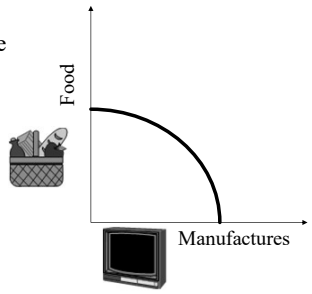
PRODUCTION POSSIBILITIES
Page 5

Economic growth

- Economic growth occurs because either:
  - people learn how to produce more output with the same inputs (technological progress).
  - the stock of available inputs increases.

Economic growth and the PP curve

- With economic growth, the PP curve expands over time.

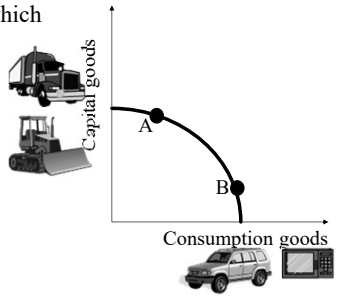


Capital accumulation and economic growth

- Growth in the future depends partly on choices made now.
- If more resources are devoted to producing capital goods (rather than consumption goods) growth will be faster.
  - Why? _____
    _____

Capital accumulation and economic growth

- In this diagram, which choice will cause faster economic growth?



Conclusions

- When the same inputs can be used to produce different kinds of outputs, producible combinations of outputs can be graphed as a _____ *curve.*
- The opportunity cost of one more unit of the output on the horizontal axis is the _____ of the PP curve.
- *Increasing opportunity cost* occurs if the PP curve is "bowed _____."

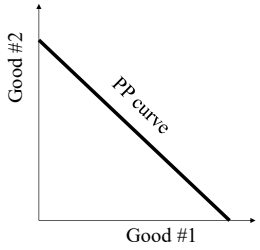
COMPARATIVE ADVANTAGE
Page 1

COMPARATIVE ADVANTAGE

- When does one producer have a comparative advantage over another?

Opportunity cost (review)

- *Opportunity cost of a good* = amount of other good that must be given up in order to get one more unit of the first good.
- = |slope| of PP curve with the first good on the horizontal axis.



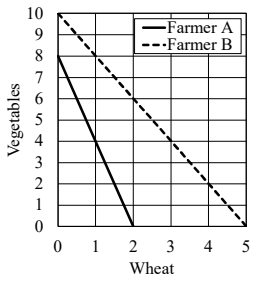
Comparative advantage: definition

- Suppose two producers have *different* opportunity costs.
  - Producers could be people, regions, countries, etc.
- The producer with the lower opportunity cost is said to have a *comparative advantage* in that particular good.

Example 1: Farmers A and B

	Opportunity cost of growing 1 unit of…	
	Wheat	Vegetables
A	units veg.	units wheat
B	units veg.	units wheat

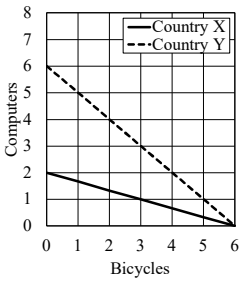
Who has comparative advantage in wheat? _____
Who has comparative advantage in vegetables? _____



Example 2: Countries X and Y

	Opportunity cost of making a…	
	Bicycle	Computer
X	computers	bicycles
Y	computers	bicycles

Who has comparative advantage in bicycles? _____
Who has comparative advantage in computers? _____



Absolute advantage versus comparative advantage

- Farmer B can produce more wheat or more vegetables than Farmer A.
- So Farmer B has an *absolute* advantage in both crops.
- But Farmer B has a *comparative* advantage in only one crop (_____).
- Farmer A has a comparative advantage in the other (_____).

COMPARATIVE ADVANTAGE
Page 2

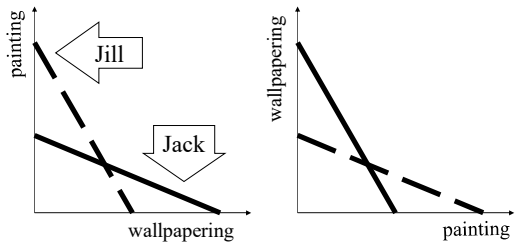
Absolute advantage versus comparative advantage

- Farmer B can produce more wheat or more vegetables than Farmer A.
- So Farmer B has an *absolute* advantage in both crops.
- But Farmer B has a *comparative* advantage in only one crop (_____wheat_____).
- Farmer A has a comparative advantage in the other (____vegetables____).

Absolute advantage versus comparative advantage (cont'd)

- Country Y can produce more computers or more bicycles than Country X.
- So Country Y has an *absolute* advantage in both goods.
- But Country Y has a *comparative* advantage in only one good (_____).
- Country X has a comparative advantage in the other (_____).

No one can have a comparative advantage in every activity: graphical proof



Jack has CA in wallpapering *implies*

Algebraic proof

$$\frac{\text{Jack's opp. cost}}{\text{of wallpapering}} < \frac{\text{Jill's opp. cost}}{\text{of wallpapering}}$$

$$\left|\frac{\Delta \text{ walls painted}}{\Delta \text{ walls papered}}\right|_{Jack} < \left|\frac{\Delta \text{ walls painted}}{\Delta \text{ walls papered}}\right|_{Jill}$$

$$\left|\frac{\Delta \text{ walls papered}}{\Delta \text{ walls painted}}\right|_{Jack} > \left|\frac{\Delta \text{ walls papered}}{\Delta \text{ walls painted}}\right|_{Jill}$$

$$\frac{\text{Jack's opp. cost}}{\text{of painting}} > \frac{\text{Jill's opp. cost}}{\text{of painting}}$$

Conclusions

- A producer has a _____ advantage over another producer in some activity if the first producer has lower opportunity cost.
- A producer (no matter how productive) can _____ have a comparative advantage in every activity.

GAINS FROM TRADE
Page 1

GAINS FROM TRADE

- Why are goods and services traded?
- When can both parties gain from trade?

Voluntary trade

- People trade goods and services voluntarily only if both parties expect to be better off as a result.
- Both parties must expect to enjoy *gains from trade.*

Why might gains from trade occur?

- Each party might have something that the other party wants more. Example:
- Each party might produce something that the other party wants more. Example:
- The two parties both produce both goods and desire the goods equally but they have *different opportunity costs*.
  - Focus of this presentation.

Produce or trade?

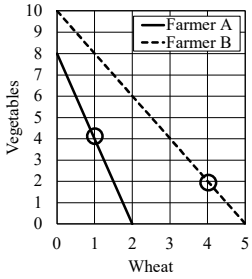
- *Key principle:* You should not produce a good for yourself if you can get it at lower cost by trading.
- Here, "lower cost" means lower opportunity cost.
- Trading allows you to get _____ your own production-possibility curve.

When does trading work?

- If two producers have _____ opportunity costs, then each will prefer to
  - specialize in producing the good in which it has a comparative advantage.
  - trade for the other good.
- Then _____ producers can get OUTSIDE their own production possibility curves.

Example 1 revisited

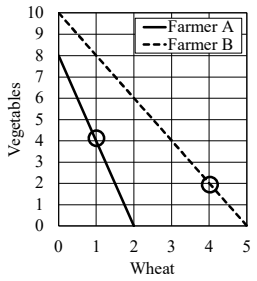
- Farmer A has comp. adv. in _____.
- Farmer B has comp. adv. in _____.
- Suppose farmers produce circled quantities.



GAINS FROM TRADE
Page 2

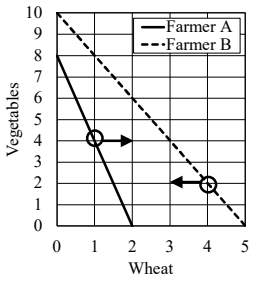
Example 1: specialization

- Suppose Farmer B offers 1 unit of wheat to Farmer A.
- Can Farmer A give some vegetables in return, and BOTH farmers come out ahead?



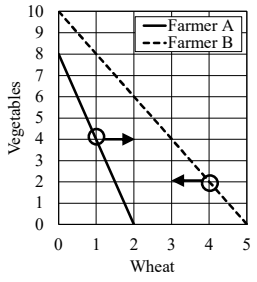
Example 1: trade

- Farmer A comes out ahead if A gives B less than _____ units of vegetables.
- Farmer B comes out ahead if B receives more than _____ units of vegetables.



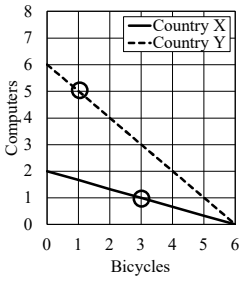
Example 1: BOTH are better off

- Both farmers come out ahead if Farmer A gives Farmer B between 2 and 4 units of vegetables.
- Example: Farmer A gives ____ units of vegetables.



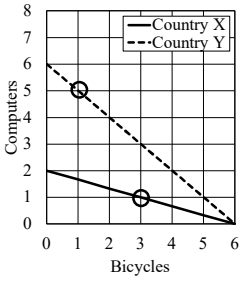
Example 2 revisited

- Country X has comp. adv. in _____.
- Country Y has comp. adv. in _____.
- Suppose countries produce circled quantities.



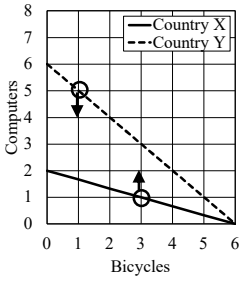
Example 2: specialization

- Suppose Country Y exports 1 computer to Country X.
- Can Country X export some bicycles back to Country Y, and BOTH countries come out ahead?



Example 2: trade

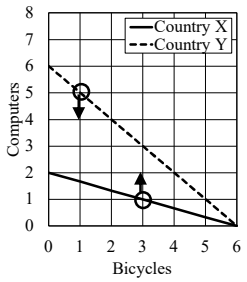
- Country X comes out ahead if X gives Y less than _____ bicycles.
- Country Y comes out ahead if Y receives more than _____ bicycle.



GAINS FROM TRADE
Page 3

Example 2: BOTH are better off

- Both countries come out ahead if Country X exports between 1 and 3 bicycles back to Country Y.
- Example: Country X exports ____ bicycles.



Conclusions

- Two producers with different opportunity costs can always _____ enjoy *gains from trade.*
- Each producer must
  - specialize in producing the good in which it has a _____*advantage*.
  - trade that good for the other good.

INSTITUTIONS THAT SUPPORT TRADE
Page 1

INSTITUTIONS THAT SUPPORT TRADE

- Does trading happen automatically?
- What institutions help maximize the gains from trade?

Supporting trade

- Trade does not happen automatically.
- In some times and places, it is easier to _____ what you want.
  - (Or to get the government to take it from someone and give it to you!)
- In some times and places, it is very difficult to _____ someone to trade with.

Property rights

- *Property rights* = social arrangements governing ownership, use, and disposal of goods and services.
- Kinds of property:
  - _____ property
  - _____ property
  - _____ property

Why property rights matter

Without property rights,

- People can take possession of whatever they have the ability to obtain ("stealing" or "tribute").
- Resources are diverted from production into stealing and protecting property from being stolen.

Money

- Modes of trading:
  - barter
  - monetary exchange
- *Money* = a particular good that everyone agrees to accept as payment = *medium of exchange*.

Why money matters

- Disadvantage of barter: To obtain desired goods via barter requires either:
  - double coincidence of wants, or
  - (potentially long) sequence of transactions.
- Monetary exchange avoids these problems.

INSTITUTIONS THAT SUPPORT TRADE
Page 2

Markets

- *Market*s = institutions that link buyers and sellers, enabling them to get information and do business.
- In a well-functioning market:
  - anyone can trade with _____ else.
  - prices at which people are buying and selling are _____ to everyone.

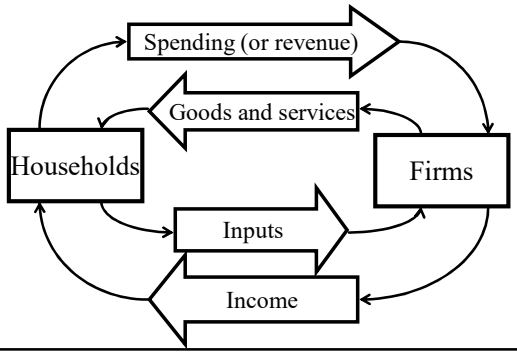
The "law of one price"

- No buyer wants to pay _____ than necessary.
- No seller wants to be paid _____ than necessary.
- Therefore prices (for the exact same good) tend to *converge* to a single number.
- A market with substantial "price dispersion" is _____ functioning well.

Why markets matter

- Markets simplify the negotiations required for trade. All one needs to know is:
  - the going *price* of the good.
- Market participants decide whether to buy or sell by comparing their own opportunity cost with the price.
  - If opportunity cost > price, buy.
  - If opportunity cost < price, sell.

Two kinds of markets



Conclusions

- _____*rights* facilitate trade and reduce the resources devoted to stealing or guarding against stealing.
- Trading is vastly simplified if everyone agrees to accept a particular good as payment. That good is called _____.
- A well-functioning *market* tends to follow the _____.

DEMAND
Page 1

DEMAND

- How do consumers respond to changes in a good's price?

Buying and selling

- When money is used, every trade involves a
  - _____, who gives up money in exchange for a good or service
  - _____, who gives up a good or service in exchange for money.

Response to price

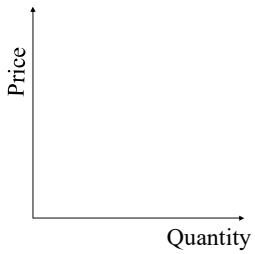
- If the market is functioning well, it will follow the law of _____.
- How will buyers and sellers respond to this price?

Demand relation (or demand curve)

- *Demand relation* = relation between the price of a good and the quantity that buyers wish to buy.
- Can be represented by:
  - schedule or table.
  - mathematical formula.
  - graph.

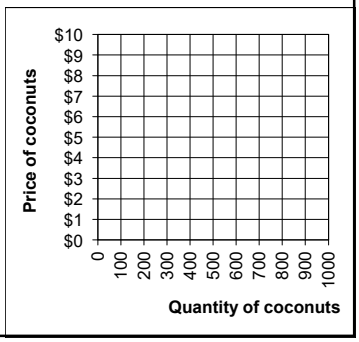
The "Law of Demand"

- Price and quantity demanded are negatively related, *ceteris paribus*.
- Ceteris paribus means "_____ _____."



Simple example of demand relation: demand for coconuts

Price	Quantity
$10	0
$9	100
$8	200
$7	300
$6	400
$5	500
$4	600
$3	700
$2	800
$1	900
$0	1000



DEMAND
Page 2

Reasons for Law of Demand

(1) Substitution effect: As price of one good rises, consumers substitute other goods that become relatively cheaper.

- Example: If price of beef rises, consumers switch to _____.
- Example: If price of orange juice rises, consumers switch to _____.

Reasons for Law of Demand

(2) Income effect: Even if no substitutes are available, a rise in price implies consumer cannot afford as much as before. Purchasing power of income falls, so buy less of everything, including this good.

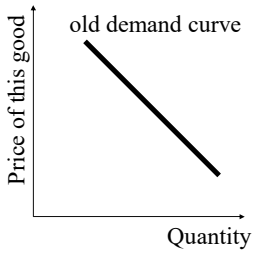
- Example: If apartments rents go up, consumers cut back on everything, move to _____.

Other factors influencing the quantity demanded

- Prices of related goods.
- Income of consumers.
- Expected future prices of same good.
- Population and demographic structure.
- Product quality.
- Preferences.

Change in demand = shift in demand curve

- When these other factors change, we say there is a *change in demand*. The demand curve *shifts.*
- By contrast, when price of good itself changes, no change in demand and no shift in curve.



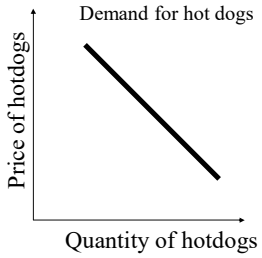
Effect of *prices of related goods* on quantity demanded

- Can be positive or negative.
- *Substitute* = good whose price has a _____ effect on quantity demanded of first good.
- *Complement* = good whose price has a _____ effect on quantity demanded of first good.

Hamburgers and hotdogs are

_____

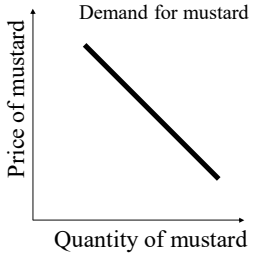
- If the price of hamburgers increases, people eat _____ hot dogs, even if the price of hot dogs does not change.



DEMAND
Page 3

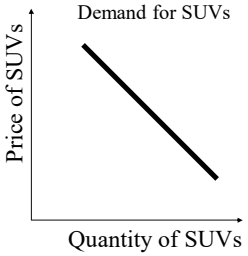
Mustard and hotdogs are _____

- If the price of hot dogs increases, people eat _____ mustard, even if the price of mustard does not change.



SUVs and gasoline are _____

- If the price of gasoline increases, people buy _____ SUVs, even if the price of SUVs does not change.

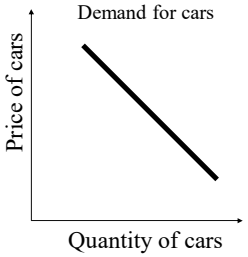


Effect of *income* on quantity demanded

- Can be positive or negative.
- *Normal good* = good whose demand _____ as income increases.
- *Inferior good* = good whose demand _____ as income increases.

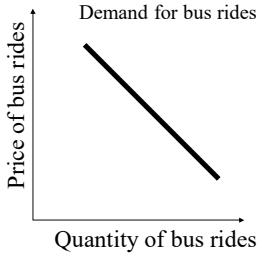
Most goods are _____ goods

- As people's incomes rise, they buy _____ cars, appliances, clothing, food, energy, etc., even if the prices of those goods do not change.



A few goods are _____ goods

- As people's incomes rise, they buy _____ bus rides, second-hand clothes, and macaroni-and-cheese dinners, even if the prices of those goods do not change.



Effect of *expected future prices* on quantity demanded

- Have a positive effect on the quantity demanded.
- If prices are expected to fall, people buy less now.
- If prices are expected to rise, people buy more now.
- Examples: _____

DEMAND
Page 4

Effect of population and age structure

- Population size has a positive effect.
  - Examples: _____
- Effect of age structure differs across goods.
  - Examples: _____

Effect of other variables on quantity demanded

- Quality has positive effect (in general).
  - Examples: _____
- Preferences and tastes affect quantity demanded.
  - Examples: _____

Conclusions

- The *Law of Demand* states that price and the quantity demanded by consumers are _____ related, *ceteris paribus.*
- It holds because any price change has a _____*effect* and an _____*effect*.
- Other things can change the quantity demanded, shifting the *demand curve*, including the _____ of related goods and the _____ of consumers.

SUPPLY
Page 1

SUPPLY

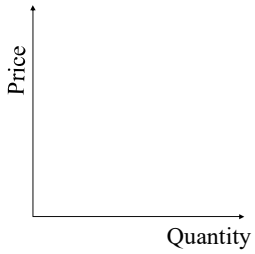
- How do producers respond to changes in a good's price?

Supply relation (or supply curve)

- *Supply relation* = relation between the price of a good and the quantity that sellers wish to sell.
- Can be represented by:
  - schedule or table.
  - mathematical formula.
  - graph.

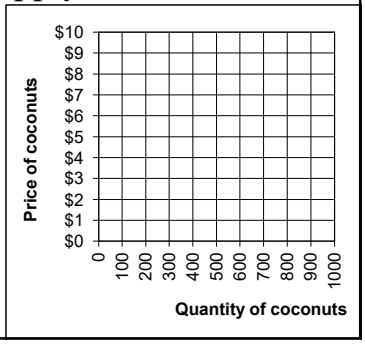
The "Law of Supply"

- Price and quantity supplied are positively related, *ceteris paribus.*
- Ceteris paribus means "_____ _____."



Simple example of supply relation: supply of coconuts

Price	Quantity
$1	0
$2	200
$3	400
$4	600
$5	800
$6	1000
$7	1200



Reasons for Law of Supply

- Increasing opportunity cost generates the law of supply.
  - As more of the good is produced, the cost of producing an additional unit usually _____.
  - A _____ price must be offered to induce suppliers to sell more.

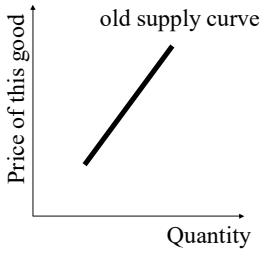
Other factors influencing the quantity supplied

- Prices of inputs.
- Technology.
- Government regulations.
- Expected future prices of same good.
- Number of suppliers.

SUPPLY
Page 2

Change in supply = shift in supply curve

- When these other factors change, we say there is a *change in supply*. The supply curve *shifts.*
- By contrast, when price of good itself changes, no change in supply and no shift in curve.

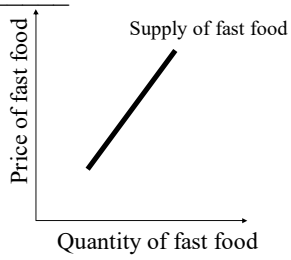


Effect of *prices of inputs* on quantity supplied

- Have a negative effect on quantity supplied.
- Reason: Because an increase in input prices increases the cost of producing the good.

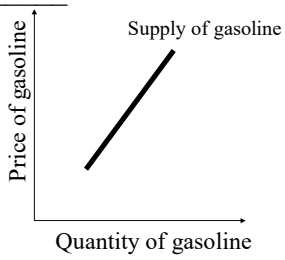
Example: increase in wages of fast-food workers shifts supply of fast food to the _____

- Fast-food workers are an input to making fast food.



Example: decrease in price of petroleum shifts supply of gasoline to the _____

- Petroleum is an input to making gasoline.

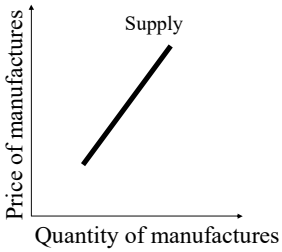


Effect of *technology* on quantity supplied

- New production technology has a positive effect on quantity supplied.
- Reason: Improved production methods _____ the cost of production, by allowing producers to do more with less.
- Examples:

Example: development of "lean" production methods shifts supply of manufactured goods to the _____

- "Lean" production methods use fewer workers, less factory space, and less energy.



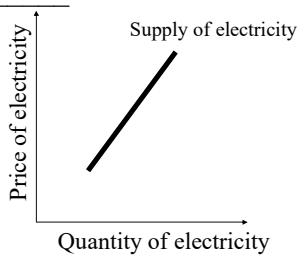
SUPPLY
Page 3

Effect of *government regulations* on quantity supplied

- Have a negative effect on quantity supplied to the extent that they increase the cost of production.
- Most government regulations *do* increase the cost of production—otherwise they would be adopted voluntarily!

Example: environmental regulations shift supply of electricity to the _____

- Environmental regulations require electricity generators to put "scrubbers" on smokestacks.



Effect of *expected future prices* on quantity supplied

- Have a negative effect on the quantity supplied.
  - If prices are expected to fall in the future, suppliers sell _____ now.
  - If prices are expected to rise in the future, suppliers sell _____ now.
- Examples:

Effect of *number of producers* on quantity supplied

- Has a positive effect on the quantity supplied.
- Reason: With more producers, output is greater.

Conclusions

- The *Law of Supply* states that price and the quantity supplied are _____ related, all other things held constant.
- It holds because as more of a good is produced, the cost of producing an additional unit usually _____.
- Other things can change the quantity supplied, shifting the *supply curve*, including the prices of inputs and the available production _____.

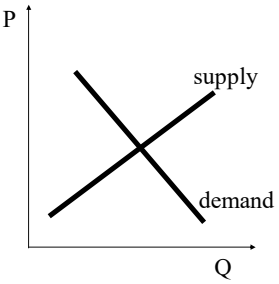
EQUILIBRIUM
Page 1

MARKET EQUILIBRIUM

- What determines market price and quantity?

Demand and supply together

- Demanders and suppliers simultaneously make decisions about how much they want to buy or sell, in response to the market price.

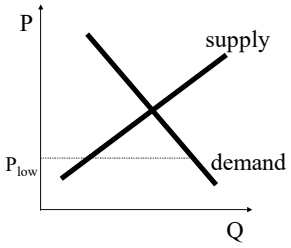


What if quantity demanded does not equal quantity supplied?

- Let:
  Q_D = quantity demanded.
  Q_S = quantity supplied.
- At any given price, Q_D might not equal Q_S.
- But in that case, price will tend to _____.
  - Not an equilibrium!

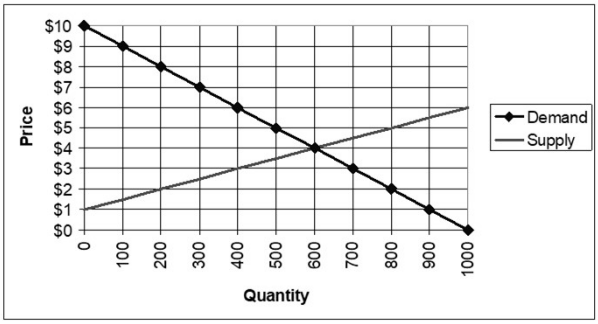
Excess demand = shortage

- At low prices, $Q_D > Q_S$.
- "Excess demand" or shortage.
- Some consumers are excluded.
- Excluded consumers *bid up* the price.
- Price tends to _____.



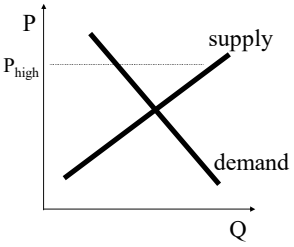
Example 1: market for coconuts

If price = \$2, excess _____ = _____ units.



Excess supply = surplus

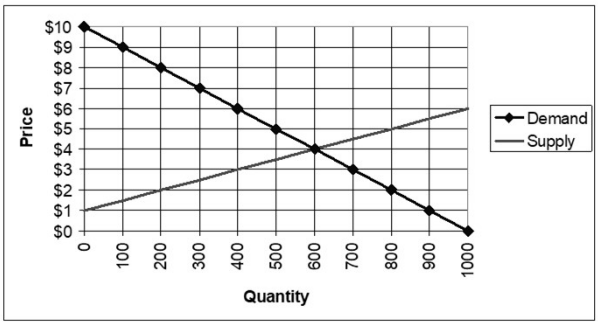
- At high prices, $Q_D < Q_S$.
- "Excess supply" or surplus.
- Some producers are excluded.
- Excluded producers *cut* the price.
- Price tends to _____.



EQUILIBRIUM
Page 2

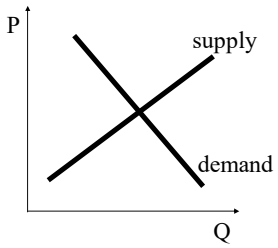
Example 1: market for coconuts

If price = \$5, excess _____ = _____ units.



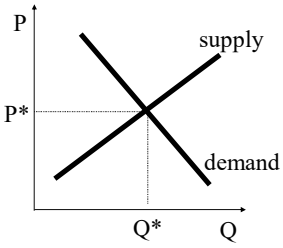
Market equilibrium

- The only stable price is where demand and supply curves intersect:
- P* = equilibrium price
- Q* = equilibrium quantity.



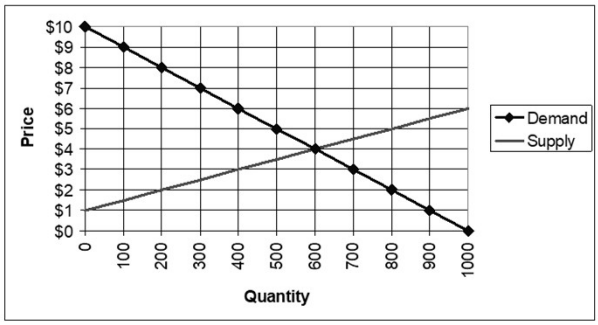
Revenue = spending

- Revenue to sellers
  = spending by buyers
  = P* × Q*
  = area of rectangle



Example 1: market equilibrium

P*= ____, Q*= ____ , Revenue= _____.



Example 2: market for steel

If price = \$20, excess _____ = _____ tons.

Price per ton	Quantity demanded (tons)	Quantity supplied (tons)
\$10	800	200
\$20	700	250
\$30	600	300
\$40	500	350
\$50	400	400
\$60	300	450
\$70	200	500

Example 2: market for steel

If price = \$70, excess _____ = _____ tons.

Price per ton	Quantity demanded (tons)	Quantity supplied (tons)
\$10	800	200
\$20	700	250
\$30	600	300
\$40	500	350
\$50	400	400
\$60	300	450
\$70	200	500

EQUILIBRIUM
Page 3

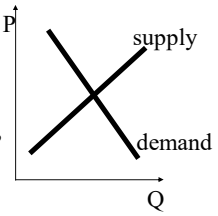
Example 2: market for steel

Equilibrium price = $_____.

Price per ton	Quantity demanded (tons)	Quantity supplied (tons)
$10	800	200
$20	700	250
$30	600	300
$40	500	350
$50	400	400
$60	300	450
$70	200	500

Example 3: market for orange juice

- Suppose demand is given by $Q_D = 400 - 20\,P$
- And supply is given by $Q_S = -50 + 30\,P$
- Equilibrium means $Q_D = Q_S$, $400 - 20\,P = -50 + 30\,P$



How soon do markets reach equilibrium?

- It may *take time* for markets to adjust to a new equilibrium.
- Usually, the better the communication between buyers and sellers,
  - the _____ the duration of any excess supply or excess demand.
  - the _____ the market reaches the new equilibrium.

Do markets always reach equilibrium eventually?

- *Government policies* may deliberately prevent price from reaching equilibrium.
- Examples:

Conclusions

- *Equilibrium price and quantity* are determined by the intersection of supply and demand curves.
- Any other price is likely to be unstable because it will create either a shortage (*excess* _____) or a surplus (*excess* _____) .

SHIFTS IN DEMAND AND SUPPLY CURVES
Page 1

SHIFTS IN DEMAND AND SUPPLY CURVES

- What happens if demand or supply shift?
- What happens if both curves shift?

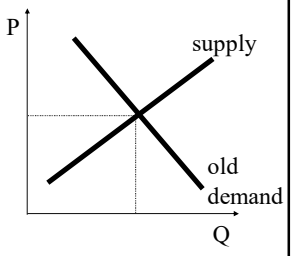
Shifts in curves

- If the supply or demand curves shift, the equilibrium price and quantity change in predictable ways.
- Changes are predictable because
  - demand always slopes _____
  - and supply slopes _____.

Effect of rightward shift in demand

- Suppose something shifts demand to the right, such as:
  - increase in price of substitute
  - decrease in price of complement.
  - increase in income.

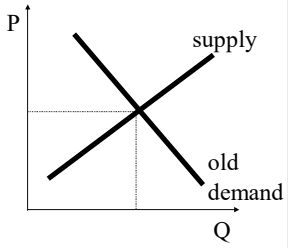
P* & Q* both _____ .



Effect of leftward shift in demand

- Suppose something shifts demand to the left, such as:
  - decrease in price of substitute
  - increase in price of complement.
  - decrease in income.

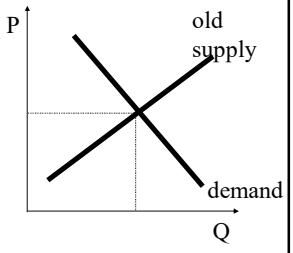
P* & Q* both _____ .



Effect of rightward shift in supply

- Suppose something shifts supply to the right, such as:
  - input price decreases.
  - discovery of new production method.
  - decrease in govt. regulation.

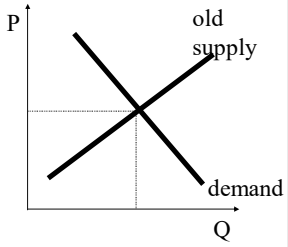
P* _____ ,
Q* _____ .



Effect of leftward shift in supply

- Suppose something shifts supply to the left, such as:
  - increase in input price.
  - increase in govt. regulation.

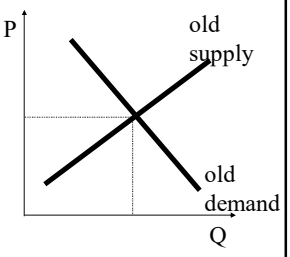
P* _____ ,
Q* _____ .



SHIFTS IN DEMAND AND SUPPLY CURVES
Page 2

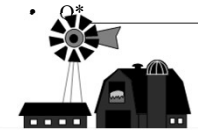
Example: World automobile market

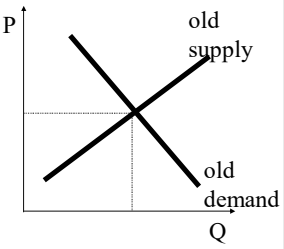
- Suppose incomes of consumers fall (perhaps due to a recession).
- Implications:
  - P* _____
  - Q* _____



Example: Agricultural market

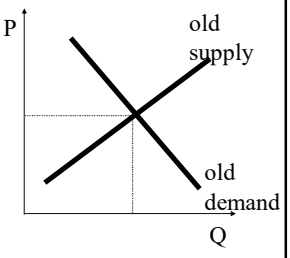
- Suppose there is a crop failure due to bad weather or disease.
- Implications:
  - P* _____
  - Q* _____





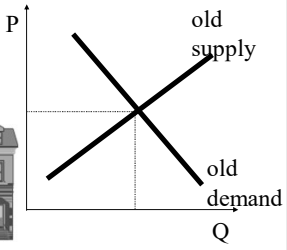
Example: Market for illegal drugs

- Suppose tougher law enforcement raises the likelihood of arrest for persons transporting drugs into the U.S.
- Implications:
  - P* _____
  - Q* _____



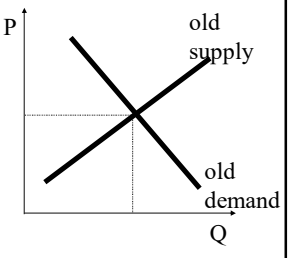
Example: Market for inner-city apartments

- Suppose an urban revitalization program increases the attractiveness of inner-city residential neighborhoods.
- Implications:
  - P* _____
  - Q* _____



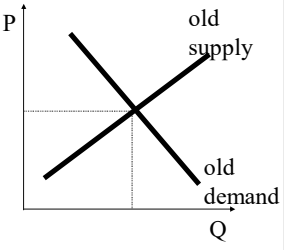
Simultaneous shifts in demand and supply in same direction

- If both curves shift to right, then:
- Q* will surely _____.
- But P* could either increase or decrease, depending on shapes of curves, and which curve shifts more.



Simultaneous shifts in demand and supply in opposite directions

- If demand shifts to right while supply shifts to left, then:
- P* will surely _____.
- But Q* could either increase or decrease, depending on shapes of curves, and which curve shifts more.



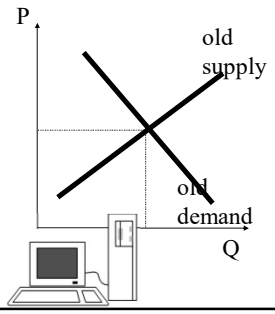
SHIFTS IN DEMAND AND SUPPLY CURVES

Page 3

Example: Market for computers

1. Due to technological breakthroughs, the price of computer chips falls sharply.
2. Simultaneously, the price of software falls.

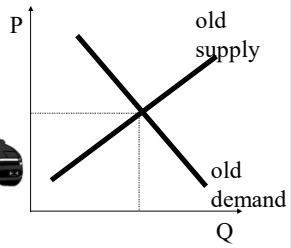
- Implications:
  - P* _____
  - Q* _____



Example: Market for U.S.-made cars

1. Suppose the United Auto Workers win a major wage increase.
2. Simultaneously, the price of foreign-made cars decreases.

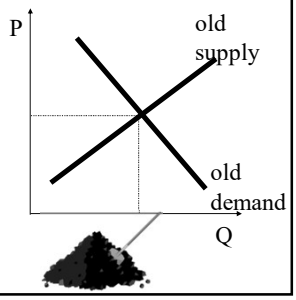
- Implications:
  - P* _____
  - Q* _____



Example: Market for coal

1. Suppose a new law requires strip-mining companies to spend more money for land restoration.
2. Simultaneously, a war in the Middle East raises the price of petroleum.

- P*_____ Q*____



Conclusions

How to predict effects of shifts in curves:

(1) Draw demand-and-supply diagram.

(2) Determine which _____ is shifting, and which _____.

(3) Read off changes in quantity and price from diagram.

(4) If both curves shift, remember that one variable (price or quantity) _____ be predicted without more info.

WILLINGNESS-TO-PAY AND CONSUMER SURPLUS
Page 1

WILLINGNESS-TO-PAY AND CONSUMER SURPLUS

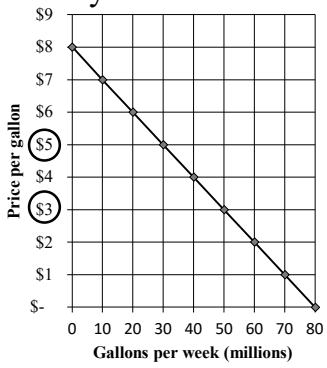
- How can we measure the gains from trade for consumers?

Two ways to read a demand curve

1. Horizontally: for any given price, the curve shows how many units consumers are willing to buy.
2. Vertically: for any given quantity, the curve shows the maximum price that consumers are willing to pay for the last unit.

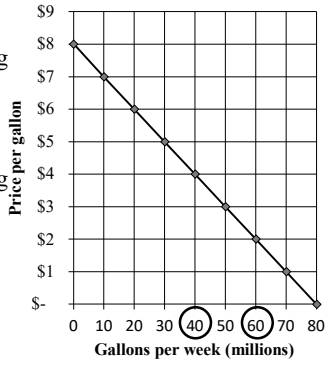
Reading the demand curve horizontally

- At a price of $5 per gallon, consumers would buy _____ million gallons.
- At a price of $3 per gallon, consumers would buy _____ million gallons.



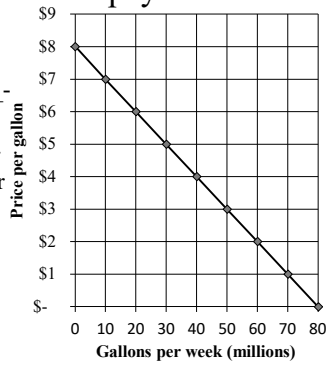
Reading the demand curve vertically

- Consumers are willing to pay a maximum of $_____ for the 40 millionth gallon
- Consumers are willing to pay a maximum of $_____ for the 60 millionth gallon.



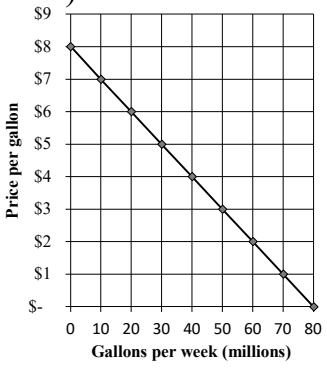
Why willingness-to-pay falls

- First few gallons are applied to _____-valued uses (going to work, shopping, etc.).
- Often there are few or no substitutes available for these uses.



Why willingness-to-pay falls (cont'd)

- Later gallons are applied to _____-valued uses (recreation, leisure travel, etc.).
- Often substitutes are available for these uses (air or train travel, etc.).



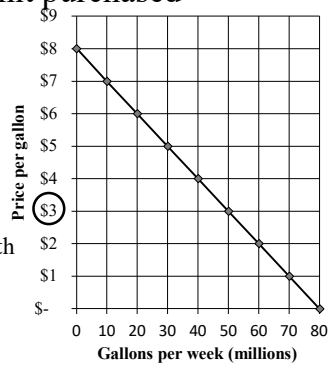
WILLINGNESS-TO-PAY AND CONSUMER SURPLUS
Page 2

Price on demand curve = willingness-to-pay = consumers' marginal benefit

- Maximum price consumers are willing to pay for a unit = marginal benefit (in $) that consumers enjoy from that unit.
- Rational consumers buy until marginal benefit equals _____.

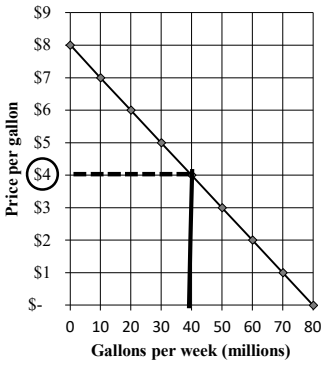
Price = willingness-to-pay only for the last unit purchased

- If price = $3, consumers buy 50 million gallons.
- The 50 millionth gallon is worth about $____ to consumers.
- Prior gallons are worth _____ than $3.



Total willingness-to-pay for all units

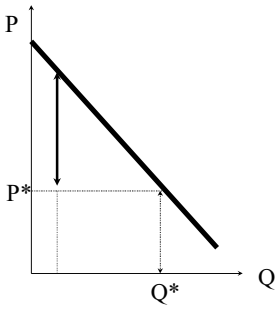
- Compute this as area under demand curve.
- Example: if price = $4, consumers buy 40 million gallons.
- Total willingness-to-pay = shaded area = $_____ million.



Consumer surplus for a particular unit: definition

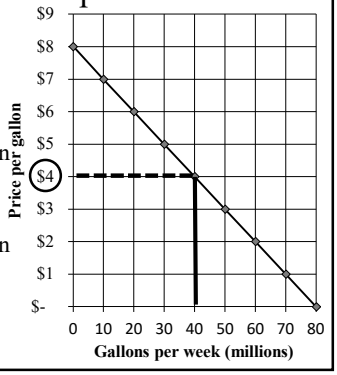
- *Difference between what the consumer is willing to pay for a particular unit and what the consumer actually pays.*

= height of demand curve minus market price P*.



Consumer surplus for a particular unit: example

- Suppose price of gasoline is $4.
- Consumer surplus for the 10 millionth gallon = $ _____.
- Consumer surplus for the 30 millionth gallon = $ _____.



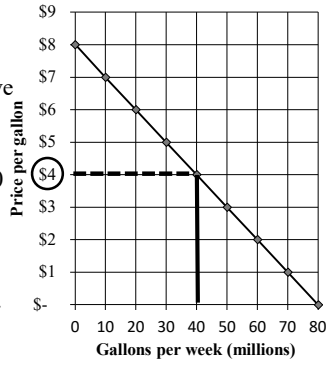
Total consumer surplus: definition

- Total CS = sum of consumer surpluses for all units purchased.
- Total CS = benefit to consumers of being able to buy as much of the good as they want (at the market price) rather than being unable to buy it at all.
- Often just called "consumer surplus."

WILLINGNESS-TO-PAY AND CONSUMER SURPLUS
Page 3

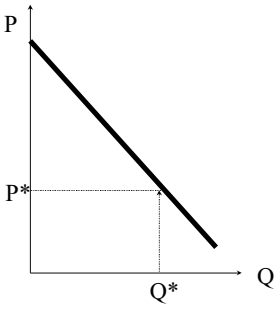
Total consumer surplus for all units

- Compute this as area between demand curve and price.
- Example: if price = $4, consumers buy 40 million gallons.
- Total consumer surplus = shaded area = $_____ million.



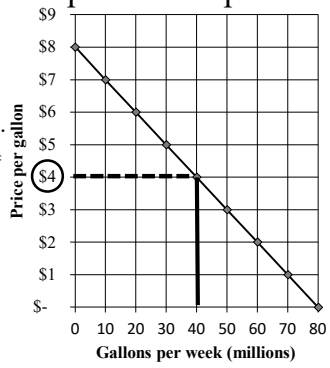
Total willingness-to-pay = spending + total consumer surplus

- Total consumer surplus is area of triangle.
- Spending = P* × Q* = area of rectangle.



Total willingness-to-pay = spending + total consumer surplus: example

- Suppose price = $4.
- Total willingness-to-pay = $_____ million.
- Spending = $4 × 40 = $_____ million.
- Total consumer surplus = $_____ million.

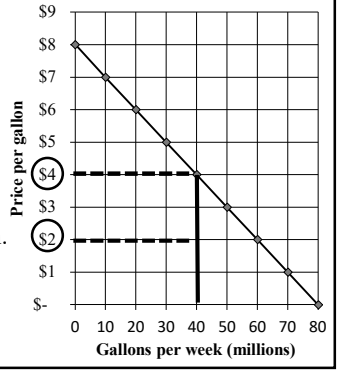


How much is a price reduction worth to consumers?

- Common (but incorrect) answer = simple cost saving with no change in quantity.
- Correct answer = increase in _____.

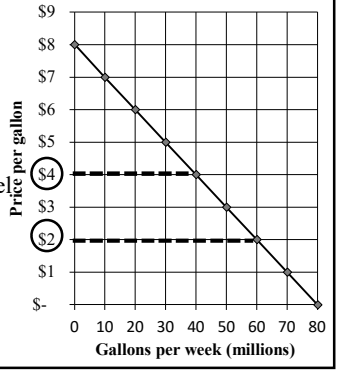
Simple cost saving from a price decrease

- Suppose price of gasoline fell from $4 to $2.
- Simple cost saving = change in price × old quantity = $ _____ million.



Value to consumers of a price decrease

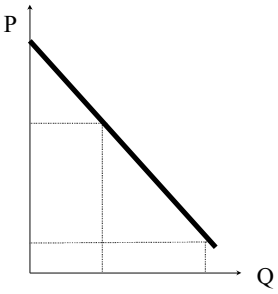
- Change in consumer surplus = area of _____
- = height × avg of parallel sides
- = $2 × (1/2)(40+60) million
- = $ _____ million.



WILLINGNESS-TO-PAY AND CONSUMER SURPLUS
Page 4

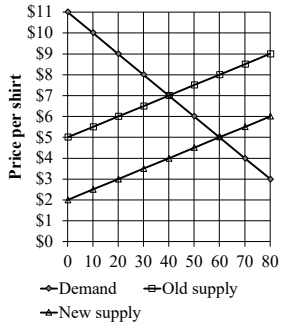
Value to consumers of price decrease is always _____ than simple cost saving

- The difference is greater…
  - the more elastic (flatter) the demand curve.
  - the bigger the price change.



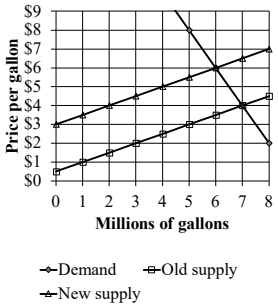
Impact on consumers of a rightward shift in supply

- Suppose the supply of shirts shifts right.
- The price falls from $7 to $_____.
- The benefit to consumers = increase in consumer surplus = $_____.



Impact on consumers of a leftward shift in supply

- Suppose the supply of gasoline shifts left.
- The price rises from $4 to $_____.
- The loss to consumers = decrease in consumer surplus = $_____.



Conclusions

- Height of demand curve = how much a person would be *willing to pay* for that unit.
- *Willingness-to-pay* for successive units _____.
- *Consumer surplus* = _____ between how much a person is willing to pay and the price actually paid (P*).
- *Total consumer surplus* = _____ between demand curve and horizontal line at P*.

MARGINAL COST AND PRODUCER SURPLUS
Page 1

MARGINAL COST AND PRODUCER SURPLUS

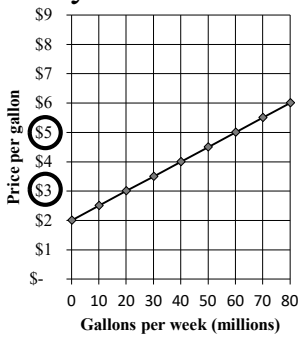
•How can we measure the gains from trade for producers?

Two ways to read a supply curve

1. *Horizontally*: for any given price, the curve shows how many units producers want to produce and sell.
2. *Vertically*: for any given quantity, the curve shows the minimum price producers must be paid to supply that quantity.

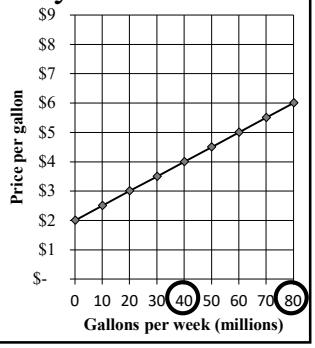
Reading the supply curve horizontally

- At a price of $5 per gallon, producers would sell _____ million gallons.
- At a price of $3 per gallon producers would sell _____ million gallons.



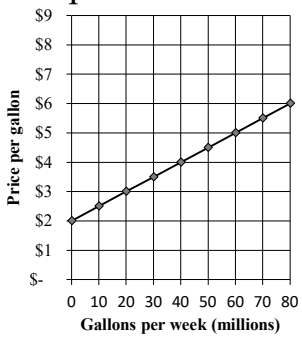
Reading the supply curve vertically

- Producers must be paid a minimum of $_____ for the 40 millionth gallon.
- They must be paid a minimum of $_____ for the 80 millionth gallon.



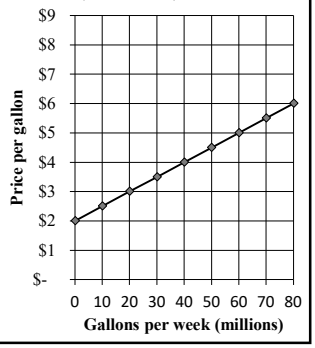
Why the minimum price producers must be paid rises

- When the price is low, producers use only their most efficient factories, fields, machines, oil wells, etc.
- These _____-cost methods of production are profitable even when the price is low.



Why the minimum price producers must be paid rises (cont'd)

- When the price is high, producers also use their less efficient factories, fields, machines, oil wells, etc.
- These _____-cost methods of production are profitable only when the price is high.



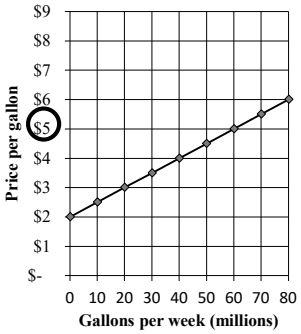
MARGINAL COST AND PRODUCER SURPLUS
Page 2

Price on supply curve = producers' marginal cost of production

- Minimum price producers must be paid = marginal cost to producers of producing the last unit.
- Rational producers sell until their marginal cost equals the market _____.

Price = marginal cost only for the last unit sold

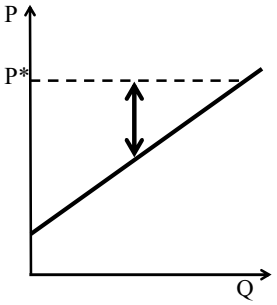
- If price = $5, producers sell 60 million gallons.
- The 60 millionth gallon cost about $_____ to produce.
- Prior gallons cost _____ than $5 to produce.



Producer surplus for a particular unit: definition

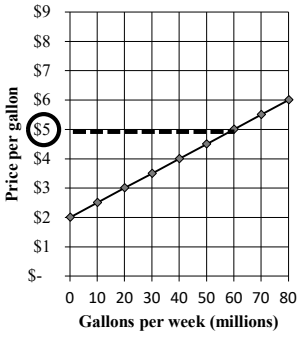
- Difference between minimum price producer must be paid and what the producer is actually paid.

= market price minus height of supply curve.



Producer surplus for a particular unit: example

- Suppose market price = $5.
- Producer surplus for the 20 millionth gallon = $_____.
- Producer surplus for the 40 millionth gallon = $_____.

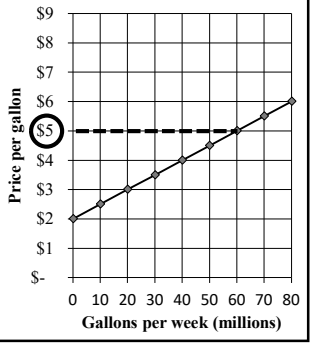


Total producer surplus: definition

- Total PS = sum of producer surpluses for all units sold.
- Total PS = net benefit to producers of being able to sell as much of the good as they want (at a given price) rather than being unable to sell it at all.
- Often just called "producer surplus."

Total producer surplus for all units

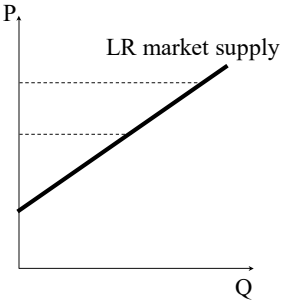
- Compute this as area between supply curve and market price.
- Example: if price = $5, producers sell 60 million gallons.
- Total producer surplus = shaded area = $ _____ million.



MARGINAL COST AND PRODUCER SURPLUS
Page 3

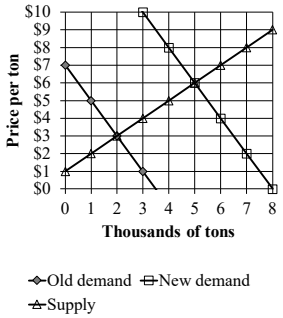
Changes in PS

- If the market price rises, PS _____.
- If the market price falls, PS _____.
- The change in PS measures the impact on producers (firms and input owners) of a change in price.



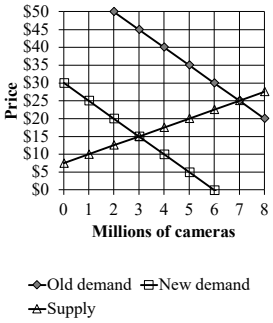
Example: increase in producer surplus from a rightward shift in demand

- Suppose the demand for food shifts right.
- The price rises from $3 to $_____.
- The benefit to producers = increase in producer surplus = $_____.



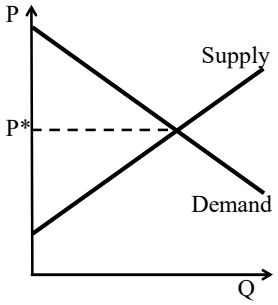
Example: decrease in producer surplus from a leftward shift in demand

- Suppose the demand for film cameras shifts left.
- The price falls from $25 to $_____.
- The harm to producers = decrease in producer surplus = $_____.



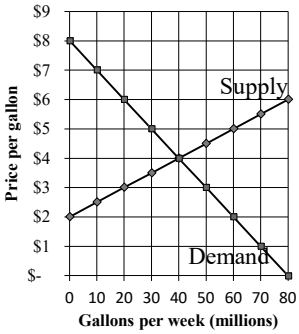
Total surplus = consumer surplus + producer surplus

- Consumer surplus = area between demand curve and market price.
- Producer surplus = area between supply curve and market price.



Total surplus: example

- Equilibrium price = $_____ .
- Consumer surplus = $_____ million.
- Producer surplus = $_____ million.
- Total surplus = $_____ million.



Conclusions

- Height of supply curve = marginal cost to producers of each unit sold.
- Marginal cost for successive units _____.
- Producer surplus = _____ between marginal cost and actual market price.
- Total producer surplus = _____ between supply curve and market price.

PART 2

Applications of Supply and Demand

Big ideas: International trade and government intervention in markets create winners and losers in predictable ways. How much they win or lose depends on the shapes of demand and supply curves.

Famous quote: "Every individual ... neither intends to promote the public interest, nor knows how much he is promoting it ...He intends only his own gain, and he is in this ... led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for society that it was no part of it. By pursuing his own interest he frequently promotes that of society more effectually than when he really intends to promote it."
--Adam Smith, *The Wealth of Nations* (1776)

MEASURING SENSITIVITY
Page 1

MEASURING SENSITIVITY

- Why do we care how sensitive one economic variable is to another?
- Why is *elasticity* a good measure of sensitivity?

Price and quantity demanded

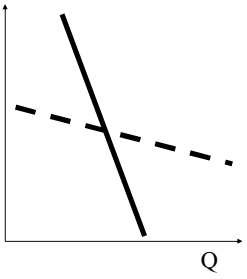
- "Law of Demand" says that quantity demanded will fall as price rises, but does not say by *how much.*
- Often would like to know how much.

When price sensitivity matters: examples

- Suppose cable TV company raises rates by 20%. How many fewer customers will they have?
- Suppose government wants to cut cigarette consumption in half. By how much must cigarette prices be raised?
- Suppose weather problems will cut a harvest by 10%. How much will prices rise?

Steepness of demand curves reveals sensitivity to price

- Steep curve implies quantity demanded is _____ to price.
- Flat curve implies quantity demanded is _____to price.



Price and quantity supplied

- "Law of supply" says that quantity supplied will rise as price rises, but does not say by *how much.*
- Often would like to know how much.

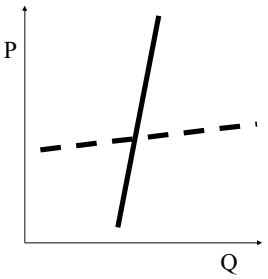
When price sensitivity matters: examples

- Suppose government is having trouble finding qualified applicants to fill civil service jobs. How many more applicants will it get if pay is increased by 10%?
- Suppose government wants to reduce milk production by 5%. By how much must milk prices be reduced?

MEASURING SENSITIVITY
Page 2

Steepness of supply curves reveals sensitivity to price

- Steep curve implies quantity supplied is _____ to price.
- Flat curve implies quantity supplied is _____to price.

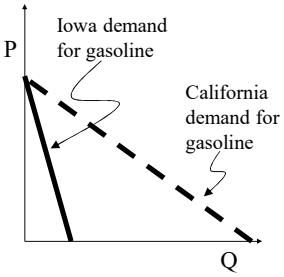


How to measure sensitivity of quantity to price?

- One possible formula is *slope,* defined as ratio of change in one variable to another.
- Slope (_____) or its reciprocal (_____) might seem like natural measures of sensitivity for either demand or supply.

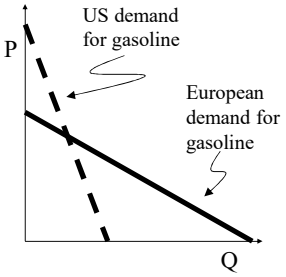
Why slope (ΔP/ΔQ) is not a good measure of sensitivity

- Even if each *individual person* behaves the same way, the bigger market always has _____ slope (in absolute value).



Why slope (ΔP/ΔQ) is not a good measure of sensitivity (continued)

- Slope depends on units of measure for quantity. Example: gallons v. _____.
- Slope depends on units of measure for price (currency). Example: dollars v. _____.



An alternative measure of sensitivity

- Instead of ratio of changes, use ratios of *percent changes*:

$$\frac{\%\text{ change in Q}}{\%\text{ change in P}} = \frac{\Delta Q / Q}{\Delta P / P}$$

- Any ratio of percent changes is called an *elasticity* in economics.

Why elasticity is more useful than slope

- If each *individual person* behaves the same way, then different sized markets have the _____ elasticity value.
- Percent changes are "pure numbers," and do not depend on the units of measure for _____ or _____.

MEASURING SENSITIVITY
Page 3

Conclusions

- Often we need to quantify the sensitivity of one variable to another variable.
- *Slopes*, which are ratios of changes, depend on the size of the market and the _____.
- Ratios of *percent* changes, called _____, do not have these problems and are more commonly used in economics.

THE PRICE ELASTICITY OF DEMAND
Page 1

THE PRICE ELASTICITY OF DEMAND

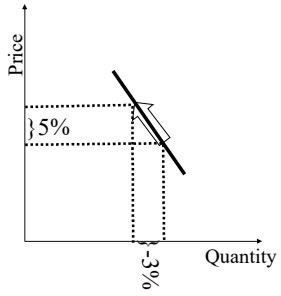
- What is the "price elasticity of demand"?
- What does its value reveal?

Price elasticity of demand: definition

- Price elasticity of demand:
$$\varepsilon = \frac{\%\ chg\ Q}{\%\ chg\ P} = \frac{\Delta Q/Q}{\Delta P/P}$$
where changes are measured along the demand curve.
- By the "Law of Demand," ε should be _____ (but many authors drop the negative sign).

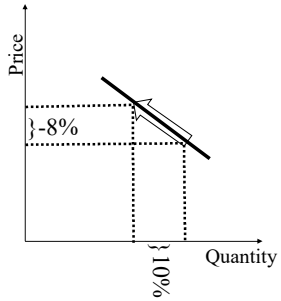
Price elasticity of demand: example

Suppose that when price of milk rises by 5 percent, the quantity demanded declines by 3 percent. Then
$$\varepsilon = \frac{\%\ chg\ Q}{\%\ chg\ P} = \frac{-3\%}{5\%}$$
=



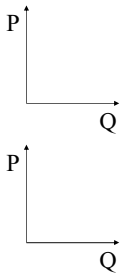
Price elasticity of demand: another example

Suppose that when price of airfares falls by 8 percent, then number of passengers increases by 10 percent. Then
$$\varepsilon = \frac{\%\ chg\ Q}{\%\ chg\ P} = \frac{10\%}{-8\%} =$$
=



What the value of $\varepsilon = \frac{\%\ chg\ Q}{\%\ chg\ P}$ means

- If Q is very sensitive to P,
  - then ε is _____ in absolute value,
  - say "demand is very elastic."
- If Q is *not* very sensitive to P,
  - then ε is _____ in absolute value,
  - say "demand is not very elastic."

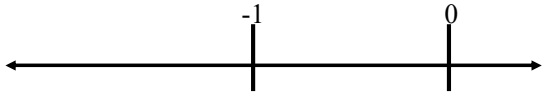


Some definitions

Unitary-elastic demand: $|\varepsilon| = 1$.

Elastic demand: $|\varepsilon| > 1$.

Inelastic demand: $|\varepsilon| < 1$.



THE PRICE ELASTICITY OF DEMAND
Page 2

Some estimates of price elasticities of demand

- Food: -0.21
- Medical services: -0.22
- Electricity: -1.14
- Automobiles: -1.20
- Beer: -0.26
- Wine: -0.88
- Cigarettes: -0.35

Source: Reported in Nicholson, *Microeconomic Theory: Basic Principles and Extensions, 6th edition*, Dryden, 1995, p. 219, table 7.3.

What determines ε? Close substitutes

- Demand is more elastic (|ε| is larger) if close substitutes for a good are available.
- Examples of goods with close substitutes: _____
- Examples of goods without close substitutes: _____

What determines ε? Share in total budget

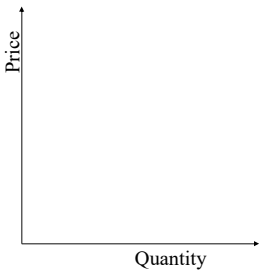
- Demand is more elastic (|ε| is larger) if the good occupies a large share of consumers' total budgets.
- Examples of goods that occupy a large share of consumers' budgets: _____
- Examples of goods that occupy a small share of consumers' budgets: _____

What determines ε? Time to respond

- Demand is more elastic (|ε| is larger) the more time consumers have had to anticipate and adjust to a price change.
- Examples where consumers have little time to respond to a price change: _____
- Examples where consumers have ample time to respond to a price change: _____

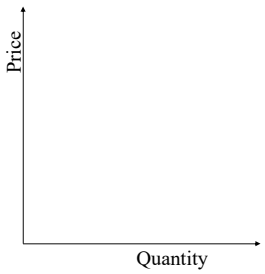
Extreme case: perfectly elastic demand

- $\varepsilon = \frac{\%\ chg\ Q}{\%\ chg\ P}$ = minus infinity.
- Even the smallest price increase reduces quantity demanded to zero.



Extreme case: perfectly inelastic demand

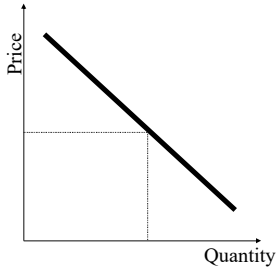
- $\varepsilon = \frac{\%\ chg\ Q}{\%\ chg\ P} = 0$.
- A price increase or decrease does not change quantity demanded.



THE PRICE ELASTICITY OF DEMAND
Page 3

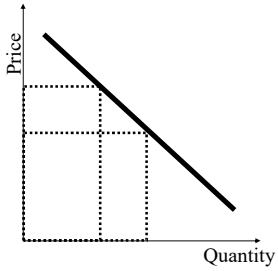
Spending (= revenue) and the demand curve

- Spending = P × Q
- Spending = area of rectangle whose upper right corner just touches the demand curve.



Effect of price change on spending

- A price increase affects spending two ways:
  - price increases.
  - quantity decreases.
- What happens to spending depends on which effect is stronger.



Changes in spending

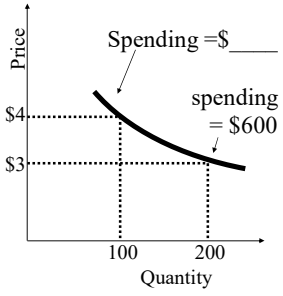
- Spending = P × Q.
- For small % changes in P and Q, this approximation holds:
  - % chg in spending = (% chg in P) + (% chg in Q)
- Example: If P increases by 1% and Q decreases by 3%, then spending ___creases by _____%

Effect of price increase on spending depends on elasticity = $\frac{\%\ chg\ Q}{\%\ chg\ P}$

- If |ε| > 1 ("elastic demand"), the % decrease in Q is larger than the % increase in P, so spending _____.
- If |ε| < 1 ("inelastic demand") , the % decrease in Q is smaller than the % increase in P, so spending _____.

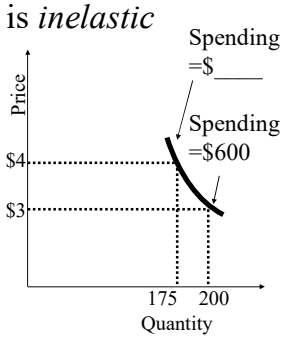
Effect of price increase on spending when demand is *elastic*

- % decrease in Q is _____ than % increase in P.
- Since spending = P × Q, it _____.



Effect of price increase on spending when demand is *inelastic*

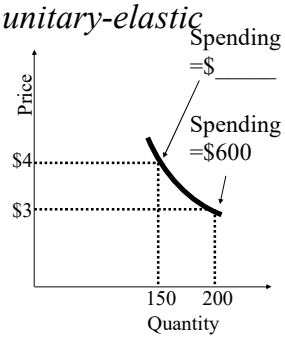
- % decrease in Q is _____ than % increase in P.
- Since spending = P × Q, it _____.



THE PRICE ELASTICITY OF DEMAND
Page 4

Effect of price increase on spending when demand is *unitary-elastic*

- Any change in P is matched by an _____ % change in Q in opposite direction.
- Since spending = P × Q, it _____.



Conclusions

- The *price elasticity of demand* (ε) is the _____ change in quantity demanded, divided by the _____ change in price.
- Its value depends on the availability of _____, the share of the good in consumers' budgets, and the time frame.
- *Elastic demand* means |ε| ____ 1.
- *Inelastic demand* means |ε| ____ 1.

CALCULATING ELASTICITIES
Page 1

CALCULATING ELASTICITIES

- How can we calculate the value of an elasticity from data?

Alternative formulas for the price elasticity of demand

Price elasticity of demand = ε

$$= \frac{\%\ change\ in\ quantity}{\%\ change\ in\ price}$$

$$= \frac{\Delta Q/Q}{\Delta P/P}$$

$$= \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

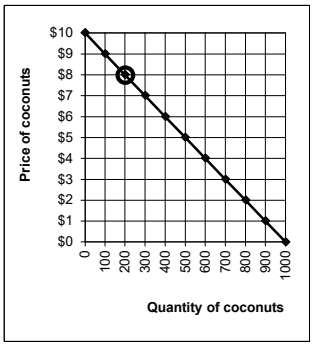
Computing elasticities at a point

- Given a particular demand curve, the elasticity can be computed at any point if the slope at that point is known.
- Just use the formula:

$$\varepsilon = \frac{\Delta Q / Q}{\Delta P / P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

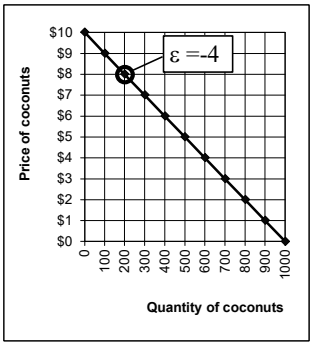
Computing elasticities at a point: example

- What is the elasticity when P=$8?
- ε = (ΔQ/ΔP) (P/Q).
- Now ΔQ/ΔP = reciprocal of slope, which is _____.
- When P=$8, Q=200.
- So ε=(1/-0.01)(8/200) = _____.



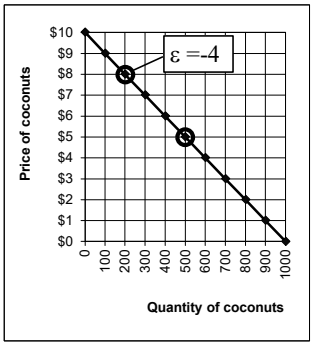
Computing elasticities at a point: example

- What is the elasticity when P=$8?
- ε = (ΔQ/ΔP) (P/Q).
- Now ΔQ/ΔP = reciprocal of slope, which is __-0.01___.
- When P=$8, Q=200.
- So ε=(1/-0.01)(8/200) = ___-4___.



Computing elasticities at a point: another example

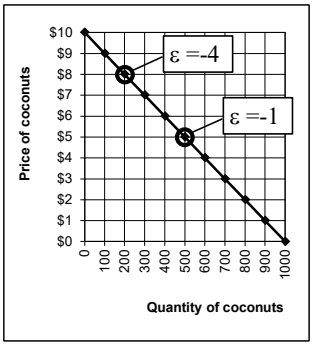
- What is the elasticity when P=$5?
- ε = (ΔQ/ΔP) (P/Q).
- Again ΔP/ΔQ = ____.
- When P=$5, Q=500.
- So ε=(1/-0.01)(5/500) = _____.



CALCULATING ELASTICITIES
Page 2

Computing elasticities at a point: another example

- What is the elasticity when P=$5?
- ε = (ΔQ/ΔP) (P/Q).
- Again ΔP/ΔQ = -0.01 .
- When P=$5, Q=500.
- So ε=(1/-0.01)(5/500) = ___-1___.

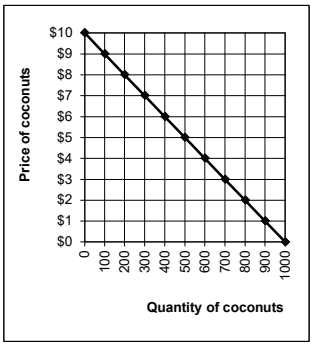


A straight-line demand curve has changing elasticity

- Along a straight line, the slope (ΔP/ΔQ) and its reciprocal (ΔQ/ΔP) are constant.
- But P and Q change, so elasticity value is _____ constant.

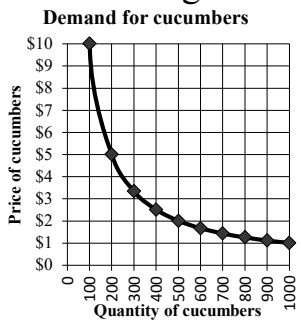
Elasticities near the intercepts

- ε = (ΔQ/ΔP) (P/Q).
- Near the price axis, Q approaches zero, so ε approaches _____.
- Near the quantity axis, P approaches zero, so ε approaches _____.



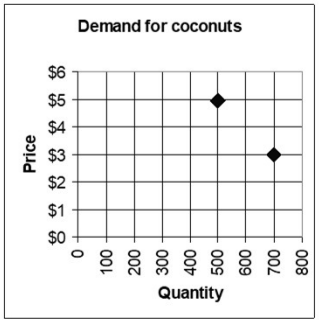
If a demand curve has constant elasticity, it cannot be straight

- For example, this curve has a constant price-elasticity of demand = _____ throughout.



Computing elasticities over an interval

- In many situations, may not have a complete graph or equation for demand curve.
- Might only have a couple of points.
- Example: test marketing.



The "arc-elasticity" formula

- To compute elasticities over an interval between two points, it is conventional to use this formula:

$$= \frac{\%\ change\ in\ quantity}{\%\ change\ in\ price} = \frac{\Delta Q / Q_{avg}}{\Delta P / P_{avg}}$$

- Note this formula computes both percent changes using _____ method.

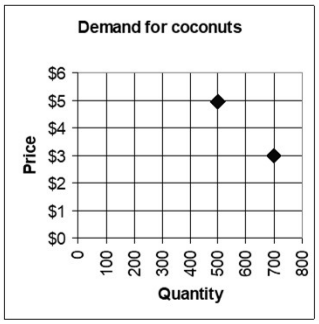
CALCULATING ELASTICITIES
Page 3

Computing elasticities over an interval: example

$$\varepsilon = \frac{\Delta Q / Q_{avg}}{\Delta P / P_{avg}}$$

$$= \frac{\quad / \quad}{\quad / \quad}$$

$$= \_\_\_\_\_$$



Conclusions

- Elasticity at any *point* on a demand curve can be computed using slope and coordinates at that point: (ΔQ/ΔP) (P/Q).
- Straight demand curves have constant slope but do _____ have constant elasticity.
- Elasticity over an *interval* between two points can be computed as ratio of percent changes computed by _____ method. This is called the _____.

CROSS-PRICE ELASTICITY OF DEMAND

Page 1

CROSS-PRICE ELASTICITY OF DEMAND

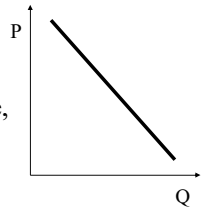
- What is the cross-price elasticity of demand?
- What does its value reveal?

The elasticity concept has many applications

- Recall: An *elasticity* is the ratio of percent changes between any two related variables.
- The elasticity of Y with respect to X is given by: $\frac{\%\text{ change in Y}}{\%\text{ change in X}} = \frac{\Delta Y / Y}{\Delta X / X}$
- The elasticity concept can be used to measure the sensitivity of quantity demanded to *any* other variable.

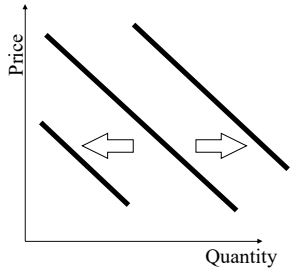
Other variables affecting the quantity demanded

- The quantity demanded also depends on:
  - prices of related goods.
  - income of consumers.
  - etc.
- When these variables change, the demand curve *shifts*.



Other demand elasticities

- Elasticities can be defined with respect to these other factors, too.
- Thus, these other elasticities measure the "shift-sensitivity" of the demand curve to changes in these variables.



Cross-price elasticity of demand: definition

- The cross-price elasticity of demand is defined by:

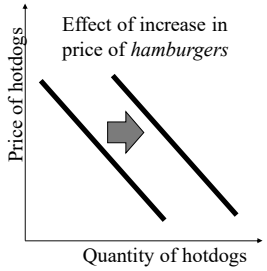
$$\alpha = \frac{\%\ change\ Q}{\%\ change\ P_{other}} = \frac{\Delta Q / Q}{\Delta P / P_{other}}$$

where P_{other} = price of a related good.

- Can be positive or negative.

What the sign of the cross-price elasticity of demand reveals

- If $\alpha > 0$, then any change in P_{other} leads to a change in Q demanded of the _____ sign.
- The related good is a _____.
- Example: hotdogs and hamburgers.

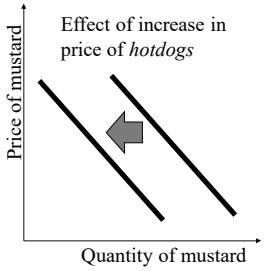


CROSS-PRICE ELASTICITY OF DEMAND

Page 2

What the sign of the cross-price elasticity of demand reveals (cont'd)

- If $\alpha < 0$, then any change in P_{other} leads to a change in Q demanded of the _____ sign.
- The related good is a _____.
- Example: mustard and hotdogs.



Values of cross-price elasticity: summary

$$\alpha = \frac{\%\ change\ Q}{\%\ change\ P_{other}} = \frac{\Delta Q/Q}{\Delta P/P_{other}}$$

- Complement 0 Substitute +

Guessing the sign of $\frac{\%\ change\ Q}{\%\ change\ P_{other}}$

Q	P_{other}	Substitutes or complements?	Sign of cross-price elasticity
Ink cartridges	Printers		
Frozen yogurt	Ice cream		
Salsa	Chips		
Burgers	Fries		
Electric vehicles	Gasoline		

Some estimates of cross-price elasticities of demand

- Elasticity of demand for butter with respect to price of margarine = **1.53**
- Elasticity of demand for electricity with respect to price of natural gas = **0.50**
- Elasticity of demand for coffee with respect to price of tea = **0.15**
- Are these examples of substitutes or complements?

Source: Reported in Nicholson, *Microeconomic Theory: Basic Principles and Extensions, 6th edition*, Dryden, 1995, p. 219, table 7.3.

Using the cross-price elasticity

- Suppose cross-price elasticity of demand for electricity with respect to natural gas = 0.5.
- Suppose the price of natural gas increases by 6 percent.
- What happens to the quantity demanded of electricity?

Using the cross-price elasticity (cont'd)

- Substitute:
- $\_\_\_\_ = \frac{\%\ change\ Q}{\%\ change\ P_{other}} = \frac{\%\ change\ Q}{\_\_\_\_\_}$
- Cross-multiply to find % change in quantity demanded of electricity = _____ %, an _____.

CROSS-PRICE ELASTICITY OF DEMAND
Page 3

Conclusions

- The *cross-price elasticity of demand* measures the sensitivity of demand to the price of another good.
- The cross-price elasticity is _____ for substitutes and _____ for complements.

INCOME ELASTICITY OF DEMAND
Page 1

INCOME ELASTICITY OF DEMAND

- What is the income elasticity of demand?
- What does its value reveal?

Income elasticity of demand: definition

- The income elasticity of demand is defined by:

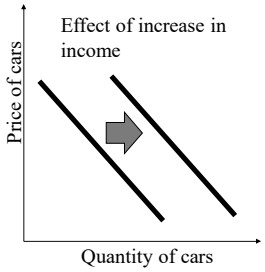
$$\eta = \frac{\%\ change\ Q}{\%\ change\ I} = \frac{\Delta Q/Q}{\Delta P/I}$$

where I = consumers' income.

- Typical value of η is about 1.

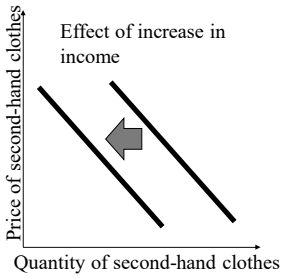
What the sign of the income elasticity of demand reveals

- If $\eta > 0$, then any change in income leads to an change in Q demanded of the _____ sign.
- This is a _____ good (usual case).
- Example: cars.



What the sign of the income elasticity of demand reveals (cont'd)

- If $\eta < 0$, then any change in income leads to an change in Q demanded of the _____ sign.
- This is an _____ good (rare).
- Example: second-hand clothes.



Some estimates of income elasticities of demand

• Food:	0.28
• Medical services:	0.22
• Electricity:	0.61
• Automobiles:	3.00
• Beer:	0.38
• Wine:	0.97
• Cigarettes:	0.50

Are these examples of normal goods or inferior goods?

Source: Reported in Nicholson, *Microeconomic Theory: Basic Principles and Extensions, 6th edition*, Dryden, 1995, p. 219, table 7.3.

Spending shares

- The share of a particular good in total spending is the amount spent on the good divided by income: $S = (P \times Q) / I$.
- Example: P_{gas} = \$1.50 per gallon, Q_{gas} = 20 gallons per week, I = \$500 per week. Therefore S = _____.

INCOME ELASTICITY OF DEMAND
Page 2

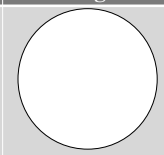
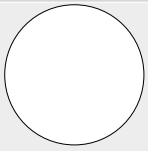
"Luxury" or "superior" goods

- If $\eta > 1$, an increase in I causes an even larger increase in Q, and therefore an _____ in S.
- Rich people spend a _____ share of their income on the good than poor people.
- Examples: _____.

"Necessary" goods

- If $\eta < 1$, but still positive, an increase in I causes a smaller increase in Q, and therefore a _____ in S.
- Rich people spend a _____ share of their income on the good than poor people.
- Examples: _____.

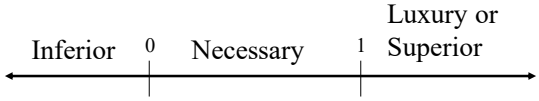
Necessary versus luxury goods

	Poor family's budget	Rich family's budget
Necessary good, like food		
Luxury good, like travel		

Necessary good or luxury good?

Good	Budget share, low income	Budget share, high income	Necessary good or luxury good?
Food	16%	11%	
Housing	42%	30%	
New cars	0.8%	4.0%	
Healthcare	10%	7%	
Entertain-ment	4.5%	6.2%	
Tobacco	1.1%	0.2%	
Alcohol	0.7%	1.0%	

Values of income elasticity: summary



$$\eta = \frac{\%\ change\ Q}{\%\ change\ I} = \frac{\Delta Q/Q}{\Delta P/I}$$

Some estimates of income elasticities of demand, revisited

- Food: 0.28
- Medical services: 0.22
- Electricity: 0.61
- Automobiles: 3.00
- Beer: 0.38
- Wine: 0.97
- Cigarettes: 0.50

Which are "luxury goods"?

Which are "necessary goods"?

Source: Reported in Nicholson, *Microeconomic Theory: Basic Principles and Extensions, 6th edition*, Dryden, 1995, p. 219, table 7.3.

INCOME ELASTICITY OF DEMAND

Page 3

Using the income elasticity

- Suppose income elasticity of demand for beer = 0.4.
- Suppose income increases by 5 percent.
- What happens to the quantity demanded of beer?

Using the income elasticity (cont'd)

- Substitute:
- $\_\_\_\_\_ = \frac{\%\ change\ Q}{\%\ change\ I} = \frac{\%\ change\ Q}{\_\_\_\_\_}$
- Cross-multiply to find % change in quantity demanded of beer = _____ %, an _____.

Conclusions

- The *income elasticity of demand* measures the sensitivity of demand to the consumer's income.
- The income elasticity is _____ for normal goods, _____ for inferior goods (rare).
- Normal goods include luxury goods (η 1) and necessary goods (η 1).

THE PRICE ELASTICITY OF SUPPLY
Page 1

THE PRICE ELASTICITY OF SUPPLY

- What is the price elasticity of supply?
- What does its value reveal?

The elasticity concept has many applications

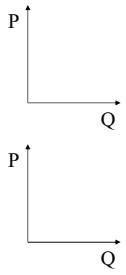
- Recall: *elasticity* is ratio of percent changes between any two related variables.
- Elasticity of Y with respect to X is
$$\frac{\%\ change\ Y}{\%\ change\ X} = \frac{\Delta Y/Y}{\Delta X/X}$$
- In principle, elasticity concept can be used to measure sensitivity of *any* variable to *any other* variable.

Price elasticity of supply: definition

- The price elasticity of supply is defined by $\beta = \frac{\%\ change\ Q}{\%\ change\ P} = \frac{\Delta Q/Q}{\Delta P/P}$.
where changes are measured along the _____ curve.
- By the "Law of Supply," β must be 0.

What the value of β means

- If Q is very sensitive to P,
  - then β is _____ .
  - say "supply is more elastic."
- If Q is *not* very sensitive to P,
  - then β is _____ .
  - say "supply is less elastic."



What determines β?

Supply is more elastic (β is larger):

- if inputs required in production have lots of other uses. Example: _____
_____
_____.
- if producers have lots of time to anticipate and adjust to price changes. Example: _____
_____
_____.

Extreme case: perfectly elastic supply

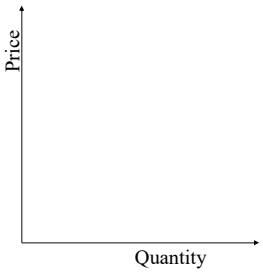
- β = infinity.
- even the smallest price decrease reduces quantity supplied to zero.
- Example: _____
_____

THE PRICE ELASTICITY OF SUPPLY
Page 2

Extreme case: perfectly inelastic supply

- $\beta = 0$.
- a price increase or decrease does not change quantity supplied.
- Example:

_____



Some estimates of long-run elasticities of supply

- Corn: 0.27
- Wheat: 0.03
- Aluminum: nearly infinite
- Coal (eastern US): 15.
- Natural gas (US) 0.50

Source: Reported in Nicholson, *Intermediate Microeconomics and Its Application, eighth edition,* Fort Worth: Dryden, 2000, page 258, table 8.3 .

Conclusions

- The *price elasticity of supply* is the percent change in quantity supplied, divided by the percent change in price.
- It is _____ if the inputs required to produce the good are freely available and have many alternative uses, and if producers have _____ to adjust to price changes.

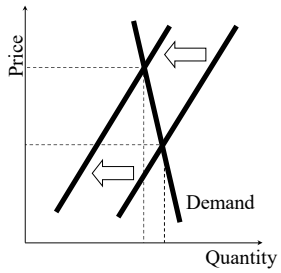
USING PRICE ELASTICITIES
Page 1

USING PRICE ELASTICITIES

- How can we use elasticity values to predict the effect of market changes?

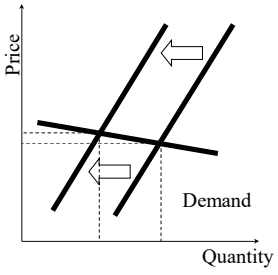
Predictions

- We already know how to make rough qualitative predictions of the effects of market changes.
- We know that if supply shifts left, P rises and Q falls.



Exact predictions

- But *how much* does P rise and Q fall?
- The same supply shift could have very different consequences.
- To make *quantitative* predictions, we need to know *how steep* the curves are.



Movements along curves

- Using elasticity values, we can make *exact quantitative* predictions.
- We now consider how to use _____ elasticities to compute
  - movements along the demand curve.
  - movements along the supply curve.

Using price elasticity of demand

- Recall: price elasticity of demand = ε =

$$\frac{\%\text{ change in Q}}{\%\text{ change in P}} = \frac{\Delta Q / Q}{\Delta P / P}$$

measured along the demand curve.
- If we know ε, and either the % change in Q or the % change in P, we can compute the other quantity.

Using price elasticity of demand: cable TV rates

- Suppose the price elasticity of demand for cable TV service is -1.2 and rates drop by 5%.
- We know the number of customers will increase, but by how much?
- Given: $-1.2 = \frac{\%\text{ change in Q}}{\%\text{ change in P}} = \frac{\%\text{ change in Q}}{-5\%}$
- So number ___creases by ____%.

USING PRICE ELASTICITIES
Page 2

Using price elasticity of demand: cable TV rates (cont'd)

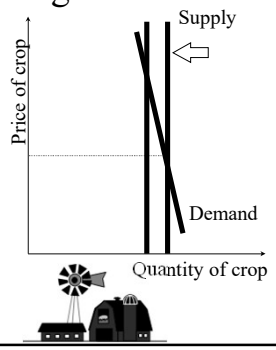
- What will happen to cable TV company revenue?
- Since Revenue = P × Q, approximately

$$\begin{pmatrix}\%\text{ change}\\ \text{in Revenue}\end{pmatrix} = \begin{pmatrix}\%\text{ change}\\ \text{in P}\end{pmatrix} + \begin{pmatrix}\%\text{ change}\\ \text{in Q}\end{pmatrix}$$

- Then revenue ___creases by _____%.

Using price elasticity of demand: supply shifts in agriculture

- Supply shifts are common in agriculture because of variations in weather, pests, etc.
- Demand for most crops is inelastic: $|\varepsilon| < 1$.
- So quantity changes are _____ (in %) than price changes.



Using price elasticity of demand: supply shifts in agriculture (cont'd)

- Suppose ε = -2/3 and bad weather causes equilibrium quantity to drop by 10%.
- We know the price will increase, but by how much?
- Given: $-2/3 = \dfrac{\%\text{ change in Q}}{\%\text{ change in P}} = \dfrac{-10\%}{\%\text{ change in P}}$
- So price ____creases by ____%.

Using price elasticity of demand: supply shifts in agriculture (cont'd)

- What will happen to farmers' revenue?
- Recall:

$$\begin{pmatrix}\%\text{ change}\\ \text{in Revenue}\end{pmatrix} = \begin{pmatrix}\%\text{ change}\\ \text{in P}\end{pmatrix} + \begin{pmatrix}\%\text{ change}\\ \text{in Q}\end{pmatrix}$$

- Therefore in this example, farmer's revenue ___creases by ____%

Using price elasticity of supply

- Recall: price elasticity of supply = β =

$$\frac{\%\text{ change in Q}}{\%\text{ change in P}} = \frac{\Delta Q / Q}{\Delta P / P}$$

measured along the supply curve.
- If we know β, and either the % change in Q or the % change in P, we can compute the other quantity.

Using price elasticity of supply: natural gas prices

- Suppose the price elasticity of supply for natural gas is 0.5 and the price is expected to increase by 8%.
- We know the amount of natural gas produced will increase, but by how much?
- Given: $0.5 = \dfrac{\%\text{ change in Q}}{\%\text{ change in P}} = \dfrac{\%\text{ change in Q}}{8\%}$
- So quantity ___creases by _____%.

USING PRICE ELASTICITIES
Page 3

Using price elasticity of supply: natural gas (cont'd)

- What will happen to revenue of natural gas producers?
- Since Revenue = P x Q, approximately

$$\begin{pmatrix}\%\text{ change}\\ \text{in Revenue}\end{pmatrix} = \begin{pmatrix}\%\text{ change}\\ \text{in P}\end{pmatrix} + \begin{pmatrix}\%\text{ change}\\ \text{in Q}\end{pmatrix}$$

- Then revenue ___creases by _____%.

Conclusions

- Price elasticities can be used to compute exact predictions of the effect of price changes on the _____ demanded or supplied.
- If we know the elasticity and either the _____ change or the _____ change, we can compute the remaining number.
- We can also compute the change in _____ (or spending).

EFFECTS OF INTERNATIONAL TRADE
Page 1

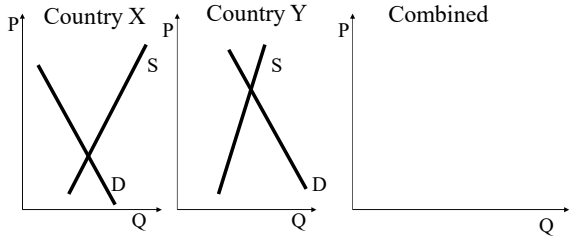
EFFECTS OF INTERNATIONAL TRADE

- How does international trade affect individual markets?
- Who wins and who loses?

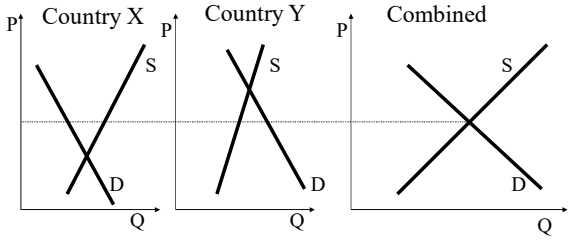
Consumption versus production

- With international trade, the amount a country consumes of a particular good need not equal the amount it produces.
- A country can consume more than it produces if it _____ the difference.
- A country can consume less than it produces if it _____ the difference.

International trade creates a combined market for trading countries



Price is set by combined market



Where do the combined demand and supply curves come from?

- Quantity demanded in combined market = sum of _____ demanded by all countries.
- Quantity supplied in combined market = sum of _____ supplied by all countries.
- A single price holds for all countries.

Example: equilibrium without international trade

	Country A		Country B	
Price	Quantity demanded	Quantity supplied	Quantity demanded	Quantity supplied
$1	50	30	45	5
$2	40	40	40	10
$3	30	50	35	15
$4	20	60	30	20
$5	10	70	25	25
$6	0	80	20	30

EFFECTS OF INTERNATIONAL TRADE
Page 2

Example: equilibrium with international trade

	Country A		Country B		Combined	
P	Q_D	Q_S	Q_D	Q_S	Q_D	Q_S
$1	50	30	45	5		
$2	40	40	40	10		
$3	30	50	35	15		
$4	20	60	30	20		
$5	10	70	25	25		
$6	0	80	20	30		

Example: imports and exports

- At the international price of $3,
- Country A demands 30 and supplies 50, so Country A _____.
- Country B demands 35 and supplies 15, so Country B _____.

Why is international trade controversial? Reason #1

- International trade creates winners and losers in each country.
- When the price goes up, _____ lose and _____ win.
- When the price goes down, _____ win and _____ lose.

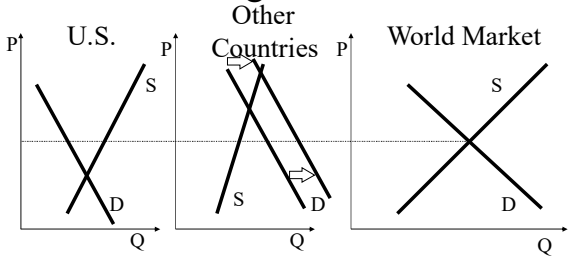
Example: winners and losers

- In Country A, the price *rose* from $2 to $____, so consumers are _____ and producers are _____.
- In Country B, the price *fell* from $5 to $____, so consumers are _____ and producers are _____.
- There were winners and losers in each country.

Why is international trade controversial? Reason #2

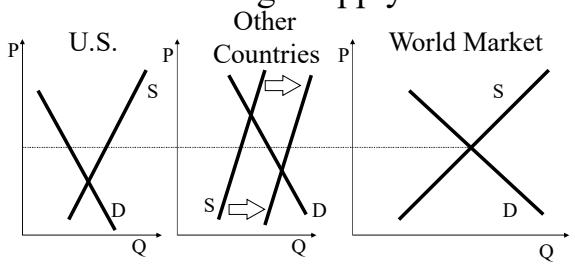
- With international trade, the equilibrium price depends on the combined demands and supplies of _____ trading countries.
- So, if demand or supply shifts in any country, the equilibrium price will change for _____ countries.

Effects of rightward shift in foreign demand



EFFECTS OF INTERNATIONAL TRADE
Page 3

Effects of rightward shift in foreign supply



Conclusions

- International trade _____ markets.
- The same price (or nearly the same price) now prevails everywhere.
- International trade creates winners and losers in _____ country.
- Shifts in demand or supply in one country now affect price _____.

ECONOMIC EFFICIENCY AND WELFARE ANALYSIS
Page 1

ECONOMIC EFFICIENCY AND WELFARE ANALYSIS

- How can we measure gains and losses from changes in the economy?

Economics and public policy

- An important application of economics is deciding whether government policies are worthwhile.
- *Welfare economics* = branch of economics that tries to quantify the benefits and costs of government policies, and other changes in the economy.

"Win-win" changes

- Occasionally, a policy or other change in the economy creates one or more winners and _____ losers.
- A change that creates at least one winner and _____ losers is called a *Pareto improvement*.*

*Vilfredo Pareto, 1848-1923, Italian economist working in France.

Example of a Pareto improvement

- Suppose at a particular intersection, cars initially are not permitted to turn right while traffic light is red.
- Then rule is changed so that cars may turn right on red. Assuming no safety issues...
- Drivers wanting to turn right _____.
- Other drivers _____.

"Win-lose" changes

- Unfortunately, most changes in the economy create _____ winners and losers.
- Example: The invention of radial tires, which last several times as long as older designs, reduced employment in the U.S. tire industry by an estimated 40%.

Examples of "win-lose" changes

Change	Winners	Losers
Invention of radial tires		
Invention of personal computers		
Quotas on imports of peanuts		
Elimination of quotas on imports of clothing		

ECONOMIC EFFICIENCY AND WELFARE ANALYSIS
Page 2

Deciding on "win-lose" changes

- If a proposed government policy creates both winners and losers, how can we decide whether it *should* be done?
- This is a problem in _____ economics.
- Economists in the 1930s proposed a conceptually simple test.

The compensation test of Kaldor and Hicks

- If the gains to the winners are greater than the losses to the losers, the change is said to pass the *compensation test*.
- In principle, winners could potentially compensate losers and still come out ahead.
- In practice, winners rarely do so.

Nicholas Kaldor, "Welfare Propositions of Economics and Interpersonal Comparisons of Utility," *The Economic Journal*, Vol. 49, No. 195 (Sept. 1939), p. 550.
John R. Hicks, "The Foundations of Welfare Economics," *The Economic Journal*, Vol. 49, No. 196 (Dec. 1939), pp. 710-711.

Potential Pareto improvement

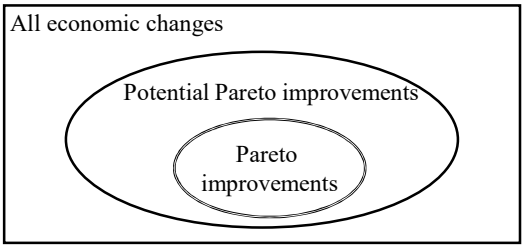
- A change that passes the compensation test is also called a *potential Pareto improvement* because if compensation were paid, it would be a *Pareto improvement.*
- Note that for any such change, if we add up the gains and losses to everyone in society, we get a _____ number.

Example of potential Pareto improvement

- Suppose a government program benefits farmers by $5 billion but costs taxpayers $3 billion.
- This program _____ the compensation test.
- It is also called a _____ Pareto improvement (even if farmers do not actually compensate taxpayers).

Pareto improvements versus potential Pareto improvements

- Venn diagram



Calculating gains and losses

- To add up gains and losses, they must be in the same units.
- Conventionally, economists use _____ (or some other currency).
- Often, gains and losses occur through changes in prices.
- Gains and losses are then measured as changes in consumer or producer _____.

ECONOMIC EFFICIENCY AND WELFARE ANALYSIS
Page 3

Economic efficiency

- If a policy or other change creates a net gain or benefit for society, it is said to _____ *economic efficiency.*
- If a policy or other change creates a net loss for society, it is said to _____ *economic efficiency.*
  - The amount of net social loss is sometimes called the "deadweight loss."

Does the compensation test always give the right answer?

- **Should** we add up gains and losses without regard to who gets them?
- This is a _____ question.
- Yes, if you feel that ... _____.
- No, if you feel that ... _____.

Criticisms of the compensation test: What about the losers?

- In practice, winners rarely compensate losers.
- If you feel the losers are much more deserving than the winners, you might _____ a policy that passes the compensation test.
- For example, if you feel that tire workers are more deserving than tire consumers, you might _____ banning radial tires.

Criticisms of the compensation test: Efficiency versus equity

- Sometimes an increase in economic efficiency brings a decrease in _____ (equality, fairness).
- For example, suppose a policy makes rich people better off by $2 billion and makes poor people worse off by $1 billion.
- Passes compensation test but makes society less equal.

But consistent use of the compensation test might spread losses around

- If the compensation test is applied to *many* policy decisions, _____ will benefit at least some of the time.
- For example, tire workers are also consumers of garments and peanuts.
- If we stick to the compensation test for *all* decisions, maybe _____ can be a net winner overall.

Conclusions

- A change where at least one person gains and no one loses is called a _____ improvement.
- A change where the gains to the winners are greater than the losses to the losers passes the _____, is a _____ Pareto improvement, and increases economic _____.

WELFARE ANALYSIS OF INTERNATIONAL TRADE
Page 1

WELFARE ANALYSIS OF INTERNATIONAL TRADE

- How can we quantify the welfare effects of international trade?
- Do the gains to the winners exceed the losses to the losers?

International trade: review

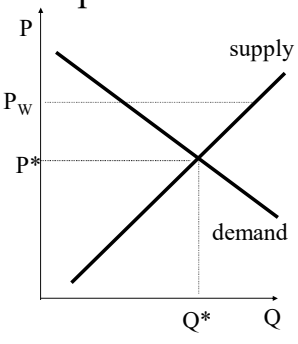
- International trade merges markets in different countries.
- The amount a country consumes of a particular good need no longer equal the amount it produces.
- Price is determined by the intersection of _____ supply and demand, not supply and demand in any one country.

Effects of international trade on domestic markets

- World price can be either *above or below* domestic price without international trade.
- If *above*, then the country's _____ lose from trade and its _____ win.
- If *below*, then the country's _____ lose from trade and its _____ win.
- But how do the gains to the winners compare with the losses to the losers?

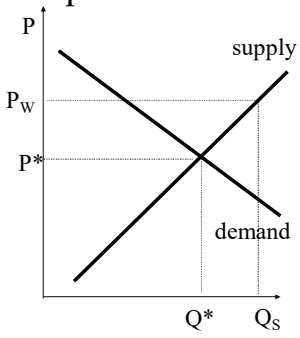
What happens if world price is above domestic price

- Price rises from P* to P_W.
- Domestic producers now sell Q_S.
- Domestic consumers buy only Q_D.
- Difference is _____ .



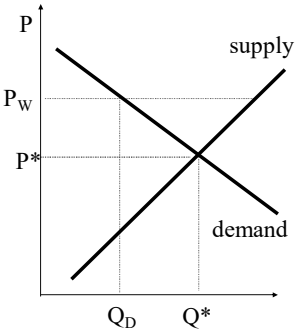
World price > domestic price: effect on domestic producers

- Producers sell more units at a higher price.
- Producer surplus increases by the area of the large trapezoid.



World price > domestic price: effect on domestic consumers

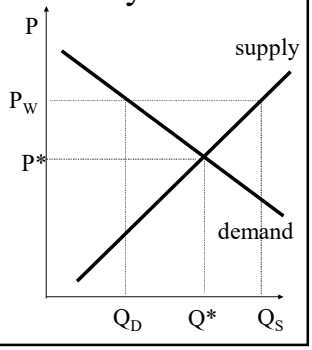
- Consumers buy fewer units at a higher price.
- Consumer surplus decreases by the area of the small trapezoid.



WELFARE ANALYSIS OF INTERNATIONAL TRADE
Page 2

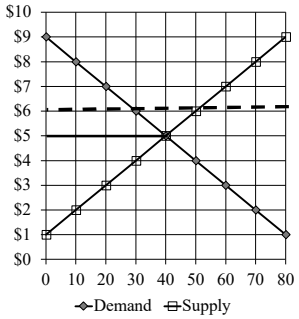
World price > domestic price: net gain for society

- Gain to producers is greater than loss to consumers by the amount of the top triangle.
- Net gain to country from international trade is _____.



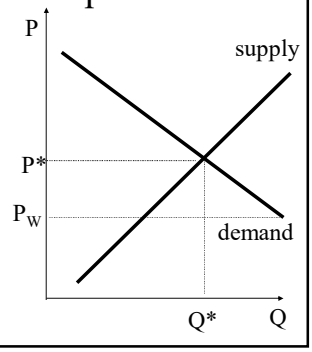
Example: world price > domestic price

- Suppose P_W = $ 6.
- PS increases by $_____.
- CS decreases by $_____.
- Net gain to whole country = $_____.



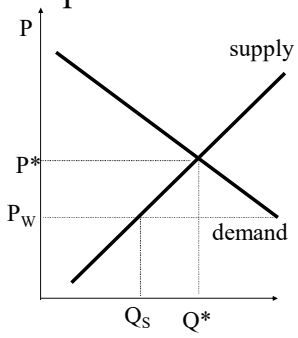
What happens if world price is below domestic price

- Price falls from P* to P_W.
- Domestic consumers now buy Q_D.
- Domestic producers sell only Q_S.
- Difference is _____ .



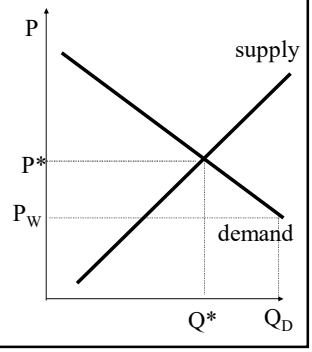
World price < domestic price: effect on domestic producers

- Producers sell fewer units at a lower price.
- Producer surplus decreases by the area of the small trapezoid.



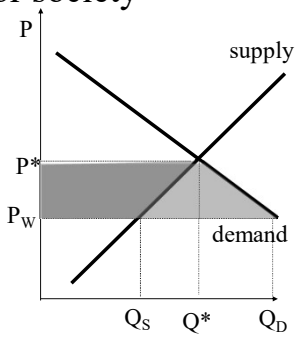
World price < domestic price: effect on domestic consumers

- Consumers buy more units at a lower price.
- Consumer surplus increases by the area of the large trapezoid.



World price < domestic price: net gain for society

- Gain to consumers is greater than loss to producers by the amount of the bottom triangle.
- Net gain to country from international trade is _____.

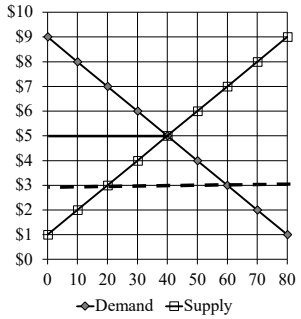


WELFARE ANALYSIS OF INTERNATIONAL TRADE

Page 3

Example: world price < domestic price

- Suppose P_W = $ 3.
- CS increases by $_____.
- PS decreases by $_____.
- Net gain to whole country = $_____.



Why economists generally support free international trade

- Whether the world price is above or below the domestic price determines who wins and who loses from international trade.
- But the gains to winners must always _____ the losses to losers.
- Therefore net gain to country from international trade is _____.
- International trade passes the _____ test.

Conclusions

- International trade creates winners and losers in every country.
- If the price rises, PS _____ and CS _____.
- If the price falls, PS _____ and CS _____.
- However, the gains to the winners always _____ the losses to the losers.
- Net gain to country from international trade is _____.

ARBITRAGE
Page 1

ARBITRAGE

- What is arbitrage?
- How does it affect prices in different locations?

What is arbitrage?

- *Arbitrage* = buying a good at a place where its price is _____ and reselling it where its price is _____, to make money.
- Opportunities for arbitrage exist if:
  - there exists a price difference between two places.
  - costs of arbitrage are _____ than that price difference.

Costs of arbitrage

- Costs of finding out prices in other places and locating buyers and sellers.
- Costs of transporting goods.
  - Some goods are cheap to move: _____ _____
  - Some goods are expensive to move: _____

Who can engage in arbitrage?

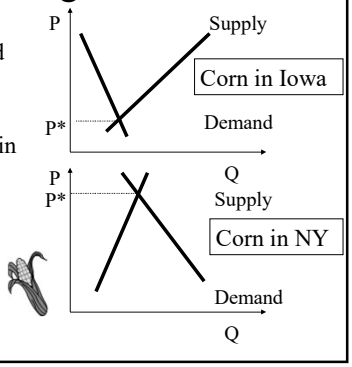
- In free-market economies, anyone.
- Producers arbitrage by redirecting their output to different markets.
- Some people have full-time jobs arbitraging financial markets (stocks, bonds, foreign currency, etc.).

How does arbitrage affect markets?

- Arbitrageurs always buy _____ and sell _____.
- Arbitraging tends to reduce price differentials between markets, although arbitrageurs don't want this to happen.
- In equilibrium, there are _____ arbitrage opportunities.

How arbitrage works

- Demand is increased in the low-priced location.
- Supply is increased in the high-priced location by same amount.
- Price differential is reduced.



ARBITRAGE
Page 2

Limits to arbitrage if there are no costs of arbitrage

- Arbitrage will continue until prices are equal in both locations.
- Locations become one big market, obeying the "law of one price."
- Examples of goods with negligible costs of arbitrage:
  _____

Limits to arbitrage if arbitrage is costly

- Arbitrage will continue until the price differential falls below the cost of arbitrage.
- So in equilibrium, prices at two locations cannot differ by more than the cost of arbitrage.
- Examples of goods with high costs of arbitrage:
  _____
  _____

Example: if there are arbitrage opportunities, then market is out of equilibrium

Suppose
- price of pumpkins in Des Moines = $3.
- cost of shipping pumpkins between Des Moines and Chicago = $1.50.

Price of pumpkins in Chicago	Are there arbitrage opportunities?	Is market in or out of equilibrium?
$1		
$2		
$3		
$4		
$5		

Equilibrium = no more arbitrage opportunities

- Suppose tomatoes are selling for $1 per pound in Des Moines and it costs $0.40 per pound to ship tomatoes between Des Moines and Minneapolis.
- In equilibrium, the price in Minneapolis must be between
  _____ and _____.

Who wins and who loses from arbitrage (other than the arbitrageurs)?

- Winners are:
  - _____ in location where price rises,
  - _____ in location price falls.
- Losers are:
  - _____ in location where price falls,
  - _____ in location where price rises.

Conclusions

- *Arbitrageurs* buy in one location for resale in another.
- The unintended effect of arbitrage is to _____ price differentials across locations.
- In equilibrium, price differentials are _____ the cost of arbitrage.

PRICE CONTROLS
Page 1

PRICE CONTROLS

- What happens when a market is subject to price controls?
- Who wins and who loses?

What are price controls?

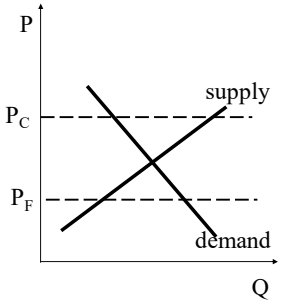
- *Price floor* = *minimum price* = price below which a good may not legally be traded.
- *Price ceiling* = *maximum price* = price above which a good may not legally be traded.

Binding versus nonbinding price controls

- Not all price control laws have an effect on the market.
- A price control is *binding* if it actually prevents the price from reaching market equilibrium.
- A *nonbinding* price control has ____ effect.

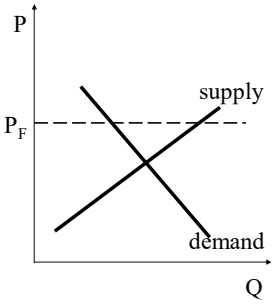
Nonbinding price controls

- A price ceiling above the market equilibrium price is not binding.
- A price floor below the market equilibrium price is not binding.
- Henceforth, we consider only *binding* price controls.



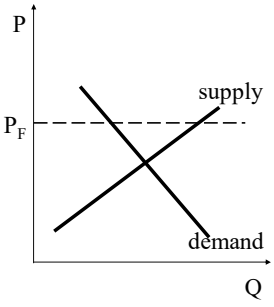
How a price floor works

- A price floor creates permanent excess _____.
- Some suppliers are not able to sell all they want at the legal minimum price.



Effect of price floor on quantity traded

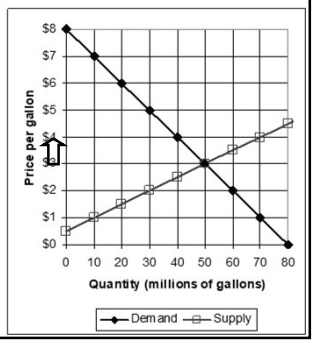
- Quantity actually traded is _____ than equilibrium quantity.



PRICE CONTROLS
Page 2

Example of a price floor

- Suppose in this market, a price floor of $4 is imposed.
- Excess supply = _____ million gallons.
- Quantity actually traded = _____ million gallons.



Who gains and who loses from a price floor?

- Buyers all _____ because they pay a higher price than they would otherwise.
- Sellers who get into the market _____ because they receive a higher price than they would otherwise.
- However, some sellers are excluded (or at least sell less than they would otherwise). They _____.

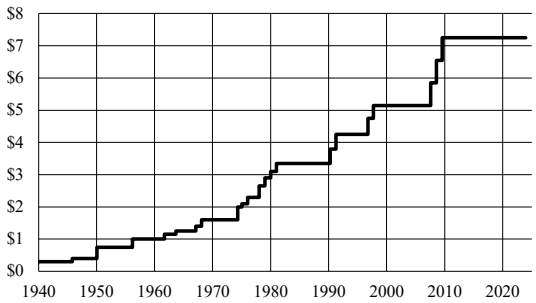
Example of price floor: agricultural price supports

- *Agricultural price supports* are not legal minimum prices, but rather price targets set by the government.
- To keep prices high, the government must either:
  - increase demand (by buying and destroying output).
  - reduce supply (by paying farmers to grow less and/or excluding foreign suppliers).

Example of price floor: minimum wages

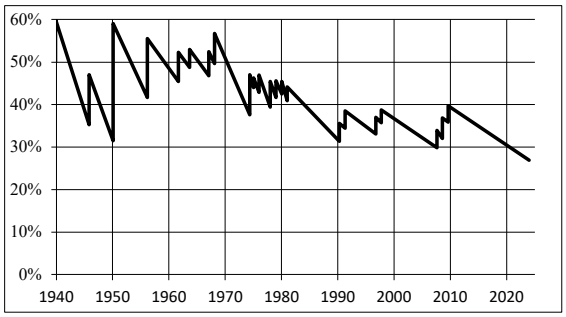
- *Minimum wage laws* are simple legal minimum prices, not enforced by supply or demand intervention.
- If binding, they contribute to unemployment.
- However, U.S. min. wage laws are probably binding on only a small fraction of the labor force—mostly young unskilled workers.

U.S. federal minimum wage



SOURCE: https://www.dol.gov/general/topic/wages/minimumwage

Federal minimum wage as percent of average manufacturing wage



SOURCE: www.bls.gov, data series CEU3000000008

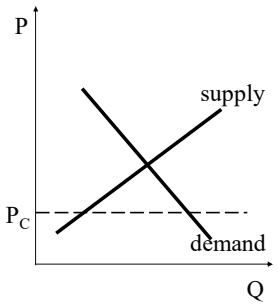
PRICE CONTROLS
Page 3

Other examples of price floors

- Airlines and trucking before federal deregulation in 1980.
- Prices were kept well above equilibrium by federal regulatory agencies.
- Excess supply was controlled by regulating entry of new firms, as well as regulating prices.

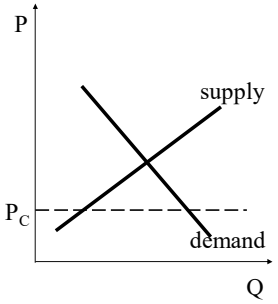
How a price ceiling works

- A price ceiling creates permanent excess _____.
- Some demanders are not able to buy all they want at the legal maximum price.



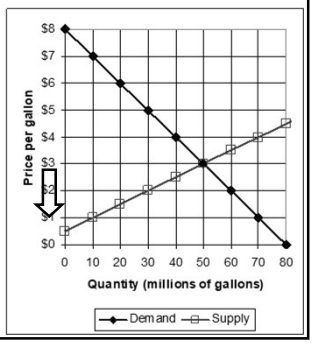
Effect of price ceiling on quantity traded

- Quantity actually traded is _____ than equilibrium quantity.



Example of a price ceiling

- Suppose in this market, a price ceiling of $1 is imposed.
- Excess demand = _____ million gallons.
- Quantity actually traded = ____ million gallons.



Who gains and who loses from a price ceiling?

- Sellers all _____ because they receive a lower price than they would otherwise.
- Buyers who get into the market _____ because they pay a lower price than they would otherwise.
- However, some buyers are excluded (or at least buy less than they would otherwise). They _____.

Example of price ceiling: usury laws

- *Usury laws* restrict the rate of interest that can be charged on loans.
- Once widespread in U.S.
- Binding if market interest rate > ceiling.
- Generate "credit crunches" if binding—becomes very difficult to borrow.
- Still binding on persons with little credit or collateral. Why?

PRICE CONTROLS
Page 4

More examples of price ceiling

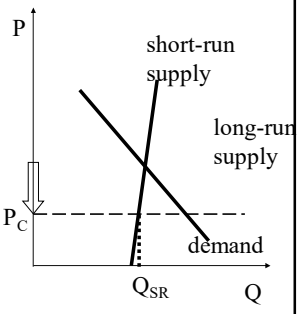
- General price controls imposed by President Nixon from August 1971 to April 1974 to restrain inflation.
- Price controls on petroleum lasted till January 1981 (lifted by President Reagan).

Example of price ceiling: rent control

- *Rent control ordinances* restrict rents that can be charged for apartments.
- Some cities have rent controls that are not probably not binding.
- New York City has strong, binding, rent control ordinance dating from World War II.

Rent control reduces quantity of housing more in the long run than short run

- Short-run supply of housing is nearly perfectly inelastic.
- Response is slow.
- Long-run supply of housing is more elastic.



Other examples of price ceilings

- Food prices in some developing countries.
- Create excess _____ for food, unless demand is restrained by rationing or supply is boosted by subsidies.

Conclusions

- *Price controls* keep price away from its equilibrium level and _____ the quantity traded in a market.
- Buyers all _____ from a *price floor*, but sellers who can still get into the market win.
- Sellers all _____ from a *price ceiling*, but buyers who can still get into the market win.

QUOTAS
Page 1

QUOTAS

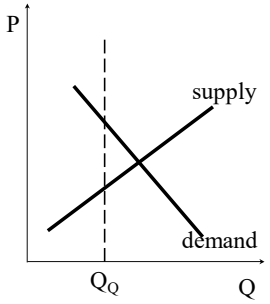
- What happens when a market is subject to a quota?
- Who wins and who loses?

What is a quota?

- A legal restriction specifying the maximum quantity that may be bought or sold in a market.
- Usually administered by giving buyers or sellers *permits* to buy or sell specified amounts of the good.
- Sometimes buyers or sellers must buy permits or bid for them in an auction.

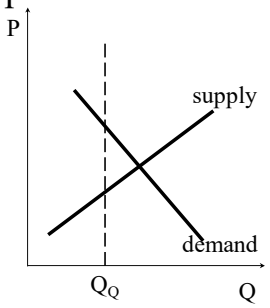
How a quota on SELLERS works

- If quota is binding, some suppliers are not able to sell all they want.
- Quantity traded is _____ than equilibrium quantity.



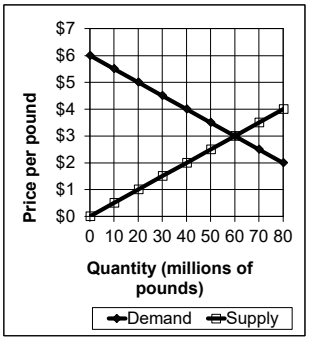
How a quota on sellers affects product price

- The legal **supply** curve bends up vertically at Q_Q.
- Product price is _____ than equilibrium price (as in a price floor).



Example of a quota on sellers

- Suppose in this market, a quota of 40 million is imposed on sellers.
- Equilibrium price is $_____.



Who gains and who loses from a quota on sellers?

- Buyers all _____ because they pay a higher price than they would otherwise.
- Sellers who are given quotas _____ because they receive a higher price than they would otherwise.
- If sellers must pay for quotas (e.g., by bidding at an auction) then they do not gain.
- In any case, some sellers are excluded (or at least sell less than otherwise). They _____.

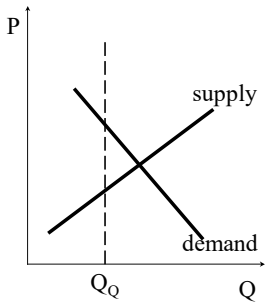
QUOTAS
Page 2

Examples of quotas on sellers: licensing

- Some licensing laws restrict the number of sellers.
- Sometimes this is explicit:
  - Examples: _____
- Sometimes this may be implicit, disguised as a difficult licensing exam.
  - Examples: _____

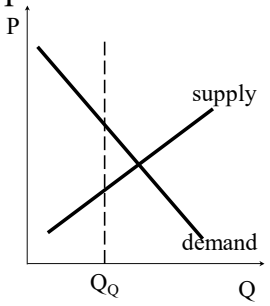
How a quota on BUYERS works

- If the quota is binding, some demanders are not able to buy all they want.
- Quantity traded is _____ than equilibrium quantity.



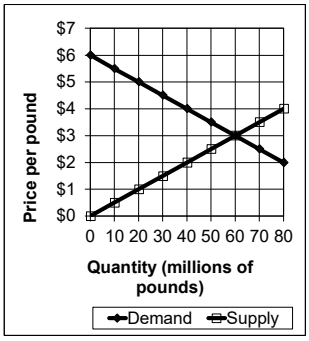
How a quota on buyers affects product price

- The legal **demand** curve drops down vertically at Q_Q.
- Price is _____ than equilibrium price (as in a price ceiling).



Example of a quota on buyers

- Suppose in this market, a quota of 20 million is imposed on buyers.
- Equilibrium price is $_____.



Who gains and who loses from a quota on buyers?

- Sellers all _____ because they receive a lower price than they would otherwise.
- Buyers who are given quotas _____ because they pay a lower price than they would otherwise.
- If buyers must pay for quotas (e.g., by bidding at an auction) then they do not gain.
- In any case, some buyers are excluded (or at least buy less than otherwise). They _____.

Examples of quotas on buyers

- Rationing tickets for flour, sugar, gasoline and many other items during World War II.
  - Explicit purpose was to keep prices low while diverting production to war effort.
- Gasoline rationing was proposed during oil embargo of 1970s, but never used.

QUOTAS
Page 3

Conclusions

- *Quotas* keep the quantity traded _____ its equilibrium level and distort the market price.
- A *quota on sellers* _____the market price. Buyers all lose but sellers who can still trade win.
- A *quota on buyers* _____the market price. Sellers all lose but buyers who can still trade win.

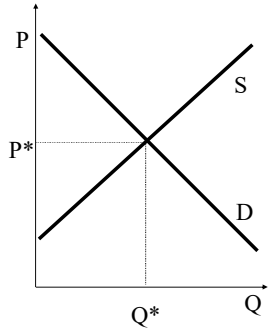
WELFARE ANALYSIS OF PRICE CONTROLS AND QUOTAS
Page 1

WELFARE ANALYSIS OF PRICE CONTROLS AND QUOTAS

- How can we measure the welfare effects of price controls or quotas?
- Do the gains to the winners exceed the losses to the losers?

Consumer and producer surplus under competition

- Under competition, price and quantity are determined by intersection of supply and demand.
- Consumer and producer surplus are triangles above and below price line.

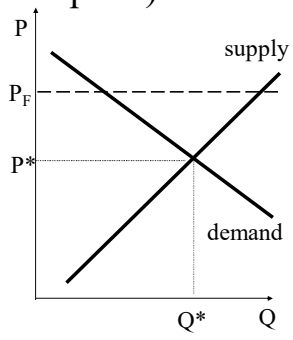


Effects of market controls

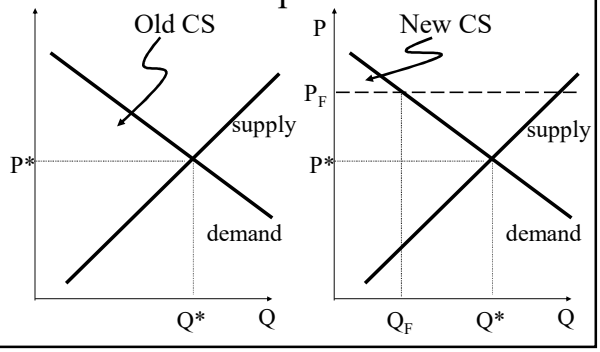
- Price floors, price ceilings, and quotas all create winners and losers.
- Using concepts of consumer and producer surplus, we can measure the _____ to winners and _____ to losers.

Price floor (legal minimum price)

- A price floor creates permanent excess _____.
- Some producers are not able to sell all they want at the legal minimum price.
- Quantity actually traded is _____ equilibrium quantity.

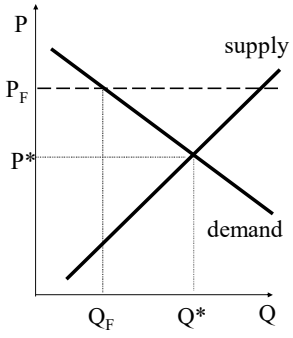


Price floor reduces consumer surplus



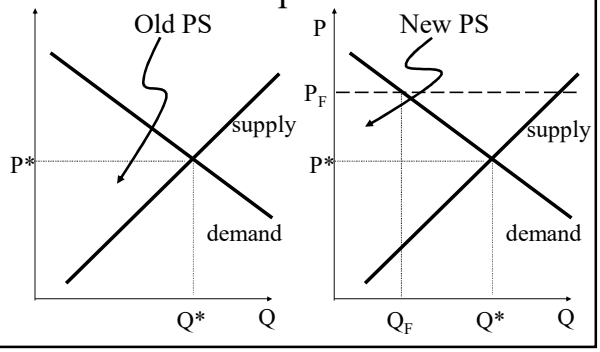
Loss of consumer surplus from price floor

- Consumers face a higher price and buy fewer units.
- Loss of consumer surplus = area of trapezoid between new and old prices.



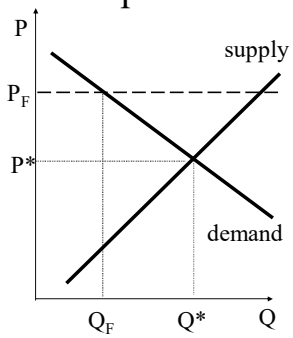
WELFARE ANALYSIS OF PRICE CONTROLS AND QUOTAS
Page 2

Price floor changes producer surplus



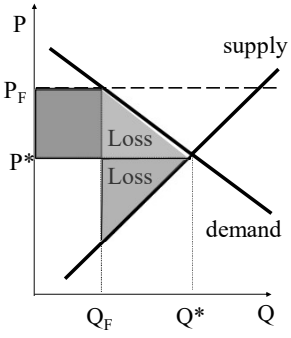
Price floor may increase or decrease producer surplus

- Producers sell fewer units but enjoy a higher price on each unit they still sell.
- Producer surplus increases by area of rectangle, decreases by area of lower triangle.



Deadweight loss from a price floor

- Part of consumers' loss is producers' gain.
- But part of consumers' loss is no one's gain.
- And producers also lose something.
- Deadweight social loss is sum of areas of two triangles.

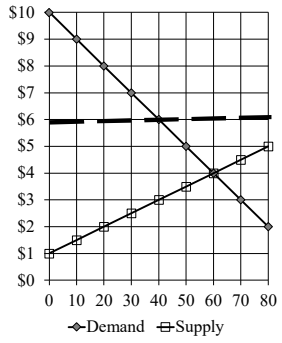


Summing gains and losses from a price floor

- Thus gains to producers from a price floor are less than losses to consumers.
- A price floor fails the _____ test.
- In other words, a price floor is not _____.

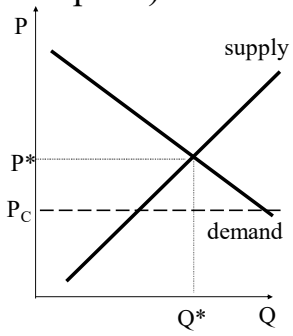
Example of price floor

- Suppose P_F = \$6.
- CS decreases by \$ _____.
- PS increases by ____-____=\$_____ .
- Deadweight loss = \$_____.



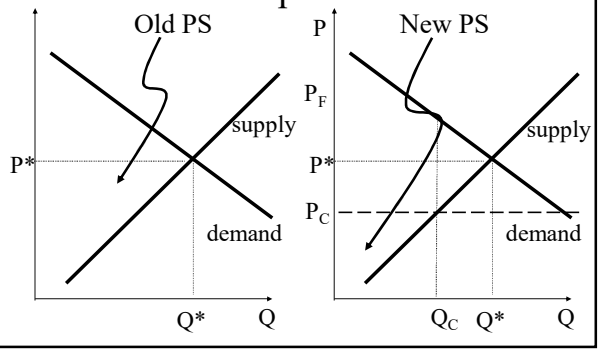
Price ceiling (legal maximum price)

- A price ceiling creates permanent excess _____.
- Some consumers are not able to buy all they want at the legal maximum price.
- Quantity actually traded is _____ equilibrium quantity.



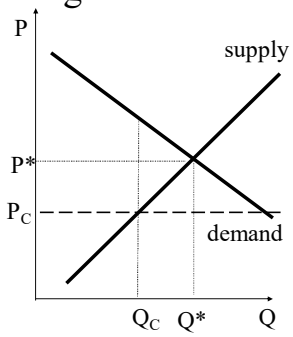
WELFARE ANALYSIS OF PRICE CONTROLS AND QUOTAS
Page 3

Price ceiling reduces producer surplus

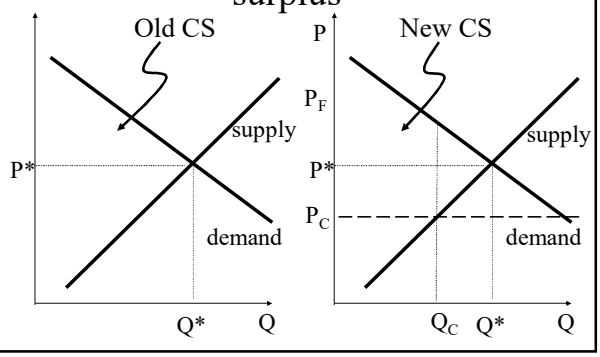


Loss of producer surplus from price ceiling

- Producers face a lower price and sell fewer units.
- Loss of producer surplus = area of trapezoid between new and old prices.

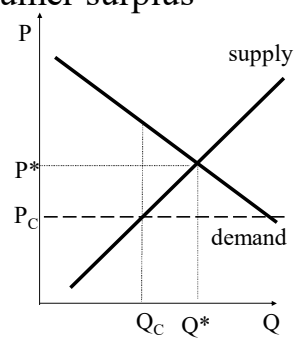


Price ceiling changes consumer surplus



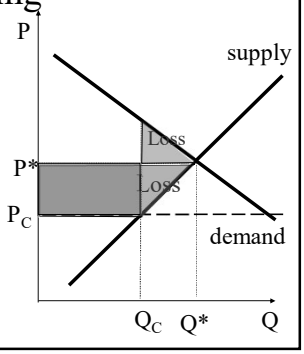
Price ceiling may increase or decrease consumer surplus

- Consumers buy fewer units but enjoy a lower price on each unit they still buy.
- Consumer surplus increases by area of rectangle, decreases by area of upper triangle.



Deadweight loss from a price ceiling

- Part of producers' loss is consumers' gain.
- But part of producers' loss is no one's gain.
- And consumers also lose something.
- Deadweight social loss is sum of areas of two triangles.



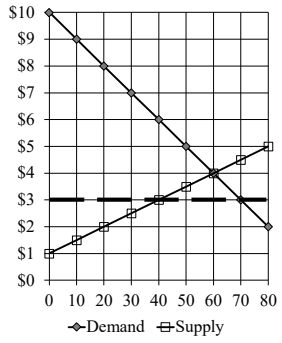
Summing gains and losses from a price ceiling

- Thus gains to consumers from a price ceiling are less than losses to producers.
- A price ceiling fails the _____ test.
- In other words, a price ceiling is not _____.

WELFARE ANALYSIS OF PRICE CONTROLS AND QUOTAS
Page 4

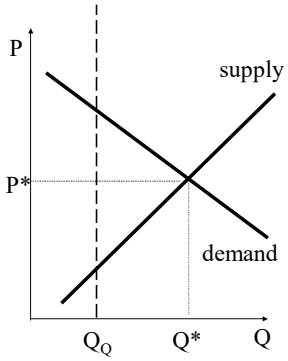
Example of price ceiling

- Suppose P_C = \$3.
- PS decreases by \$ _____.
- CS increases by ____-____=\$_____ .
- Deadweight loss = \$_____.



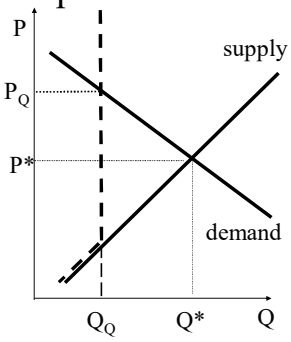
Quota on sellers

- Quota on sellers bends supply curve up vertically.
- Price is pushed up above equilibrium price.
- Effect is similar to price floor.



Quota on sellers reduces consumer surplus

- Consumers face a higher price and buy fewer units.
- Consumer surplus shrinks by area of trapezoid between new and old prices.



Quota on sellers may increase or decrease producer surplus

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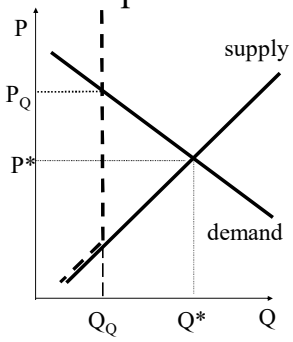
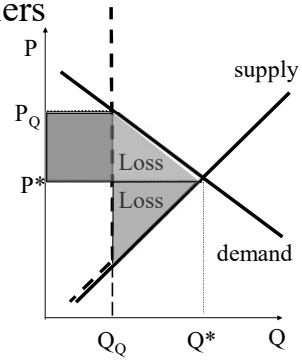
- Producer surplus increases by area of rectangle, decreases by area of lower triangle.



Deadweight loss from a quota on sellers

- Part of consumers' loss is producers' gain.
- But part of consumers' loss is no one's gain.
- And producers also lose something.
- Deadweight social loss is sum of area of two triangles.



Summing gains and losses from a quota on sellers

- Thus gains to producers from a quota are less than losses to consumers.
- A quota on sellers fails the _____ test.
- In other words, a quota on sellers is not _____.

WELFARE ANALYSIS OF PRICE CONTROLS AND QUOTAS
Page 5

Conclusions

- Price floors, price ceilings, and quotas all create_____.
- Gains to winners are less than losses to losers, so they all fail the _____ test.
- In other words, they are never _____.

TAXES
Page 1

TAXES

- What happens to a market when a good or service is taxed?
- Who bears the burden of the tax?

Taxes on market transactions

- Almost all taxes are applied to market transactions.
- Examples:
  - Sales taxes.
  - Hotel, restaurant, and other taxes.
  - Payroll taxes.
  - Income taxes.

Two basic kinds of taxes

- Unit tax: tax paid depends only on the *number* of units sold.
  - Examples: _____.
- *Ad valorem* tax: tax paid is a percent of *value* of sales.
  - Examples: _____.

Who pays the tax?

- Which party (buyer or seller) remits the tax to the government varies with the particular tax law.
- However, the party that remits the tax may or may not be the party that *bears the greatest burden* of the tax.

Tax as a wedge

- Any tax necessarily drives a wedge between:
  - total amount the buyer pays, and
  - net amount the seller receives (after tax is remitted to the government).

Two prices in the market

- Let P_D = total price paid by buyers, including the tax.
- Let P_S = net price received by sellers, excluding the tax.
- Whether the posted price is P_D or P_S varies with the particular tax. Examples:
  - Posted price = P_S for: _____
  - Posted price = P_D for: _____

TAXES
Page 2

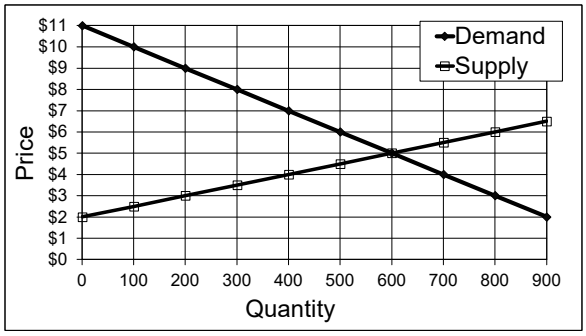
How taxes affect behavior

- Buyers care only about the total price they must pay (P_D).
  - Hence the demand curve *in terms of* P_D stays the same.
- Sellers care only about the net price they receive (P_S).
  - Hence the supply curve *in terms of* P_S stays the same.

A tax is a wedge between P_D and P_S

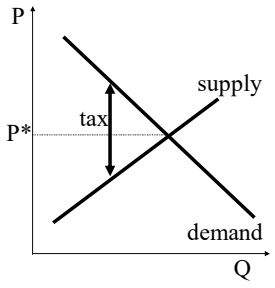
- But $P_D > P_S$.
- Let *tax* = unit tax rate in dollars (e.g., \$0.20 per pack, \$0.10 per gallon, etc.)
- Then
- To graph tax, find quantity where demand curve is *higher than supply curve by amount of tax*.

Example 1: graphing a tax
Suppose tax rate is \$3 per unit



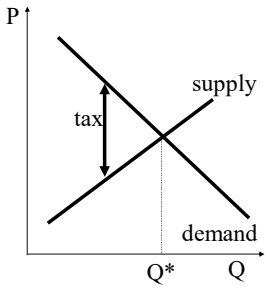
Effect of tax on prices

- As a result of any tax:
  P_D increases.
  P_S decreases.
- In equilibrium:
  $P_D = P_S + tax$.
  $P_D > P^* > P_S$.



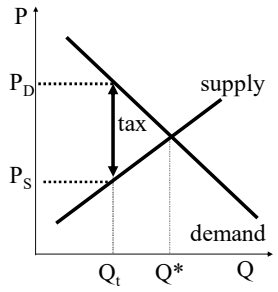
Effect of tax on quantity traded

- In equilibrium, quantity demanded = quantity supplied.
- New equilibrium quantity < original equilibrium quantity.



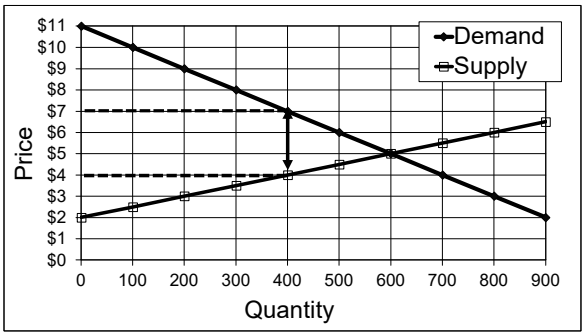
Tax revenue collected by government

- Tax revenue collected:
  $= tax \times Q_t$.
  $< tax \times Q^*$.



TAXES
Page 3

Example 1:
If tax rate is \$3, tax revenue = \$_____.

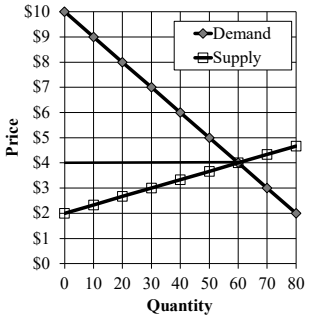


Who pays the tax?

- As a result of the tax:
  - Buyer's price P_D _____.
  - Seller's price P_S _____.
- So _____ buyers and sellers bear part of the burden of the tax, regardless of who is assigned to send the money to the government.
- But they do not share the burden equally.

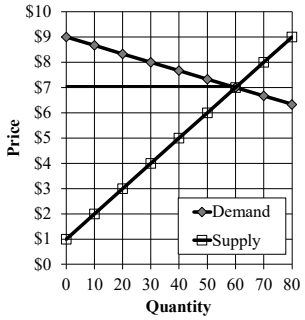
Example 2: unequal tax burden

- Suppose tax rate = \$4.
- Buyers' price increases by \$____.
- Sellers' price decreases by \$____.
- So _____ bear most of tax burden.

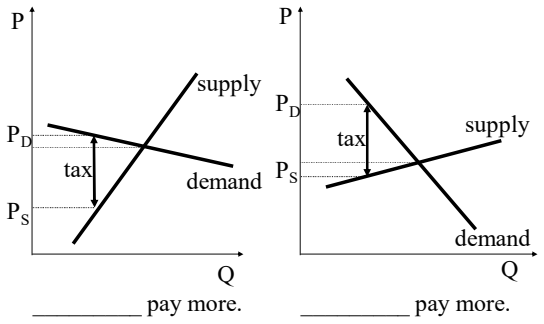


Example 3: unequal tax burden

- Again suppose tax rate = \$4.
- Buyers' price increases by \$____.
- Sellers' price decreases by \$____.
- So _____ bear most of tax burden.



Whichever side has less elastic (steeper) curve pays _____ of the tax



_____ pay more. _____ pay more.

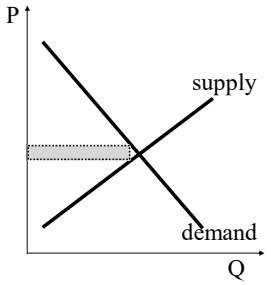
Example 4

- Suppose the elasticity of demand for beer is -0.2 and the elasticity of supply is 3.0.
- Recall that the smaller the elasticity value, the _____ the curve.
- So in this case, the _____ curve is steeper.
- So _____ of beer bear more of the tax burden.

TAXES
Page 4

How changes in tax rates affect tax revenues

- As the tax rate increases, the quantity traded decreases.
- So the tax revenue box can increase or decrease in area.
- A very high tax rate could wipe out a market, yielding no tax revenues at all!

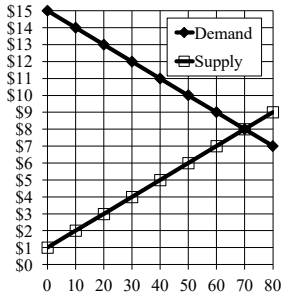


Laffer curve

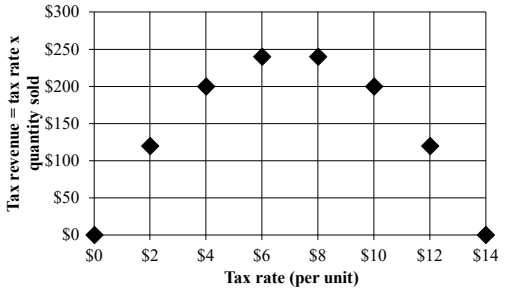
- Typically, as tax rates increase, tax revenues at first _____ .
- But as tax rates are raised to very high levels, tax revenues may _____.
- Relationship between tax *rate* and tax *revenue* is called a "Laffer curve."

Finding a Laffer curve: example

Tax rate	Quantity	Tax revenue
$2		
$4		
$6		
$8		
$10		
$12		
$14		

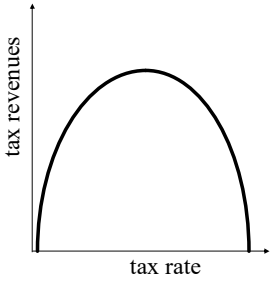


Finding a Laffer curve: example (cont'd)



Laffer curves in the real world

- Most real-life tax rates are on the increasing portion of the Laffer curve.
- However, when U.S. income taxes were cut at the high end in the 1980s from 90% to 50% to 33%, tax revenues *increased*.



Conclusions

- A *tax* inserts a wedge between *total price* paid by demanders and *net price* received by suppliers: $P_D = P_S +$ _____.
- In general, both sides of the market pay part of the tax, but the side with the _____ (less elastic) curve pays more.
- The quantity traded always _____ with a tax.
- If the tax rate rises high enough, tax revenues also begin to fall.

SUBSIDIES
Page 1

SUBSIDIES

- What happens to a market when a good or service is subsidized?
- Who enjoys the subsidy?

Subsidies on market transactions

- A subsidy is a negative tax:
  - government *pays* either the buyer or the seller for each unit sold.
- Examples:
  - Agricultural products.
  - Vouchers for low-income housing.
  - Proposed vouchers for private schools.

Who enjoys the subsidy?

- Which party (buyer or seller) receives the payment from the government varies with the particular program.
- However, the party that receives the payment may not be the party that *enjoys the greatest benefit* from the program.

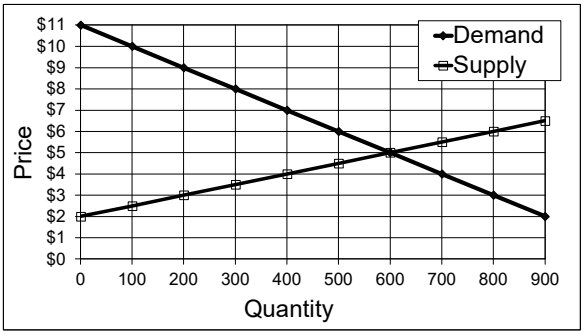
Subsidy as wedge

- Any subsidy necessarily drives a wedge between
  - total amount the seller receives, including the subsidy (P_S), and
  - net amount the buyer pays, not including the subsidy (P_D).

A subsidy is a wedge between P_D and P_S

- So $P_D < P_S$.
- Let *sub* = dollar subsidy rate (e.g., \$0.50 per bushel of wheat, \$1000 per year of school tuition, etc.).
- Then
- To graph subsidy, find quantity where supply curve is higher than demand curve by amount of subsidy.

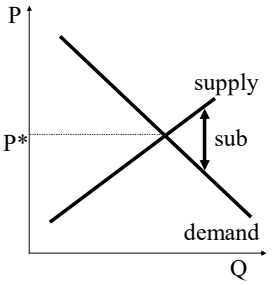
Example 1: graphing a subsidy
Suppose subsidy is \$3 per unit



SUBSIDIES
Page 2

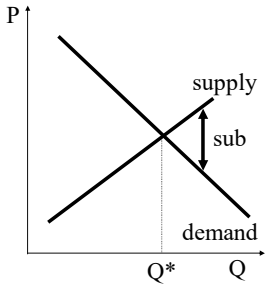
Effect of subsidy on prices

- As a result of any subsidy:
  P_D decreases.
  P_S increases.
- In equilibrium:
  P_D + sub = P_S .
  P_D < P*< P_S.



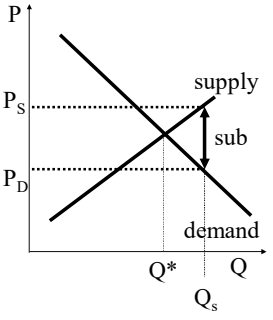
Effect of subsidy on quantity traded

- In equilibrium, quantity demanded = quantity supplied.
- New equilibrium quantity > original equilibrium quantity.

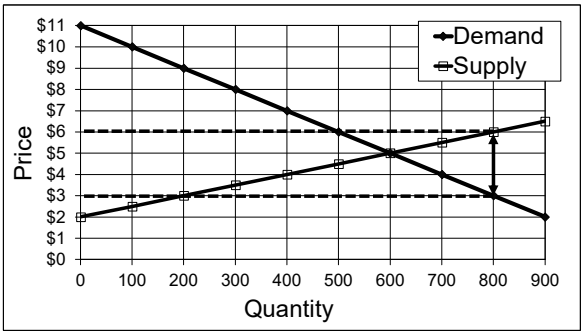


Direct cost of subsidy program to the government

- Direct cost of program = payments to buyers or sellers
  = *sub* × Q^s.
  > *sub* × Q*.



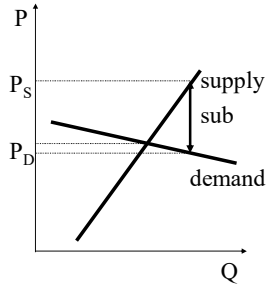
Example 1: if subsidy rate is $3 per unit, direct cost = $_____



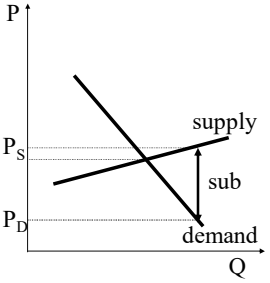
Who receives the subsidy?

- As a result of the subsidy:
  - Buyer's price P_D _____.
  - Seller's price P_S _____.
- So _____ buyers and sellers enjoy the benefit of the subsidy, regardless of who receives payment from the government.
- However, they do not share the benefit equally.

Whichever side has the steeper (less elastic) curve enjoys _____ of the subsidy



_____ enjoy more.



_____ enjoy more.

SUBSIDIES
Page 3

Example 2

- Suppose the elasticity of demand for books is -0.5 and the elasticity of supply is 4.0.
- Now, the _____ the elasticity value, the steeper the curve.
- So in this case, the _____ curve is steeper.
- So _____ of books enjoy more of the subsidy.

Conclusions

- A *subsidy* works like a negative tax.
- It inserts a wedge between *net price* paid by demanders and *total price* received by suppliers: P_D + _____ = P_S .
- In general, both sides enjoy part of the subsidy, but the side with the _____ (less elastic) curve enjoys more of it.
- The quantity traded always _____ with a subsidy.

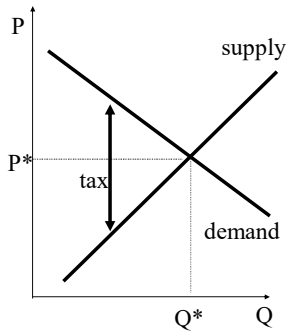
WELFARE ANALYSIS OF TAXES AND SUBSIDIES
Page 1

WELFARE ANALYSIS OF TAXES AND SUBSIDIES

- Is the cost of a tax simply the amount paid to the government?
- Is the benefit from a subsidy program worth its cost to the government?

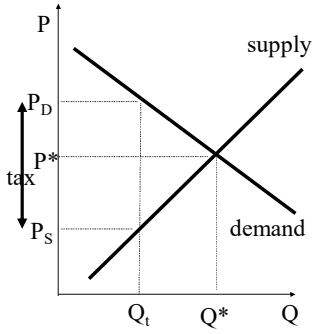
Tax

- For a unit (excise) tax, $P_D = P_S + \text{tax}$.
- As a result of the tax:
  - P_D increases.
  - P_S decreases.
  - quantity decreases.



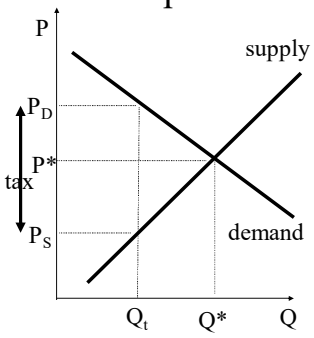
Consumer and producer surplus after the tax

- New consumer surplus is the area between the demand curve and the horizontal line at P_D .
- New producer surplus is the area between the supply curve and the horizontal line at P_S .



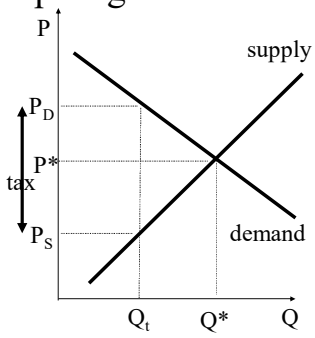
Tax reduces both consumer surplus and producer surplus

- Consumer surplus shrinks by the area of the upper trapezoid.
- Producer surplus shrinks by the area of the lower trapezoid.



Where the loss of consumer and producer surplus goes

- Tax revenue = tax rate × Q_t = gain to government.
- Remainder of loss is deadweight social loss = sum of area of two triangles.
- "Deadweight loss" = "excess burden of tax."



Summing gains and losses

- Thus the loss to consumers and producers from a tax is _____ than simply the tax revenues paid to the government.
- There is an additional deadweight social loss as _____ units are produced.
- Surplus from trade on these units is lost because of the tax.

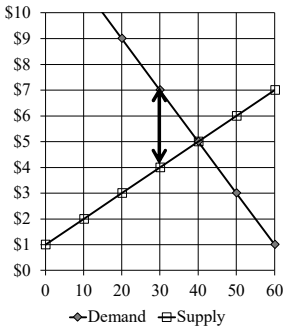
WELFARE ANALYSIS OF TAXES AND SUBSIDIES
Page 2

Net loss from taxes

- Therefore there is a net loss to society from taxes...
- UNLESS government tax revenues are spent on valuable things...
- more valuable than what people spend their own money on.

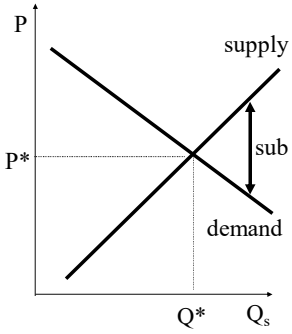
Example of tax

- Suppose tax = $3.
- CS decreases by $ _____.
- PS decreases by $ _____ .
- Tax revenue = $____.
- Deadweight loss = $_____.



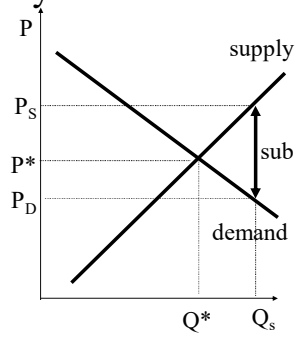
Subsidy

- For a unit subsidy, $P_D + sub = P_S$.
- As a result of the subsidy:
  - P_D decreases.
  - P_S increases.
  - quantity increases.



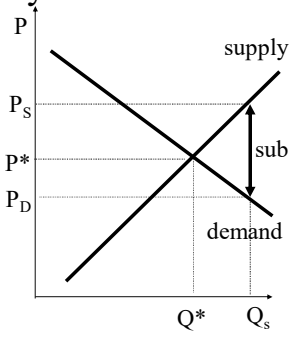
Consumer surplus after the subsidy

- New consumer surplus is the area between the demand curve and the horizontal line at P_D .



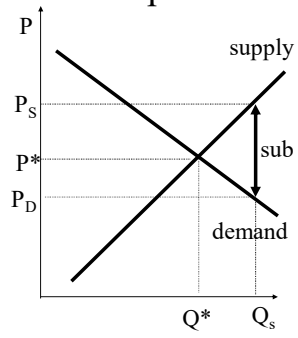
Producer surplus after the subsidy

- New producer surplus is the area between the supply curve and the horizontal line at P_S .



Subsidy increases both consumer surplus and producer surplus

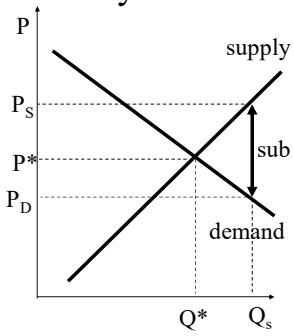
- Producer surplus increases by the area of the upper trapezoid.
- Consumer surplus increases by the area of the lower trapezoid.



WELFARE ANALYSIS OF TAXES AND SUBSIDIES
Page 3

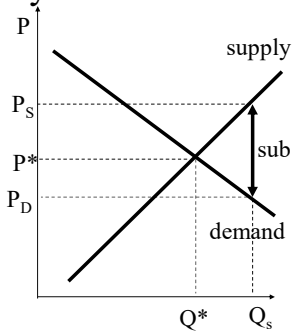
But the subsidy program costs the government money

- Cost of program to government = sub x Q_s .
- This is more than the gains to producers and consumers.



Deadweight social loss from subsidy

- Deadweight social loss
  - = difference between cost of program to goverment and gains to producers and consumers
  - = area of triangle to right of competitive equilibrium

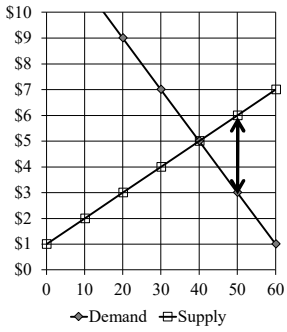


Summing gains and losses

- Thus the gain to consumers and producers from a subsidy is _____ than the dollar cost of the subsidy program to the government.
- There is a deadweight social loss as too _____ units are produced.
- The last few units cost more to produce than they are worth to consumers.

Example of subsidy

- Suppose subsidy = $3.
- CS increases by $ _____.
- PS increases by $ _____ .
- Cost of subsidy program = $_____.
- Deadweight loss = $_____.



Conclusions

- Total loss of welfare to consumers and producers from a tax is _____ than actual tax revenues paid to government.
- Total gains to consumers and producers from a subsidy are _____ than cost of subsidy program to government.
- Both taxes and subsidies cause _____ _____ as too few or too many units of the good are produced.

PART 3

Choices Underlying Supply and Demand

Big ideas: Buyers and sellers must decide whether to participate in markets and how much to buy or sell. Economic theory assumes buyers and sellers make these decisions by doing the best they can with what they have.

Famous quote: "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest."
--Adam Smith, *The Wealth of Nations* (1776)

TWO KINDS OF DEMAND CURVES
Page 1

TWO KINDS OF DEMAND CURVES

- *How* are price and quantity inversely related, as the Law of Demand claims?

Law of Demand

"If the price falls, people buy more, ceteris paribus" can mean two things:

1. More people buy the good (a change at the _____ margin), or
2. Each person buys more of the good (a change at the _____ margin).

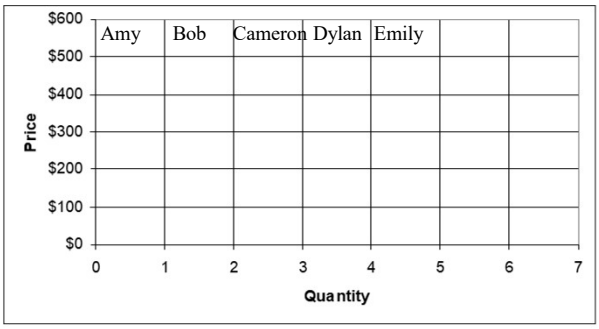
1. "More people buy the good"

- Suppose each person buys at most one unit: "_____" decision.
- Example: houses, cell phones, internet access.
- But different people are willing to pay different amounts for the good, depending on individual tastes and incomes.
- Change in price causes change in quantity demanded at the _____ margin.

Example: demand for smartphones

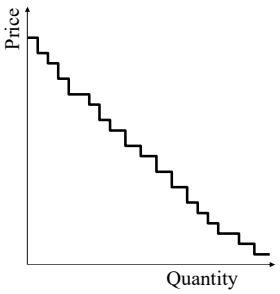
- Suppose Amy is willing to pay $500 for a smart phone.
- Bob is willing to pay $450.
- Cameron is willing to pay $300.
- Dylan is willing to pay $200.
- Emily is willing to pay $150.

Leads to stair-step market demand curve



Stairsteps in a large market

- In a large market, stair-steps are nearly invisible.
- Demand curve can be closely approximated a smooth curve.

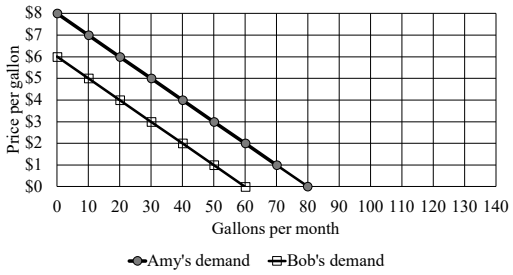


TWO KINDS OF DEMAND CURVES
Page 2

2. "Each person buys more"

- Suppose each person can buy many units, perhaps even fractional amounts: "_____" decision.
- Example: gasoline, electricity, ground beef, ice cream, phone usage.
- How much each person wants depends on price.
- Change in price causes change in quantity demanded at the _____ margin.

Example: market demand for gasoline



Leads to smooth market demand curve

- Market demand is the sum of the quantities chosen by each person in the market.
- But how does each person choose how much to buy?
- Short answer: _____ _____
- Long answer: see next slideshows.

Conclusions

- There are two kinds of demand curves.
- First kind applies to goods of which each person buys at most one. As price falls, _____ the good.
- Second kind applies to goods of which each person can buy many. As price falls, _____ of the good.
- Second kind is focus of what follows.

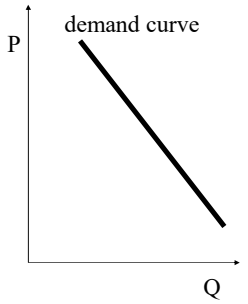
THE CONSUMER'S BUDGET CONSTRAINT
Page 1

THE CONSUMER'S BUDGET CONSTRAINT

- What set of choices are available to a consumer?
- How does this set change when the consumer's income changes or prices change?

Choices underlying demand

- In the next few presentations, we show:
- how a demand curve arises from choices made by a rational consumer.



The rational consumer

- *Assume:* As consumers, people do best they can, based on their own values and information, under circumstances they face.
- *Implication:* People pick the best combination of goods that is affordable.
- *Question for this presentation:* What does "affordable" mean?

Affordability

- Affordable choices are choices such that *spending does not exceed income*.
- Affordable choices can be described by an equation called a *budget constraint*:
  - Income =_____.

Spending

- The amount spent on a single good is simply the price times the quantity purchased:
  - Spending = p q.
- Spending on two or more kinds of goods is the sum of the amounts spent on all goods.
- Suppose we number goods 1, 2, ...
  - Spending = $p_1 q_1 + p_2 q_2 + ...$

The budget constraint

- Let I = consumer's income (given).
- Then the general form of a budget constraint with two goods is:
  - Income = spending, or
  - $I = p_1 q_1 + p_2 q_2$.

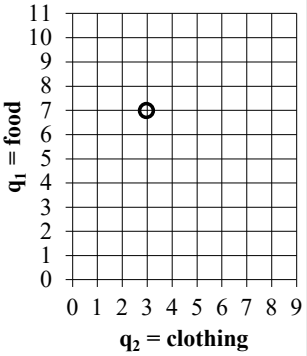
THE CONSUMER'S BUDGET CONSTRAINT
Page 2

Budget constraint for 2 goods: Example 1

- Suppose a consumer has income = \$40 to spend on two goods: food and clothing.
  - Let q_1 = units of food (p_1 = \$4).
  - Let q_2 = units of clothing (p_2 = \$5).
- Then budget constraint:
  - \$40 = _____.

Plotting combinations of goods

- Axes are *quantities* of goods.
- Points represent *combinations* or *bundles*: a certain amount of good 1 and a certain amount of good 2.

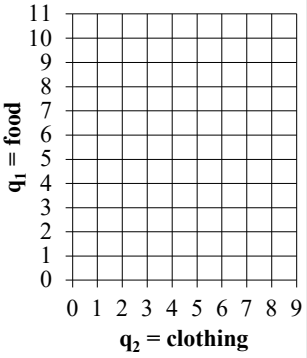


Drawing budget constraint

- Budget constraint is a _____ because $I = p_1 q_1 + p_2 q_2$ is the equation for a line (assuming p_1 , p_2, and I are given).
- Several ways to draw this line.
- Easiest way: first find _____.
- Intercept = amount consumer could afford to buy if consumer spent entire income on that one good = _____.

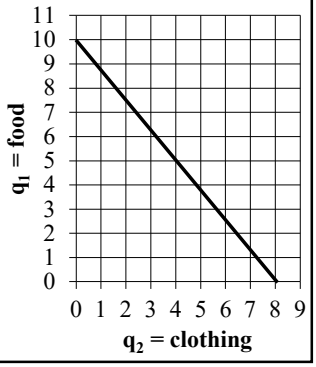
Drawing budget constraint: example 1 (cont'd)

- Given income = \$40 price of food = \$4, price of clothing = \$5.
- Food intercept = \$40/\$4 = _____.
- Clothing intercept = \$40/\$5 = _____.
- So connect intercepts with straight line.



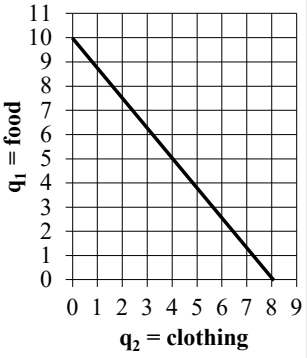
Barely affordable bundles

- Bundles _____ budget line are just barely affordable.
- Example: a bundle of 5 units of food and 4 units of clothing costs exactly \$_____.



Bundles with money left over

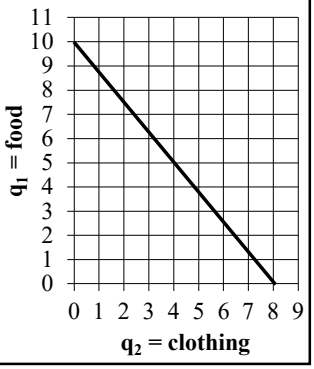
- Bundles _____ budget line do not use up all the consumer's income.
- Example: a bundle of 3 units of food and 2 units of clothing costs only \$_____.



THE CONSUMER'S BUDGET CONSTRAINT
Page 3

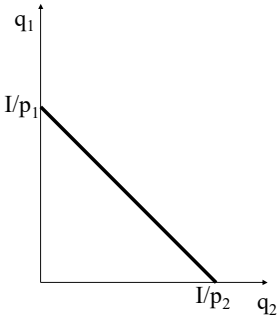
Bundles that are not affordable

- Bundles _____ budget line are not affordable.
- Example: a bundle of 10 units of food and 5 units of clothing costs $_____.



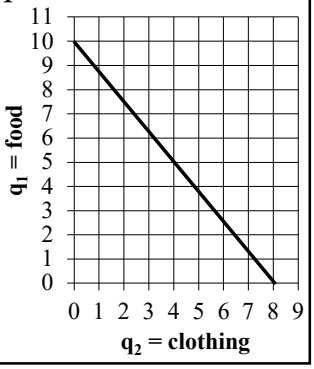
Computing slope of budget line

- Slope = rise / run = - vertical intercept / horizontal intercept.
- If good #1 on vertical axis, then slope $= -\frac{I/p_1}{I/p_2} = -\frac{p_2}{p_1}$



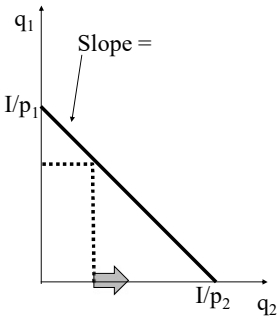
Computing slope of budget line: example 1

- Example: Given price of food = $4, price of clothing = $5.
- Then slope = $- p_{clothing} / p_{food}$ = _____.
- Slope depends on prices only, not _____.



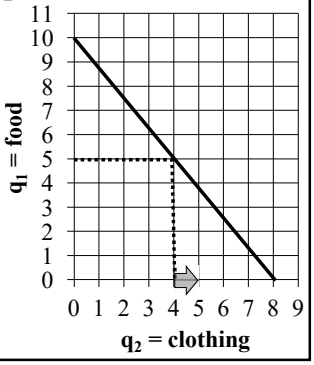
Interpreting slope of budget line

- Suppose good #1 is on vertical axis.
- Slope shows how much of good #1 must be sacrificed to get one more unit of good #2.
- Slope = opportunity cost of good #2.

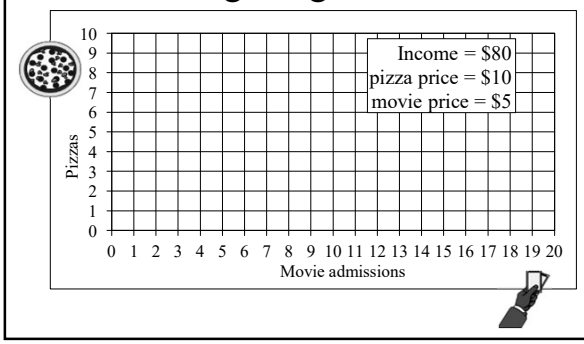


Interpreting slope of budget line: example 1

- Suppose slope = -5/4 and consumer is already spending entire income.
- Then to get one more unit of clothing, consumer must give up _____ units of food.



Example 2: Drawing budget constraint



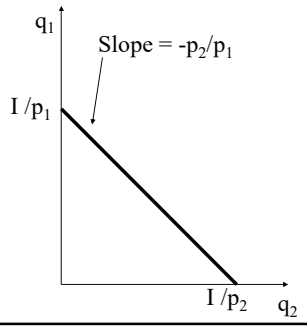
THE CONSUMER'S BUDGET CONSTRAINT
Page 4

Effect of change in income

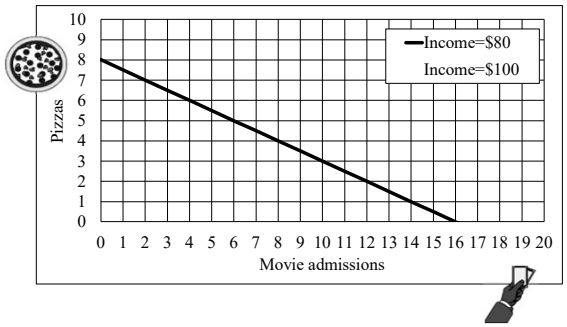
- Suppose income increases by, say, 25%.
- What happens to intercepts?

  _____
- What happens to slope?

  _____



Example 2: Income increases to $100



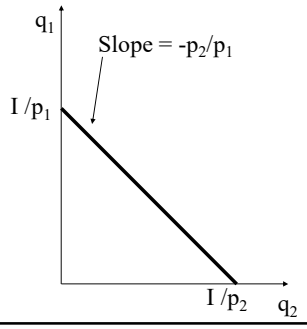
Effect of increase in p_1

- What happens to q_1 intercept?

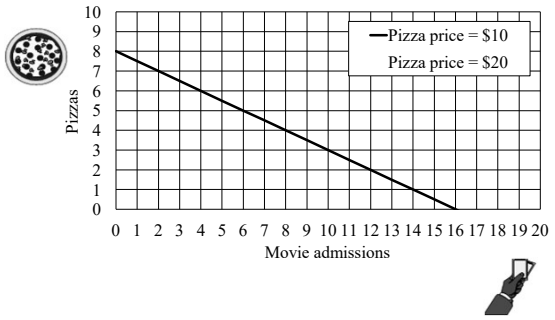
  _____
- What happens to q_2 intercept?

  _____
- What happens to slope?

  _____



Example 2: Price of pizzas increases from $10 to $20



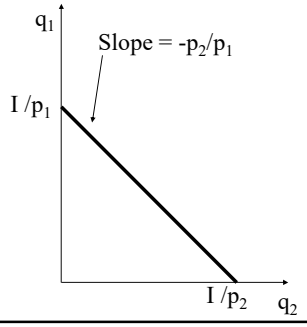
Effect of increase in p_2

- What happens to q_1 intercept?

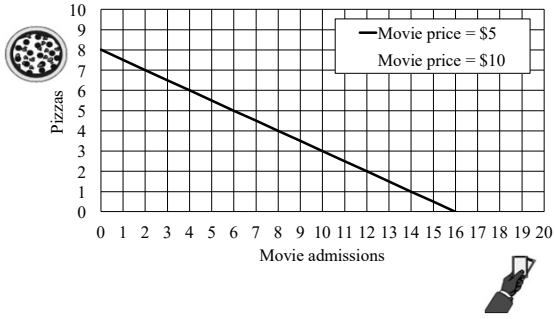
  _____
- What happens to q_2 intercept?

  _____
- What happens to slope?

  _____



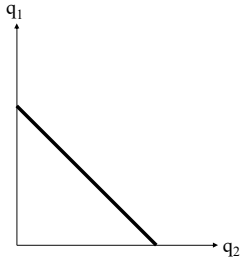
Example 2: Price of movies increases from $5 to $10



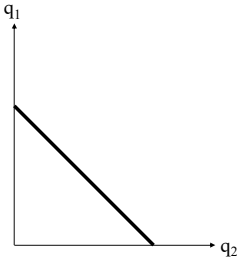
THE CONSUMER'S BUDGET CONSTRAINT
Page 5

Effect of price *decreases*

- Decrease in p_1.



- Decrease in p_2.

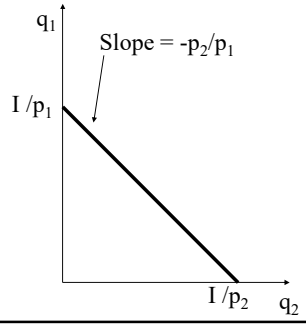


Effect of proportionate change in income and all prices

- Suppose income and all prices increase by, say, 50%.
- What happens to intercepts?

  _____
- What happens to slope?

  _____



Conclusions

- The *budget constraint* shows combinations of goods affordable to a person facing given income and prices.
- When the person's income changes, *budget line* _____ but slope does not change.
- When the price of a good changes, budget line _____.

INDIFFERENCE CURVES
Page 1

INDIFFERENCE CURVES

- How can we graph consumer preferences for combinations of goods?

The rational consumer

- *Assume:* As consumers, people do best they can, based on their own values and information, under circumstances they face.
- *Implication:* people pick the best bundle that is affordable.
- *Question for this presentation:* What does "best" mean?

Preferences

- "Best" means "most preferred," according to the person's own values and tastes.
- In choosing between two bundles, a person might prefer one bundle, or the other bundle, or might be indifferent between the two.

Preferences: example

- A particular consumer might find the following bundles equally desirable:
  - 5 units of food with 5 units of clothing.
  - 4 units of food with 7 units of clothing.
  - 7 units of food with 4 units of clothing.
- The same consumer might find the following bundle less desirable:
  - 4 units of food with 4 units of clothing.

Indifference curve: definition

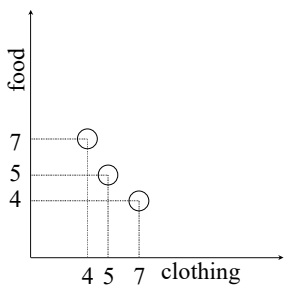
- Curve linking bundles between which the person is indifferent—that is, bundles that this consumer finds _____.
- Indifference curves are a graphical representation of a person's preferences.

Indifference curve: example

Suppose the following bundles are equally preferred:

- 7 food, 4 clothing
- 5 food, 5 clothing
- 4 food, 7 clothing

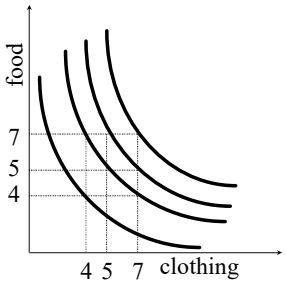
How should we draw the indifference curve?



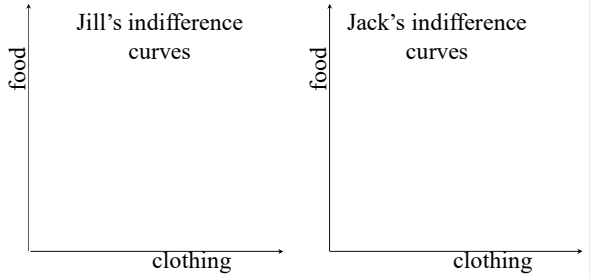
INDIFFERENCE CURVES
Page 2

Each consumer has many indifference curves

- Bundles on higher indifference curves are preferred to bundles on lower indifference curves.

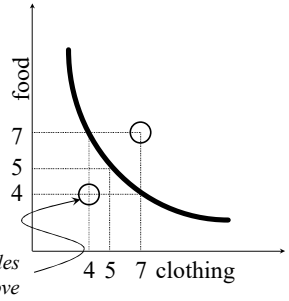


Different preferences imply different indifference curves



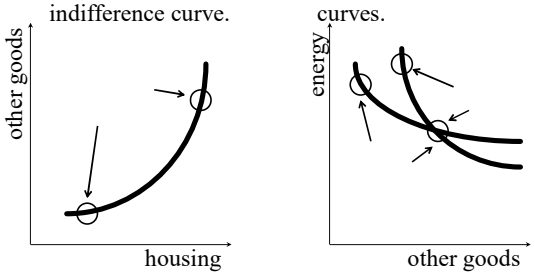
More is better

- Usually more is preferred to less.
- A bundle having more of both goods is usually preferred to a bundle having less.



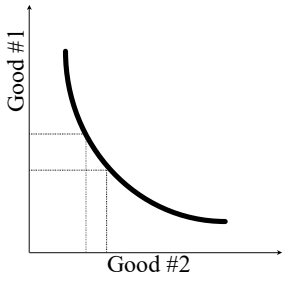
What's wrong with these indifference curves?

- Upward-sloping indifference curve.
- Crossing indifference curves.



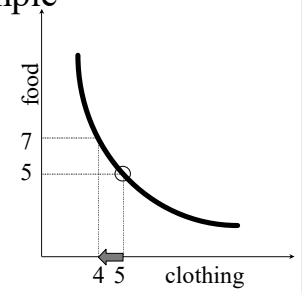
Slope of indifference curves

Slope shows rate at which consumer is willing to trade off one good for another, while staying equally happy.



Slope of indifference curves: example

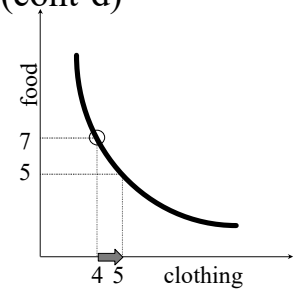
- Suppose this consumer has 5 units of food and 5 units of clothing.
- If 1 unit of clothing were taken away, how many more units of food would keep them equally happy?
- ____ units of food.



INDIFFERENCE CURVES
Page 3

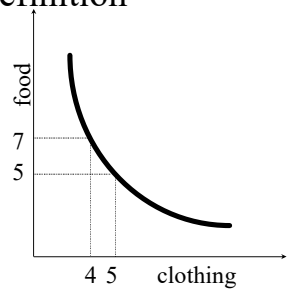
Slope of indifference curves: example (cont'd)

- Suppose this consumer has 7 units of food and 4 units of clothing.
- How much food would they be willing to give up in exchange for 1 more unit of clothing?
- ____ units of food.



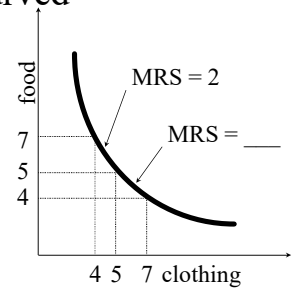
Marginal rate of substitution (MRS): definition

- *MRS of good 2 for good 1* = |slope| of indifference curve with good #1 on vertical axis.
- What is this person's MRS of clothing for food between these points? _____



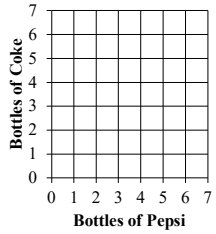
Why indifference curves are curved

- MRS depends on how much a person already has.
- Usually, the less a person has of a good (compared to other goods) the more valuable it is to them.

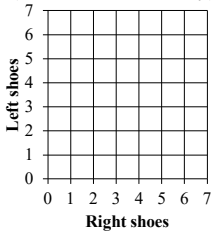


Extreme cases of indifference curves

- Perfect substitutes (MRS = constant).

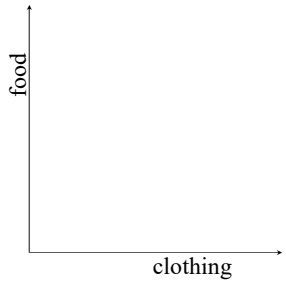


- Perfect complements (MRS = 0 or infinity).



Typical indifference curves

- Smooth.
- Downward-sloping.
- Curved: the MRS gets smaller as we go down the curve.



Conclusions

- Indifference curves show how a consumer ranks alternative bundles.
- They connect combinations of goods that a person feels are _____-preferred.
- They usually slope _____ and are curved.
- Their |_____| (or marginal rate of substitution) shows the rate at which a person is willing to trade one good for another.

CONSUMER CHOICE
Page 1

CONSUMER CHOICE

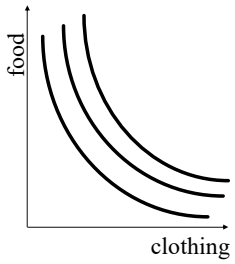
- What bundle of goods will a rational consumer choose?

The rational consumer

- *Assume:* Consumers do best they can, based on their own values and information, under circumstances they face.
- *Implication:* Consumers pick the best bundle of goods that is affordable.
- *Question for this presentation:* What bundle will be chosen?

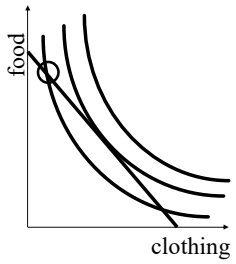
Rational choice

- A person will choose the affordable bundle that the person most prefers.
- This means choosing bundle on the highest indifference curve that still touches person's budget line.



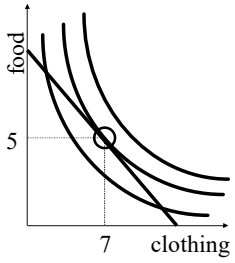
Where is the rational choice?

- Would a person ever choose a bundle where an indifference curve *crosses* budget line?
- _____!
- Can reach a higher indifference curve and stay within budget.

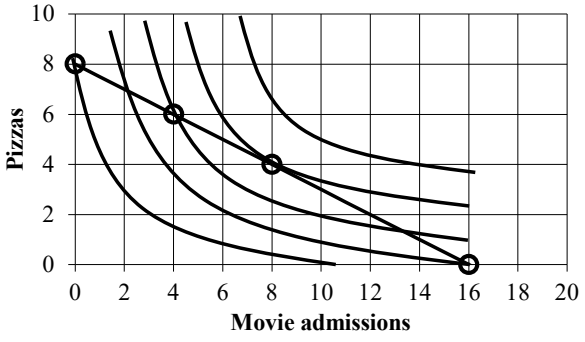


Rational choice is at *tangency*

- ... between the budget line and the highest indifference curve the consumer can reach.



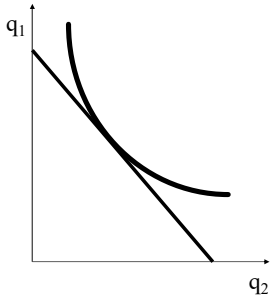
What is this consumer's rational choice?



CONSUMER CHOICE
Page 2

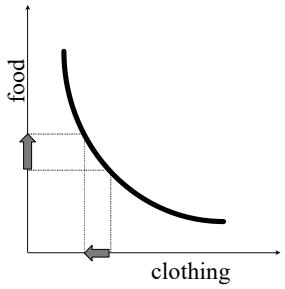
Tangency implies slope of budget line = slope of indifference curve

- |Slope| of budget line = p_2 / p_1.
- |Slope| of indifference curve = marginal rate of substitution (MRS) of good 2 for good 1.
- Thus, at rational choice: _____



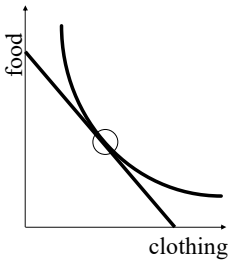
Interpreting tangency

Recall that slope of indifference curve, or _____, equals rate at which consumer is willing to trade off one good for another, while staying equally happy.



Interpreting tangency (cont'd)

- Let P_F = price of food.
- Let P_C = price of clothing.
- At consumer's rational choice, $MRS = P_C / P_F$.

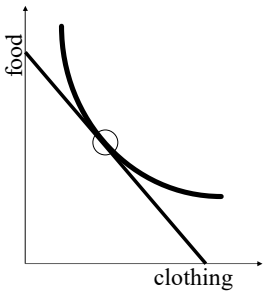


What does tangency imply?

- Slope of budget line = P_C / P_F = rate at which markets _____ consumer to trade one good for another.
- Slope of indifference curve = MRS = rate at which consumer is _____ to trade one good for another.
- At tangency point, consumer's best choice, these are _____.

Example: price of food = \$4 and price of clothing = \$5

- Slope of budget line = P_C / P_F = -5/4.
- So markets allow consumer to trade ___ units of food for 1 unit of clothing (and vice versa).
- At tangency, consumer is just willing to make that trade.



Conclusions

- Rational consumer choice means choosing the best affordable bundle.
- Rational consumer choice is at _____ between budget line and consumer's highest attainable indifference curve.
- At rational choice, MRS = _____.

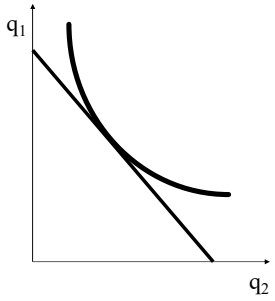
CONSUMER DEMAND
Page 1

CONSUMER DEMAND

- How do rational choices, responding to price changes, trace out a consumer's demand curve?

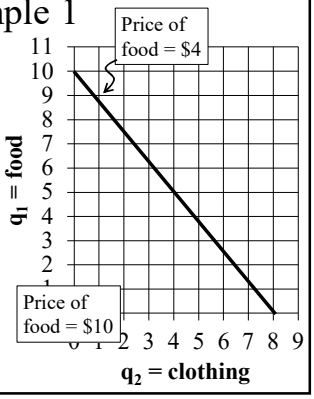
Slope of budget line = slope of indifference curve

- Rational consumer chooses a combination where the budget line is tangent to the highest possible indifference curve.
- If the budget set changes, the consumer must make a new choice.



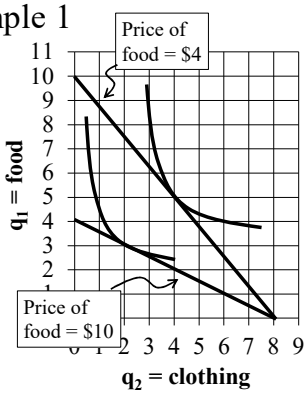
Changes in budget constraint: example 1

- If one price changes, then budget constraint rotates.
- Suppose income = $40 and price of food rises from $4 to $10.
- New intercept on food axis = _____.



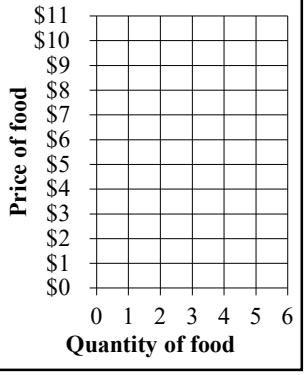
Response to change in price: example 1

- At a price of $4, this consumer chose _____ units of food.
- After the price rose to $10, the consumer chose _____ units of food.

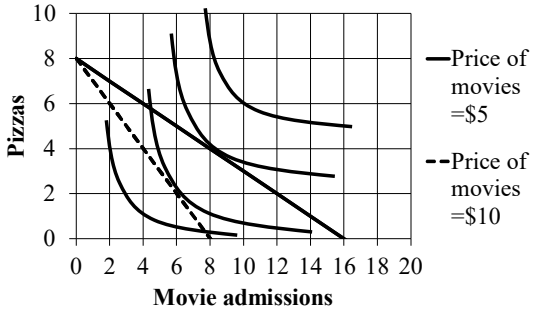


Tracing a demand curve: example 1

Price of food	Quantity of food
$4	5
$10	3



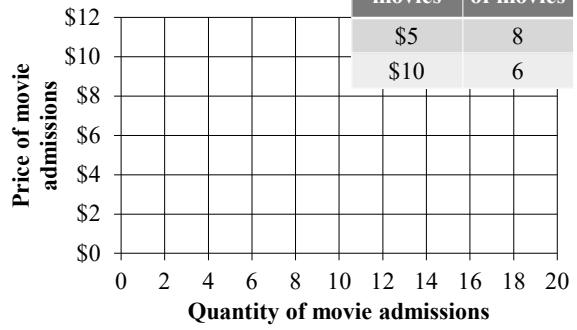
Response to change in price: example 2



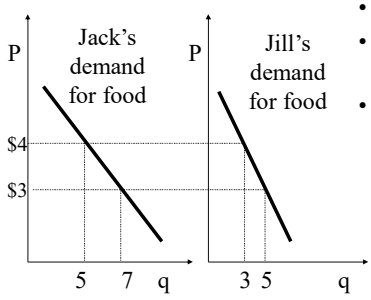
CONSUMER DEMAND
Page 2

Tracing a demand curve: example 2

Price of movies	Quantity of movies
$5	8
$10	6

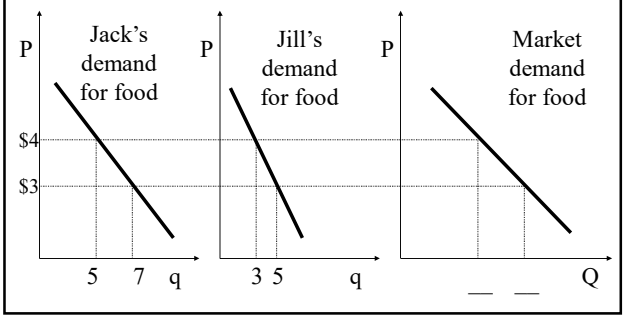


Different consumers may make different choices



- Why?
- Different _____.
- Different _____ (i.e., indifference curves).

Market demand = ____ of quantities demanded by all consumers



Conclusions

- A change in the _____ causes the consumer to choose a new bundle.
- Graphing quantity chosen of a good against its _____ traces out consumer's demand curve for that good.
- *Market demand* is the _____ of quantities demanded by all consumers.

RATIONAL CHOICE
Page 1

RATIONAL CHOICE

- What is rational choice?
- What is the "MB = MC" rule?

Rational choice: definition

- *Choosing the best, according to one's own tastes and preferences.*
- Distinguish:

Irrational choice

Choice based on preferences that you don't agree with

- Examples:

Choosing *whether* to do something: one-time action

Examples:

Comparing benefit and cost

- Rational choice: Do something if its benefit exceed its cost.
  - That is, if net benefit is positive.
- Example: If latte costs $3 and value to you is $5, then net benefit is _____ and the rational choice would be to _____.

Choosing *how many or how much*: repeated action

Examples:

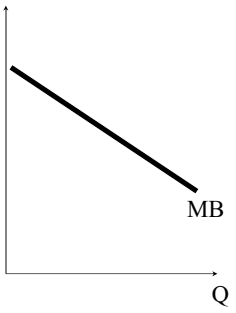
Marginal benefit (MB): definition

- *Additional benefit provided by the last unit.*
- Or, the increase in total benefit provided by the last unit.
- Or, change in benefit divided by change in quantity.
- Formula:
  MB = _____.

RATIONAL CHOICE
Page 2

Marginal benefit usually falls

- Marginal benefit usually depends on how many units chosen in total.
- Usually falls with each successive unit.
- Examples:

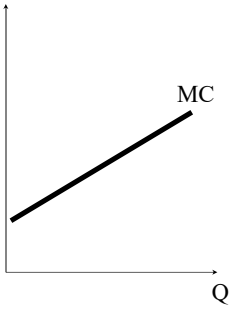


Marginal cost (MC): definition

- *Additional cost caused by the last unit.*
- Or, the increase in total cost caused by the last unit.
- Or, change in cost divided by change in quantity.
- Formula:
  MC = _____.

Marginal cost often rises

- Marginal cost sometimes depends on how many units chosen in total.
- If so, usually rises with each successive unit.
- Examples:

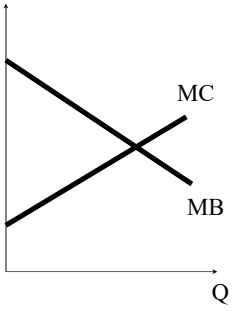


Comparing marginal benefit and marginal cost

- *Rule of rational choice:* Keep doing something until its marginal benefit drops below marginal cost.
- This rule maximizes total net benefits = total benefits - total costs.
- Rule has many applications in economics.

Graphical solution

- Total benefit = area under MB curve.
- Total cost = area under MC curve.
- Total NET benefit = total benefit – total cost.
- Maximized at Q*, where _____.



Example 1: checked bags

- American Airlines charges these prices for checked bags on domestic flights.
- What is the *marginal cost* to consumer of each checked bag?
- Δ total cost / Δ Q

https://www.aa.com/i18n/travelInformation/baggage/baggageAllowance.jsp#baggage_charges

Q	Total cost	MC
0 bags	$0	
1 bag	$25	
2 bags	$60	
3 bags	$210	
4 bags	$410	

RATIONAL CHOICE
Page 3

Example 1: checked bags (cont'd)

- Suppose Abby is willing to pay \$50 for first bag, \$40 for second bag, \$20 for third bag, \$5 for fourth bag.
- These are Abby's *marginal benefits*.

Q	MC	MB
0 bags		
	\$25	
1 bag		
	\$35	
2 bags		
	\$150	
3 bags		
	\$200	
4 bags		

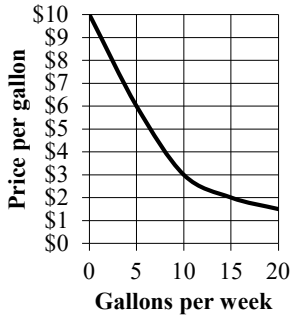
Example 1: checked bags (cont'd)

- What is Abby's rational choice?
- MB drops below MC after _____ bags.
- Abby should choose _____ bags.

Q	MC	MB
0 bags		
	\$25	\$50
1 bag		
	\$35	\$40
2 bags		
	\$150	\$20
3 bags		
	\$200	\$5
4 bags		

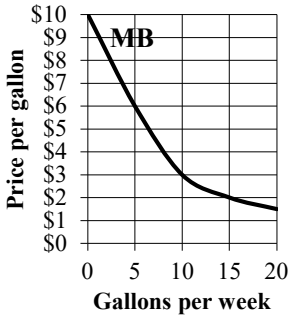
Example 2: Demand for gasoline

- Graph shows Ben's weekly demand for gasoline.
- Recall that height of demand curve = Ben's _____ _____ (or MB) of each gallon.



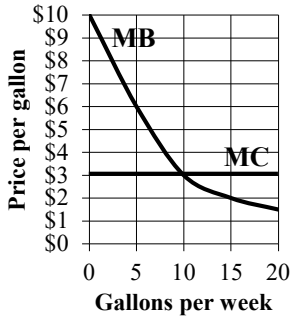
Example 2: Demand for gasoline (cont'd)

- Suppose the price of gasoline = \$3.
- So \$3 is Ben's _____ of gasoline.



Example 2: Demand for gasoline (cont'd)

- What is Ben's rational choice?
- MB drops below MC after _____ gallons.
- Ben should choose _____ gallons per week.



Example 3: light-rail line

- Suppose a city faces these expected costs for a light-rail (trolley) line.
- What is the *marginal cost* per mile?
- Δ total cost / Δ Q

Miles of track	Total cost	MC per mile
0	\$0	
2	\$2 mill	
4	\$4 mill	
6	\$10 mill	
8	\$18 mill	
10	\$30 mill	

RATIONAL CHOICE
Page 4

Example 3: light-rail line (cont'd)

- Suppose a city faces these expected benefits.
- What is the *marginal benefit* per mile?
- Δ total benefit / Δ Q

Miles of track	Total benefit	MB per mile
0	$0	
2	$20 mill	
4	$30 mill	
6	$38 mill	
8	$44 mill	
10	$46 mill	

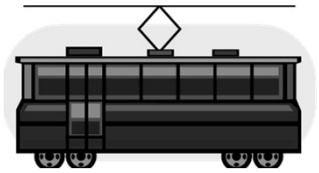
Example 3: light-rail line (cont'd)

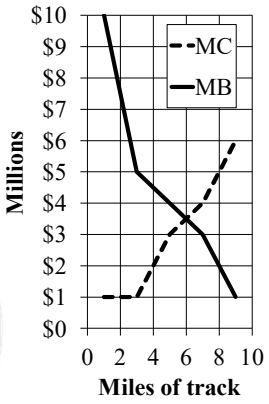
- How long should the light-rail line be?
- MB drops below MC after _____ miles.
- The line should be _____ miles long.

Miles of track	MC per mile	MB per mile
0		
	$1 mill	$10 mill
2		
	$1 mill	$5 mill
4		
	$3 mill	$4 mill
6		
	$4 mill	$3 mill
8		
	$6 mill	$1 mill
10		

Example 3: light-rail line (graph)

MB drops below MC after _____ miles.





Example 3: light-rail line (check)

Does the MB=MC rule really work?

Miles of track	Total cost	Total benefit	Total net benefit
0	$0	$0	
2	$2 mill	$20 mill	
4	$4 mill	$30 mill	
6?	$10 mill	$38 mill	
8	$18 mill	$44 mill	
10	$30 mill	$46 mill	

Conclusions

- Rational choice means choosing the best alternative, given one's circumstances.
- Rational choice implies that
  - a one-time action should be taken if its benefit _____ its cost.
  - a repeated action should be continued until its MB _____ its MC.
- A consumer's demand curve is one kind of MB curve, and a good's price is its MC to a consumer.

BUSINESS FIRMS
Page 1

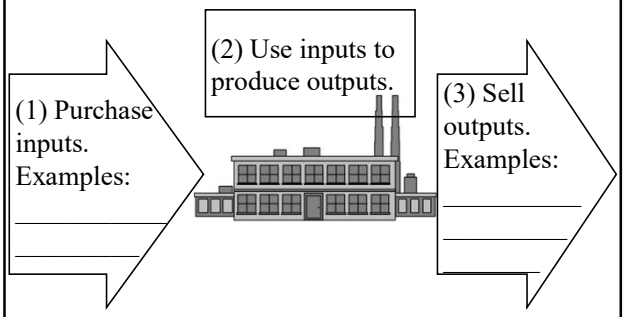
BUSINESS FIRMS

- What is a business firm?
- What do firms do?

Major kinds of firms in U.S.

- *Proprietorships:* single owner, _____ liability.
- *Partnerships:* multiple owners, _____ liability.
- *Corporations:* (possibly) multiple owners (stockholders), _____ liability.

What all firms do



A firm's cost

- Money paid for inputs purchased or hired.

Firm	Cost
Grocery store	Payments to _____ _____.
Law firm	Payments to _____ _____.
Automobile manufacturer	Payments to _____ _____.

A firm's revenue

- Money received from selling output.
- Number of units sold × price.

Firm	Revenue
Grocery store	_____ _____.
Law firm	_____ _____.
Automobile manufacturer	_____ _____.

Profit of the firm

- *Profit* = total _____ minus total _____.
- We will assume firms make business decisions with intent to maximize their profit.
- Is this a reasonable assumption?

BUSINESS FIRMS
Page 2

Why firms try to maximize profits

(1) Firms are owned and (usually) controlled by people who can keep the profits.

(2) Firms that do not maximize profits do not survive. They are either

- _____ by competitors that *do* maximize profits.
- _____ by new owners able to exert more control.

Accounting cost versus economic cost

- *Accounting cost* = money cost measured by standard accounting methods.
- *Economic cost* = money cost plus _____ cost, if any. Examples:
  - Value of proprietor's time, even if unpaid.
  - Potential lease value of the firm's buildings and equipment.

Accounting profit versus economic profit

- Economic cost is typically greater than accounting cost.
- Therefore, economic profit is typically _____ than accounting profit.
- Economic profit can even be negative (a loss) while accounting profit is positive.
- _____ profit drives business decisions.

Accounting profit versus economic profit: example

- Adam operates a small business.
- Annual accounting profit is $20,000.
- But Adam could earn $30,000 working for someone else.
- And Adam's equipment could be rented out for $2,000 per year.
- Adam's ECONOMIC profit is _____

Law of Supply

"If the price rises, firms produce and sell more, ceteris paribus" can mean two things:

1. More firms sell the good (a change at the _____ margin), or
2. Each firm sells more of the good (a change at the _____ margin).

Two kinds of supply curves

- In the next few slideshows, we analyze the *intensive* margin: how each firm determines _____ to produce and sell.
- Later, when we discuss business entry and exit, we analyze the *extensive* margin: how each firm determines _____ to produce and sell at all.

BUSINESS FIRMS
Page 3

Conclusions

- Firms purchase inputs, and then produce and sell outputs.
- Profit equals _____ minus _____.
- We assume firms make decisions to maximize their _____ profit.

PROFIT MAXIMIZATION
Page 1

PROFIT MAXIMIZATION

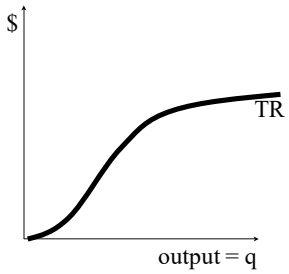
- How should a firm choose its level of output to maximize its profit?

The rational business owner

- *Assume:* As business owners, people do best they can, under circumstances they face.
- *Implication:* Business owners attempt to choose a level of output that maximizes economic profit.
- *Question for this presentation:* In general terms, what output level will be chosen?

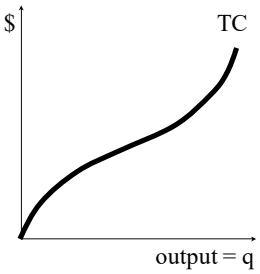
Total revenue and output

- Total revenue = money received for outputs sold.
- Let TR(q) = total revenue function.
- TR generally rises with output.
- (Revenue is a firm's *benefit*.)



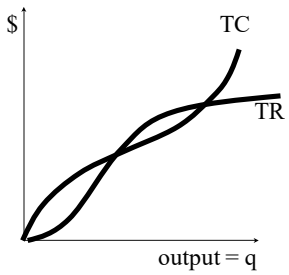
Total cost and output

- Total cost = money paid for inputs hired.
- Let TC(q) = total cost function.
- TC generally rises with output.



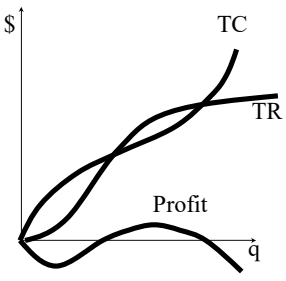
The output decision

- Total revenue, total cost, and profit all depend on how much output is produced and sold.



Profit = total revenue – total cost

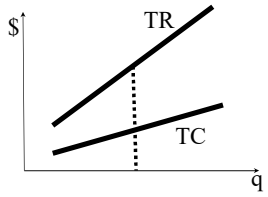
- Profit
  = TR(q) - TC(q).
  = vertical gap between total revenue and total cost functions.



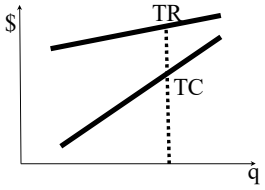
PROFIT MAXIMIZATION
Page 2

How to maximize profit

If slope of TC < slope of TR, should _____ output.



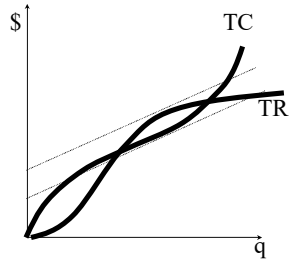
If slope of TC > slope of TR, should _____ output.



When is profit already maximized?

Profit is maximized where

- vertical gap between TR and TC is greatest.
- slope of TC = slope of TR.



Marginal revenue (MR): definitions

- *The increase in total revenue caused by the last unit sold.*
- Or, slope of total revenue curve.
- Or, change in total revenue divided by change in quantity.
- Formula: MR = _____.
- (MR is a firm's *marginal benefit*.)

Marginal revenue: example

- Suppose General Mfg. Co. has this TR schedule.
- What is General Mfg. Co.'s MR schedule?

Output	TR	MR
0	$0	
10	$100	
20	$180	
30	$240	

Marginal cost (MC): definitions

- *The increase in total cost caused by the last unit produced and sold.*
- Or, slope of total cost curve.
- Or, change in total cost divided by change in quantity.
- Formula: MC = _____.

Marginal cost: example

- Suppose General Manufacturing also has this total cost schedule.
- What is General Mfg.'s MC schedule?

Output	TC	MC
0	$0	
10	$40	
20	$100	
30	$180	

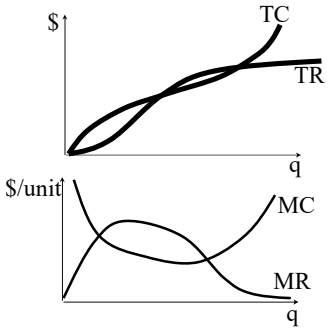
PROFIT MAXIMIZATION
Page 3

The "MR=MC" rule in graphs

MR(q)
= marginal revenue
= slope of TR.

MC(q)
= marginal cost
= slope of TC.

- Thus profit is maximized when MR(q) = MC(q).

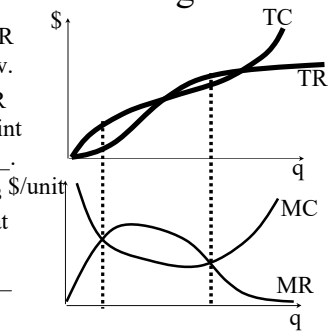


The "MR=MC" rule in words

- *Produce output up to the level where the cost added by the last unit starts to _____ the revenue contributed by the last unit.*
- For business firm, MR=MB. So this is special case of "MB=MC" principle.

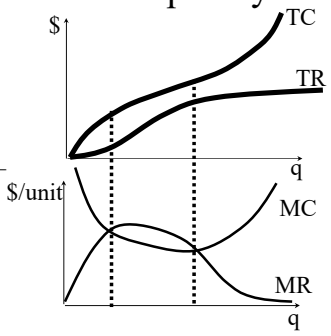
Qualification to "MR=MC" rule: direction of crossing

- MC can intersect MR from above or below.
- If MC intersects MR from below, that point is _____.
- But if MC intersects MR from *above*, that point is _____ _____



Exception to "MR=MC" rule: when to shut down completely

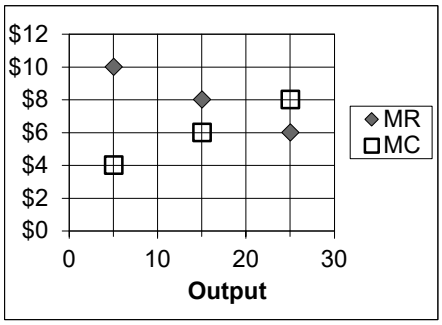
- Firm might make a loss at all levels of output.
- In that case the firm should set q=_____ to cut its losses.
- The MC=MR rule does not apply.



Does the "MR=MC" rule work for General Manufacturing?

Output	TR	TC	MR	MC	Profit
0	$0	$0			
			$10	$4	
10	$100	$40			
			$8	$6	
20	$180	$100			
			$6	$8	
30	$240	$180			

Graph of General Mfg.'s MR and MC curves



PROFIT MAXIMIZATION
Page 4

Average cost: definition and example

AC = TC / q.

What is General Mfg. Co.'s AC schedule?

Output	TC	MC	AC
0	$0		
		$4	
10	$40		
		$6	
20	$100		
		$8	
30	$180		

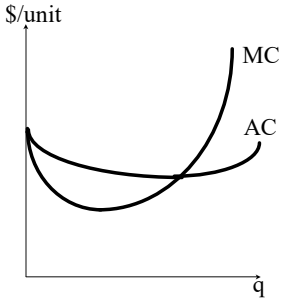
Average cost, price and profit

$$\text{Profit} = TR - TC$$
$$= p \cdot q - AC \cdot q$$
$$= (p - AC) \cdot q$$

- Therefore, profit is positive if and only if price is _____ than AC.

Marginal cost "pulls" average cost

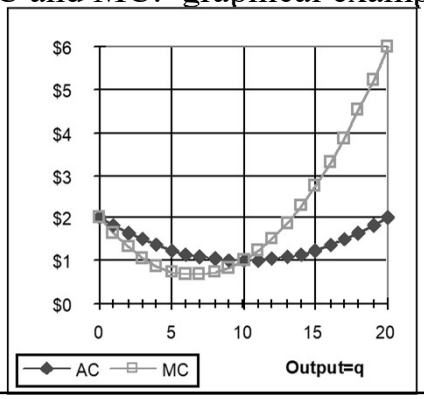
- When MC<AC, AC _____.
- When MC>AC, AC _____.
- When MC=AC, AC neither rises nor falls.
- Curves intersect at minimum AC.



Why MC "pulls" AC: analogy with homework scores

- Suppose your *average* homework score (AH), at mid-semester, is AH=85.
- How will your next homework score—your *marginal* homework score (MH)—affect your average?
- If MH > AH, then AH will _____.
- If MH < AH, then AH will _____.

AC and MC: graphical example



Conclusions

- To maximize profit, the firm should choose output such that *marginal* _____ equals *marginal* _____.
- This rule is valid if:
  - MC crosses MR from below, and
  - profit is not negative (AC P).
- MC curve intersects *average cost* curve at the minimum point of _____.

PROFIT MAXIMIZATION WHEN PRICE IS TAKEN AS GIVEN
Page 1

PROFIT MAXIMIZATION WHEN PRICE IS TAKEN AS GIVEN

- How should a firm choose its level of output to maximize profit if it cannot control price?

Firms with small market share

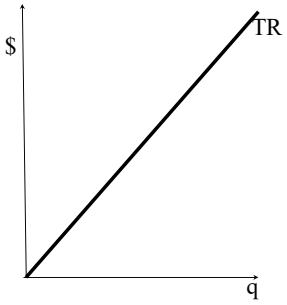
- Many firms have small market share, and compete against other firms selling nearly identical products.
- Examples:

"Price-taking" firms

- These firms cannot affect price by changing their level of output.
  - They can sell all they want at the market price.
  - But they cannot raise that price by restricting production.
- They must take the market price as _____ (constant).

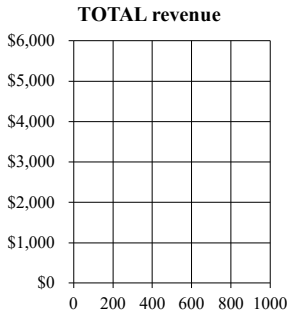
Total revenue for a "price-taker"

- TR(q) = price × q.
- But price is a given constant.
- TR(q) = straight line through origin.
- Slope = _____.



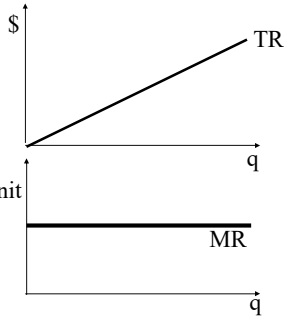
TOTAL revenue for a "price-taker": example 1

- Suppose Acme Manufacturing is a small player in its market.
- Suppose market price = $5.
- Then total revenue = _____.



Marginal revenue for a "price-taker"

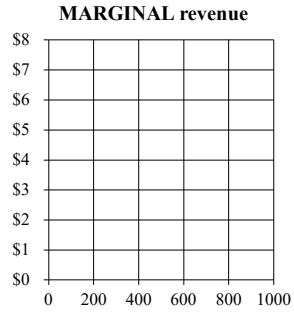
- MR = increase in revenue from last unit sold.
- Or, slope of total revenue curve.
- Or, ΔTR /Δq.
- So for a "price-taker," MR = _____ (constant).



PROFIT MAXIMIZATION WHEN PRICE IS TAKEN AS GIVEN
Page 2

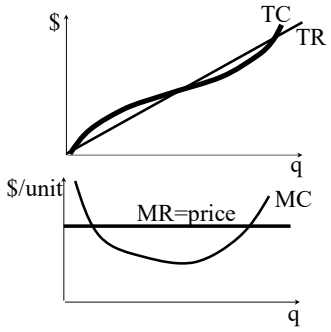
Marginal revenue for a "price-taker": example 1 again

- Again suppose Acme Mfg. is a small player in its market, and market price = $5.
- Then marginal revenue = _____ .



Maximizing profit

- Profit gap is widest when slope of TC equals slope of TR.
- So a "price-taker" maximizes profit by choosing q where MR = _____.



Profit-maximization rule for a price-taker

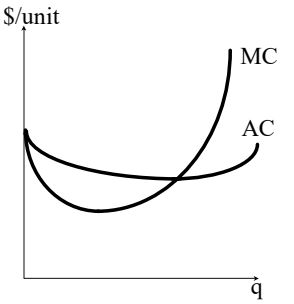
- Suppose firm takes price as given.
- Choose q such that:
  - MC(q) = MR = _____.
- In words: *Produce output up to the level where the cost added by the last unit starts to _____ the price at which the good is sold.*

Qualification and exception

- *Qualification:* MC(q) must intersect price from below.
  - Otherwise, a profit minimum!
- *Exception:* Profit must not be negative.
  - Thus TR(q) ≥ TC(q) or P ≥ AC(q).
  - Otherwise, firm can cut its losses by shutting down (q=_____) !

As price changes, firm must adjust output to maximize profit

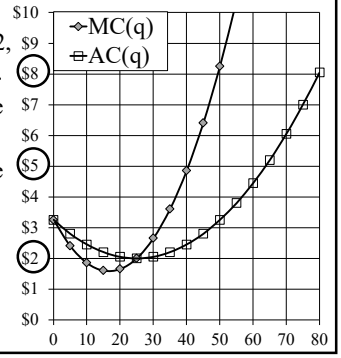
- Marginal cost slopes up (in relevant range).
- So the higher the price, the _____ output the firm will want to produce to maximize profit.



Example 1 again: Suppose Acme Mfg. has these MC and AC curves

- If price is less than $2, produce _____units.
- If price = $5, produce about _____ units.
- If price = $8, produce about _____ units.

Shutdown price = min AC(q)

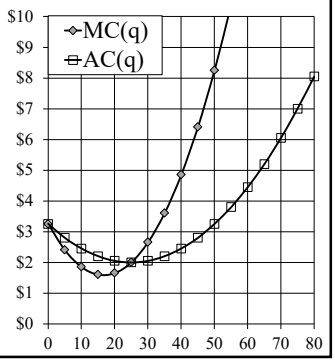


PROFIT MAXIMIZATION WHEN PRICE IS TAKEN AS GIVEN
Page 3

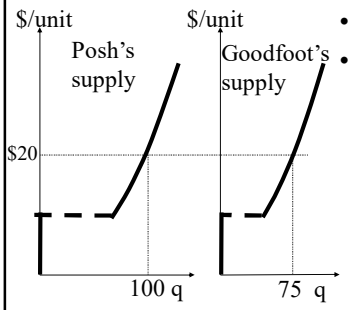
Firm's supply curve: definition

- *Curve showing how much output firm will produce at any given price.*
- Graph is identical to MC curve, above shutdown price.

Shutdown price = min AC(q)

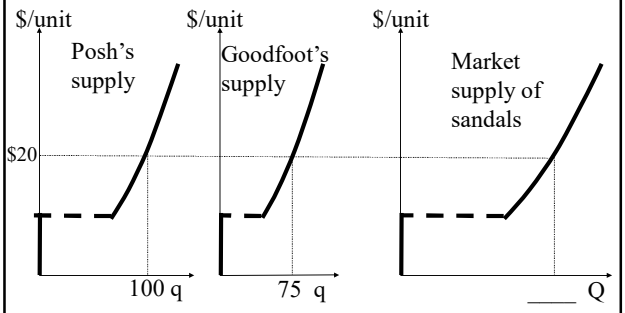


Different firms may make different output decisions



- Why?
- Different _____.

Market supply = _____ of quantities supplied by all firms



Conclusions

- For a firm that takes price as given, marginal revenue = _____.
- To maximize profit, a "price-taking" firm chooses output so that _____ = price.
- This rule is valid if MC is rising and profit is nonnegative (P≥AC).
- If profit is negative the firm can cut its losses by _____.

THE FIRM'S COST IN THE SHORT RUN
Page 1

THE FIRM'S COST IN THE SHORT RUN

- What do the firm's cost curves look like when there is not enough time to adjust all inputs?

Responding to a drop in price

- Suppose a business like a copy shop faces a sudden change in demand—say, a drop in price.
- It can quickly reduce its costs for paper, toner, electricity, and maybe labor.
- But it may have signed a long-term lease for the copy machine and the store.
- What quantity should it produce now?

Adjusting inputs quickly

- All businesses find that some inputs are easier to adjust quickly than others.
- Examples: Easy or hard?
  - Materials inputs _____
  - Labor inputs _____
  - Equipment inputs _____
  - Buildings and structures _____

"Short-run" versus "long-run" behavior

- *Long run* = period of time over which people _____ fully adjust to a change.
- *Short run* = period over which people _____ fully adjust to a change.
- In short run, firm can adjust only *some* inputs to maximize profits.

Two kinds of inputs in the short run

- *Variable inputs* = inputs that can be adjusted in the short run.
  - Examples: _____
- *Fixed inputs* = inputs that cannot be adjusted in the short run. Levels are dictated by past decisions.
  - Examples: _____

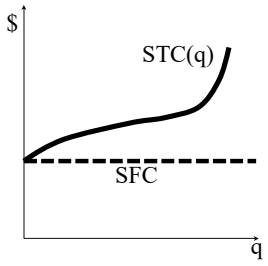
Two kinds of cost in the short run

- *Short-run variable cost (SVC)* = payments for variable inputs.
  - Examples: _____
- *Short-run fixed cost (SFC)* = payments for fixed inputs.
  - Examples: _____
- *Short-run total cost (STC)* = SVC + SFC.

THE FIRM'S COST IN THE SHORT RUN
Page 2

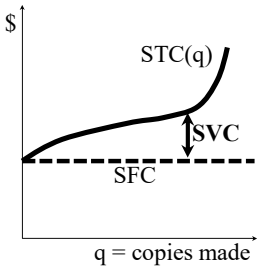
What the short-run total cost curve looks like

- SFC are constant, regardless of output.
- SVC start at zero and increase with output.
- STC = SFC + SVC.
- So intercept of STC = _____.



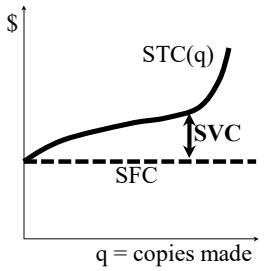
Copy shop example

- Suppose a copy shop pays $1200 per month to rent a store and $300 per month to lease a copy machine.
- Then its SFC = $_____.



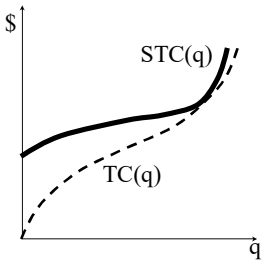
What are the copy shop's likely variable costs?

Payments that depend on the number of copies it makes, such as:



Short-run versus long-run total cost curves

- In general, short-run total cost STC(q) is higher than long run total cost TC(q).
- Reason: Given time to adjust *all* inputs, firm can cut costs.

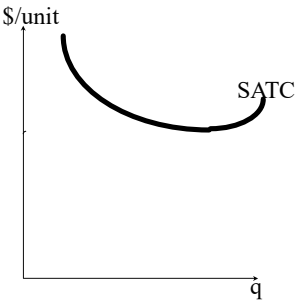


Short-run average cost concepts

- *Short-run average fixed cost (SAFC)* = _____.
- *Short-run average variable cost (SAVC)* = _____.
- *Short-run average total cost (SATC)* = STC / q = _____.

The SATC curve

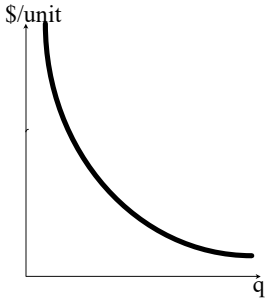
- SATC typically falls and then rises.
- Minimum SATC = lowest price at which firm can avoid losses = *breakeven price.*



THE FIRM'S COST IN THE SHORT RUN
Page 3

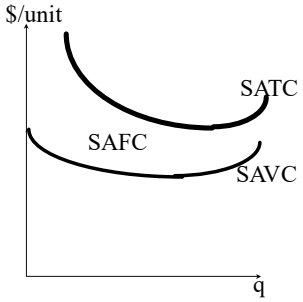
The SAFC curve

- Recall SFC is constant.
- So SAFC = SFC/q must decrease with q, approaching _____.
- Example: If copy shop has SFC=$1500, then its SAFC = _____.



The SAVC curve

- SATC = SAFC + SAVC.
- So the gap between SATC and SAVC is just SAFC.
- So the gap must _____ with q.

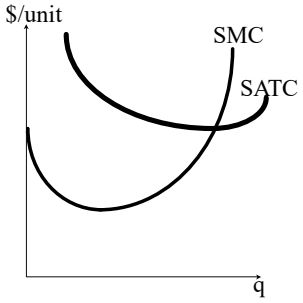


Short-run marginal cost

- *Short-run marginal cost (SMC)* = increase in short-run total cost caused by the last unit produced = Δ STC / Δ q = Δ SVC / Δ q .
- In short run, by definition, output and costs rise only from increase in *variable* inputs.
- SMC is _____ of STC (or SVC) curve.

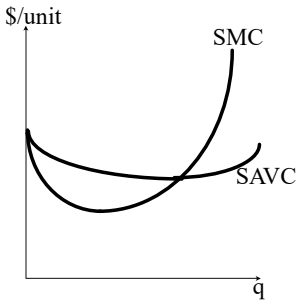
SMC curve "pulls" SATC curve

- When SMC<SATC, SATC _____.
- When SMC>SATC, SATC _____.
- Curves intersect at minimum SATC.



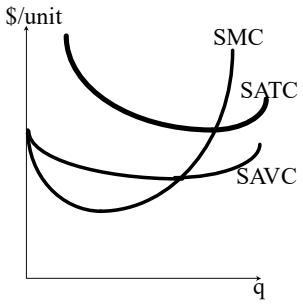
SMC also "pulls" SAVC

- When SMC<SAVC, SAVC _____.
- When SMC>SAVC, SAVC _____.
- Curves intersect at minimum SAVC.



All three SR cost curves together

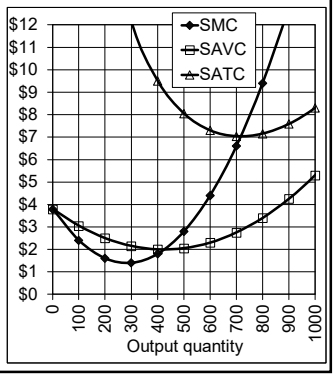
- Typically, all three curves are U-shaped.
- SMC intersects the other curves at their _____ points.



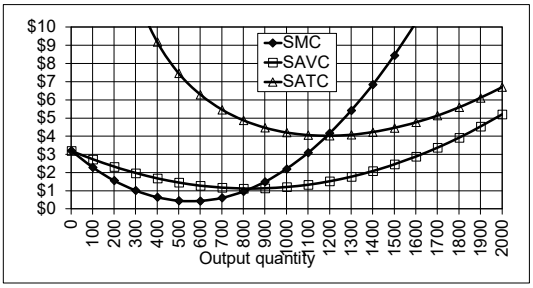
THE FIRM'S COST IN THE SHORT RUN
Page 4

Example 1: What is the breakeven price?

Breakeven price
= minimum SATC
= lowest price at which firm can avoid losses
= $_____.



Example 2: What is the breakeven price?



Conclusions

- In short run, the firm can vary some inputs to change output, but other inputs are _____.
- Avg. costs of these inputs per unit of output are called SAVC and SAFC, respectively.
- Short-run marginal cost (SMC) is the cost of an additional unit of output, produced by increasing _____ inputs only.
- SMC intersects SAVC and SATC at their _____ points.

PROFIT MAXIMIZATION IN THE SHORT RUN
Page 1

PROFIT MAXIMIZATION IN THE SHORT RUN

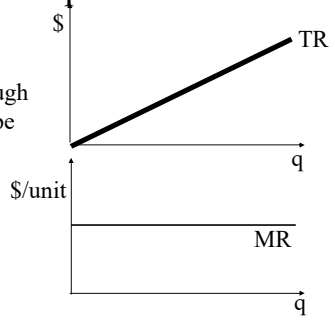
- How should a firm choose its level of output to maximize profits when some inputs are fixed?
- When should the firm shut down?

Assumptions

- *Short run:* Some inputs are variable, some are fixed.
- *"Price taker":* Assume again that firm cannot influence price (p) by changing output (q). Takes market price as _____.

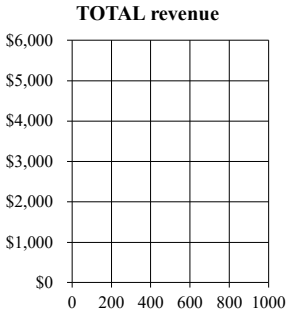
Total revenue and marginal revenue for a "price-taker"

- Total revenue = price × q, a straight line through the origin with slope = _____
- Marginal revenue = _____



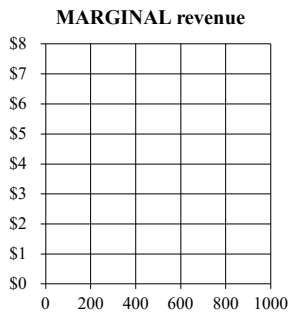
TOTAL revenue for a "price-taker": example

- Suppose Acme Manufacturing is a small player in its market.
- Suppose market price = $5.
- Then total revenue = _____.



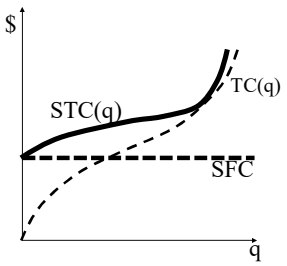
MARGINAL revenue for a "price-taker": example

- Again suppose Acme Mfg. is a small player in its market, and market price = $5.
- Then marginal revenue = _____ .



Only *short-run* costs are relevant

- Long-run TC function is irrelevant.
- Cannot reach it in the short run.

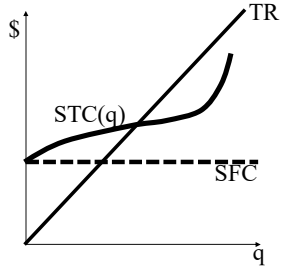


PROFIT MAXIMIZATION IN THE SHORT RUN
Page 2

A rule for profit maximization in the short run

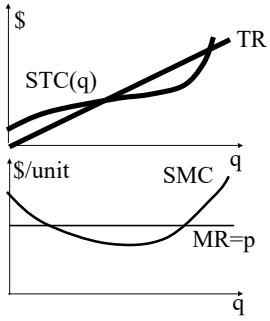
Profits are maximized where:

- vertical gap between TR and STC is greatest.
- slope of STC = slope of TR.



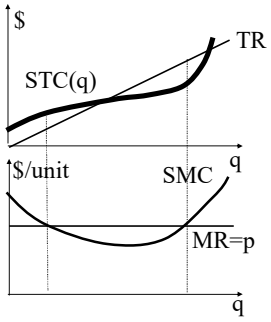
The "marginal cost = marginal revenue" rule again

- SMC(q) = slope of STC.
- MR=p = slope of TR.
- Thus profits are maximized when _____ = _____.



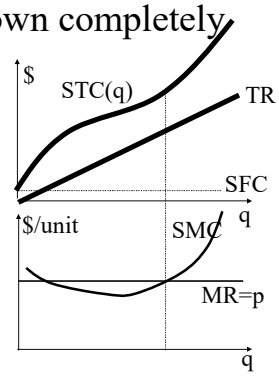
Qualification to the rule: direction of crossing

- SMC(q) must intersect p from below.
- Otherwise, a profit *minimum!*
- Here, which p=SMC intersection is the true profit maximum?



Exception to the rule: when to shut down completely

- If firm shuts down (setting q=0), then profit = _____
- If setting p=SMC causes greater losses than this, firm should shut down.
- The p=SMC rule does not apply.



Exception to the rule (cont'd)

- Should shut down if loss from shutting down is less than loss while operating.
- That is, shut down if
  profit while operating $<$ $-$ SFC
- Shut down if revenue < SR variable cost.

Copy shop example

- Suppose a copy shop spends
  $3000 per month on paper
  $5000 per month on labor
  $500 per month on electricity
  $1200 per month to rent store*
  $300 per month to lease machine**
- Shop receives $9000 per month in revenue.
- Shut down? _____

* Just signed a three-year lease. ** Just signed one-year lease.

PROFIT MAXIMIZATION IN THE SHORT RUN
Page 3

Why shutdown decision depends only on *variable* costs

Stay open for business

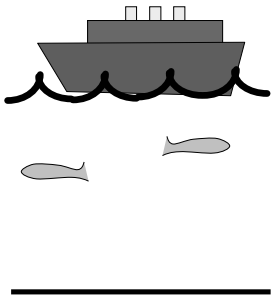
- Revenue: $9000
- Costs:
  $3000 paper
  $5000 labor
  $500 electricity
  $1200 rent store
  $300 lease machine

Shut down

- Revenue: $0
- Costs:
  $1200 rent store
  $300 lease machine

Sunk costs

- A firm's short-run fixed costs are an example of ***sunk costs***.
- Sunk costs cannot be recovered or avoided.
- So they may be ignored in making decisions.

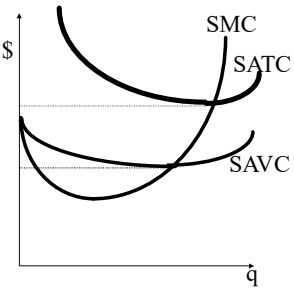


Short-run shutdown price

- Shut down if revenue < SR variable cost:
  TR < SVC
- Shutdown price = minimum SAVC.

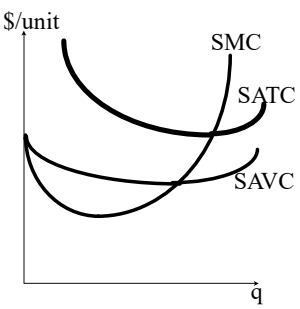
Shutdown price versus breakeven price

- If price < min SATC, firm makes losses, but it does not necessarily shut down.
  - min SATC = *breakeven price*.
- If price < min SAVC, firm will shut down.
  - min SAVC = *shutdown price.*



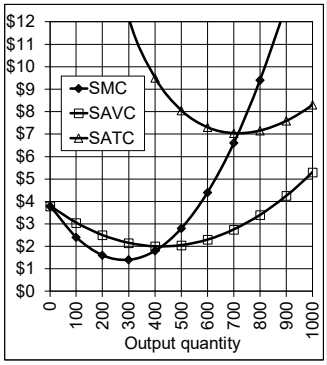
Short-run supply by the firm

- If price > min SAVC, firm chooses output using SMC curve.
- If price < min SAVC, firm shuts down.



Example: deriving firm's supply curve from its cost curves

- Shutdown price = $ _____.
- Below this price, firm's supply curve = _____ output.
- Above this price, firm's supply curve = _____ curve.

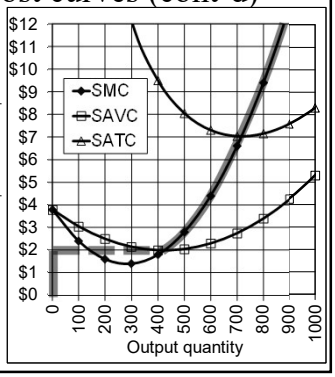


PROFIT MAXIMIZATION IN THE SHORT RUN

Page 4

Example: deriving firm's supply curve from its cost curves (cont'd)

- If P = $9, firm produces about _____ units output.
- If P = $4, firm produces about _____ units output.
- If P = $1.50, firm produces _____ units output.



Conclusions

- To maximize profits in the short run, the price-taking firm chooses output so that *price equals* _____.
- This rule is valid if SMC crosses price from below and losses are less than SFC--that is, if price is greater than _____.
- If price is below minimum SAVC, then the firm can reduce its losses by shutting down.
- SFC are _____ and cannot be avoided.

DISCOUNTING AND THE VALUE OF THE FIRM
Page 1

DISCOUNTING AND THE VALUE OF THE FIRM

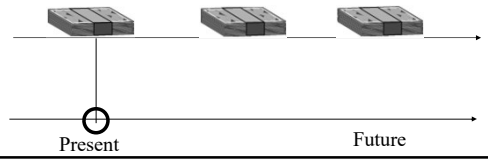
- How can a firm maximize profit when costs and revenues happen at different points in time?

Costs now, revenues later

- Firms often take on projects that incur cost now without generating much revenue right away.
- Examples:
  Drug company - _____
  Car company - _____
  Internet company - _____
- Simple maximization of *current* profit cannot explain this behavior.

Rational decision-making

- Firms must compare cost incurred today with revenue received in the *future*.
- One way to do this: convert all future payments into equivalent dollars today.



Definition of present discounted value (PDV)

- PDV of X dollars to be received N years from now in the future is *amount of money one would need to put aside now, earning interest, to have X dollars by N years from now.*

Discounting over a one-year interval (N=1)

- Suppose X dollars will be received one year from now.
- Then X = PDV × (1+r), so PDV = X/(1+r).
- Example: $110 to be received one year from now, interest rate = 10%.
  - PDV = $ _____.

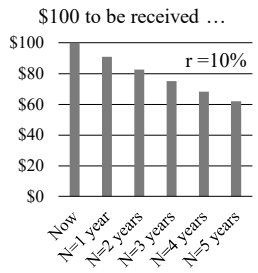
Discounting over many years: compounding

- Suppose X dollars will be received N years from now.
- Then $X = PDV \times (1+r)^N$.
- So $PDV = X/(1+r)^N$.
- Example: $1000 to be received 5 years from now, interest rate = 8%.
  - $PDV = 1000/(1.08)^5 =$ _____

DISCOUNTING AND THE VALUE OF THE FIRM
Page 2

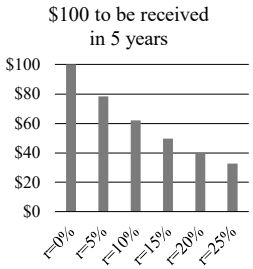
Interpreting the formula: $PDV = \frac{X}{(1+r)^N}$

- The earlier money is received, the _____ the PDV, because money received earlier can grow by earning interest.



Interpreting the formula: $PDV = \frac{X}{(1+r)^N}$

- The higher the interest rate, the _____ the PDV of money received in the future.



Discounting a stream of payments

- Suppose a *stream* of payments will be received: X_1 dollars 1 year from today, X_2 dollars in 2 years, X_3 dollars in 3 years, etc.
- PDV of a stream = sum of individual PDVs:

$$PDV = \frac{X_1}{(1+r)} + \frac{X_2}{(1+r)^2} + \frac{X_3}{(1+r)^3} + \ldots$$

Discounting a stream of payments: example

- *Example:* $1000 to be received 1 year from now, $3000 in 5 years, $5000 in 10 years, interest rate = 5%.

$$PDV = \frac{1000}{(1.05)} + \frac{3000}{(1.05)^5} + \frac{5000}{(1.05)^{10}} =$$

= _____ + _____ + _____.
= _____.

Discounting a perpetual stream of payments

- Suppose X dollars will be received one year from now and every year thereafter, forever.
- Amount of money one would need to put aside now, earning interest, to generate this stream satisfies the equation: X = PDV × r.
- Therefore: PDV = _____.

Discounting a perpetual stream: example

- Example*:* $10,000 to be received one year from now and every year thereafter, forever. Interest rate = 5%.
- PDV = 10,000 / 0.05 = _____.

DISCOUNTING AND THE VALUE OF THE FIRM
Page 3

Net present value

- NPV of a project = PDV of (revenues – costs).
- Example: suppose a company's project would cost \$1000 now but bring in \$500 in revenue next year and \$700 two years from now. Assume interest rate = 8%.
- NPV = $-1000 + \frac{500}{1.08} + \frac{700}{(1.08)^2}$ = \$_____

Choosing projects

- If projects incur cost now and generate revenue in future, firm should compute each project's net present value.
- Firm should choose projects where NPV _____.

Value of the firm

- Firms with many projects incurring cost now and generating revenue in the future must think ahead.
- Instead of maximizing only current profit, they maximize current profit *plus* PDV of expected future profits.
- This is called the _____ of the firm.

Value of the firm: example

- Suppose a firm will make \$30 million in profit one year from now and every year thereafter, perpetually.
- Assume the interest rate is 6%.
- Then the value of the firm = \$30 million / 0.06 = \$ _____ million.

Conclusions

- Firms often take on projects that incur cost now and generate revenue in the future.
- Future revenues can be compared to current costs by taking their _____ *values.*
- The *value of a firm* = current profit plus present discounted value of its future _____.

LONG-RUN COMPETITIVE EQUILIBRIUM
Page 1

LONG-RUN COMPETITIVE EQUILIBRIUM

- What choices does a firm have in the long run?
- What happens to markets in long-run competitive equilibrium?

Definitions: review

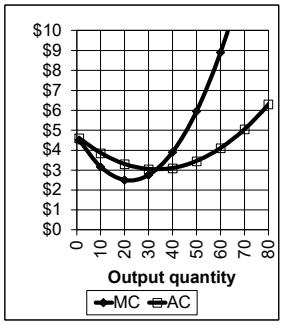
- *Short run* = period of time over which firms have _____ flexibility. Some costs are sunk. For example, leases must be paid.
- *Long run* = period of time over which firms have _____ flexibility. No costs are sunk. Leases expire and can be renewed or not.
- *Equilibrium* = situation where no one wants to change. Change what?

Two kinds of equilibrium for firms

Short-run equilibrium	Long-run equilibrium
Each firm can change its variable inputs to maximize profit.	Each firm can change _____ its inputs.
Other inputs are fixed.	_____ inputs are fixed.
Number of firms in the industry is fixed.	New firms can _____ industry and existing firms can _____ industry.

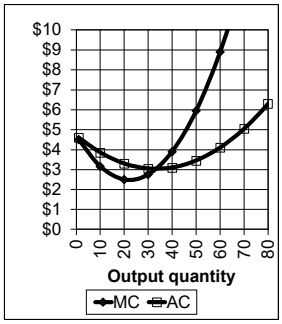
How firms adjust inputs in the long run: review

- To maximize its own profit, firm chooses output level such that P = long-run MC.
- Unless P< long-run min AC, in which case the firm shuts down to avoid losses.



How firms adjust inputs in the long run: example

- If price = $9, this firm produces _____ units.
- If price = $6, this firm produces _____ units.
- If price = $4, this firm produces _____ units.



How firms decide whether to leave an industry

- In the short run, if firms make losses, they keep operating if they make enough revenue to cover their _____ costs.
- In other words, they keep operating in the short run if P > min _____, even if they make losses.

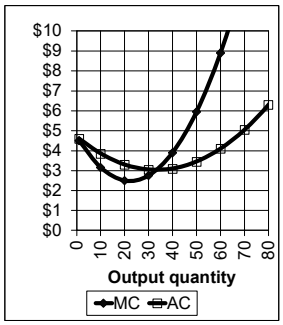
LONG-RUN COMPETITIVE EQUILIBRIUM
Page 2

How firms decide whether to leave an industry (cont'd)

- However, in the long run, _____ inputs can be adjusted, so firms can cut their losses to _____ by shutting down (leaving industry).
- So firms making losses leave the industry as soon as they can get rid of their fixed costs.
- In the popular press, this is called a "shake-out."

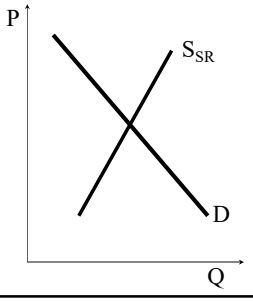
How firms decide whether to leave an industry: example

- Example: if price < _____, this firm shuts down (leaves the industry) .
- The firm might continue to exist if it sells other products in other industries.



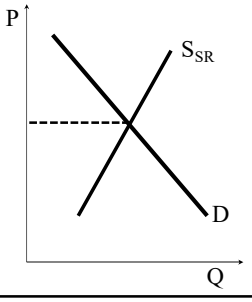
What happens to the industry's SR supply curve when some firms leave?

- The SR supply curve is drawn assuming a fixed number of firms.
- So if the number of firms decreases, the SR supply curve must shift _____.



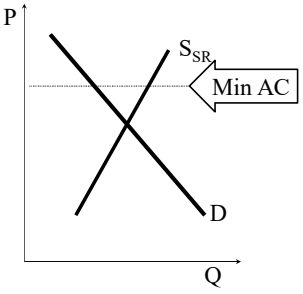
When firms leave an industry, the equilibrium price _____

- Are the exiting firms *trying* to raise the price?
- _____!
- They are just trying to avoid losses.
- *Inadvertently*, they push the price up.



How far does the industry's SR supply curve shift?

- Since the supply curve shifts left, P* rises.
- Supply keeps shifting left, and P* keeps rising, until firms no longer have any reason to leave.
- That is, when P* rises to _____.



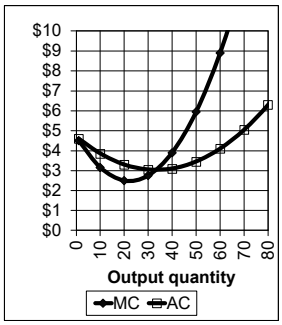
How firms decide whether to enter an industry

- If P* > min AC, then existing firms in an industry are making profits and people will notice.
- Some people ("entrepreneurs") may form new firms ("start-ups").
- Also, firms in other industries may try to expand into this industry.
- Profit attracts new firms as honey attracts bears.

LONG-RUN COMPETITIVE EQUILIBRIUM
Page 3

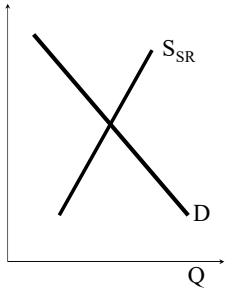
How firms decide whether to enter an industry: example

- Example: if price > _____, this firm can make profit.
- Entrepreneur should be able to borrow money from bank or venture capitalist.



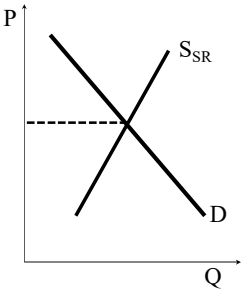
What happens to the industry's SR supply curve when new firms enter?

- The SR supply curve is drawn assuming a fixed number of firms.
- So if the number of firms increases, the SR supply curve must shift _____.



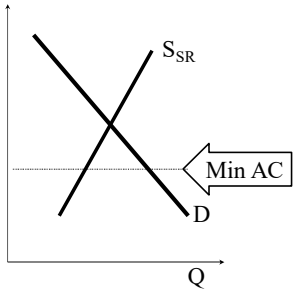
When new firms enter an industry, the equilibrium price _____

- Are the new firms *trying* to lower the price?
- _____!
- They are just chasing profit opportunities.
- *Inadvertently*, they push the price down.



How far does the industry's SR supply curve shift?

- Since the supply curve shifts right, P* falls.
- Supply keeps shifting right, and P* keeps falling, until firms no longer have any reason to enter.
- That is, when P* falls to _____.



Zero economic profit in the long run

- Assume firms are free to enter industries in search of profit and to exit industries to escape losses.
- Then any economic profits will eventually be eliminated by _____ of new firms.
- Any losses will eventually be eliminated by _____ of firms that are losing money.

Reminder about economic versus accounting cost and profit

- *Accounting cost* = money cost measured by standard accounting methods.
- *Economic cost* = money cost plus implicit opportunity cost.
- *Economic profit* = total revenue minus total economic cost.

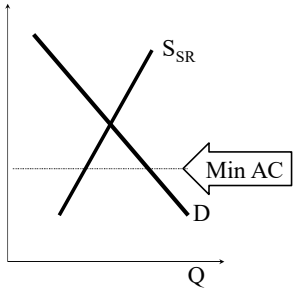
LONG-RUN COMPETITIVE EQUILIBRIUM
Page 4

What opportunity costs include

- A _____ rate of return on invested financial capital.
- The opportunity cost of renting or licensing things that the firm owns, such as real estate, copyrights, or patents.
- For small firms, the opportunity cost of the owner's time.
- So "zero economic profit" usually corresponds to _____ accounting profit.

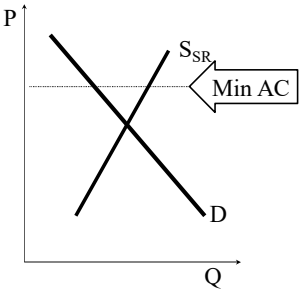
Free entry = _____ legal barriers to entering the industry

- There are few legal entry barriers in most industries in most developed countries.
- However, if there are entry barriers, then firms can enjoy _____ economic profit indefinitely.



Free exit = _____ legal barriers to exiting the industry

- There are virtually no legal exit barriers in most developed countries.
- However, if legal restrictions prevent firms from shutting down, they can be forced to endure _____ indefinitely.



Implications of two kinds of equilibrium for firms

Short-run equilibrium

- SR supply curve is horizontal sum of all firms' SMC curves.
- In equilibrium, firms may make profit or loss.
- In equilibrium, P = SMC.

Long-run equilibrium

- LR supply curve reflects _____ and _____ of firms.
- In equilibrium, all firms make _____ economic profit.
- In equilibrium, P = MC *and* P = AC.

Conclusions

- In the long run, firms can:
  - adjust all their inputs to maximize profit (the intensive margin),
  - _____ or _____ any industry in response to profit opportunities (the extensive margin).
- Therefore, in *long-run equilibrium*, all firms make _____ economic profits.

HORIZONTAL LONG-RUN SUPPLY CURVES
Page 1

HORIZONTAL LONG-RUN SUPPLY CURVES

- What determines the long-run supply curve for an industry?
- Why is long-run supply often horizontal?

Long-run supply curve: definition

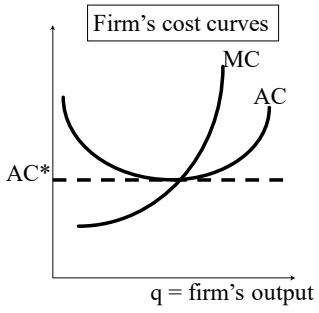
- *Curve relating price and quantity supplied, when firms can:*
  - *adjust all their inputs,*
  - _____ *an industry to exploit profit opportunities.*
  - _____ *the industry to cut losses.*
- Two most likely shapes: horizontal or upward-sloping.

What conditions cause horizontal long-run supply?

(1) Many firms have same cost of producing a good in long run, and

(2) Their costs do not depend on total size of industry.

- Minimum AC = AC* is constant.



"Constant-cost industry"

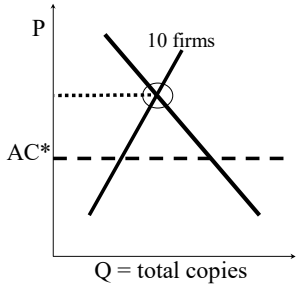
- Definition: cost curves (and min AC) are not affected by size of industry.
- Examples:

"Constant-cost industry"

- Definition: cost curves (and min AC) are not affected by size of industry.
- Examples:
  - Copy shops
  - Restaurants
  - Grocery stores

Profits encourage entry

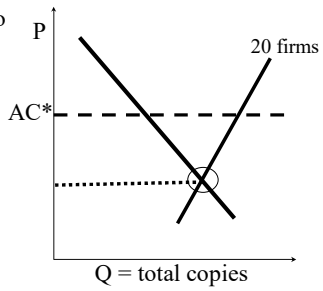
- If price > AC*, firms will enter industry, looking for profits.
- SR supply curve shifts right.
- Keep entering until _____



HORIZONTAL LONG-RUN SUPPLY CURVES
Page 2

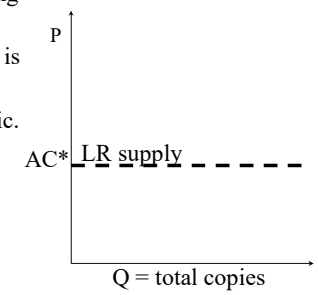
Losses encourage exit

- If price < AC*, firms will leave industry, to escape losses.
- Keep leaving until _____



Constant-cost industry must have horizontal long-run supply

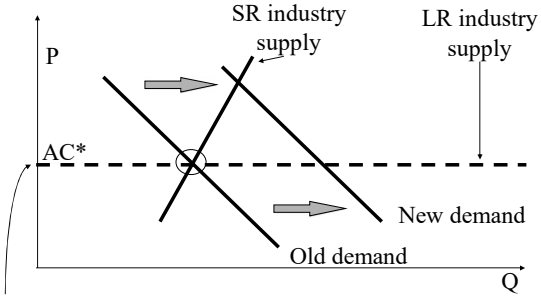
- Price keeps returning to AC* in long run.
- So long-run supply is horizontal at AC*.
- _____ elastic.



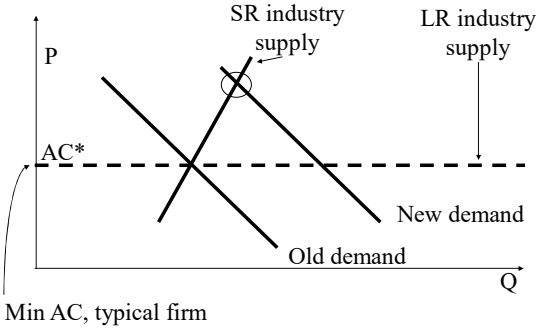
Adjustment of supply in response to a change in demand

- Suppose demand shifts left or right.
- In SR, number of firms in industry is _____, so SR supply curve is relevant.
- In LR, number of firms in industry may _____, so LR supply curve is relevant.
- Together, SR and LR supply curves help explain how price fluctuates over time.

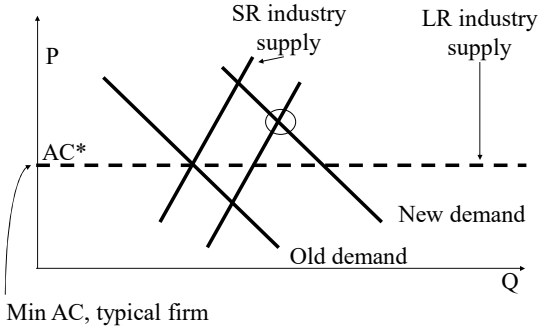
SR response to increase in demand: price rises, existing firms increase production



LR response: new firms enter industry looking for profits, price falls a little



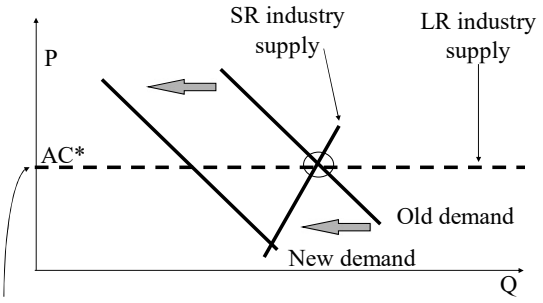
LR equilibrium: when P falls to AC*, no more firms want to enter the industry



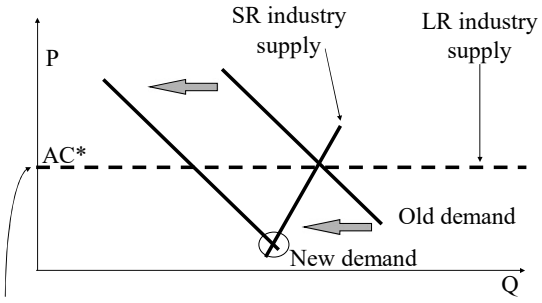
HORIZONTAL LONG-RUN SUPPLY CURVES

Page 3

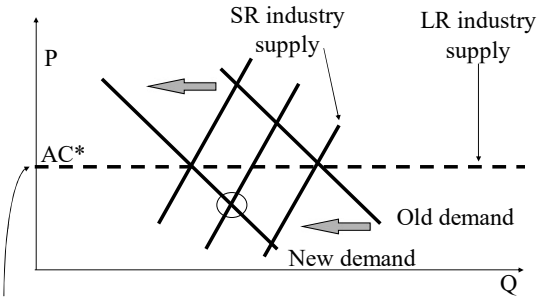
SR response to decrease in demand:
existing firms decrease production, price falls



LR response to decrease in demand: firms
leave industry to escape losses, price rises



LR equilibrium: when P rises to AC*,
no more firms want to leave the industry



Conclusions

- Long-run supply shows how price affects quantity supplied when firms have enough time to _____ or _____ the industry.
- Long-run supply is _____ (_____elastic) if all firms have the same costs and these costs are unaffected by total size of industry (a constant cost industry).
- In this case, price always returns to the same value (AC*) after demand shifts.

UPWARD-SLOPING LONG-RUN SUPPLY CURVES
Page 1

UPWARD-SLOPING LONG-RUN SUPPLY CURVES

- Why does long-run supply sometimes slope upward?

What conditions cause upward-sloping long-run supply?

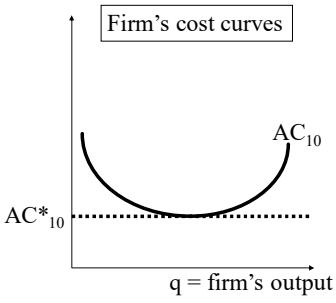
(1) Costs of each firm might rise as industry expands, and/or

(2) Some firms might be more efficient than others.

- We now look at both scenarios.

(1) What happens when costs rise as industry expands

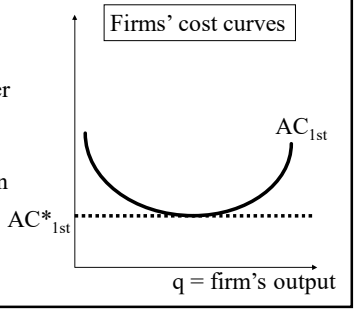
- Reason: Limited supply of some input.
- Input price gets bid up as industry output grows.
- Each firm's costs rise.
- Example:



Example of limited supply of an input: land in Manhattan, New York City

(2) What happens when some firms more efficient than others

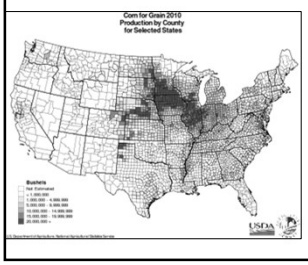
- First few firms might be very efficient.
- As price rises, other less-efficient firms enter industry.
- First few firms then enjoy "economic rents."

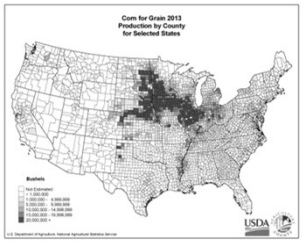


Example of some firms (farms) more efficient than others

Corn-growing counties when price was low.

Corn-growing counties when price was high.





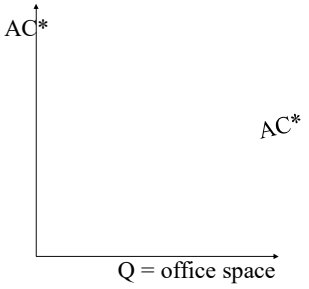
UPWARD-SLOPING LONG-RUN SUPPLY CURVES
Page 2

"Increasing-cost industry"

- Definition: cost curves (and min AC) of all firms, or just the last firm, increase as the industry expands.
- Thus, either scenario (1) or (2).
- Examples:

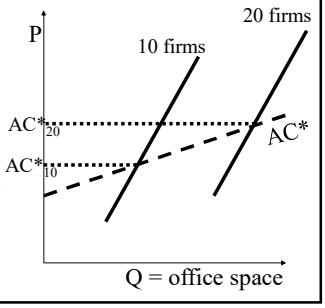
Effect on AC* as the industry expands

- Let AC* denote the average cost of the last firm.
- Under either scenario (1) or (2), AC* increases as industry expands.



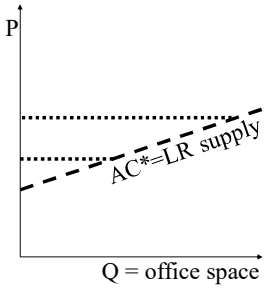
Entry and exit

- If price is low, only a _____ firms will enter the industry.
- If price rises, _____ firms are willing to enter the industry.
- But price must remain high or they will not stay.



Increasing-cost industry must have upward-sloping long-run supply

- Price keeps returning to AC* in long run.
- But AC* rises or falls depending on industry supply.
- Supply is _____ perfectly elastic.



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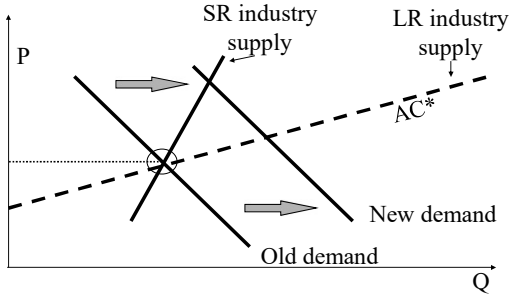
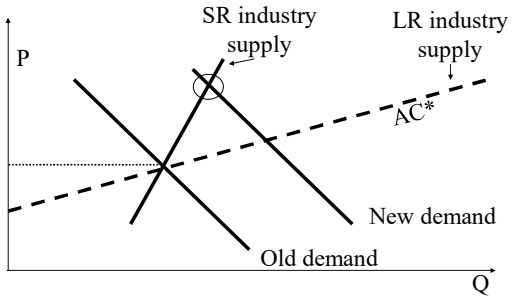


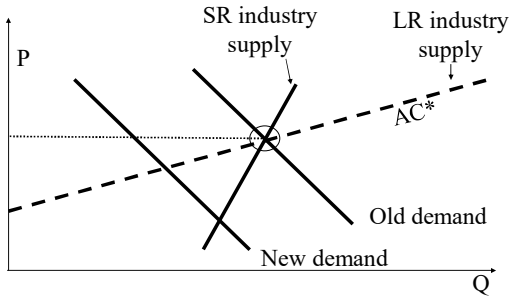
UPWARD-SLOPING LONG-RUN SUPPLY CURVES

Page 3

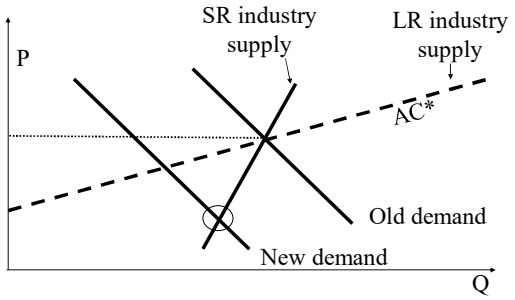
LR equilibrium: new firms enter industry, price falls only PARTWAY back



SR response to decrease in demand: existing firms decrease production, price falls



LR equilibrium: firms leave industry, price rises only PARTWAY back



Conclusions

- Long-run supply slopes _____ if firms have different costs or if their costs _____ as total industry output increases (an increasing-cost industry).
- In this case, price returns _____ back to its earlier value after demand shifts.

PART 4

Perfect and Imperfect Competition

Big ideas: Marginal-cost pricing makes competitive markets efficient. But sellers, if they are few in number, try to limit competition and push price above marginal cost. This helps sellers, of course, but hurts society as a whole.

Famous quote: "People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices."
--Adam Smith, *The Wealth of Nations* (1776)

PERFECT COMPETITION
Page 1

PERFECT COMPETITION

- What is "perfect competition"?
- Why do firms take price as a given?

Competition and perfect competition: definitions

- *Competition* = process by which each firm tries to increase its own profits at the possible expense of _____ firms' profits.
- *Perfect competition* = competition among firms that produce perfect _____ and take the market _____ as given.

What it means to "produce perfect substitutes"

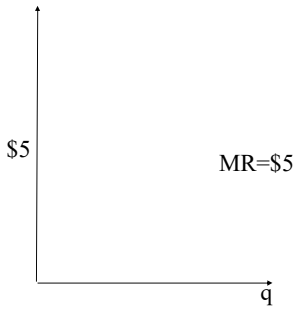
- Consumers don't care whom they buy from.
- Products of different firms are identical in consumers' eyes—no brand preference.
- Consumers buy from firm offering lowest _____.
- Examples: _____
  _____
  _____

What it means to "take market price as given"

- Firm must match price charged by rivals.
- Firm believes it will not affect price by changing output.
  - Cannot push price _____ by selling less.
  - Cannot push price _____ by selling more.
- No "market power" (i.e., pricing power).

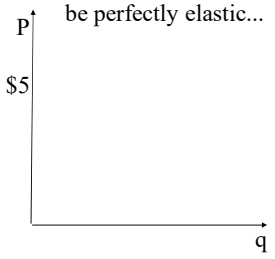
"Price-taking" firm perceives its demand curve to be perfectly elastic

- Firm's revenue = P*×q and MR = P*.
- Example: suppose market price P* = $5
- Then TR = $5 × q and MR = $5.
- Selling one more unit increases firm's revenue by $5.

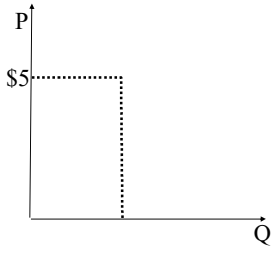


Market demand curve versus firm's demand curve

- Why would a *firm* perceive its demand to be perfectly elastic...



... when the *market* demand slopes down?

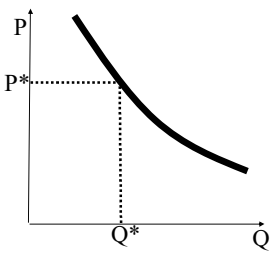


PERFECT COMPETITION
Page 2

Why firms often perceive their demand to be perfectly elastic

Firm believes if it sells more, total output Q* and market price P* will hardly change, either because it ...

- will simply take business away from its rivals, or
- is too _____ to make a difference.



What is exact relationship between market elasticity and firm's elasticity?

- Let $\varepsilon_M = \frac{\Delta Q/Q}{\Delta P/P}$ = market elasticity of demand.
- Assume that if firm increases its own output by some amount (Δq), then its rivals do _____ change their outputs.
  So Δq = ΔQ.
- What is the *firm's* elasticity of demand?

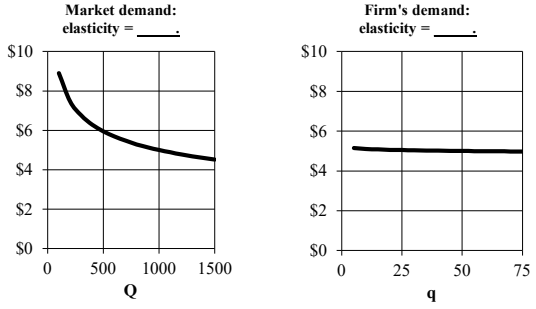
What is exact relationship between market elasticity and firm's elasticity? (cont'd)

- Let S = q/Q = firm's market share.
  So q = S Q.
- Let $\varepsilon_F = \frac{\Delta q/q}{\Delta P/P}$ = firm's elasticity of demand.
- Substitute: $\frac{\Delta q/q}{\Delta P/P} = \frac{\Delta Q/(SQ)}{\Delta P/P} = \frac{\Delta Q/Q}{\Delta P/P} \cdot \frac{1}{S}$.
- So $\varepsilon_F =$

So a firm with small market share must perceive its own demand to be very elastic

- Example:
  Suppose *market* elasticity = ε = -4
  and firm's market share = S = 0.05.
- Then *firm's* elasticity = -4/0.05 = _____.

A very elastic demand curve is practically horizontal



Price taking: short-run versus long-run

- Firm sometimes has market power in short run but not _____ run.
- Initially, might be one of only a few firms in the industry.
- Later, many more firms enter industry and firm's market share _____.
- Examples: _____
  _____

PERFECT COMPETITION
Page 3

Conclusions

- Perfect competition arises if consumers view firms' outputs as perfect _____ and firms take market price as _____.
- A firm takes price as given if it thinks the price will _____ change if it sells more, either because it will simply take business away from its rivals, or because it is too _____ to make a difference.

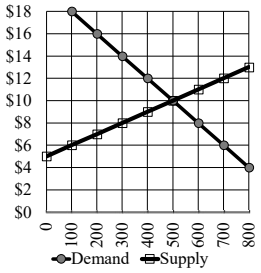
EFFICIENCY OF COMPETITIVE MARKETS
Page 1

EFFICIENCY OF PERFECTLY COMPETITIVE MARKETS

- Are perfectly competitive markets efficient?
- Do they divide the gains from trade equally between buyers and sellers?
- Why are some groups opposed to competition?

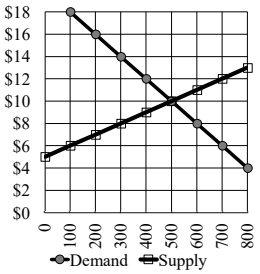
What is so efficient about the competitive equilibrium?

- Suppose equilibrium in the market for tee-shirts occurs at Q=500.
- Is this more efficient than, say, Q=300 or Q=600?



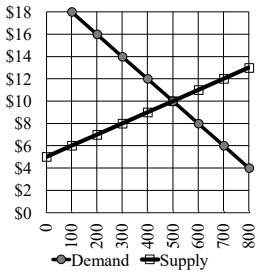
Inefficiency from too little output

- Suppose only 300 tee-shirts were produced.
- Then consumers would be willing to pay $ _____ for another tee-shirt.
- Marginal cost of making another tee-shirt would be $ ____.



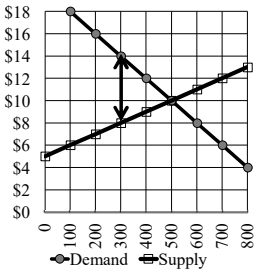
Inefficiency from too little output (cont'd)

- Marginal benefit to consumers of another tee-shirt exceeds marginal cost to producers.
- So increasing output passes the _____ (whether or not producers are actually paid for the teeshirt).



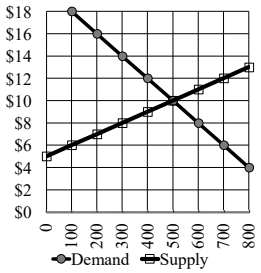
Inefficiency from unexploited surplus

- Put differently, there is a *surplus* of $14-$8 = $ ___ from making 301st tee-shirt.
- No matter how that surplus is divided, producing 301st teeshirt is a potential Pareto improvement.



Inefficiency from too much output

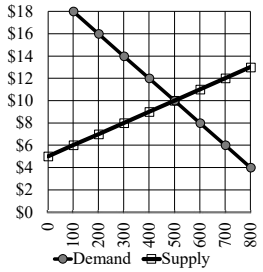
- Suppose 600 tee-shirts were produced.
- Then consumers were willing to pay only $ _____ for 600th tee-shirt.
- But marginal cost of making 600th tee-shirt was $ _____.



EFFICIENCY OF COMPETITIVE MARKETS
Page 2

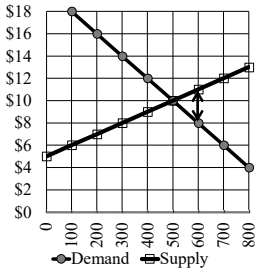
Inefficiency from too much output (cont'd)

- The cost savings from producing one less tee-shirt exceeds the lost benefit to consumers.
- So decreasing output passes the _____ (whether or not consumers actually receive a refund).



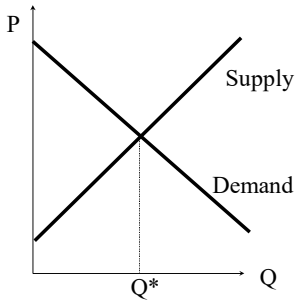
Inefficiency from negative surplus

- Put differently, there is a *negative surplus* of $11-$8 = $ _____ from producing 600th tee-shirt.
- Not producing 600th tee-shirt is a potential Pareto improvement.



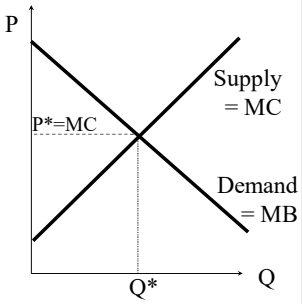
Efficiency of competition

- Starting from the competitive level of output, no increase or decrease can pass the _____.
- Put differently, the competitive level of output maximizes the _____.



Why competition is efficient

- Competition ensures that price = _____.
- Everyone willing to pay marginal cost of the good, will buy it.
- Anyone not willing to pay marginal cost, will not buy it.

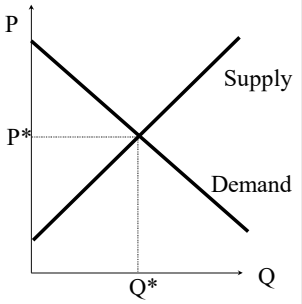


Gains from trade

- Through _____ pricing, competition *maximizes* the total surplus.
- But it also *divides* that surplus between consumers and producers.
- We can measure how much they gain using concepts of consumer surplus (CS) and producer surplus (PS).

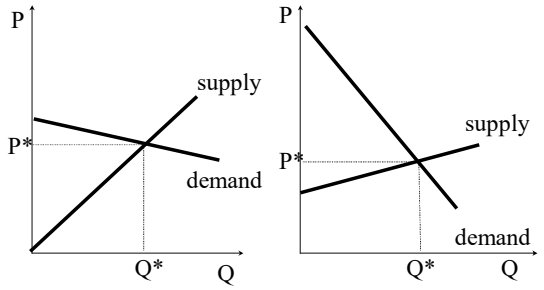
Measuring gains from trade in a competitive market

- CS = area between demand curve and horizontal line at P*.
- PS = area between the supply curve and the horizontal line at P*.
- Total gains from trade in this market = total surplus = CS + PS.



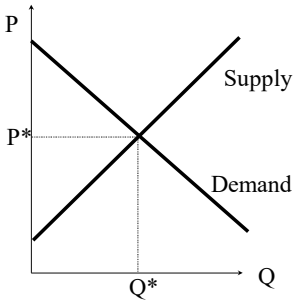
EFFICIENCY OF COMPETITIVE MARKETS
Page 3

Gains from trade need NOT be equal



Why the market mechanism is sometimes controversial

- Everyone likes the idea of maximizing total surplus.
- Not everyone likes the way competitive markets _____ the surplus between consumers and producers.



Market controls

- Although total surplus is maximized by competition, groups of buyers or sellers may enjoy higher surplus if the market is controlled in some way.
- They may try to get government to impose regulations like _____ _____.
- Or they may try to gain *market power.*

When markets are not competitive

- We can compare free competition with regulation or monopoly by comparing gains from trade: _____ surplus, _____ surplus, and total surplus.
- Measurement of gains from trade from changes in markets is called "_____ analysis."

Conclusions

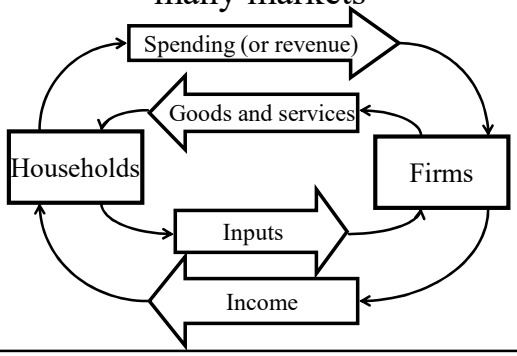
- Competition, through _____ pricing, ensures that the level of output is _____.
- Total gains from trade in a market are the sum of consumer and producer _____, which are not necessarily equal.
- Competition maximizes the _____ surplus, but some groups may do better with government controls or market power.

ECONOMY-WIDE EFFICIENCY
Page 1

ECONOMY-WIDE EFFICIENCY

- What needs to happen for a whole economy to be efficient?
- Does perfect competition insure this result?

An economy consists of many markets



Markets are linked

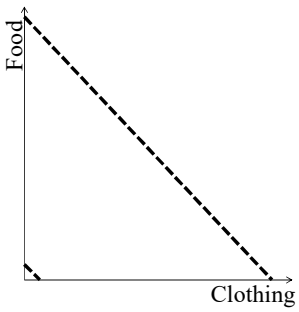
- Prices in one output market affect demand (for _____) in other markets.
- Prices in output markets affect firms' demands for _____.
- Prices in input markets affect firms' costs and thus affect _____ curves in output markets.

If *all* markets are in competitive equilibrium, then...

- No excess demand or excess supply in any market.
- Price = _____ in every market.
- No more opportunities for arbitrage.
- Everyone faces the same prices.
- Everyone's budget line has same _____.

Implications of competitive equilibrium (cont'd)

- Although everyone faces same prices, it is *not* true that everyone has same income.
- Slopes of budget lines are equal.
- But intercepts are _____ equal.



Adam Smith's (1776) claim

"Every individual ... neither intends to promote the public interest, nor knows how much he is promoting it...

"He intends only his own security, his own gain.

"And he is in this ... led by an _____ to promote an end which was no part of his intention.

"By pursuing his own interest he frequently promotes that of society more effectually than when he really intends to promote it."

ECONOMY-WIDE EFFICIENCY
Page 2

Was Smith right?

When people individually do the best they can with what they have, do they (inadvertently) "promote the interest of society" as a whole?

This slideshow breaks this down into two questions.

1. What needs to happen for a whole economy to be efficient?
2. Does perfect competition insure this result?

Three requirements for an economy to be economically efficient

#1. Efficiency in production (also called "technical efficiency").

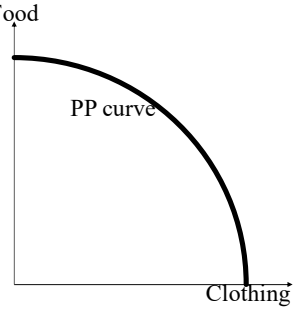
#2. Efficiency in consumption (also called "exchange efficiency").

#3. Efficiency of output mix.

- Does a competitive economy pass these tests?

Requirement #1: Efficiency in production

- *Economy must be* on *(not inside) the PP curve.*
- Being "*on* the PP curve" means:
  - Firms are not wasting inputs.
  - Firms are the right size.

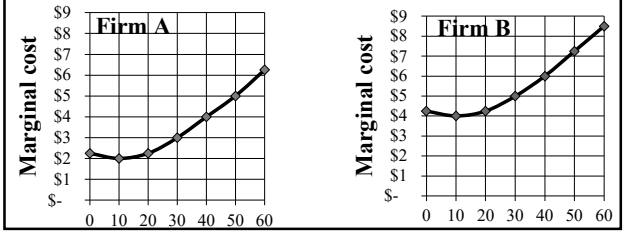


Does perfect competition ensure that inputs are not wasted?

- *Amounts of inputs:* Clearly, no profit-maximizing firm will use more inputs than it needs because _____.

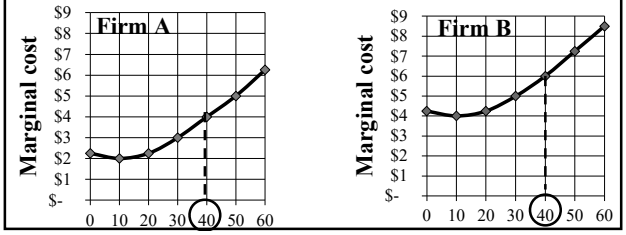
Does perfect competition ensure that firms are the right size?

Example: Suppose the flash drive industry, consisting of two firms, must produce a total of 80 units of output. What is the cheapest way to do this?



Example: Allocating production across firms

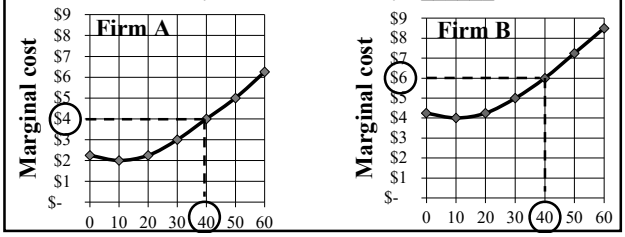
Suppose initially each firm produces 40 units of output. Is this the cheapest way to produce 80 units total? _____!



ECONOMY-WIDE EFFICIENCY
Page 3

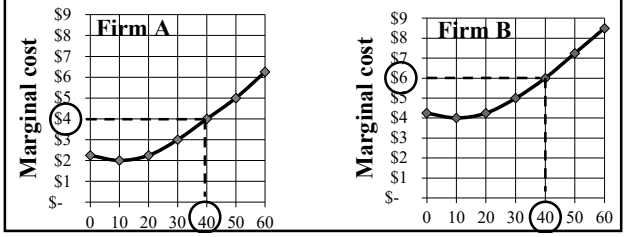
Example: Allocating production across firms (cont'd)

- If Firm A produced one more flash drive, its cost would rise by $____. If Firm B produced one less flash drive, its cost would fall by $_____.
- Total industry costs would **fall** by $_____.



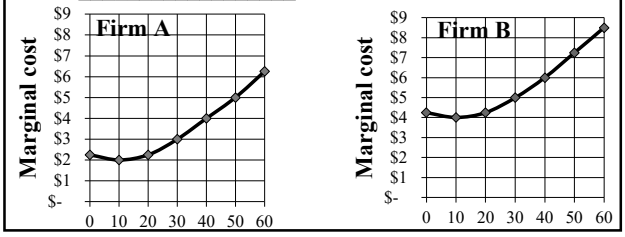
Example: Allocating production across firms (cont'd)

- If MCs are unequal, industry costs can be lowered by _____ output at the firm with lower MC, and _____ output at the firm with higher MC.



When are firms the "right size"?

- How should total output be divided between firms to minimize total industry costs?
- Answer: Set output so that _____ _____



Does perfect competition ensure that firms are the right size?

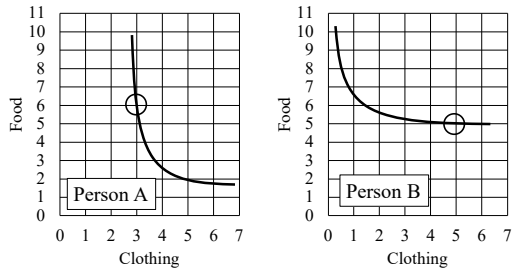
- Do all firms in a perfectly competitive industry have the same value of MC?
- Answer: _____ (inadvertently).
- Reason: All firms, seeking their "own gain" (profit) set their output levels so that their MCs are equal to the _____ and thus to each other's MC.

Requirement #2: Efficiency in consumption

- *Goods must be distributed to consumers in an economically efficient way.*
- The "right way" means:
  - Any further exchange among consumers would make at least one consumer worse off.
  - No potential gains from further trade among consumers.

When are there potential gains from trade among consumers?

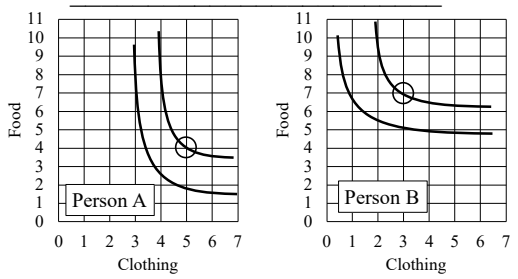
_____



Reminder: MRS = |slope| of indifference curve.

ECONOMY-WIDE EFFICIENCY
Page 4

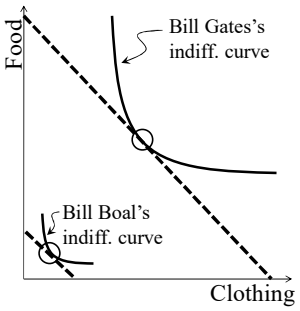
When are there NO potential gains from further trade among consumers?



Reminder: MRS = |slope| of indifference curve.

Economically efficient = no potential gains from further trade

- Efficiency does NOT require that everyone have equal income or the same bundle.
- Just requires |slopes| of indifference curves (MRSs) to be equal.
- Efficiency is different from fairness.

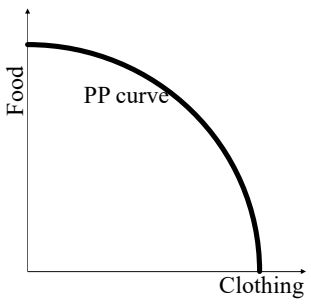


Does perfect competition ensure efficiency in consumption?

- Under perfect competition, every consumer faces the same prices.
- Does every consumer have the same MRS?
- Answer: _____ (inadvertently).
- Reason: All consumers, seeking their "own gain," choose combinations at _____ with their budget lines, which are parallel.

Requirement #3: Efficiency of output mix

- *The right combination of goods must be produced.*
- That is, the right point on the PP curve must be chosen.

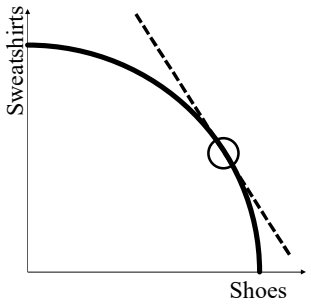


How is the slope of the PP curve related to competitive prices?

- It can be proved that |slope| of PP curve equals ratio of marginal costs:
  - $|\text{Slope}| = MC_{clothing} / MC_{food}$.
- Under perfect competition, MC = P in every industry, so:
  - $|\text{Slope}| = P_{clothing} / P_{food}$.

In a competitive economy, prices reflect true opportunity costs in production

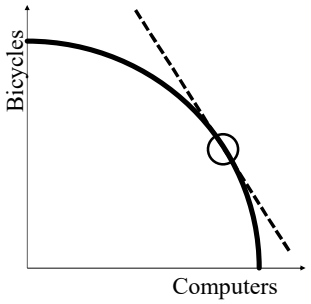
- Suppose price of sweatshirts = \$25 and price of shoes = \$75.
- With sweatshirts on the vertical axis, slope of PP curve
  = opp cost of shoes
  =
  =



ECONOMY-WIDE EFFICIENCY
Page 5

Conversely, opportunity costs in production determine prices

- Suppose opportunity cost of computer is two bicycles.
- Then 2 = price of computer / price of bicycle.
- If price of computer is $500, then price of bicycle is _____



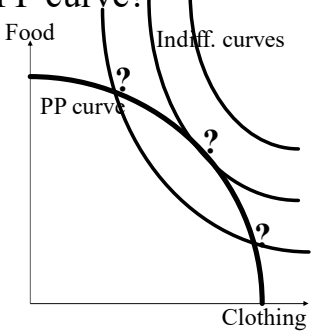
What is the "right combination" of goods to produce?

- The "right combination" is where:

The rate of tradeoff that consumers ***want*** to make	=	The rate of tradeoff that the economy ***can*** make

Where is the "right point" on the PP curve?

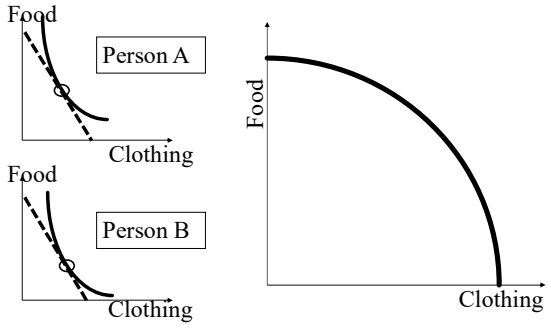
- MRS at everyone's chosen combinations of goods (slope of indiff. curve) = slope of PP curve.
- (Diagram shows case of one big consumer.)



Does perfect competition push the economy to the "right point" on the PP curve?

- Is |slope| of PP curve equal to every consumer's MRS (slope of indiff. curve)?
- Answer: _____ (inadvertently).
- Reason: MRS
  =
  =
  =

In competitive equilibrium, slope of each consumer's budget line = slope of PP curve



Competitive prices are signals

- In a competitive economy, relative prices thus signal the true _____ of each good.
- For example, if the competitive price of a computer is twice the price of a bicycle, then the economy's opportunity cost of a computer must be ____ bicycles.

ECONOMY-WIDE EFFICIENCY
Page 6

Competitive prices are signals

- In a competitive economy, relative prices thus signal the true ___opportunity cost____ of each good.
- For example, if the competitive price of a computer is twice the price of a bicycle, then the economy's opportunity cost of a computer must be __2__ bicycles.

Summary: competitive prices direct people toward efficient behavior

Although each consumer and firm "intends only his own gain," prices create incentives for

- each consumer to choose an _____ combination of consumption goods.
- each firm to produce an _____ amount of output using an efficient combination of inputs.

Competitive prices are Adam Smith's "invisible hand"

- Assuming all markets in the economy are perfectly competitive, Smith was basically right.
- When people do the best they can with what they have, people (_____) "promote the interest of society."

Conclusions

Economy-wide perfect competition is efficient:

- *Efficient in production:* The economy operates _____(not inside) the PP curve.
- *Efficient in consumption:* Goods are distributed to consumers so that there are no potential _____.
- *Efficient in product mix:* The right combination of goods is produced.

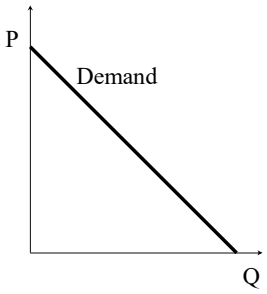
MONOPOLY AND BARRIERS TO ENTRY
Page 1

MONOPOLY AND BARRIERS TO ENTRY

- What is a "monopoly"?
- Why do monopolies arise?

Monopoly: definition

- *Single seller in the market.*
- Faces entire market demand curve.
- Cannot take price as given, must recognize that own output influences price.



Why monopolies exist

- *Barriers to entry* by new firms.
  - Legal barriers:
    1. government franchise monopoly
    2. patent monopoly
    3. regulation such as FDA
  - Technical barriers:
    1. ownership of a unique resource
    2. "natural" monopoly

Legal barriers: (1) government franchise monopoly

Government sometimes permits only one firm in industry.

Historical examples:

Examples today:

Government franchise monopoly (cont'd)

- Why do governments grant franchises?
- Historically:

- Today:

Legal barriers: (2) patent monopoly

- In U.S., patent protection lasts for 20 years in most cases.
- Extremely important in some industries:

- Important in other industries:

MONOPOLY AND BARRIERS TO ENTRY
Page 2

Patent monopoly (cont'd)

- Why do governments provide patent protection?

Technical barriers: (1) ownership of a unique resource

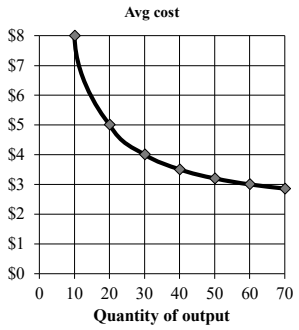
- If a particular resource is required to produce some good, then ownership of the resource confers monopoly power.
- Historical examples:
- Examples today:

Technical barriers: (2) "natural" monopoly

- *DEFINITION: Output is more cheaply produced by one firm rather than by several firms.*
- Economies of scale (falling average cost) imply natural monopoly.
- Note: "natural" monopoly has _____ to do with natural resources.

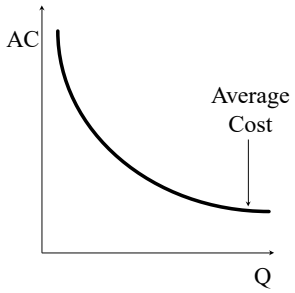
Example of natural monopoly: suppose a total of 60 units of output must be produced

- If produced by 1 firm, AC = $_____.
- If produced by 2 firms, AC = $_____.
- If produced by 3 firms, AC = $_____.



"Natural" monopoly in the real world

- Electric power distribution.
- Natural gas distribution.
- Airlines serving small communities.



Is the software industry a natural monopoly?

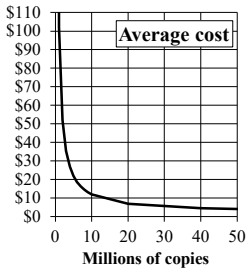
- Example: Suppose it costs
  - $100 million to develop a new word processing app.
  - $2 per copy to register a customer and let them download the app.
- Then TC = $100 million + 2Q.
- So AC = _____.

MONOPOLY AND BARRIERS TO ENTRY
Page 3

Is the software industry a natural monopoly? (cont'd)

Q	AC
1 million	$_____
10 million	$_____
50 million	$_____.

- Whenever there are big up-front costs to making a product, natural monopoly results.



Implications of natural monopoly for society

- Competition is *unstable,* because _____ firms can drive out _____ firms.
- Competition may be *undesirable,* because society's total costs are minimized by having only _____ producer.

Conclusions

- A *monopolist* is a "_____."
- Monopolies arise because of _____.
- Legal barriers include government franchises and patents.
- Technical barriers to entry include: ownership of a unique resource and _____*monopoly* (economies of scale).

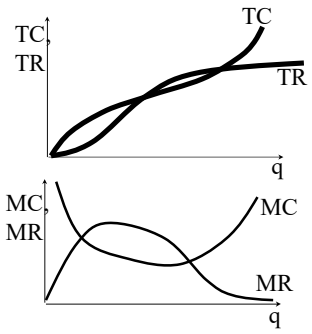
MONOPOLY PRICING
Page 1

MONOPOLY PRICING

- How does a monopolist choose what quantity to produce and what price to charge?

The MR=MC rule again

- ANY profit-maximizing firm chooses an output level Q that maximizes profits.
- General rule: set output so that marginal revenue = marginal cost.

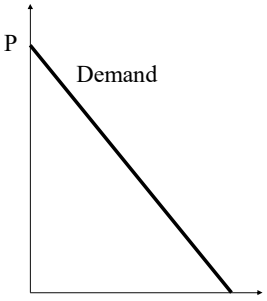


Why a monopolist is different

- A monopolist can change the market price by changing its own quantity.
- It has "market power" (power over price).

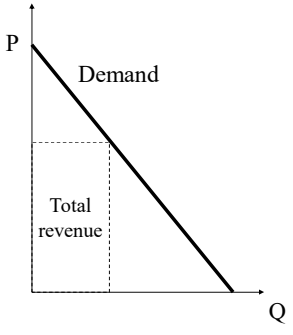
Monopolist faces downward-sloping demand

- It can raise price by decreasing output.
- Conversely, it must accept a lower price to increase output.



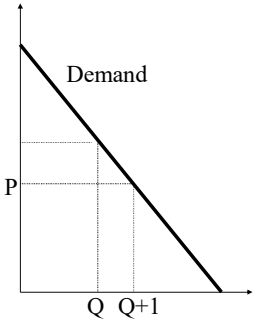
Revenue and marginal revenue when demand slopes down

- *Total revenue* = area of the rectangle under the demand curve.
- *Marginal revenue* = change in this area as output increases by one unit.



Like competitor, monopolist gets revenue from additional unit sold

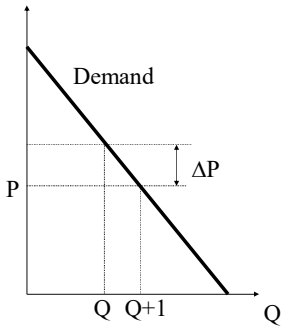
- When a monopolist sells 1 more unit at price P, revenue rises by P.



MONOPOLY PRICING
Page 2

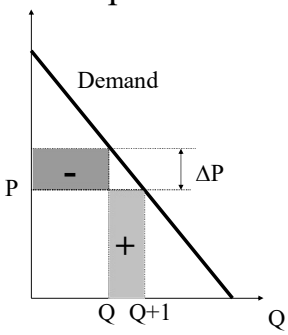
Unlike competitor, monopolist must cut price to increase sales

- However, to sell that unit, monopolist must ____ price on existing sales: $\Delta P < 0$.
- Thus revenue falls by quantity of existing sales (Q) times the price cut (ΔP): $Q \times \Delta P < 0$.



Thus for monopolist, marginal revenue < price

- Thus MR from selling one more unit of output
  $= P + (Q \times \Delta P)$
  $< P$, since $\Delta P < 0$.



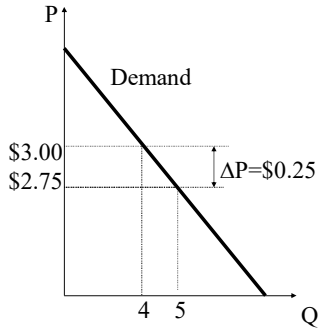
Example 1

- Suppose a vendor sells 4 corn dogs at price=$3. No other vendors nearby.
- If vendor cuts price to $2.75 it can sell one more (that is, 5 corn dogs).
- What is the vendor's marginal revenue? $2.75 ?

Example 1

MR = $P + Q \times \Delta P$
= $2.75 + 4 \times (-\$0.25)$

= $_____



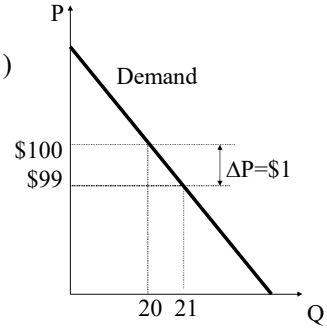
Example 2

- Suppose a store is now selling 20 designer sweaters per day at $100 each.
- Only store selling this style.
- If it cuts price to $99, it can sell one more sweater (that is, 21 sweaters per day).
- What is the store's marginal revenue? $99 ?

Example 2 (cont'd)

MR = $P + Q \times \Delta P$
= $99 + 20 \times (-\$1)$

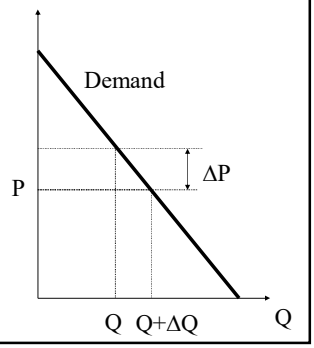
= $_____.



MONOPOLY PRICING
Page 3

What if output rises by more (or less) than one full unit?

- Suppose output increases by ΔQ.
- Then total revenue: rises by ΔQ × P, falls by Q × ΔP.
- ΔTR = ΔQ × P + Q × ΔP

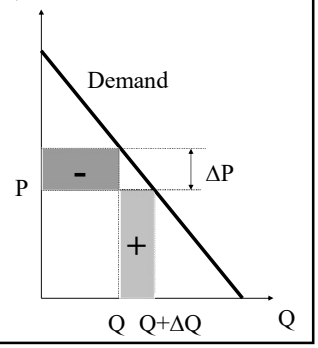


Marginal revenue when output rises by more (or less) than one unit

Marginal revenue = MR

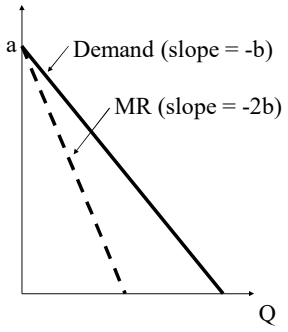
$$= \frac{\Delta TR}{\Delta Q}$$

$$= \frac{\Delta Q \times P + Q \times \Delta P}{\Delta Q}$$



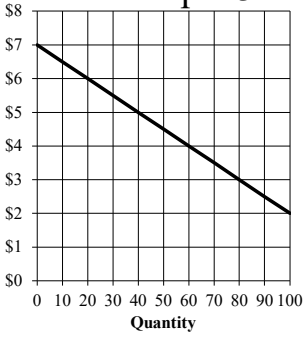
Marginal revenue curve for linear demand curve

- Suppose demand is given by: P = a - bQ.
- MR = $P + Q \times \frac{\Delta P}{\Delta Q}$ = (a - bQ) + Q (-b) = a - 2bQ
- *Conclusion:* MR has _____ price-intercept but _____ slope of demand curve.



Marginal revenue curve for linear demand curve: example 3

- Suppose demand is given by: P = 7 – 0.05 Q.
- Then MR =



Marginal revenue and the price elasticity of demand

- MR = $P + Q \times \frac{\Delta P}{\Delta Q}$

$$= P + P \times \frac{Q}{P} \times \frac{\Delta P}{\Delta Q} = P + P \times \frac{\Delta P/P}{\Delta Q/Q}$$

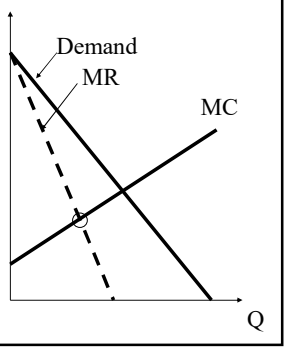
$$= P\left(1 + \frac{\Delta P/P}{\Delta Q/Q}\right)$$

- But $\varepsilon = \frac{\Delta Q/Q}{\Delta P/P}$, so MR =

Using the MR=MC rule

- To maximize profits, monopolist chooses Q_M so that MR=MC.
- Chooses price P_M on demand curve.
- Why is P_M > MC?

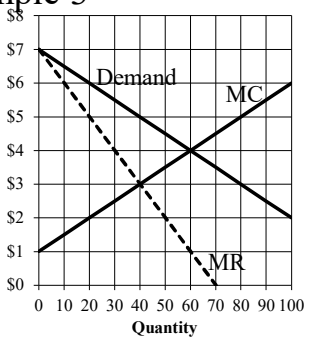
_____



MONOPOLY PRICING
Page 4

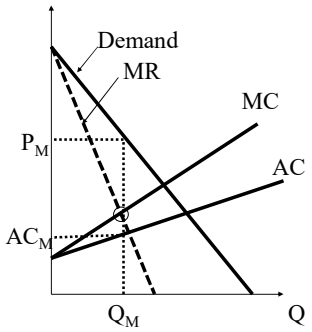
Choosing output and price: example 3

- Suppose MC is given by:
  MC = 1 + 0.05 Q.
- What will monopolist do?
- Choose Q_M = _____
- Choose P_M = _____



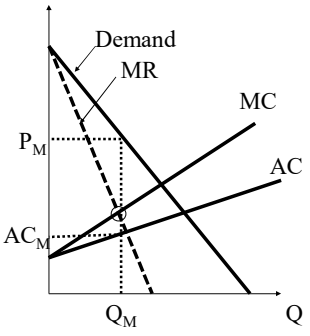
Monopoly revenue and cost

- Total revenue
  = $P_M \times Q_M$
- Total cost
  = $AC_M \times Q_M$
- Profit
  = Total revenue – Total cost



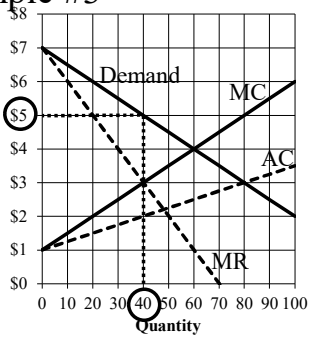
Monopoly profit

- A monopoly's economic profit can persist indefinitely, because it is protected by _____ _____.
- Monopoly profits sometimes called *"monopoly rents."*



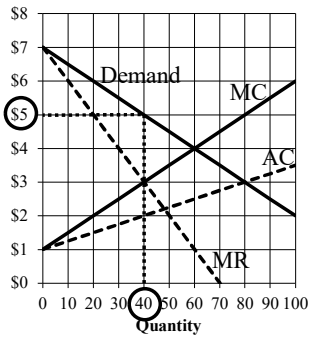
Computing revenue and cost: example #3

- Total revenue (TR)
  = $P_M \times Q_M$
  = $5 × 40
  = $_____.
- Total cost (TC)
  = $AC_M \times Q_M$
  = $2 × 40
  = $_____.



Computing profit: example #3

- Profit = TR – TC
  = $_____.
- Alternatively, profit
  = $(P_M - AC_M) \times Q_M$
  = (5-2) × 40
  = $_____.



Conclusions

- Like a competitor, a monopolist chooses output so that _____ = MC.
- But MR is _____ than price for a monopolist because it faces downward-sloping demand.
- In particular, MR = P + Q (ΔP/ΔQ)
  = P (1 + 1/ε) < P.
- So unlike a competitor, a monopolist sets price _____ MC and enjoys positive economic profit even in the long run.

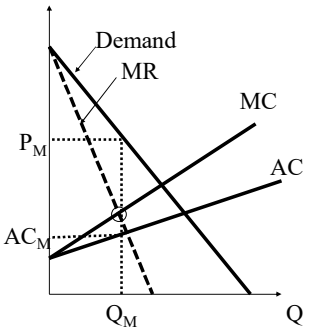
WELFARE ANALYSIS OF MONOPOLY
Page 1

WELFARE ANALYSIS OF MONOPOLY

- What's wrong with monopoly?

Monopoly profit

- A monopolist sets price _____ MC.
- A monopolist enjoys positive economic profit even in the long run because it is protected by barriers to _____.



What's wrong with monopoly?

- "Monopoly" has negative connotations in most people's minds.
- Noneconomic arguments against monopoly are often vague and inconsistent.
- Goal here is to clarify economic arguments against monopoly.

Noneconomic arguments against monopoly

- *Argument:* Big is bad.
  - *Weakness:* _____
- *Argument:* Concentration of power is bad for society.
  - *Weakness:* _____
- *Argument:* Bad for income distribution.
  - *Weakness:* _____

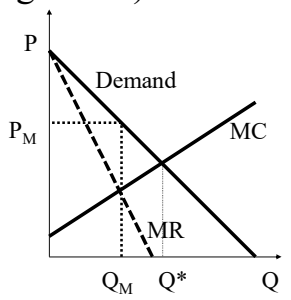
Economic arguments against monopoly

- *Argument:* Because price is greater than marginal cost, some welfare (potential gains from trade) is lost.
- Monopolies are not _____.

Measuring loss of social welfare (deadweight loss)

- Deadweight loss = loss of potential gains from trade.

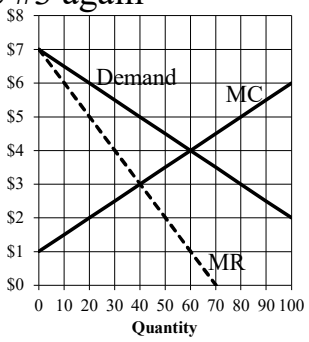
  = area between demand and MC curves from Q_M to Q^*.



WELFARE ANALYSIS OF MONOPOLY
Page 2

Measuring deadweight loss: example #3 again

- Choose Q_M where MR=MC and P_M on demand curve.
- Q_M = _____.
- P_M = _____.
- But Q* = _____.
- Deadweight loss = $_____.



More economic arguments against monopoly

- *Argument:* Barriers to entry may reduce incentives for efficiency (e.g., cost minimization).
- *Argument:* May encourage rent-seeking behavior.
  - DEF: *Rent-seeking* = devotion of resources to erect barriers to entry.

An economic argument in favor of monopoly

- *Argument:* Monopolist may have greater incentive than a competitor to develop lower-cost methods of production (Joseph Schumpeter*).
- Possible example: _____
- But evidence for greater technical innovation is weak at best.

Joseph Schumpeter 1883–1950) Austrian-born American economist and political scientist.

Conclusions

- While noneconomists often have numerous arguments against monopoly, these are often vague and inconsistent.
- Economists have a specific argument: _____from pricing _____ marginal cost.
- Additional economic arguments include loss of technical efficiency and _____ _____ behavior.

MONOPOLY PRICE DISCRIMINATION
Page 1

MONOPOLY PRICE DISCRIMINATION

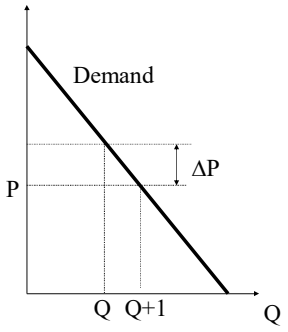
- What is "price discrimination"?
- What are its impacts on individual consumers and social welfare?

Price discrimination: general definition

- *Charging multiple prices (for reasons unrelated to costs) in order to increase profits.*
- Types of price discrimination:
  - perfect price discrimination.
  - market segmentation.

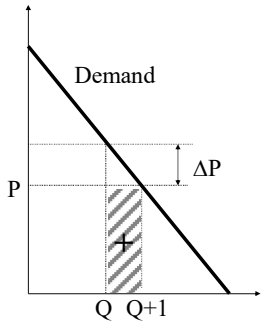
Why price-discriminate?

- Ordinary monopolist must charge same price to all customers.
- Therefore, must cut price on all customers to increase sales.

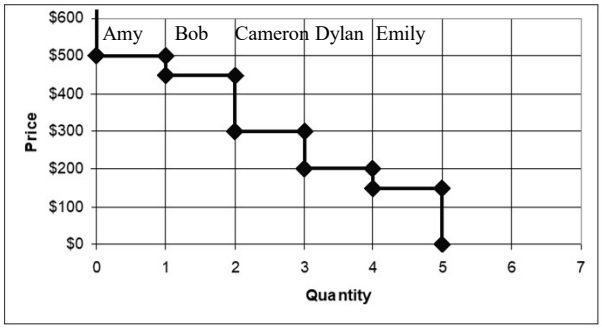


What if you could charge different prices to each customer?

- You would NOT have to cut price on all customers to increase sales.



Example: What price could you charge each customer?



Price discrimination: general requirements

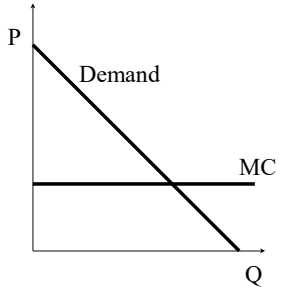
(1) *Market power* (power over price).
- Why important:

(2) Ability to *prevent arbitrage* between customers.
- Why important:

MONOPOLY PRICE DISCRIMINATION
Page 2

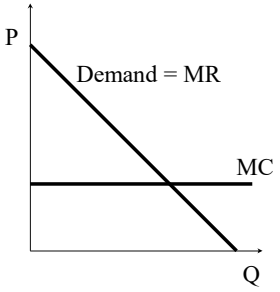
Perfect price discrimination: definition

- Monopolist charges a different price for every unit sold.
- Each unit is charged the consumer's willingness-to-pay.
- Marginal revenue curve = _____ _____



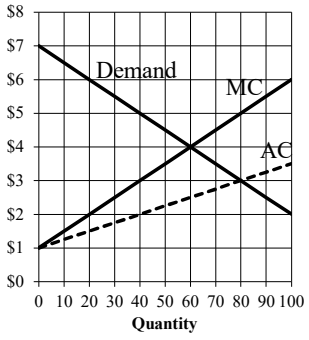
Perfect price discrimination: how much is sold?

- Serves all customers willing to pay at least the marginal cost of production.
- Entire gains from trade captured by monopolist.



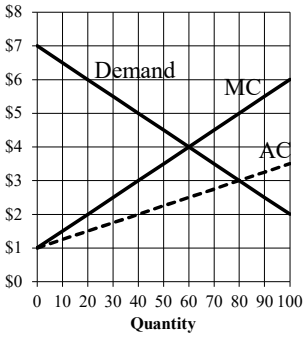
Pricing with perfect price discrimination: example 3 again

- Suppose monopolist could charge everyone a different price.
- Quantity sold = _____
- Highest price = _____
- Lowest price = _____



Revenue and profit with perfect price discrimination: example 3 again

- Revenue = area under demand curve = $_____.
- Total cost = = output × AC = $_____.
- Profit = revenue – total cost = $ _____.
- Consumer surplus = $_____.



Welfare analysis of perfect price discrimination

- Monopolist serves all customers willing to pay at least the marginal cost of production.
- Thus there is *no deadweight loss!*
  - Output is _____ as under competition.
- But seller gets all the gains from trade.
  - Consumer surplus is _____.

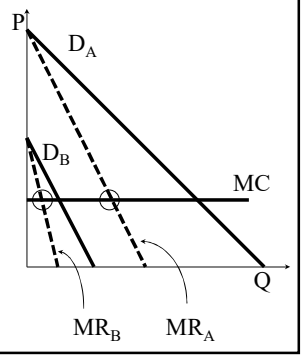
But perfect price discrimination is impractical

- Monopolist must know the maximum that *each buyer* is willing to pay for each unit.
- Are buyers likely to reveal this information?
- Most that monopolist knows (usually) is the price-sensitivity (elasticity) of different market *segments*.

MONOPOLY PRICE DISCRIMINATION
Page 3

Market segmentation: definition

- *Charging a different price to each market segment.*
- Suppose elasticities differ across segments.
- To maximize profits, set each segment's price so that its own MR = MC.



Pricing and elasticity

- We previously showed that for any monopolist, $MR = P\left(1+\frac{1}{\varepsilon}\right)$.
- Setting MR=MC gives $MC = P\left(1+\frac{1}{\varepsilon}\right)$.
- Solving for P gives a rule for monopoly pricing: $P =$

Different elasticities → different prices

- Suppose different market segments have different elasticities of demand (ε).
- To maximize profit, monopolist should set different prices according to ε , even if MC is the same.
- Market segment with most elastic demand should get _____ price.

Market segmentation: example

- Consider a symphony orchestra or a theatre.
- Suppose MC of seat = \$10, general public's ε = -2, and students' ε = -5 .
- To maximize profits, should set:
  - Price for general public = $\frac{10}{\left(1+\frac{1}{-2}\right)}$ = \$_____.
  - Price for students = $\frac{10}{\left(1+\frac{1}{-5}\right)}$ = \$_____.

How market-segmenting price discrimination works

- Customers with more elastic demand are more sensitive to price, perhaps because have close substitutes available. They get _____ price.
- Customers with less elastic demand are less sensitive to price, perhaps because have no close substitutes. They get _____ price.

Market-segmenting price discrimination in the real world

- Movie theaters and performing arts:
- Airlines:
- Supermarket products:

MONOPOLY PRICE DISCRIMINATION
Page 4

Conclusions

- *Price discrimination* means charging multiple prices to maximize profits.
- Price discrimination always yields _____ profits for monopolist.
- With market-segmenting price discrimination, customers with less elastic (price-sensitive) demand pay a _____ price.
- However, price discrimination is not necessarily worse for society than ordinary monopoly.

CARTELS AND ANTITRUST LAW
Page 1

CARTELS AND ANTITRUST LAW

- What is a cartel?
- Why do cartels usually fail?
- Are there laws against cartels and monopolies?

More from Adam Smith

"People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices."

Adam Smith, *The Wealth of Nations*, New York: Modern Library, 1937, Book I, Chapter X, p. 128.

Ways to form a monopoly

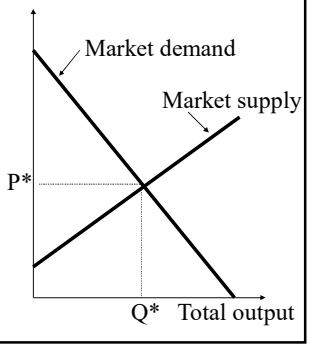
(1) Get government to set up entry barriers, excluding all other firms.
- Examples:

(2) Merge with other firms in same industry.
- Examples:

(3) Form a *cartel,* an agreement with other firms in same industry to raise price.

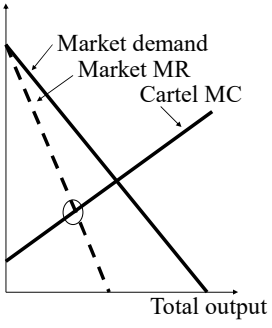
Tasks facing a cartel

- Choose level of total cartel output Q** < Q*.
- Divide this total output among cartel's member firms.
- Each member assigned an output *quota* q**.



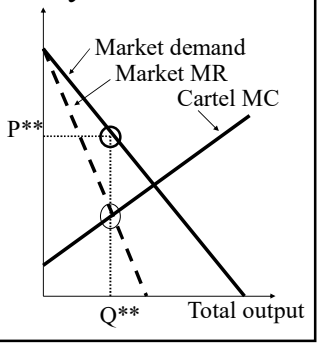
The ideal cartel: how to maximize total cartel profits

- Divide total output so that every member firm has same _____.
- Then cartel MC curve is same as competitive supply curve.
- Set total output Q** where MR = cartel MC.



The ideal cartel: consequences for society

Deadweight loss = area between demand and cartel MC curves from cartel output to socially-optimal output.



CARTELS AND ANTITRUST LAW
Page 2

Internal pressures facing a cartel

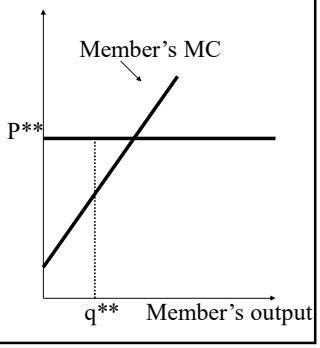
- Cartels are bad for society because they set prices _____ marginal cost, causing deadweight loss.
- But need we fear them?
- Many cartels fall apart by themselves.
- Why?

Members' incentives to cheat

Now P** > MC for every member.

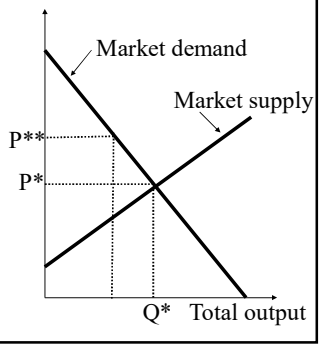
Every member has incentive to:

- cut price slightly (if necessary),
- produce more than its quota (q**).



Cheating can undo a cartel

- If many firms produce more than their quotas, the price _____.
- Market returns to competition.



Enforcement

- Cartels need an enforcement mechanism to make sure every member sticks to its quota.
- In U.S., cartel agreements not enforceable in courts and are usually _____ under "antitrust" laws.

Antitrust laws: definition

- *Laws that prohibit forming monopolies through mergers, cartels, or certain other actions.*
- Name refers to "trusts," a kind of merger briefly popular in the U.S. in the late 19th century.

The U.S.'s Sherman Act of 1890

Prohibits:

- Any "contract, combination, ... or conspiracy, in restraint of trade or commerce" [Section 1]
- Any action to "monopolize, or attempt to monopolize, or combine or conspire with any other person or persons to monopolize" any "trade or commerce" [Section 2]

CARTELS AND ANTITRUST LAW
Page 3

What is illegal under the Sherman Act?

- Forming a cartel? _____ _____
- Merging with other firms in the industry? _____
- Predatory pricing (setting price below cost to drive a competitor out of business)? _____ _____
- Having large market share? _____

Other major U.S. antitrust laws

- Clayton Act of 1914
  - strengthened restrictions on mergers.
  - prohibited price discrimination.
  - forbade practices that "lessen competition."
- Federal Trade Commission Act of 1914
  - prohibited "unfair methods of competition in commerce, and unfair or deceptive acts or practices of commerce."

Price-fixing

- Making an agreement with other firms to raise prices is called price-fixing.
- Recent U.S. antitrust prosecutions for price-fixing can be found at https://www.justice.gov/atr/antitrust-case-filings (check the box for "price fixing—horizontal").

Conclusions

- Monopolies can be formed by _____ or _____.
- But cartel members always have an incentive to cheat by cutting price and producing more output than their quotas.
- U.S. _____*law* prohibits forming monopolies by mergers or cartels, and forbids some other kinds of behavior "in restraint of trade."

OLIGOPOLY
Page 1

OLIGOPOLY

•How do markets behave when there are a small number of sellers?

Oligopoly: definition

- Small number of sellers: "highly concentrated."
- Reason: some barriers to entry.
- Examples of oligopoly markets:
  - Aluminum: _____.
  - Processor chips for personal computers: _____.
  - Soft drinks: _____.

Oligopoly models

- There are many models that try to predict how markets work with a small number of sellers.
- All models assume each firm sets price to maximize _____.
- But you cannot figure out where to set your price unless you make a guess (or *conjecture*) about what your _____ will do.
- Models differ in what firms are assumed to conjecture about their rivals' behavior.

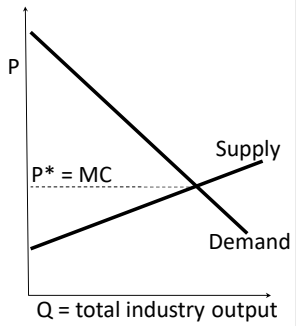
Model	What each firm conjectures its rivals will do
(1) Cartel model	"My rivals will cooperate in restricting output and raising price."
(2) Price competition model	"My rivals will keep their prices constant."
(3) Cournot model	"My rivals will keep their quantities constant."

(2) Price competition model

- Key assumption: Each firm conjectures that its rivals will keep their _____ constant.
- So if their price is greater than your marginal cost, your best strategy is to _____ your rivals slightly and increase your market share.
- If their price is equal to your marginal cost, your best strategy is to keep your price equal to marginal cost.

(2) Price competition: equilibrium

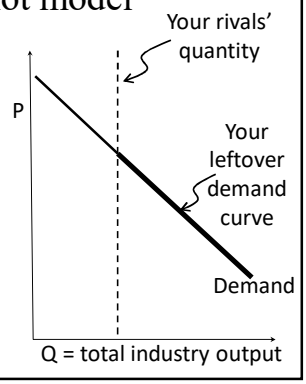
- If price is greater than marginal cost, firms keep undercutting each other, lowering the price.
- In equilibrium, price = _____.
- Outcome is _____ (no DWL).



OLIGOPOLY
Page 2

(3) Cournot model

- Key assumption: Each firm assumes that its rivals will keep their output _____ constant.
- Each firm's demand curve is whatever is left over.



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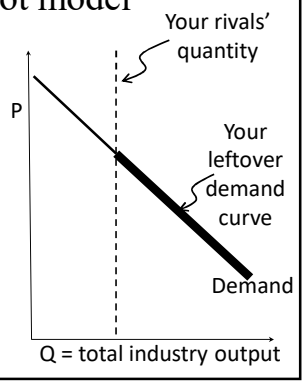
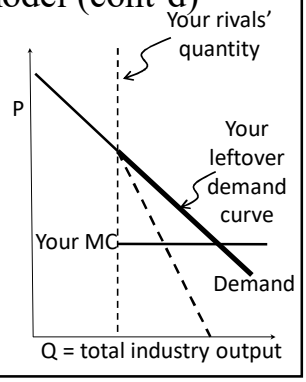


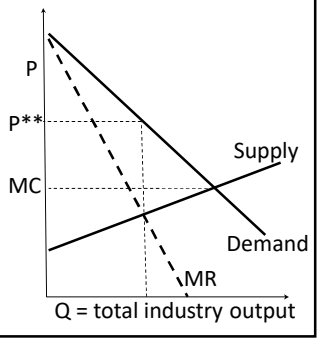
(3) Cournot model (cont'd)

- Best strategy is to act like a monopolist on your "leftover" demand curve.
- Choose your output where your MC equals your MR.
- Set price above your MC.



(3) Cournot model : equilibrium

- Can be proven that equilibrium lies on demand curve _____ cartel and price competition.
- Exact price depends on elasticity of demand and number of firms.
- Some DWL.



(3) Cournot model: equilibrium (cont'd)

- Suppose ε = market elasticity of demand and n = number of firms in the industry.
- Also assume all firms have same costs.
- It can be shown (using calculus) that the % markup of price over marginal cost will be:

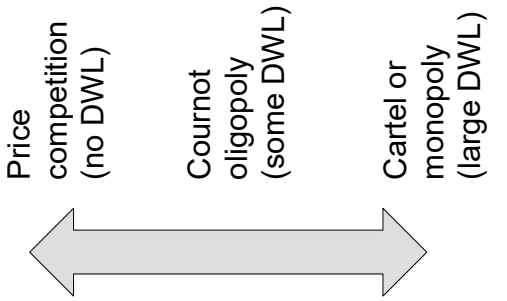
$$\frac{P - MC}{P} = \frac{1}{|\varepsilon|\, n}$$

(3) Cournot model: equilibrium (cont'd)

- Example: Suppose an industry has 3 firms and the market elasticity of demand is -2. Then the Cournot model predicts that the % markup will be (1/6) or about _____.
- If the same industry has 10 firms, then the % markup will fall to (1/20) or _____.
- Markup is lower, the _____ firms in the industry and the _____ elastic demand.

OLIGOPOLY
Page 3

A spectrum of market structures



Conclusions

- Oligopoly means a market with _____ sellers.
- All models assume firms maximize profit, but differ in what firms conjecture about their rivals.
- Price competition model predicts price will _____ marginal cost, despite few sellers.
- Cournot model predicts price will be _____ than marginal cost, but less than the monopoly (or cartel) price.

MONOPOLISTIC COMPETITION
Page 1

MONOPOLISTIC COMPETITION

- What happens if firms face competitors producing somewhat different products?

What is "monopolistic competition"?

- A hybrid model combining elements from monopoly and competitive models.
- Like _____, each firm has *market power* (downward-sloping demand) due to product differentiation.
- Like _____, there is free entry, which drives profit to zero in the long run.

Differentiated products: definition

- *Products produced by different firms that are good, but not perfect substitutes in the eyes of consumers.*
- Each firm's product is a little bit unique.
- Examples:

Why products may not be perfect substitutes

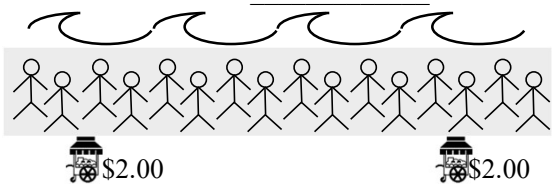
- Differences in style, design, flavor.
- Differences in quality.
- Differences in location.

Example of differentiation by location

- Suppose ice-cream stands are positioned at intervals along a beach.
- Sunbathers scattered continuously.
- No one likes walking on the hot sand.

Example of differentiated products (cont'd)

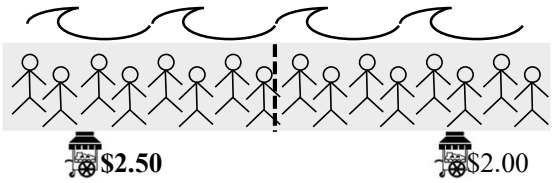
- Ice-cream stands are therefore _____ by location.
- If the prices are equal, each sunbather buys ice cream from the _____ stand.



MONOPOLISTIC COMPETITION
Page 2

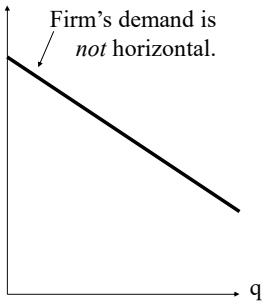
Example of differentiated products (cont'd)

- If the stand on the left raised its price *above* its rival's, would it lose *all* its customers, as under perfect competition?



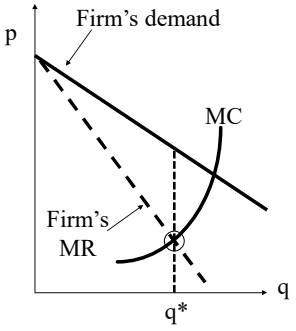
Consequences of differentiated products

- Each firm faces downward-sloping demand: the higher its price, the _____ its customers.
- But the position of its demand curve depends on availability and prices of other firms' products.



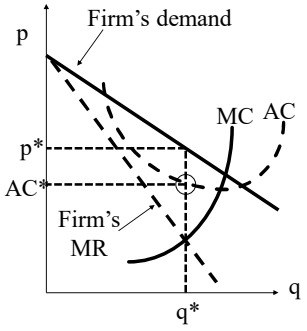
Pricing with differentiated products

- Like ordinary monopolist, firm chooses q* so that MC=MR.
- Sets P* above MC.



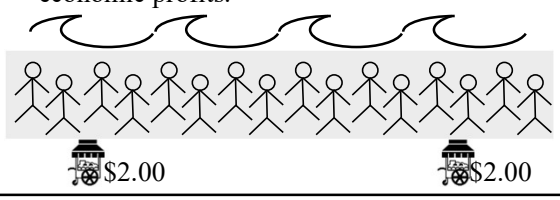
Profits in the short run

- In short run, firm might earn positive profits.
- Positive profits are possible when demand curve is anywhere higher than AC curve.



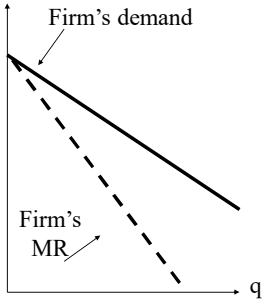
Free entry

- Many industries have few barriers to entry.
- Entry occurs whenever there are opportunities to make _____ economic profits.



Effects of entry

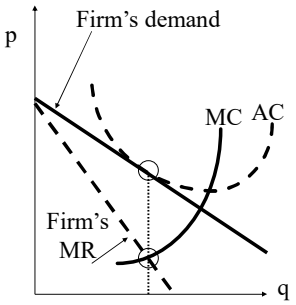
- New firms enter, producing close substitutes.
- New firms take away business from existing firm.
- Existing firm's demand and MR curves fall toward the origin.



MONOPOLISTIC COMPETITION
Page 3

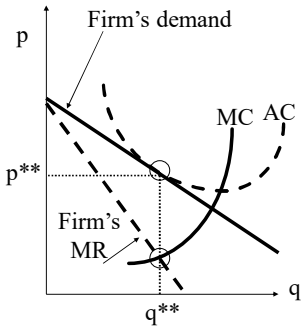
Profits in the long run

- Entry stops only when there are no more opportunities for positive profits.
- Occurs when firm's demand is _____ to its AC curve.
- p**=AC, so profit = (p**q**)-(AC q**)=0.



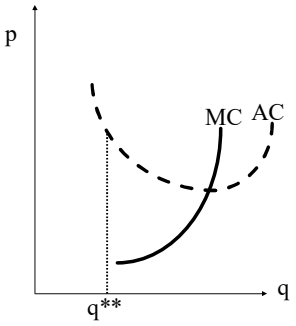
Deadweight loss

- Although p** = AC, p** > MC.
- Deadweight loss exists because some people willing to pay the marginal cost do not buy the product.



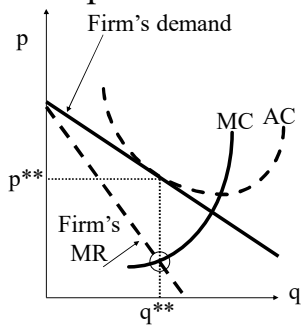
"Excess capacity": general definition

- *Producing at an output level where AC is falling.*
- MC ____ AC.
- A firm with excess capacity could reduce its average cost by increasing output.



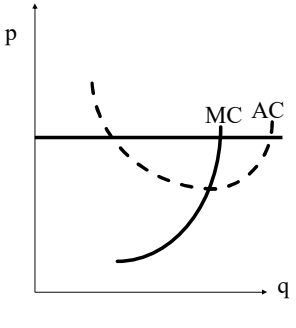
"Excess capacity" under monopolistic competition

- Why does long-run equilibrium imply excess capacity in this model?
- Because AC is _____ to demand, and demand slopes _____.



Is there "excess capacity" under perfect competition?

- Under perfect competition, entry also stops when firm's demand is tangent to its AC curve.
- But firm's demand is _____ because all firms produce perfect substitutes.
- _____ excess capacity.



Too many small firms?

- Monopolistic competition seems to yield too many small firms, each with excess capacity.
- So total industry costs could be reduced by limiting the number of firms in the industry.
- Would this be a good idea? _____.
- We would lose variety because products are _____.

MONOPOLISTIC COMPETITION
Page 4

Conclusions

- When firms produce _____ *products* but entry is free, *monopolistic competition* results.
- Price _____ marginal cost, but in the long run, firms earn _____ profits.
- In the long run, all firms produce where the firm's demand curve is _____ to average cost.

PART 5

Public Goods and Externalities

Big ideas: Markets fail to work efficiently when third parties are affected—pollution is a classic example—or when many people consume the same item simultaneously.

Famous quote: "In general industrialists are interested, not in the social, but only in the private, net product of their operations."
-- Arthur C. Pigou, *The Economics of Welfare* (1920)

NONRIVAL GOODS
Page 1

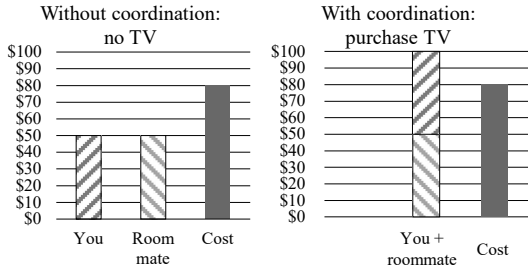
NONRIVAL GOODS

- What are nonrival goods?
- Why do nonrival goods require coordination among people?
- Why do nonrival goods lead to market failure?

Deciding whether to buy a good consumed by more than one person

- Suppose you and your roommate both want a TV in your room, which you could easily share.
- You are each willing to pay $50 for a TV.
- TV costs $80, so total benefit > total cost.
- But without coordination, there will be _____.

If good is consumed by more than one person, must SUM the benefits, coordinate purchase



Nonrival good: definition

- *A good whose consumption by one person does not necessarily preclude consumption by another.*
- Synonym: public good.

Rival versus nonrival goods

- For *rival goods*, only one person benefits from the good.
- Examples:

Rival versus nonrival goods (cont'd)

- For *nonrival goods*, several persons can enjoy the good simultaneously.
- Examples:

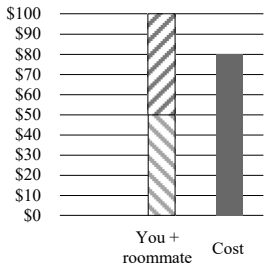
NONRIVAL GOODS
Page 2

Ideas and inventions are nonrival goods

- "He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me."
  --Thomas Jefferson (1813)

Deciding *whether* to produce a nonrival good

- Since many people can enjoy a nonrival good without interfering with each other, must _____ up the benefits enjoyed by everyone.
- Compare with cost.



Deciding *whether* to produce a nonrival good: bigger example

- Suppose 200 people live near a proposed park. Each is willing to pay $300 for the park. The park costs $20,000 to build.
- Would any *one* person pay for the park?
  _____
- Should the park be built?
  _____

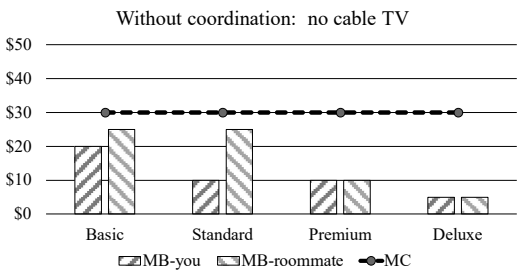
A *how much* decision

- Suppose you and your roommate both want cable TV service, which you can easily share.
- More channels cost more.
- So how many channels should you get?

Example: Cable TV choices

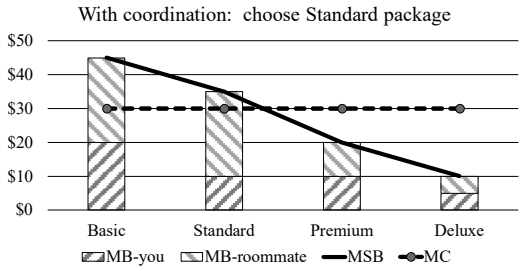
		Willingness to pay			Marginal benefit	
Cable TV package	Total cost	You	Room mate	MC	You	Room mate
Basic	$30	$20	$25			
Standard	$60	$30	$50			
Premium	$90	$40	$60			
Deluxe	$120	$45	$65			

If good is consumed by more than one person, must SUM their marginal benefits, coordinate purchase



NONRIVAL GOODS
Page 3

If good is consumed by more than one person, must SUM their marginal benefits, coordinate purchase



Two dimensions of nonrival goods

Number of people served (n) **Amount produced (Q)**

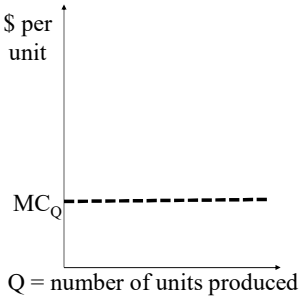
Deciding *how much* (Q) of a nonrival good to produce

- Suppose the government plans to produce the nonrival good.
  - Examples: _____
- But *how much* (Q) should be produced?

Marginal cost of Q for a nonrival good

Marginal cost of Q is typically positive:

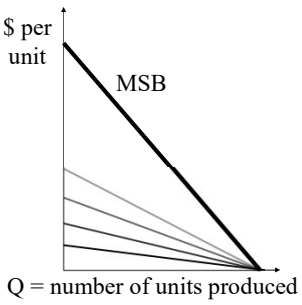
- Public TV shows.
- Miles of highway.



Marginal social benefit of Q for a nonrival good

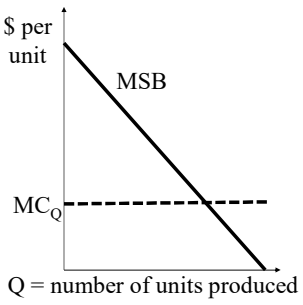
MSB = vertical sum of MBs of everyone who would enjoy the good:

- MBs of everyone who would watch a public TV show.
- MBs of everyone who might use a highway.



Optimal Q* is where MC = MSB

- Social optimum = Q*, where MSB = MC_Q.
- Typically, Q* is far greater than quantity demanded by any individual person.



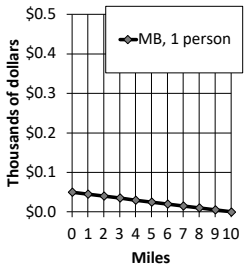
NONRIVAL GOODS
Page 4

Deciding *how much* (Q) of a nonrival good to produce: example

- Suppose 2000 people live near proposed bike trail.
- Suppose a typical individual person's benefit from these bike trail is
  MB = 50 – 5 Q,
  where Q = miles of trail.

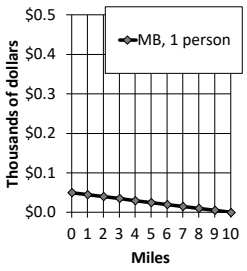
Deciding *how much* (Q) of a nonrival good to produce: example (cont'd)

- Now suppose marginal cost of building trail is $30,000 per mile.
- How much would any one person be willing to build for themselves?
- Q = _____



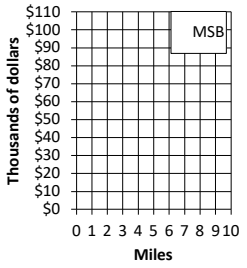
Deciding *how much* (Q) of a nonrival good to produce: example (cont'd)

- But many people can enjoy the trail simultaneously.
- So _____ sum the MB curves of the other people who would also enjoy the bike trail.



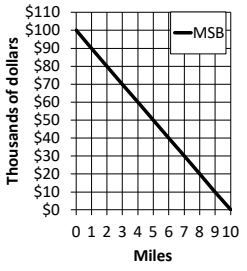
Deciding *how much* (Q) of a nonrival good to produce: example (cont'd)

MSB = sum of MBs for all 2000 people
= 2000 MB
= 2000 (50 – 5 Q)
= _____
_____.



Deciding *how much* (Q) of a nonrival good to produce: example (cont'd)

- Recall MC_Q = $30,000 per mile.
- Social optimum at MSB = MC_Q, or 100,000–10,000 Q = 30,000.
- Solve to get Q* = _____.



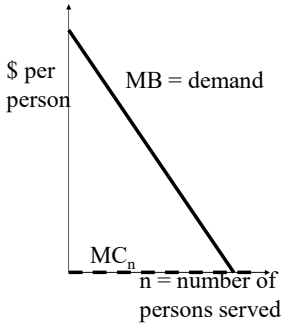
Paying for nonrival goods

- There is _____ marginal cost of allowing additional people to enjoy a nonrival good like a park or a road (MC_n).
- But there IS a cost of producing the nonrival good ($MC_Q > 0$).
- How to pay for it?

NONRIVAL GOODS
Page 5

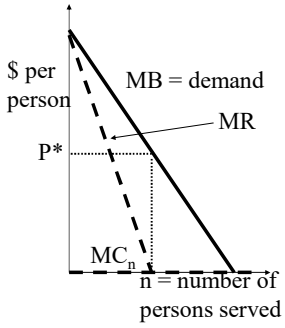
Marginal cost pricing means no revenue!

- To maximize social welfare, no one should be excluded who enjoys any benefit from the good.
- Welfare is maximized when price = MC_n = _____



Production of a nonrival good by a private firm

- Extreme case of natural monopoly.
- If produced by private firm, a monopoly price will be charged and too few customers will be served.
- Deadweight loss occurs.



Why there is market failure with nonrival goods

- Marginal-cost pricing (P=$0) would increase the number of people served and maximize social welfare.
- But a zero price cannot cover _____ costs.
- So private firm is forced to price nonrival goods too high and therefore too few people (n) enjoy them.

A role for government coordination

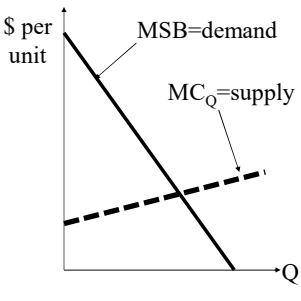
- Government could produce the good and give it away for free, since MC_n = _____.
- Examples: most roads, public television shows, and some museums are produced by government and are _____.
- But government must decide how much to produce (Q) because MC_Q is NOT zero.

Determining optimal quantity Q* in real world (hard!)

- Suppose good is produced by the gov't, which then gives it away free.
- Government's tasks:
  - find out the individual MB curves somehow (surveys?).
  - sum them to find MSB.
  - produce Q*, where MC_Q= MSB.
  - recover costs somehow (taxes?).

Contrast with private goods: no coordination required and no market failure

- MSB for private goods is exactly the market demand curve.
- Consumers reveal their willingness-to-pay by their purchases.
- Market _____ produces socially-optimal quantity in equilibrium.



NONRIVAL GOODS
Page 6

Conclusions

- A nonrival good can be enjoyed by many people simultaneously.
- Without coordination, too few nonrival goods are produced.
- Marginal social benefit of nonrival good = _____ sum of all persons' MB curves.
- The socially-optimal quantity of a nonrival good is the quantity where _____ = MC_Q.

NONEXCLUDABLE GOODS AND COMMON RESOURCES
Page 1

NONEXCLUDABLE GOODS AND COMMON RESOURCES

- What happens if people cannot be excluded from consuming a good?

Nonexcludable good: definition

- *A good no one can be excluded from consuming.*
- Synonym: nonexclusive good.

Examples of excludable goods

- For *excludable* goods, each person who uses the good can be forced to pay for it.
- Examples:
  - _____
  - _____
  - _____
  - _____
  - _____

Examples of nonexcludable goods

- For *nonexcludable goods*, no one who uses the good can be forced to pay for it.
- Examples:
  - _____
  - _____
  - _____
  - _____
  - _____

The "free-rider" problem

- Nonexcludable goods cannot be priced, because it is not possible to prevent anyone from consuming them.
- If the good or service is already available, no one has any incentive to pay for it, since they can "ride for free."
- What's the problem? _____ are unclear or unenforceable.

Who will produce nonexcludable goods?

- _____ has any incentive to produce nonexcludable goods (except for their own use).
- If the good is a *rival* nonexcludable good, the producer may not even get to enjoy it before other people use it up!

NONEXCLUDABLE GOODS AND COMMON RESOURCES
Page 2

Common resources: definition

- So-called "common resources" are _____ but _____ goods.
- Since a rival good, if anyone uses a common resource, less of the resource is available for others.
- Since nonexcludable, _____ can be prevented from using it.

Example 1: highway congestion

- Consider a congested freeway.
- Suppose an individual driver who enters the freeway saves 10 minutes of travel time.
- But if the freeway is congested, the driver will slow _____ down.
- Suppose 50 other drivers lose 30 seconds of travel time if this driver enters the freeway.

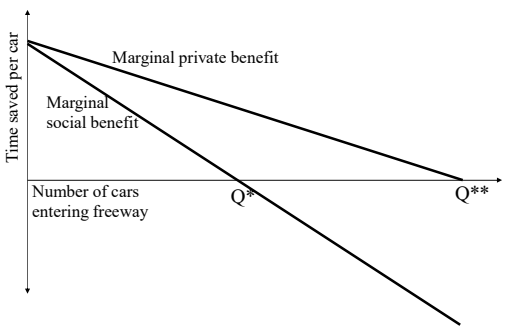
Example 1: private versus social benefit

- Marginal _____ benefit = savings in driver's own travel time = +10 minutes.
- Marginal _____ benefit = total savings in everyone's travel time = + 10 minutes – (50 × 0.5 minutes) = _____.

Market failure leads to inefficiency

- Net loss in travel time.
- Bad for society if more drivers enter freeway.
- But each driver cares only about _____ benefit, not social benefit, so driver enters anyway.

Example 1: economic inefficiency



Example 1: market failure

- Too many cars enter the freeway because it is a **common resource.**
- Common resources are inevitably overexploited.

NONEXCLUDABLE GOODS AND COMMON RESOURCES
Page 3

Example 1: policy options

- Quantity restrictions: _____ to limit entry into freeways when congested.
- Artificial prices: _____ during congested periods.

Other examples of common resources

Policy options to limit use of common resources

1. Quantity restrictions: quotas, licenses, etc.
   - Examples: _____
2. Artificial prices: taxes or fees based on usage.
   - Examples: _____
3. Improved definition of property rights: conversion to (excludable) private property.
   - Examples: _____ _____

Can people solve common-resource problems without government?

- Elinor Ostrom showed that often they do.
- Her research showed that resource users often organize themselves to limit overuse, contribute toward nonexcludable goods, and sanction free riders.
- "More cooperation occurs than predicted" by conventional theory.

Ostrom, E. (2010). Nobel lecture: Beyond markets and states: polycentric governance of complex economic systems. *American Economic Review, 100*(3), 641-672.

Conclusions

- A *nonexcludable good* is one that people cannot be prevented from consuming.
- It creates a *"_____ problem."*
- If the good is also a rival good, it will be _____. This is the case of *common resources.*
- Policy options include quantity restrictions, artificial prices, or better-defined property rights.

PURE PUBLIC GOODS
Page 1

PURE PUBLIC GOODS

- Can a good be both nonrival and nonexcludable?

Nonrival and nonexcludable goods (review)

	Rival or nonrival?	Excludable or nonexcludable?
Hamburgers		
Broadcast TV		
Websites		
Deep ocean fisheries		

Pure public goods: definition

- A pure public good is *both* nonrival and nonexcludable.
- Examples:

But not everything the government produces is a "public good" in the economic sense

	Rival or nonrival?	Excludable or nonexcludable?
Public bus service		
Public education		
Trash collection		

Pure public goods: market failure

- Since nonrival, socially optimal price = $0.
  - No one _____ be excluded.
- Since nonexcludable, cannot be priced.
  - No one _____ be excluded.
- Thus, pure public goods generally will *hardly be supplied at all* by the private sector, because of "free-rider" problem.

Example: pothole repair

- Suppose 100 people drive frequently on a street.
- Street has a big pothole, which costs each person an average of $100 in car repair.
- Social benefit of fixing pothole = $_____.
- Suppose it costs $500 to fix.
- Should the pothole be fixed? _____
- Will anyone want to fix pothole? ____
- How will it get fixed?

PURE PUBLIC GOODS
Page 2

Example: building parks

- Suppose 50 households live near a vacant lot.
- If the lot were developed into a park, it would be worth about $1000 to each household.
- Social benefit of park = $_____.
- Suppose it costs $20,000 to build.
- Should the park be built? _____.
- Will anyone want to build it? _____.
- How will the park be built?

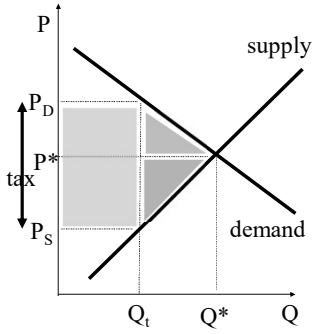
Pure public goods: policy options

Pure public goods unlikely to be produced without government involvement, such as...

1. Public production, funded by general tax revenues.
2. Subsidized private production, funded by general tax revenues.
3. Mandatory production.

Pure public goods: why we need taxes

- Earlier we showed that taxes reduce CS and PS by more than the tax revenue raised.
- Thus taxes create _____.
- So why do we need taxes?
- One reason: to pay for pure public goods.



Public versus private goods: classification

	Excludable	Nonexcludable
Rival		
Nonrival		

Conclusions

- *Pure public goods* are both *nonrival* and *nonexcludable*.
- Both of these qualities create market _____.
- Pure public goods are hardly produced at all by profit-maximizing firms.
- So governments often pay for pure public goods with tax money.

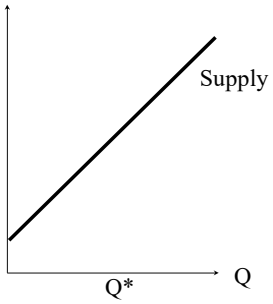
EXTERNAL COSTS AND BENEFITS
Page 1

EXTERNAL COSTS AND BENEFITS

- What happens if a good generates costs or benefits to third parties?

Supply = marginal cost for sellers

- Height of supply curve = minimum price that sellers must be paid to supply the last unit.
- Until now we have assumed that the cost of production is borne only by sellers.



Private versus external costs

- *Private cost* = cost of producing a good that is paid by the firm that produces and sells it. Reflected in _____ curve.
- Sometimes producing (or consuming) a good imposes costs on people other than those who produce and consume it.
- *External cost* = cost to these other people. Also called _____.

Examples of external costs

- Generating electricity from coal imposes:

- Driving a car imposes:

- Other examples:

Social cost

- *Social cost*
  = total costs of a good to society,
  = private cost + external cost.
- External cost = amount that other people (not buyers or sellers) would be willing to pay to *prevent* the good from being produced.
- But they never get the opportunity.

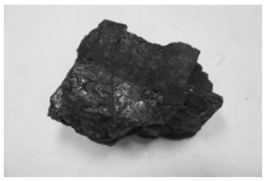
Marginal social cost

- *Marginal private cost* = additional cost to sellers from producing one more unit of output. Same as _____ curve.
- *Marginal external cost* = additional cost, to people other than buyers and sellers, of producing one more unit of output.
- *Marginal social cost* = marginal private cost + marginal _____ cost.

EXTERNAL COSTS AND BENEFITS
Page 2

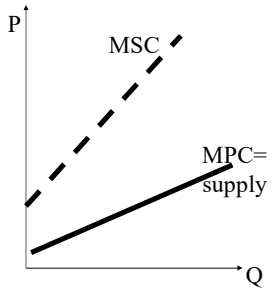
Marginal social cost of coal

- Estimates of the marginal social cost of coal vary widely, but are typically roughly twice the market price of coal (which is about $100 per ton).



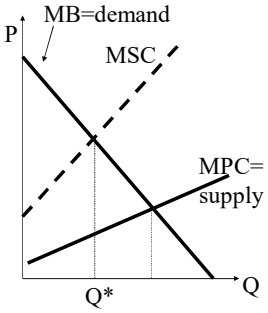
Marginal social cost versus marginal private cost

- MSC = MPC + MEC.
- If there are many sellers, MPC curve is same as competitive supply curve.



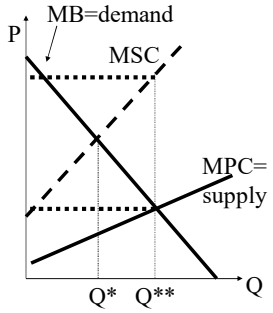
Market failure with external cost: too much is produced

- MSC = MPC + MEC.
- MB = demand curve.
- Economically efficient level of output = Q*.
- Actual level of output = Q**.



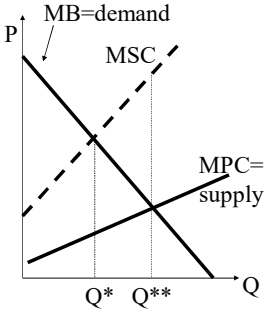
Why the market fails

- We do not have _____ _____.
- Market price reflects only marginal private cost, not marginal *social* cost.



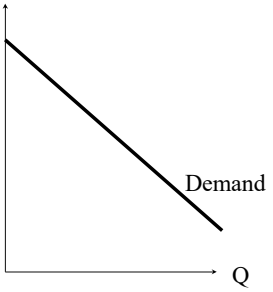
Deadweight social loss from a external cost

- Deadweight loss = difference between MB and MSC for each unit of output produced from Q* to Q**.
- Equals loss to society from producing too _____.



Demand = marginal benefit for buyers

- Height of demand curve = maximum price that buyers are willing to pay for the last unit.
- Until now we have assumed that benefit is enjoyed only by buyers.



EXTERNAL COSTS AND BENEFITS
Page 3

Private versus external benefits

- *Private benefit* = benefit of consuming a good that is enjoyed by the person who buys it. Reflected in _____ curve.
- Sometimes producing (or consuming) a good creates benefits for people other than those who produce and consume it.
- *External benefit* = benefit to these other people. Also called _____ externality.

Examples of external benefits

- Obtaining a vaccination creates:
- Scientific research creates:
- Landscaping, mosquito control creates:
- Other examples:

Social benefit

- *Social benefit*
  = total benefit of a good to society,
  = private benefit + external benefit.
- External benefit = amount that other people (not buyers or sellers) would be willing to pay to have the good produced.
- But they never get the opportunity.

Marginal social benefit

- *Marginal private benefit* = additional benefit to buyers from one more unit of output. Same as _____ curve.
- *Marginal external benefit* = additional benefit, to people other than buyers and sellers, from one more unit of output.
- *Marginal social benefit* = marginal private benefit + marginal _____ benefit.

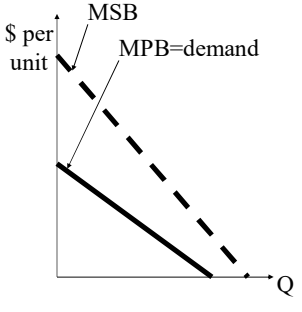
Marginal social benefit from flu vaccinations

- A recent paper estimated the marginal social benefit of a vaccination includes at least $63 from reduced mortality and $87 from reduced work absences.

White, C. (2021). Measuring Social and Externality Benefits of Influenza Vaccination *Journal of Human Resources, 56(3), 749-785.*

Marginal social benefit versus marginal private benefit

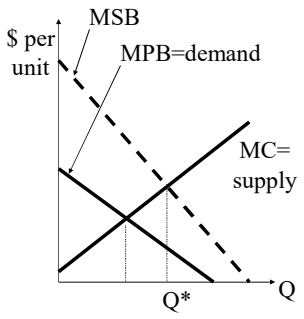
- MSB = MPB + MEB.
- If there are many buyers, MPB curve is same as competitive demand curve.



EXTERNAL COSTS AND BENEFITS
Page 4

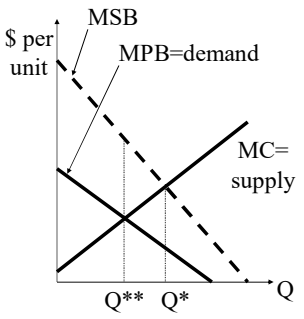
Market failure with an external benefit: too little is produced

- MSB = MPB + MEB.
- Economically efficient level of output = Q*
- Actual level of output = Q**



Deadweight social loss from an external benefit

- Deadweight loss = difference between MC and MSB for each unit of output not produced from Q** to Q*.
- Equals loss to society from producing too _____.



Conclusions

- If a good (such as pollution) generates an *external cost,* then too _____ will be produced compared to the economically-efficient quantity.
- If a good (such as vaccinations) generates an *external benefit,* then too _____ will be produced compared to the economically-efficient quantity.

REGULATING PRODUCTS THAT CAUSE POLLUTION
Page 1

REGULATING PRODUCTS THAT CAUSE POLLUTION

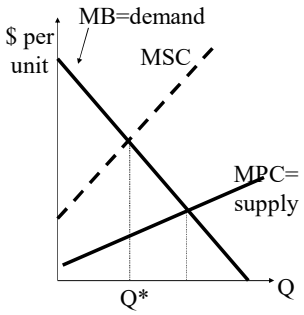
- How can products that cause pollution be regulated efficiently?

Some goods create external costs

- Goods like coal generate external costs.
- The burning of coal inevitably generates CO_2 , a greenhouse gas, which creates costs for other people.
- Too much coal is produced by a private market because buyers and sellers _____ the costs of coal that are imposed on others.

Consequences of external costs

- Sellers and buyers ignore external costs (such as pollution).
- Actual output is at intersection of marginal *private* cost and marginal benefit.
- There is deadweight loss.



Voluntary solution

- How can this problem be resolved?
- Perhaps sellers of polluting products could be persuaded to reduce output voluntarily.
- Has not worked well historically.

Bargaining solution

- Perhaps victims of pollution could negotiate with sellers of polluting products.
- They might offer to _____ polluters to reduce ("abate") pollution.

But bargaining might not work

- There may be many parties involved:
  - many sources of pollution.
  - many people affected by pollution.
- Bargaining is much more difficult if more than two parties are involved.

REGULATING PRODUCTS THAT CAUSE POLLUTION

Page 2

Government regulation

If these fail, government may be able to decrease quantity to the efficient level Q* through

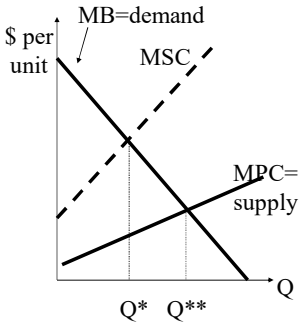
(1) quantity limits, or

(2) pollution taxes.*

*Also called "Pigou taxes" after English economist A.C. Pigou (1877-1959), who first proposed them.

Government regulation: (1) quantity controls

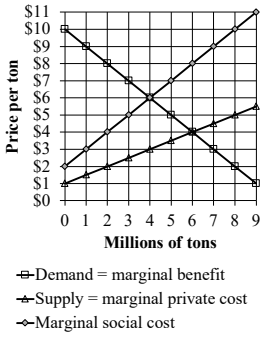
The government could set a legal limit, or quota, at Q*.



Example

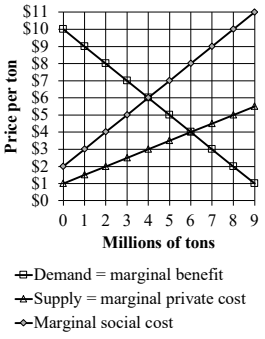
Suppose a product (like coal) creates an external cost (like global warming).

- Marginal external cost at 2 million tons = $__
- Marginal external cost at 8 million tons = $__



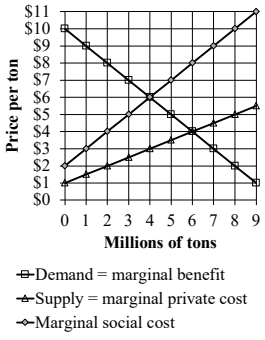
Example: efficient output

Efficient level of output is where marginal benefit (demand) equals marginal *social* cost: _____ million tons.



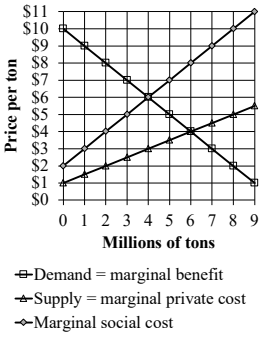
Example: unregulated output

- Sellers consider only their own cost.
- Without regulation, ____ million tons are produced.



Example: deadweight loss

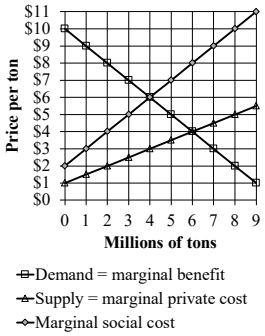
Deadweight loss = difference between marginal benefit and marginal social cost, summed over all units that should *not* have been produced = $ _____ million.



REGULATING PRODUCTS THAT CAUSE POLLUTION
Page 3

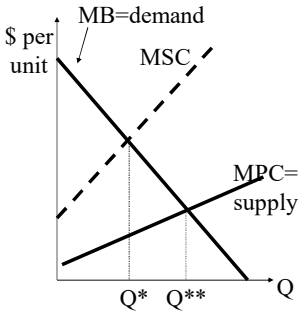
Example: quantity controls

- Government could try to limit coal output to _____ million tons.
- This would eliminate the deadweight loss.



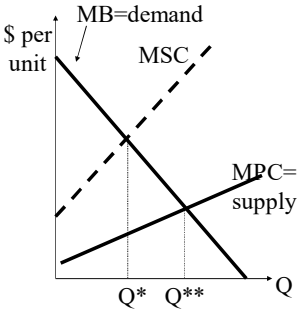
Government regulation: (2) pollution taxes

- Alternatively, the government could tax the product causing the pollution.
- All taxes reduce the quantity produced.
- The optimal pollution tax would reduce quantity to Q*.



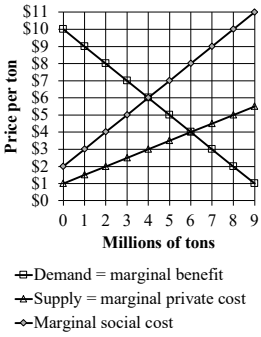
Finding the efficient pollution tax

- To reduce quantity to Q*, set tax rate = vertical distance between demand and supply curves at Q*.
- In other words, set tax = MEC at Q*.



Example: efficient pollution tax

- MEC at optimal output (4 million tons) = $__.
- So efficient pollution tax is $ ____ per ton.
- Tax forces sellers (or buyers) to _____ the external cost of pollution.



A very unusual tax!

Ordinary taxes distort markets.

- cause deadweight loss
- _____ social welfare.

But a pollution tax *corrects* a distortion caused by market failure.

- eliminates deadweight loss,
- _____ social welfare.

Conclusions

- Some products inevitably create external costs.
- In principle, over-production could be solved by voluntary action or _____, but this may not work.
- Alternatively, government can impose quantity controls or tax the product that causes pollution.
- Efficient tax rate _____ _____ at the efficient quantity Q*.

PROMOTING PRODUCTS THAT PROVIDE EXTERNAL BENEFITS

Page 1

PROMOTING PRODUCTS THAT PROVIDE EXTERNAL BENEFITS

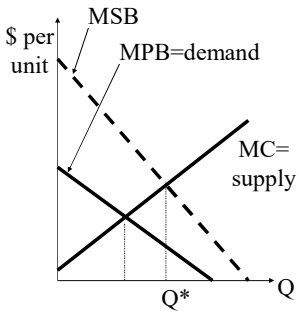
- How can products that provide external benefits be promoted efficiently?

Some goods provide external benefits

- Goods like vaccines provide external benefits.
- Problem is reverse of external costs.
- Too *little* is purchased in a private market because buyers and sellers ignore the benefits provided to others.

Consequences of a external benefit

- Sellers and buyers ignore external benefits (such as preventing disease).
- Actual quantity is at intersection of MC and marginal private benefit.
- *Too little* is produced.



Government regulation

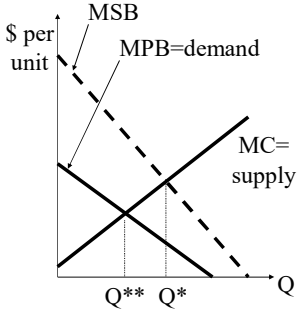
- Perhaps people can be persuaded to change voluntarily.
- Perhaps affected parties could bargain with buyers or sellers, paying them to increase output.
- If these fail, government may be able to increase quantity to the efficient level Q* through
  (1) quantity requirements, or
  (2) subsidies, also called "Pigou subsidies."*

*After English economist A.C. Pigou (1877-1959), who first proposed them.

Government regulation: (1) quantity requirements

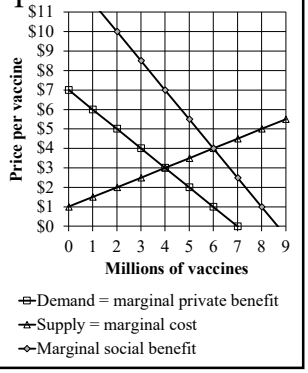
Government could

- require school children to be vaccinated.
- require homeowners to mow their lawns, shovel sidewalks.
- require office complexes to include outdoor art.



Example

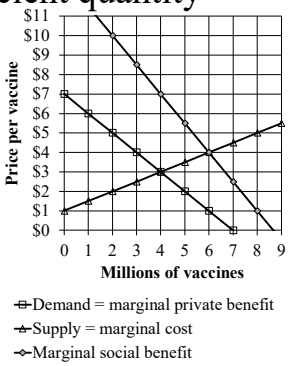
- Suppose a product (like flu vaccine) provides an external benefit.
- Marginal external benefit (MEB) at 2 million = $___.
- MEB at 6 million = $___.



PROMOTING PRODUCTS THAT PROVIDE EXTERNAL BENEFITS
Page 2

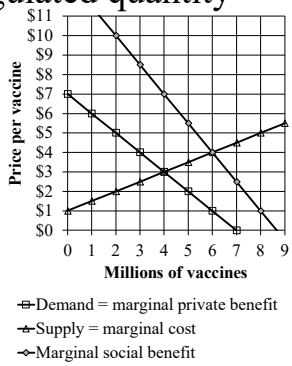
Example: efficient quantity

- Efficient level of output is where marginal *social* benefit equals marginal cost (supply): _____ million.



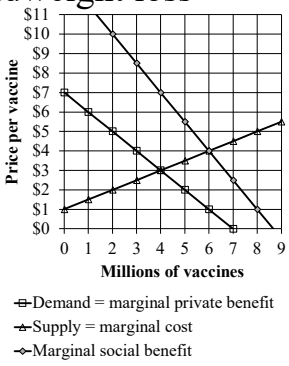
Example: unregulated quantity

- Demanders consider only their own benefit.
- Without regulation, ____ million vaccines are purchased.



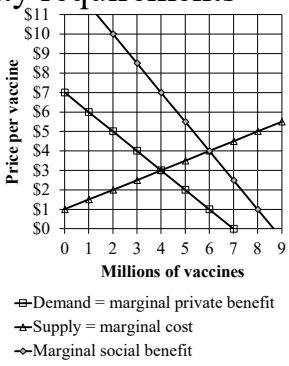
Example: deadweight loss

- Deadweight loss = difference between marginal social benefit and marginal cost, summed over all units that *should* have been purchased = $ _____ million.



Example: quantity requirements

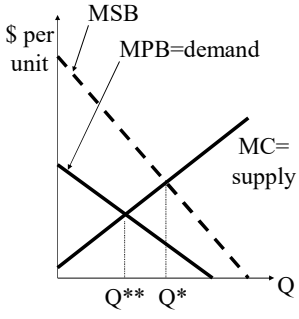
- Government could require _____ million people to get vaccines.
- This would eliminate the deadweight loss.



Government regulation: (2) subsidies

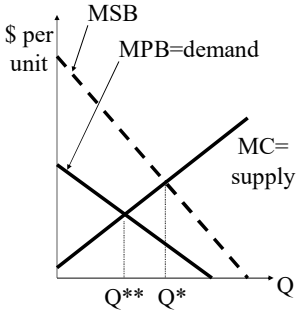
Alternatively, government could subsidize

- vaccines.
- tree planting.
- public art.



Finding the efficient subsidy

- To increase quantity to Q*, set subsidy = vertical distance between demand and supply curves at Q*.
- In other words, set subsidy = MEB at Q*.

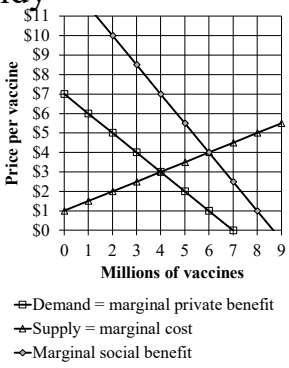


PROMOTING PRODUCTS THAT PROVIDE EXTERNAL BENEFITS

Page 3

Example: efficient vaccine subsidy

- MEB at efficient quantity (6 million) = $____.
- So efficient subsidy is $ _____ per vaccine.
- Subsidy allows buyers (or sellers) to _____ the external benefit.



Conclusions

- Some goods provide external benefits, benefits enjoyed neither by buyers nor sellers.
- In principle, under-production could be solved by voluntary action or _____, but this may not work.
- To promote a good that provides an external benefit, the government can impose quantity requirements or subsidize the good.
- Efficient subsidy rate = _____ _____ at the efficient quantity Q*.

REGULATING POLLUTION DIRECTLY
Page 1

REGULATING POLUTION DIRECTLY

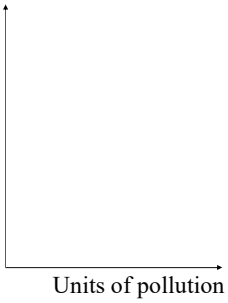
- How can pollution be cleaned up at minimum cost?

Pollution not caused by one single product

- Sometimes external costs are *not* tightly connected with any one product.
- Examples: Air pollution from many factories producing a variety of products.
- Nevertheless, pollution sources will typically _____ costs of that pollution to other people—health problems, dirt, etc.
- So _____ pollution is emitted.

Modify the graph

- We now assume external costs are *not* tightly connected with any one product sold in a market.
- So we put "pollution" itself on horizontal axis.

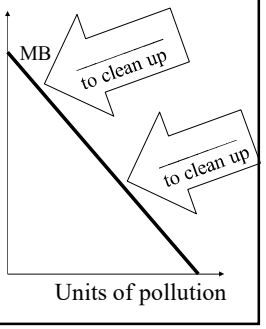


Benefits and costs of pollution

- Of course, there is no "market" for pollution, so no supply or demand curves.
- But pollution creates _____ for polluters and _____ for everyone else.

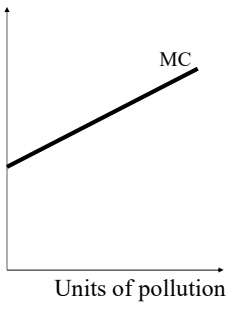
Benefits of pollution to polluters

- Benefits = savings from not having to pay for clean-up.
- Some sources of pollution are very expensive to clean up.
- Others are cheaper to clean up.
- Arrange from high cleanup cost to low.



Costs of pollution to everyone else

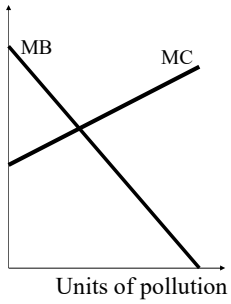
- Costs = damage to health, environment, etc.
- Total costs surely increase with pollution.
- But MC might slope up or down.



REGULATING POLLUTION DIRECTLY
Page 2

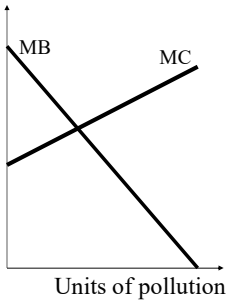
Efficient level of pollution

- MB of pollution = cost saving from allowing one more unit of pollution.
- MC of pollution = damage to health and environment from one more unit.
- Efficient level Q*, is where _____ = _____.



Actual level of pollution

- Polluters typically _____ costs of pollution to other people.
- They pollute whenever it saves them money.
- So _____ pollution is emitted.



Solutions

- Perhaps polluters could be persuaded to reduce pollution voluntarily.
  - Has not worked well historically.
- Perhaps victims of pollution could negotiate with polluters.
  - Difficult if there are many polluters and many victims.

Government regulation

If these fail, government may be able to push polluters back to the efficient level of pollution Q* through

(1) Quantity limits (also called "pollution standards"), or

(2) Pollution fees.

(1) Implementing quantity limits

- Government could set *standards* (permissible levels) for every pollution source (every machine, vehicle, etc.).
- Standards should be _____ where cutting pollution is cheap, and _____ where cutting pollution is expensive.
- Traditional "command and control" approach—very difficult.

Alternative ways to implement quantity limits

- Government could _____ off Q* pollution permits, or waivers, to the highest bidders.
- Or, government could issue Q* _____ pollution permits, that firms could buy or sell to each other.
- Either way, same polluters end up with the permits: those for whom cutting pollution is _____ expensive. Why?

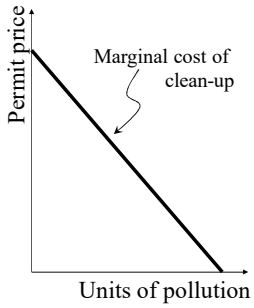
REGULATING POLLUTION DIRECTLY
Page 3

Demand for pollution permits

Q: How much is a polluter willing to pay for a pollution permit?

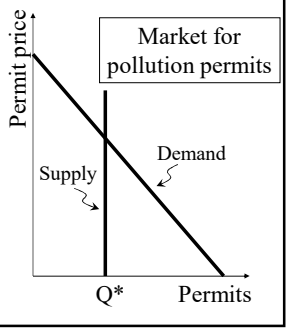
A: Up to the cost of cleaning up their unit of pollution.

- So demand = clean-up costs, arranged from highest to lowest.



Creating a market

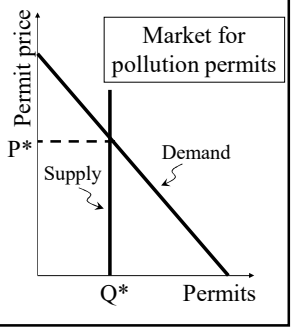
- Suppose pollution permits are auctioned off by the government.
- In any market, if supply is limited, goods end up in hands of demanders willing to pay the most.



Who will win the bidding for permits?

Polluters for whom cleaning up pollution is _____ costly than buying a permit.

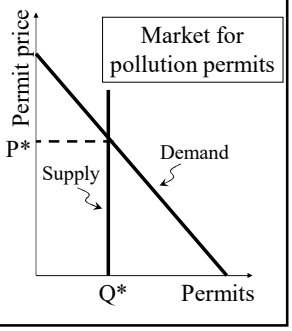
- Older factories.
- Industries where alternative less-polluting technologies are NOT available.



Who will lose the bidding for permits?

Polluters for whom cleaning up pollution is _____ than buying a permit.

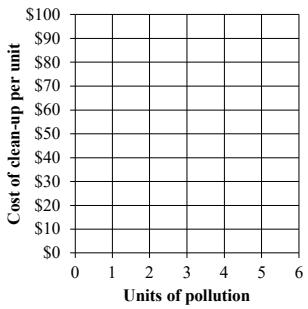
- Newer factories.
- Industries where alternative less-polluting technologies ARE available.



Example: clean up costs

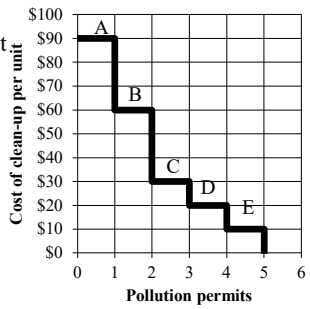
Suppose costs of clean-up are:

- $90 for factory A.
- $60 for factory B.
- $30 for factory C.
- $20 for factory D.
- $10 for factory E.



Example: optimal assignment of permits

- Suppose government knows optimal amount of pollution is Q* = 3.
- If the government knows each factory's clean up costs, it should give pollution permits to factories _____.



REGULATING POLLUTION DIRECTLY
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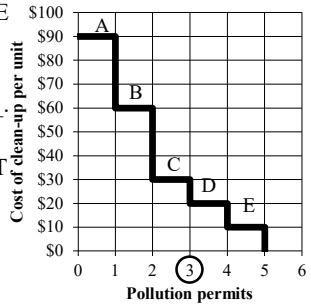
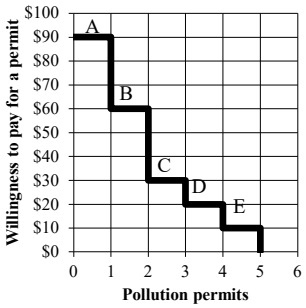
Example: optimal assignment of permits (cont'd)

- Only factories D and E must clean up.
- Total cost of clean-up = \$20 + \$10 = \$_____.
- But what if the government does NOT know each factory's clean-up cost?



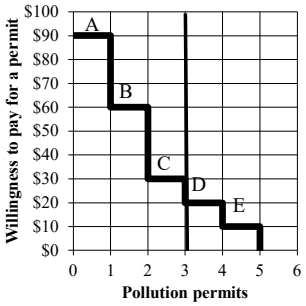
Example: random assignment (bad idea)

- Suppose permits were assigned randomly to, say, factories A, C, and E.
- Then factories B and D would have to clean up, for a total cost of \$60 + \$20 = _____.



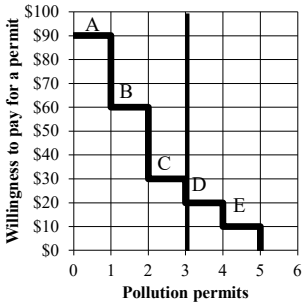
Example: auctioning pollution permits (good idea)

- Suppose instead the government auctioned off 3 permits.
- Obviously, factories A, B, and C would bid the highest.
- Equilibrium price would be about \$___.



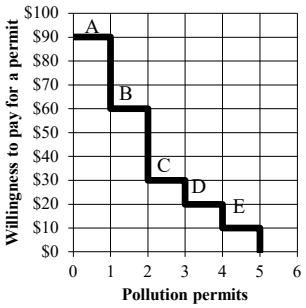
Example: cost of clean up with auction

- Factories _____ would buy permits.
- Factories _____ would not, because at \$25 they would find it cheaper to clean up.
- Total cost of clean-up = \$20 + \$10 = _____.



Example: trading permits (another good idea)

- Again assume permits are assigned to factories A, C, and E.
- If allowed, factory E would gladly sell its permit to factory B for between \$_____ and \$_____.
- Total cost of clean-up = \$20 + \$10 = \$_____.



Why auctions or tradable permits cut the cost of reducing pollution

- Pollution is reduced most by polluters where cleaning up is _____.
- Pollution is reduced least by polluters where cleaning up is most _____.
- Costs are minimized through the permit market mechanism, automatically.
- Government does _____ need to know each polluter's cost of cleaning up.

REGULATING POLLUTION DIRECTLY
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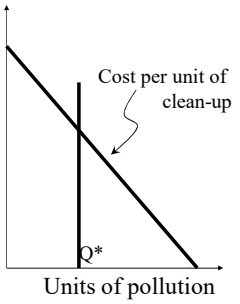
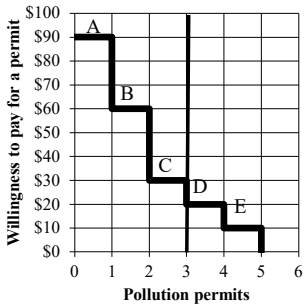
(2) Implementing pollution fees

- Alternatively, the government could impose a fee for producing pollution.
- Fee can be set to reduce pollution to the desired level Q*.



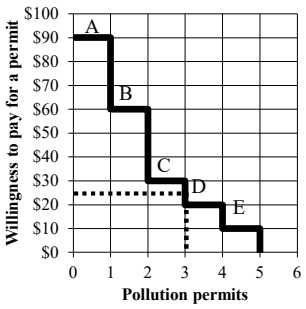
Example: setting a pollution fee

- Suppose government determined that 3 units of pollution was the optimal quantity.
- By setting a fee of $_____, the government could reduce pollution to the target level.



Example: cost of clean up

- At a fee of $25 for pollution, factories _____ would find it cheaper to pay the fee.
- Factories _____ would find it cheaper to clean up, for a total cost of $20+$10=___.



Conclusions

- Sometimes, pollution is not connected to any one product.
- In principle, external costs from pollution could be solved by voluntary action or _____, but this may not work.
- Alternatively, government can impose quantity standards or pollution fees.
- The total cost of reducing pollution can be minimized by _____ pollution permits, or issuing _____ permits, or setting pollution fees.