ECON 115 - Labor Economics
Drake University, Spring 2024
William M. Boal

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BOAL'S ECON 115

SLIDESHOW HANDOUTS

SPRING 2024

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Old exams: wmboal.com/labor
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TENTATIVE COURSE SYLLABUS

1. Resources | 2. Requirements | 3. Schedule

1. Resources

Description from Course Catalog: Analysis of labor markets, including employment and unemployment, wages and benefits, education and training, worker incentives, occupational safety, labor mobility and migration, discrimination, and labor unions. Public policy issues including minimum wages, welfare programs, and unemployment compensation.

Prerequisites: ECON 002 or 010. Experience with Excel is helpful.

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 (1), (2), and (5).

University "Engaged Citizen" Area of Inquiry: In this course, students will learn to participate effectively in the democratic process primarily through these outcomes:

2. *Establish skills, knowledge, or dispositions that lead them to be active stewards for the common good.* We all have a common interest in the functioning of the labor market because most of us are workers or dependents of workers. "Labor Economics" establishes skills and knowledge to evaluate how well the labor market and related government policies serve the common good. In particular, the course develops economic theory and data analysis to evaluate the consequences of welfare programs for the poor, taxes, affirmative action, minimum wages, immigration policy, occupational health and safety regulation, investment in education and training, policy toward unions (the Wagner Act, etc.), and unemployment insurance.
3. *Critically reflect on the social, economic, or political issues that they will face as citizens.* As citizens, we face economic issues such as poverty, immigration, health and safety on the job, income inequality, discrimination, and unemployment. All of these topics are examined critically in ECON 115. Then we critically examine public policies intended to address these issues.

and to a lesser extent through this outcome:

1. *Learn to evaluate the mix of diverse values and interests that influence democratic decision-making.* Government policies are the outcome of democratic decision-making among people with diverse interests. Even bad policies usually benefit someone. As we study government policies in "Labor Economics", we use economic theory and data analysis to determine who wins and who loses from each policy, and use economic welfare analysis to evaluate how much they win or lose.

Who should take this course: This course counts as an elective for the following programs:

- Economics major; Quantitative Economics major; and Economics minor
- Human Resources concentration.
- Management and Organizational Leadership major, Human Resources track.

Lectures: Tuesday and Thursday 12:30-1:45 PM in room 112 Aliber Hall.

How to contact instructor:

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

- U.S. mail: College of Business and Public Administration
  Drake University, 2507 University Avenue, Des Moines, Iowa 50311-4505

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

Office hours: Office hours are a time when you can get help with homework, ask questions about course material, discuss your grade or anything related to this course or economics in general. Office hours this semester will be **TBA**. 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: George Borjas, *Labor Economics*, 9th Edition, 2024, New York: McGraw Hill Education, ISBNs: book 9781264201419, looseleaf 9781266834936, ebook 9781264648214. Used copies are acceptable. The 8th edition is acceptable. The "Connect" feature is NOT needed.
- Required: *Boal's Econ 115 Slideshow Handouts*, a course packet. 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, mobile phones, and wireless devices are NOT permitted during quizzes or exams.
- Recommended: A three-ring binder and highlighter for your course packet.

Online resources:

- A Drake email account is required for all students. Course announcements will occasionally be sent to this account, so you should check it daily. Announcements often get diverted to "Junk" or "Clutter" folders, so check them as well as your inbox.
- Homework assignments are posted on Blackboard. If you have difficulty accessing Blackboard, please contact the Drake ITS HelpDesk at 271-3001.
- Old exams are posted at wmboal.com/labor.

2. Requirements

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

$$\textit{SCORE} = 75\% \times \textit{Avg exam score} + 15\% \times \textit{Avg problem set score} + 10\% \times \textit{Avg data exercise score} - \textit{Absences}$$

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: There will be four in-class hour exams and a final examination. All exams are closed-book, closed-notes. Simple calculators are permitted. Graphing calculators, calculators with alphabetical keyboards, mobile phones, and wireless devices are NOT permitted. Exam seating is assigned. 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.

Problem sets: Problem sets are posted on Blackboard (drake.blackboard.com) in PDF format. Print the them, complete them in pen or pencil, and submit them at class on or before the due dates listed in the schedule below.

Data exercises: Four exercises requiring the use of Microsoft Excel will be assigned. Drake students may obtain Excel for free—see https://drake.teamdynamix.com/TDClient/2025/Portal/KB/ArticleDet?ID=28599&SIDs=10769 for instructions. Once Excel is installed on your computer, you must install an Add-In called the "Analysis

Toolpak." For instructions, go to support.office.com and search for "Analysis Toolpak." If you are unfamiliar with Excel, please stop by my office hours for help.

Policy on late work: Early submissions are welcome but late submissions not accepted. Computer problems are *not* an acceptable excuse for late assignments.

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 a sheet from the Director of Athletics, 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 (e.g., by phone or email) and soon afterward submit a written explanation (including date of absence and documentation).

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 anticipated, 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.

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/labor. Don't look at the answer key until **after** you have solved each problem, or you will become overconfident.
- If you are doing all this and still having trouble, please ask for help. Talk to me after class, send email to william.boal@drake.edu, or just drop by during 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. Textbook should be read before class.

Part 1: Labor Supply and Demand

Big ideas: Employment and wages are determined in markets where workers are suppliers and employers are demanders.

A. Introduction [Jan 30, Feb 1]

- ☐ Read Borjas chapter 1 including appendix, and chapter 2 through section 2-1.
- ☐ Slideshow handouts: *Labor markets. Elasticities of labor supply and demand. Economic models and policy decisions. Regression analysis. Measuring the labor force.*
- ☐ Do Slideshow Quiz on Blackboard by Feb 2.
- ☐ Problem set due Feb 6.

B. Labor supply theory [Feb 6, 8]

- ☐ Read Borjas remainder of chapter 2, sections 2-2 through 2-8.
- ☐ Slideshow handouts: *Trends in labor supply. Preferences. The budget constraint. Optimal choice. Changes in nonlabor income. Changes in the wage. Labor supply curves.*
- ☐ Do Slideshow Quiz on Blackboard by Feb 9.
- ☐ Problem set due Feb 13.

C. Labor supply applications [Feb 13, 15]

- ☐ Read Borjas remainder of chapter 2, section 2-9 to the end.
- ☐ Slideshow handouts: *Elasticities of individual labor supply. Household specialization. Fertility. Welfare programs. The Earned Income Tax Credit. Life cycle labor supply. Decline in labor force participation of older men.*
- ☐ Do Slideshow Quiz on Blackboard by Feb 16.
- ☐ Problem set due Feb 20.

D. Labor demand [Feb 20, Feb 22, Feb 27]

- ☐ Read Borjas chapter 3.
- ☐ Slideshow handouts: *Production. Demand for labor in the short run. Producing output at minimum cost in the long run. Affirmative Action and production costs. Demand for labor in the long run. Elasticity of labor demand. Input demand with more than two inputs. Effects of minimum wages. Demand for workers versus demand for hours. Adjustment of employment.*
- ☐ Do Slideshow Quiz on Blackboard by Feb 28.
- ☐ No problem set. Instead, study for exam.
- ☐ Data exercise 1 due Mar 5 (see Blackboard).

First exam [Feb 29]

- Prepare by reviewing slideshow handouts and studying old exams posted online (wmboal.com/labor).
- 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 2: Equilibrium and Differences in Pay

Big ideas: The competitive model can be used to analyze a variety of scenarios. However, some markets show evidence of employer market power. Systematic differences in pay are largely driven by differences in conditions across jobs and differences in productivity across workers.

A. Competitive labor market equilibrium [Mar 5,7]

- ☐ Read Borjas chapter 4 through section 4-8.
- ☐ Slideshow handouts: *Equilibrium in a single labor market. Competitive equilibrium across labor markets. Payroll taxes and subsidies. Mandated benefits. Immigration and market equilibrium. Economic benefits from immigration.*
- ☐ Do Slideshow Quiz on Blackboard by Mar 8.
- ☐ Problem set due Mar 19.
- ☐ Enjoy Spring Break! [Mar 11-15]

B. Employer market power [Mar 19]

- ☐ Read Borjas chapter 4 section 4-9.
- ☐ Slideshow handouts: *Monopsony in the labor market. Welfare analysis of monopsony. Effect of minimum wage on monopsony. Detecting monopsony. Employer collusion.*
- ☐ Do Slideshow Quiz on Blackboard by Mar 20.
- ☐ Problem set due Mar 21.

C. Compensating wage differentials [Mar 21, 26]

- ☐ Read Borjas chapter 5.
- ☐ Slideshow handouts: *Compensating wage differentials. Hedonic equilibrium. Value of a statistical life. Occupational safety and health regulation. Compensating differentials for risk of layoff. Compensating differentials for benefits.*
- ☐ Do Slideshow Quiz on Blackboard by Mar 27.
- ☐ Problem set due Mar 24.

D. Human capital [Mar 28, Apr 2]

- ☐ Read Borjas chapter 6, and chapter 7 through section 7-4.
- ☐ Slideshow handouts: *Education in the labor market. A simple model of the schooling decision. A general model of the schooling decision. Measuring the return to schooling. School quality and earnings. Job market signaling. On-the-job training.*
- ☐ Do Slideshow Quiz on Blackboard by Apr 3.
- ☐ No problem set. Instead, study for exam.
- ☐ Data exercise 2 due Apr 9 (see Blackboard).

Second exam [Apr 4]

- Prepare by reviewing slideshow handouts and studying old exams posted online (wmboal.com/labor).
- 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 3: Wage Distribution, Mobility, and Discrimination

Big ideas: Earnings and wages have become more unequal in recent decades, but proposed explanations are controversial. Workers move because the benefits of moving outweigh the costs. Discrimination is real and in some ways puzzling, but economics offers several alternative explanations.

A. The wage distribution [Apr 9, 11]

- ☐ Read Borjas chapter 7 section 7-5 to the end.
- ☐ Slideshow handouts: *The distribution of income, earnings and wages. Measuring inequality. Trends and explanations of U.S. wage inequality. Superstars. Intergenerational mobility.*
- ☐ Do Slideshow Quiz on Blackboard by Apr 12.
- ☐ Problem set due Apr 16.

B. Labor mobility [Apr 16]

- ☐ Read Borjas chapter 8.
- ☐ Slideshow handouts: *The migration decision. Internal migration within the United States. History of immigration into the United States. Who immigrates into the United States? Immigrants in the U.S. labor market. Job turnover.*
- ☐ Do Slideshow Quiz on Blackboard by Apr 17.
- ☐ Problem set due Apr 18.

C. Discrimination [Apr 18]

- ☐ Read Borjas chapter 9.
- ☐ Slideshow handouts: *Evidence of discrimination. Preference-based theories of discrimination. Other economic theories of discrimination. Black-White wage ratio. Female-male wage ratio.*
- ☐ Do Slideshow Quiz on Blackboard by Apr 19.
- ☐ No problem set. Instead, study for exam.
- ☐ Data exercise 3 due Apr 25 (see Blackboard).

Third exam [Apr 23]

- Prepare by reviewing slideshow handouts and studying old exams posted online (wmboal.com/labor).
- 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: Unions, Incentive Pay, and Unemployment

Big ideas: Unions were once crucial in setting pay but are less prevalent than they used to be. Incentive pay schemes are still prevalent, but sometimes have unintended consequences. Unemployment is inevitable in a dynamic economy, but perhaps can be ameliorated.

A. Labor unions [Apr 25, Apr 30]

- ☐ Read Borjas chapter 10.
- ☐ Slideshow handouts: *Labor unions in the United States. The monopoly union model. The efficient bargaining model. Strikes. Measuring the effects of unions. Occupational licensing.*
- ☐ Do Slideshow Quiz on Blackboard by May 1.
- ☐ Problem set due May 2.
- ☐ Data exercise 4 due May 7 (see Blackboard).

B. Incentive pay [May 2]

- ☐ Read Borjas chapter 11.
- ☐ Slideshow handouts: *Piece rates and time rates. Tournaments. Delayed compensation. Efficiency wages.*
- ☐ Do Slideshow Quiz on Blackboard by May 3.
- ☐ Problem set due May 7.

C. Unemployment [May 7, May 9]

- ☐ Read Borjas chapter 12.
- ☐ Slideshow handouts: *Unemployment in the United States. Types of unemployment. Unemployment dynamics. Searching for a job. Theories of cyclical unemployment. Unemployment insurance in the United States. The Phillips curve.*
- ☐ Do Slideshow Quiz on Blackboard by May 10.
- ☐ No problem set. Instead, study for final exam.

Final Exam

The University Registrar (www.drake.edu/registrar) has scheduled the final exam for this course on **TBA** in the regular classroom. The content of the final exam is comprehensive and includes questions from all parts of the course.

- Prepare by reviewing the hour exams you have taken already and old final exams posted online.
- 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

Labor Supply and Demand

Big ideas: Employment and wages are determined in markets where workers are suppliers and employers are demanders.

LABOR MARKETS

- What is labor economics about?

Labor markets

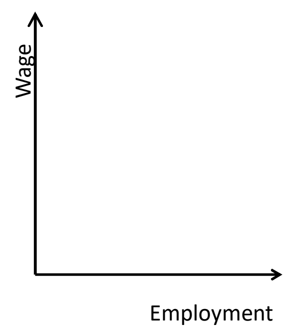
- Labor economics analyzes work and pay as outcomes of *markets*.
- The market quantity is ___________________: the number of people working (or perhaps the total hours they work).
- The market price is the __________________: the amount they are paid per hour (or perhaps per week or per year.)

Players in the labor market

- Suppliers are ______________ looking for jobs.
- Demanders are ____________________ (or other employers) who want to hire workers.
- Government sometimes changes the rules of the market.

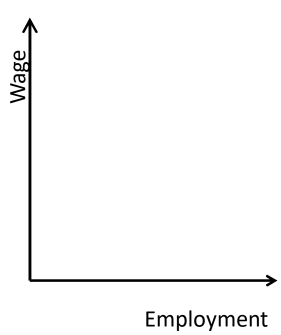
Labor supply

- Workers, trying to maximize their own well-being, decide whether to work, and how many hours.
- The higher the wage, the more workers choose to work at least some hours.
- Thus, labor supply slopes _________.



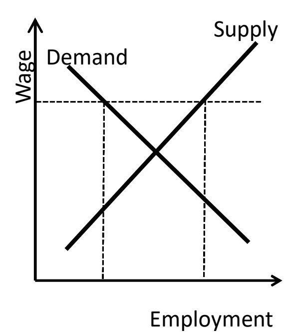
Labor demand

- Firms, trying to maximize their profit, decide how many workers to hire, and for how many hours.
- The higher the wage, the fewer workers they find it profitable to hire.
- Thus, labor demand slopes ___________.



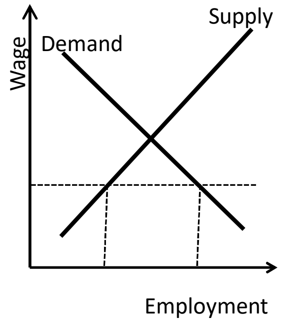
How demand and supply interact

- If wage is very high, more people want to work than firms are willing to hire.
- Excess ______________.
- Firms find they can lower wage and still fill all their vacancies.
- Market wage __________.



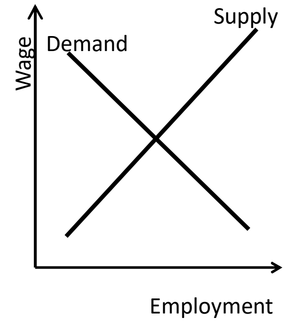
How demand and supply interact (cont'd)

- If wage is very low, fewer people want to work than firms want to hire.
- Excess _____________.
- Firms find they can fill their vacancies only by raising wage.
- Market wage __________.



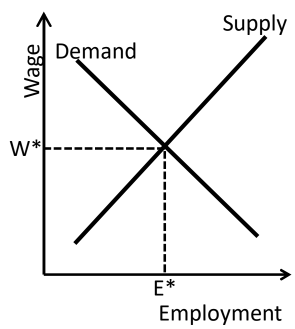
Equilibrium

- Equilibrium occurs when there is no downward or upward pressure on the wage.
- Number of workers who choose to work equals number of workers that firms want to hire.



Earnings = wage bill

- Total amount of money paid to workers
  = W* x E* .
  = "total labor earnings" for workers.
  = "wage bill" for firms.

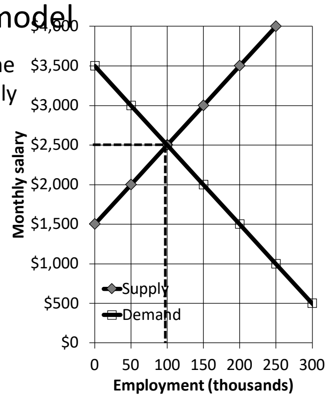


Application: the Alaska oil pipeline

- 1968: oil discovered in Prudhoe Bay, northern Alaska.
- Oil companies proposed to build 789-mile pipeline to bring oil across Alaska to Valdez, an ice-free port.
- 1973: Congress approved pipeline.
- 1974-1977: Pipeline constructed.

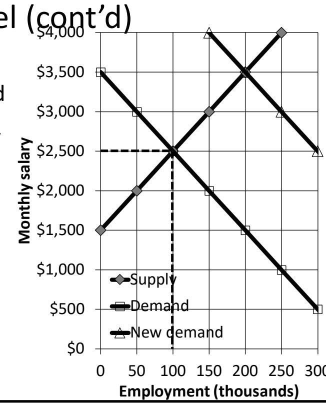
Applying the supply-and-demand model

- Construction of pipeline should have temporarily increased demand for engineers in Alaska.
- What happens when demand curve shifts __________?



Applying the supply-and-demand model (cont'd)

- Temporary rightward shift in demand should have ______________ both wages and employment.
- Reason: supply curve slopes _________ in this model.



Model successfully predicted what actually happened

- Wages ____________ at the beginning of construction, then ___________ when pipeline was finished.
- Employment was already rising before the pipeline, as Alaska's population was growing.
- Employment ____________ sharply at the beginning of construction, then ___________ back to its prior trend when pipeline was finished.

Conclusions

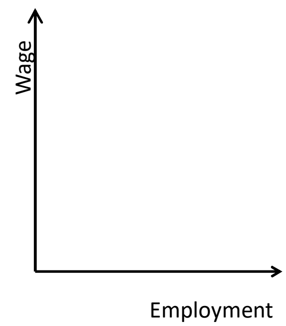
- Labor economics analyzes work and pay as outcomes of labor *markets*.
- The simplest market model assumes _____________________-sloping demand by employers and _________________-sloping supply by workers.
- It can explain broad movements in employment and wages.

ELASTICITIES OF LABOR DEMAND AND SUPPLY

- How can we measure the sensitivity of labor demand or supply to the wage?

How flat or steep is labor demand?

- The higher the wage, the fewer workers firms want to hire.
- How many fewer?
- We need a way to measure the sensitivity of labor demand to the wage.



Wage elasticity of labor demand: definition

$$\varepsilon_E^D = \frac{\%\ chg\ E}{\%\ chg\ W} = \frac{(\Delta E)/E}{(\Delta W)/W} = \frac{\Delta E}{\Delta W} \cdot \frac{W}{E}$$

where changes (Δ) are measured along labor demand curve.

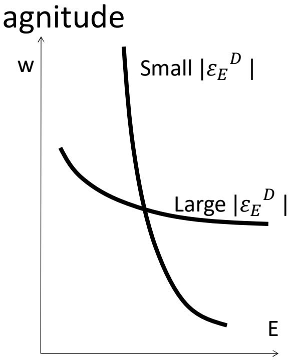
- Since demand slopes down, ε_E^D must be _______________ (but some authors drop the minus sign).

Wage elasticity of labor demand: examples

- Suppose a 10% increase in wage causes the industry to hire 4% less labor input.
  Then $\varepsilon_E^D = \frac{\%\ change\ E}{\%\ change\ w} = \frac{-4\%}{10\%}$ = _________.
- Alternatively suppose a 10% increase in wage causes the industry to hire 15% less labor input.
  Then $\varepsilon_E^D = \frac{\%\ change\ E}{\%\ change\ w} = \frac{-15\%}{10\%}$ = ________.

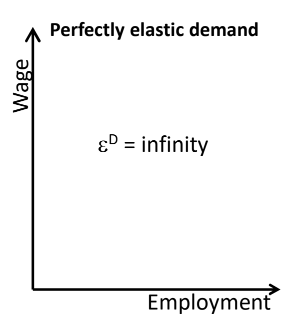
Elasticity of labor demand: sign and magnitude

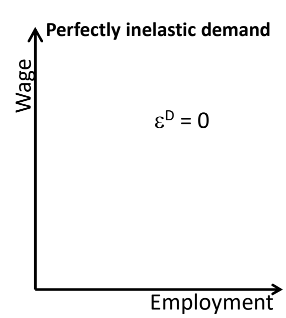
- Note that ε_E^D must always be _________*, because labor demand slopes down.
- But how large is ε_E^D in absolute magnitude?
- Large implies ________ labor demand curve.
- Small implies ________ labor demand curve.



* Some authors drop the negative sign.

Extreme cases: $\varepsilon_E^D = \frac{\%\ chg\ E}{\%\ chg\ W}$





Using wage elasticity of labor demand: example

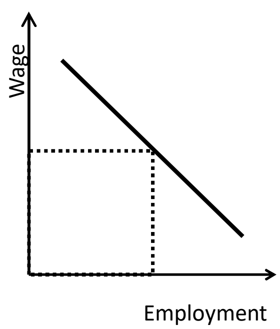
- Assume no shift in labor demand curve.
- If wage rises by 5% and $\varepsilon_E{}^D$ = -0.8 , what happens to employment?
- Set $\varepsilon_E^D = -0.8 = \frac{\%\ chg\ E}{\%\ chg\ W} = \frac{\%\ chg\ E}{5\%}$.
- Solve to get % chg E = -0.8 × 5% = _____%.
- Conclude that employment _______________ by _____ percent.

Using wage elasticity of labor demand: another example

- Again assume no shift in labor demand curve.
- If employment decreases by 3% and $\varepsilon_E{}^D$ = -0.6, what happens to wage?
- Set $\varepsilon_E^D = -0.6 = \frac{\%\ chg\ E}{\%\ chg\ W} = \frac{-3\%}{\%\ chg\ W}$.
- Solve to get % chg W = -3% / -0.6 = _____ %.
- Conclude that wage _______________ by _____ percent.

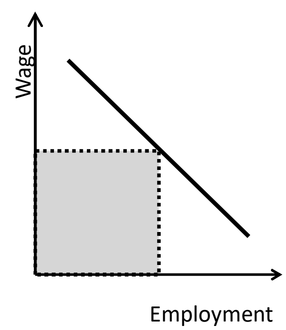
Wage bill: definition

- $Wage\ bill = W \times E$
- Total amount of money firms spend on all employees.
- Equals labor income of all employees.
- Equals area of box.



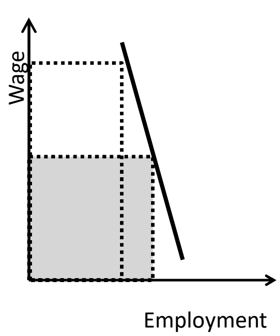
Changes in wage bill

- Assume no shift in labor demand curve.
- As wage increases, employment decreases.
- What happens to wage bill?
- Key formula:
  % change in wage bill ≈
  % chg W **+** % change E



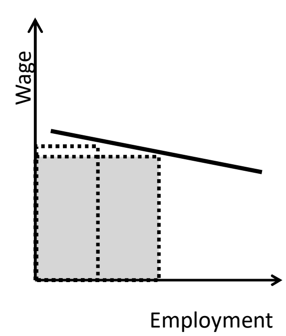
Inelastic labor demand

- If % decrease in employment is less than % increase in wage, then area of box increases.
- So wage bill _________.
- This happens if
  $\left|\varepsilon_E^D\right| = \left|\frac{\%\ chg\ E}{\%\ chg\ W}\right|$ 1.



Elastic labor demand

- If % decrease in employment is greater than % increase in wage, then area of box decreases.
- So wage bill _________.
- This happens if
  $\left|\varepsilon_E^D\right| = \left|\frac{\%\ chg\ E}{\%\ chg\ W}\right|$ 1.



Computing changes in wage bill: example

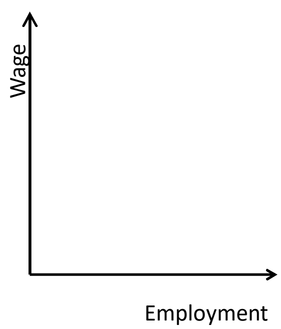
- Assume no shift in labor demand curve.
- If wage rises by 5% and ε_E^D = -0.8 , what happens to wage bill?
- We already found E decreases by 4%.
- So % change in wage bill = +5% + -4% = _______%.
- Conclude that wage bill ______________ by _______ percent.

Computing changes in wage bill: another example

- Again assume no shift in labor demand curve.
- If employment decreases by 3% and ε_E^D = -0.6, what happens to wage bill?
- We already found w increases by 5%.
- So % change in wage bill = +5% + -3% = _______%.
- Conclude that wage bill ______________ by _______ percent.

How flat or steep is labor supply?

- The higher the wage, the more workers will want to work in this labor market.
- How many more?
- We need a way to measure the sensitivity of labor supply to the wage.



Wage elasticity of labor supply: definition

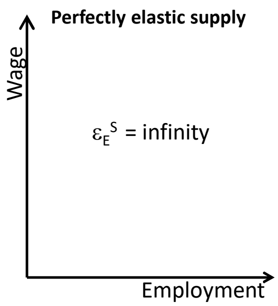
$$\varepsilon_E^S = \frac{\%\ chg\ E}{\%\ chg\ W} = \frac{(\Delta E)/E}{(\Delta W)/W} = \frac{\Delta E}{\Delta W} \cdot \frac{W}{E}$$

where changes (Δ) are measured along labor SUPPLY curve.

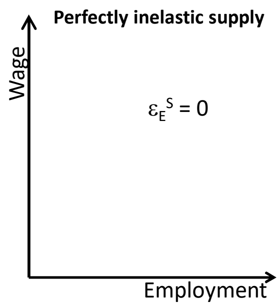
- Since supply slopes up, ε_E^S must be _____________.

Extreme cases: $\varepsilon_E^S = \frac{\%\ chg\ E}{\%\ chg\ W}$

Perfectly elastic supply



Perfectly inelastic supply



Conclusions

- Elasticities measure the sensitivity of labor demand or supply to the wage.
- Elasticities = $\frac{\qquad}{\qquad}$, measured either along the labor demand or supply curves.
- If labor demand is inelastic, the wage bill _______________ when the wage rises.

ECONOMIC MODELS AND POLICY DECISIONS

- How can models help us analyze public policy?
- What can models NOT do?

What good are economic models?

- Models help us understand how labor markets work—what causes what.
- Good models have ________________ predictions. We can check them.
- But to be manageable and understandable, models must omit some ______________ of the real world.

Models help evaluate government policies

- For example, models can predict the consequences of government policies that change demand or supply, or change the market mechanism.
- Models can predict what will happen to ____________, ___________________, and sometimes other things like output prices, wage inequality, etc.

Examples of government policies that can be analyzed with economic models

- Changes in the minimum wage.
- Changes in tax rates on workers or firms.
- Changes in unemployment benefits.
- Changes in government support for higher education.
- Changes in immigration policy.
- Changes in discrimination law.

Limits of models

- Models can predict who wins, who loses, and how much from changes in government policies.
- But cannot tell us directly _______________ a policy should be changed.
- That requires a ______________ judgment, which models cannot provide.

Example 1

- Suppose a proposed change in immigration policy would allow 10 million new immigrants.
- Suppose our model predicted that this change would
  - reduce income of native workers by $50 billion
  - but increase profits of their employers by $80 billion.

Example 1 (cont'd)

- Should this change be made? Our model cannot answer that question.
- To decide, we must make a ____________ judgment. Must somehow decide whether rise in profits is worth fall in workers' incomes.
- Model is helpful, but _________ sufficient for making decisions.

Example 2

- Suppose a proposal would increase the minimum wage by $2.
- Suppose our model predicted this would
  - increase the earnings of some workers by $20 billion,
  - decrease the earnings of other workers (through lost jobs) by $10 billion,
  - and decrease profits of employers by $15 billion.

Example 2 (cont'd)

- Should the minimum wage be increased? Again, our model cannot answer that question.
- To decide, we must make a ____________ judgment. Must somehow decide whether rise in workers' earnings is worth fall in other workers' earnings and fall in profits.
- Model is helpful, but _________ sufficient for making decisions.

Positive versus normative economics

- ______________ economics = understanding how markets work.
  - Requires models.
- ______________ economics = deciding what should be done.
  - Requires models AND value judgments.

Pareto improvements: "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*.*
- Most people would agree that Pareto improvements should be done.

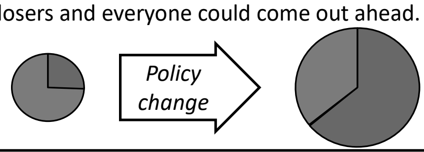
*Vilfredo Pareto, 1848-1923, Italian economist working in France.

"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 U.S. tire industry by about 40%.
- So a more practical approach is needed.

A practical approach to normative economics

- How to decide
  - Simply _______________ gains and losses to everyone, and check if pie has increased in size.
- Motivation
  - If winners' gains are larger than losers' losses, winners could in principle ________________ losers and everyone could come out ahead.



Applying the "compensation test"

- Example 1
  - Net gain to society = - \$50 + \$80 = \$ ________ billion.
  - ______________ pass test.
- Example 2
  - Net gain to society = + \$20 - \$10 - \$15 = \$ ________ billion.
  - ______________ pass test.

Does the "compensation test" make sense?

- Yes
  - Policy changes that pass the "compensation test" ______________ the pie.
  - They are called "economically __________."
- No
  - In reality, when policies are changed, compensation is almost __________ really paid.
  - Someone __________ from almost every policy change.

Positive economics still useful without compensation test

- Even if we do not strictly apply the compensation test, we still want to know who wins, who loses, and how much.
- Example 1: we might reconsider minimum wage if net loss were ___________.
- Example 2: we might question immigration change if net gain were __________.
- So economic models are still useful.

Conclusions

- Economic models can predict what will happen after a policy change (___________ economics).
- However, they cannot decide whether the change should be made (_______________ economics).
- The "________________________ test" is a simple approach to normative economics that adds up gains and losses to everyone.

REGRESSION ANALYSIS

- How can we test and measure economic relationships in the real world?

Analyzing data

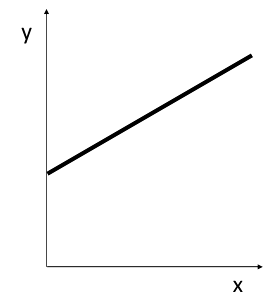
- To test and measure economic relationships, labor economists use __________ from the real world.
- We usually want to find out ____________ one variable affects another, and if so, how _____________ the relationship is.

Examples of economic relationships

- Does more education increase a worker's earnings? If so, how much?
- Does an increase in the minimum wage reduce employment? If so, how much?
- Do unions raise wages? If so, how much?
- Do increased unemployment benefits cause people to remain unemployed longer? If so, how much?

Linear relationships

- Suppose x and y have a linear relationship: $y = \beta_1 + \beta_2 x$.
- β_1 = ___________
- β_2 = ___________

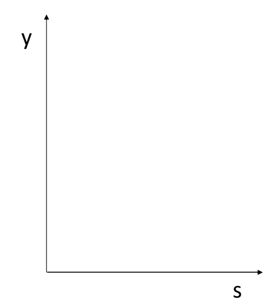


Meaning of slope

- If x increases by a small amount, then y changes by β_2 times that amount.
- Example: Suppose $\beta_2 = 2$ and x increases by 0.4. Then y increases by (approximately) _______.

Measuring relationships

- Suppose we have data on x_i and y_i, for $i = 1$ through n.
- We believe that x and y have a roughly _______ relationship: $y = \beta_1 + \beta_2 x$.
- How can we estimate β_1 and β_2?

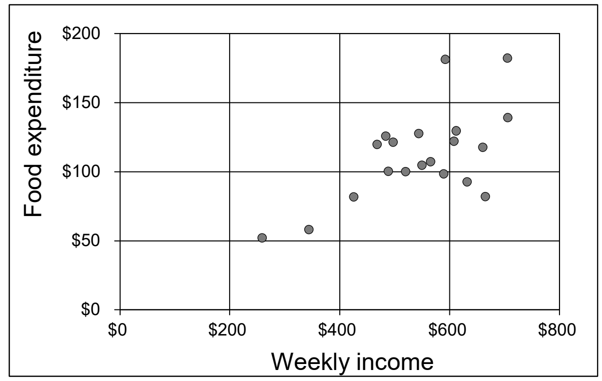


Example 1: household income and food expenditure

Household no.	Weekly income	Food expenditure
1	258.3	52.25
2	343.1	58.32
3	425	81.79
4	467.5	119.9
5	482.9	125.8
6	487.7	100.46
7	496.5	121.51
8	519.4	100.08
9	543.3	127.75
10	548.7	104.94

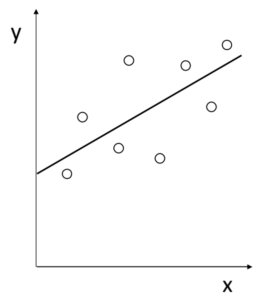
Household no.	Weekly income	Food expenditure
11	564.6	107.48
12	588.3	98.48
13	591.3	181.21
14	607.3	122.23
15	611.2	129.57
16	631	92.84
17	659.6	117.92
18	664	82.13
19	704.2	182.28
20	704.8	139.13

Scatterplot of household food expenditure dataset



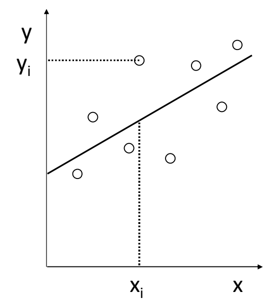
Fitting a line to data

- Economic data rarely lie exactly on a straight line.
- So we must find a line that fits the data "best."
- How to choose the "best"-fitting line?



Deviations from the line

- The "best" line would come as close as possible to the actual data points.
- Suppose we measure deviations from the line vertically.



The least-squares principle

- Choose the line that minimizes the sum of the squared vertical deviations.
- In other words, find values of β_1 and β_2 that minimize the following:

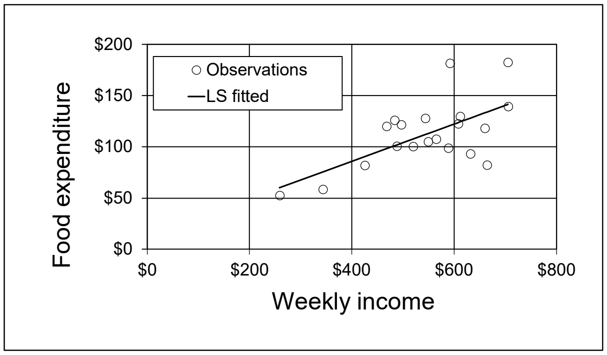
$$\sum_{i=1}^{n}\left(y_i - [\beta_1 + \beta_2 x_i]\right)^2$$

- MS Excel has a "regression tool" for this.

LS estimates for the household food expenditure dataset

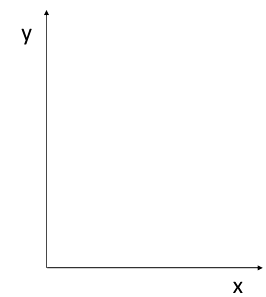
- Y-intercept (β_1): 12.94
- Slope (β_2) : 0.18
- Fitted line: y = __________ + ________ x
- Interpretation: if income increases by one dollar, spending on food increases by $___________.

LS fitted line for household food expenditure dataset



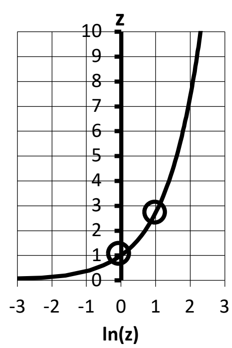
Nonlinear relationships

- If the relationship between x and y is not likely to be linear, we can still use LS regression if we first apply a trick.
- Convert one or both variables to natural _____________ (ln).



Natural logs

- Definition of natural logarithm:
  ln(z) = logarithm of z to base e = 2.711828…
- In other words $z = e^{\ln(z)}$.
- Thus if ln(z) increases by 1 unit, then z itself is ________________ by a factor of e = 2.711828…



Small changes in natural logs

- From calculus we know that $\frac{d\ln(z)}{dz} = \frac{1}{z}$ or $d\ln(z) = \frac{dz}{z}$.
- This implies that if ln(z) increases by a small amount, then z itself changes by approximately that ______________.

Change in ln(z)	Approx. change in z
0.01	%
0.03	%
0.05	%
0.10	%

Percent change ≈ change in natural log: example

- How much more are engineers paid than managers, on average? _______%.
- How much more are engineers paid than mathematicians and computer scientists? _______%.

Occupation	Hourly wage	**Log** hourly wage
Managers	$23.57	3.16
Engineers	$29.08	3.37
Mathematical and computer scientists	$28.79	3.36

Meaning of slope when y is in natural logarithms

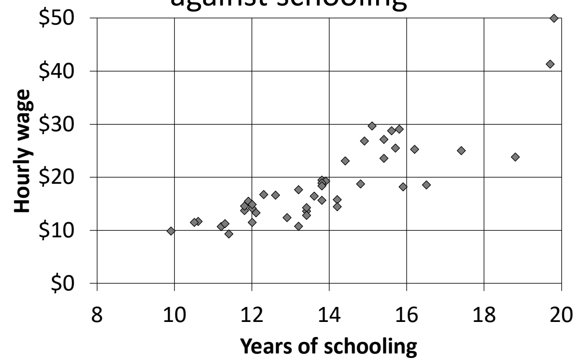
- Suppose $\ln y = \beta_1 + \beta_2 x$.
- If x increases by a small amount, then ln(y) changes by β_2 times that amount.
- But y itself changes by a ______________ about equal to β_2 times that amount.
- Example: Suppose $\beta_2 = 0.03$ and x increases by 2. Then y increases by (approximately) _______%.

Example 2: average hourly wage and average schooling by occupation

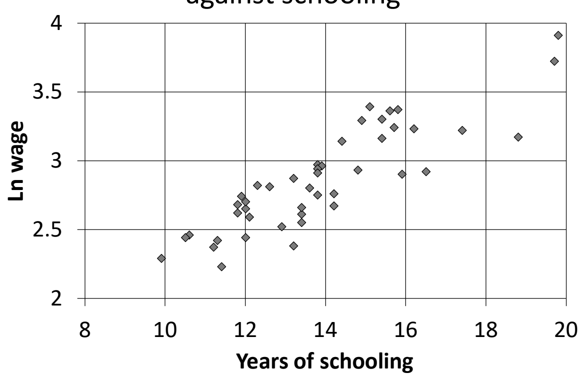
Occupation	Mean log hourly wage of male workers	Mean years of schooling for male workers
Administrators and officials, public admin.	3.24	15.7
Other executives, administrators, and managers	3.29	14.9
Management-related occupations	3.16	15.4
Engineers	3.37	15.8
Mathematical and computer scientists	3.36	15.6
Etc.	Etc.	Etc.
Forestry and fishing occupations	2.70	12.0

Borjas 5th edition, page 15, table 1-1. 45 observations total.
SOURCE: Annual demographic files of the CPS, 2002.

Scatterplot of average hourly wage against schooling



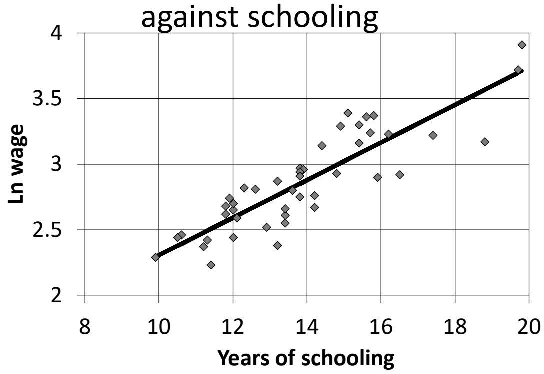
Scatterplot of **ln**(wage) against schooling



LS estimates for the wage and schooling dataset

- Using Excel, I computed LS estimates of
  ln w = $\beta_1 + \beta_2$ s.
- Intercept (β_1): 0.869
- Slope (β_2) : 0.143
- Fitted line: ln w = _________ + _________ s
- Interpretation: if schooling increases by one year, wage increases by about _________ %.

LS fitted line of ln(wage) against schooling



Standard errors and confidence intervals

- LS estimates are not precise because datasets are, at best, _____________ samples from a much larger population.
- The "standard error" of a LS estimate is a measure of its precision.
- Roughly speaking, an estimate is within ____________ standard errors of its true value 95% of the time.

Standard errors for the wages and schooling dataset

- Excel also reported the standard errors shown below in parentheses:
  ln w = 0.869 + 0.143 s
  (0.172) (0.012)
- So a 95% confidence interval (or "margin of error") for the slope would be
  0.143 ± 2 × 0.012 = 0.143 ± __________.

Statistical significance

- We say that an estimate is "statistically significant at the 5% level" if
  - the 95% confidence interval does not include zero,
  - or equivalently, $t = \frac{estimate}{standard\ error} > 2$.
- For the slope estimate, t = 0.143/0.012 = ____________.
- Clearly the slope estimate _______ statistically significant.

Multiple regression

- In the real world, any variable y is affected by multiple variables.
- If an important variable (other than x) is changing in our dataset, then our simple LS estimate of the slope may be ____________.
- To get an unbiased estimate, we must include that other variable in a ______________– regression equation:
  $y = \beta_1 + \beta_2 x + \beta_3 z$.

Example 2: percent female employment by occupation

Occupation	Mean log hourly wage of male workers	Mean years of schooling for male workers	Female share (%)
Administrators and officials, public admin.	3.24	15.7	52.4
Other executives, administrators, and managers	3.29	14.9	42.0
Management-related occupations	3.16	15.4	59.4
Engineers	3.37	15.8	10.7
Mathematical and computer scientists	3.36	15.6	32.2
Etc.	Etc.	Etc.	Etc.
Forestry and fishing occupations	2.70	12.0	3.7

LS estimates for the multiple-regression equation

- ln w = 0.924 + 0.150 s - 0.003 f
  (0.154) (0.011) (0.001)
- Interpretation: holding female share (f) constant, if schooling increases by one year, wage increases by about __________ %.
- Holding schooling constant, if female share increases by one percentage point, wage __________________ by about __________%.

Conclusions

- LS regression allows us to test and measure real-world relationships between variables.
- If the y variable is in natural logs, then the estimate of β_2 shows the _______________ increase in y from a one-unit increase in x.
- If an important variable (other than x) is changing in our dataset, we should use __________________ regression.

MEASURING THE LABOR FORCE

- How is the labor force counted?
- How does the labor force in the U.S. today compare with other countries and with the past?

Who collects the data?

- Census Bureau surveys about 60,000 households each month in its "Current Population Survey."
- Results related to labor force are released by the Bureau of Labor Statistics (BLS).
- Working-age population defined as persons 16 years old and older, not in institutions (prison, mental institutions, active duty in military, etc.).

How people are classified

- All working-age persons are categorized as either:
  - Employed (at a paid job).
  - Unemployed (looking for work).

  - Not in labor force.

Who is counted as "employed"?

- Worked full time ____
- Worked part time ____
- Self-employed ____
- Worked in a family business ____
- Did unpaid work at home _____
- Did volunteer work _____

Last week, did you do any work for pay?

Who is counted as "unemployed"?

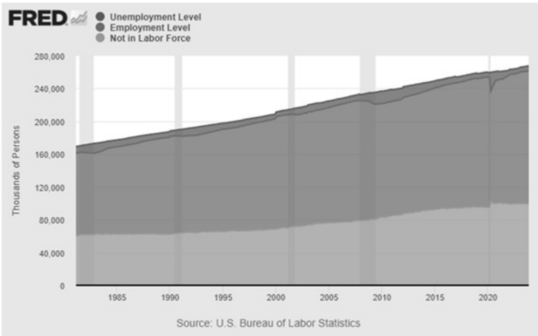
- Contacted employer ____
- Cont. empl. agency ____
- Cont. friends, relatives ____
- Sent out resumes _____
- Placed or answered ads _____
- Looked at ads _____
- Attended job training course _____

Have you been doing anything to find work during the last 4 weeks?

Who is counted as "in the labor force"?

- Employed ____
- Unemployed ____
- Been hired for job but not yet started work ____
- Want a job but have given up looking for one ("discouraged worker") _____

Trends in U.S. working-age population



Source: FRED (fred.stlouisfed.org).

Labor market indicators

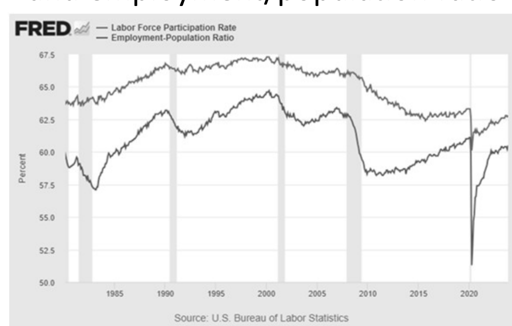
- *Unemployment rate =*
- *Labor force participation rate =*
- *Employment/population ratio =*

Example: 2019

- Working-age population = 259.2 million
- Employed = 157.5 million
- Unemployed = 6.0 million
- Labor force = ___________ million
- Unemployment rate = ___________ %
- Labor force participation rate = ________ %
- Employment/population ratio = ________ %

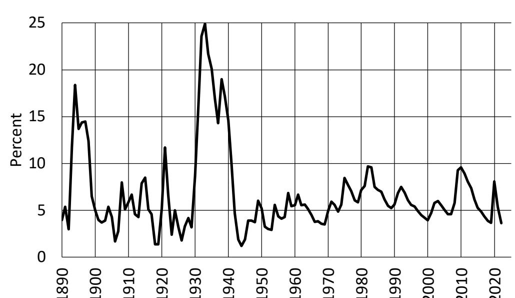
Source: FRED (fred.stlouisfed.org).

Trends in U.S. labor participation rate and employment/population ratio

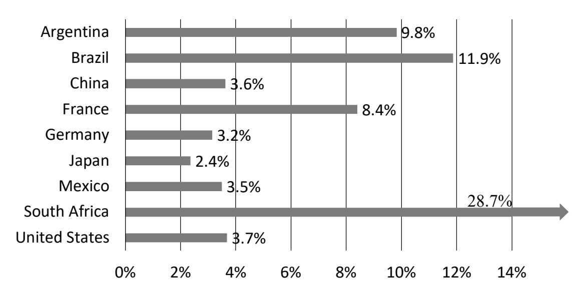


Source: FRED (fred.stlouisfed.org).

Trends in U.S. unemployment rate



Unemployment rates in other countries (2019)



Source: IMF, World Economic Outlook.

The "natural rate" of unemployment

- *Natural rate of unemployment* = unemployment rate in the absence of booms or recessions.
  - That is, when GDP = _______________ GDP.
- Also called "non-accelerating-inflation rate of unemployment" or ________________.

The "natural rate" varies...

...over time.

- Was probably around 5% in the 1950s.
- Probably increased to 6% or 7% in the late 1960s and early 1970s.
- Seems to be around _________ now.

...across countries.

"Hidden unemployed"

- During recessions and slumps, some people _____________ the labor force.
- Persons out of the labor force who
  (1) want a job,
  (2) are available for work, and
  (3) looked for a job in the last year
  are called "marginally attached to the labor force" by the BLS.
- In November 2023, __________ million people were counted as "marginally attached to the labor force."

"Hidden unemployed" (cont'd)

- A subset of these persons, who say they did not look for work in the last 4 weeks because they thought no jobs are available, are called "discouraged workers."
- In November 2023, ________ million people were counted as "discouraged workers."

"Hidden unemployed" (cont'd)

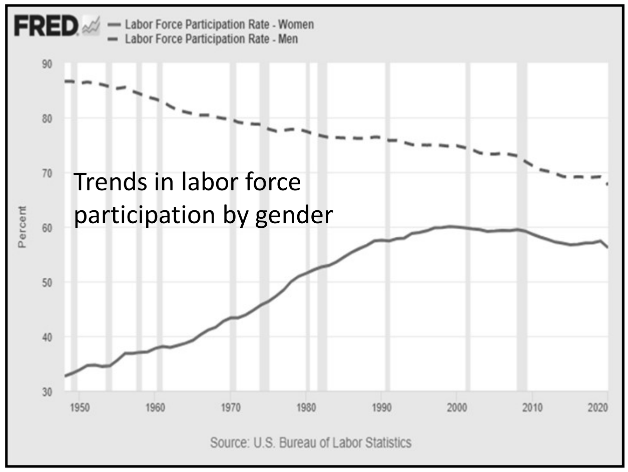
- Finally, some persons who are working part-time want to work full-time.
- The number of these persons increases in recessions.
- In November 2023, ________ million people were counted as "working part-time for economic reasons."

Conclusions

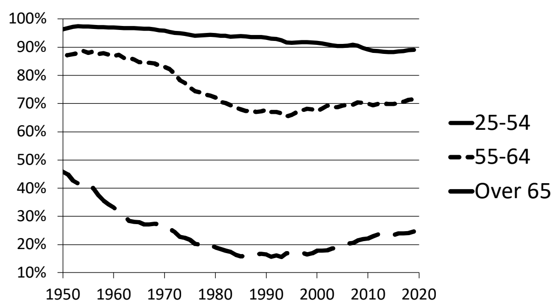
- Each month, ________________________________ estimates the number of people *employed, unemployed*, and *out of the labor force.*
- *Unemployment rate* = ____________________________________.
- The "*natural rate*" of unemployment seems to be about __________ in the U.S. now.

TRENDS IN LABOR SUPPLY

- What are the basic facts of labor supply in the U.S.?

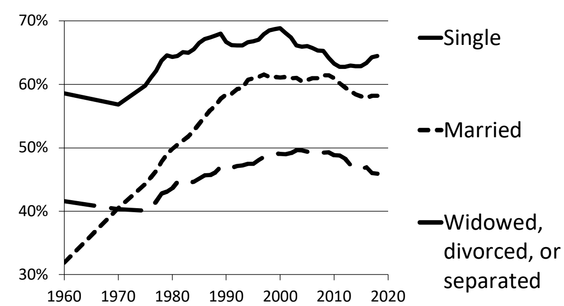


Labor force participation rates of men, by age



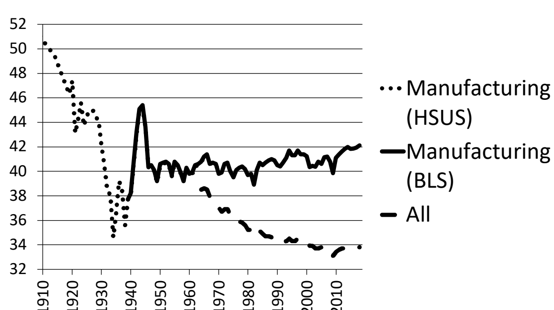
SOURCE: Bureau of Labor Statistics, accessed 12/17/19.

Labor force participation rates of women, by marital status



SOURCE: Bureau of Labor Statistics, accessed 12/17/19.

Average weekly hours of work of production and nonsupervisory workers



SOURCES: *Historical Statistics of the US,* series D-802; Bureau of Labor Statistics, accessed 12/17/19.

Labor supply and gender

	Women	Men
Labor force participation rate	71.4%	83.1%
Annual hours of work	1933 hours	2170 hours
Percent of workers in part-time jobs	12.9%	4.3%

SOURCE: CPS March 2017, as reported by Borjas, 8th edition, p. 24, table 2-3.

Labor supply and education

- Labor force participation is __________ for persons with more education.
- Among those working, hours of work are _________ for persons with more education.
- College-educated workers are ________ likely to hold part-time jobs than workers without a high-school diploma.

SOURCE: CPS March 2017, as reported by Borjas, 8th edition, p. 24, table 2-3.

Labor supply and race

- Labor force participation is _________ for white men than for African-American men.
- Hours of work are _________ for white men than for African-American men.
- _________ difference for women.

SOURCE: CPS March 2017, as reported by Borjas, 8th edition, p. 24, table 2-3.

Conclusions

- Over the last 50-100 years...
  - Labor supply of older men has ____________.
  - Labor supply of married women has ____________ sharply.
  - Weekly hours of work have _____________.
- Today, labor supply is _____________ on average...
  - for men than for women.
  - for more educated persons.

PREFERENCES

- People value both consumption goods and leisure time.
- How can we represent their preferences graphically?

Preferences

- The "neoclassical" model of labor supply assumes that workers ___________________ ______________________________________.
- Workers value both leisure time (L) and consumption goods they must purchase (C).
- L is usually measured in hours, but sometimes in days or weeks.
- C is measured as the total ___________ value of consumption goods purchased.

Utility function

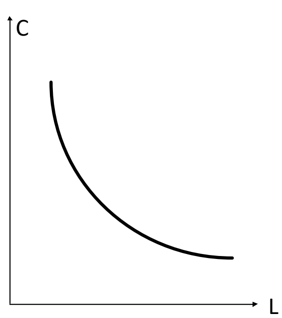
- One way to represent a worker's preferences is through a utility function: U = f(C, L).
- The utility function assigns points (or "utils") to every combination (or "bundle") of C and L.
- The more utils, the _____________ attractive a combination is to this worker.

Utility function: example

- Suppose a worker had the utility function U = C (L-10).
- Then bundle A, consisting of C=$100 and L=40 hours, gives U = __________ utils.
- Bundle B, consisting of C=$200 and L=30 hours, gives U = __________ utils.
- This worker prefers bundle _____ over bundle _____ because it brings more utils.

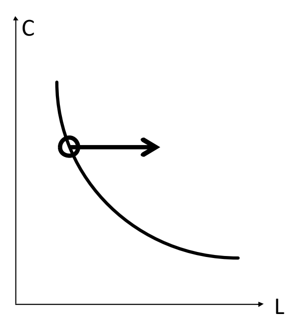
Indifference curves

- A graphical way to represent preferences is to draw curves connecting equally-preferred bundles.
- Bundles on the curve provide the same number of ________.



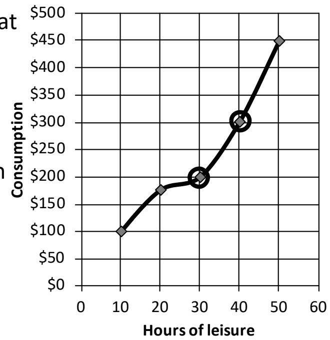
Indifference curves must slope down

- People value both L and C.
- If a worker gets more L, the only way they can remain equally well-off is if they lose some C.



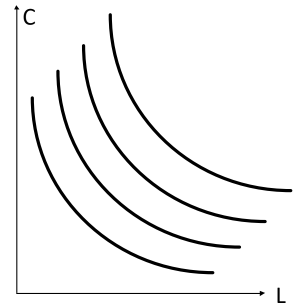
Indifference curves must slope down: example

- This curve suggests that ($200, 30 hours) is equally preferred to ($300, 40 hours).
- Violates assumption that people value both L and C.
- _________ a valid indifference curve!



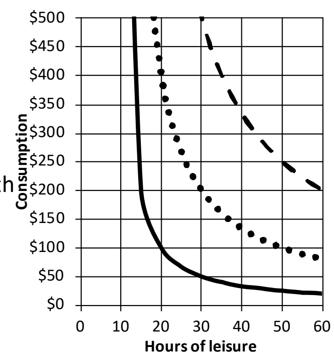
Families of indifference curves

- Everyone has a whole family of indiff. curves.
- More of either C or L is preferred.
- Indifference curves that are ___________ and to the _________ represent preferred combinations.



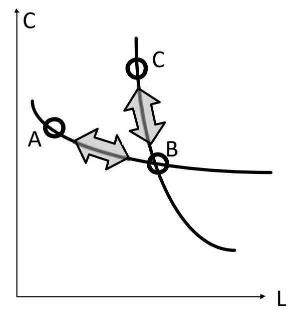
Families of indifference curves: example

- For this worker,
- ($100, 20 hours is equally preferred to ($50, 30 hours).
- ($100, 50 hours) is more preferred to both of the above.
- ($200, 60 hours) is preferred to all three.



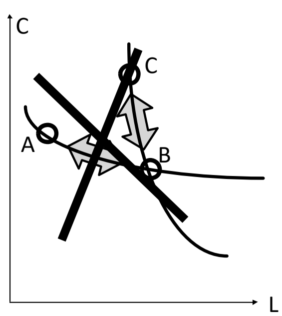
Indifference curves cannot cross

- These curves suggest that A is equally preferred to B, and B is equally preferred to C.
- But A cannot be equally preferred to C!
- Violates assumption that people value both L and C.



Indifference curves cannot cross

- These curves suggest that A is equally preferred to B, and B is equally preferred to C.
- But A cannot be equally preferred to C!
- Violates assumption that people value both L and C.



Marginal utility

- MU_L = marginal utility of leisure = increase in utility from one more hour of leisure (holding consumption constant).
- MU_C = marginal utility of consumption = increase in utility from one more dollar of consumption (holding leisure constant).
- Since we assume people value both L and C, MU_L and MU_C must be ______________.

Finding formulas for marginal utility

- Given a utility function, marginal utilities can be found using calculus.
- $MU_L = \frac{\partial U(C,L)}{\partial L}$ = derivative of U w.r.t. L.
- We use the "∂" symbol rather than "d" to indicate a *partial* derivative—that is, C is treated as a _______________ in finding MU_L.
- Similarly, $MU_C = \frac{\partial U(C,L)}{\partial C}$.

Finding formulas for marginal utility: example 1

- Suppose worker #1 has utility function $U(C,L) = C^2 L$.
- Then worker #1's marginal utility of leisure = $MU_L = \frac{\partial U(C,L)}{\partial L} =$ _____________.
- Worker #1's marginal utility of consumption = $MU_C = \frac{\partial U(C,L)}{\partial C} =$ _____________.

Finding formulas for marginal utility: example 2

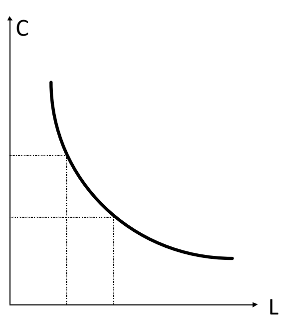
- Suppose worker #2 has utility function $U(C,L) = (C-200) L$.
- Then worker #2's marginal utility of leisure = $MU_L = \frac{\partial U(C,L)}{\partial L} =$ _____________.
- Worker #2's marginal utility of consumption = $MU_C = \frac{\partial U(C,L)}{\partial C} =$ _____________.

Finding formulas for marginal utility: example 3

- Suppose worker #3 has utility function $U(C,L) = C (L-6)$.
- Then worker #3's marginal utility of leisure = $MU_L = \frac{\partial U(C,L)}{\partial L} =$ _____________.
- Worker #3's marginal utility of consumption = $MU_C = \frac{\partial U(C,L)}{\partial C} =$ _____________.

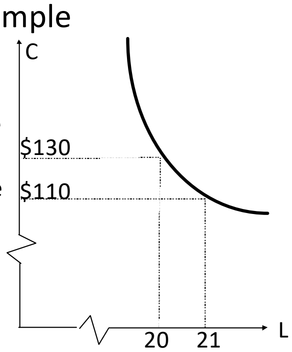
Slope of indifference curve

- If we move down an indifference curve, we are taking away consumption while adding leisure time.
- But worker is ___________ well off.
- So worker is willing to make this trade.



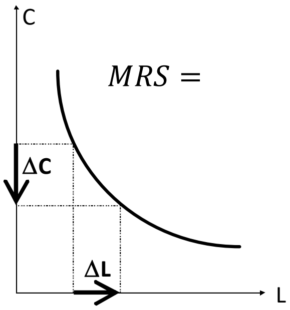
Slope of indifference curve: example

- This worker is just willing to give up $______ of C for one more hour of L.
- Also just willing to give up one hour of L for $______ more of C.



Marginal rate of substitution: definition

- MRS of leisure time for consumption goods
  = |slope| of indifference curve.
  = dollar value of C willing to give up for one more hour of L.



$MRS =$

MRS and marginal utilities

- If leisure time increases by ΔL hours, then utility increases by ($\Delta L \times MU_L$) utils.
- If consumption increases by ΔC dollars, then utility increases by ($\Delta C \times MU_C$) utils.
- Along an indifference curve, utility does _____ change, so ($\Delta L \times MU_L$) + ($\Delta C \times MU_C$) = ______. A little algebra shows

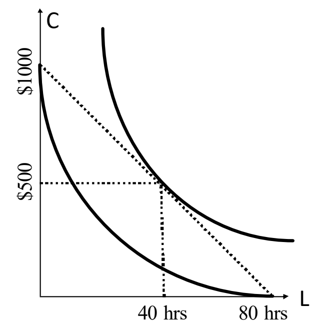
$$\text{MRS} = -\frac{\Delta C}{\Delta L} =$$

MRS and marginal utilities: example 3

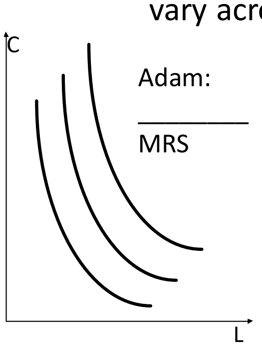
- We showed earlier that if worker #3 has utility function U(C,L) = C (L-6), then
  $MU_L = \frac{\partial U(C,L)}{\partial L} =$ C, and
  $MU_C = \frac{\partial U(C,L)}{\partial C} =$ (L-6) .
- Worker #3's MRS must therefore be
  $\text{MRS} = \frac{MU_L}{MU_C} =$.

Indifference curves are curved

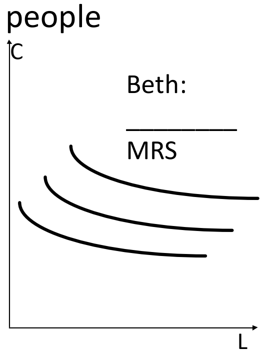
- "Diminishing MRS."
- Why we know this: people would prefer a little of *both* C and L, rather than *only* C or *only* L.



Shape of indifference curves can vary across people



Adam:
____
MRS



Beth:
____
MRS

Conclusions

- The "neoclassical" model assumes workers value both consumption and leisure.
- Preferences can be represented by a _______ function U = f(C,L) and graphically by __________________ curves.
- The |slope| of an indifference curve is called the ___________. Its formula is = MU_L / MU_C .

THE BUDGET CONSTRAINT

- Workers face a tradeoff between consumption goods and leisure time.
- What does that mean?

Labor income

- Part of a worker's income depends on the number of hours worked.
- Let h = hours worked during this period.
- Let w = hourly wage rate, assumed constant.
- Then labor income = __________.

Nonlabor income

- The other part of a worker's income does not depend on the number of hours worked.
- Examples: ____________________________ ______________________________________.
- Let V = nonlabor income.

Budget constraint: consumption = income

- The maximum amount of consumption a worker can enjoy equals the worker's income:

$$C = wh + V .$$

- We assume w and V are ___________.
- Worker chooses only C and h.

Work versus leisure

- Worker can use their time for either work or leisure.
- Let T = total time available during this period (also given).
- Thus T = h + L or h = ___________.
- Example: If worker's total time is T=80 hours per week, and chooses L=50 hours leisure, then hours of work are h = 80-50 = _________.

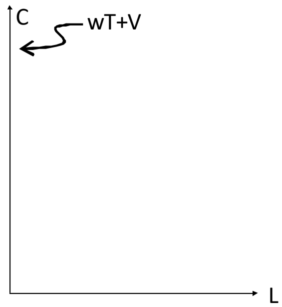
Rewrite budget constraint

- C = w h + V
- h = T – L .
- Substituting into budget constraint:

  C = w (T-L) + V = ______________________.

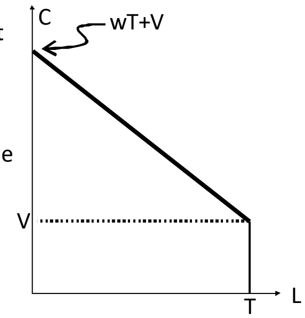
Graphing the budget line

- C = (wT+V) – w L .
- Intercept = ________ = maximum consumption possible, working every available hour.
- Slope = ________ = "price" of leisure.



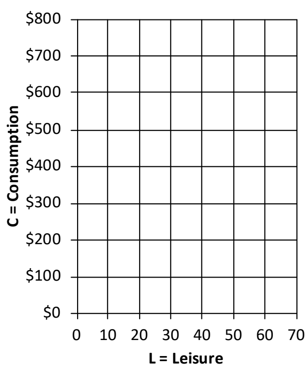
Endowment point

- If worker chooses not to work, then L = T and C = V.
- This point on budget constraint is called the "endowment point."



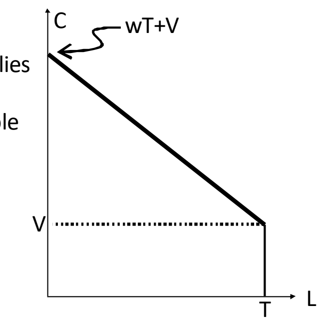
Example of budget constraint

- Worker has T=60 hours per week available for work or leisure
- Worker is paid a wage of w=$10 per hour.
- Worker has V=$100 in nonlabor income.
- So intercept = $ ______ and slope = $ ______.



Opportunity set

- Any consumption-leisure bundle that lies on or below the constraint is available to the worker.



Conclusions

- The budget constraint shows the bundles of consumption and leisure available to a worker, given the worker's wage w, total available time T, and nonlabor income V.
- The intercept shows __________________ consumption possible, working every available hour.
- The slope equals - _____________, and shows the "_____________" of leisure.

OPTIMAL CHOICE OF HOURS OF WORK

- What does it mean for a worker to “do the best they can with what they have”?

Optimal choice

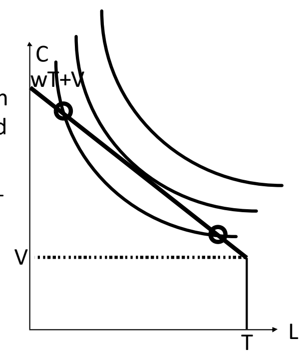
- How will workers choose among bundles in their opportunity set?
- We assume that workers ________________ ______________________________________.
- Formally, we assume that workers *maximize utility subject to their budget constraint*.

Graphical implications

- This means they choose best bundle of C and L that they can afford, going to the __________________ indifference curve attainable in the opportunity set.
- For now, we assume they set their own hours of work, so they can choose any level of L between zero and total available time T.

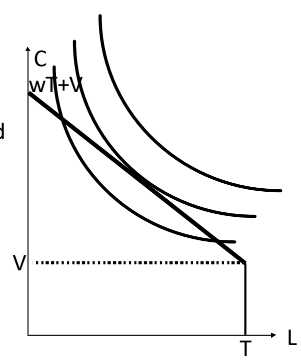
Where is the best bundle?

- Bundles at intersections between budget constraint and indifference curves are clearly _________ the best.
- Can reach a higher indifference curve.



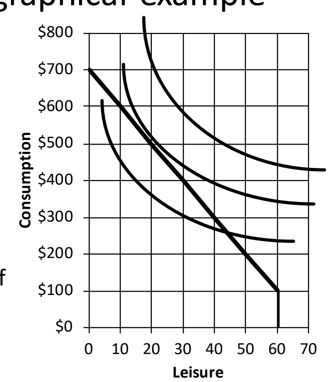
Best bundle is at tangency

- Best bundle is at __________ between budget constraint and highest attainable indifference curve.
- Note: hours of work chosen implicitly as $h^* = T - L^*$.



Best bundle: graphical example

- Suppose worker #2’s indifference curves are as shown.
- Worker #2 will choose C^* = $ __________ , L^* = ________ hours,
- Implicitly, worker #2 is choosing h^* = ________ hours of work.



Algebra of tangency condition

- At tangency, slope of budget line equals slope of indifference curve: -w = - MRS.
- Multiplying both sides by (-1) gives

$$w \; = MRS = \frac{MU_L}{MU_C} \; .$$

- This equation, together with budget equation can be used to solve for the best bundle algebraïcly.

Best bundle: algebraic example

- Suppose a worker has utility function U = f(C,L) = C (L-6).
- We showed in previous slideshow that, with this utility function, MU_L = C and MU_C = L-6, so $\text{MRS} = \frac{MU_L}{MU_C} =$.

Best bundle: algebraic example Tangency condition

- Suppose this worker can earn a wage of w = $15.
- Tangency requires ____________.
- So the tangency condition is
  .
- Note: two unknowns in this equation.

Best bundle: algebraic example Budget constraint

- Now suppose this worker has T=80 hours per week available for work or leisure, and enjoys V=$60 per week of nonlabor income.
- If enjoyed NO leisure (L=0, h=T=80), then would enjoy consumption of (15×80 + 60) = $_________ (intercept).
- Worker's budget constraint is thus C = _______________.

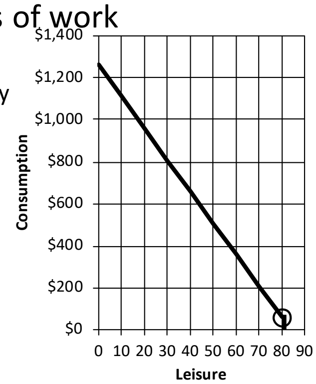
Best bundle: algebraic example Solution

- The tangency condition $15 = \frac{C}{(L-6)}$ implies
  C = 15×(L – 6) = 15L – 90.
- Set this equal to the budget constraint
  C = 1260 – 15L and solve.
- L* = _______ hours of leisure.
- C* = $ _______ of consumption.

Best bundle: algebraic example Hours of work

- Total available time is T=80 hours, so implicitly chooses to work h* = T - L*

  = ______ hours.



Conclusions

- We assume workers “do the best they can with what they have.”
- Graphically, worker chooses leisure-consumption bundle at ____________________ between budget constraint and highest attainable indifference curve.
- Algebraically, worker chooses bundle satisfying tangency condition (______=_______) and equation for budget line.

CHANGES IN NONLABOR INCOME

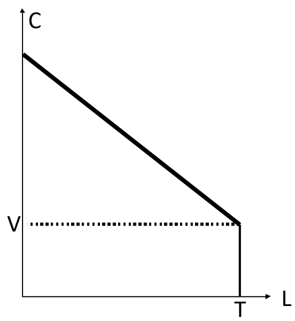
- Will a worker work more or fewer hours if nonlabor income increases?

Changes in circumstances

- Our model assumes workers "do the best they can with what they have."
- We can use model to predict how workers respond to changes in nonlabor income or wages.
- We assume their preferences (utility function, indifference curves) remain _____________.

Changes in budget constraint

- If the budget constraint changes shape, people respond by making new choices.
- Can we predict whether labor supply will increase or decrease?

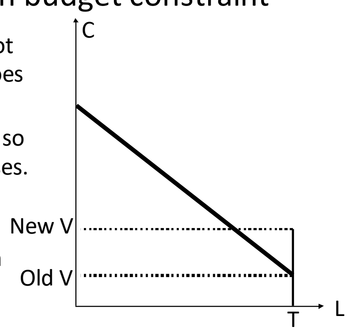


Increase in nonlabor income

- Suppose a worker
  - wins a lottery
  - unexpectedly inherits money from a distant relative
  - enjoys an rise in value of stock portfolio.
- How does the worker's budget constraint change?
- How will the worker respond?

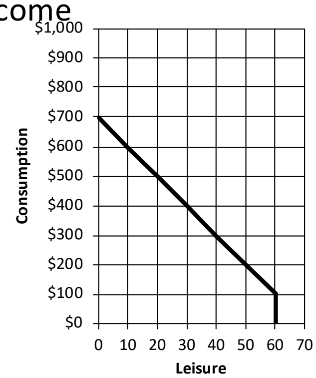
Effect of increase in nonlabor income on budget constraint

- Since w does not change, slope does not change.
- But V increases so intercept increases.
- So budget constraint shifts _______ in parallel fashion.



Example of increase in nonlabor income

- Worker has T=60 hours available, is paid wage of w=$10 per hour.
- Initially, worker has V=$100 in nonlabor income.
- Then nonlabor income increases to V=$300.
- Budget constraint then shifts ______.

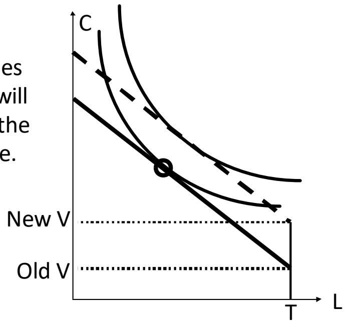


Normal goods

- A good is called a “normal good” if people buy more of it when their incomes rise—that is, when their budget constraints shift up in ________________ fashion.
- All broad categories of goods are normal goods—food, clothing, energy, health care, housing, transportation, etc.
- We assume that consumption and leisure are ________________ goods.

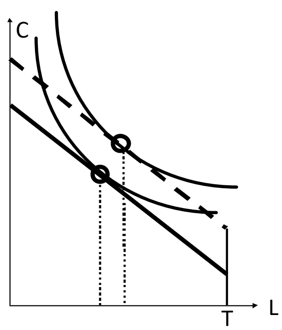
New choice

- “Normal goods” assumption implies that new choice will be above and to the right of old choice.
- Both C* and L* ____________.



Predicted change in labor supply

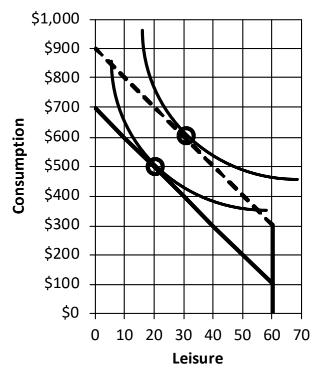
- Leisure L* increases with an increase in nonlabor income V.
- But total available time is unchanged.
- So hours of work h* must _____________.



Example of new choice

Assume nonlabor income increases from $100 to $ __________. Then…

- C* increases from $500 to $________.
- L* increases from 20 hours to ______ hours.
- Hours of work h* _____________ from 40 to _______ hours.



Evidence

- Several studies* have shown that lottery winners reduce their labor supply.
- Sometimes they stop working altogether.
- More often they work fewer hours.

*Imbens, G. W., Rubin, D. B., & Sacerdote, B. I. (2001). Estimating the Effect of Unearned Income on Labor Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players. *American Economic Review, 91*(4), 778-794.
Cesarini, D., Lindqvist, E., Notowidigdo, M. J., & Östling, R. (2017). The Effect of Wealth on Individual and Household Labor Supply: Evidence from Swedish Lotteries. *American Economic Review, 107*(12), 3917-3946.

Conclusions

- If nonlabor income increases, a worker’s budget constraint shifts up in parallel fashion.
- Economic theory predicts the worker will work ________________ hours.
- This assumes that consumption and leisure are _________________ goods.

CHANGES IN THE WAGE

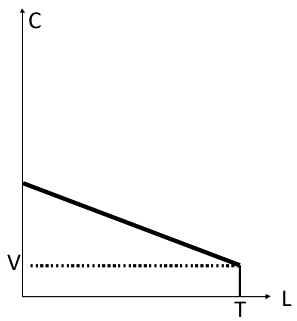
- Will a worker work more or fewer hours if the wage increases?

Increase in the wage

- Suppose a worker enjoys an increase in the wage.
- How does the worker's budget constraint change?
- How will the worker respond?

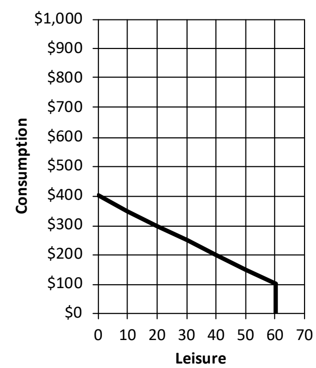
Effect of increase in wage on budget constraint

- Endowment point remains fixed.
- But budget constraint becomes steeper, since slope = - _____.



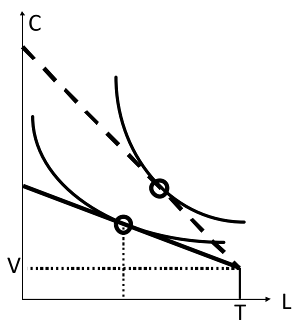
Example of increase in wage

- Assume worker has T=60 hours available, and has V=$100 in nonlabor income.
- Initially, wage is w=$________.
- Then wage rises to w=$15.
- Budget constraint then _________________.



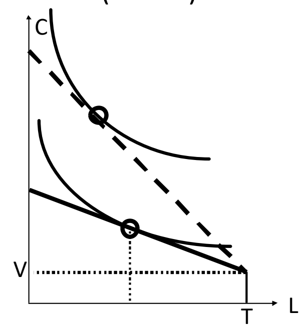
If wage increases, will worker choose to work more or less?

- In this graph, the worker has chosen more leisure L*, and therefore _________ hours of work h*.



If wage increases, will worker choose to work more or less? (cont'd)

- In this graph, the worker has chosen *less* leisure L*, and therefore _________ hours of work h*.



Conflicting forces

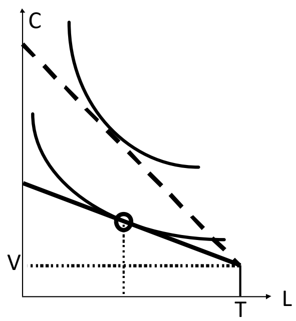
- The ambiguity is real.
- A wage increase creates two conflicting forces: an _______________ effect and a __________________ effect.
- Both effects push the worker to spend more on consumption C*.
- But they push in ________________ directions on leisure L* and work hours h*.

Income effect of a wage increase

- An increase in the wage is similar to an increase in nonlabor income in that the opportunity set _______________.
- Like an increase in nonlabor income, an increase in the wage encourages the worker to purchase _____________ consumption and _____________ leisure.
- "Purchasing" more leisure means working ______________ hours.

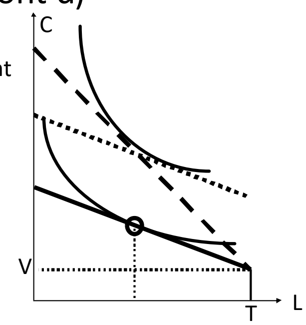
Graphing the income effect

- Pretend the worker enjoyed an increase in nonlabor income.
- Move the budget line up in _____________ fashion till tangent to the new indifference curve.



Graphing the income effect (cont'd)

- New choice will be above and to the right of the old choice.
- Both C* and L* _______________ because they are normal goods.
- Hours of work h* _____________.

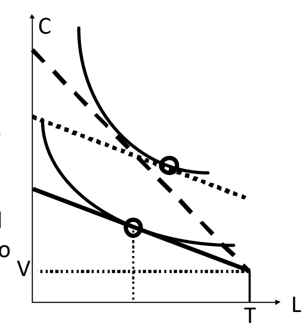


Substitution effect of a wage increase

- At the same time, an increase in the wage implies a rise in the relative _____________ of leisure.
- This should encourage the worker to "purchase" ____________ leisure and more goods.
- "Purchasing" less leisure means working _____________ hours.

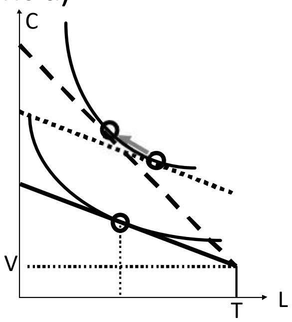
Graphing the substitution effect

- Now compare choice on pretend budget line with choice on new, real budget line.
- Curvature of indifference curve implies that new, real choice is above and to the left.



Graphing the substitution effect (cont'd)

- Increase in wage (slope) pushes worker to substitute away from leisure, toward consumption.
- L* _____________.
- Hours of work h* _____________.

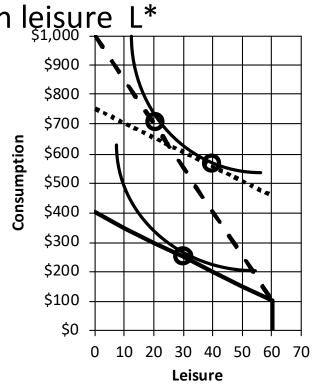


If wage increases, will worker choose to work more or less?

- Income and substitution effects push the worker in _________________ directions on leisure L* and work hours h*.
- Which effect dominates depends on the worker's individual __________________.
- People with different preferences may respond differently to a wage increase.

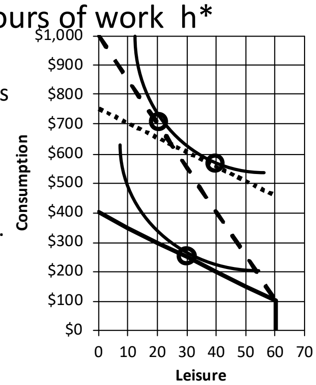
Example 1: income and substitution effects on leisure L*

- Income effect increases L* from _______ to _______ hours.
- Substitution effect decreases L* from ______ to _____ hours.
- Total effect *decreases* L* from ______ to ______ hours.



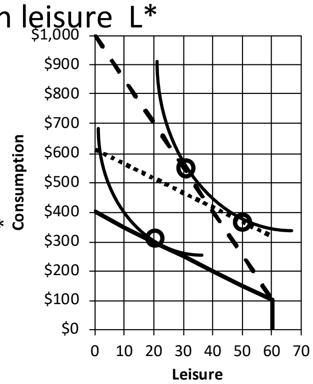
Example 1: income and substitution effects on hours of work h*

- h* = 60 – L*.
- Income effect decreases h* from _______ to _______ hours.
- Substitution effect increases h* from ______ to _____ hours.
- Total effect *increases* h* from ______ to _______ hours.



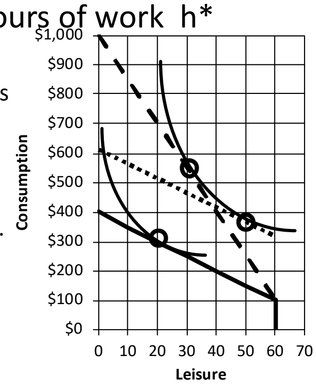
Example 2: income and substitution effects on leisure L*

- Income effect increases L* from _______ to _______ hours.
- Substitution effect decreases L* from ______ to _____ hours.
- Total effect *increases* L* from ______ to ______ hours.



Example 2: income and substitution effects on hours of work h*

- h* = 60 – L*.
- Income effect decreases h* from _______ to _______ hours.
- Substitution effect increases h* from ______ to _____ hours.
- Total effect *decreases* h* from ______ to ______ hours.



Summary of examples 1 and 2

- In example 1, the worker's substitution effect was _____________ than the income effect.
  - An increase in the wage caused this worker to work _____________ hours.
- In example 2, the worker's substitution effect was _____________ than the income effect.
  - An increase in the wage caused this worker to work _____________ hours.

Conclusions

- If the wage increases, a worker's budget constraint rotates, hinged at the endowment bundle.
- The income effect encourages the worker to work _______________ hours while the substitution effect encourages the worker to work ______________ hours.
- Without more information on the individual worker's preferences, economic theory cannot predict which effect will dominate.

LABOR SUPPLY CURVES

- How does the wage affect the decision to work?
- What is the difference between individual and market labor supply?

Individual versus market labor supply

- Quantity of labor supplied to a particular labor market depends on the wage two ways:

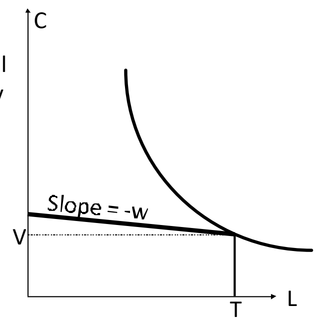
  (1) Through changes in the number of ____________ that existing workers work (the "intensive margin").

  (2) Through changes in the number of ____________ actually working (the "extensive margin").

Corner solutions

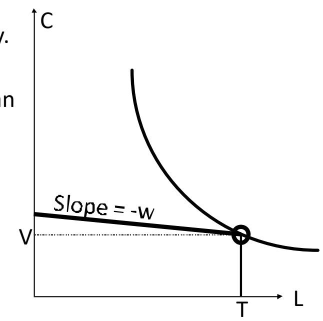
Some people may choose not to work at all ($h^*=0$), especially if they

- face low wage w,
- have high nonlabor income V.



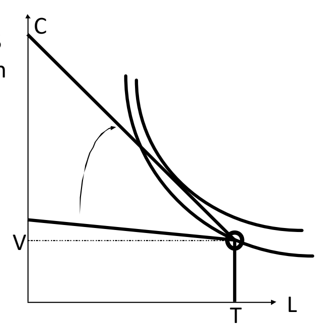
MRS at corner solutions

- ________ a tangency.
- Indifference curve is ______________ than budget constraint.
- MRS w .



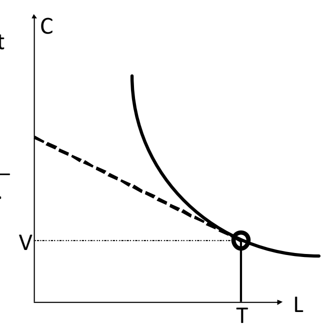
Deciding to work

- If w rises above MRS at corner, then person chooses $h^* > 0$.
- Begins working.



The reservation wage

- The lowest wage that will induce people to work is called the "reservation wage."
- Equal to __________ at endowment point.



Computing reservation wage: example 1

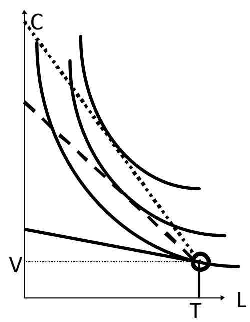
- Suppose a person
  - has utility function U = C (L-10)
  - enjoys V=$200 of nonlabor income per week.
  - has a total of T=60 hours available per week.
- It can be shown that this person's MRS = MU_L/MU_C = C / (L-10).
- Substituting, the person's reservation wage = ___________________ = $ _______.

Computing reservation wage: example 2

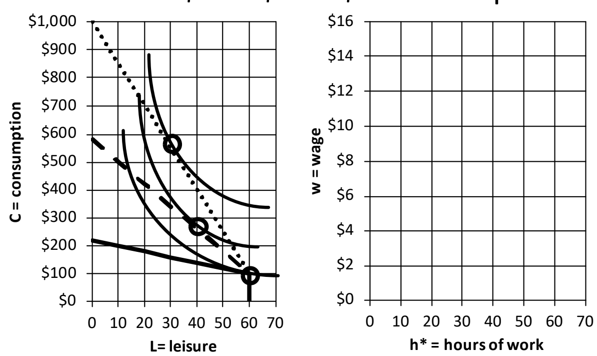
- Suppose a person
  - has utility function U = (C-50) L
  - enjoys V=$400 of nonlabor income per week.
  - has a total of T=70 hours available per week.
- It can be shown that this person's MRS = MU_L/MU_C = (C-50) / L.
- Substituting, the person's reservation wage = ___________________ = $ _______.

What happens when wage rises above reservation wage?

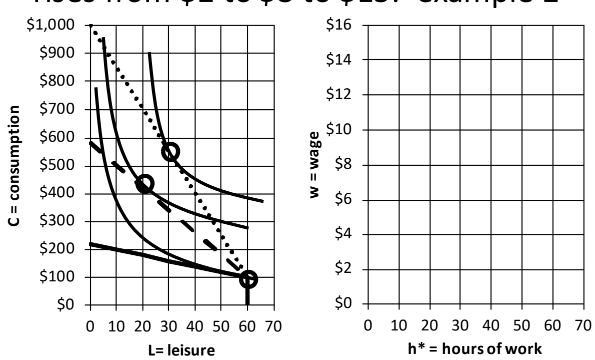
- Income and substitution effects push in _______________ directions.
- Hours of work h* can either increase or decrease.
- In the following examples, w rises from $2 to $8 to $15.



Individual labor supply as wage w rises from $2 to $8 to $15: example 1



Individual labor supply as wage w rises from $2 to $8 to $15: example 2

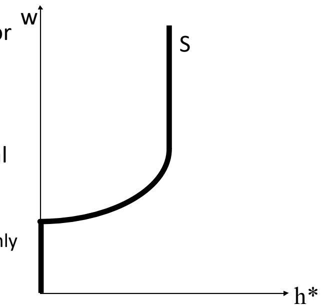


Possible shapes of individual labor supply curves

- Example 1 shows ___________________________ labor supply curve.
  - Substitution effect dominates income effect.
  - Increase in wage w always brings ________________ in hours of work h*.
- Example 2 shows ___________________________ labor supply curve.
  - When the wage rises high enough, income effect dominates substitution effect.
  - Increase in wage w eventually brings _____________ in hours of work h*.

Individual labor supply on average

- Thus, individual labor supply slopes up at first.
  - Corner effect.
- Then roughly vertical for many people.
  - Substitution and income effects roughly equal.



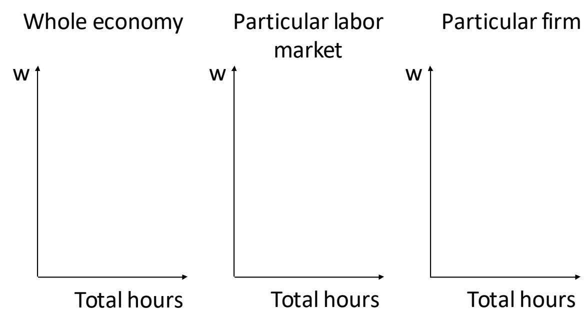
Aggregate labor supply

- Labor supply to whole economy reflects changes at the:
  - ______________ margin (changes in hours by existing workers).
  - ______________ margin (changes in participation).

Aggregate labor supply (cont'd)

- For a particular labor market (occupation or region) must also include movement of workers _____________________________.
- For a particular firm, must also include movement of workers ________________ ______________.

Aggregate labor supply to ...



Conclusions

- The lowest wage at which an individual is willing to work is called the ___________________ wage.
- Individual labor supply curves do not necessarily slope up due to conflict between ______________ and _________________ effects.
- But aggregate labor supply does, due to changes in labor force participation.
- Labor supply is flatter (more elastic) at the level of a particular market and even flatter (nearly __________________ elastic) at the level of the individual firm.

ELASTICITIES OF INDIVIDUAL LABOR SUPPLY

- Do people's labor supply curves slope up or down?
- How responsive are they to the wage?

Measuring responsiveness

- The most convenient way to measure how strongly hours of work respond to wages is with an elasticity.
- Elasticity of h with respect to w is defined as
$$\varepsilon_h{}^s = \frac{\%\ change\ h}{\%\ change\ w},$$
measured along the individual labor _______________ curve.

Why not use slope of supply curve?

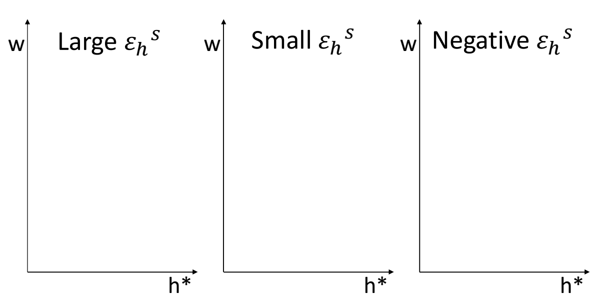
- Slopes change depending on units of measure.
  - Wages might be quoted in today's dollars, 1950 dollars, euros, yen, etc.
  - Wages might be measured per hour, per week, per month, or per year.
  - Hours might be measured per day, per week, per month, or per year.
- Elasticities are pure numbers. They do _________ change with units of measure.

Examples

- Suppose a 10% increase in wage causes hours of work to increase by 3%.
- Then $\varepsilon_h{}^s = \frac{\%\ change\ h}{\%\ change\ w} = \frac{3\%}{10\%} =$ __________.

- Alternatively, suppose a 20% increase in wage causes hours of work to ***de***crease by 2%.
- Then $\varepsilon_h{}^s = \frac{\%\ change\ h}{\%\ change\ w} = \frac{-2\%}{20\%} =$ __________.

Elasticity and the shape of labor supply



Size of $\varepsilon_h{}^s$

If $\varepsilon_h{}^s > 1$ ...
- % change in hours   % change in wage.
- We say labor supply is "_________________."

If $0 < \varepsilon_h{}^s < 1$ ...
- % change in hours   % change in wage.
- We say labor supply is "_________________."

Sign of $\varepsilon_h{}^s$ (+ or -)

If $\varepsilon_h{}^s$ is positive...

- Then the higher the wage, the _______________ hours people work.
- Substitution effect is ________________ than income effect.

If $\varepsilon_h{}^s$ is negative...

- Then the higher the wage, the _______________ hours people work.
- Substitution effect is ________________ than income effect.

How are labor supply elasticities measured in the real world?

- Using datasets on individual workers, researchers estimate equations like

$$h = \beta w + \gamma V + other\ variables$$

  using ____________________________________.
- Then compute $\varepsilon_h{}^s = \beta \times \frac{average\ w}{average\ h}$.
- Large number of studies, with a range of estimates for β and $\varepsilon_h{}^s$.

Datasets

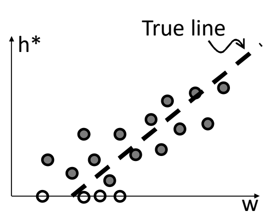
- Datasets are usually from large surveys of workers, many conducted by government.
- For workers paid by the hour, h and w are usually reliable.
- For workers who are not paid by the hour...
  - h is worker's own (rough) estimate.
  - w is imputed as total earnings/h.

Problems with data

1. For workers who are not paid by the hour...
   - If estimate of h is too high, then w is too low (and vice versa).
   - Introduces a false _______________ correlation between h and w.
2. Nonlabor income tends to be high for older workers who prefer to work and save more.
   - Introduces a false _______________ correlation between h and V.

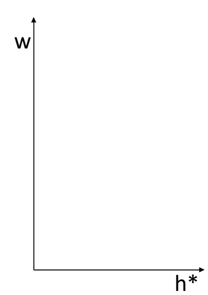
More problems with data

3. If h=0 we do not observe the person's (potential) wage.
   - Usually persons with low w or high V.
   - Loss of these data biases the LS estimates.
   - Makes estimate of β too ____________.



Elasticity of labor supply for prime-age men

- Consensus estimate, correcting for data problems, is roughly $\varepsilon_h{}^s$ = ___________.
- Implies that labor supply curve is nearly ________________, but bending back slightly.



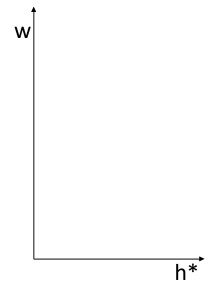
Does an elasticity value of -0.1 for men make sense?

- Nearly vertical
- Slightly backward-bending

- Most prime-age age men work full time, despite variety of wages.
- Hours of work fell in early 20th century, as wages rose.

Elasticity of labor supply for women

- Consensus estimate, correcting for data problems, is roughly $\varepsilon_h{}^s$ = ___________.
- Implies that labor supply curve is __________________.



Does an elasticity value of +0.2 for women make sense?

- This value shows that working women's *hours of work* are __________________ responsive (but not very) to the wage.
- However, women's *labor-force participation* seems to be __________________ responsive to the wage.

Other possible reasons for growth in women's labor force participation

- Decline in family size.*
- New labor-saving technology in the household.
- Changes in cultural and legal attitudes.
- Availability of oral contraceptives beginning in 1960s.

Household decision-making

- An increase in husband's wage tends to _________________ wife's labor force participation.
- Similar to effect of nonlabor income.
- However, wife's wage has little effect on husband's labor force participation.

Conclusions

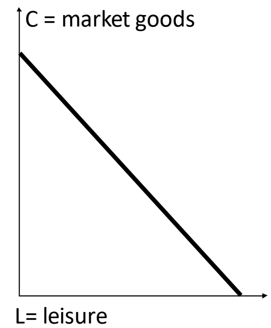
- Elasticity of labor supply = $\varepsilon_h{}^s = \frac{\%\ change\ h}{\%\ change\ w}$ shows responsiveness of hours to wages.
- Elasticity for prime-age men ≈ ___________, so income effect is slightly larger than substitution effect.
- Elasticity for women ≈ ___________, so substitution effect is slightly larger than income effect.

HOUSEHOLD SPECIALIZATION

- Who works in the labor market?
- Who works at home?

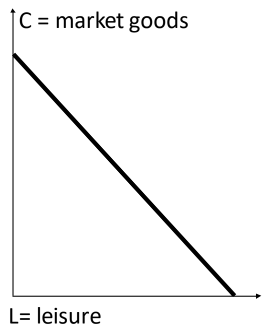
Worker's budget line

- Individual worker confronts budget line, showing tradeoff between "leisure" and consumption goods (purchased from labor earnings).



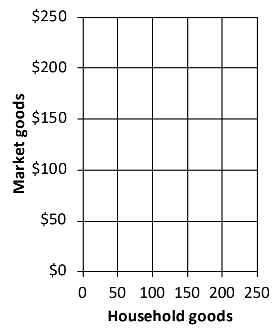
"Leisure" time used for household production

- In fact, "leisure" time is often used for production of goods and services at home.
- Examples: cooking, cleaning, home repair, caring for children or the elderly.



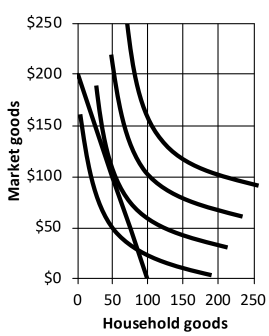
Individual worker's production-possibility curve: example

- Suppose Worker A has 10 hours per day for market work or production of household goods.
- Market wage = $20/hr.
- Household productivity = 10/hr.



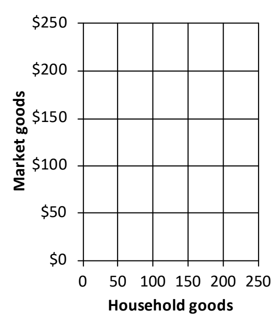
Individual worker's choice

- If the worker is single, then that she/he will simply choose most preferred affordable combination of market and household goods.



Another worker's production-possibility curve

- Now suppose Worker B also has 10 hours per day for market work or production of household goods.
- Market wage = $10/hr.
- Household productivity = 25/hr.



A household

- Suppose Workers A and B form a household, pooling their resources and consuming market and household goods together.
- How will they allocate their time?
- To answer this, first find their *combined* ______________________________________.

Comparative advantage = lower opportunity cost

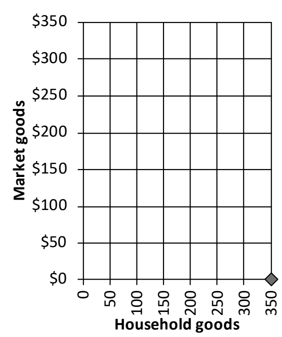
	Worker A	Worker B
Market wage	$20/hr	$10/hr
Household productivity	10H/hr	25H/hr
Opp. cost of market goods (household goods sacrificed per $ of market goods)		
Opp. cost of household goods ($ of market goods sacrificed per household good)		

Specialization

- Total output of the household is maximized if each ___________________ according to comparative advantage.
- Another way to see this is to plot the production possibility curve for the ___________________.

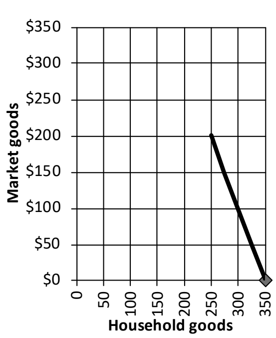
Household production-possibility curve

- Suppose initially both workers spend 10 hours per day in household production.
- If market goods are needed, who should enter labor market?
- Worker with lowest _________________ of market goods.



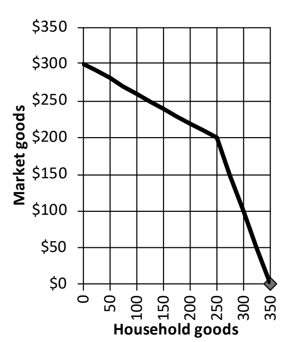
Household production-possibility curve (cont'd)

- Suppose Worker A is working 10 hours per day in labor market.
- If more market goods are needed, then what?
- _________________ enters labor market.



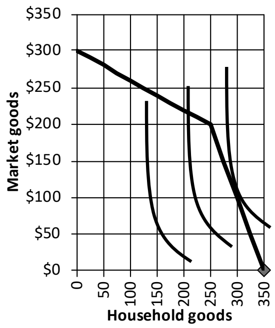
Optimal choice

- Which point on production-possibility curve will household choose?
- Three possibilities, depending on preferences (indifference curves).



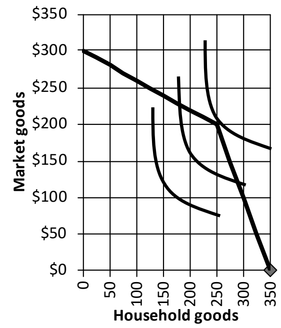
Possible choice (1)

- Worker A works in labor market ________________, Worker B not in labor market.



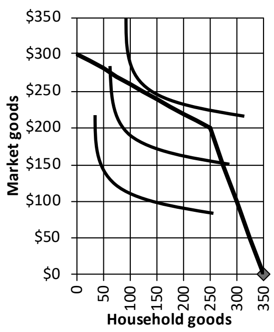
Possible choice (2)

- Worker A works in labor market ________________, Worker B not in labor market.



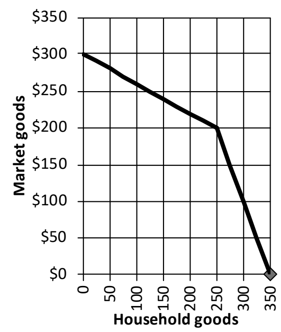
Possible choice (3)

- Worker A works in labor market full time, Worker B works in labor market ____________.



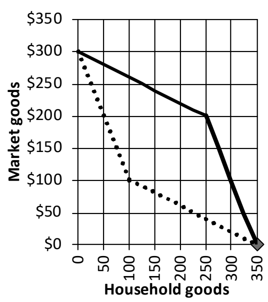
Sub-optimal choice

- One outcome that will not be chosen is for ____________ people to work in the labor market part time.
- That choice would put the household ____________ its production-possibility curve.



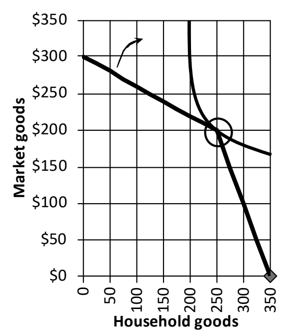
Another sub-optimal choice

- Reverse specialization, contrary to comparative advantage.



Comparative statics

- Suppose initially we have complete specialization.
- What happens if Worker B's market wage rises?
- If wage rises enough, Worker B ____________ ____________________.



The Becker model

- This model of household specialization is due to famous labor economist Gary Becker* (1930-2014).
- As it stands, the model cannot predict which gender will specialize in market work.
- But Becker went further, suggesting that for biological reasons, women had an absolute advantage in caring for children and therefore in home production.

Becker, G. S. (1981). *A treatise on the family*. Cambridge, Massachusetts: Harvard University Press.

What can this household model explain?

1. On average, women do more household work and men do more market work.
2. Over the last 60 years, women's labor force participation has _______________. Comparative advantage has probably shifted because:
   - Fewer market jobs require physical strength.
   - Home appliances have reduced skill requirements for home production.
   - Families have become smaller, some couples having no children.

Alternate explanations

- Another explanation for specialization is social expectations or ___________________.
- The increase in women's labor force participation might be caused by cultural change—the decline of gender norms.
- Many studies have tried to test the two models using data.

Evidence

- A recent study* analyzes data from Australia on market wages and time use by couples.
- Finds that 78% of couples specialize according to gender.
- But only 61% specialize according to market wages.
- Same-sex couples' specialization is not related to market wages.

*Siminski, P., & Yetsenga, R. (2020). *Rethinking Specialization and the Sexual Division of Labor in the 21st Century*. Working Paper Series. University of Technology Sidney.

Conclusions

- When two workers form a household, they can gain from each specializing in either the labor market work or home production, according to ____________________________.
- The model predicts that at least one will completely specialize.
- However, there is evidence that couples do not always specialize according to comparative advantage.

FERTILITY

- Why did Thomas Malthus believe overpopulation was inevitable?
- Did his prediction come true?
- How can modern economics explain why fertility rates have fallen?

Income, fertility and population

- Fertility = birth rate.
- Total fertility = average number of children a woman has in her lifetime.
- Thomas Malthus, in *Essay on the Principle of Population,* 1798, argued that fertility was ________________ related to income, leading to overpopulation and poverty.

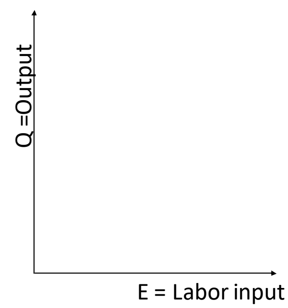
The Malthusian model

Two key assumptions:

1. Production has only one variable input, labor, subject to ______________ returns.
2. The level of output required to sustain the population is _______________ to the population.

Graphing the aggregate production function

- Write aggregate production function as: Q = F(E).
- Graph production function as upward-sloping curve.
- Diminishing returns to labor implies slope ______ as E increases.

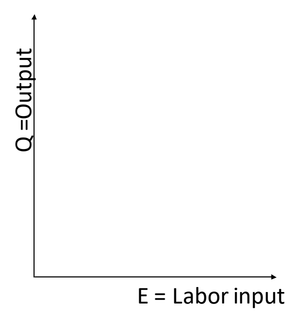


Subsistence in the Malthusian model

- Suppose the subsistence level of output per person is fixed quantity *a*.
- Labor force is some fraction *b* of the total population: E = b x POP.
  POP = (1/b) E
- Total output required to sustain a given labor force is given by: Q = a x POP
  = _________.

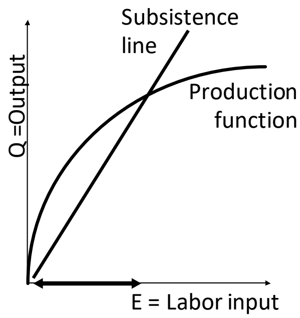
Graphing the subsistence line in the Malthusian model

- Subsistence line shows output required to sustain any given level of labor input.
- Graph of Q=(a/b) E is an upward-sloping line through origin.
- Slope = _________ .



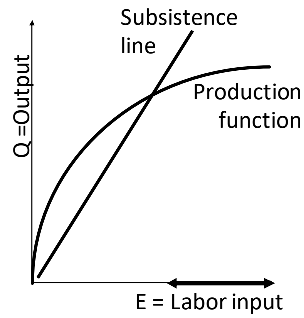
What if output is *above* the level required for subsistence?

- This occurs at any E where the aggregate production function is above the subsistence line.
- In that case, the population and E must ____________.



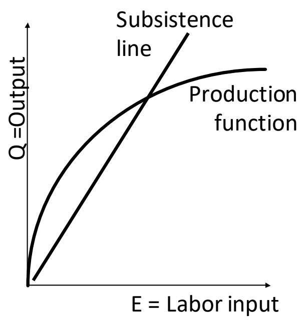
What if output is *below* the level required for subsistence?

- This occurs at any E where the aggregate production function is below the subsistence line.
- In that case, the population and E must _____________.



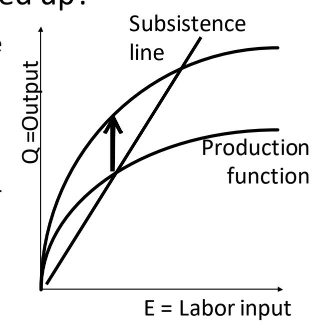
Malthus's dismal conclusion

- Output Q always converges to the subsistence level ___________.
- Output per worker converges to _______.
- "Iron Law of Wages"



What if the production function shifted up?

- What if new land were brought under cultivation?
- Eventually, population would ___________ and output per worker would converge to ___________.



Quote from Malthus

"Must it not then be acknowledged ...

"That the increase of population is necessarily limited by the means of subsistence,

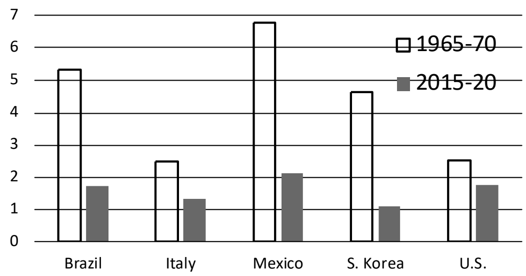
"That population does invariably increase when the means of subsistence increase. And that the superior power of population is repressed, and the actual population kept equal to the means of subsistence, by misery and vice."

Thomas Robert Malthus, *An Essay on the Principle of Population*, Norton Critical Edition, edited by Philip Appleman, 1976, p. 56 [originally published 1798].

Malthusian prediction versus reality

- Population has indeed grown, but income per capita has grown also.
- Meanwhile, fertility has ___________.
- Fertility rates in western Europe and North America began to fall beginning around 1900.
- Fertility rates in Asia began to __________ in the middle 20th century.
- Fertility rates in Latin America and Africa have recently begun to __________.

In recent years, total fertility has decreased worldwide



Source: U.N. Department of Economic and Social Affairs, World Population Prospects 2019.

Modern economic theory of fertility

- Began with Gary Becker (1960).
- Views children as a "good," valued by parents but costing resources:
  - ________________________: food, clothing, shelter, education, etc.
  - ________________________: parents must reduce work hours to care for children.
- Faced with these costs, parents ____________ ____.

Notation

I = total income of parents, assumed fixed.

C = number of children

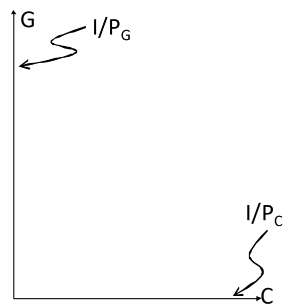
P_C = price of children = total cost of raising a child.

G = quantity of other goods.

P_G = price of other goods.

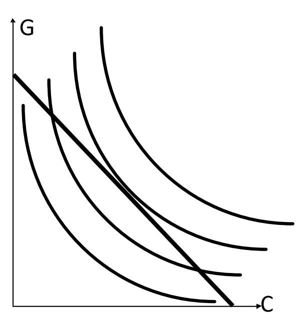
Budget constraint

- Budget constraint is income = spending, or $I = P_C\,C + P_G\,G$.
- Slope = $-P_C / P_G$.
- Intercept on G axis $= I/P_G$.
- Intercept on C axis $= I/P_C$.



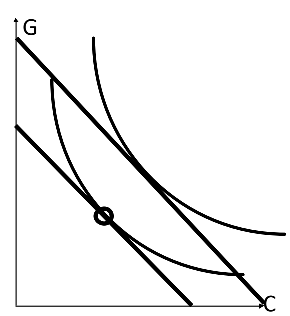
Choice

- Parents value both children and other goods.
- They choose point on budget constraint touching highest attainable indifference curve.
- Tangency: MRS = P_C / P_G .



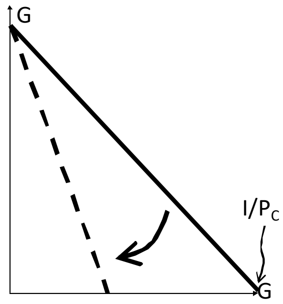
Effect of increase in income on budget constraint and choice

- Causes budget constraint to shift up in ____________ fashion.
- Assume children are a normal good.
- Then parents will choose more goods and ____________ children.



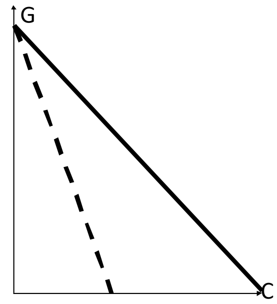
Effect of increase in price of children on budget constraint

- Intercept on C axis $= I/P_C$.
- Since P_C increases, this intercept ___________.
- Budget constraint rotates in.



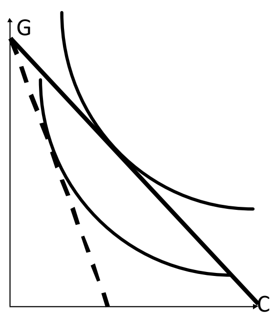
Effect of increase in price of children on choice

- Income effect: opportunity set shrinks, encouraging parents to choose fewer goods and ___________ children.
- Substitution effect: relative price of children rises, causing parents to choose more goods and ___________ children.



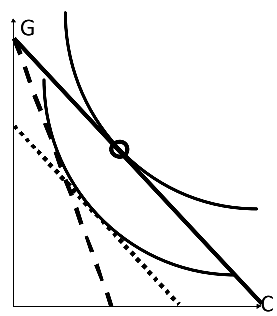
Graphing the income effect

- Pretend the parents suffered a decrease in income.
- Move the budget line down in ____________ fashion till tangent to the new indifference curve.



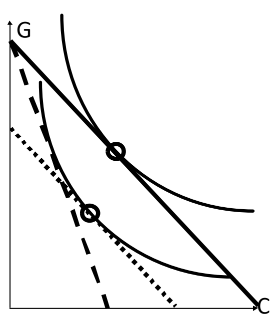
Graphing the income effect (cont'd)

- New choice will be below and to the left of the old choice.
- Both G* and C* ________________ because they are normal goods.



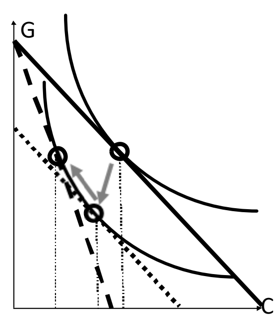
Graphing the substitution effect

- Now compare choice on pretend budget line with choice on new, real budget line.
- Curvature of indiff. curve implies that new, real choice is above and to the left.
- G* increases but C* ___________________.



Summary: income and substitution effects

- When the price of children rises, both income and substitution effects push parents to choose _____________ children.



Why did the price of children P_C increase?

- Movement from farms (where children can help with chores) to cities.
- _______________ in women's market wages.
- Sometimes governments try to change the price of children...
  - _________________ P_C through subsidies and tax benefits (e.g., Hungary).
  - _________________ P_C through penalties (e.g., China).

Conclusions

- Thomas Malthus argued in 1798 that fertility was _________________ related to income, so that advances in income would be undercut by overpopulation.
- Modern theory says fertility is also _________________ related to the price of children.
- Modern theory can explain why fertility rates ______________ when women's wages rise.

WELFARE PROGRAMS

- What are the effects of welfare programs on labor supply?

Welfare and work incentives

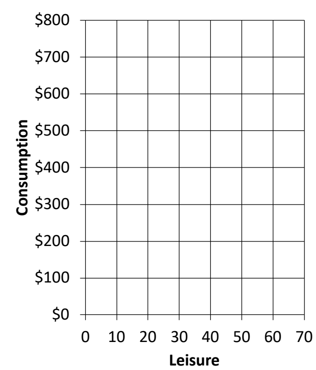
- Welfare programs, intended to help poor people, change their budget constraints and thereby change their choices.
- We will analyze
  1. a simple cash grant program.
  2. a cash grant reduced by earnings.
  3. a cash grant partly reduced by earnings.
  4. a wage subsidy.

Using the theory of labor supply

- A parallel shift in the budget line is equivalent to an increase in nonlabor income.
  - If a worker is already working, they will work __________ hours.
- A clockwise rotation of the budget line is equivalent to an increase in the wage.
  - If the worker is not already working, they will be ___________ likely to work.
  - If the worker is already working, economic theory ___________ predict what they will do.

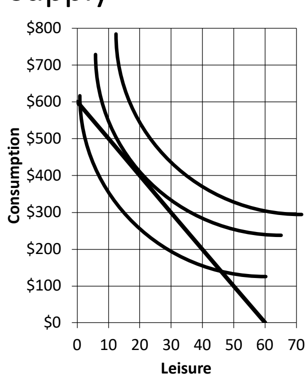
Assumptions

- Nonlabor income V=0.
- Wage w=$10 per hour.
- Total available time T= 60 hours per week.
- Thus endowment point is at L = _______ hours and C = $ _______.



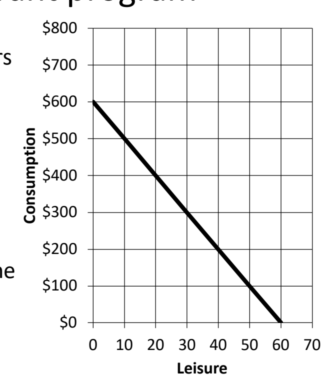
Labor supply

- Suppose that the person had the indifference curves shown at right.
- Then L* = ______ hours and hours of work h* = ______ hours.



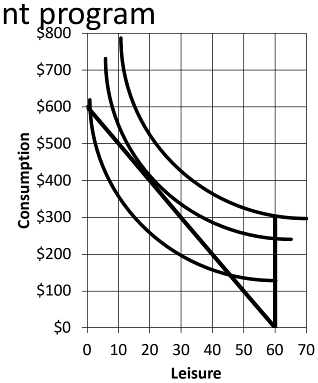
1. Cash grant program

- Suppose program offers cash grant of $300 per week to persons who have no income.
- However, if the person works any hours, they lose the cash grant.
- Puts spike in budget line at L=T=60 hours.



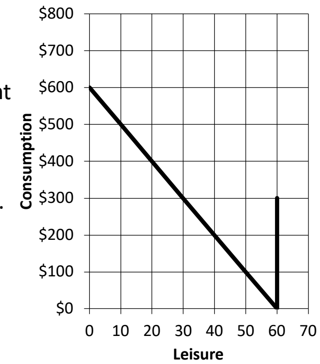
Labor supply under cash grant program

- Now the person will choose hours of work h* = ______ hours.
- Program creates disincentive to work.



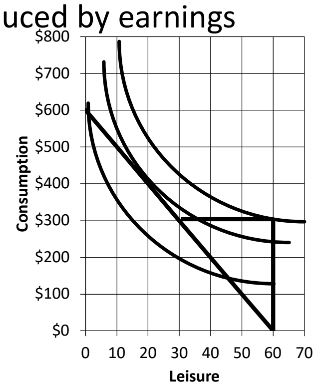
2. Cash grant reduced by earnings

- Most programs allow the person to keep some of their cash grant even if they work.
- Suppose the person's grant is reduced by $1 for each $1 of earnings.
- Creates ____________ segment of budget constraint.



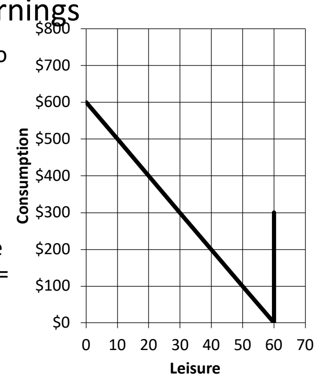
Labor supply under cash grant reduced by earnings

- Again, the person will choose hours of work h* = ______ hours.
- Effectively, a _______% tax on earnings up to $300.
- Program again creates disincentive to work.



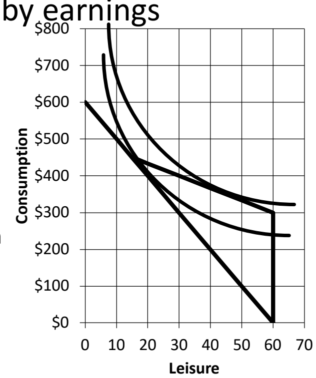
3. Cash grant partly reduced by earnings

- More common rule is to take away *part* of earnings, like a tax.
- Suppose the person's grant is reduced by $0.67 for each $1 of earnings.
- New segment has slope net wage = -w (1-0.67) = $-10 (0.33) = $-_____.



Labor supply under cash grant partly reduced by earnings

- Now it is more likely that the person will continue to work some hours.
- However, the person will surely work __________ hours than without the program.
- How do we know?

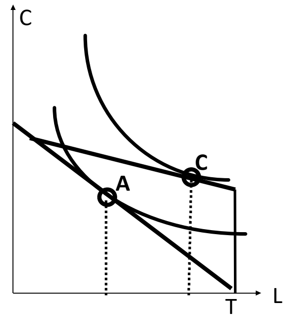


Income and substitution effects with cash grant partly reduced by earnings

- Program creates both income and substitution effects.
- Program expands the person's opportunity set. Since leisure is normal good, income effect should cause an increase in leisure hours L* and a _________________ in work hours h*.
- Program reduces person's net wage w. Since leisure is now "cheaper," substitution effect should also cause an increase in leisure hours L* and a _________________ in work hours h*.

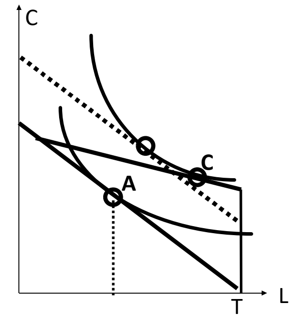
Graphing the income and substitution effects

- Point A is choice without program.
- Point C is choice with cash grant partly reduced by earnings.
- How do we know that point C *must* be to the _________ of point A?



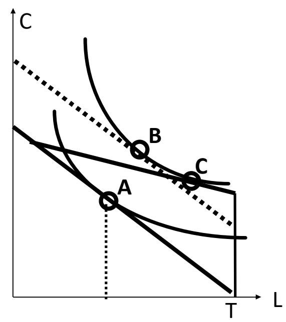
Graphing the income effect

- Dotted line is parallel to original budget constraint.
- Movement from A to B is income effect, causing leisure hours L* to _____________ and work hours h* to _______________ .



Graphing the substitution effect

- Dotted line is tangent to same indiff. curve as program line segment.
- Movement from B to C is subst. effect, also causing leisure hours L* to _____________ and work hours h* to _______________ .



What happens in practice?

- Studies of welfare before 1996 ("AFDC") generally confirmed theoretical predictions: cash grants _________________ labor supply.
- 1996 legislation ("TANF") allowed states to set own eligibility rules and benefit levels, including "tax rate" on earnings.
- TANF experience also generally confirms that the lower the "tax rate," the _____________ the hours worked.

AFDC = Aid to Families with Dependent Children
TANF = Temporary Assistance to Needy Families

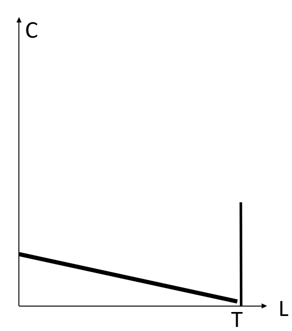
"Universal Basic Income"*

- Proposals vary, but most would replace existing welfare programs with a cash grant to every person or every household.
- In short run, income effect only: _________________ in work hours (h).
- In long run, possible benefits for children later in life (health, educational attainment, earnings).
- However, UBI would be MUCH more expensive than current programs and more of the benefits would go to people already well off.

*Similar to proposals for "Negative Income Tax" in 1960s and 1970s.

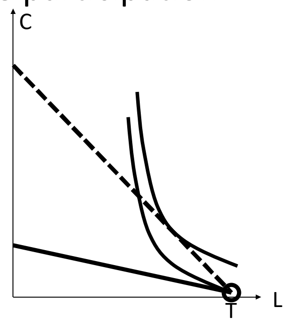
4. Wage subsidy

- Alternative approach to helping poor people is *wage subsidy*.
- Instead of increasing nonlabor income V, a wage subsidy increases wage w.



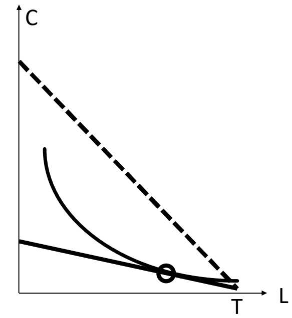
Predicted effect of wage subsidy on labor-force participation

- Suppose person is not yet working (because w < reservation wage).
- Then a wage subsidy makes the person ___________ likely to work.



Predicted effect of wage subsidy on hours of work

- Suppose person is already working (w > reservation wage).
- Then wage subsidy may _____________ or ______________ work hours h*, depending on income and substitution effects.



Conclusions

- Traditional welfare programs create income and substitution effects.
- Both effects tend to __________________ labor force participation and _________________ hours of work h* for those already working.
- A wage subsidy, however, ________________ labor force participation.

EARNED INCOME TAX CREDIT

- What is the Earned Income Tax Credit (EITC)?
- How does it affect labor supply?

Earned Income Tax Credit (EITC)

- Program began in 1975, expanded substantially since then.
- Administered by ___________, not welfare agencies.
- Works like a wage subsidy, but with a cap and a phase-out.
- Cap and phase out create ____________ in budget constraint.

Benefits and eligibility raised over time

- 1986: Benefits indexed to inflation.
- 1990: Benefits raised and increased further for families with two or more children.
- 1993: Benefits raised sharply and small benefits given to families without children.
- 1996: Benefits raised sharply again.

Source: Nichols, A., & Rothstein, J. (2015). *The earned income tax credit*. Institute for Research on Labor and Employment Working Paper. University of California, Berkeley.

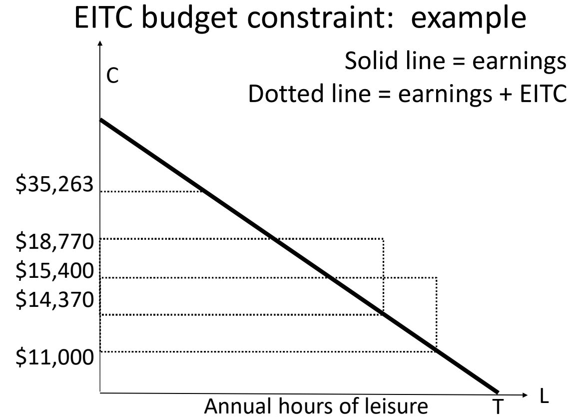
EITC: example

- Suppose a household consists of a woman and two dependent children.
- In 2005, the woman could claim 40% of earnings as long as earnings were less than $11,000.
- Thus cap or maximum credit = $11,000 × 40% = $ ______________.

EITC phaseout: example

- Could keep maximum credit if earnings were less than $14,370.
- Thereafter, credit was phased out: each additional dollar of earnings reduced credit by $0.2106.
- Thus credit completely phased out when earnings reached $14,370 + ($4400/0.2106) = $ _______________.

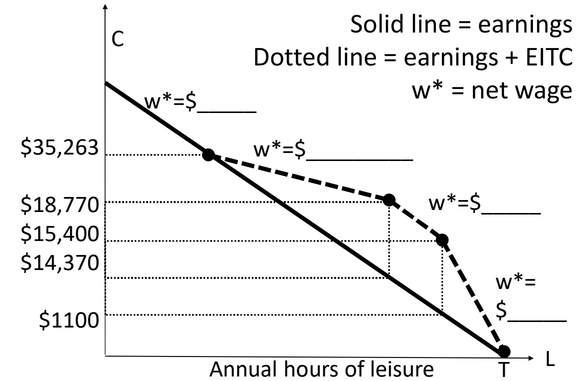
EITC budget constraint: example



EITC net wage: example with market wage w = $10 per hour

- Then net wage = $_______ until she has worked $11,000/$10 = ______________ hours.
- Then net wage = $_______ until she has worked $14,370/$10 = ______________ hours.
- Then net wage falls to $_________ until she has worked $35,263/$10 = __________hours.
- Thereafter, no longer eligible for EITC.

EITC budget constraint: w=$10



Using the theory of labor supply

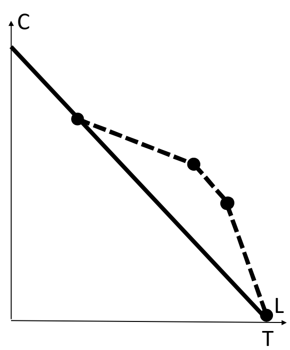
- A parallel shift in the budget line is equivalent to an increase in nonlabor income.
  - If a worker is already working, they will work _________ hours.
- A rotation of the budget line is equivalent to an increase in the wage.
  - If the worker is not already working, they will be ___________ likely to work.
  - If the worker is already working, economic theory ___________ predict what they will do.

Effect of EITC on labor supply

- If the person was initially not working at all, then the EITC may raise the net wage above the person's __________________ wage.
- So theory clearly predicts that EITC should ________________ labor force participation, unlike traditional welfare programs.
- If the person was initially working, then the effect of EITC is more complicated to predict.

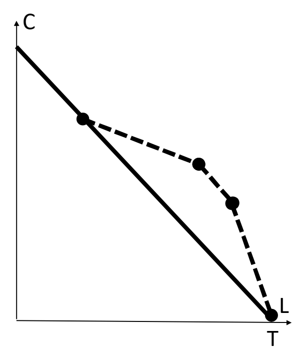
Effect of EITC on hours of work: case 1

- Suppose that EITC induces person to choose a point on lower segment.
- For this person, EITC ≈ increase in ________.
- h* ________________ __________________.



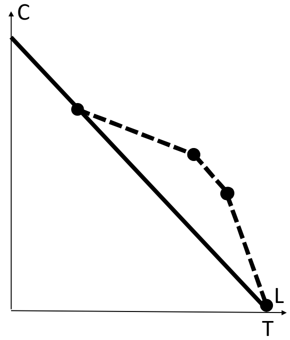
Effect of EITC on hours of work: case 2

- Suppose that EITC induces person to choose a point on middle segment.
- For this person, EITC ≈ increase in _________ __________________.
- h* ________________ .



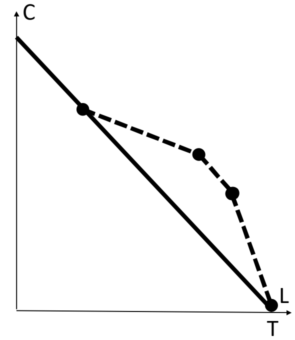
Effect of EITC on hours of work: case 3

- Suppose that EITC induces person to choose a point on top segment.
- For this person, EITC ≈ cash grant partly reduced by earnings.
- h* _______________.



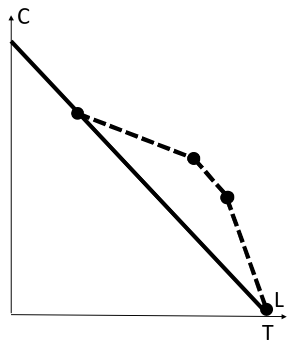
Effect of EITC on hours of work: case 4

- Suppose that EITC induces person to choose the upper kink.
- One can show that h* will be even less than with an increase in nonlabor income.
- h* _______________.



Effect of EITC on hours of work: case 5

- Suppose that EITC induces person to choose the lower kink.
- One can show that this case is also ambiguous, like case 1.
- h* ________________ __________________.



What happens in practice?

- EITC was expanded sharply in 1986.
- Data show that labor force participation (LFP) of eligible groups grew from 72.9% to 75.3%.
- This seems to confirm theory.
- But wait! Did other things cause the increase in LFP? Expanding economy? Long-run social trends toward increased LFP?
- Should compare with a _____________ group.

Difference-in-differences estimates of effect of EITC expansion in 1986

Group	LFP before	LFP after	Diff.	Diff.-in-diff.
Treatment group--Eligible for EITC: low-income women *with* children	72.9%	75.3%		
Control group--Not eligible for EITC: low-income women *without* children	95.2%	95.2%		

Findings from other studies

- EITC increases labor force participation, as predicted by theory.
- EITC has little effect on hours worked.
- Take-up rates are much higher than for other welfare programs.

Source: Nichols, A., & Rothstein, J. (2015). *The earned income tax credit*. Institute for Research on Labor and Employment Working Paper. University of California, Berkeley.

Other effects of EITC

Expansion of EITC in 1990s

- lowered child poverty rates.
- improved the health of mothers and children.
- increased children's educational achievement (test scores and educational attainment).

Source: Nichols, A., & Rothstein, J. (2015). *The earned income tax credit*. Institute for Research on Labor and Employment Working Paper. University of California, Berkeley.

Conclusions

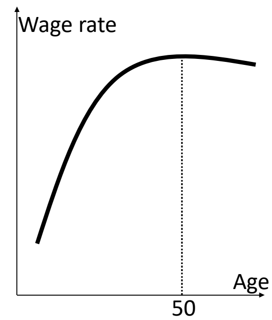
- The Earned Income Tax Credit tends to _________________ labor force participation.
- However, it can either increase or decrease hours of work h*.

LIFE-CYCLE LABOR SUPPLY

- How should LFP and hours of work vary over one's lifetime, according to economic theory?
- How do they vary in fact?

Actual path of wage rate over life cycle

- On average, wage rate is low when person is young,
- rises until about age 50,
- stable or falls slightly after age 50.
- How should labor force participation and hours of work respond to this pattern?



What does our simple model predict?

- Labor force participation should be _______________ when wage is higher.
- Hours of work _______________ be predicted because income and substitution effects push h* in __________________ directions.

Limitations of our simple static model

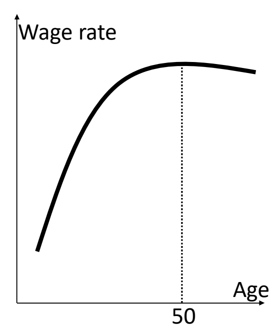
- In our model, h* is decided independently each period without planning ahead.
  - No ___________________ of leisure in different periods.
  - No ___________________ of consumption in different periods.
  - No _______________ for, or borrowing against, the future.
- This kind of model is called a *static* model.

A dynamic model

- Suppose people expect the wage pattern showed earlier, and plan ahead.
- Suppose their utility function depends on consumption and leisure in _______________ period of one's lifetime:
  $U = f(C_1, L_1, C_2, L_2, C_3, L_3, \text{etc.})$.
- Suppose people can engage in ______________________ substitution.

Constant wage rate path versus actual wage path

- Compare a hypothetical constant wage rate path with the actual path.
- How should labor force participation and hours of work respond, according to a _______________ model?



What does a dynamic model predict?

- Labor force participation should be _______________ when wage is higher.
- Hours of work should be ________________ when wage is higher (and leisure is more expensive). Why?
  - Lowering wage in one period and raising it in another has no effect on ________________ income.
  - So there is no income effect, only a ___________________ effect.

Labor force participation over the life cycle in fact

- Labor force participation of men peaks between about ages 25 and 45, then drops sharply.
- Labor force participation of women is similar but
  - Is ___________ throughout lifetime.
  - Still rising slightly from ages 25 to 45 (probably reflecting declining __________ responsibilities).

Hours of work over the life cycle in fact

- Hours of work for men rise sharply at first, remain nearly constant between about ages 35 and 60.
- Hours of work for women are similar, but continue to rise slowly until about age 50.

Does the dynamic model fit the facts?

- Overall, dynamic model fits the facts.
  - LFP and hours of work peak about the ______________ time that the wage peaks.
- However, dynamic model does not explain
  - why actual LFP ______________ so fast after age 45, when wage is still high.
  - why hours of work are nearly _______________ from ages 35 to 60.

Conclusions

- The wage rate rises over the life cycle until about age 50, then is stable or falls slightly.
- A _________________ model of labor supply predicts that people's LFP and hours of work should follow this same pattern.
- This prediction is roughly correct, except that actual LFP drops too __________ after age 45 and actual hours are too _________________.

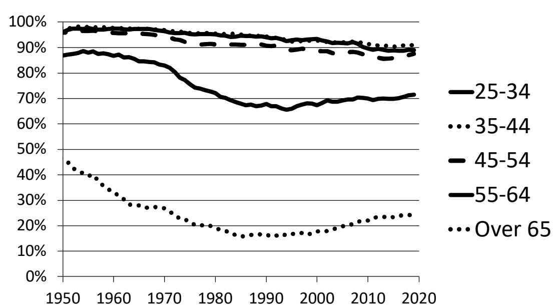
DECLINE IN LABOR FORCE PARTICIPATION OF OLDER MEN

- What explains the decline in LFP of older men?

Labor force participation rates of older men

- LFP rates for all men fell slightly in last 60 years.
- However, LFP rates for older men fell ________________ from 1950 to 1990.
- Declining health is not the explanation—life expectancy _______________ over this period.

Labor force participation rates of men



SOURCE: www.bls.gov accessed 1/16/12 and 12/17/19.

Partial explanations

- Increase in private pension benefits—fraction covered by pensions has increased sharply.
- Increased generosity of Social Security retirement benefits.
- Increased generosity of Social Security Disability Program.

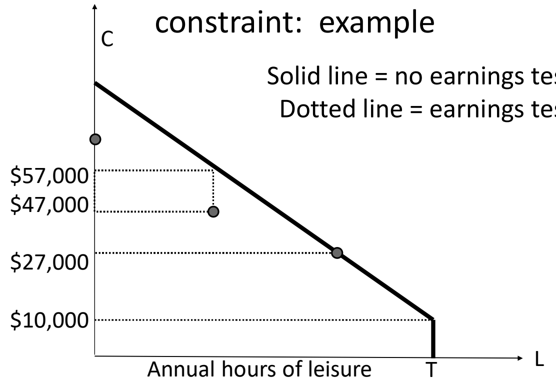
Social Security earnings test for retirees

- Until 2000, Social Security benefits were reduced for retirees aged 65-69 who earned more than $17,000 per year.
- $1 in benefits was withheld for every $3 earned above $17,000—an implicit ________% marginal tax.
- Test did not apply to retirees over 70.
- Test was eliminated in 2000.
- Did the test discourage work?

Effect of SS earnings test on budget constraint: example

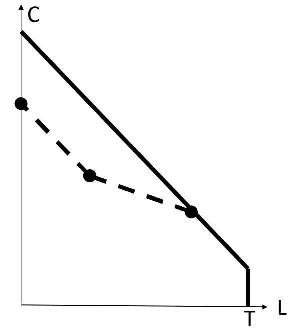
- Suppose retiree receives $10,000 in SS benefits (nonlabor income).
- When earnings exceed $17,000, marginal net wage falls by 1/3 as benefits are withheld.
- Therefore kink occurs in budget constraint at C=$10,000+$17,000= $________________.
- Another kink occurs when all SS benefits have been withheld, when earnings reach C=$17,000+($10,000×3) = $_______________.

Effect of SS earnings test on budget constraint: example



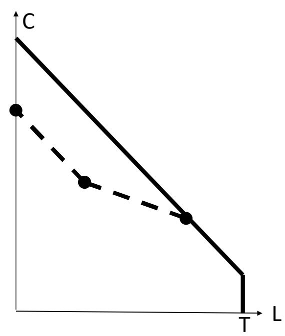
Effect of SS earnings test on labor supply: case 1

- Suppose earnings test induces person to choose a point on top segment.
- For this person, earnings test ≈ decrease in ______________________________.
- h* _______________ .



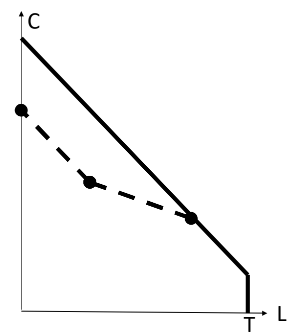
Effect of SS earnings test on labor supply: case 2

- Suppose earnings test induces person to choose a point on middle segment.
- For this person, earnings test ≈ decrease in _________.
- h* ________________ __________________.



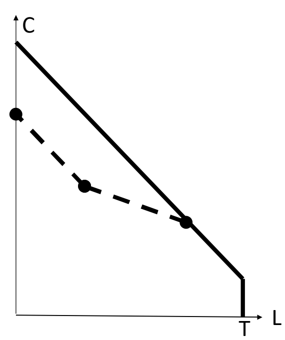
Effect of SS earnings test on labor supply: case 3

- Suppose earnings test induces person to choose a point on bottom segment.
- For this person, earnings test has no effect.
- h* ________________ __________________.



Effect of SS earnings test on labor supply: case 4

- Suppose earnings test induces person to choose lower kink.
- h* ________________ __________________.



Effect of SS earnings test on budget constraint: conclusion

- Theory of labor supply gives little reason to think that earnings test reduced labor supply, except if person is near first kink.
- Studies of actual behavior showed effects were in fact ____________.

Social Security Disability Program

- Workers who become disabled can claim disability payments as long as the disability lasts.
- Before this program, disability meant instant poverty for many people.
- Benefit = retirement benefit amount worker would receive had they worked till age 65.

https://www.ssa.gov/disability/

Strict eligibility requirements

- Have to have worked a minimum amount.
- Waiting period of five months before applying.
- Applicant must often be certified by physician chosen by the government.
- Cannot earn more than certain amount ($1180 per month in 2018).
- Cases are periodically reviewed by gov't.

Does the Disability Program discourage labor force participation?

- Generosity of program might encourage people to apply, who might otherwise have worked.
- In fact, there is negative correlation between receiving disability payments and labor force participation.
- But this does not prove cause and effect.
- Both outcomes could obviously be caused by a third factor: ___________________________.

Research strategies

- Compare outcomes in disability programs with different levels of benefits.
- Compare outcomes for people rejected from the program with people who are not.
- Compare outcomes for applicants assigned to strict versus lax claims examiners.

Comparing outcomes with different levels of benefits

- Benefits are the same across the U.S.
- But not in Canada—Quebec has a separate program.
- Quebec's program was more generous until 1987, when benefits in rest of Canada were raised substantially.

Difference-in-differences estimates of the effect of disability benefits

	Before 1987	After 1987	Diff.	Diff.-in-diff.
Annual benefits				
Canada	CA$ 5134	CA$ 7776	CA$ 2642	
Quebec	CA$ 6876	CA$ 7852	CA$ 976	
Percent not employed (men aged 45 to 59)				
Canada	20.0 %	21.7 %	1.7 %	
Quebec	25.6 %	24.6 %	-1.0 %	

SOURCE: Jonathan Gruber, "Disability Insurance Benefits and Labor Supply," *Journal of Political Economy,* v. 108, (December 2000), p. 1175.

Comparing outcomes with different levels of benefits: conclusions

- Raising benefits by CA$ 1666 apparently caused employment to decrease by 2.7 percentage points.
- Increasing benefits does decrease employment.

Comparing outcomes for people rejected from the program

- One study followed people whose claims were rejected.
- 40% went back to work.
- But was that because of rejection, or because their health was better than those whose claims were approved?

Compare outcomes for applicants assigned to different examiners

- Another study compared applicants randomly assigned to strict and lax claims examiners.
- Since randomly assigned, health was presumably similar on average.
- Those assigned to strict claims examiners were more likely to be working 4 years later.

Conclusions

- Labor force participation of men over 45 ________________ sharply from 1950 to 1990.
- Increased generosity of private pensions, Social Security, and disability programs may explain part of the decrease.
- The Social Security earnings test, abolished in 2000, probably did ___________ play a role.
- The Social Security Disability Program __________ discourage LFP and employment.

PRODUCTION

- Why is a worker valuable to a firm?

Workers in production process

- Workers are hired to help produce goods and services for sale.
- Demand for workers is __________________ from demand for the firm's output: goods and services.
- Workers contribute to output via some sort of ___________________ process: making cars, growing food, building houses, serving meals, etc.

Notation: quantities

- We can model a generic production process with a production ________________: $q = f(E, K)$

  q = quantity of output
  E = labor input = worker-hours hired by firm
  K = total amount of other inputs hired by firm, such as machines, buildings, land, energy, raw materials, etc.
- Output depends on both labor input and other inputs.

Example 1: numerical example of a production function: $q = f(E,K)$

Example	K=10 machines	K=20 machines	K=30 machines
E=20 hours	q=100 tons	q=140 tons	q=170 tons
E=40 hours	q=150 tons	q=200 tons	q=240 tons
E=60 hours	q=180 tons	Y=255 tons	q=300 tons

Algebraic examples of production functions: $q = f(E,K)$

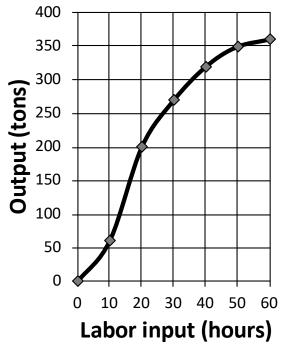
- $q = 5E + 3K$.
- $q = E^{1/2} K^{1/2}$.
- $q = E^{2/3} K^{1/3}$.
- $q = (E^{1/2} + K^{1/2})^2$.
- $q = 10 \min\{ E/6, K/2\}$.

Simplifying assumptions

- Firm produces only one kind of output.
- Production depends only on workers' ____________________ E.
  - 1 worker working 40 hours a week contributes as much as 5 workers working 8 hours a week.
- All workers have the same skill level—______________________.

Example 2: production function with K held constant

E	q
0 hours	0 tons
10 hours	60 tons
20 hours	200 tons
30 hours	270 tons
40 hours	320 tons
50 hours	350 tons
60 hours	360 tons



Average product

- Average product is output per worker.
- Average product = AP
  = total output / total input
  = _______________.

AP: Example 2

E	q	AP
0 hours	0 tons	--
10 hours	60 tons	tons/hr.
20 hours	200 tons	tons/hr.
30 hours	270 tons	tons/hr.
40 hours	320 tons	tons/hr.
50 hours	350 tons	tons/hr.
60 hours	360 tons	tons/hr.

Changes in output

- Average product is easy to compute but less relevant for managerial decisions.
- What managers really care about is the _____________ at which output will increase if they hire more labor.

Marginal product

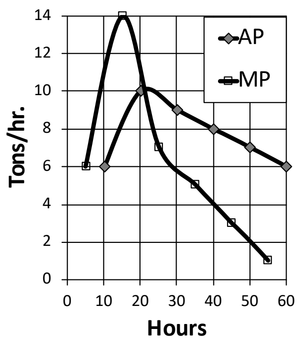
- Marginal product = rate at which output increases when an input increases,
  OR the contribution of the last unit of that input to output, holding other inputs constant.
- Marginal product = MP
  = change in output / change in input
  = slope of production function
  = _____________

MP: Example 2

E	q	MP
0 hours	0 tons	
10 hours	60 tons	tons/hr.
20 hours	200 tons	tons/hr.
30 hours	270 tons	tons/hr.
40 hours	320 tons	tons/hr.
50 hours	350 tons	tons/hr.
60 hours	360 tons	tons/hr.

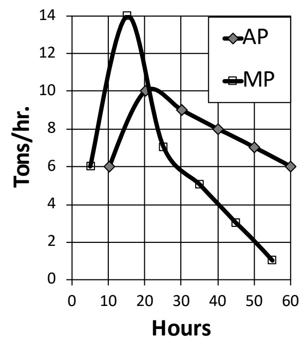
Diminishing returns

- MP may increase at first, but typically eventually __________________.
- Main reason is that we are holding K __________________.
- As we add more worker-hours, the workers must share machines.



Relationship between MP and AP

- When MP>AP, then AP must ____________.
- When MP<AP, then AP must ____________.
- MP=AP only when AP is neither rising nor falling (such as when it is at its _________________).



Conclusions

- Workers are hired as an ______________, to help produce some output.
- The relationship between inputs and outputs is called a _________________ function.
- ___________ product = total output / total input.
- ___________ product = change in output / change in input.

DEMAND FOR LABOR IN THE SHORT RUN

- How much labor will a firm want to hire in the short run?

Notation: prices

- p = market price of output
- w = market wage (price of labor input)
- r = market price of other inputs

Value of average product and value of marginal product

- Value of average product = VAP
  = output price x AP
  = _______________
  = p x (q / E).
- Value of marginal product = VMP
  = output price x MP
  = _______________
  = p x (Δq / ΔE).

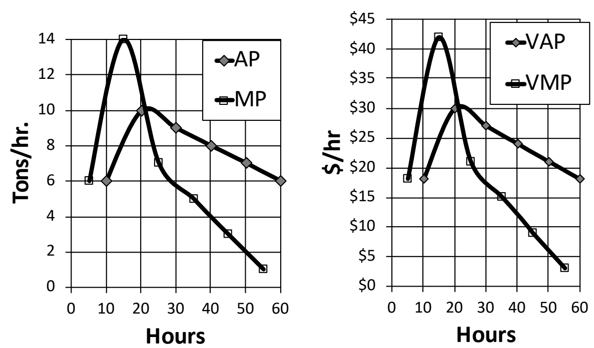
VAP: Example 2 with p=$3

E	q	AP	Value of AP
0 hours	0 tons	--	--
10 hours	60 tons	6 tons/hr.	/hr.
20 hours	200 tons	10 tons/hr.	/hr.
30 hours	270 tons	9 tons/hr.	/hr.
40 hours	320 tons	8 tons/hr.	/hr.
50 hours	350 tons	7 tons/hr.	/hr.
60 hours	360 tons	6 tons/hr.	/hr.

VMP: Example 2 with p=$3

E	q	MP	VMP
0 hours	0 tons		
10 hours	60 tons	6 tons/hr.	/hr.
20 hours	200 tons	14 tons/hr.	/hr.
30 hours	270 tons	7 tons/hr.	/hr.
40 hours	320 tons	5 tons/hr.	/hr.
50 hours	350 tons	3 tons/hr.	/hr.
60 hours	360 tons	1 ton/hr.	/hr.

VAP and VMP must have same shape as AP and MP curves



Assumption: firm maximizes profit

- Firm's profit
  = revenue – cost
  = (pq) – (wE + rK).
- We assume a firm makes choices to maximize _______________ (not output, not revenue, not employment).

Assumption: firm is a "price-taker"

- For the moment, we assume the firm is a small player in output and input markets.
- The firm is therefore competitive, taking all prices as ____________.
- The firm controls _______________ (and by implication q) but NOT p, w, or r.

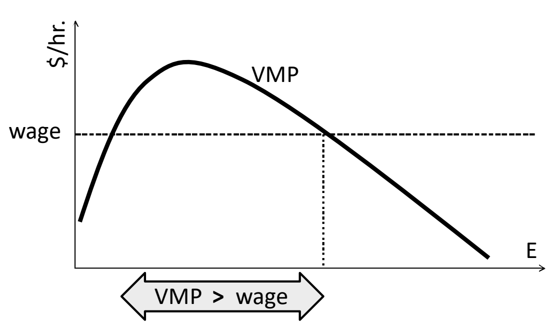
Assumption: short-run time horizon

- Firm does not have time to adjust K.
- K is fixed at some predetermined level.
- Firm controls only ___________________ (and by implication output q).
- What level of E should the price-taking firm choose to maximize profit?

What if VMP > wage?

- Suppose VMP = $25 and wage = $10.
- Then if firm hires one more hour of labor input, revenue will increase by $25 and cost will increase by $10. So profit will ___________ by $________.
- Similarly, if firm hires one less hour of labor input, revenue will decrease by $25 and cost will decrease by $10. So profit will ____________ by $ _______.
- Clearly firm should ____________ employment!

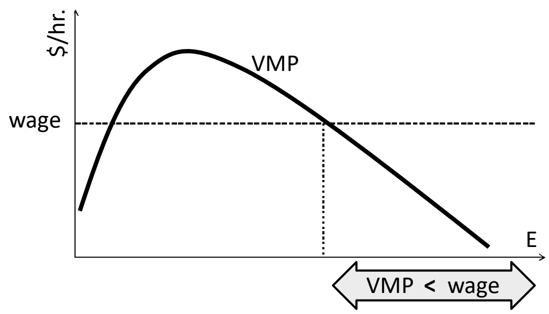
If VMP > wage, then firm can increase profit by hiring _______ labor input E



What if VMP < wage?

- Suppose VMP = $7 and wage = $10.
- Then if firm hires one more hour of labor input, revenue will increase by $7 and cost will increase by $10. So profit will ____________ by $_______.
- Similarly, if firm hires one less hour of labor input, revenue will decrease by $7 and cost will decrease by $10. So profit will ___________ by $_______.
- Clearly firm should _____________ employment!

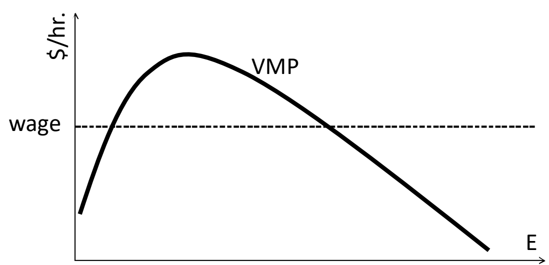
If VMP < wage, then firm can increase profit by hiring _______ labor input E



What if VMP = wage?

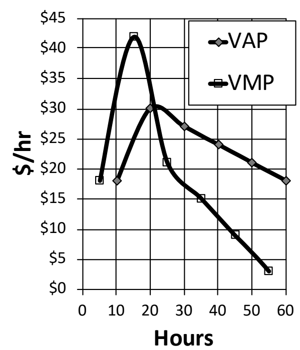
- Suppose VMP = $10 and wage = $10, exactly equal.
- Then hiring one more or one less unit of labor will have ________ effect on profit.
- Profit is __________________!

To maximize profit, hire labor input E up to the point where VMP   wage



Example

- Suppose the wage is $12 per hour.
- To maximize profit, the firm should hire about __________ hours of labor input.

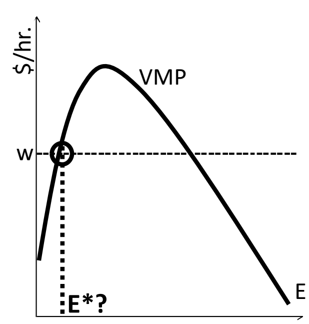


Clarification: choose E not wage

- We have assumed that wage w is set by _______________, not the individual firm.
- Paying less than the market wage makes it impossible to attract workers.
- Paying more than the market wage is a waste of money.
- Firm chooses labor input E , takes wage w as _______________.

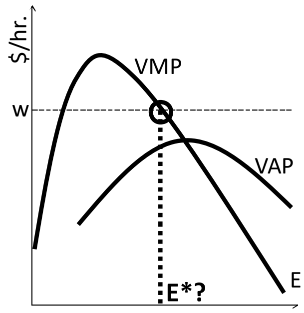
Clarification: choose E where VMP slopes _______

- It would not make sense to choose E where VMP sloped up.
- Firm could increase profit by increasing or decreasing E!
- VMP eventually slopes down due to law of _________________.



Clarification: if wage > VAP, shut down

- If w > VAP, then w > p (q / E).
- Multiply both sides by E to get E w > p q.
- Thus wage bill > revenue.
- Firm can cut losses by shutting down, choosing E = ________.



VMP=w condition is equivalent to short-run MC=p

- We have shown that at the profit-maximizing level of E,

VMP = w
or p x MP = w
or p x (Δq / ΔE) = w
or p = w x ΔE / Δq .

VMP=w condition is equivalent to short-run MC=p (cont'd)

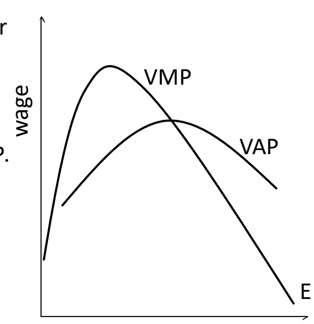
- Now MC = Δ_______ / Δ____ by definition.
- Also, cost = wE + rK .
- So Δcost = w x ΔE because in the short run, the firm's cost increases only if it hires more labor input E (since w, r, and K are assumed fixed).
- So SMC = Δcost / Δq = w x ΔE / Δq .
- So, using previous slide, p = _________.

Demand curves

- All demand curves show how much people want to buy at any given price.
- A LABOR demand curve shows how much labor input firms want to hire at any given wage.
- A firm's short-run labor demand curve holds constant ____________________________ ____________________________________.

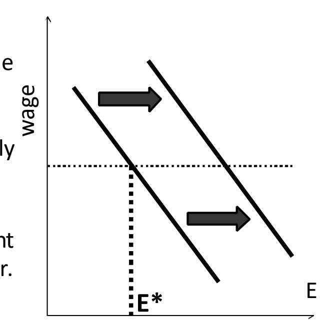
Firm's short-run labor demand curve

- A firm's short-run labor demand curve = VMP provided...
- VMP slopes ________,
- VMP is _________ VAP.



Change in output price

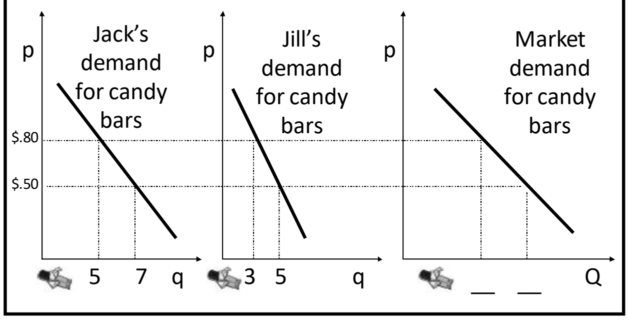
- VMP = p x MP.
- If p increases, then the firm's short-run labor demand curve shifts ______, or equivalently to the __________.
- If wage remains constant, firm will want to hire ________ labor.



From firm to industry

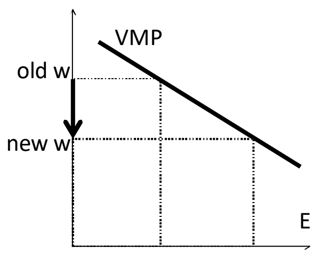
- What about wage changes that apply to a whole industry?
  - Examples: increase in minimum wage, union wage increase, etc.
- In markets for consumer goods, we derive market demand by adding up demands of all consumers in the market.
  - Market demand is the ________________ sum of all consumers' demands.
  - Will that approach work for labor demand?

Market demand for a consumer good = sum of demands by all consumers



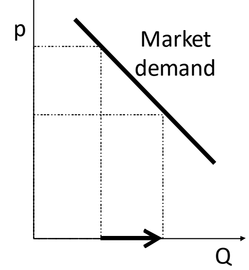
Industry demand curves for labor are different

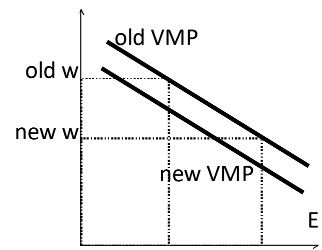
- Unfortunately, that approach will not work for labor demand.
- Suppose the wage decreases.
- ALL firms hire more workers.
- The workers produce ___________ output.



Industry demand curves for labor depend on the output market price

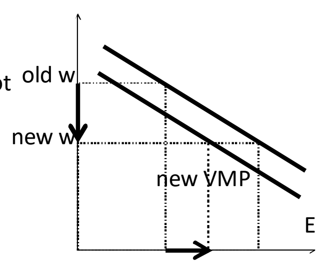
- But then the output price p _________.
- So VMP = p x MP _______ for all firms.





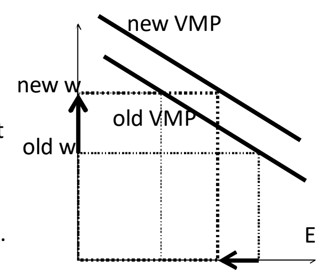
Industry demand is <u>less</u> sensitive to the wage than individual firms are

- Thus when w decreases, the VMP curve shifts ________ at all firms.
- As a result, E does not increase as much when ________ firms enjoy the same wage decrease.



Industry demand curves for labor

- Conversely, E does not decrease as much when ________ firms suffer the same wage increase.
- Explains why unions prefer to raise wage at _________ firms in an industry simultaneously, to preserve employment.



Conclusions

- Value of marginal product = price of firm's output × marginal product of labor input.
- In the short run, a competitive profit-maximizing firm chooses its employment level E such that VMP equals the market _______________.
- The industry labor demand curve is ____________ elastic than the individual firm's VMP curve, because when employment increases, the market price of output p _________________.

PRODUCING OUTPUT AT MINIMUM COST IN THE LONG RUN

- How will a firm set the levels of all inputs, if it enjoys complete flexibility?

Setting levels of inputs

- Every firm must decide the levels of its inputs: workers, computers, trucks, office space, energy, etc.
- In the short run, only one input might be flexible.
- Last slideshow showed that if only labor E is flexible, the firm sets E so that VMP equals ___________________.

Long run time horizon

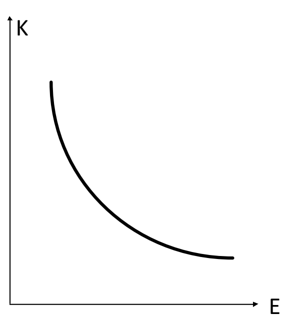
- In the long run, all inputs are flexible (or ______________) and can be substituted for each other.
- Suppose firm has two inputs, E = labor and K = physical capital, and a given production function q = f(_______) .
- What levels of E and K should the price-taking firm choose to maximize profit?

Graphing production functions

- A graphical way to represent a production function is to draw curves connecting combinations of inputs that yield the same quantity of ___________.
- Each curve holds constant the level of q in the production function q = f(E, K) .
- Production functions are likely to be different in different industries, so curves are likely to be different.

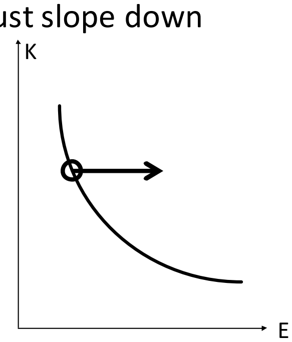
Isoquant: definition

- Input combinations on the same isoquant yield the same target quantity of _______________.
- Equation:
  target output = f(E, K)



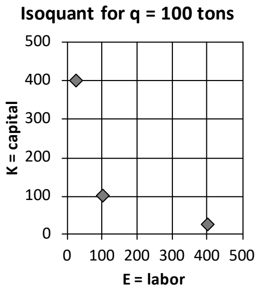
If MPs are positive, isoquants must slope down

- Capital K and labor E both contribute to output.
- If E is increased, the only way output can remain constant if K is ________________.



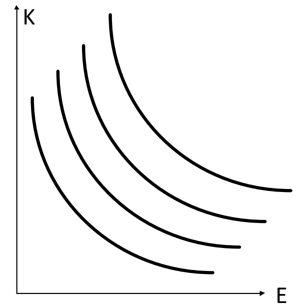
Example of isoquant

- Suppose production function is $q = E^{1/2}\,K^{1/2}$.
- Suppose target output is q = 100 tons.
- These combinations will produce target output:
  E = 25 & K = 400,
  E = 100 & K = 100,
  E = 400 & K = 25.



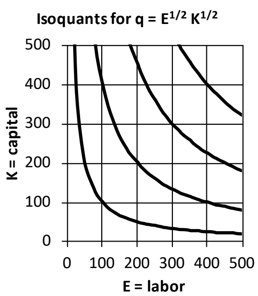
Families of isoquants

- Each production function has a whole family of isoquants.
- More of either K or E increases output.
- Isoquants that are _________ and to the _________ represent more output.



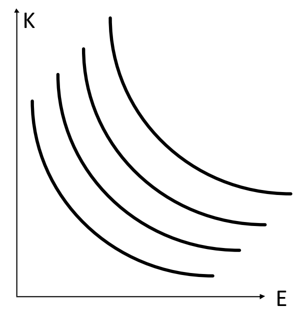
Example of family of isoquants

- Again suppose production function is $q = E^{1/2}\,K^{1/2}$.
- Which curve is for…
  q = 100 tons?
  q = 200 tons?
  q = 300 tons?
  q = 400 tons?



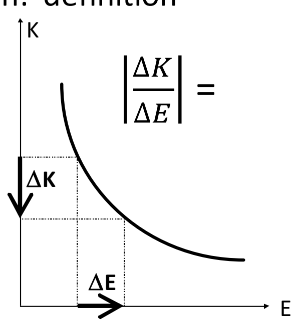
Shape of isoquants

- Isoquants are mathematically similar to indifference curves.
- Must slope down.
- Cannot cross.
- Are usually curved away from origin.



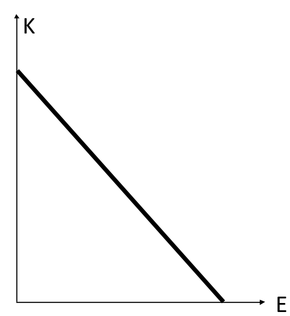
Marginal rate of technical substitution: definition

- MRTS of E for K
  = |slope| of isoquant.
  = amount of capital that can replace one unit of labor, keeping output constant.
  = MP_E / MP_K .



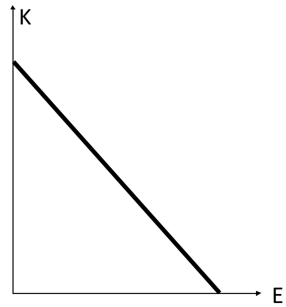
Isocost line: definition

- Input combinations on same isocost line must have same constant _______________.
- Let
  w = price of labor
  r = price of capital
- Equation for isocost line: $\overline{TC}$ **= wE + rK**



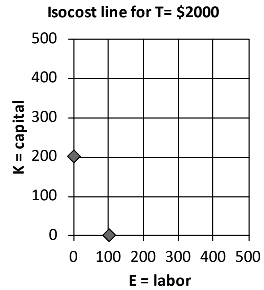
Slope of isocost lines

- To find slope, solve equation for K:
  $K = \frac{\overline{TC}}{r} - \frac{w}{r} E$
- Slope
  = coefficient of E
  = (-w/r).



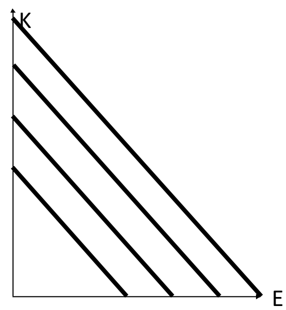
Example of isocost line

- Suppose $\overline{TC}$ = \$2000, w = \$20, r = \$10.
- Then slope = -w/r = ________.
- Intercept on E axis = \$2000/\$20 = ______.
- Intercept on K axis = \$2000/\$10 = ______.



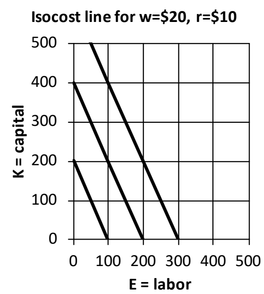
Families of isocost lines

- More of either K or E increases total cost.
- Isocost lines that are higher and to the right represent higher ________________.



Example of family of isocost lines

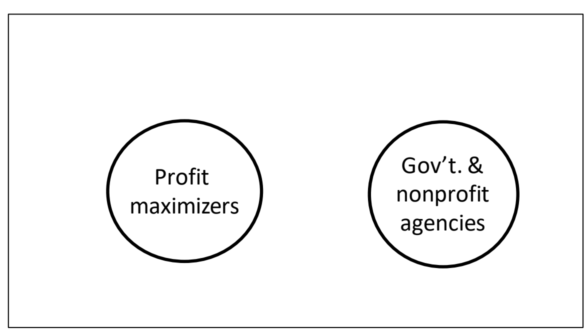
- Again suppose w = \$20, r = \$10.
- Which line is for…
  $\overline{TC}$ = \$2000?
  $\overline{TC}$ = \$4000?
  $\overline{TC}$ = \$6000?



Cost minimization

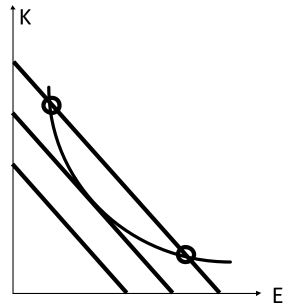
- If firm is maximizing profit, then whatever target output level it chooses must be produced at _____________ cost.
- So *profit maximization* implies *cost minimization*.
- But cost minimization does __________ imply profit maximization.
- Some employers do not maximize profit—for example, some government agencies that sell their output for free—but they may still minimize cost.

Venn diagram



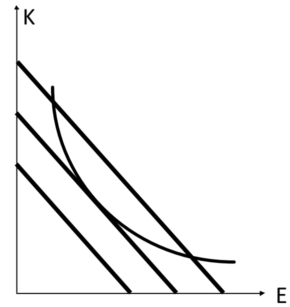
Where is the cheapest input combination?

- Combinations at intersections between isoquant and isocost lines are clearly _______ the cheapest.
- Can reach lower isocost line.



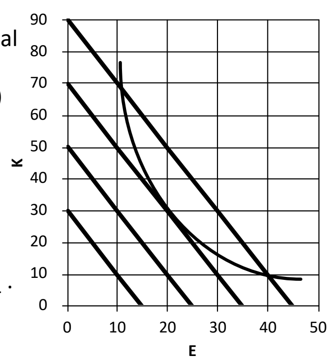
Cheapest input combination is at tangency

- Cheapest input combination is at _______________ between target isoquant and lowest attainable isocost line.



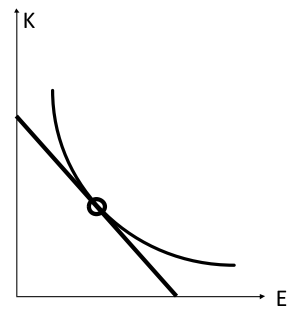
Example of cheapest bundle

- Suppose price of capital (K) is \$10 per unit and price of labor input (E) is \$20 per hour.
- This firm will choose K^* = _______ units, E^* = _______ hours.
- Total cost of this input combination = \$_____ .



Algebra of tangency condition

- At tangency, slope of isocost line equals slope of isoquant: $-w/r = -$ MRTS.
- Multiplying both sides by (-1) gives $\frac{w}{r} = MRTS = \frac{MP_E}{MP_K}$.



Full solution for maximizing profit

- Profit maximization requires cost minimization, but it also requires choosing the right output quantity q (or equivalently choosing the right _________________).
- A full solution is to choose E so that $VMP_E = w$, and choose K so that $VMP_K = r$.
- In other words, $p \times MP_E = w$ and $p \times MP_K = r$.
- These two equations can in principle be solved for ____________-maximizing levels of E and K.

Conclusions

- In the long run, all inputs are variable and can be substituted for each other.
- Any firm that maximizes profit will want to produce its target output level at the lowest possible cost.
- The cost-minimizing employer chooses an input combination at a tangency between the target ________________ and the lowest attainable ________________ line.

AFFIRMATIVE ACTION AND PRODUCTION COSTS

- How do discrimination and affirmative action programs affect cost and profit of firms?

Affirmative action

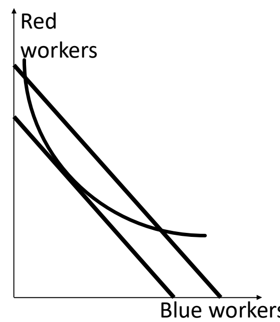
- Affirmative action (AA) programs are intended to reduce discrimination by requiring firms to hire more women or minorities.
- Targets are firms that have few women or minority workers.
- Isoquants and isocost lines provide a useful framework for thinking about the effects of these programs.

Red and blue workers

- Suppose there are two kinds of workers: red and blue.
- Suppose these workers are __________ perfect substitutes in production—perhaps because they have different kinds and levels of education, and training, or work experience.
- Ignore other inputs.
- Production function is q = ____________.

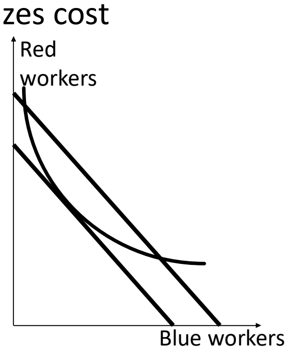
Isoquants and isocost lines

- Firm's isoquants are ___________ because workers not perfect substitutes.
- Isocost lines are _______________ because can hire as many workers as desired, at market wage.



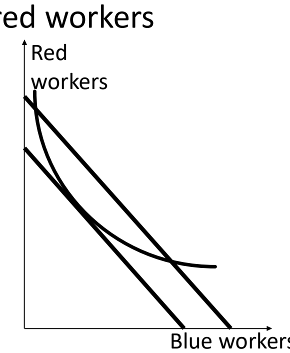
Colorblind firm simply minimizes cost

- Goes to lowest isocost line compatible with target isoquant.
- Chooses input combination at tangency point A.



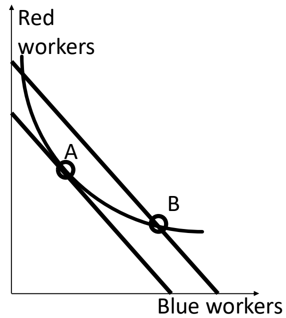
Discriminating firm dislikes red workers

- "Discriminating" firm does not simply minimize cost.
- Owners or managers get disutility from hiring red workers.
- Avoids hiring red workers and moves to non-tangent point B.



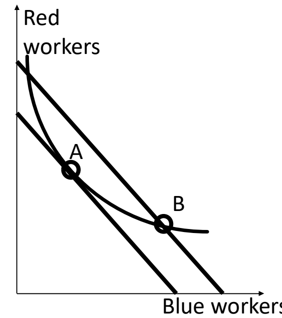
Discrimination is unprofitable

- Discriminating firm chooses combination B over combination A even though it costs ____________.
- Discrimination raises cost and ___________ profit.



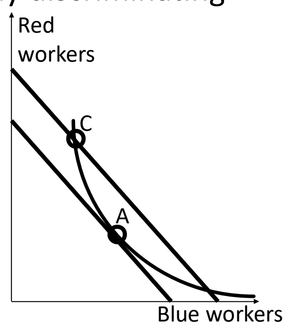
Effect of AA program on discriminating firm

- AA program forces firm to hire more red workers (relative to blue workers).
- Moves firm toward point A.
- ___________ cost and ___________ profit.



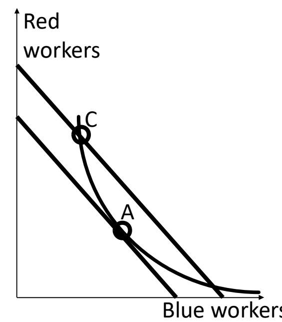
But the above analysis assumes firms are already discriminating

- What if target of AA is _________ already discriminating?
- Then AA program moves firm away from cost-minimizing combination A to combination C.



If not already discriminating, then AA program raises cost

- Movement away from tangency __________ cost and __________ profit.
- So AA lowers cost only if firms are already discriminating.



Conclusions

- Affirmative action programs force firms to hire more women and minorities.
- AA programs can _____________ cost, if firms were initially discriminating against such workers.
- AA programs will _____________ cost, if firms were not initially discriminating.

DEMAND FOR LABOR IN THE LONG RUN

- How much labor will a firm want to hire in the long run?

Changes in input prices

- Input prices change over time. For example,
  - Wages of workers could rise if legal minimum wage is increased.
  - Price of computers and related equipment will likely fall over time as technology advances.
  - Price of energy could rise or fall.
- How will a profit-maximizing firm respond to changes in input prices?

Two effects

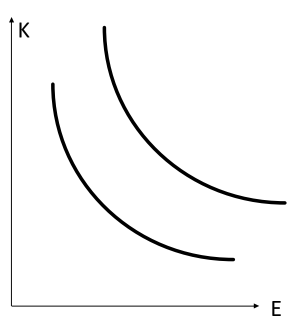
- Change in price any input has two effects on the firm's choice of inputs in the long run.
  - _______________ effect
  - _______________ effect.
- This slideshow presents
  - first a verbal, intuitive explanation,
  - then a graphical explanation.

Scale effect of a change in an input price

- Input prices determine a firm's costs.
- If an input price increases, firm's costs (including MC) increase. Firm will want to _________________ ("scale down") its output, and thus all its inputs.
- If an input price decreases, firm's costs (including MC) decrease. Firm will want to _________________ ("scale up") its output, and thus all its inputs.

Scale effect and isoquants

- *Scale effect* means changing all inputs and outputs in same direction.
- Firm _________ from one isoquant to another.

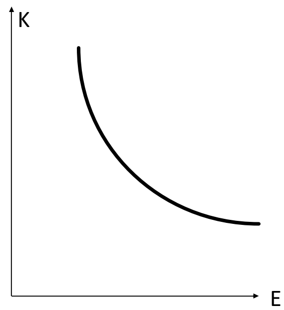


Substitution effect of a change in an input price

- A change in one input price affects how costly inputs are *relative to each other*.
- If an input price increases, firm will want to economize on that input, using _____________ of that input and substituting more of other inputs.
- If an input price decreases, firm may be able to reduce costs by using _____________ of that input and less of other inputs.

Substitution effect and isoquant

- Substitution effect means substituting one input for another *without* changing output level.
- Firm slides ________ an isoquant.



Suppose price of capital decreases

	Change in output (q)	Change in capital input (K)	Change in labor input (E)
Scale effect			
Substitution effect	No change		
Total effect			

Suppose wage DECREASES

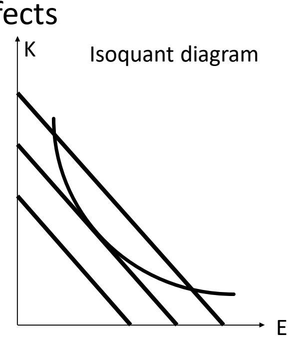
	Change in output (q)	Change in capital input (K)	Change in labor input (E)
Scale effect			
Substitution effect	No change		
Total effect			

Suppose wage INCREASES

	Change in output (q)	Change in capital input (K)	Change in labor input (E)
Scale effect			
Substitution effect	No change		
Total effect			

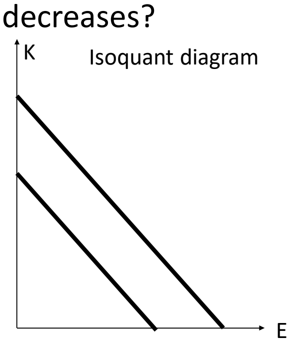
Graphing the scale and substitution effects

- We can illustrate these effects using an isoquant diagram.
- Isoquants connect combinations that produce same output.
- Isocost lines connect combinations with same total cost.



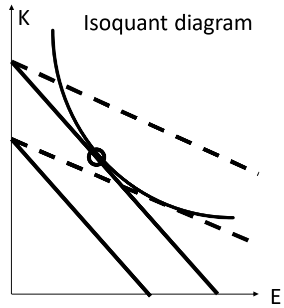
What happens to isocost lines when the wage decreases?

- Slope of isocost lines = -w/r.
- So if w decreases, then each isocost line gets ______________.



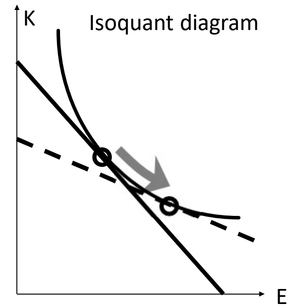
Substitution effect of wage decrease

- If firm kept output constant, it would want to change input proportions to reduce cost.
- It would want to ____________ K and ____________ E.
- Go to new tangency.



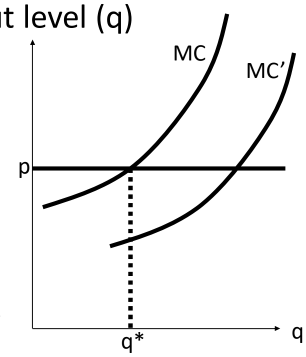
But will firm really keep the same level of output?

- Probably ________.
- Firm can choose whatever level of total output (q) it wants to maximize _________.
- Will it increase or decrease output?



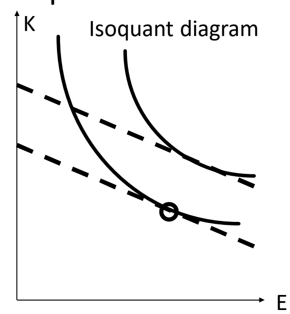
Effect of wage decrease on output level (q)

- Usually firm will ______________ its output q.
- Reason: if w falls, then marginal cost usually falls as well.
- So the profit-maximizing level of output ___________.



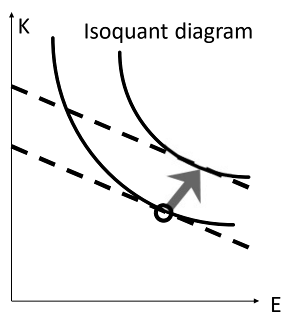
Increasing output means moving to higher isoquant

- Now suppose relative input prices (w/r) do not change, but firm chooses to increase output.
- Firm will move to a point on a higher isoquant with the same slope.



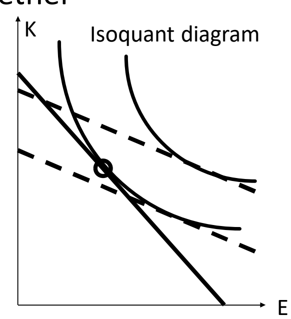
Scale effect of wage decrease

- If both inputs are "normal inputs," then K and E will both ______________.



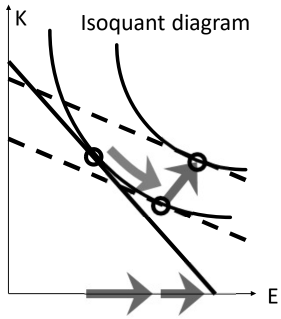
Substitution and scale effect together

- Substitution effect = movement along old isoquant to new slope.
- Scale effect = movement from one isoquant to another without changing slope.



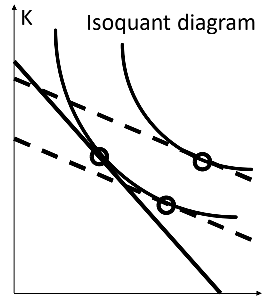
What the graph shows: effect of wage decrease on E

- If w decreases, *both* substitution effect and scale effect cause firm to ______________ E.
- Total effect = substitution effect + scale effect.
- So total effect is ______________ in E.



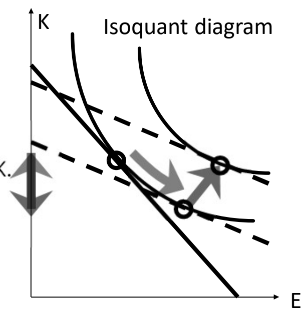
What the graph shows: effect of wage decrease on K

- If w decreases, substitution effect causes firm to ______________ K.
- Scale effect causes firm to __________ K.
- Total effect on K is ______________: depends on which effect is larger.



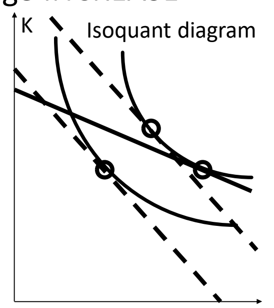
What the graph shows: effect of wage decrease on K

- If w decreases, substitution effect causes firm to __decrease__ K.
- Scale effect causes firm to __increase__ K.
- Total effect on K is __uncertain__: depends on which effect is larger.



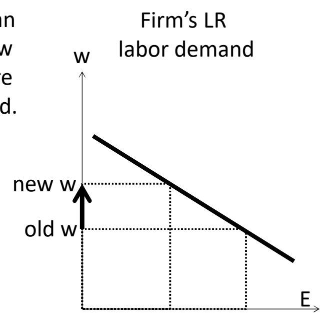
What the graph shows: effect of wage INCREASE

- If w INCREASES, *both* substitution effect and scale cause firm to ______________ E.
- So total effect is ______________ in E.
- But total effect on K is again uncertain.



Firm's LR demand for labor

- We conclude that for an individual firm, wage w and employment E are ____________ related.
- Individual firm's labor demand curve slopes ___________.



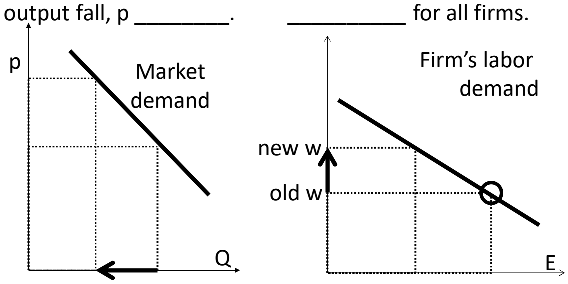
From firm to industry

- What about wage changes that apply to a whole industry?
  - Examples: increase in minimum wage, union wage increase, etc.
- Key difference: output price p no longer held constant.
- If ALL firms decrease employment and output, then output price p will ________.

Industry demand curve for labor affected by change in market price

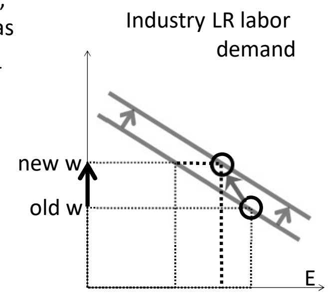
As employment and output fall, p ________.

So LR labor demand __________ for all firms.



Industry demand is *less* sensitive to the wage than individual firms are

- As a result of the shift, E does not decrease as much when ________ firms enjoy the same wage decrease.
- Industry demand for labor is __________ elastic (steeper) than an individual firm's demand.



Conclusions

- In the long run, firms can substitute labor for capital, and *vice versa*, in response to wage changes.
- When the wage increases, labor demanded by a profit-maximizing firm decreases due to both ___________ and _________________ effects.
- LR industry demand for labor is __________ elastic than an individual firm's LR demand.

ELASTICITY OF LABOR DEMAND

- What determines the industry elasticity of labor demand?
- What are the "Hicks-Marshall rules"?

Measuring responsiveness

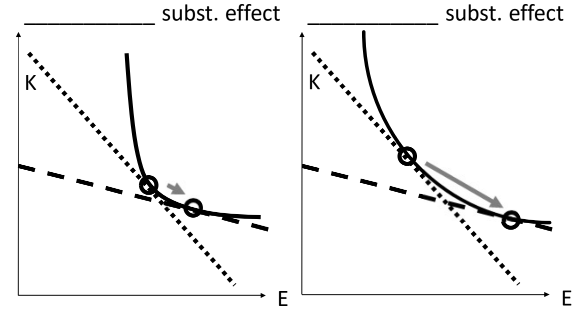
- The most convenient way to measure how strongly the quantity of labor hired responds to the wage is with an elasticity.
- Demand elasticity of E with respect to w is defined as
$$\varepsilon_E^D = \frac{\%\ change\ E}{\%\ change\ w}\ ,$$
measured along the industry labor ___________________ curve.

What does the magnitude of ε_E^D depend on? Intuitively…

- Shape of isoquants: how easy it is to substitute labor E for capital K.
- Demand curve for the output: how fast the output price p falls as output quantity q increases.
- Share of labor in total cost: whether labor cost is important or unimportant.
- Time horizon: short-run versus long run.

Shape of isoquants determines strength of substitution effect

___________ subst. effect ___________ subst. effect

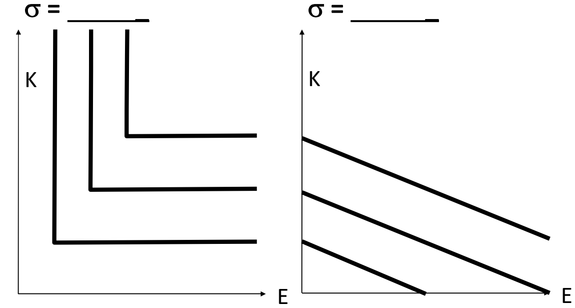


Elasticity of substitution

- Elasticity of substitution
$$= \sigma = \frac{\%\ change\ in\ (K/E)}{\%\ change\ in\ (w/r)}\ .$$
- Must be ____________ because an increase in w/r leads to more capital K and less labor E.
- Is small if substitution effect is small and isoquant has a ________________ curve.
- Is large if substitution effect is large and isoquant has a ________________ curve.

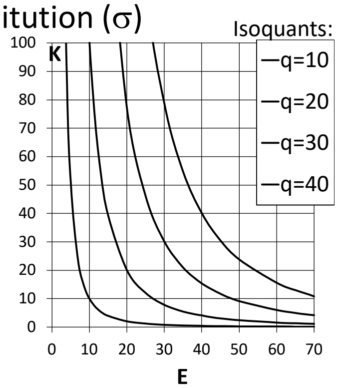
Extreme values of elasticity of substitution (σ)

σ = ______ σ = ______



Typical value of elasticity of substitution (σ)

- Cobb-Douglas production functions have formulas like $q = E^a K^b$.
- They usually fit real data fairly well.
- For these functions, σ = _______.



Exact formula for industry elasticity of labor demand

Hicks (1935) derived a formula for the industry demand for labor (ε_E^D) that depends on

- elasticity of substitution (σ) ___________________________________
- elasticity of demand for output (ε_q^D) ___________________________________
- share of labor cost in firm's total cost (S_E) ___________________________________
- elasticity of supply of capital (ε_K^S) ___________________________________

(John R. Hicks, *The Theory of Wages*, 1935, pp. 242-244.)

Exact formula for industry elasticity of labor demand (cont'd)

Hicks's formula:

$$\varepsilon_E^D = \frac{\sigma\left(\varepsilon_q^D - \varepsilon_K^S\right) + S_E\, \varepsilon_K^S\left(\varepsilon_q^D + \sigma\right)}{-\varepsilon_q^D + \varepsilon_K^S + S_E\left(\varepsilon_q^D + \sigma\right)}$$

where
σ = share of labor in total cost,
ε_q^D = elasticity of demand for product,
ε_K^S = elasticity of supply of capital,
S_E = share of labor cost in total cost.

(John R. Hicks, *The Theory of Wages*, 1935, pp. 242-244.)

Using Hicks's formula: SR versus LR industry demand for labor

- In the ___________ run, the amount of capital K is fixed. This implies that $\varepsilon_K^S = 0$, and Hicks's formula simplifies to

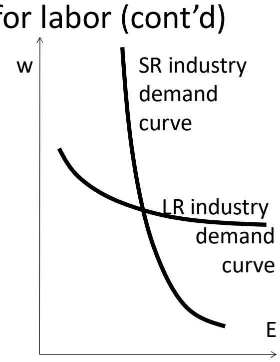
$$\varepsilon_E^D = \frac{\sigma\, \varepsilon_q^D}{-\varepsilon_q^D + S_E\left(\varepsilon_q^D + \sigma\right)}$$

- In the ___________ run, capital K is available at a constant price r. This implies that $\varepsilon_K^S \to \infty$, and Hicks's formula simplifies to

$$\varepsilon_E^D = -\sigma + S_E(\varepsilon_q^D + \sigma).$$

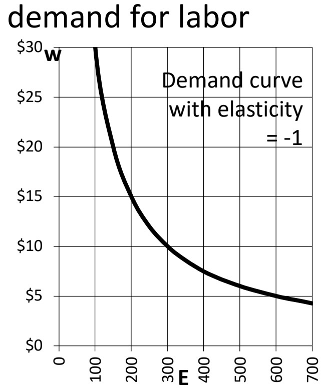
Using Hicks's formula: SR versus LR industry demand for labor (cont'd)

- It can be proved from Hicks's formulas that the LR ε_E^D > SR ε_E^D , in absolute value.
- So industry demand must be ____________ elastic (____________) in the long run than in the short run.



Using Hicks's formula: typical value of LR elasticity of demand for labor

- Focus on LR elasticity: $\varepsilon_E^D = -\sigma + S_E(\varepsilon_q^D + \sigma)$.
- For the US economy as a whole, $\sigma \approx 1$, $S_E \approx 0.7$, and $\varepsilon_q^D \approx -1$.
- Therefore ε_E^D
  $= -\sigma + S_E(\varepsilon_q^D + \sigma)$
  $= -1 + 0.7(-1 + 1)$
  = ______ .

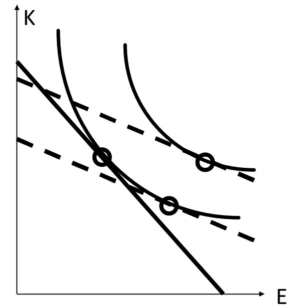


Using Hicks's formula: substitution and scale elasticities

- LR elasticity: $\varepsilon_E^D = -\sigma + S_E(\varepsilon_q^D + \sigma)$.
- Substitution effect assumes output level is ___________. This implies $\varepsilon_q^D = 0$ and Hicks's formula simplifies to
  subst.-effect elasticity $= -\sigma + S_E\sigma$.
- Scale effect assumes output may change but input proportions are ___________. This implies $\sigma=0$ and Hicks's formula simplifies to
  scale-effect elasticity $= S_E\, \varepsilon_q^D$.

Using Hicks's formula: substitution and scale elasticities (cont'd)

- It is easy to show that
  $-\sigma + S_E\sigma$
  $+ S_E\, \varepsilon_q^D$
  $= -\sigma + S_E(\varepsilon_q^D + \sigma)$.
- Again, total effect = sum of substitution effect and scale effect.



Using Hicks's formula: the "Hicks-Marshall rules"

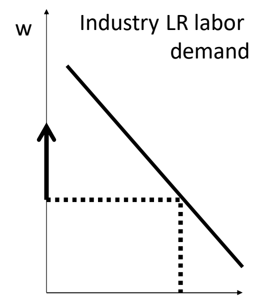
- LR elasticity: $\varepsilon_E^D = -\sigma + S_E(\varepsilon_q^D + \sigma)$.
- Implies that industry elasticity of labor demand ε_E^D is larger in absolute value,

1) the ____________ the elasticity of demand for the output (ε_q^D).
2) the ____________ the elasticity of substitution (σ).
3) the ____________ the share of labor in total costs (S_E), provided $(\varepsilon_q^D + \sigma) < 0$.

Alfred Marshall, *Principles of Economics* (1982, p.319).

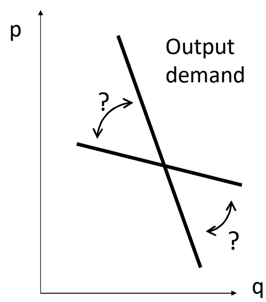
Using Hicks-Marshall rules to understand union strategy

- Labor unions like to increase wages.
- But unions worry about decreasing employment.
- Unions therefore prefer that labor demand be ________ elastic.



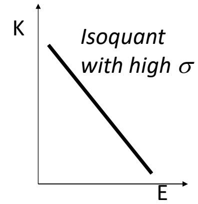
Hicks-Marshall rule (1) and union strategy

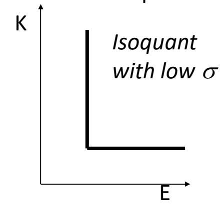
- Would a union rather face high or low elasticity of demand for the industry's *output* (ε_q^D)?
- ________ elasticity!
- So unions will try to exclude close substitute products such as imports.



Hicks-Marshall rule (2) and union strategy

- Would a union rather face high or low elasticity of substitution in production (σ)?
- __________ elasticity of substitution!
- So unions will try to limit use of other inputs.





Hicks-Marshall rule (3) and union strategy

- Would a union rather that labor's share of total costs (S_E) be large or small?
- ______________ share! (provided $(\varepsilon_q^D+\sigma) < 0$).
- So unions will be most aggressive in raising wages when they are a small share of total costs.

Estimates of elasticities of labor demand from data

- Considerable variation in estimates, partly due to differences in σ, ε_q^D, and S_E across industries, and partly due to data problems.
- Typical estimate of SR elasticity = ________________ (inelastic).
- Typical estimate of LR elasticity = ________________ .

Conclusions

- Long-run demand for labor is _____________ elastic than short-run demand.
- The Hicks-Marshall rules show that LR demand for labor is more elastic
  1) the _____________ the elasticity of demand for output .
  2) the _____________ the elasticity of substitution.
  3) the _____________ the share of labor in total costs.

INPUT DEMAND WITH MORE THAN TWO INPUTS

- What are "substitutes" and "complements" in production?
- How are demands for skilled and unskilled labor related to the price of capital?

Extending the production-function model

- We assumed that production depended on just two inputs: $q = f(K, E)$.
- However, we can extend this model to more than two inputs.
- For example, we can divide workers into skilled and unskilled categories: $q = f(K, E_S, E_U)$.

Key results still hold

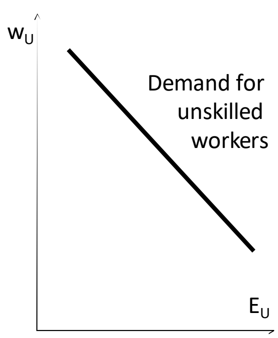
- If we continue to assume that firms minimize cost and maximize profit, key results still hold:
- In SR, firms choose employment levels that equate wages with VMP:
  $w_S = MP_S \times p$ and $w_U = MP_U \times p$.
- All SR and LR input demand curves slope ____________.
- LR demand is ____________ elastic than short-run demand.

Cross-elasticities

- Cross elasticity of input demand $= \frac{\%\ change\ in\ input\ x}{\%\ change\ in\ input\ price\ y}$.
- If positive, then inputs are called ______________________ in production.
- If negative, then inputs are called ______________________ in production.

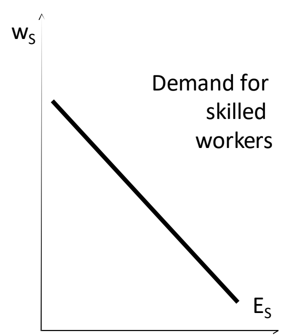
Unskilled workers and machines

- There is some evidence that capital and unskilled workers are ______________ in production.
- As price of capital (machines) decreases, demand for unskilled workers ____________.



Skilled workers and machines

- There is some evidence that capital and skilled workers are ______________ in production.
- As price of capital (machines) decreases, demand for skilled workers ____________.



Implications of capital-skill complementarity

- Falling cost of capital
  - ____________ unskilled workers.
  - ____________ skilled workers
  - increases income inequality.
- Thus tax credits for investment spending may
  - ______________ economic growth
  - ______________ income inequality.

Conclusions

- With more that two inputs, pairs of inputs can be substitutes or complements in production.
- There is some evidence that capital and unskilled labor are ________________________ but capital and skilled labor are _________________________ .

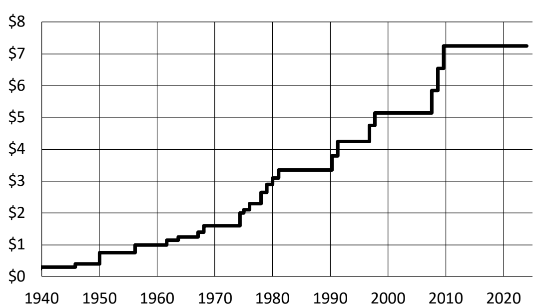
EFFECTS OF MINIMUM WAGES

- How does a legal minimum wage affect the labor market?

Fair Labor Standards Act of 1938

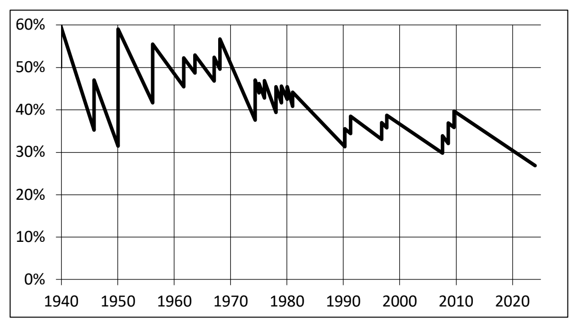
- Introduced a federal minimum wage of $0.25 per hour.
- Average manufacturing wage was about $0.45 per hour in 1938.
- Act also required time-and-a-half pay over 40 hours per week and restricted child labor.

U.S. federal minimum wage



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

Federal minimum wage as percent of average manufacturing wage

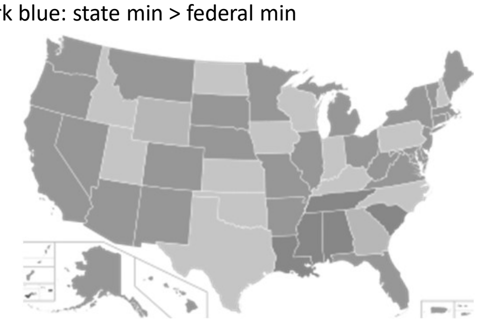


SOURCE: www.bls.gov, data series CEU3000000008

Minimum wage since 1938

- Minimum wage is not indexed to inflation, but periodically raised by Congress.
- Last raised to $7.25 in 2009.
- Coverage steadily _________________by Congress.
- Many states have ______________ minimum wages.

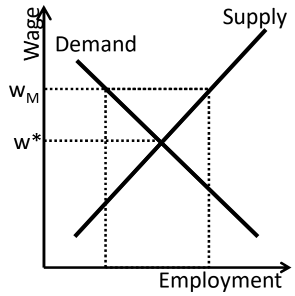
Dark green: no state min wage
Pale green: state min < federal min (so federal applies)
Pale blue: state min = federal min
Dark blue: state min > federal min



SOURCE: https://en.wikipedia.org/wiki/Minimum_wage_in_the_United_States, accessed 2023-12-17.

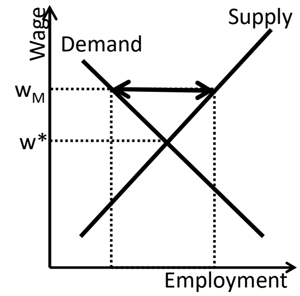
Minimum wage in a competitive labor market

- A binding minimum wage w_M pushes the wage above the competitive wage w^*.
- This creates excess ____________ in the labor market.



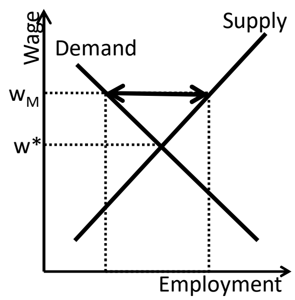
Reasons for excess supply

1. Labor supply slopes up: ________ workers want to work at the higher wage.
2. Labor demand slopes down: employers want to hire ________ workers at the higher wage.



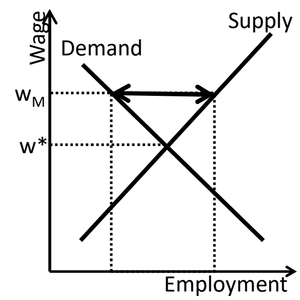
Result of excess supply

- Excess supply contributes to unemployment: workers who want to work at wage w_M but cannot find jobs.
- Employment decreases.
- Labor force increases.

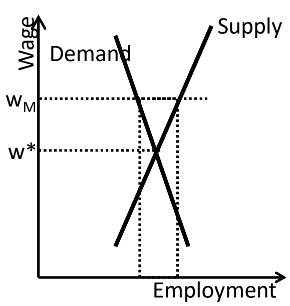


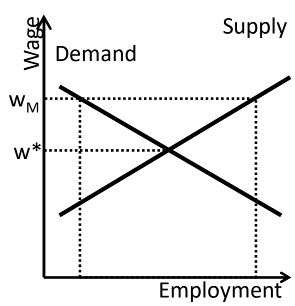
How much unemployment?

- Amount of unemployment depends on level of minimum wage w_M.
- The higher the minimum wage, the greater the unemployment.



Amount of unemployment also depends on elasticities of supply and demand





Who wins and who loses from a minimum wage?

- Employers all _________ because their costs are higher than they would otherwise.
- Workers who still have jobs ________ because they receive a higher wage than they would otherwise.
- However, some workers lose their jobs (or work fewer hours than they would like). They ________.

Who earns the minimum wage?

Minimum-wage workers are more likely than other workers to be

- young.
- without a high school diploma.
- working part-time.
- working in service occupations like food preparation and serving.

Bureau of Labor Statistics, *Characteristics of Minimum Wage Workers: 2010,* February 25, 2011.

Compliance

- In 2010, 2.5% of wage and salary workers were paid _______________ the minimum wage.
- Another 3.5% were paid __________ than minimum wage.
- Some of these workers were not covered by the minimum wage law, but some surely reflect _________________________ with law.
- Penalties on employers for noncompliance are weak.
- Noncompliance implies little effect on employment.

Bureau of Labor Statistics, *Characteristics of Minimum Wage Workers: 2010,* February 25, 2011.

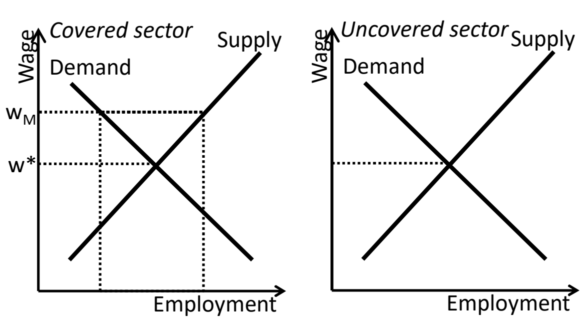
Who is covered by the Fair Labor Standards Act?

- Initially, only about 43% of nonsupervisory workers were covered.
- Today, ______________ workers are covered by the federal minimum wage, with only about 10 million uncovered.
- Uncovered include ________________ workers and self-employed persons.
- However, in the past (and even today in other countries) many workers were not covered.

Covered and uncovered sectors

- How does minimum wage affect wages of workers in uncovered sector?
- One possibility is that unemployed workers in covered sector "spill over" into uncovered sector to look for jobs.
- Supply in uncovered sector shifts ___________, ________________ wage there.

"Spillover" model

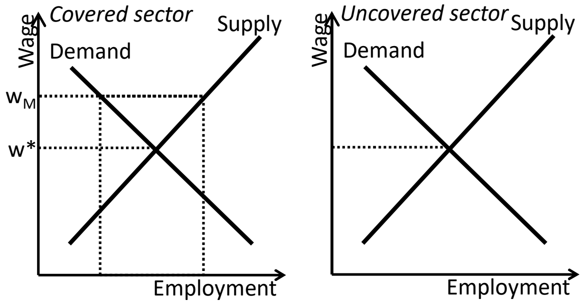


Waiting for a high-paying job

- Another possibility is that unemployed workers in covered sector "wait" for a job there, joined by some workers from uncovered sector.
- Supply in covered sector shifts _____________, _________________ unemployment further there.
- Supply in uncovered sector shifts ____________, _________________ wage there.

John R. Harris and Michael P. Todaro, "Migration, Unemployment & Development: A Two-Sector Analysis," *American Economic Review*, March 1970, v. 60, no. 1, pp. 126-42.

"Wait unemployment" model



Equilibrium in "wait unemployment" model

- In long run equilibrium, expected wage in covered sector equals actual wage in uncovered sector:
  $$\pi \ w_M = w_U$$
  where π = probability of finding a job in covered sector.
- If there is substantial job churn in covered sector, then $\pi =$ in that sector.
- However, if workers in covered sector keep their jobs a long time, π might be much less.

Evidence of effects of minimum wages

- Large number of studies estimate effects of minimum wages on employment.
- Usually focus on groups most affected, especially ___________________ , often using data from Current Population Survey.
- Estimates are generally ____________ but vary depending on the time period.

Consensus estimates

- Elasticity of demand for teenager workers is probably between -0.1 and -0.3.
- Minimum wage was raised in July 2009 from $5.85 to $7.25, a _________% increase
- This should have caused decrease in teenage employment between __________% and ___________% .
- Teenage unemployment rate in June 2009 was about 24.7%.

Revisionist estimates

- In 1990s, several researchers studied particular sectors and found near _________ effect of minimum wage increases.
- One case study surveyed Texas fast-food restaurants before and after increase in minimum wage in 1991.
- Another examined teenage unemployment in California before and after its state minimum wage was raised in 1988.

New Jersey and Pennsylvania fast food study

- Best-known case study compared employment changes in New Jersey and Pennsylvania fast food restaurants.
- New Jersey raised its state minimum wage on April 1992, but Pennsylvania did not.
- NJ restaurants are ________________ group.
- PA restaurants are ________________ group.

David Card and Alan B. Krueger, "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania," *American Economic Review*, Vol. 84 (Sept 1994), pp. 772-93.

PA & NJ fast food study: Difference-in-differences estimates of effect of minimum wage increase

	Avg employment (FTE)			
Group	Before increase	After increase	Diff.	Diff.-in-diff.
Treatment group—New Jersey fast-food restaurants	20.4	21.0		
Control group—Pennsylvania fast-food restaurants	23.3	21.2		

PA & NJ fast food study: conclusions

- Surveyed NJ fast-food restaurants _____________ employment, while surveyed PA restaurants ______________ employment.
- PA restaurants control for macroeconomic trends (hopefully).
- Conclusion is that increase in NJ minimum wage caused employment to _____________.
- Very surprising result!

PA & NJ fast food study: criticisms

- Data errors—administrative data give different estimates than survey data used by study.
- Study did not consider openings and closings of restaurants.
- Minimum wage might take ___________ to have an effect on employment.
- Rise in minimum wage might _____________ big fast-food chains' market share at expense of smaller restaurants.

Effect of minimum wage on earnings

- Demand is inelastic, so wage rises __________ than employment declines.
- Example: If elasticity = -0.2 and wage increases by 10%, then employment decreases by 0.2 x 10% = _______% and earnings increase by 10% - 2% = ______%.
- So an increase in the minimum wage should increase total earnings of affected workers.

Effect of minimum wage on poverty

- But are affected workers poor?
- Many are teenagers from households that are not poor.
- So benefits of minimum wage are __________ well-targeted on the poor.

"Living wage" ordinances

- Some cities have "living wage" ordinances that cover municipal employees and employees of businesses that deal with the city.
- Usually several dollars ____________ than the federal minimum wage.
- Do not affect many workers, but apparently _______________ employment of low-wage workers slightly.

Conclusions

- The US has had a federal minimum wage since 1938. It affects mostly ____________ workers with little education.
- The supply-and-demand model predicts that a minimum wage _____________ employment.
- Most studies show that minimum wage _____________ employment of young workers, with a demand elasticity of -0.1 to -0.3.
- However, some recent case studies find zero or even positive effects on employment.

DEMAND FOR WORKERS VERSUS DEMAND FOR HOURS

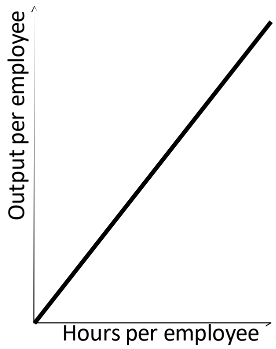
- Why would an employer care how many hours each worker works?

Workers versus hours

- We have implicitly assumed that employers adjust labor input simply by changing the number of workers.
- However, employers can also change the amount of hours that a worker works.
- Why would an employer care whether it
  - hires 1 more worker (@ 40 hours per week)
  - or has 40 workers (@ 1 hour per week)?

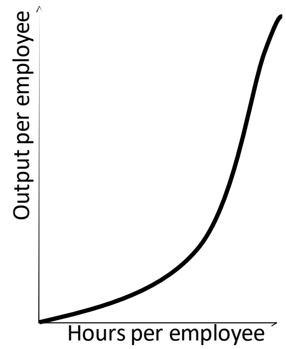
Constant returns in production for each worker

- Many jobs are easy for one worker to hand off to another worker. Examples:



Increasing returns in production for each worker

- Some jobs may be difficult for one worker to hand off to another worker. Possible examples:
- Lawyers:
- Doctors:

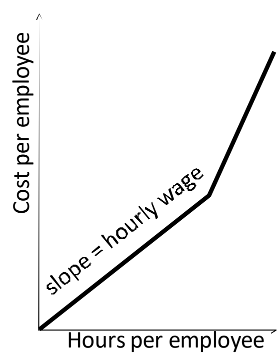


Implications

- If there are *constant* returns, total hours determine output.
  - The employer does __________ care how long each worker works.
- If there are *increasing* returns, then if same total hours are worked by fewer employees, output increases.
  - The employer prefers to have each worker work ______________ hours, rather than hire additional workers.

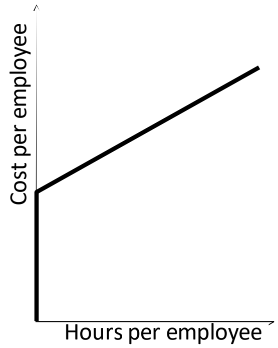
Rules for overtime pay

- Federal law requires many workers to be paid 50% higher wages after 40 hours per week ("overtime pay").



Fixed costs of labor

- Some costs may depend on the number of workers but not their hours. Examples:
- Govt-mandated benefits.
- Hiring and training costs.



Implications

- All else equal, overtime pay laws encourage employers to limit each employee to ________________________.
- All else equal, fixed costs encourage employers to have each worker work as many hours as possible.
  - An increase in mandated benefits will therefore _____________ employment of part-time workers.

Conclusions

- Employers might not be indifferent to the hours of work per employee.
- If there are ________________________ in production or ________________ of labor, employers will prefer that each worker work longer hours.
- If higher wages must be paid after 40 hours, the employer will be reluctant to allow workers to work more than 40 hours.

ADJUSTMENT OF EMPLOYMENT

- How do employers respond to changes in their business environment?

Adjusting employment

- In the real world, productivity, input prices and output prices do not remain constant.
- Firms must adapt to changes in their business environment.
- They must adjust their levels of output and inputs, including labor input (E).

Patterns of adjustment

- As product demand or production costs change,
  - some employers tend to make small ______________ adjustments to E,
  - others (especially in automobiles) tend to make large ______________ adjustments to E.
- Reasons are related to costs of adjustment.

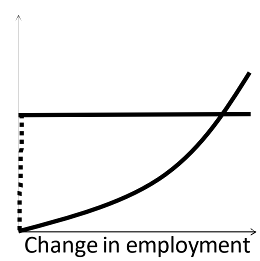
Adjustment costs

Costs of hiring
- Advertising and interviewing for new positions.
- Training new employees.
- Processing new hires through HR office.

Costs of laying off
- Loss of experience and knowledge.
- Possible severance pay and out-placement.
- Possible legal penalties.
- Processing terminations through HR office.

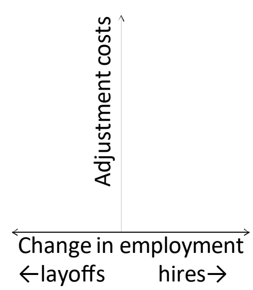
Variable or fixed?

Are an employer's adjustment costs…
- variable, increasing with the number of workers affected?
- or fixed, same regardless of number of workers affected?



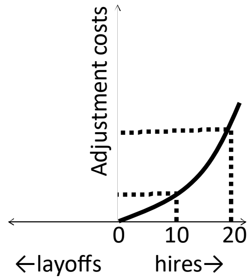
Variable adjustment costs

- Variable costs vary with the number of workers hired or laid off.
- May rise at an increasing rate.
- May be greater for layoffs than for hires, if there are legal penalties for layoffs.



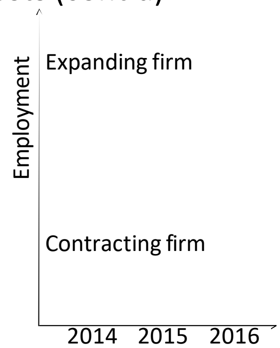
Implications of variable adjustment costs

- If variable costs rise at an increasing rate, then
- Cheaper for the firm to hire, say, 10 workers this year and 10 workers next year, rather than 20 workers this year.
- Similarly for layoffs.



Implications of variable adjustment costs (cont'd)

- Expanding firms will do so slowly, adding a few workers every year.
- Contracting firms will also do so slowly, laying off a few workers every year.

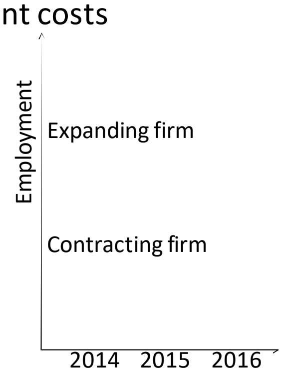


Fixed adjustment costs

- Fixed costs do not vary with number of workers hired or laid off.
- These are "one-shot" costs.
- It costs as much to hire 1 worker as to hire 10 or 20.
- Similarly for layoffs.

Implications of fixed adjustment costs

- Expanding firms will do so abruptly, hiring many workers at once to save on cost.
- Contracting firms will also do so abruptly, laying off many workers at once.



Effect of employment protection legislation on adjustment costs

- Some countries have legislated penalties for laying off workers, such as mandated severance pay.
- This increases adjustment costs for layoffs and therefore ____________ the rate at which firms lay off workers in recessions.
- However, this likely also _________________ hiring during expansions, because firms anticipate higher costs at the next recession.

Employment protection in U.S.

- U.S. has no laws that discourage laying off workers (except unemployment insurance and advance notification).
- However, courts have increasingly limited the traditional doctrine of "employment at will," making it more difficult to fire workers.
- This seems to have prompted U.S. firms to seek alternatives to regular employees, such as ____________________________________.

Simultaneous job creation and destruction

- At any point in time, some firms are expanding and others are contracting.
- Simultaneously,
  - New jobs are created.
  - Old jobs disappear.

Small business, the "engine of growth"?

- It is often claimed that most new jobs are created by small businesses.
- However, research indicates otherwise.
- In manufacturing, firms employing at least 500 workers account for more than half of new jobs are created and destroyed.
- Also, jobs at large firms are more likely to last.

Conclusions

- As the business environment changes, firms adjust their levels of employment.
- If adjustment costs are variable, rising at an increasing rate, adjustments will be ________________________.
- If there are big fixed costs of adjustment, then adjustments will be ______________.
- Employment protection laws can reduce layoffs during recessions but may also ______________ the average level of employment.

PART 2

Equilibrium and Differences in Pay

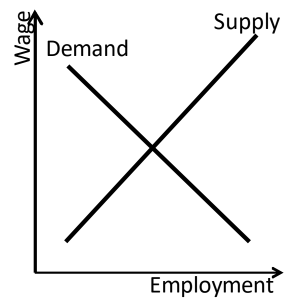
Big ideas: The competitive model can be used to analyze a variety of scenarios. However, some markets show evidence of employer market power. Systematic differences in pay are largely driven by differences in conditions across jobs and differences in productivity across workers.

EQUILIBRIUM IN A SINGLE LABOR MARKET

- Who gains how much from the operation of a competitive market?
- How does the market automatically maximize total gains from trade?

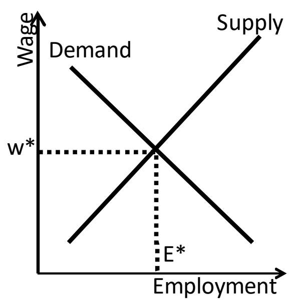
Competitive equilibrium

- In the competitive model of the labor market, the equilibrium wage occurs where quantity of labor supplied by workers = quantity of labor demanded by employers.



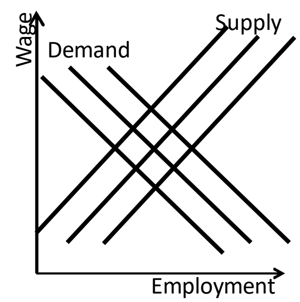
A simplified model

- In this simplified model, there are _________ job vacancies or unemployment.
- Firms hire all the workers they want at the market wage.
- Everyone willing to work at the market wage finds a job.



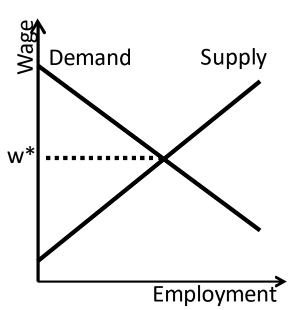
Shocks

- In reality, labor markets may not quite reach equilibrium before they are hit by a demand or supply shift.
- Then they start moving toward the new equilibrium.



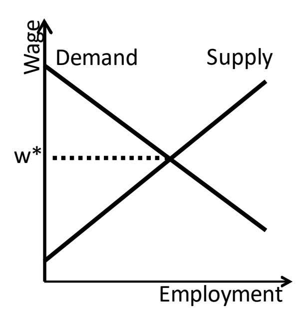
Gains from trade for employers

- Height of demand curve = VMP of each worker.
- Difference between VMP and w* = employer's surplus for that worker.



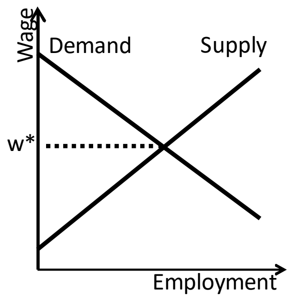
Total employer surplus

- Area between demand and wage = total employer surplus.



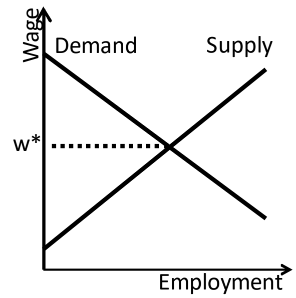
Gains from trade for workers

- Height of supply curve = amount required to attract a particular worker into this labor market = opportunity cost of the worker's time.
- Difference between supply curve and w* = that worker's surplus.



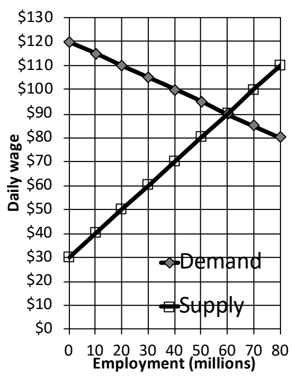
Total worker surplus

- Area between supply and w* is total worker surplus.



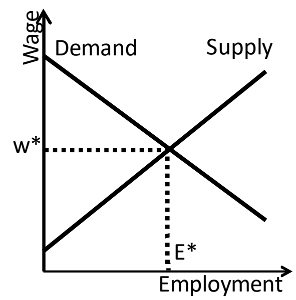
Example

- Equilibrium daily wage = $ _________.
- Equilibrium employment = ________ million.
- Employer surplus = $ _________ million.
- Worker surplus = $ _________ million.



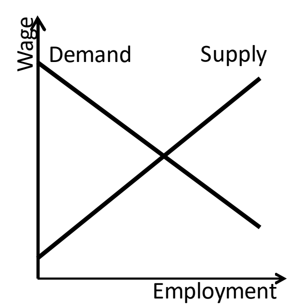
Total social surplus = employer surplus + worker surplus

- Competition determines both equilibrium wage and equilibrium quantity.
- Total surplus = area between demand and supply curves, up to equilibrium quantity.



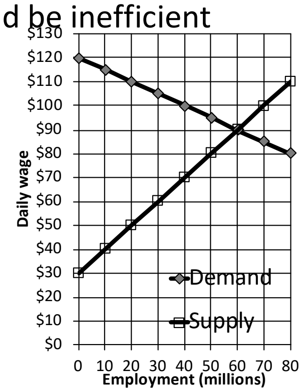
Competition maximizes total social surplus

- Competition ensures that efficient number of workers are hired to maximize total surplus.
- Hiring more than E* or less than E* would be inefficient.
- Why?



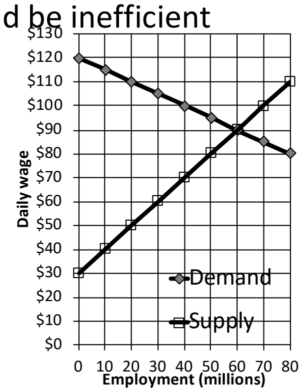
Hiring more than the competitive quantity would be inefficient

- Consider workers in excess of 60 million.
- The value of their time is _________ than $90.
- But the value of their marginal product in employment is ___________ than $90.
- So employing them would be inefficient.



Hiring less than the competitive quantity would be inefficient

- Consider workers before 60 million.
- The value of their time is _________ than $90.
- But the value of their marginal product in employment is ___________ than $90.
- So NOT employing them would be inefficient.



Conclusions

- Markets create ______________ surplus = difference between VMP of workers and what employers actually pay them.
- Markets also create __________ surplus = difference between opp. cost of workers' time and what they are actually paid.
- Competition ensures that the efficient number of workers is hired to maximize total surplus.

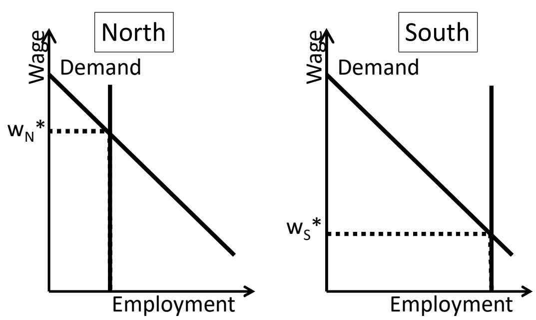
COMPETITIVE EQUILIBRIUM ACROSS LABOR MARKETS

- How are labor markets linked when workers can move freely?
- How does migration affect wages and economic efficiency?

Multiple labor markets

- For analyzing migration, it is useful to think of multiple labor markets.
- How are multiple labor markets linked?
- Consider two markets (e.g., North and South) each containing workers of similar skills.
- Assume for simplicity that labor supply is perfectly inelastic (_______________) in each market.

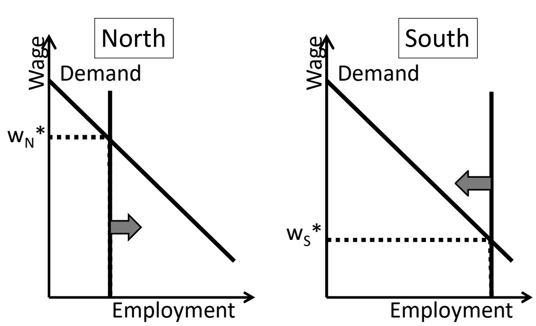
Are these markets in equilibrium?



Equilibrium across markets

- Each market is in equilibrium by itself.
- But there is a regional wage ______________.
- If workers can move, they have an incentive to ________________ from South to North to take advantage of higher wages.

Migration shifts labor supply curves



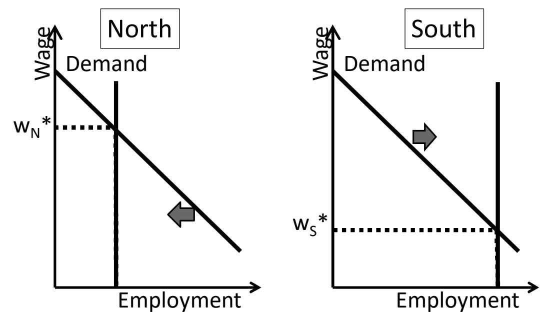
Migration causes wage convergence

- Migration shifts labor supply ____________ in low-wage region, and shifts supply __________ in high wage region.
- Migration causes wages in two regions to ________________.
- If workers can move completely freely, eventually wages in two regions will be ________________.

Movement of employers

- What if employers can move?
- Employers will move from North to South to take advantage of lower wages.
- Labor demand will shift ___________ in high-wage region and shift ____________ in low-wage region.
- Again, wages in two regions _____________.

Effects of movement of firms



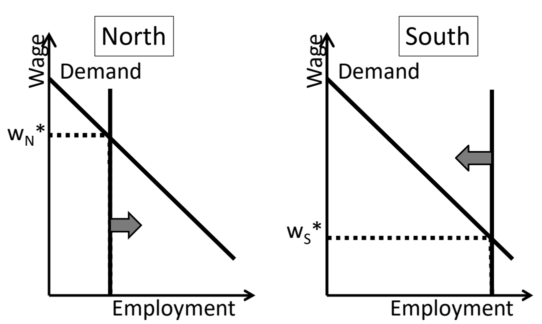
Migration increases efficiency

- Even though workers move for selfish reasons, and their purpose is certainly __________ to equalize wages, they inadvertently increase economic efficiency.
- Loss of output in low-wage area is _________ than gain in output in high-wage area.

Migration increases efficiency: example

- Suppose initially that wage in North = $20 and wage in South = $15.
- Then VMP of marginal worker in North = $20 and VMP of marginal worker in South = $15.
- Removing one worker from South lowers output by $_______.
- Adding that same worker to North raises output by $_______.
- Net gain in efficiency = $______.

Efficiency gains are exhausted when wages are equal

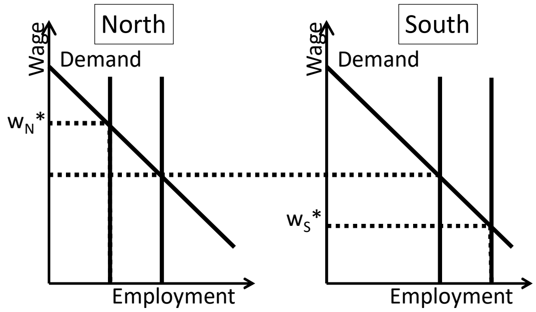


Computing total efficiency gains

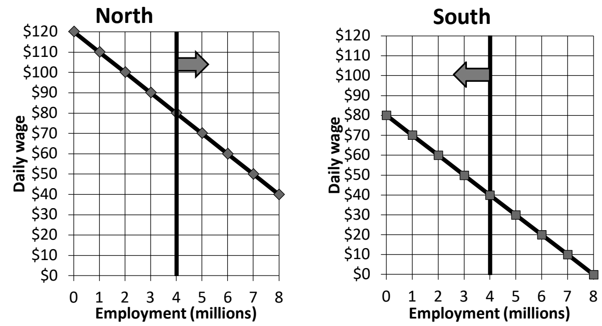
- Total efficiency gains from migration = dollar value of

Gain in output in _________-wage region	—	Loss of output in _________-wage region

Total efficiency gains from migration
= this minus this

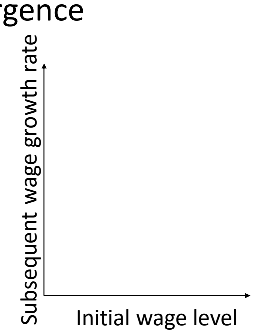


Example: total efficiency gains =
$______ - $______ = $_____ million



Graphical representation of wage convergence

- Convergence implies regions or countries with low initial wages should see wages grow ____________.
- Implies ___________ relationship between initial wage and subsequent wage growth.



Evidence for wage convergence

- States with the lowest wages 50-100 years ago (mostly in ____________) have had fastest subsequent wage growth.
- Similar regional convergence in other countries, such as Japan.
- Also international wage convergence across countries with similar ________________ levels.
- NAFTA/USMCA could cause some convergence between U.S. and Mexican wages, due to employer movement.

Conclusions

- If workers can move freely, then wage differentials between labor markets should cause ___________________.
- Migration of workers (or employers) causes wages to ________________.
- Migration increases __________________ by raising output more in destination region than it reduces output in source region.
- There is clear evidence of wage convergence within the U.S. and internationally.

PAYROLL TAXES AND SUBSIDIES

- How do payroll taxes and subsidies affect labor markets?

Payroll taxes

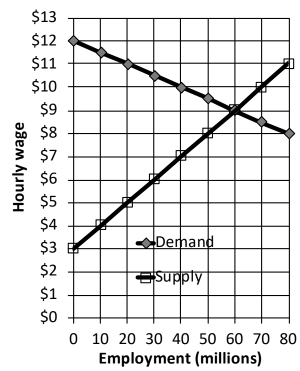
- Payroll taxes are taxes on workers' wages.
- Sometimes the law says worker must pay. Sometimes the law says employer must pay.
- Usually tax is a certain percent of worker wages, not a fixed amount per hour.
- However, to simplify graphs, consider a payroll tax of $3 per hour.

Payroll tax assessed on employers

- Suppose *employers* are required to pay a payroll tax of $3 per hour.
- Then employers will be less willing to hire workers, their because net benefit is $3 less.
- Put differently, total labor cost per hour = ___________________.
- Labor demand curve shifts down by the amount of the tax ($3).

Payroll tax on employers: example

- Initial equilibrium wage = $ _____ .
- Tax shifts demand curve down by $3.
- Worker's new equilibrium wage, excluding tax, is $_____.
- Labor cost per hour for employers, including tax, is $ _______.



Effects of payroll tax on employers

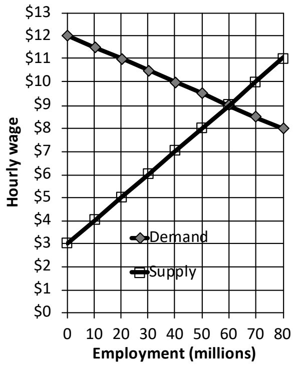
- Employment ________________.
- Total labor cost per hour paid by employers (including tax) ________________.
- Net wage received by workers (excluding tax) __________________.
- Thus both sides bear burden of tax.

Payroll tax on workers

- Suppose *workers* are required to pay a payroll tax of $3 per hour.
- Then workers will be less willing to work, because their net benefit is $3 less.
- Put differently, the net wage (or "take-home pay") = ____________________.
- Labor supply curve shifts up by the amount of the tax ($3).

Payroll tax on workers: example

- Initial equilibrium wage = $ _____ .
- Tax shifts supply curve up by $3.
- Worker's new equilibrium net wage, excluding tax, is $_____.
- Total wage paid by employers, including tax, is $ _______.

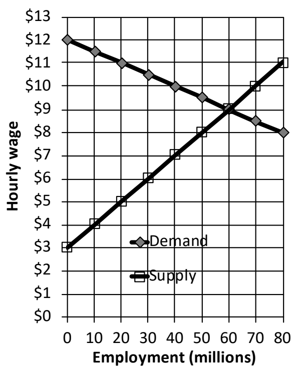


Effects of payroll tax on workers

- In equilibrium, effects are exactly the same, regardless of whether tax is assessed on workers or employers.
- Employment _______________.
- Total labor cost per hour paid by employers (including tax) _______________.
- Net wage received by workers (excluding tax) __________________.

An easier way to graph a tax

- No need to shift curves.
- Simply find place where demand is higher than supply by amount of tax.
- Demand curve shows total wage paid by employers (incl. tax).
- Supply curve shows net wage received by workers (excl. tax).

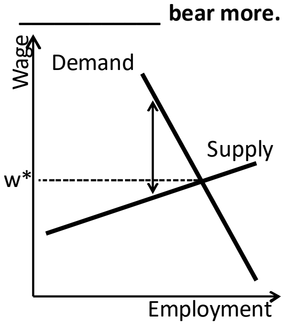


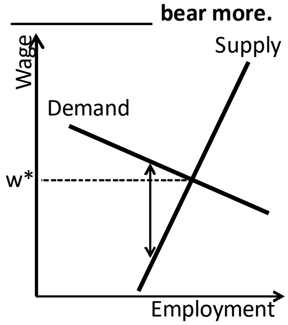
Who really bears burden of tax?

- True incidence of tax (who pays how much) does ________ depend on who is required to send the money to the government.
- Instead, depends on slopes of supply and demand curves.
- Side with __________ elastic (steeper) curve pays more of the payroll tax.

Side with less elastic curve bears more of the burden of the tax

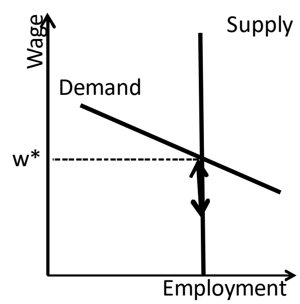
___________ **bear more.** ___________ **bear more.**





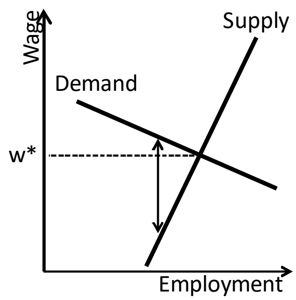
What if supply is perfectly inelastic?

- Suppose labor supply is perfectly inelastic (vertical).
- Then _____________ bear *all* of burden of the tax, regardless of how it is assessed.



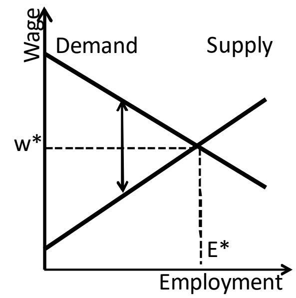
Who bears burden of U.S. payroll taxes?

- Labor supply of men is quite inelastic.
- So most of burden falls on ______________.



Efficiency effects of payroll taxes

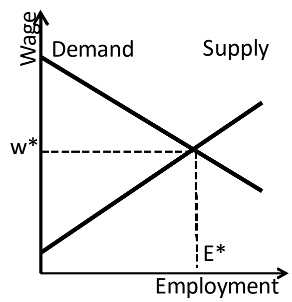
- Like all taxes, payroll taxes reduce quantity.
- Workers' take-home pay is now __________ than value of their marginal product.
- Some workers will stop working.



Total surplus without a tax

Without a payroll tax,

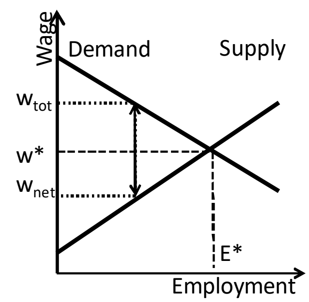
- employers enjoy surplus between demand curve and w*.
- Workers enjoy surplus between w* and supply curve.



Loss of employer and worker surplus

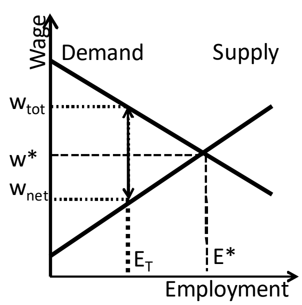
With a payroll tax,

- employers lose part of their surplus.
- workers lose part of their surplus.



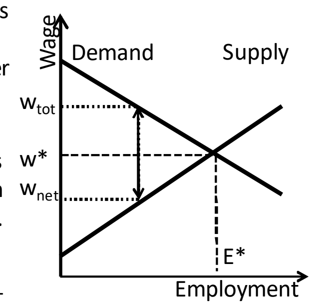
But the government collects payroll tax revenue

- Tax revenue
  = tax rate
  × new employment (E_T).



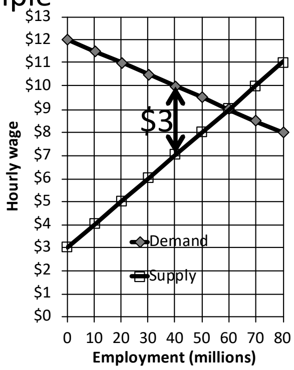
Deadweight loss from payroll tax

- Note that tax revenue is ___________ than loss of employer and worker surplus.
- Put differently, employers and workers lose ____________ than amount they pay gov't.
- Additional amount is called _______________ loss.



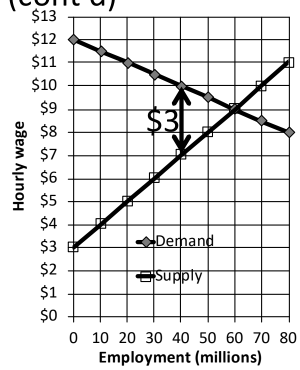
Efficiency effects of payroll taxes: example

- Employment decreases to ______ million.
- Employer surplus decreases by $_______ million.
- Worker surplus decreases by $_______ million.



Efficiency effects of payroll taxes: example (cont'd)

- The government collects $________ million in payroll tax revenue.
- Deadweight loss = = 100 + 50 – 120 = $_______ million.



Payroll taxes in the U.S.

- Social Security (OASDI) tax rate is currently 6.2%. Medicare (HI) tax rate is 1.450%.
- Paid by both workers and employers, so total tax rate = 2 × (6.2% + 1.450%) = _________%.
- Social Security tax paid on all wages (and self-employed earnings) up to a limit, which is adjusted each year. As of 2020, limit = $_______________.
- Medicare tax has no limit.

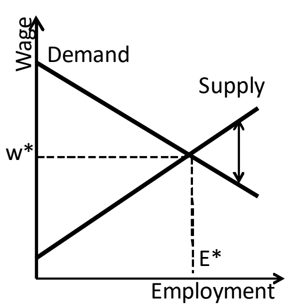
Payroll taxes in the U.S. (cont'd)

Other U.S. payroll taxes include…

- Workers compensation, which funds insurance for injuries on the job (paid by ___________).
- Unemployment insurance (paid by _________________).
- State and federal personal income tax (paid by _________________).

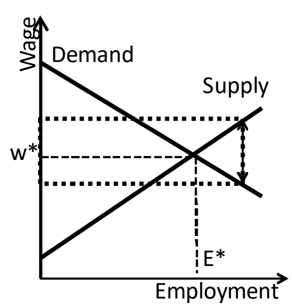
Payroll subsidies

- A simple payroll subsidy acts like a negative tax.
- Employment _______________.
- Total wage received by workers ___________.
- Net wage paid by employers __________.



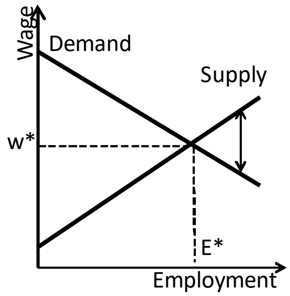
Efficiency effects of payroll subsidies

- Both sides would enjoy some of the benefit, depending on slopes of curves.
- Worker surplus increases.
- Employer surplus increases.



Efficiency effects of payroll subsidies

- But government's cost of subsidy program is greater than the increase in worker and producer surplus.
- Difference is deadweight loss.



Payroll subsidies in U.S.

- Payroll subsidies paid to employers have been targeted toward particular groups of workers for a particular time period.
- Usually include cap on total amount gov't pays.
- Subsidy programs (except EITC*) have had little effect on employment because
  (1) employers ____________ of program;
  (2) employers may be _____________ of hiring targeted workers.

* Earned Income Tax Credit is paid to workers, not employers.

Conclusions

- Payroll taxes ________________ employment and wages, and cause deadweight social loss.
- Tax burden falls on both sides of the market, regardless of how tax is assessed. Side with ____________ elastic curve bears more of burden.
- Payroll subsidies __________________ employment and wages, but still cause deadweight loss.

MANDATED BENEFITS

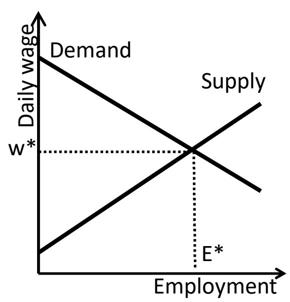
- How do mandated benefits affect labor markets?

Mandated benefits

- A mandated benefit is a benefit for workers that employers are required by law to provide.
- Example: Suppose the government required that all employers give workers free bus passes.
- What are the effects on labor supply and demand?

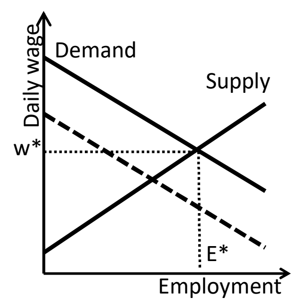
Effect on labor market of mandated benefit NOT valued by workers

- Suppose workers do not value the benefit.
- No change in labor supply.
- But total labor cost per worker now increases by cost of bus pass.
- So labor demand shifts ______ by cost of pass.



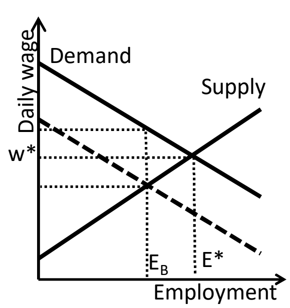
Mandated benefit NOT valued by workers is just like payroll tax

- Employment ______________.
- Total labor cost per worker paid by employers (including benefit) ______________.
- Wage received by workers ______________.



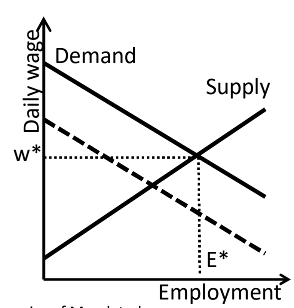
Mandated benefit NOT valued by workers is just like payroll tax (cont'd)

- Worker and employer surplus both decline.
- Even if the mandated benefit is worth its cost (because, say, it reduces pollution) it causes __________________ in this market.



Effect on labor market of mandated benefit VALUED by workers

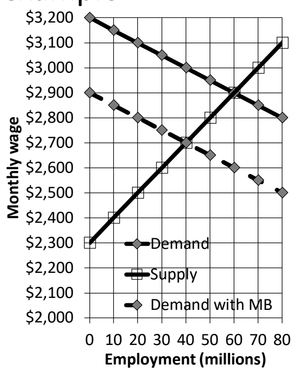
- Suppose workers value the bus pass a little.
- Labor supply shifts ____________ by their value of the bus pass.
- Employment decreases but not as much.



Lawrence H. Summers, "Some Simple Economics of Mandated Benefits," *American Economic Review,* Vol. 79 (May 1989), pp. 177-183.

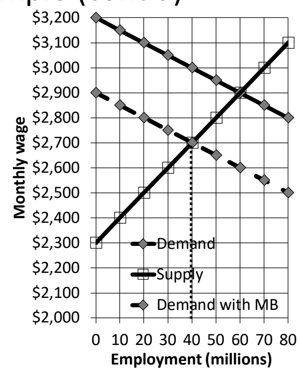
Mandated benefit NOT valued by workers: example

- Suppose gov't mandates that workers be given free health insurance.
- Suppose insurance costs employers $300 per worker per month.
- So monthly labor demand shifts down by $300.
- Employment decreases to _______ million.



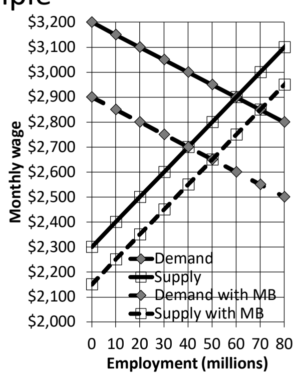
Mandated benefit NOT valued by workers: example (cont'd)

- Wage decreases to $ _________.
- Total labor cost per worker (including insurance) increases to $ _________.



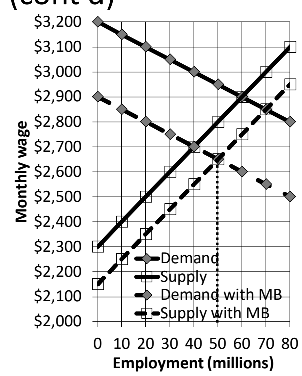
Mandated benefit VALUED by workers: example

- Suppose insurance is worth $150 to workers.
- Labor supply shifts down by $150.
- Employment decreases to _______ million.



Mandated benefit VALUED by workers: example (cont'd)

- Wage decreases to $ __________, but entire compensation package (including insurance) is worth $________ to workers.
- Total labor cost per worker (including insurance) = $_______.



Mandated benefits in U.S.

- Mandated health insurance first proposed by Clinton Administration.
- Later enacted in Affordable Care Act.
- Alternatively, government could have provided health insurance directly, paying for it with a payroll tax.
- If workers value health insurance, mandate should have _________ effect on employment than payroll tax.

Conclusions

- A mandated benefit acts like a tax, tending to ________________ employment and wages, and cause deadweight social loss.
- However, it has ____________ adverse effect if workers value the benefit.

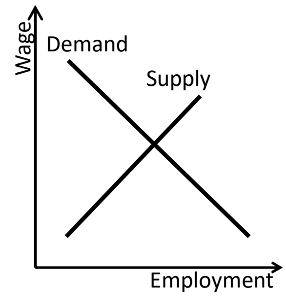
IMMIGRATION AND MARKET EQUILIBRIUM

- How does immigration affect labor supply?
- How does immigration affect labor demand?

Simplest model

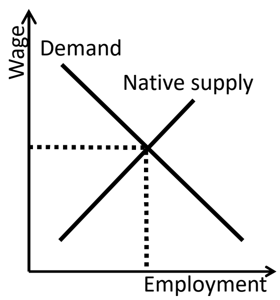
Simplest short-run model of immigration assumes

- Native workers and immigrants have same skills, are perfect _______________ in production.
- No change in labor demand.



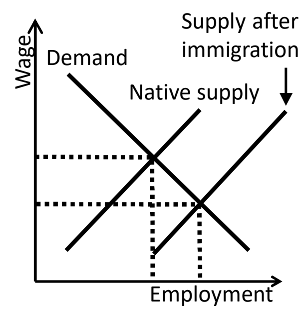
Implications of simplest model

- In short run, immigration shifts labor supply to the right.
- Wage _____________.
- Total employment _____________.



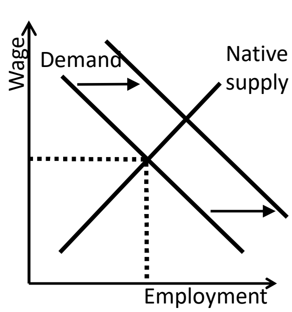
What happens to native workers?

- Some native workers withdraw from the labor force because of lower wages.
- Employment of natives _____________.
- Immigrants "take" jobs from natives.



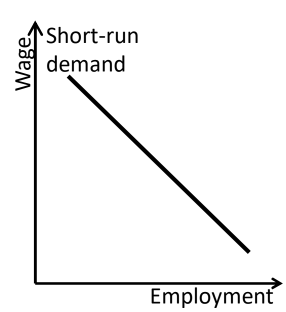
An alternative model

- Suppose native workers and immigrants have different skills, and are _______________ in production.
- Then immigration might boost demand for native workers.
- Wages and employment of natives might both _____________.



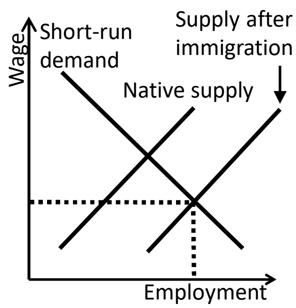
Does immigration affect labor demand too?

- Labor demand slopes down in simplest model because capital stock is assumed fixed.
- But if wage falls, then in long run, more capital will be attracted to the country.



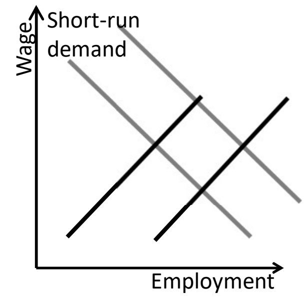
Long-run shifts in labor demand

- Increase in stock of capital stock boosts demand for other inputs to production, such as labor.
- In long run, demand shift might offset decrease in wages.



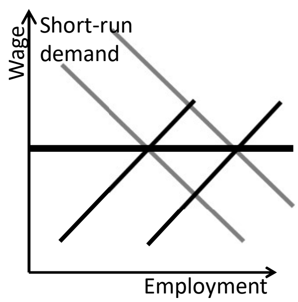
Long-run equilibrium

- Under plausible assumptions (constant returns to scale in aggregate production), enough capital will be attracted to restore wages to previous level.
- Long-run labor demand is horizontal (perfectly elastic).



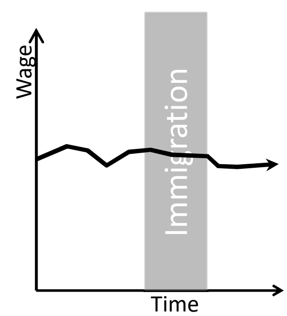
Conclusions from economic theory

- Immigration may lower wages of natives in short run.
- Immigration may have no effect on wages of natives in long run.
- But theory does not say how long till the "long run" arrives.



How to measure effects of immigration?

- Economic theory says immigration may decrease wages in the short run, but does not say how much.
- Can we measure how much from data?



Measurement from simple differences

Labor market	Avg wage before immigration	Avg wage after immigration	Difference
Market X	$10	$12	

- Could compare wages in some labor market before and after immigration.
- Could attribute any difference in wage to immigration.

Problems with simple differences

- Assumes that the wage before immigration would have continued in absence of immigration—that is, the first-period wage is the ___________________________.
- But other things could affect the wage even without immigration:

Fixing the simple difference approach

Labor market	1st period avg wage	2nd period avg wage	Difference	Difference-in-differences
Market X	$10	$12	$2	
Market Y	$8	$11	$3	

- Need a______________________, some labor market Y affected by these same things, but NOT by immigration.
- Compute effect of immigration as difference-in-differences (DID).

DID using spatial markets

- Many studies have compared cities affected by immigration with cities not affected.
- Usually find __________________ effect of immigration.
- But controls have been criticized. Cities that do not receive immigration from abroad sometimes receive internal migration.

DID using skill markets

- Some studies have compared skill markets (education levels) affected by immigration with skill markets less affected.
- Usually find some _________________ effect of immigration on wages.

Conclusions

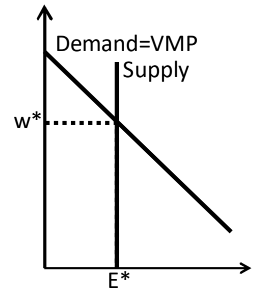
- The simplest short-run model predicts that immigration will cause the average wage to ____________, total employment to ____________, and employment of natives to ____________.
- However, theory predicts wages will be unaffected in the long run, whenever that is.
- Measurement of the effects of immigration requires a control group.
- Some studies find _______ effect of immigration on wages and some find a ______________ effect.

ECONOMIC BENEFITS FROM IMMIGRATION

- How much does the receiving country gain from immigration?

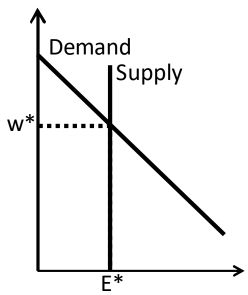
Assumptions

- Short run: demand for labor equals VMP and slopes down.
- Domestic and immigrant labor have perfectly inelastic (vertical) supply curves.
- Native and immigrant workers are perfect substitutes.



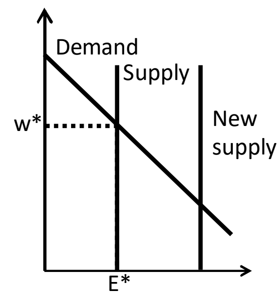
Surplus before immigration

- Employer surplus = area between demand curve and w*.
- Worker surplus
  = area between supply curve and w*
  = w* x E*
  = labor earnings.



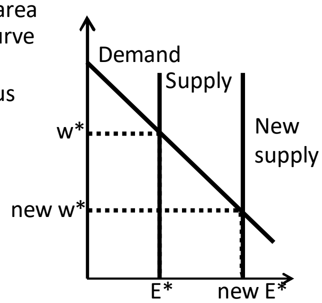
Effects of immigration

- Immigration shifts the supply curve to the right.
- After immigration, employment increases to “new E*” and wage decreases to “new w*”.



Surplus after immigration

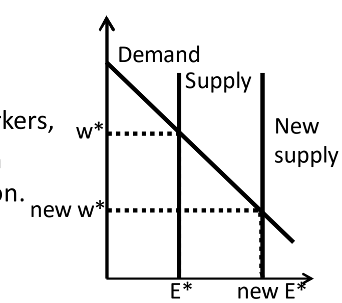
- Employer surplus = area between demand curve and new w*.
- Native worker surplus
  = new w* x E*
  = native worker earnings.
- Immigrant earnings
  = new w* x
  (new E* - E*).



Gain in employer surplus

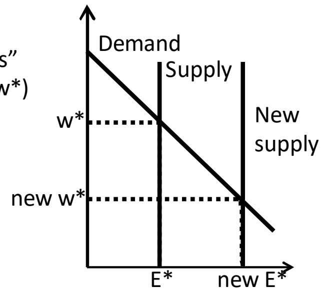
Gain in employer surplus is

- partly a transfer from native workers,
- partly a net gain from immigration.



Calculating immigration surplus

- Net gain from immigration = "immigration surplus" = (1/2) × (w* - new w*) × (new E* - E*) = (1/2) (Δw) (ΔE)



Immigration surplus as percent of national income

"immigration surplus" / national income

= (1/2) (Δw) (ΔE) /national income

$= \left(\frac{1}{2}\right)\left(\frac{\Delta w}{w}\right)\left(\frac{\Delta E}{E}\right)\left(\frac{wE}{national\ income}\right)$

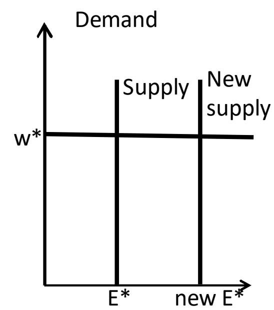
$= \left(\frac{1}{2}\right)$

Estimating immigration surplus as a percent of national income

- Immigration in the U.S. has resulted in
  - % chg w = about 3.5%
  - % chg E = about 10%
- Labor's share of national income = about 0.7.
- So "immigration surplus"/national income = (1/2) (3.5%) (10%) (0.7) = ________ percent.

Immigration surplus in the long run

- In long run, K is not fixed and VMP does not slope down.
- Wage and rate of return to capital ____ affected by immigration.
- Immigrants increase GDP, but entire increase is paid to them.
- Immigration surplus = __________.



Conclusions

- In short run, immigration increases employment and decreases the wage in the receiving country.
- But increase in employer surplus is __________ than decrease in worker surplus.
- Short run "immigration surplus" = = (1/2) (Δw) (ΔE) .
- Long run "immigration surplus" = __________.

THE COBWEB MODEL OF LABOR MARKETS

- Why do some professional labor markets experience boom-bust cycles?

Booms and busts

- Some labor markets do not seem to converge quickly and directly to equilibrium.
- Markets for engineers and some other highly-skilled fields seem to go through periods of booms and busts.
- In booms, wages are _________, jobs are plentiful, and workers are scarce.
- In busts, wages are __________, jobs are scarce, and workers seem plentiful.

A model of booms and busts

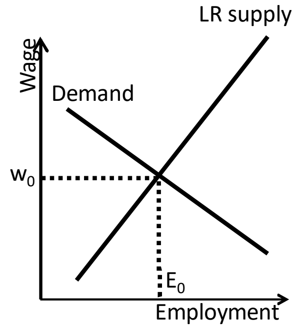
- A competitive model of supply and demand, with two additional assumptions:

(1) It takes time to educate a new engineer. Thus, short-run supply is very inelastic.

(2) People decide whether to become engineers based only on pay levels prevailing at the time they enter engineering school—years before they look for a job.

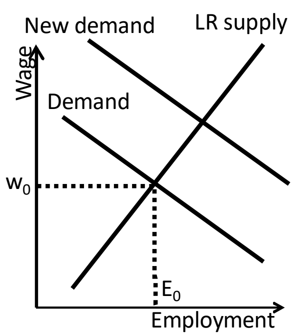
Initial equilibrium and sudden boom

- Initially, market for engineers is in long-run equilibrium.
- Then demand shifts out suddenly—perhaps because of a new space or defense program.



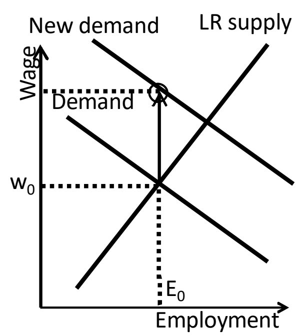
Short-run response to boom

- New engineers take time to train.
- In short run, supply is therefore perfectly inelastic.
- Competition for existing engineers causes the wage to shoot up.



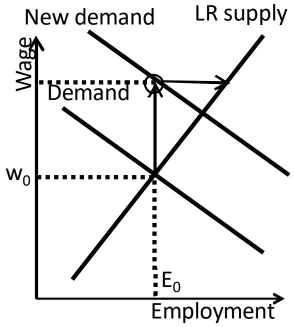
Medium-run response to boom

- High wage encourages more people to enter engineering schools, as shown by the LR supply curve.
- Years later, they graduate and enter labor market.



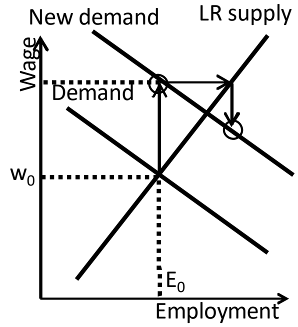
Bust

- When all these new engineers reach the market, they create excess supply.
- The wage falls to the demand curve.
- Engineers do not leave the market immediately because they cannot convert their skills to another occupation.



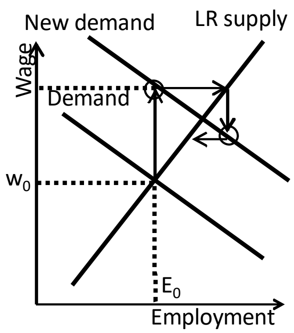
Medium-run response to bust

- Low wage discourages people from entering engineering school, as shown by the LR supply curve.
- Years later, few engineers enter the labor market.



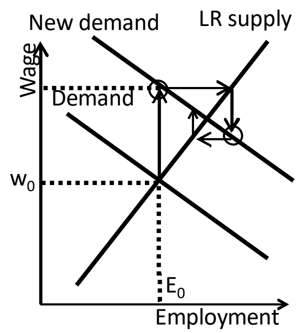
Boom starts again

- Scarcity of engineers causes excess demand.
- In the short run, supply is perfectly inelastic.
- Competition for existing engineers causes the wage to shoot up again.
- Etc.



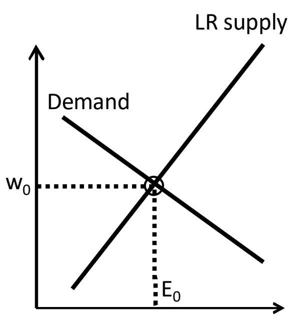
Long-run equilibrium

- Cycles of boom and bust repeat.
- Converge to new LR equilibrium provided supply is less elastic (steeper) than demand.



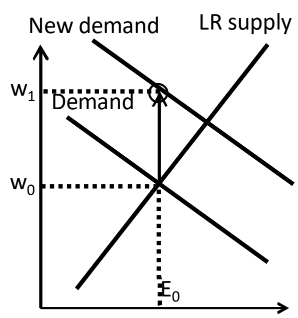
Algebraic example

- Suppose LR supply for computer scientists is $E_t = -200 + 100\ w_{t-1}$.
- Suppose initial demand is $w_t = 50 - 0.005\ E_t$.
- Solve jointly for initial LR equilibrium:
  w_0 = $__________.
  E_0 = ___________.



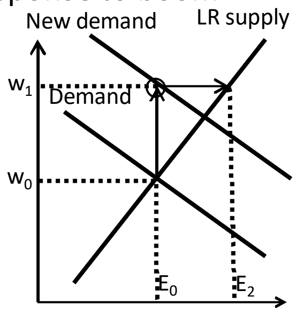
Algebraic example: initial boom

- Then suppose demand shifts up to $w_t = 100 - 0.005\ E_t$.
- E does not change in short run.
- Substitute E_0 to find new wage:
  $w_1 = 100 - 0.005\ (3200)$
  = $_______.



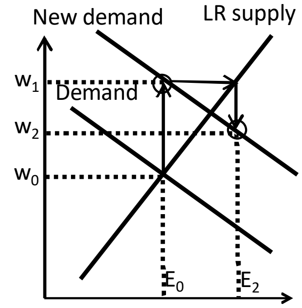
Algebraic example: medium-run response to boom

- High wage attracts more people to study computer science.
- Use supply equation to compute number of computer scientists supplied in MR at this high wage:
  E_2 = -200 + 100 (84)
  = ___________.



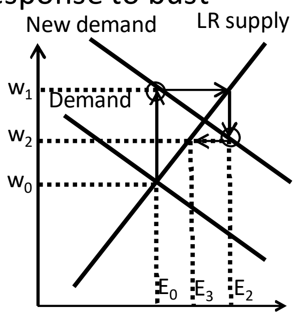
Algebraic example: bust

- This causes a glut of computer scientists.
- Excess supply forces wages down.
- Use demand equation to compute new wage:
  w_2 = 100 – 0.005 (8200)
  = $ ________.



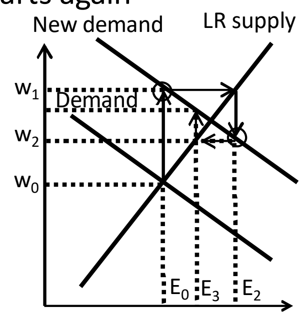
Algebraic example: medium-run response to bust

- Low wage discourages people from studying computer science.
- Use supply equation to compute number of computer scientists supplied in MR at this low wage:
  E_3 = -200 + 100 (59)
  = __________.



Algebraic example: boom starts again

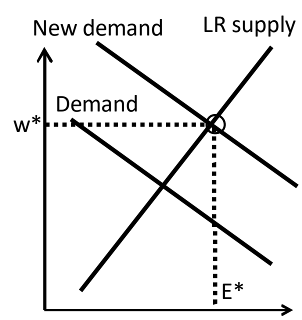
- When so few computer scientist in the market, the wage shoots up.
- Use demand equation to compute new wage:
  w_3 = 100 – 0.005 (5700)
  = $ ________.



Booms and busts in cobweb model

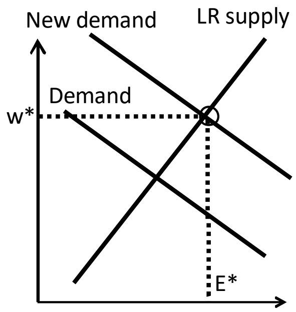
Long-run equilibrium

- To find new LR equilibrium, solve new demand and LR supply jointly, ignoring time subscripts ($_t$).
- New demand:
  w = 100 – 0.005 E.
- LR supply:
  E = -200 + 100 w .



Long-run equilibrium (cont'd)

- Substitute:
  w = 100 – 0.005
  (-200 + 100 w).
- w* = $ __________ .
- E* = ____________ .



A "cobweb model"

- Graph of boom-bust cycle inspired the term "cobweb model."
- Assumption (2) is controversial:
  - Why can't people see the cycle?
  - Why don't people take a longer view in deciding whether to enter a profession?
- Nevertheless, there is clear evidence of cycles in many professional markets.

Conclusions

- Some professional labor markets seem to experience boom-bust cycles.
- One model of cycles assumes
  1) it takes time to train for the profession, and
  2) people decide whether to train based only on pay levels prevailing ______________________ ______________________.
- The resulting "cobweb model" approaches equilibrium slowly, in ______________ cycles.

MONOPSONY IN THE LABOR MARKET

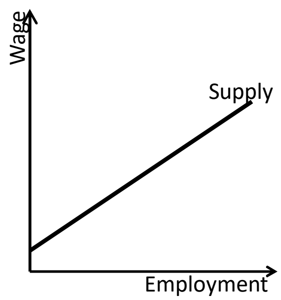
- How does a firm behave if it faces upward-sloping labor supply?

Definition of monopsony

- Monopsony = “single ____________.”
- Contrast with monopoly = “single seller.”
- An employer that is a monopsony has the labor market to itself.
- It does ________ take the wage as given.
- However, we assume that it pays all workers the __________ wage—not a “discriminating monopsonist.”

Market power of monopsonist

- It cannot hire all the labor it wants at a constant market wage.
- It must recognize that if it wants to hire more labor, it must __________ the wage.



Marginal labor cost

- Marginal labor cost = MLC
  = increase in labor cost (wE) that results from hiring one more unit of labor
  = Δ(labor cost) / ΔE .
- If the wage is taken as given at, say \$5, then MLC = \$5.
- However, if the wage increases the more workers are hired, then MLC > \$5.

Marginal labor cost for a firm that takes wage as given

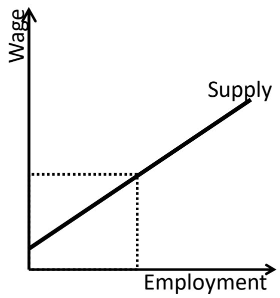
w	E	Labor cost	MLC = Δ(labor cost) / ΔE
\$5	10		
\$5	20		
\$5	30		
\$5	40		
\$5	50		
\$5	60		
\$5	70		

Marginal labor cost for a monopsonist

w	E	Labor cost	MLC = Δ(labor cost) / ΔE
\$5	10		
\$6	20		
\$7	30		
\$8	40		
\$9	50		
\$10	60		
\$11	70		

Labor cost and marginal labor cost (MLC)

- Labor cost = w × E
  = area of rectangle .
- Marginal labor cost
  = change in this area as E increases by one.
- So why is MLC > wage?

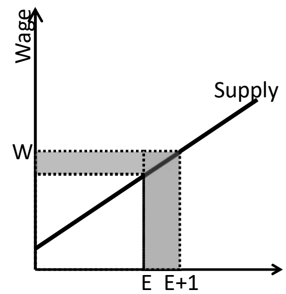


Marginal labor cost when supply slopes up

MLC has two parts:

1) wage paid next worker (# E+1).
2) increase in wages paid to all E existing workers.

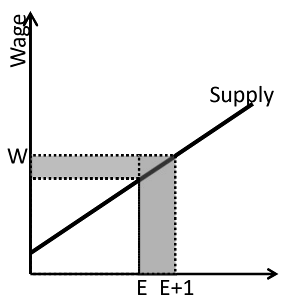
(Second part is zero for a wage taker.)



A formula for marginal labor cost

1) wage paid next worker (# E+1) = W
2) increase in wages paid to all E existing workers = E × ΔW
   = E × (ΔW/ ΔE)
   since here ΔE = 1.

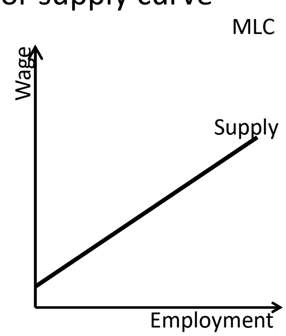
So MLC =
___________________.



Marginal labor cost for straight-line labor supply curve

- Suppose labor supply curve is straight line:
  W = a + bE .
- Slope = ΔW/ΔE = _____.
- MLC = W + E (ΔW/ΔE)
  = (a + bE) + E b .

  = ______________.



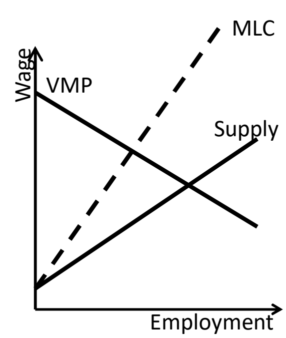
MLC has same intercept and twice the slope as labor supply curve*

Labor supply	Marginal labor cost
W = 5 + (E/100)	MLC =
W = 2 + (E/2000)	MLC =
W = 1 + 0.03 E	MLC =

* If labor supply curve is a straight line.

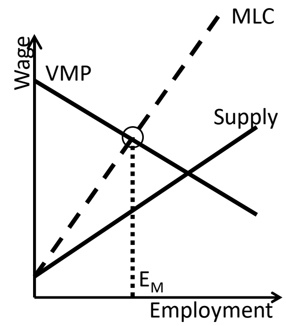
Profit maximization

- Firm hires labor to the point where the contribution of last worker to revenue = contribution to cost.
- In other words, choose E so that VMP = MLC .



Monopsony wage < VMP

- Firm does NOT need to pay w = VMP.
- Instead it pays the lowest wage it can pay, while still hiring E_M workers.
- Wage is on __________ curve, not VMP curve, and not MLC curve.



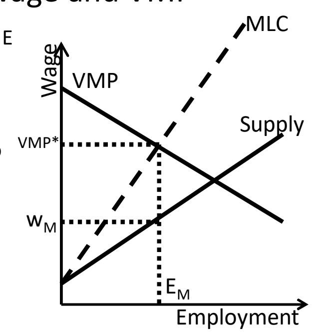
Marginal labor cost and the elasticity of labor supply

- We showed that MLC = w + E (Δw/ΔE).
- This can be rearranged as follows.

$$MLC \quad = w + \left(\frac{w}{w}\right) E \left(\frac{\Delta w}{\Delta E}\right)$$
$$= w + w\left(\frac{\Delta w/w}{\Delta E/E}\right)$$
$$= w + w\left(\frac{\%\ change\ w}{\%\ change\ E}\right) =$$

Measuring the gap between wage and VMP

- Recall that firm chooses E so that VMP = MLC $= w + w\,(\varepsilon_E{}^S)^{-1}$.
- Subtract w from both sides and divide by w to get $\frac{\text{VMP}}{w} =$.
- So % gap between wage and VMP = _______________ of elasticity of labor supply.



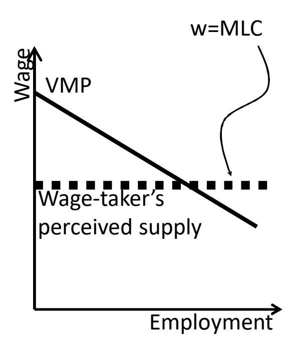
What does the gap mean?

- $\frac{\text{VMP}}{w} = \left(\boldsymbol{\varepsilon_E{}^S}\right)^{-\mathbf{1}}$ was called the "rate of __________________" by famous economist A.C. Pigou.*
- It measures how bad monopsony is.
- Similar to "Lerner index" of market power in product markets.

*Arthur C. Pigou, 1924, *The economics of welfare*. 2nd ed., London: Macmillan and Co., 1924, p. 754.

Comparison with "wage takers"

- Employers without monopsony power perceive their supply curve to be horizontal: $\left(\boldsymbol{\varepsilon_E{}^S}\right) = \infty$.
- So their "rate of exploitation" = $\left(\boldsymbol{\varepsilon_E{}^S}\right)^{-\mathbf{1}}$ = ________

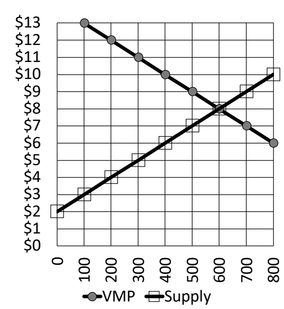


Example

Assumptions

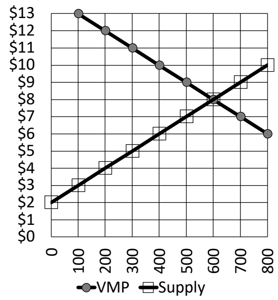
- VMP (labor demand) is W = 14 – (E/100).
- Supply is W = 2 + (E/100).

Then competitive wage W_C = $______ and efficient employment E_C = ______.



Example: monopsony

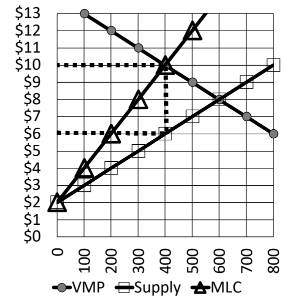
- Given supply is
  W = 2 + (E/100),
  MLC = ______________.
- Set VMP = 14 – (E/100) = MLC and solve to find E = ________.
- Use supply equation to find W = $_______.



Example: Pigou's rate of "exploitation"

- $\frac{\text{VMP}-w}{w} =$

  __________________.



Examples of simple monopsony

- Isolated "company towns"?
  - Mining camps
  - Logging camps
  - Paper manufacturing towns
- But employers may not have had much market power. Workers in such camps are often very mobile.

Monopsony throughout the labor market

- Recently, some economists have suggested that employers have monopsony power whenever the job search process is slow.
- Employers will ________ lose all their workers immediately if they pay less than other employers.
- Thus every employer confronts slightly _______________-sloping supply of labor, at least in the short run.

Monopsony through collusion

- Another possibility is that groups of employers cooperate in hiring workers and setting wages.
- May succeed in pushing wages below VMP, though perhaps not all the way down to monopsony wage.

Conclusions

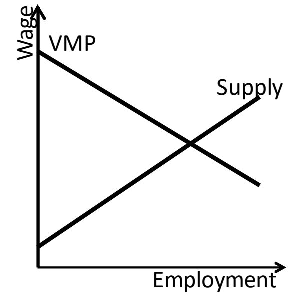
- A labor monopsonist is an employer who confronts ________________________ supply of labor.
- A monopsonist hires until its VMP = its marginal labor cost. But both of these are greater than the monopsonist's wage.
- So a monopsonist pays a ____________ wage and hires ____________ workers than an employer who takes wage as given.

WELFARE ANALYSIS OF MONOPSONY

- Why is monopsony economically inefficient?

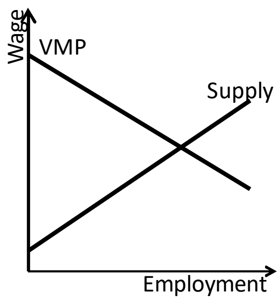
Efficient employment

- Efficient level of employment is where value of marginal product = opportunity cost of marginal worker's time.
- That is, where VMP curve intersects labor __________ curve.



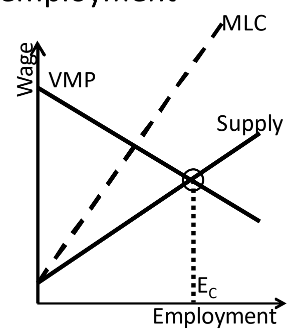
Competitive labor markets

- Competitive employers are "wage _________."
- They hire workers until w = VMP.
- So competitive labor markets are efficient and maximize _______ surplus.



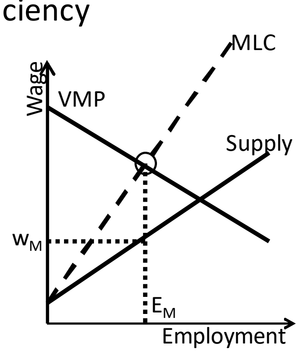
Monopsony employment < competitive employment

- But monopsonists do not take the wage as given.
- Monopsony ___________________ employment below efficient level.
- There is less social surplus.



Monopsony creates economic inefficiency

- Because too little labor is hired, there is deadweight loss from monopsony.
- Some workers whose VMP > opportunity cost of their time are not hired.



Conclusions

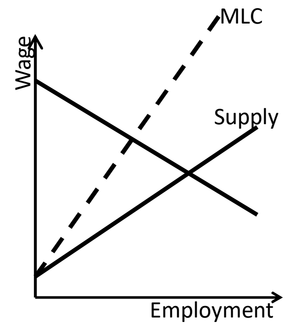
- Labor monopsony is inefficient because too __________ workers are hired.
- Unlike in a competitive market, some workers whose VMP at work is greater than opportunity cost of their time are not hired.
- Monopsony therefore _______________ the total surplus in a labor market.

EFFECT OF MINIMUM WAGE ON MONOPSONY

- How does a monopsony employer respond to a minimum wage?

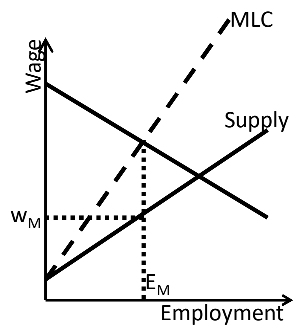
Monopsony: review

- Single buyer in a labor market.
- Faces upward-sloping supply of labor.
- Hires workers until VMP = MLC.
- Hires fewer workers and pays lower wage than employer who takes wage as given.



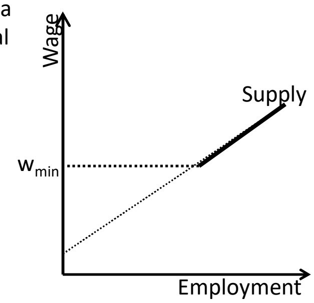
Minimum wages and monopsony

- Minimum wage laws affect monopsonies differently from competitive labor markets.
- This is because monopsony outcome is on labor ____________ curve, not labor demand curve.



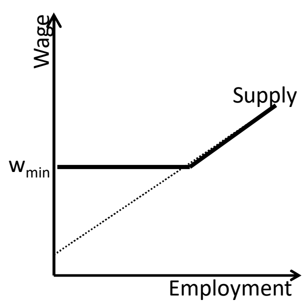
Minimum wage puts kink in monopsonist's labor supply curve

- Employer may not pay a wage less than the legal minimum.
- Thus monopsonist's labor supply curve is horizontal at w_{min} .



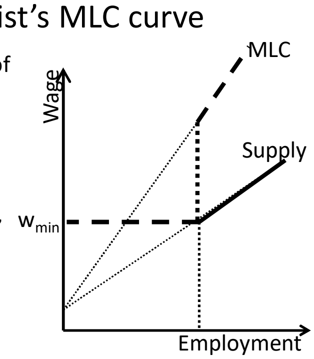
Minimum wage changes marginal labor cost

- At low end of supply curve, min. wage is binding.
- At low end of supply curve, employer need ________ raise wage to hire more workers.
- At low end of supply curve, MLC = w_{min} .



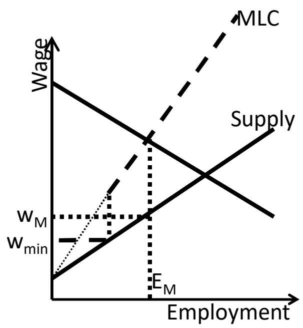
Minimum wage puts "jump" in monopsonist's MLC curve

- To left of intersection of supply and min. wage, monopsonist MUST take wage as given, so MLC = minimum wage.
- To right of intersection, MLC is as before.
- MLC "jumps" at intersection.



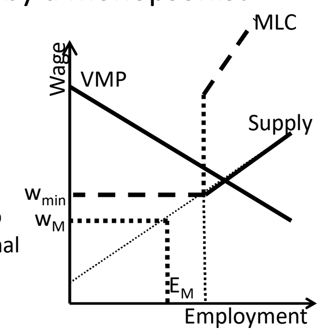
Effect of very low minimum wage

- Suppose min. wage is lower than what monopsonist would otherwise pay: $w_{min} < w_M$.
- Min. wage is ________ binding.
- Then the minimum wage will have _______ effect.



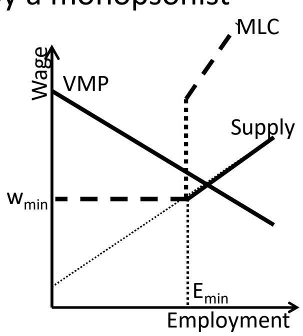
Effect of modest minimum wage on employment by a monopsonist

- Suppose min. wage is slightly higher than what monopsonist would otherwise pay: $w_{min} > w_M$.
- Then VMP intersects MLC at jump point, to ___________ of original employment level.



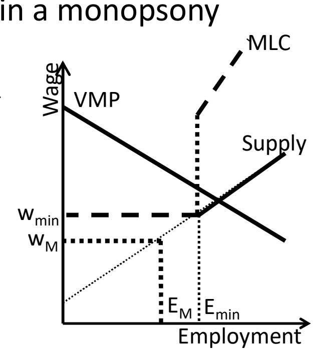
Modest minimum wage INCREASES employment by a monopsonist

- Minimum wage pushes market up supply curve.
- As long as minimum wage is less than efficient wage, it tends to ___________ employment.



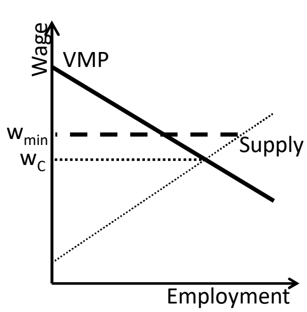
Modest minimum wage DECREASES inefficiency in a monopsony

- Because more labor is hired, there is _______ deadweight loss.
- More workers whose VMP > value of their time are hired.



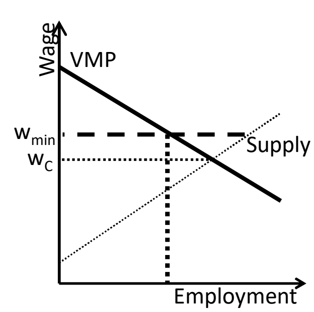
But high minimum wage can DECREASE employment

- As in any price control, quantity is either quantity demanded or quantity supplied, whichever is _______________.
- Once min. wage > efficient wage, then __________ curve is binding.



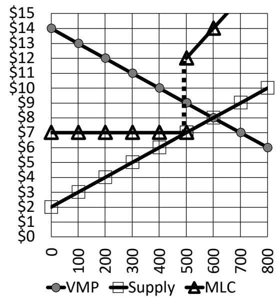
Very high minimum wage

- Further increases in min. wage cause employment to ______________.



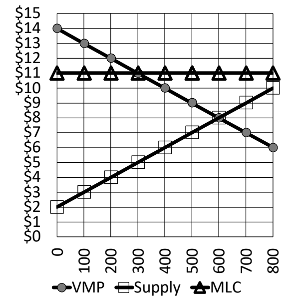
Example: monopsony with modest minimum wage

- Suppose minimum wage is set at $7.
- Now monopsonist's MLC "jumps" at 500.
- Min. wage increases employment from 400 to _______ and increases wage from $6 to $______.



Example: monopsony with high minimum wage

- Suppose minimum wage is set at $11.
- Now $11 > W_C = $8, so ___________ curve is binding.
- Employment falls to ________.



Conclusions

- A modest legal minimum wage causes a monopsonist to _______________ pay *and* employment.
- This _______________ economic efficiency.
- But a minimum wage higher than the efficient wage ______________ employment even in a monopsony.

DETECTING MONOPSONY

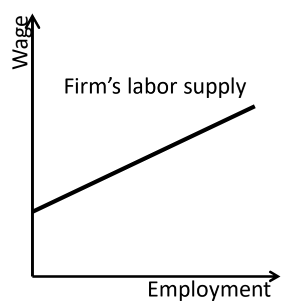
- How can we tell if employers have monopsony power?

Competitive labor market or monopsony?

- Difficult to tell whether a labor market is a monopsony from just looking at wage data.
- Low wages can occur in both competitive and monopsony labor markets.
- Researchers have used a variety of statistical methods to detect monopsony.

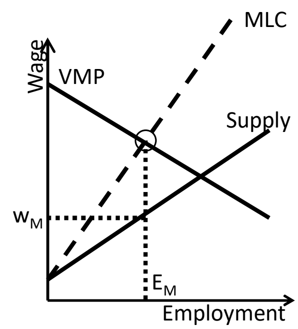
Method 1

- Try to measure labor supply curve to an __________________.
- $\text{Ln}(W) = \beta_1 + \beta_2 \ln(E)$
- Here, $\beta_2 = (\varepsilon_E{}^S)^{-1}$, Pigou's "rate of exploitation," which = 0 if firm is a competitor.



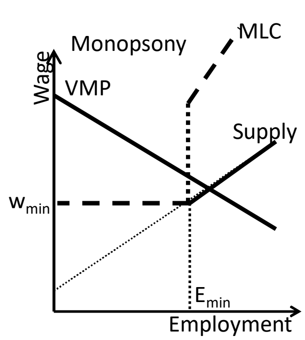
Method 2

- Try to measure gap between VMP and wage.
- Gap = 0 if a competitor, > 0 if a _____________.
- Challenge is how to measure VMP of an individual worker.



Method 3

- Try to measure the effect of an increase in the minimum wage on employment.
- $\text{Ln}(E) = \beta_1 + \beta_2 \ln(\text{minW})$
- A wage increase should ________ employment in a competitive market but _____________ employment in a monopsony.



Method 4

- Try to measure the effect of employer "concentration" in local labor markets on local wages.
- A labor market is "concentrated" if it is dominated by a few large employers.
- $\text{Ln}(W) = \beta_1 + \beta_2\, C$
- Here, C is some measure of employer concentration, such as __________________ _____________________.

Conclusions

- Researchers have used a variety of statistical approaches to detecting monopsony.
- They don’t simply look for low wages.
- Instead they focus on the differences between how competitive and monopsony labor markets behave, according to theory.

EMPLOYER COLLUSION

- Do employers ever cooperate to exert monopsony power?

Adam Smith on employer collusion

"We rarely hear, it has been said, of the combinations of masters [employers]; though frequently of those of workmen. But whoever imagines, upon this account, that masters rarely combine, is as ignorant of the world as of the subject. Masters are always and everywhere in a sort of tacit, but constant and uniform combination, not to raise the wage of labour above their actual rate. To violate this combination is everywhere a most unpopular action, and a sort of reproach to a master among his neighbours and equals."

Adam Smith, *An Inquiry in the Nature and Causes of the Wealth of Nations*, Volume 1, Strahan, 1776, pp. 81-82.

Modern examples of employer collusion

1) Reserve clauses in professional sports.
2) "No-poaching" agreements between employers.
3) "Noncompete" clauses in employment contracts.

1) Reserve clauses in professional sports contracts

- Beginning in 1879, major leagues required each baseball player to negotiate with only ___________ team.
- Clause included in player contracts.*
- Eliminated in 1970s through collective bargaining with Major League Baseball Players Association. Pay rose rapidly.
- Similar rules in football, basketball, hockey, and soccer.

* U.S. Supreme Court held in 1922 that baseball not subject to antitrust laws. Federal Baseball Club v. National League (259 U.S. 200)

2) "No-poaching" agreements

- Employers agree not to compete for workers.
- Example: from 2005-09 Apple, Google, Adobe, Intel, Intuit, Pixar, and Lucasfilm agreed orally not to poach each others' technical workers.
- Steve Jobs said, "If you hire a single one of these people that means war!" according to Sergey Brin.*

* http://money.cnn.com/interactive/technology/apple-google-adobe-intel-case/index.html?iid=EL pp. 11-12.

Antitrust complaint filed by Dept of Justice

- In 2010, U.S. Department of Justice filed a complaint, alleging the companies had agreed not to "cold call" each other's employees.
- In settlement with DOJ, companies abandoned those agreements.

Dept of Justice Office of Public Affairs, "Justice Department Requires Six High Tech Companies to Stop Entering into Anticompetitive Employee Solicitation Agreements," September 24, 2010.
https://www.justice.gov/atr/case/us-v-adobe-systems-inc-et-al

Lawsuit by Silicon Valley employees

- Firms were sued 2011 by employees under Section 1 of Sherman Antitrust Act.
- Expert witness economist Edward Leamer estimated damages at $3.05 _____________ in lost wages.
- Eventually settled for $415 million. 64,000 workers received about $5,800 each.
- Since then, "poaching" has become common.

http://www.telegraph.co.uk/technology/news/11843237/Apple-Google-and-others-to-pay-415m-to-settle-Silicon-Valley-no-poaching-lawsuit.html

"No poaching" clauses in franchise agreements

- Recent study found that 58% of franchise contracts with major chains include "no poaching" clauses.
- Franchisee agrees not to hire workers who have worked recently for another franchisee in the same chain.
- Examples include McDonald's, Burger King, Jiffy Lube, and H&R Block.

Krueger, A. B., & Ashenfelter, O. (2017). *Theory and evidence on employer collusion in the franchise sector*. Working paper. Industrial Relations Section. Princeton University. Princeton, NJ. https://ideas.repec.org/p/pri/indrel/614.html

Legal status of "no poaching" agreements

- Agreements among employers not to recruit certain employees or not to compete on terms of compensation are ____________ under Section 1 of the Sherman Antitrust Law.
- Exchanging salary information is legal only if information is aggregated so as not to reveal salaries at particular employers.

Dept of Justice and Federal Trade Commission, "Antitrust Guidance for Human Resource Professionals," October 2016.
https://www.justice.gov/atr/file/903511/download

3) "Non-compete" agreements

- Employees required to promise not to work for competing employers after leaving.
- Example from Amazon:
  " . . . for 18 months after the Separation Date, Employee will not . . . engage in or support the development, manufacture, marketing, or sale of any product or service that competes or is intended to compete with any product or service sold, offered, or otherwise provided by Amazon . . . "*

*Starr, Evan P.; Norman Bishara and J. J. Prescott. 2015. "Noncompetes in the U.S. Labor Force," presented at Western Economic Association Annual Meeting, San Diego, July 2017. This example is required of temporary packers and permanent engineers.

Legal status of "non-competes"

- Apparently legal under antitrust law.
- Enforceability varies according to state law.
- May have some legitimate use—to protect trade secrets.
- But many workers signing "non-competes" are low-level workers who do not have access to trade secrets.

U.S. Department of the Treasury, "Non-Compete Contracts: Economic Effects and Policy Implications," March 2016. https://www.treasury.gov/resource-center/economic-policy/Documents/UST%20Non-competes%20Report.pdf

Conclusions

- Employers do sometimes cooperate.
- In professional sports, a reserve clause formerly tied players to individual teams. After it disappeared, teams had to compete for players and pay rose.
- No-poaching agreements between employers are sometimes used to suppress competition, but they are ____________ under antitrust law.
- Non-compete agreements between employers and employees are legal but not always enforceable.

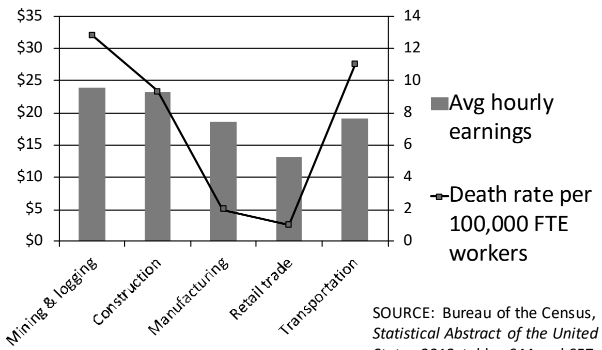
COMPENSATING WAGE DIFFERENTIALS

- Why are workers paid wage differentials for taking risky jobs?
- What determines the equilibrium wage differential?

Variation in job characteristics

- The wage is not the only job characteristic that workers care about.
- Workers also care about ___________________
____
____
____
- Different workers may like or dislike these characteristics.
- But most workers dislike the risk of injury or death.

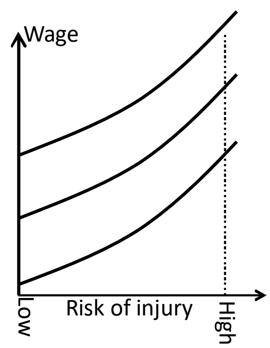
Wage and risk of death on the job



SOURCE: Bureau of the Census, *Statistical Abstract of the United States 2012*, tables 644 and 657.

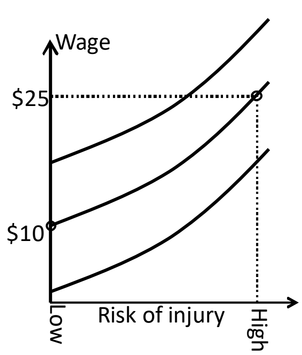
Worker preferences

- Assume workers like wages but *dislike* risk of injury on the job.
- Utility = f(w, risk).
- Then workers' indifference curves must slope ________.
- Jobs on the same indifference curve are equally desirable.



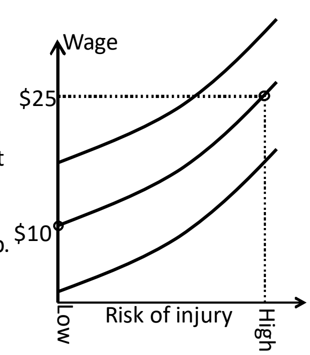
Wage versus risk

- Suppose this person already held a low-risk job with wage $10.
- She/he would only switch to a high-risk job if the wage were at least $ _______.



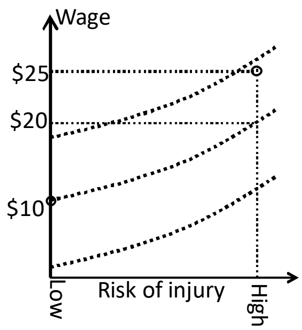
Reservation price of job risk

- Thus for this person, the *reservation price* of job risk = $25 - $10 = $ _________.
- She/he requires at least a compensating wage differential of $ ______ to take the high-risk job.



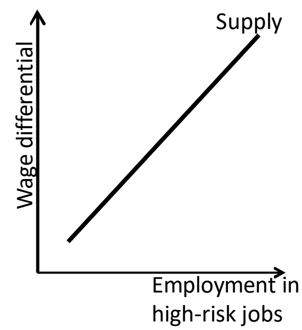
Reservation price of job risk

- Different workers have different preferences, and higher or lower reservation prices for high-risk jobs.
- For example, this worker's reservation price is only $ _______.



Supply of workers to high-risk jobs

- The higher the wage differential, the ___________ workers are willing to take high-risk jobs.
- Supply of workers to high-risk jobs thus slopes ________.



Firms' costs of reducing risk

- If it cost firms nothing to reduce risk, they would do so immediately (so they could avoid paying the wage differential).
- But reducing many risks is costly.
  - Out-of-pocket costs: purchasing or renting helmets, protective gloves, screens, barriers, etc.
  - Lower productivity: doing things the slow and careful way, inspecting machinery frequently, etc.

Pay to reduce risk or pay the wage differential?

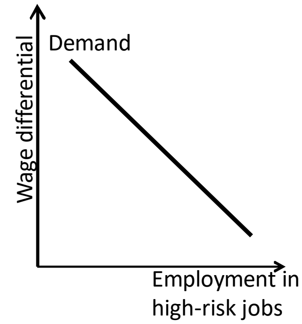
- Suppose a firm can convert a job from high-risk to low-risk by renting safety equipment at a cost of $10.
- If wage differential is _____________ than $10, the firm will rent the equipment.
- If wage differential is _____________ than $10, the firm will pay the wage differential instead of renting the equipment.

Pay to reduce risk or pay the wage differential? (cont'd)

- This firm will hire a worker for a high-risk job only if wage differential is less than $ ______.
- Other firms might have higher or lower costs of converting jobs from high-risk to low-risk.
- For example, if another firm can reduce risk only at a cost of $5, it would be willing to pay a wage differential only up to $ _______.

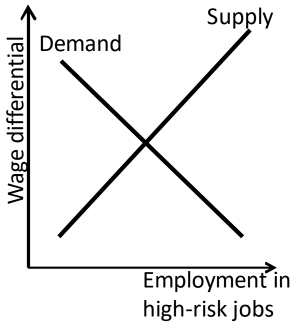
Demand for workers in high risk jobs

- The lower the wage differential, the ___________ workers that firms want to hire for high-risk jobs.
- Demand for workers in high-risk jobs thus slopes _________.



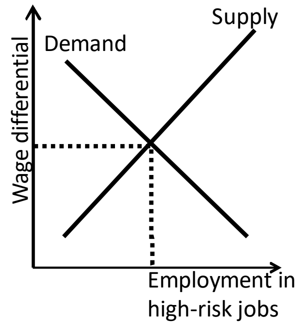
Equilibrium

- At equilibrium wage differential, number of workers willing to take high-risk jobs = number of high-risk jobs offered by firms.



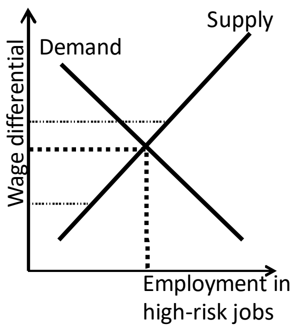
What does the equilibrium wage differential equal?

- It equals reservation price of ____________ high-risk worker (last to be hired).
- It equals the amount required to attract the marginal (last) worker into a high-risk job.



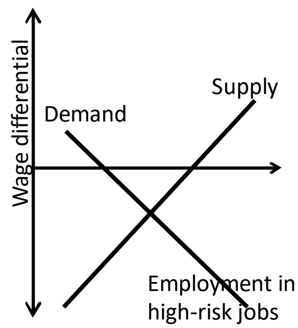
What does the equilibrium wage differential NOT equal?

- It does ________ equal the average reservation price of all workers in the economy.
- It also does ________ equal the average reservation price of all workers in high-risk jobs.



Could the equilibrium wage differential be *negative*?

- If many workers liked risk, supply curve would be lower and equilibrium wage differential could be ________________.
- Seems unlikely for risk of injury.
- Perhaps possible for other job characteristics such as frequent travel.



Adam Smith on compensating differentials

"The whole of the advantages and disadvantages of the different employments of labour and stock must, in the same neighbourhood, be either perfectly equal or continually tending to equality."

Smith, A. (1937). *An inquiry into the nature and causes of the wealth of nations.* New York: Modern Library, p. 99.

Conclusions

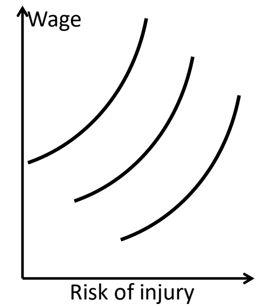
- Workers dislike job risk, so they must be paid compensating wage ___________________ to take high-risk jobs.
- Risk reduction is costly, so firms are willing to pay wage differentials to attract workers to high-risk jobs.
- The equilibrium wage differential equals the ___________________________ of the marginal worker for taking a risky job.

HEDONIC EQUILIBRIUM

- How does the market create a continuous tradeoff between pay and job risk?

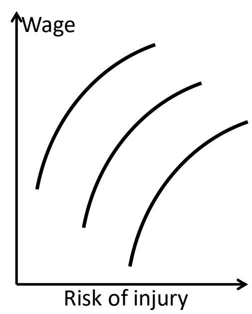
Worker preferences and risk of injury

- Assume workers like wages but *dislike* risk of injury on the job.
- Indifference curves, connecting equally desirable combinations, must therefore slope up.
- Different workers have slightly different preferences, however.



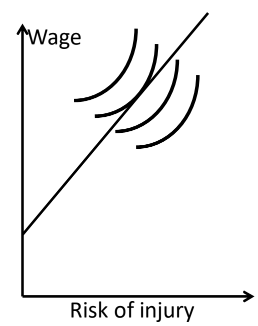
Firm profits and risk of injury

- Wages and safety are both costly for firm to provide.
- Isoprofit curves, connecting equally profitable combinations, must therefore slope up.
- Different firms have slightly different curves, however.



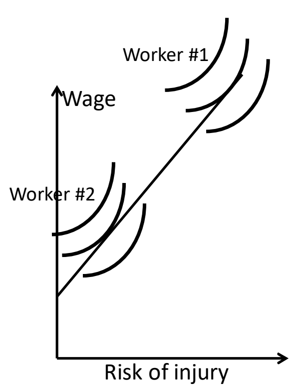
Workers in equilibrium

- *Hedonic equilibrium* is a market-determined wage-risk tradeoff curve.
- Each worker chooses her/his most preferred location on hedonic wage function (tangency).



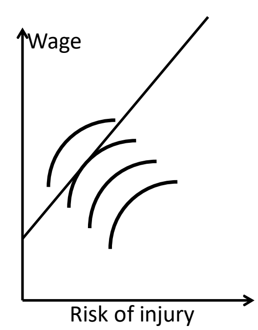
Differences in preferences for risk

- Workers with different preferences have different sets of indifference curves.
- Workers with different preferences locate themselves on different parts of hedonic wage function.



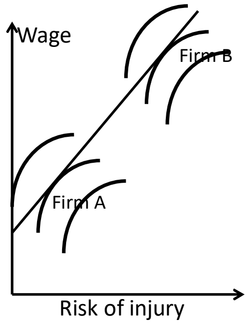
Firms in equilibrium

- Each firm chooses its most profitable point on hedonic wage function (tangency).



Differences in costs of risk reduction

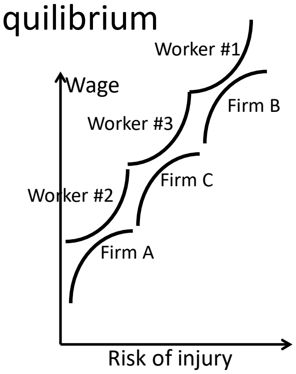
- Firms in different industries have different isoprofit curves.
- Firms with different isoprofit curves locate themselves on different parts of hedonic wage function.



Hedonic equilibrium

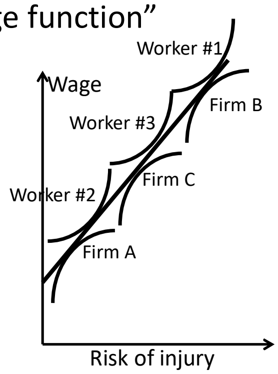
In hedonic equilibrium,

- No worker or firm wants to change position on the hedonic wage function.
- Every firm has the number of workers it wants.



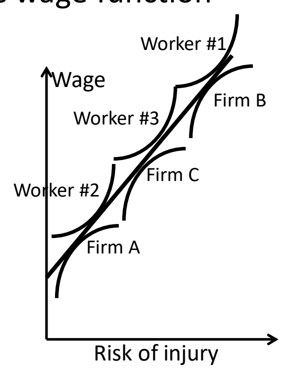
Equilibrium curve is called the "hedonic wage function"

- 2-dimensional analog of equilibrium wage.
- Shows tradeoff between wages and risk available in the market.



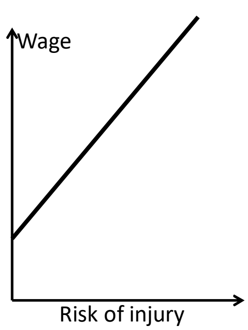
Shape of hedonic wage function

- Hedonic wage function for risk of injury or death must slope _________ because all curves to which it is tangent slope up.
- Might be curved.



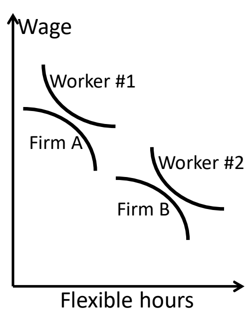
Shifts in "hedonic wage function"

- Like a simple equilibrium price, it depends on both demand and supply.
- For example, if more workers enter market, the whole function moves down and to the right.



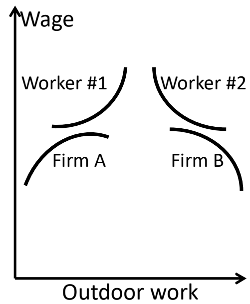
Hedonic wage function for attractive job amenities

- Assume all workers like wages *and* more flexible hours.
- Indifference curves must slope down.
- Assume isoprofit curves slope down.
- Then hedonic wage function curve would slope _________, too.



Hedonic wage function when workers' preferences vary

- Suppose some workers like a particular amenity and others dislike it.
- Shape of hedonic wage function is difficult to predict.
- Might slope up, down, or be flat.



Evidence on hedonic wage functions

- Clear statistical evidence of positive relationship between wages and risk of death on the job.
- Some evidence of positive relationship between wages and risk of layoff.
- Weak evidence for other hedonic wage functions.

Conclusions

- A ___________________ wage function is a curve showing the equilibrium relationship between market wages and job characteristics such as risk of injury.
- Curve shows tradeoff available in the market.
- Curve slopes _________ if workers' indifference curves and firms' isoprofit curves slope up.
- In equilibrium, every worker and firm chooses a _________________ point on this curve.

VALUE OF A STATISTICAL LIFE

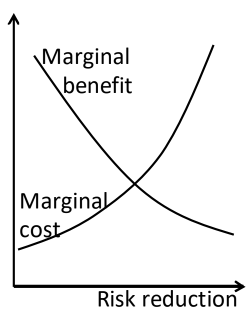
- How much are people willing to pay for reducing risk?
- How can this number help make safety regulation more efficient?

Fatal risks

- Many regulations focus on reducing risk, especially fatal risk.
- Examples:
  - job hazards
  - auto accidents
  - airplane accidents
  - dangerous chemicals in food or consumer products

Cost-benefit analysis

- Ideal policy to reduce risk should consider both cost and benefit.
- Costs are often monetary.
- But benefits are not.
- How can we calculate the benefit of reducing risk?



Willingness to pay for risk reduction

- Suppose you face a 1 in 10,000 of being hit by a car and dying on your way to class.
- How much would you be willing to pay annually to eliminate this (very small) risk?
- \$10? \$100 \$500? \$1000? \$5000?

We are *not* asking…

- How much would you be willing to pay to avoid *certain* death?
  - Very different question because probability is so much larger.
- What is the present discounted value of your future *earnings*?
  - Although this might affect your answer.

Value of a statistical life

$$VSL = \frac{\text{willingness-to-pay}}{\text{size of risk reduction}}$$

For example, if you answered \$200 to the previous question, then for you,

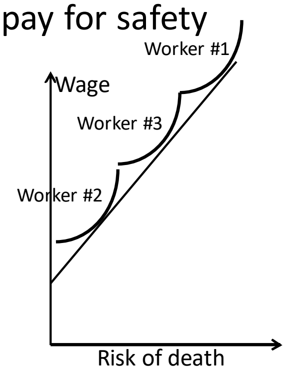
$$VSL = \frac{\$200}{(1/10{,}000)} =$$

More calculations

Willingness to pay to eliminate 1/10,000 risk	VSL
\$10	
\$100	
\$500	
\$1000	
\$5000	

Willingness to pay for safety

Slope of hedonic equilibrium curve
= slope of every worker's indifference curve.
= Δ wage / Δ risk.
= willingness to pay / size of risk reduction.
= __________.



Measuring VSL from labor-market data

- Use data on individual workers (annual earnings, job risk, etc.) to estimate the regression equation:

Wage = β_1 + β_2 Risk + controls + error term

- Here, β_2 = slope = key parameter.

What are regression "controls"?

- Controls are additional explanatory variables in the regression equation.
- Controls for worker characteristics include ____________________________________.
- Controls for job characteristics include ____________________________________.

Why must controls be included in the regression equation?

- These may be correlated with job risk.
- Omitting them will bias estimate of β_2.
- For example, low-risk jobs such as doctors, lawyers, etc. often have ___________ wages.
- But not *because* they are low risk—rather, because they require _________________.
- Must separate the effects of education and job risk.

Computing VSL

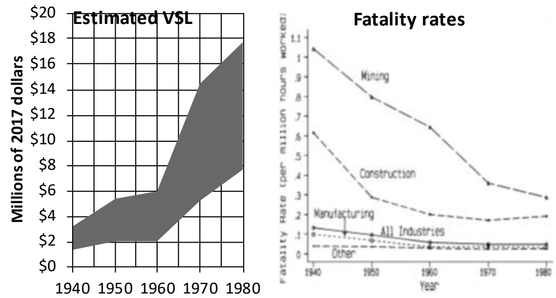
- VSL = Δ wage / Δ risk
  = (β_2 / units of measure for "risk").
- Example: Suppose we estimate β_2 = \$50 and "risk" is measured as deaths per 100,000 workers per year.
- Then VSL = \$50 / (1/100,000)
  = \$________________.

Typical estimates of VSL in various countries (millions of 2000 US dollars)

Country	VSL		Country	VSL
United States	7.0		Australia	4.2
Austria	3.9-6.5		Canada	3.9-4.7
India	1.2-1.5		Japan	9.7
South Korea	0.8		Switzerland	6.3-8.6
Taiwan	0.2-0.9		United Kingdom	4.2

W.K. Viscusi and J.E. Aldy, “The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World,” *Journal of Risk and Uncertainty,* Vol. 27, No. 1 (2003), pp. 5-76.

U.S. historical VSL estimates and actual fatality rates



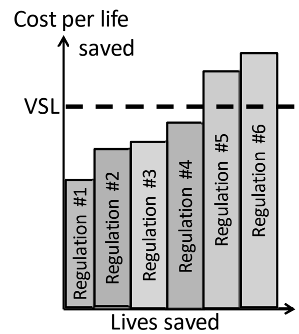
Costa, D., & Kahn, M. E. (2004). Changes in the value of life, 1940-1980. *Journal of Risk and Uncertainty, 29*(2), 159-180.

Using VSL for regulatory decisions

- Compare estimated cost per life saved to estimated VSL.
- What value of VSL should be used?
- Recall that typical estimated VSL for the US is about $_____ million in 2000 dollars (median of 30 studies surveyed by Viscusi and Aldy).
- In practice, a precise estimate is ________ always needed, because proposed regulations vary widely in cost.

Efficient safety regulation in principle

- Nevertheless, we should use __________ value of VSL for all regulatory decisions.
- This gets biggest “bang for the buck,” _________________ number of lives saved for a given total cost.



Inefficient safety regulation in practice

- In practice, US government agencies use ___________ values for VSL, unfortunately.
- By law, some agencies are __________ even permitted to balance costs and benefits in setting regulations: EPA, OSHA.
- This can lead to extreme over-regulation and under-regulation.

Regulation	Year	Agency	Cost per life saved	Good or bad regulation?
Unvented space heater ban	1980	CPSC	$0.1 m	
Aircraft floor emergency lighting	1984	FAA	$0.7 m	
Automobile side-impact standards	1990	NHTSA	$1.0 m	
Rear lap-shoulder belts for automobiles	1989	NHTSA	$3.8 m	
Benzene occupational exposure limit	1987	OSHA	$10.6 m	
Asbestos ban	1989	EPA	$131.8 m	
Hazardous waste land disposal ban	1988	EPA	$5.0 b	

W.K. Viscusi, J.K. Hakes, and A. Carlin, “Measures of Mortality Risk,” *J. of Risk and Uncertainty 14* (1997): pp. 228-229. [See VHV 4th ed. pp.734-735]

Conclusions

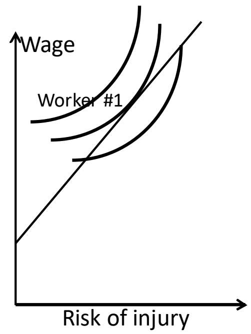
- Value of a statistical life
  = willingness to pay / size of risk reduction
  = Δ wage / Δ risk.
- Can be measured from regressions of worker wages on risk of death.
- VSL = roughly $______ million for U.S. (in 2000 dollars).
- In principle, same value of VSL should be used to evaluate ________ proposed safety regulations in cost/benefit analysis.

OCCUPATIONAL SAFETY AND HEALTH REGULATION

- Why does the government regulate occupational safety and health?
- How does it regulate?
- Is there a better way?

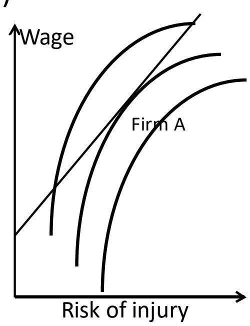
Compensating differences in theory

- Each worker chooses the job with the most preferred wage-risk combination from the hedonic wage function.



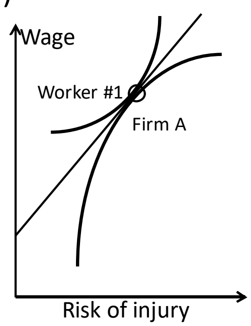
Compensating differences in theory (cont'd)

- Each firm offers the job with the most profitable wage-risk combination on the hedonic wage function.



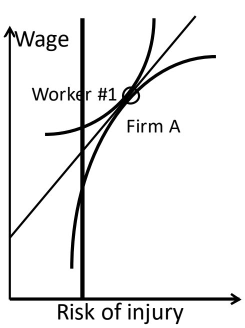
Compensating differences in theory (cont'd)

- Workers are matched to firms.



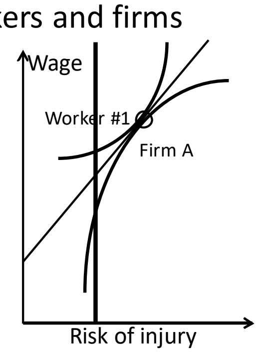
Occupational safety regulation in theory

- In theory, occupational safety regulation puts an upper limit on job risk.
- Firms may no longer offer high-risk jobs, even with compensating wage differentials.



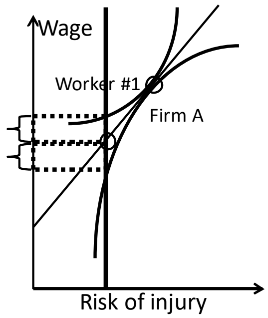
Cost of occupational safety regulation to workers and firms

- Regulation forces firms to offer less-profitable jobs with legal risk levels.
- Workers must accept less-preferred wage-risk combinations.
- Risk falls, but utility ____________.



Cost of occupational safety regulation (cont'd)

- Assume hedonic wage function does not change.
- Cost to worker
- Cost to firm
- Cost is born by both workers and firms.

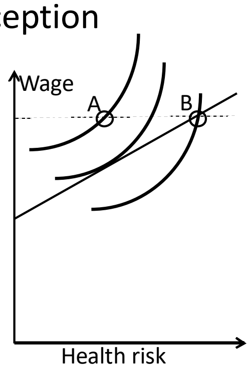


If workers misperceive risk

- What if workers are unaware of job risks?
- Problem seems most likely for ___________ hazards:
  - Toxic chemicals.
  - Bio-hazards .
- In this case, worker might ___________ choose job with most preferred wage-risk combination.
- Regulation might help the worker.

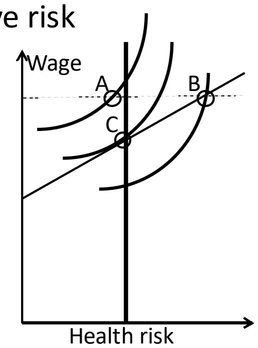
Risk misperception

- Suppose worker believes her/his job is at point A.
- In fact, job is much riskier at point B.
- Worker is __________ off than she/he realizes.



Effect of regulation when workers misperceive risk

- Now suppose gov't regulation puts an upper limit on job risk.
- Job moves to point C on hedonic wage function.
- Worker's wage falls, but utility _________.



Occupational safety regulation in practice

- Occupational Safety and Health Administration (OSHA) established in 1971.
- Preceded by state regulation.
- Difficult to gauge how effective OSHA has been.
- However, most studies find that it has reduced injuries and deaths only slightly, but has certainly increased employer cost.

http://www.osha.gov/

What does OSHA do?

- Does not regulate risk directly.
- Instead sets regulations (or "____________") for work practices:
  - Required safety equipment.
  - Exposure limits for noise, dust and chemicals.
- Gives employers little flexibility on ________ to reduce risk.
- Inspects workplaces for violations, but very infrequently. Fines employers in violation.

What should OSHA do?

- Some people have suggested that OSHA give employers more flexibility in meeting safety targets.
- Others have suggested replacing regulation with taxes or fines for injuries.

Workers' Compensation

- Government-required (and sometimes government-run) program of insurance for occupational injuries.
- Enacted by individual states mostly between 1910 and 1920.
- Replaced earlier tort law, which was expensive and unpredictable, though it usually favored employers.

Incentives created by Workers Compensation

- Employers are charged premiums that are partly based on prior claims experience ("experience rated").
- Thus WC gives employers some incentive to improve safety.
- However, WC gives employees __________ incentive to take care ("moral hazard").
- Some evidence that accident rates ________ as a result of WC.

P.V. Fishback and S.E. Kantor, *A Prelude to the Welfare State: The Origins of Workers' Compensation,* Univ. of Chicago Press, 2000.

Conclusions

- Occupational safety and health regulation is intended to prohibit risky work environments.
- Makes sense if workers ______________ risk.
- But actual regulation focuses on safety "standards" and may not have much effect.
- Worker's Compensation insures workers against accidents but may make accidents ___________ frequent.

COMPENSATING DIFFERENTIALS FOR RISK OF LAYOFF

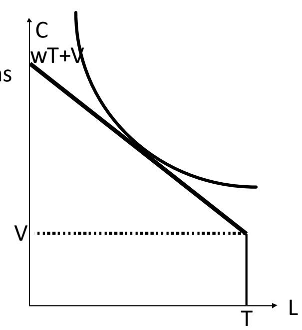
- How does the risk of layoff affect wages?

Layoffs

- Some jobs do not provide continuous employment.
- Seasonal jobs (_________________________) predictably disappear in the off-season.
- Other jobs (___________________________) have an unpredictable risk of layoff (British English: “redundancy”).
- Are there compensating wage differentials for these jobs?

Unconstrained choice of hours

- Suppose workers can work as many hours as they choose.
- Then they will maximize utility by choosing L, C, and h* at a tangency.

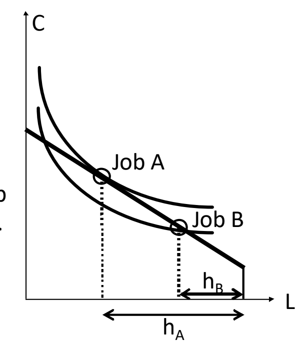


Distribution of hours of work

- Suppose T denotes available time over YEAR instead of week.
- Diagram says nothing about how people prefer to __________ their hours.
- Would they prefer to work
  1. 6 hours/day, 12 months/year, or
  2. 8 hours/day, 9 months/year?
- Some might __________ #2, seasonal work.

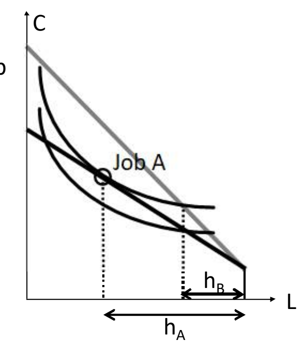
Constrained choice of hours: less than desired

- Other workers may not.
- Here, job B offers limited hours h_B.
- Given choice, this worker will choose job _____ over job _____.



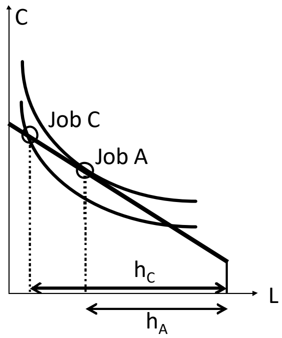
Possible compensating wage differential

- If most workers have these preferences, job B will have to offer a ___________ hourly wage to attract workers.



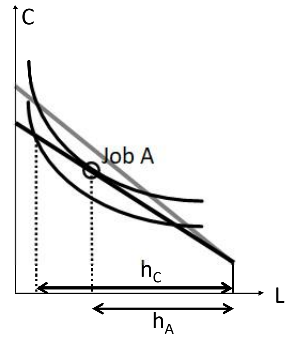
Constrained choice of hours: more than desired

- Other jobs may require more work hours than desired.
- Here, job C requires longer hours h_C.
- Given choice, this worker will choose job _____ over job _____.



Another possible compensating wage differential

- If most workers have these preferences, job C will have to offer a ___higher___ hourly wage to attract workers.



From possible to actual compensating wage differential

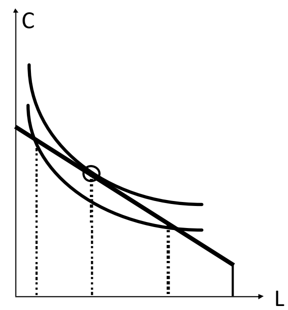
Requirements:

- ________________ worker must dislike constrained hours.
- Employers' _____________ profit from constrained hours must be sufficient to pay the differential.
- There is some evidence of wage differentials for seasonal work—e.g., in agriculture.

Enrico Moretti, "Do Wages Compensate for Risk of Unemployment? Parametric And Semiparametric Evidence from Seasonal Jobs," *Journal of Risk and Uncertainty,* Vol. 20 (January 2000), pp. 45-66.

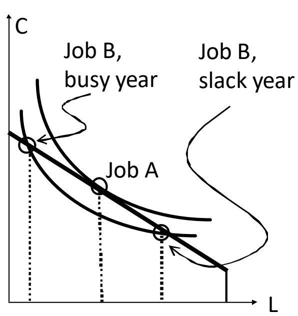
Unpredictable layoff

- Previous analysis assumes hours constraint is known to workers in advance.
- What if hours of work are unpredictable?



Risk aversion

- Even if AVERAGE earnings are same, worker might prefer steadier Job A to layoff-prone Job B.



Compensating differential for layoff risk

- There is some evidence of wage differentials for layoff risk.
- One estimate: 5 percentage-point increase in probability of layoff increases wage by about ________.

Unemployment insurance (UI)

- Many jobs in U.S. today are covered by unemployment insurance (UI), a government program.
- If laid off, worker can receive weekly ________________ for a limited period while looking for a new job.
- Coverage under UI would (and apparently does) ___________ compensating wage differentials for layoff risk.

Conclusions

- If the ________________ worker dislikes constrained hours—predictable or not—then the labor market will generate a compensating wage differential for such jobs.
- There is some evidence of such differentials
- However, the differential is _______________ if worker is covered by unemployment insurance.

COMPENSATING DIFFERENTIALS FOR BENEFITS

- What does theory predict about the correlation of wages and benefits?
- What do the data show?

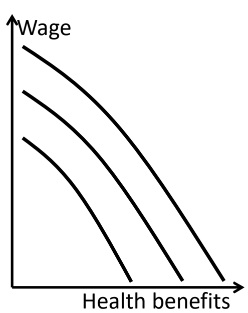
Benefits as % of total compensation

	Civilian workers	Private industry	State & local government
Wages and salaries	69.1%	70.6%	61.9%
Paid leave	7.4%	7.4%	7.3%
Supplemental pay	3.2%	3.7%	1.0%
Insurance (mostly health)	8.0%	7.3%	11.2%
Retirement and savings	5.2%	3.4%	13.2%
Legally required (SS, WC, UI, etc.)	7.1%	7.5%	5.3%

Bureau of Labor Statistics, "Employer Costs for Employee Compensation—September 2023," table 1 (https://www.bls.gov/news.release/pdf/ecec.pdf).

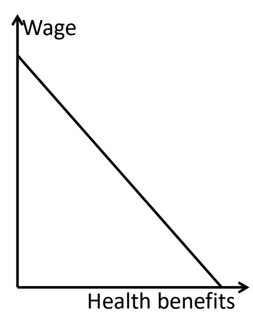
Isoprofit curves

- Benefits like health insurance are costly for firms.
- For fixed total compensation, a neg. tradeoff between wage and benefits.
- Isoprofit curves slope ____________.



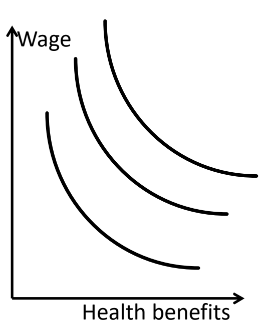
Hedonic equilibrium

- Suppose isoprofit curves are same for all firms.
- Then hedonic equilibrium curve is same as one of those curves.



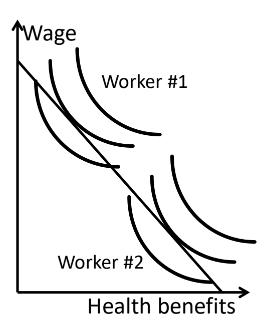
Worker preferences

- Workers value both wages and benefits, so their indifference curves also slope _________.



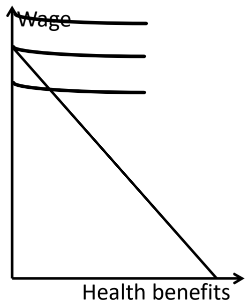
Workers in equilibrium

- Workers with different preferences have different sets of indifference curves.
- Each worker chooses her/his most preferred location on hedonic curve.



Corner solutions

- Some workers may not want health insurance at all, possibly because they are covered under someone else's insurance plan.

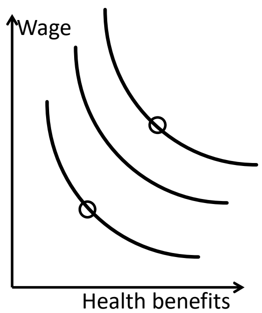


What the data show

- Theory predicts a ______________ correlation between wages and employer-paid benefits like insurance.
- But a simple comparison of workers with and without employer-paid insurance shows a ______________ correlation with wages.
- Why?

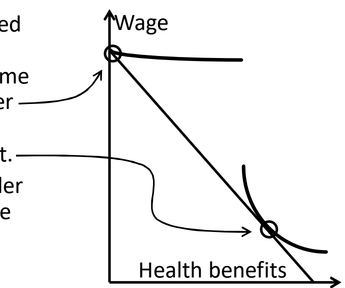
Workers with and without benefits are not comparable

- Some workers are more productive than others, due to ability, education, motivation, etc.
- Highly productive workers enjoy both higher wages AND more benefits.



Finding equally-productive workers with different preferences

- One study compared workers who were identical except some were covered under spouse's insurance and some were not.
- Those covered under spouse's plan chose higher wages and skipped insurance.



Craig A. Olson, "Do Workers Accept Lower Wages in Exchange for Health Benefits?" *Journal of Labor Economics*, Vol. 20 (April 2002, part 2): S91-S114.

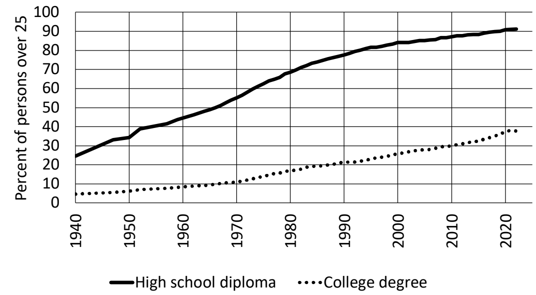
Conclusions

- The theory of compensating wage differentials predicts that jobs with good employer-paid benefits should have ________ wages than jobs that do not.
- Raw data often contradict the theory.
- The trick is to compare wages and benefits of ___________________________ workers with different preferences.

EDUCATION IN THE LABOR MARKET

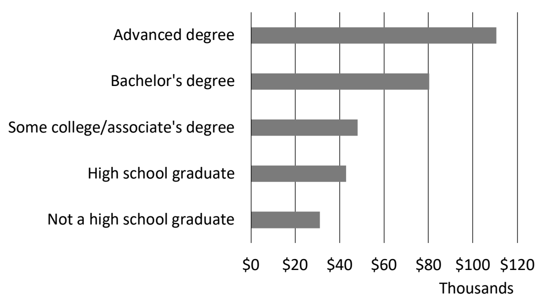
- How does education affect the labor market?

Educational attainment in US



SOURCE: U.S. Census, CPS Historical Time Series Tables, *Table A-2*, downloaded December 2023.

Mean earnings of workers 18 years and older by educational attainment, 2021



SOURCE: U.S. Census, CPS Historical Time Series Tables, *Table A-3*, downloaded December 2023.

Some basic facts

- Persons with college degrees earn
  - almost ____________ as much as persons with only a high school diploma,
  - and almost ________ times as much as high school dropouts.
- Yet not everyone obtains a college degree.
- Even fewer obtain advanced degrees.
- What is the economic explanation?

Education increases productivity

- Wages vary because jobs are different (compensating differentials) but also because workers have different levels of __________.
- More skilled workers earn higher wages because they are more productive (their __________ is greater).
- Skills can be acquired through education.

Education is costly

- Cost of education include out-of-pocket costs (books, tuition, etc.) and _________________ cost of a worker's time.
- Costs of education must be born now and rewards (higher earnings) come later.
- In this respect, education is similar to ______________________ (machines, computers, vehicles, etc.).

Who chooses more education?

- Workers weigh the benefits and costs of education.
- Workers are more likely to pursue education the more willing they are to __________ for higher earnings.
- Some people may get more out of education than others. They are more likely to pursue education also.
- Skills and earnings can also increase from work ________________ and on-the-job training.

Conclusions

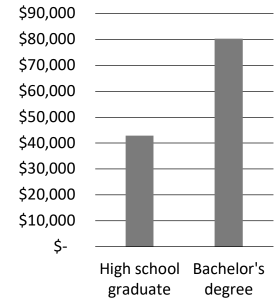
- Educational attainment, though increasing, still varies across the population.
- Earnings are _________________ related to educational attainment.
- The economic explanation is that education increases ___________________.
- Workers weigh the cost and benefits in choosing to obtain education.

A SIMPLE MODEL OF THE SCHOOLING DECISION

- College or not?

High school versus college

- Let's simplify the schooling decision into a choice between high school versus college.
- Here are mean earnings of workers 18 years and over.

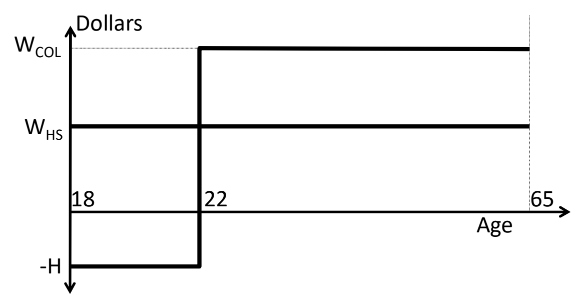


SOURCE: U.S. Census, CPS Historical Time Series Tables, *Table A-3*, downloaded December 2023.

A simple education choice

- Assume for simplicity that education is valued only because it increases future earnings.
- Assume 18-year-old faces simple choice:
  1. Begin working and earn annual wage of w_{HS} .
  2. Attend college for 4 years, paying H dollars per year out-of-pocket. Then earn annual wage of $w_{COL} > w_{HS}$.
- Assume no change in wage over lifetime.
- Assume retires at age 65.

Alternative age-earnings profiles



Making a decision

- How should the 18-year-old evaluate each choice?
- Just add up earnings over lifetime and subtract any out-of-pocket costs?
- No! $1 today ≠ $1 in the future.
- Must account for ____________ value of money.

Present discounted value (PDV): definition

- The 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.*
- r = interest rate, also called _______________ rate.

Discounting over a one-year interval (N=1)

- Suppose X dollars will be received one year from now.
- Then X = PDV x (1+r), so PDV = ____________.
- *Example:* $110 to be received one year from now, discount rate = 10%.
  PDV = ___________

Discounting over many years: compounding

- Suppose X dollars will be received N years from now.
- Then X = PDV x $(1+r)^N$.
- So PDV = $X/(1+r)^N$.
- *Example:* $1000 to be received 5 years from now, discount rate = 8%.
  PDV = $1000/(1.08)^5$ = $____________.

Why the PDV is less than future value

- It is better to receive money today than in the future, because money received today can grow by earning interest.
- The higher the discount rate (r), the ___________ the PDV of money received in the future.
- The longer the wait for the money (that is, the higher N), the _____________ the PDV.

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:

$$\boxed{PDV = \frac{X_1}{(1+r)} + \frac{X_2}{(1+r)^2} + \frac{X_3}{(1+r)^3} + \ldots}$$

Discounting a stream of payments: example

- *Example:* $1000 to be received 1 year from now, $3000 to be received in 5 years, $5000 to be received in 10 years, discount rate = 5%.

$$\boxed{PDV = \frac{1000}{(1.05)} + \frac{3000}{(1.05)^5} + \frac{5000}{(1.05)^{10}} =}$$

= ___________ + ___________ + __________.

= _____________.

PDV of simple education choices

- PDV of "no-college" choice =
  $$w_{HS} + \frac{w_{HS}}{(1+r)} + \frac{w_{HS}}{(1+r)^2} + \cdots + \frac{w_{HS}}{(1+r)^{46}}$$
- PDV of "college" choice =
  $$-\mathrm{H} + \frac{-H}{(1+r)} + \frac{-H}{(1+r)^2} + \frac{-H}{(1+r)^3} + \frac{w_{COL}}{(1+r)^4} + \frac{w_{COL}}{(1+r)^5} + \cdots + \frac{w_{COL}}{(1+r)^{46}}$$

Numerical example

- Suppose
  r = 0.05,
  H = $20,000,
  w_{HS} = $35,000,
  w_{COL}= $50,000.
- Then with the help of Excel we can compute…
  - PDV of "no college" = $_____________.
  - PDV of "college" = $_____________.

Another numerical example

- Use same data, but let r = 0.06.
- Then with the help of Excel we can compute…
  - PDV of "no college" = $_____________.
  - PDV of "college" = $_____________.

Role of discount rate

- Clearly, the discount rate affects a person's choice.
- The higher the discount rate,
  - the ________ value the worker attaches to boosts in future earnings.
  - the ________ likely the worker choose more schooling.

Where does the discount rate come from?

- Discount rate reflects a person's *rate of time preference*—willingness to give up consumption today for consumption tomorrow. How can it be observed?
- If person has positive net worth, discount rate = interest rate on _______________.
- If person has negative net worth and has access to credit, discount rate = interest rate paid on _________________ money.

Conclusions

- In a simple model with two choices, the worker chooses the schooling level that maximizes the _______________________________________ of net earnings.
- The higher the discount rate, the ___________ likely the person is to choose more schooling.

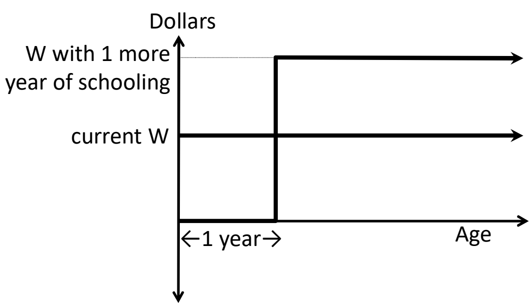
A GENERAL MODEL OF THE SCHOOLING DECISION

- How much schooling should a person get?
- Why do different people make different choices?

Deciding how much schooling

- Suppose a person can choose *any* amount of schooling (not just 2 choices). As before,
  - More schooling provides higher wage.
  - But while in school, cannot work.
- Person makes a ____________ of choices: "Should I get one more year of schooling?"
- Compares PDVs, and stops when PDV of one more year falls below current choice.

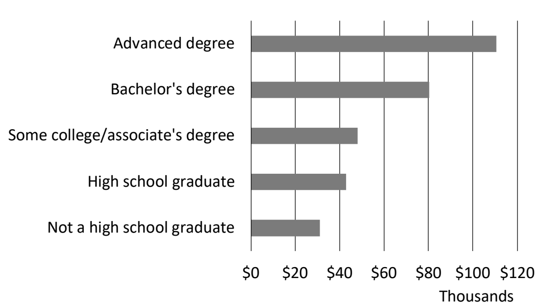
One more year of schooling or not? Alternative age-earnings profiles



Deciding how much schooling (con't)

- Simplifying assumptions:
  - Person's work life lasts forever.
  - Ignore out-of-pocket costs (H).
- Under these assumptions, comparing PDVs is equivalent to comparing the ____________ ____________ to one more year of schooling with the discount rate (r).

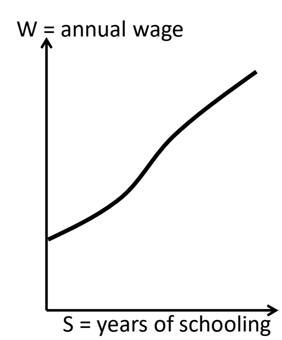
Mean earnings of workers 18 years and older by educational attainment, 2021



SOURCE: U.S. Census, CPS Historical Time Series Tables, *Table A-3*, downloaded December 2023.

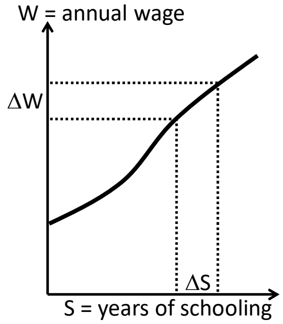
Wage-schooling locus

- Suppose a person can choose *any* amount of schooling.
- More schooling provides higher wage.



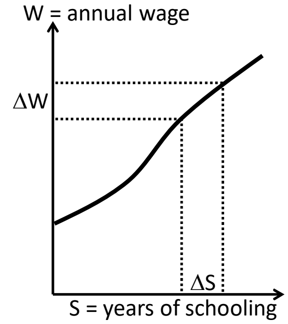
Slope of wage-schooling locus

- Slope $\Delta W/\Delta S$ = increase in wage from one-year increase in schooling for a particular person.
- Slope might decrease or increase, but not increase drastically.



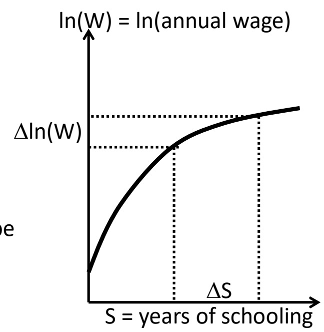
Marginal rate of return to schooling

- MRR = $(\Delta W/\Delta S)$ / W = *percent* increase in wage from one-year increase in schooling for a particular person.
- MRR generally ______________ as S and W increase, because denominator increases.



Marginal rate of return to schooling

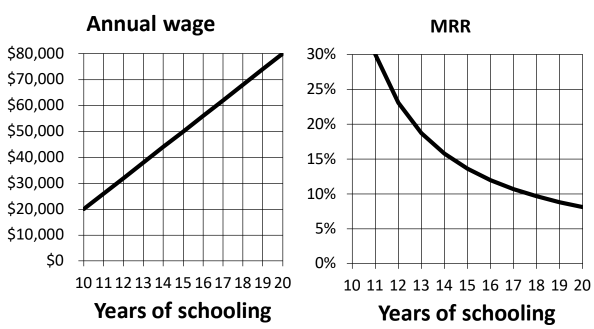
- Now MRR
  = $(\Delta W/\Delta S)$ / W
  = $(\Delta W/ W)$ / ΔS
  = Δ ln(W) / ΔS
  where "ln" means "natural logarithm."
- So decreasing MRR means decreasing slope of ln(w) locus.



Why called "rate of return"?

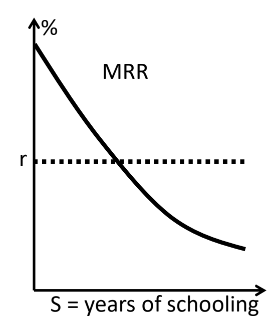
- Suppose only cost of education is foregone earnings. (No out-of-pocket cost H.)
- Suppose a person can earn W=$30,000 per year but another year of school would raise their wage by $\Delta W/\Delta S$ = $3000.
- Thus an "investment" of $30,000 brings an "annual return" of $3000.
- Then the rate of return of this investment = $(\Delta W/\Delta S)$ / W = _________ (assuming a long career).

Example of MRR curve



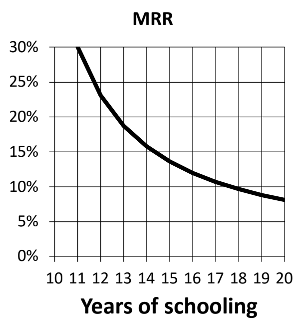
A stopping rule

- Person should continue in school until their MRR drops below their discount rate (r).
- This rule maximizes PDV of lifetime earnings.



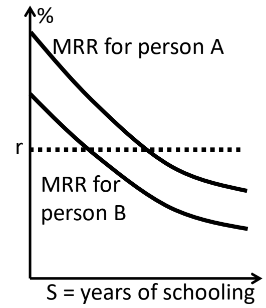
Example of stopping rule

- If this person's discount rate r=25%, should choose about S=_____.
- If r=15%, should choose about S=_____.
- If r=10%, should choose about S=_____.



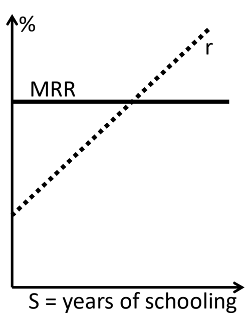
Why do people make different choices of S ?

- Above example suggest one answer: the cost of schooling (r) is different for different people.
- Another possibility is that the benefit of schooling (MRR) is different for different people.



What if r is not constant?

- If person must borrow, then interest rate might rise as they borrow more.
- So r might rise with S.
- Model still makes sense, even if MRR is constant.



How realistic is this model?

- Often people are uncertain about the MRR.
- Many other factors may influence schooling decision.
- At best, economic models predict _________ behavior.

Other factors influencing schooling decisions

-
-
-
-
-
-

Conclusions

- For a particular person, more schooling yields a higher wage.
- The percent increase in the wage from one more year of schooling = _______________ ___________________ (MRR) to schooling.
- To maximize PDV of lifetime earnings, a person should continue schooling until the MRR drops below that person's __________ _________.

MEASURING THE RETURN TO SCHOOLING

- How can we measure the return to schooling in the real world?

Many government programs encourage people to get more schooling

K-12 programs
- Compulsory schooling laws.
- Programs for "at risk" children.

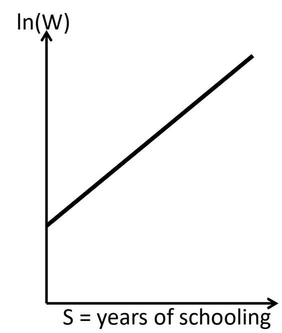
College programs
- "Bridge to college" programs.
- Loans and scholarships.
- Gov't funding of community colleges and public universities.

Are these programs worthwhile?

- Do their benefits outweigh their costs?
- Benefits depend on the return to schooling.
- To evaluate these programs, we must have reliable estimates of the return to schooling for a typical worker.
- Marginal rate of return = MRR = $\Delta\ln(W) / \Delta S$.

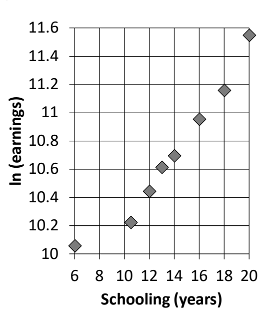
How much does schooling benefit a typical worker?

- We are asking, what is the wage-schooling locus for a typical worker?
- In particular, what is the MRR (=$\Delta\ln(W)/\Delta S$) for a typical worker?



What the data say: average earnings by education level

Education	Earnings
None-8th grade	$23,277
9th-12th grade	$27,470
High school grad	$34,197
Some college	$40,556
Associate's degree	$44,086
Bachelor's degree	$57,026
Master's degree	$69,958
Professional degree	$103,411

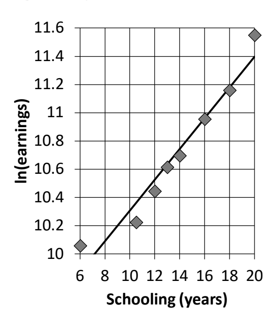


Regression analysis of average data for education groups

Applying least-squares to these 8 data points,

ln(earnings)
$= 9.218 + 0.109\ S$

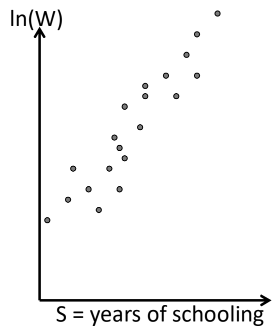
Suggests that 1 more year of S…
- increases **ln**(earnings) by 0.109 .
- increases earnings by __________%.



What the data say: data on individual workers' schooling and wages

Various government agencies survey many thousands of workers on their schooling and wages (or earnings).

- Current Population Survey.
- Decennial Census.
- American Community Survey.
- etc.

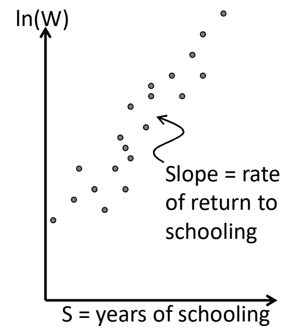


Regression analysis of large samples of individual data

Applying least-squares to data on many workers:

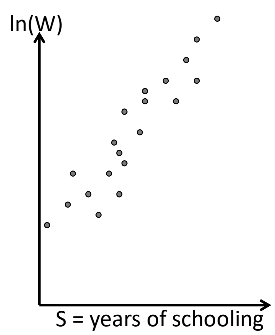
$\ln W = \beta_1 + \beta_2 S$
+ error term.

Here, β_2
$= (\Delta \ln(W) / \Delta S)$
= MRR.



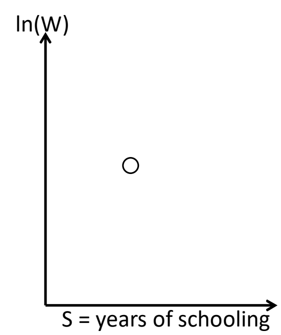
Doubts

- There is a clear *correlation* between schooling and earnings.
- But is there a ________________ relationship?
- Does increased schooling __________ earnings to rise?



Why this is a tricky problem

- We only observe what each worker *actually* earns with the schooling they *have*.
- We want to know how much a worker *would* earn *if* the same person *hypothetically* had more (or less) schooling.
- This is called a ____________________.



Ceteris paribus? Are other things equal?

- Regression analysis compares schooling and wages of *different* workers.
- Aside from schooling, are workers with more schooling *identical* in earning power to workers who have less schooling (on average) ?
- If yes, least squares gives an ________________ estimate of MRR.
- If no, least squares is ______________ (too high or too low on average).

Why did some workers get more schooling than others?

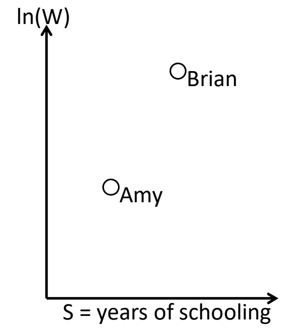
- If reasons are *unrelated* to future earning power, then least squares is _____________.
- If reasons are *related* to future earning power, then least squares is ___________.
  - These workers would have earned higher wages regardless of schooling.
  - Least squares is attributing their higher earnings to education, but other factors are true cause.

Ceteris paribus?

Reason person got more schooling	Would that person have earned higher wages regardless?
Laws requiring school attendance.	
Laws restricting work as a minor.	
Live close to community college.	
Qualify for scholarships.	
Parental help.	
Enjoy school and have aptitude for school work.	

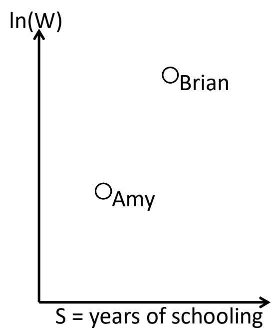
Suppose reasons for getting more schooling are unrelated to earning power

- Then we can use other workers with different levels of schooling as *counterfactuals*.
- Brian and Amy are on the same "track."
- Correlation reflects _________ relationship.
- LS gives unbiased estimate of MRR.



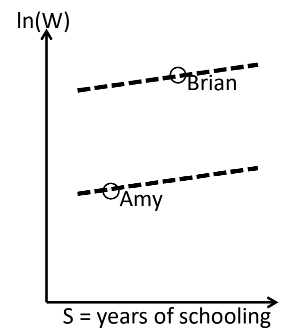
Suppose reasons for getting more schooling ARE related to earning power

- Brian would have earned more than Amy regardless of schooling.
- Brian and Amy are not counterfactuals for each other.
- They are on different "tracks".



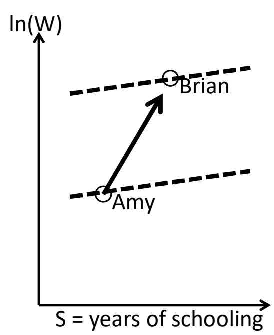
Differences in "ability"

- If workers are on different "tracks," for reasons we cannot observe, economists say they have differences in "ability."
- LS estimate of MRR will be _______________ (too high, on average).



Why getting the correct MRR matters for public policy

- Suppose gov't program helps Amy get same amount of schooling as Brian.
- If LS is biased up, then we overestimate benefits of program.
- Amy's wage will still not equal Brian's.



The problem of "ability bias": summary

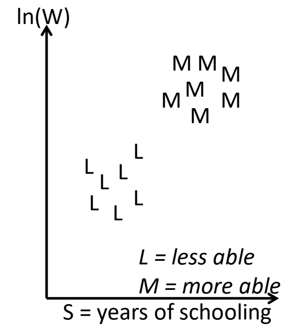
- If some workers are more able than others, they may both
  - choose more schooling
  - and earn higher wages.
- But part of their wage advantage is due to "ability," ________ schooling.
- If we simply compare workers, as LS does, we will _________ -estimate MRR.

Correcting for ability bias: 4 approaches

1) Special samples of workers.
2) Include control variables.
3) "Instrumental variables" regression instead of ordinary least-squares.
4) "Selection bias" corrections to ordinary least squares.

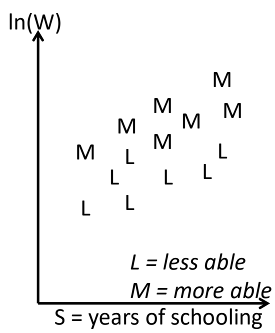
1) Special samples

- In ordinary samples, more able workers *may* be same ones who attend school longer.
- This would cause bias in estimating return to schooling.



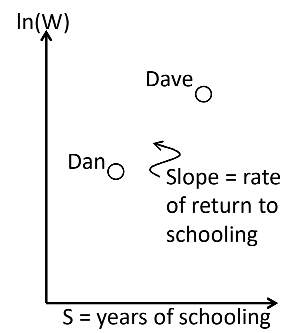
1) Special samples: randomization

- Suppose we could assign people random amounts of schooling.
- Randomization would eliminate bias.
- *But randomization of schooling would be impractical and perhaps unethical.*



1) Special samples: identical twins

- Suppose "ability" is genetic and we have data on identical twins.
- Compute Δln(W) and ΔS for each pair.
- Ratio Δln W/ΔS = estimate of returns to schooling.
- *But why do twins make different choices? Maybe ability is not purely genetic.*



2) Control variables

- Alternatively, include additional regressors:

  ln W = $\beta_1 + \beta_2$ S + β_2 X_1 + β_2 X_2 + error term.

- Xs are measures of ability, such as ______________________________________.
- *But do these variables really measure* <u>earning power</u> *ability?*

3) "Instrumental variables" regression

- Schooling depends on ability and on other variables not related to earnings (such as compulsory schooling laws) called "instruments."
- IV regression strips the schooling regressor of all influences except the instrument:

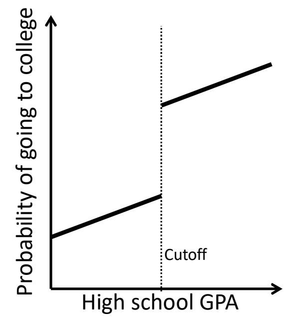
  ln W = $\beta_1 + \beta_2$ S' + error term.

3) "Instrumental variables" regression: examples

- A good instrument must be correlated with schooling but not directly affect ability.
- Instruments that have been tried:
  - ______________________ laws across states.
  - ___________ (subsidizing college for veterans).
  - _____________________________ to college.
- *But often instrumental variables are not closely correlated with schooling.*

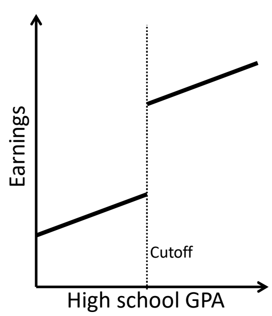
4) Discontinuities

- For some state universities, admission and/or financial aid is based on high school GPA.
- Students with GPA just a hair above the cutoff are much more likely to attend college than those just a hair below.



4) Discontinuities (cont'd)

- People close to the cutoff are presumably very similar in ability.
- By comparing earnings 10 years later of people who were just above and just below cutoff, can measure return to schooling.



Correcting for ability bias: assessing the 4 approaches

- Estimates of MRR vary a lot, from 5% to 15%.
- Most corrections for ability bias lower estimates of MRR slightly, but each approach has critics.
- But instrumental variables regression tends to *raise* the estimate of MRR.*
- Consensus now is that ability bias is not as big a problem for MRR as originally feared.

* Card, David. 2001. "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems." *Econometrica*, 69(5), 1127-60.

Ability bias in other settings

- Same basic issue complicates evaluation of other voluntary government programs.
- People who volunteer for gov't programs tend to be more motivated, and would make higher wages regardless, so benefits of programs tend to be over-estimated.
- Examples of other programs:
  ____
  ____
  ____

Conclusions

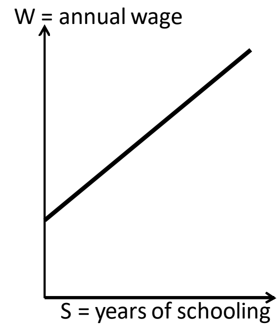
- Benefits of schooling depend on marginal return to schooling (MRR) for workers.
- MRR can be estimated by applying LS to data on workers.
- But workers who get the most schooling might have earned _____________ wages regardless.
- If so, LS is vulnerable to "________________" and MRR estimates are too high.
- Various correction methods have been proposed.
- Consensus now is that ability bias is not as big a problem for MRR as originally feared.

SCHOOL QUALITY AND EARNINGS

- Does school quality affect the return to schooling?

School quality

- It is natural to suspect that the quality of schooling (not just the quantity) might affect earnings.
- Much research on this topic.
- Early research could not find a correlation between school inputs and outcomes.



Differences across states

- Study by Card and Krueger (1992) showed that differences across states in worker earnings were
  - positively correlated with teacher salaries.
  - negatively correlated with pupil/teacher ratios.
- Convinced economists that school quality mattered.
- Did not convince economists that effects of quality were measured with precision.

David Card and Alan B. Krueger, "Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States, *Journal of Political Economy,* Vol. 100, No. 1 (February 1992), pp. 1-40.

Bias from other unmeasured influences

- Example: class size likely affects outcomes.
- Yet comparing class sizes in different schools might not work.
- Other things are likely different as well:

  ____
  ____
  ____
  ____

Overcoming bias

- Problem is similar to "_____________ bias" in measuring effect of schooling on earnings.
- Possible approaches:
  1) Special samples.
  2) Include control variables.
  3) "Instrumental variables" regression.
  4) "Selection bias" corrections.

Special sample: Tennessee STAR program

- Tennessee Student/Teacher Achievement Ratio experiment began in 1985. Involved 6000-7000 students per year.
- Randomly assigned students and teachers to small classes (13-17) or large classes (22-25).
- Experiment students remained in same size class for 4 years.
- Outcome: Students in small classes scored _____________ on achievement tests.

Alan B. Krueger, "Experimental Estimates of Education Production Functions," *Quarterly Journal of Economics,* Vol. 114 (May 1999), pp. 497-532.

Israel public schools

- Use rigid rule: class size may not exceed 40.
- If enrollment reaches 41, class is divided into two classes.
- Outcome: Again, students in small classes scored ____________ on achievement.

Joshua D. Angrist and Victor Lavy, "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement," *Quarterly Journal of Economics*, Vol. 114 (May 1999), p. 533-575.

Control variables: tracking individual teachers

- Research on Chicago public schools* examined outcomes for individual students over time (year-over-year change in test scores).
- Holding constant student and school characteristics, different ______________ have significantly different effects.
- New York City** did a similar study from 2007-2010. Results released to media in February 2012.

*Daniel Aaronson, Lisa Barrow, and William Sander, "Teachers and Student Achievement in the Chicago Public Schools," *Journal of Labor Economics*, Vol. 25 (January 2007), pp. 95-135.

** http://schools.nyc.gov/Teachers/TeacherDevelopment/TeacherDataToolkit/default

Conclusions

- The effects of school quality on educational and labor-market outcomes is an area of active research.
- Separating the effects of school quality from other influences is similar to the problem of "____________ bias" in measuring effect of schooling on earnings.
- The effects of _______________ and individual teachers have been documented.

JOB MARKET SIGNALING

- Could schooling pay off for individual workers *without* making workers more productive?

Human capital model (review)

- The human capital model assumes that schooling increases productivity.
- Workers with more schooling are paid better because schooling has ______________ them more productive.

Alternative view

- The "signaling" model argues that some workers are more productive than others, regardless of schooling.
- Schooling merely helps employers _____________________ between high-productivity workers and low-productivity workers.

A. Michael Spence, "Job Market Signaling," *Quarterly Journal of Economics,* Vol. 87 (August 1973), pp. 355-374.

Numerical example: 2 types of workers

Type of worker	Proportion of population	PDV of lifetime productivity
Low-productivity (L)	q	$200,000
High-productivity (H)	1-q	$300,000

Perfect information

- Suppose employers could easily distinguish between low-productivity (L) and high-productivity (H) workers.
- Employers are willing to pay each worker (up to) their VMP.
- In market equilibrium, each type of worker would earn a wage equal to its VMP.

Asymmetric information

- Suppose workers know how productive they are, but employers do not.
- Employers are willing to pay for productivity and workers know this.
- If employers ask job applicants "How productive are you?" then ALL workers will answer…

Pooling equilibrium

- If employers cannot distinguish between L and H workers, they must receive the same wage in equilibrium ("pooling").
- Equilibrium (lifetime) wage
  = average productivity of all workers
  = ($200,000 x q) + ($300,000 x (1-q)).
- For example, if q = 0.6, then equilibrium wage for all workers = $_________________.

Signaling

- High-productivity workers have an incentive to provide *credible* information on their productivity—a "_____________."
- To be credible, H workers must have it, but L workers must not—perhaps because it is too ____________ for L workers to acquire.
- Education can work as a signal **IF** it is more costly for L workers to acquire than it is for H workers.

Differential costs of the education signal

- Tuition rates are the same for everyone.
- What costs would be greater for L workers than for H workers?
  ____
  ____
  ____
  ____

Wage difference based on signal

- Recall difference in productivity = $100,000.
- Suppose employers offer a (lifetime) wage of $300,000 to workers who have a college degree and a wage of $200,000 to workers who do not.
- Assume a college degree costs ___________ than $100,000 for low-productivity workers.
- Assume a college degree costs ___________ than $100,000 for high-productivity workers.

Separating equilibrium

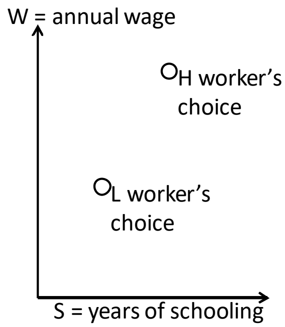
- All L workers choose _________________, because for them, cost > wage boost.
  - L workers are paid $200,000.
- All H workers choose _________________, because for them, cost < wage boost.
  - H workers are paid $300,000.
- Employers can afford this policy because all workers are paid their productivity.

Another constraint

- For employers, $240,000 single-wage policy costs same as two-wage policy.
- For employers to *prefer* two-wage policy, we need another assumption:
  - Assume it is useful to employers to know each worker's type (L or H), or
  - Assume cost of college is < $_____________ for H workers. Then H workers all prefer two-wage employers.

Empirical implications

- Human capital model and signaling model have same prediction.
- ________________ correlation between schooling and earnings.
- Difficult to say from data which model is right.



Policy implications

- Degree signal does NOT MAKE workers more productive—just gives them a wage boost.
- Policies that are worthwhile under the human capital model are not worthwhile under the signaling model.
- Example: Under signaling model, raising compulsory school age is ______________________________.

Conclusions

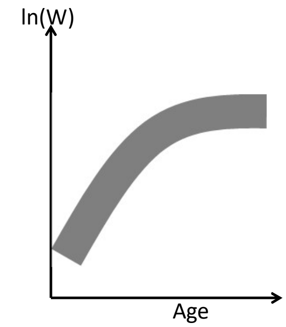
- In the "signaling" model of schooling and wages, schooling does ___________ make workers more productive.
- It merely helps employers __________________ between high-productivity workers and low-productivity workers.
- The signaling model still predicts a ____________ correlation between schooling and earnings.
- However, policies that boost schooling are not as worthwhile for society.

ON-THE-JOB TRAINING

- Why do workers' wages rise with age?

Age-earnings profiles

- Using survey data, one can plot earnings against age, controlling for education.
- Typical pattern is upward slope at first, then flattening out.



Features of age-earnings profiles

- Highly-educated workers earn _____________ than less-educated workers.
- Earnings rise with age, but at a _________________ rate.
- Profiles ______________ as workers get older. Highly-educated workers' earnings grow faster than less-educated workers' earnings.

Why do earnings rise with age?

- One explanation:
  Workers continue to acquire human capital after they finish school.
- On-the-job training (OJT) is one way they acquire human capital. Includes...
  - Formal training programs.
  - Informal job experience.

General training

- General training = training useful at _____________ employers. Examples:
  - Learning to use Excel or Python.
  - Learning to drive a truck or a forklift.
- Workers carry benefit of general training with them if they change employers.
- Thus, general training raises workers' potential wage at _____________ employers.

Specific training

- Specific training = training useful at only ____________ employer. Examples:
  - Learning a company's unique computer system, org chart, product line, procedures, etc.
- Value of specific training is lost if the worker leaves the firm.
- Thus, specific training has ________ effect on worker's potential wage at other employers.

A two-period model: notation

	First period	Second period
Total labor costs (wage + any training costs)	TLC_1	TLC_2
Value of marginal product (including results of training)	VMP_1	VMP_2

Two-period model

- Let r = discount rate.
- In competitive labor market, firm maximizes profit by hiring workers until
  PDV of labor cost = PDV of VMP:
  $$TLC_1 + \frac{TLC_2}{1+r} = VMP_1 + \frac{VMP_2}{1+r}$$
- Let H = training cost. If training only happens in first period,
  $$(w_1 + H) + \frac{w_2}{1+r} = VMP_1 + \frac{VMP_2}{1+r}$$

Two-period model when worker can leave after first period

- If training is *general*, then after training, other firms are willing to pay worker wage = VMP_2 .
- So employer must set $w_2 = VMP_2$ to retain the worker.
- Thus we have
  $$(w_1 + H) + \frac{w_2}{1+r} = VMP_1 + \frac{VMP_2}{1+r}$$
- Conclusion: $w_1 + H = VMP_1$.

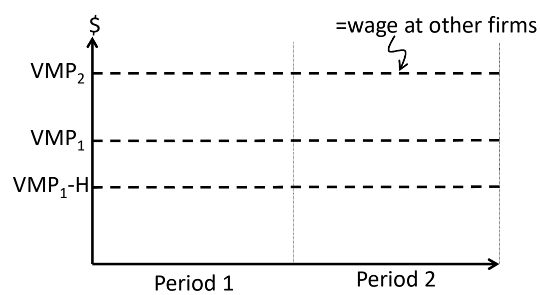
Who pays for general training?

- Therefore $w_1 = VMP_1 - H$.
- Worker gets reduced "training" wage during first period, but enjoys __________ of the return in the second period.
- Competitive firms provide general training only if they pay _____________ of the cost.

Examples of general training paid for by worker through lower starting wages

- Apprenticeship programs in construction trades.
- Hospital residencies for new medical doctors.
- Low starting salaries for attorneys, business consultants, etc.

Worker pays for general training and enjoys all of the return



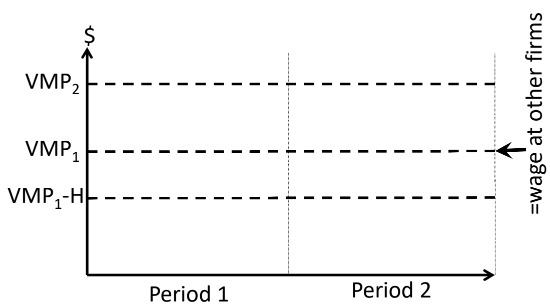
What about specific training?

- If training is *specific*, then worker's new skills have no value at other firms.
- Even after training, *other* firms are only willing to pay wage = VMP_1 .
- So current employer must pay $w_2 \geq VMP_1$ but does __________ need to pay $w_2 = VMP_2$ to keep the worker.

Should employer pay for specific training?

- Suppose employer paid the same wage in both periods: $VMP_1 = w_1 = w_2$
- Effectively, employer pays _________ the training cost and enjoys all the return: $w_2 < VMP_2$.
- However, if worker quits for any reason, employer __________ its investment.
- Needs to discourage worker from quitting.

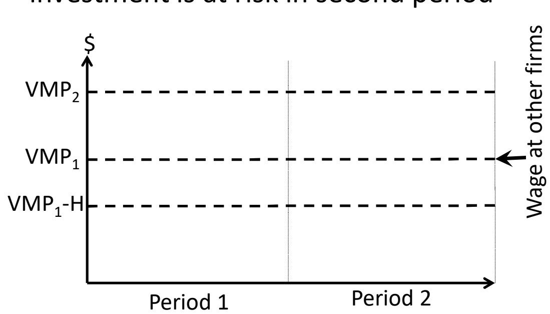
If employer pays for specific training, its investment is at risk in second period



Should worker pay for specific training?

- Suppose worker paid all of the training cost and enjoyed all of the return: $VMP_1 - H = w_1 < w_2 = VMP_2$.
- Then w_2 > alternative wage at other employers.
- If employer fires worker for any reason, worker ____________ her/his investment.
- Needs to discourage employer from firing.

If worker pays for specific training, her/his investment is at risk in second period



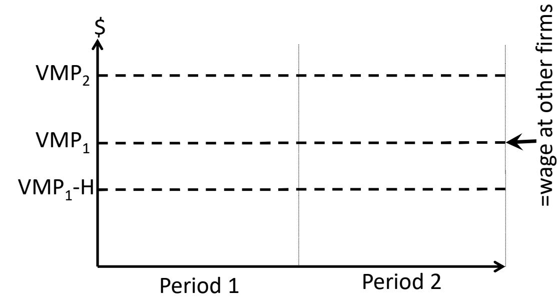
Who pays for specific training?

- If training is *specific*, then worker's new skills have no value at other firms.
- Value of specific training is lost if worker leaves employer.
- So wage must be structured so that worker has incentive to stay AND firm has incentive not to fire the worker.

Solution: share the investment in specific training

- Worker is discouraged from quitting if worker enjoys at least *some* of returns from training.
- Employer is discouraged from firing worker if employer enjoys at least *some* of returns from training.
- Solution: must ____________ returns in second period.
- Competition forces them to also __________ costs of training in first period.

Sharing the investment in specific training (cont'd)



Specific training and job tenure

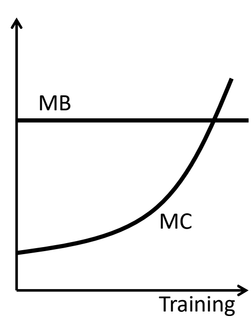
- Job tenure = ___________________ at a particular employer.
- Specific training is shared investment.
- In second period,
  - worker's wage < VMP, so firm wants worker to stay.
  - worker's wage > wage at other firms, so worker wants to stay.
- So specific training tends to ______________ job tenure.

What the theory of specific training can explain

1) Probability of leaving a firm (quit or layoff) _____________ with job tenure.
2) ____________ rules: "last hired, first fired."
   - Senior employees are paid less than their VMP.
   - So firm prefers to retain them even when business turns down.
3) ___________ layoffs common. Workers wait to be recalled rather than look for a new job.

How much training?

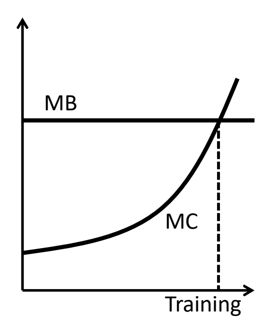
- In any one period, marginal cost of OJT probably rises (diminishing returns).
- Worker (and employer) choose a level of OJT that equates marginal benefit and marginal cost.



Training over the life cycle

As the worker gets older...

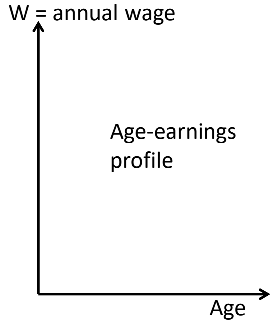
- MB _____________ because less time remains to recoup higher productivity before retirement.
- MC _____________ because rising wage increases opportunity cost of worker's time.



Training over the life cycle (cont'd)

As the worker gets older...

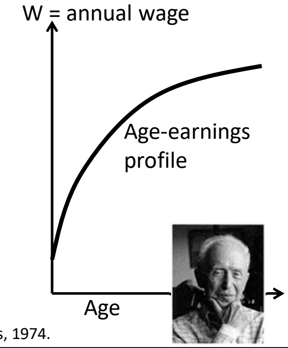
- OJT continues, but at a decreasing rate.
- So earnings rise with age and job-market experience, but at a decreasing rate.



What the data typically show: Mincer earnings function

- $\log W = \beta_1$
  $+ \beta_2$ Schooling
  $+ \beta_3$ Experience
  $+ \beta_4$ Experience^2
  $+ \beta_5$ other variables
  + error term.

- β_2 and β_3 are positive.
- β_4 is _______________.



Jacob Mincer, *Schooling, Experience, and Earnings,* New York: Columbia Univ. Press, 1974.

Conclusions

- Workers' wages rise with age because they continue to invest in human capital and become more productive, even while working.
- _________________ training is paid for by the worker, often through a lower wage.
- _________________ training is a shared investment, paid for by both worker and employer.
- Wages rise at a _________________ rate because costs of training rise and benefits fall with age.

PART 3

Wage Distribution, Mobility, and Discrimination

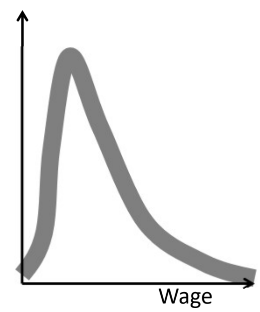
Big ideas: Earnings and wages have become more unequal in recent decades, but proposed explanations are controversial. Workers move because the benefits of moving outweigh the costs. Discrimination is real and in some ways puzzling, but economics offers several alternative explanations.

THE DISTRIBUTION OF INCOME, EARNINGS AND WAGES

- What does the distribution of wages look like and why?

The shape of the wage distribution

Wage distributions can be computed from data sources like
- Current Population Survey.
- IRS Statistics of Income.
- Social Security detailed earnings reports.



Distribution of weekly earnings in the U.S., 2019

- Widely dispersed.
- Not symmetric.
  - Mean = $1133
  - Median = $923
- ________________ skewed: long tail to the right shows that
  - Most workers have low wages.
  - A few workers have very high wages.

Why do different people have different wages?

- Wages can vary for many reasons:
  - Monopsony.
  - Compensating wage differentials.
  - On-the-job training paid for by worker.
  - etc.
- However, most economists believe main reason for variation in wages is variation in worker __________.

The human capital model

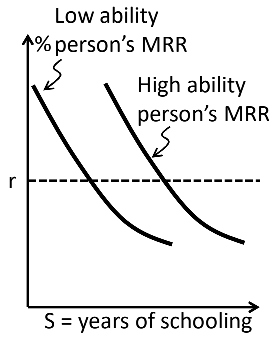
- Human capital model can explain many features of the wage distribution.
- Wage = VMP – OJT paid for by worker.
- Productivity (VMP) depends on
  - Individual ability.
  - Schooling.
  - Prior on-the-job training.

Wage variation according to the human capital model

- Some workers have more ability than others.
- Some workers have more human capital than others.
- Also, younger workers are investing in human capital (OJT) and paying for it through reduced earnings.

Ability differences are reinforced

- Suppose the most able people choose the most schooling.
- Then ability differences are reinforced by differences in human capital.
- Helps explain why distribution is positively skewed.



Conclusions

- The distributions of income, earnings, and wages are widely dispersed.
- They are _______________ skewed—a few people earn a lot.
- The human capital model can explain some of this skewness, especially if ability and schooling are ________________.

MEASURING INEQUALITY

- How can we compare inequality between countries and over time?

Differences in inequality

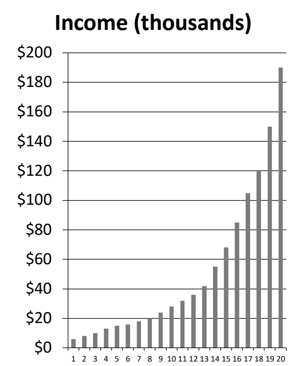
- Is inequality greater in the U.S. than in other countries?
- Has inequality increased over time?
- To answer these questions we need a way to measure inequality.

Possible measures

- Range
- Variance or standard deviation
- Variance or standard deviation of logarithm
- Coefficient of variation
- etc.

Another approach

- How much income goes to each segment of the distribution?
- Begin by ordering all households from lowest income to highest income.
- Here is an artificial example with 20 households.

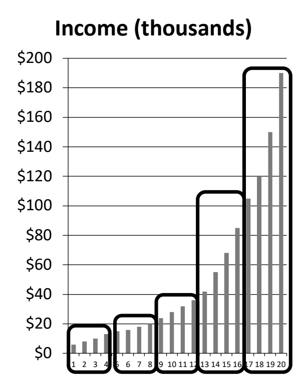


Quantiles

- Then divide population into groups of equal size.
- Same number of households in each group.
  - 4 groups: "________________."
  - 10 groups: "________________."
  - 100 groups: "__________________."

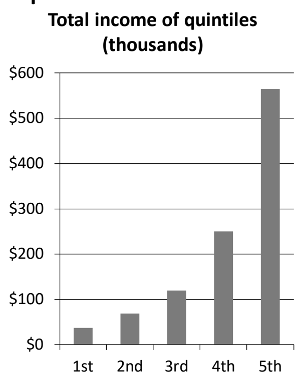
Quintiles

- If we divide observations into ______ groups of equal size, groups are called "quintiles."



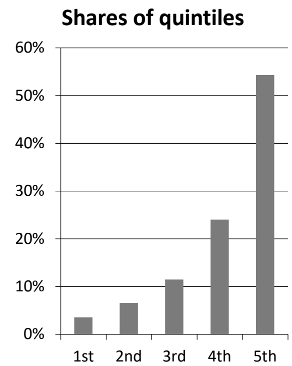
Income of quintiles

- Then sum the income of each group.



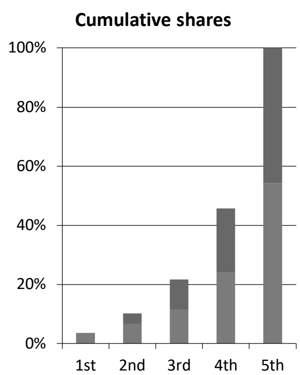
Income shares of quintiles

- Then divide the income of each group by the total of all groups.
- In this example, the 1st quintile's share is less than _______ percent.
- 5th quintile's share is over _______ percent.



Cumulative shares of quintiles

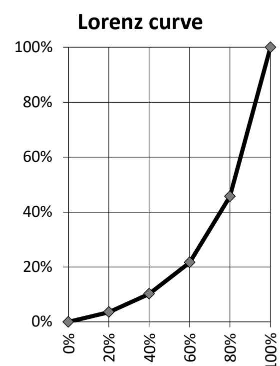
- Now *cumulate* the income shares.
- 1st is unchanged.
- New 2nd = 1st + 2nd.
- New 3rd = 1st + 2nd + 3rd.
- Etc.
- Last share must equal _________%.



Lorenz curve

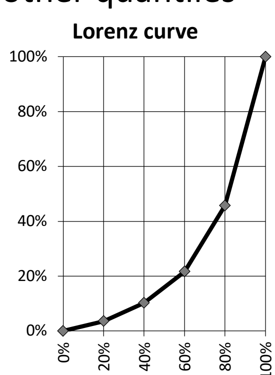
- Graph cumulative income share against cumulative population share.
- Result is a curve with increasing slope.

Lorenz, M. O. (1905). *Methods of measuring the concentration of wealth*. Publications of the American Statistical Association. Vol. 9 (New Series, No. 70) 209-219.



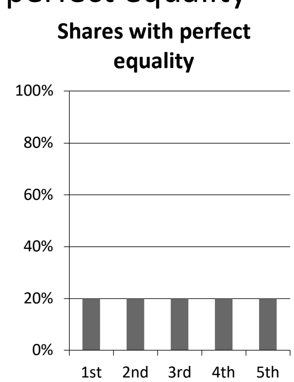
Lorenz curve with other quantiles

- What happens if we divide population into smaller groups (e.g., percentiles)?
- Lorenz curve gets smoother, more accurate.
- Still goes through _________________.



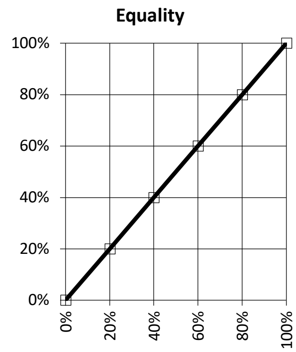
Extreme cases: perfect equality

- Suppose every household had exactly the same income.
- Then each quintile would have exactly a _________ share.



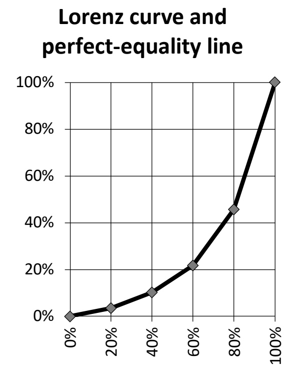
Extreme cases: perfect equality (cont'd)

- Graph cumulative income share against cumulative population share.
- With perfect equality, Lorenz curve would be a ________________ at 45 degrees.



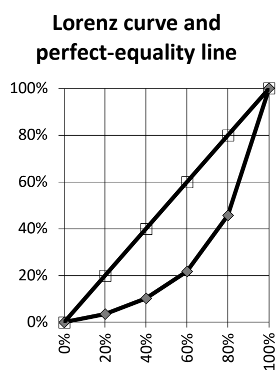
Actual curve versus perfect equality

- The farther the actual Lorenz curve is from the 45-degree line, the more _____________ the distribution.



Extreme cases: perfect inequality

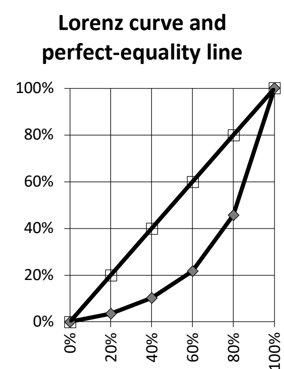
- Perfect inequality would occur if ______ household had all the income.
- Lorenz curve would look like a backwards "L".



Gini coefficient

= area between Lorenz curve and equality line, divided by total area under equality line.

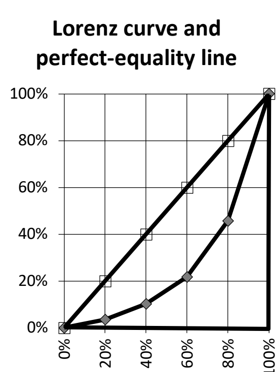
= _______ in this example.



Gini, C. (1912) Italian: Variabilità e mutabilità (Variability and Mutability), C. Cuppini, Bologna, 156 pages.

Extreme values of Gini coefficient

- With perfect equality, Gini coefficient = 0/0.5 = _________.
- With perfect inequality, Gini coefficient = 0.5/0.5 = ________.



Quintiles for US household income, 2022

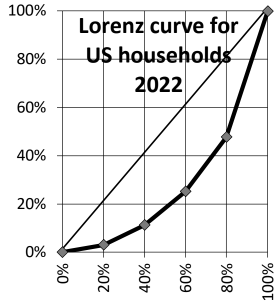
Quintile	Share of income	Cumulative share of income
First	0.030	
Second	0.082	
Third	0.140	
Fourth	0.226	
Fifth	0.522	

SOURCE: U.S. Census Bureau, "Income and Poverty in the United States: 2022." Table A-4b, p. 33. Issued September 2023.

Lorenz curve and Gini coefficient for US household income, 2022

Gini coefficient can be computed from areas of triangles and rectangles between Lorenz curve and equality line.

Gini coefficient = _______.

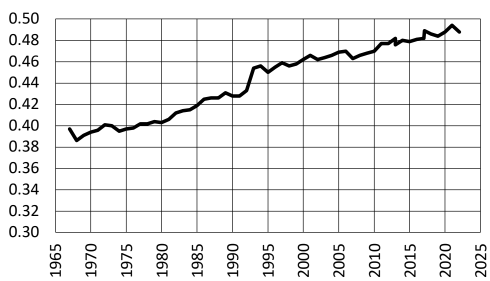


Gini coefficients of family income

Country	Gini	Country	Gini
Canada	33.3	China	38.2
Germany	31.7	India	35.7
Sweden	29.3	Malaysia	41.1
United Kingdom	35.1	Mexico	45.4
United States	41.5	South Africa	63.0

SOURCE: CIA World Factbook, https://www.cia.gov/the-world-factbook/field/gini-index-coefficient-distribution-of-family-income/country-comparison/, accessed December 2023. Note: household ≠ family.

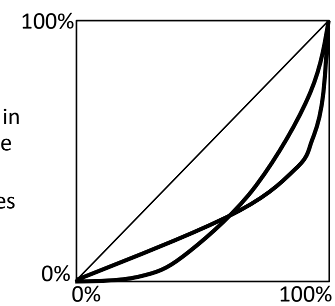
Gini index of US household income inequality



SOURCE: U.S. Census Bureau, "Income and Poverty in the United States: 2022." Table A-4b, p. 34. Issued September 2023.

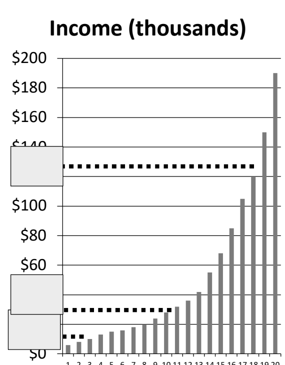
Limitations of Gini coefficient

- Gini coefficient is a _______________ measure, a single number.
- Cannot distinguish between inequality in different parts of the distribution.
- Alternative measures of inequality are needed.



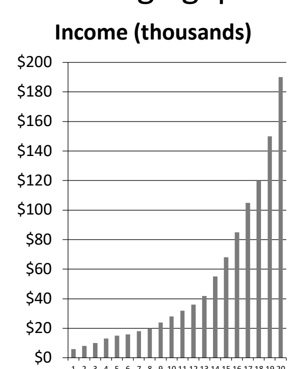
Alternative measures

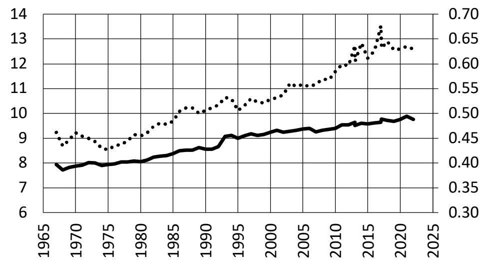
- Let w_{10} = wage of 10th percentile.
- Let w_{50} = wage of 50th percentile (or ______________).
- Let w_{90} = wage of 90th percentile.



Alternative measures: wage gaps

- 90-50 wage gap = $(w_{90}-w_{50})/w_{50}$.
- 50-10 wage gap = $(w_{50}-w_{10})/w_{10}$.
- 90-10 wage gap = $(w_{90}-w_{10})/w_{10}$.

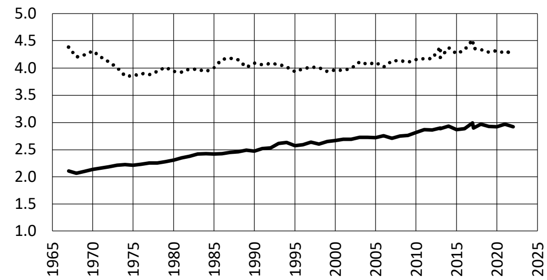




••••90/10 US household income gap (left scale)

—Gini index of US household income inequality (right scale)

SOURCE: U.S. Census Bureau, "Income and Poverty in the United States: 2022." Tables A-4a and A-4b, pp. 33-34. Issued September 2023.



—90/50 US household income gap
••••50/10 US household income gap

SOURCE: U.S. Census Bureau, "Income and Poverty in the United States: 2022." Tables A-4a and A-4b, pp. 33-34. Issued September 2023.

Conclusions

- To compare inequality across countries or over time, we need a way to measure it.
- A ______________ curve graphs cumulative shares against cumulative population.
- A ___________ coefficient = area between Lorenz curve and perfect equality line / 0.5.
- Other measures of inequality are the 90-50 wage gap and the 50-10 wage gap.

TRENDS AND EXPLANATIONS OF U.S. WAGE INEQUALITY

- What has happened to wage inequality in the U.S. and why?

Rising wage inequality since about 1980

- Wage gap between top and bottom of wage distribution ______________.
- Wage differentials *between* education groups, and *between* experience groups widened.
- Wage differentials *within* each education and experience group also widened.

Role of human capital

- Much of the rising wage inequality is a rising return to _____________________.
- Wage advantage of college graduates over high school graduates fell from 1970 to 1980, but rose steadily since then.
- Simultaneous rise in wage advantage of experienced workers over new workers.

No single explanation

- Early research searched for a single explanation for this rise in inequality.
  - _____________ shifts: changes in educational attainment, immigration
  - _____________ shifts: international trade, technological change
  - Changes in wage-setting _______________: decline of unionism, decline in real minimum wage.
- No single explanation explains even half of the increase.
- Area of ongoing research and debate.

Modeling skill differences

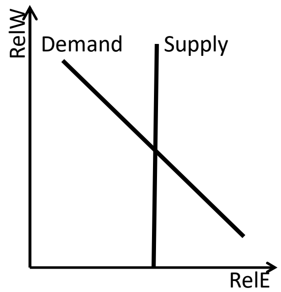
- Most explanations focus on supply and demand for skilled versus unskilled workers.
- Let RelW = wage of skilled workers / wage of unskilled workers.
- Let RelE = employment of skilled workers / employment of unskilled workers.

Relative demand and supply

- Assume relative supply of skilled workers is perfectly inelastic in short run.
  - In long run, higher returns to skill would encourage more workers to acquire skills.
- Relative demand is downward-sloping because workers of different skills can be substituted somewhat.
  - If RelW is large, then employers prefer to hire ______________ skilled workers and ______________ unskilled workers.

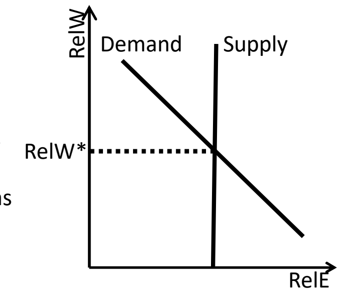
Relative demand and supply

- In equilibrium relative wage of skilled workers is given by intersection.
- Normally expect RelW* > _______.

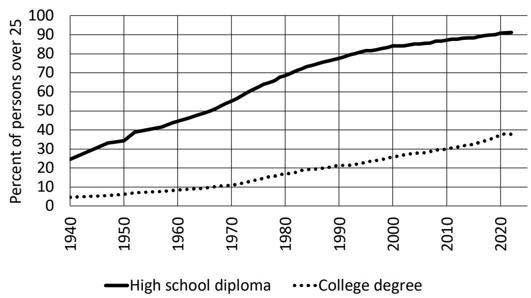


Why would RelW* increase?

- Two possibilities.
- First is that relative supply might shift __________.
- However, data show that relative supply of skilled workers has _______________, not decreased.



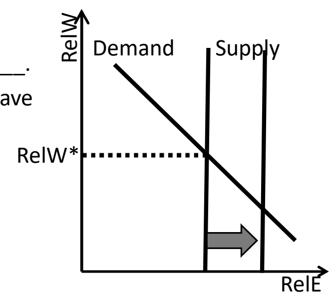
Relative supply of skilled workers has increased, not decreased



SOURCE: U.S. Census, CPS Historical Time Series Tables, *Table A-2*, downloaded December 2023.

Must be shift in relative demand

- Second possibility is that relative demand might shift __________.
- Moreover, it would have to shift a lot because relative supply has also shifted ____________.



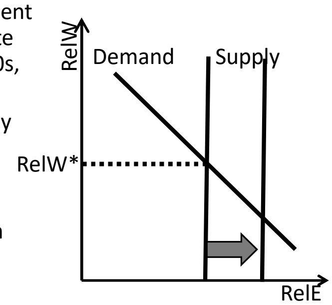
Claudia Goldin and Lawrence Katz, *The Race Between Education and Technology,* Cambridge: Harvard Univ. Press, 2008.

Supply shifts

- Most of the explanation for increased inequality must be _____________ shifts.
- Yet supply shifts can still help explain some of nuances in the trends.
  - College enrollment in 1960s and 1970s.
  - Immigration.

College enrollment in 1960s and 1970s

- Male college enrollment rose rapidly in the late 1960s and early 1970s, then slowed.
- Shifted relative supply of skilled workers ___________ very rapidly in 1970s.
- Effect was brief fall in RelW from 1970-80.



Immigration

- Immigration (legal and illegal) increased in the 1980s.
- Many immigrants were high school dropouts.
- This would have increased relative supply at the very _____________ of wage distribution.
- Helps explain some of the relative wage decrease for these workers.

Demand shifts

- Most of the explanation for increased inequality must be demand shifts.
- Most research attention focused on
  - Increased ________________________.
  - ______________________________ (especially computers).

International trade

- Expanding international trade has
  - increased employment in exporting industries
  - decreased employment in importing industries.
- Workers employed in exporting industries tend to be better-educated than workers in importing industries.
- So imports hurt low-skilled workers and exports help high-skilled workers.

Technological change

- Many have suggested that changes in technology might increase relative demand for ______________ workers.
- However, difficult to measure technological change directly.
- Some researchers simply control for everything else (supply shifts, int'l trade, etc.) and attribute any remaining relative wage change to technological change.

Technological change: computers

- Evidence shows that workers who use computers tend to be highly educated.
- Some evidence shows that capital (including computers) and skills are _________________ in production.
- But evidence that computers help skilled workers and hurt unskilled workers is indirect.

Revisionist view

- Some recent papers argue that technological change is *not* a major culprit.
- 50-10 wage gap grew sharply in 1980s and then ______________________.
- Yet the computer revolution and internet revolution continue to today.

Card, David and John E. DiNardo. 2002. "Skill-Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles." *Journal of Labor Economics*, 20(4), 733-83.

Another view

- Others point out that 90-50 wage gap continued to increase.
- Changes in wages were "polarized" in 1990s.
  - strong persistent increase in inequality in ______ half of distribution.
  - little further increase inequality in ___________ half of distribution.
- Suggests that simple "high-skill versus low-skill" framework is inadequate.

David H. Autor, Lawrence F. Katz, and Melissa S. Kearney, "Trends in U.S. Wage Inequality: Revising the Revisionists," *Review of Economics and Statistics*, vol. 90, no. 2 (May 2008), pages 300-323. See esp. p. 318.

Another view (cont'd)

Hypothesize that computer technology

- ________________ demand for educated professionals and managers
- ________________ demand for middle-educated white-collar and manufacturing workers
- had __________________ on demand for low-skilled workers such as health aides, security guards, orderlies, cleaners, and servers.

Autor, Katz, and Kearney (2008).

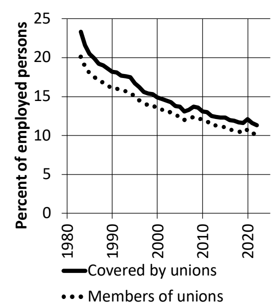
Changes in wage-setting institutions

Most research attention focused on

- Decline of unionism
- Decline of real minimum wage (especially in 1980s).

Decline of unionism

- Fraction of U.S. workforce who are unionized has declined since 1960s, especially in private sector.



SOURCE: www.bls.gov, series LUU0204899700 and LUU0204899600, downloaded December 2023.

Decline of unionism (cont'd)

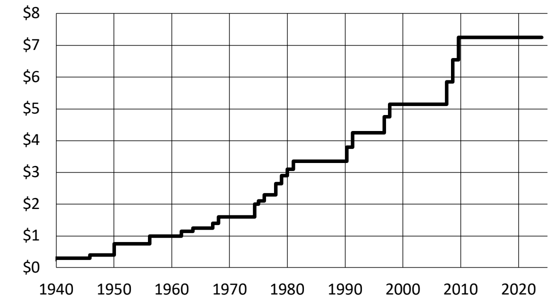
	1983		2022	
	Union members	Covered by unions	Union members	Covered by unions
Private sector	16.5%	14.3%	6.0%	6.8%
Public sector	36.7%	45.5%	33.1%	36.8%
All	20.1%	23.3%	10.1%	11.3%

SOURCES: 1983—Bureau of the Census, *Statistical Abstract of the United States,* 2012, table 664. 2018—BLS, "Union Members—2022," tables 1 and 3.

Effects of decline of unionism on inequality

- Unions tend to raise wages about 15% on average.
- If unions had previously raised wages up for low-skilled workers, then their decline might have increased 90-10 wage gap and 50-10 wage gap.
- However, high-skilled workers rarely belonged to unions.
- So decline of unionism _____________ explain increase in 90-50 wage gap.

U.S. federal minimum wage

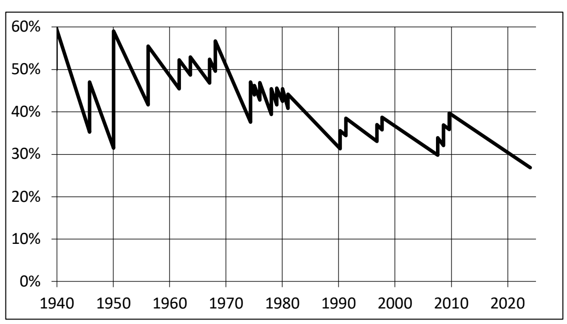


SOURCE: https://www.dol.gov/general/topic/wages/minimumwage

Real federal minimum wage in 2016 dollars

Federal minimum wage adjusted by CPI-U, using average value of CPI-U for January through November 2016.

Federal minimum wage as percent of average manufacturing wage



SOURCE: www.bls.gov, data series CEU3000000008

Effects of decline of real minimum wage on inequality

- Decline in real min. wage might have increased 90-10 wage gap and 50-10 wage gap.
- However, min. wage affects only low end of wage distribution.
- So decline in real min. wage _____________ explain increase in 90-50 wage gap.

Puzzles remain

- Changes in _________________ and ________________________ are the leading explanations.
- Yet they cannot explain why inequality increased sharply in US but not in some other industrialized countries.
- Area of ongoing research and debate.

Conclusions

- Wage inequality has risen steadily in the U.S. since _____________.
- Since relative supply of high-skilled workers increased, relative demand must have increased even ____________.
- No simple explanation, but ______________ ______________, international trade, and institutional changes in the labor market are most frequently blamed.

SUPERSTARS

- Why do some people earn far more than others in the same occupation?

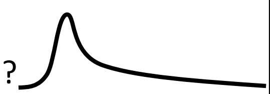
Extremely high wages

- In some occupations, the wage distribution is extremely skewed.
- Most entertainers are barely surviving, but top entertainers make many millions per year.
- Most professional athletes make modest salaries, but top ones make many millions per year.
- Called “_______________ phenomenon.”

Top salaries in Major League Baseball, 2023 (avg salary = $4.2 million)

SOURCE: USA Today, Major League Baseball Salaries 2023, https://databases.usatoday.com/major-league-baseball-salaries-2023/

Why is the wage distribution so skewed?



- In some occupations, relatively small differences in ability create big differences in demand.
- People prefer to watch the __________ entertainers, the __________ athletes, etc.
- People prefer to read the ___________ authors and listen to __________ musicians.

Rosen, Sherwin. 1981. "The Economics of Superstars." *American Economic Review*, 71(5), 845-58.

Why is the wage distribution so skewed? (cont’d)

- Technology of mass production allows one person to reach a ___________ audience.
  - Television allows many people to watch top athletes.
  - Recordings allow many people to enjoy top entertainers.
- Small differences in ability result in ___________ differences in VMP for employers.

Not all occupations have superstars

Contrast with other occupations where no one enjoys a wage 10 times the average.

- Truck drivers.
- Teachers.
- Grocery clerks.
- Economists.
- Surgeons.

Conclusions

- In some occupations, “superstars” earn far more than others.
- In these occupations, small differences in ability create ________ differences in demand.
- Technology of mass production translate small differences in ability into ____________ differences in VMP for employers.

INTERGENERATIONAL MOBILITY

- How big of an income advantage do children of high-income parents enjoy?

Is inequality passed from one generation to the next?

- Does each generation start fresh?
- Or does each generation simply inherit their position in the income distribution from their parents?
- Put differently, how strong is the relationship between parents' incomes and their children's incomes?

Data

- To answer this question, we need data on the incomes (or wages) of parents and the incomes (or wages) of their children a generation later.
- One approach is to divide all the parents into quintiles.
- Then for each parent quintile, count where the children went in the new generation's quintiles.

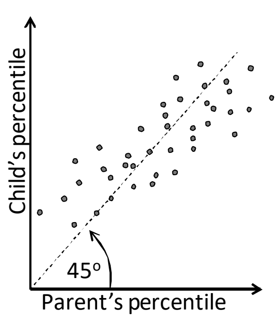
A transition matrix for income quintiles

Child quintile	Parent Quintile 1	2	3	4	5
1	*33.7%*	*24.2%*	*17.8%*	*13.4%*	*10.9%*
2	*28.0%*	*24.2%*	*19.8%*	*16.0%*	*11.9%*
3	*18.4%*	*21.7%*	*22.1%*	*20.9%*	*17.0%*
4	*12.3%*	*17.6%*	*22.0%*	*24.4%*	*23.6%*
5	*7.5%*	*12.3%*	*18.3%*	*25.4%*	*36.5%*

Source: Chetty, R., Hendren, N., Kline, P., & Saez, E. (2014). Where is the land of opportunity? The geography of intergenerational mobility in the United States. *Quarterly Journal of Economics, 129*(4), 1553-1623. Table II, p. 1577. Computed using children born in 1980-1982.

A scatter plot of income percentiles

- Suppose we compute the *percentiles* of each parent in the parents' distribution and each child in the children's distribution.
- Some children do better than their parents and some do worse.



Summarizing the data

To summarize the data, we can estimate an equation by OLS:

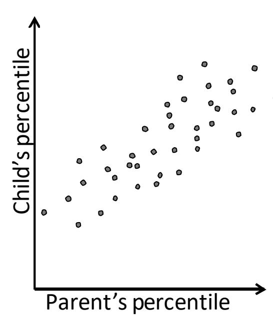
child's percentile

= β_1

+ β_2 parent's percentile

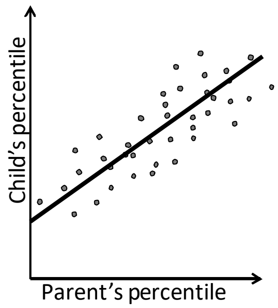
+ error term.

It turns out a simple line fits the data pretty well.



Interpreting the OLS line

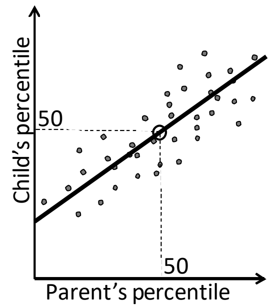
- As always, the OLS line shows the *conditional ("what-if") mean* of the Y-variable.
- So for example, if the parent is in the 30th percentile, then the child will on average be in the __________ percentile.



OLS estimates

- Now OLS lines always pass exactly through means of the data—in this case, 50 and 50.
- So, $50 = \beta_1 + \beta_2\, 50$.
- Subtracting equations,

$$\begin{pmatrix} child's \\ percentile \end{pmatrix} - 50 = \beta_2 \begin{pmatrix} parent's \\ percentile \end{pmatrix} - 50$$



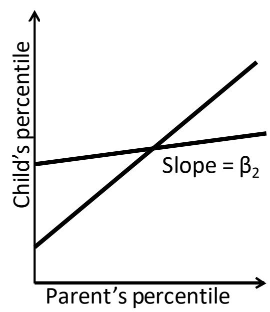
Example

- Suppose β_2 is estimated to be 0.4 and the parent's income is in the 60th percentile.
- What is the conditional mean of the child's income percentile?
- $\begin{pmatrix} child's \\ percentile \end{pmatrix} - 50 = 0.4\ (60 - 50)$
- So child's income percentile = ________.

What does the value of β_2 imply?

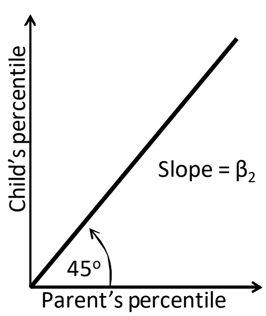
The larger β_2,

- the ____________ the estimated line,
- the ____________ the income advantage enjoyed by children of high-income parents,
- the ______________ is intergenerational mobility.



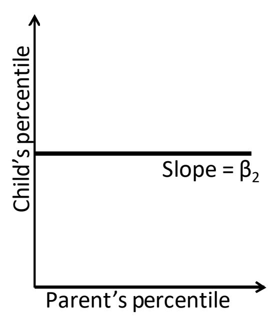
What if $\beta_2 = 1$?

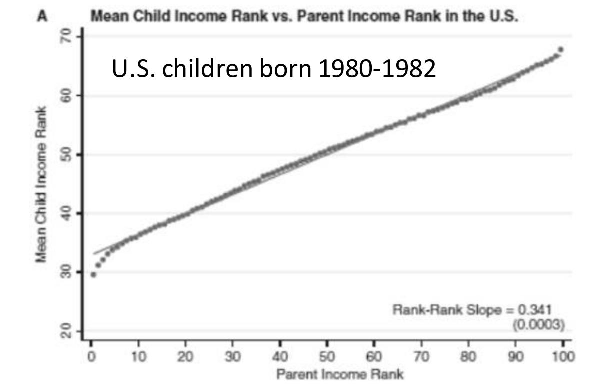
- Implies that children have the ___________ percentile as their parents.
- _____ intergenerational mobility.



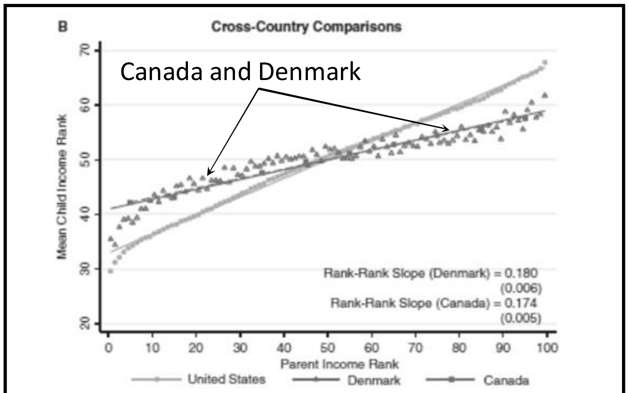
What if $\beta_2 = 0$?

- Implies that parent's percentile as ________ effect on child's percentile.
- _____________ intergenerational mobility.



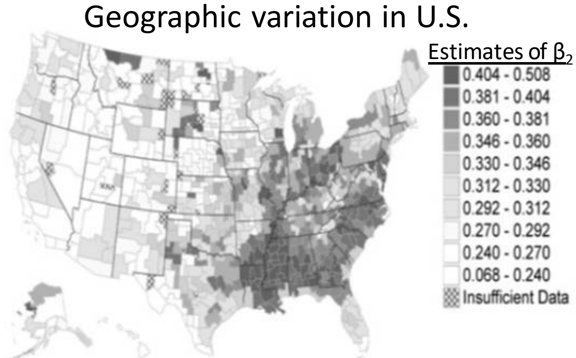


Source: Chetty, R., Hendren, N., Kline, P., & Saez, E. (2014). Where is the land of opportunity? The geography of intergenerational mobility in the United States. *Quarterly Journal of Economics, 129*(4), 1553-1623. Figure II, p. 1576.



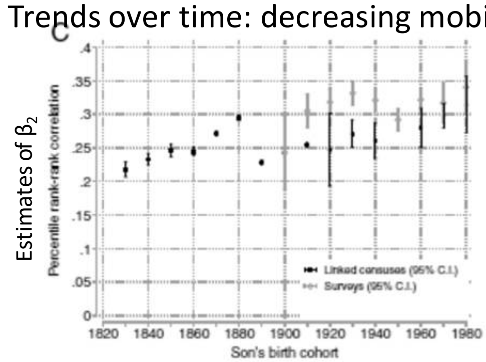
Source: Chetty, R., Hendren, N., Kline, P., & Saez, E. (2014). Where is the land of opportunity? The geography of intergenerational mobility in the United States. *Quarterly Journal of Economics, 129*(4), 1553-1623. Figure II, p. 1576.

Geographic variation in U.S.



Source: Chetty, R., Hendren, N., Kline, P., & Saez, E. (2014). Where is the land of opportunity? The geography of intergenerational mobility in the United States. *Quarterly Journal of Economics, 129*(4), 1553-1623. Figure VI, p. 1591.

Trends over time: decreasing mobility



Source: Song, X., Massey, C., Rolf, K., Ferrie, J., Rothbaum, J., & Xie, Y. (2019). Long-term decline in intergenerational mobility in the United States since the 1950s. *Proceedings of the National Academy of Sciences.*

Conclusions

- Intergenerational mobility can be measured as the coefficient in an OLS regression of children's income percentiles on parents' income percentiles.
- The higher the coefficient, the ________ mobility.
- A typical value for the U.S. today is about ________.
- Intergenerational mobility in the U.S. today is __________ than in some other countries and less than in the past.

THE MIGRATION DECISION

- Why do people move?

Main motivation is usually economic

- "Differences in net economic advantages, chiefly differences in wages, are the main causes of migration."
  J.R. Hicks, *The Theory of Wages* (1932).
- Standard economic model: workers compare wages in each location, then subtract costs of moving.
- Similar to schooling decision.

Earnings stream of stayer

- Suppose a worker, age 22, currently lives in Des Moines but is considering a move to Chicago.
- Let w_n^D = wage at age n in Des Moines.
- If worker stays in Des Moines, present value of earnings stream =

$$PDV^D = w_{22}^D + \frac{w_{23}^D}{(1+r)} + \frac{w_{24}^D}{(1+r)^2} + \cdots$$

Earnings stream of mover

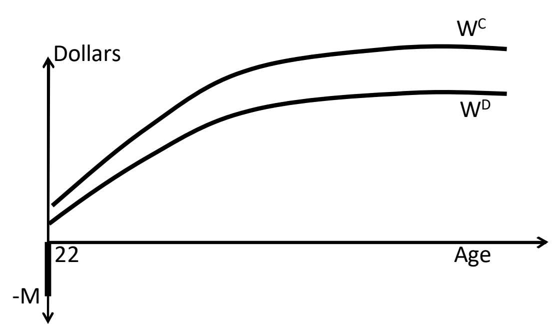
- Let w_n^C = wage at age n in Chicago.
- If worker moves to Chicago, present value of earnings stream =

$$PDV^C = w_{22}^C + \frac{w_{23}^C}{(1+r)} + \frac{w_{24}^C}{(1+r)^2} + \cdots$$

Moving costs

- _______________ cost of travel (gasoline, etc.).
- _______________ cost of moving furniture and personal goods.
- _______________ cost of moving away from friends, family, and social networks. (Different for different people and difficult to observe.)
- Let M = total moving costs.

Alternative earnings streams



Net gain to migration

- Net gain to migration =
  $$NGM = PDV^C - PDV^D - M .$$
- The worker moves if net gain ____ 0.
- Same standard model can be applied to migration _____________ a country and _______________ countries.
- Can even be applied to job changes in same city.

Implications of standard model

- Increase in PDV^C ______________ probability of a move.
- Increase in PDV^D ______________ probability of a move.
- Increase in M _______________ probability of a move.

Conclusions

- The main reasons people move are economic.
- Standard economic model defines net gain to migration as difference in present discounted value of expected earnings streams, minus moving cost:
  $$NGM = PDV^C - PDV^D - M .$$
- Worker moves if NGM is ______________.

INTERNAL MIGRATION WITHIN THE UNITED STATES

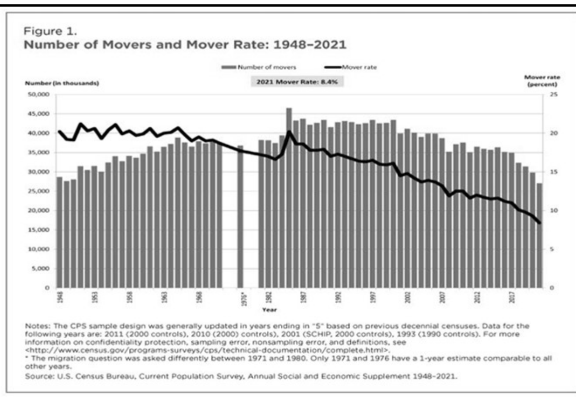
- What determines migration within the United States?

Mobility of Americans

From 2021 to 2022,

- 6.9 million Americans moved to a different county in the same state.
- 4.8 million Americans moved to a different state.
- 1.4 million Americans moved from abroad.

SOURCE: U.S. Bureau of the Census, *Geographic Mobility: 2022*, Table 1, https://www.census.gov/data/tables/2022/demo/geographic-mobility/cps-2022.html



SOURCE: U.S. Census, "Pandemic did not disrupt decline in rate of people moving," https://www.census.gov/library/stories/2022/03/united-states-migration-continued-decline-from-2020-to-2021.html

Empirical studies

- Many studies estimate the effects of location and worker characteristics on the probability of migration.
- Data generally confirm the standard economic model.
- Probability of moving is ________________ related to the net gain to migration:

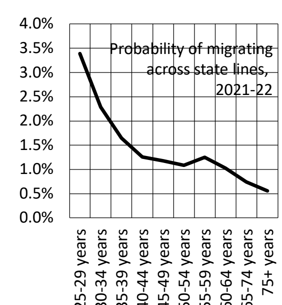
$$NGM = PDV^C - PDV^D - M .$$

What the data show: migration and characteristics of states

- The greater the wage difference, the _______________ the probability of migration.
- The faster the employment growth in the state of origin, the __________ the probability of migration.
- The greater the distance, the ___________ the probability of migration. Likely reason: distance is correlated with cost M.

What the data show: migration and age of workers

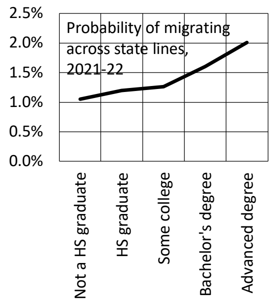
- The older the worker, the less the probability of migration.
- Likely reason: _______ ___________________.



SOURCE: U.S. Bureau of the Census, *Geographic Mobility: 2022*, Table 1, https://www.census.gov/data/tables/2022/demo/geographic-mobility/cps-2022.html

What the data show: migration and education of workers

- The more schooling, the greater the probability of migration.
- Likely reasons:
- More ____________ of distant opportunities.
- _______________ skills with fewer alternative employers nearby.



SOURCE: U.S. Bureau of the Census, *Geographic Mobility: 2022*, Table 1, https://www.census.gov/data/tables/2022/demo/geographic-mobility/cps-2022.html

Gains from migration

- Individual migration appears to increase quality of employment match for each worker.
  - Workers who choose to move enjoy a wage gain of about _______%, on average.
- Migration in aggregate increases economic efficiency.
  - Causes wages in different states to _______________.

Return migration and repeat migration

Some migrants return and some move on to a third location. Possible reasons:

- ______________: opportunities at destination were less than hoped.
- ______________: temporary stay to acquire human capital ("stepping-stone" career path).

Inferring moving cost M for the marginal worker

- The marginal worker is indifferent between moving and staying.
- So net gain to migration for marginal worker= NGM = ________ = $PDV^{NEW} - PDV^{OLD} - M$.
- Given wages in both locations and the discount rate r, we can estimate M for the marginal worker:

$$M = PDV^{NEW} - PDV^{OLD}$$

Inferring moving cost M for the marginal worker (cont'd)

- Let w^{OLD} = annual wage in old location.
- Then

$$PDV^{OLD} = w^{OLD} + \frac{w^{OLD}}{(1+r)} + \frac{w^{OLD}}{(1+r)^2} + \cdots$$

- If the worker has a long career, then this sum is approximately equal to the infinite series

$$\sum_{i=0}^{\infty} \frac{w^{OLD}}{(1+r)^i} =$$

Inferring moving cost M for the marginal worker (cont'd)

- So $PDV^{OLD} \approx \frac{(1+r)w^{OLD}}{r}$.
- Similarly, $PDV^{NEW} \approx \frac{(1+r)w^{NEW}}{r}$.
- Substituting:

$$M = PDV^{NEW} - PDV^{OLD}$$
$$= \frac{(1+r)w^{NEW}}{r} - \frac{(1+r)w^{OLD}}{r}$$
$$= \frac{(1+r)}{r}(w^{NEW} - w^{OLD})$$

Inferring moving cost M: example

- Suppose a young Puerto Rican is considering migrating to the U.S.
- Now w^{OLD} = \$22,000 and w^{NEW} = \$48,400.
- Assume r = 5% = 0.05.
- Then M = \$____________.
- Assume r = 10% = 0.10.
- Then M = \$____________.

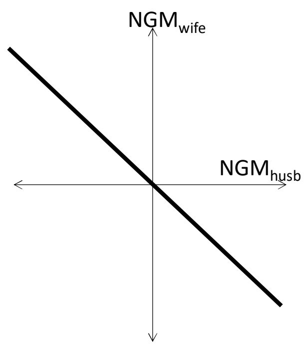
Family migration

- Suppose a family has *two* workers.
- An efficient migration decision takes account of net gains from migration (NGM) for ____________ workers.
- Family will migrate if total net gains are positive—that is, if

$$NGM_{wife} \qquad NGM_{husb} > 0$$

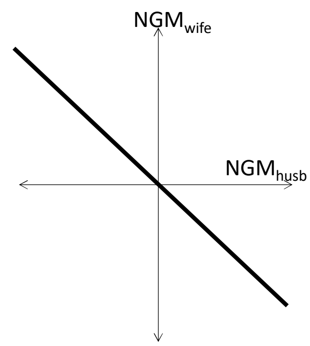
The family migration decision

- The equation $NGM_{wife} + NGM_{husb} = 0$ is a line with slope = __.
- Family is indifferent between moving and staying if it is on the line.
- Family will migrate if it is above and to the right of that line.



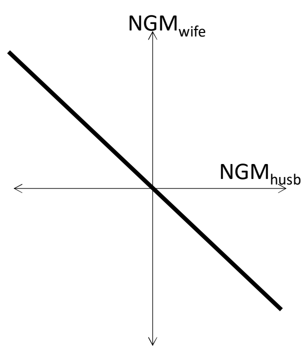
Unanimous decisions

- Suppose $NGM_{wife} > 0$, and $NGM_{husb} > 0$. Both workers benefit from moving, so family will surely move.
- Suppose $NGM_{wife} < 0$, and $NGM_{husb} < 0$. Family will not move.
- But there are other possibilities.



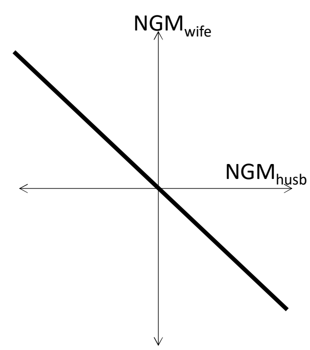
Tied movers

- Suppose $NGM_{husb} < 0$, but $NGM_{wife} + NGM_{husb} > 0$.
- Then moving is bad for husband but good for family as a whole.
- Husband is called a __________________.



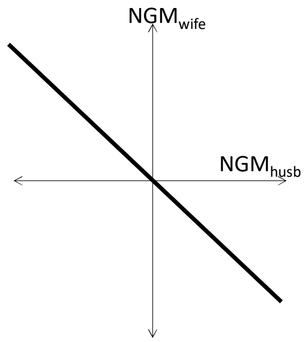
Tied stayers

- Suppose $NGM_{wife} > 0$, but $NGM_{wife} + NGM_{husb} < 0$.
- Then moving is good for wife but bad for family as a whole.
- Wife is called a __________________.



More possibilities

- Wife is a tied mover.
- Husband is a tied stayer.



Pressures on families

- Often difficult to find moves that are good for both workers.
- Conflict between what is best for individuals and what is best for family as a whole may make family less stable.
- If *both* workers have highly specialized skills, the optimal family destination is likely to be a ______________________________________.

Conclusions

- The standard economic model fits migration patterns within the U.S.
- The probability of migration is greater,
  - the greater the wage difference between states.
  - the ____________ the worker's age.
  - the ____________ schooling the worker has.
- Family migration decisions take account of _____________ workers' gains from migration.

HISTORY OF IMMIGRATION TO THE UNITED STATES

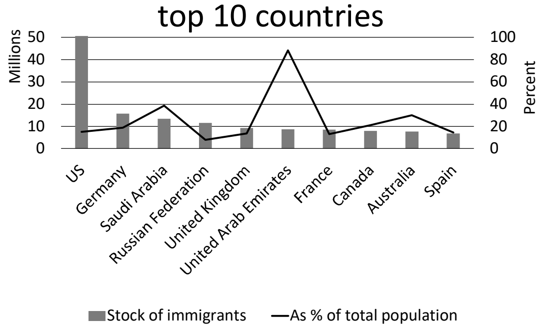
- How has immigration to the U.S. changed over time?

Importance of immigration

- In the last few decades, immigration to the U.S. and other high-income countries has increased sharply.
- U.N. estimates that as of 2020, about 281 million people lived in a country different from where they were born.

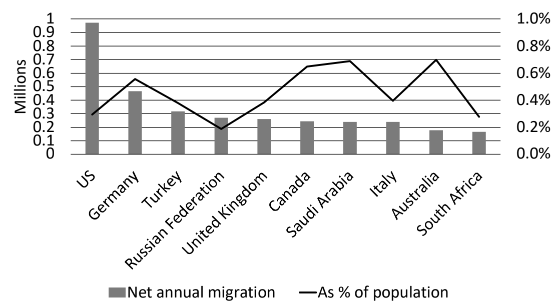
SOURCE: United Nations Department of Economic and Social Affairs, International Migration 2020 Highlights, p. 1, https://www.un.org/development/desa/pd/content/publications

Stock of immigrants, 2020, top 10 countries



SOURCE: United Nations Department of Economic and Social Affairs, International Migration 2020 Highlights. Annex table: International migrant stock 2020. https://www.un.org/development/desa/pd/content/publications

Annual net migration flow, 2010-2020, top 10 countries

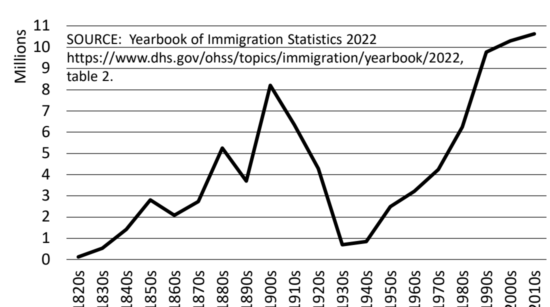


SOURCE: United Nations Department of Economic and Social Affairs, International Migration 2019. Table II.3, p. 25. https://www.un.org/development/desa/pd/content/publications

History of U.S. immigration

- Immigration rose steadily in 19th century, except in 1860s and 1890s.
- Reached a peak in___________________.
- In 1920s, Congress passed a quota system by national origin, giving most visas to northwest Europe and sharply limiting the total.
- As a result, immigration fell dramatically in __________________________.

Total U.S. immigration flows, 1820s-2010s

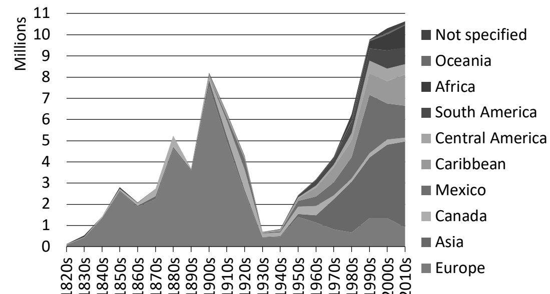


History of U.S. immigration (cont'd)

- In 1965, Congress increased number of visas and replaced national origin with "_________ reunification" as top criterion.
- As a result, immigration has risen dramatically, with many more immigrants from Asia and Latin America.
- Illegal immigration: estimated stock of _________ million as of 2015.

SOURCE: Department of Homeland Security, "Estimates of the Unauthorized Immigrant Population Residing in the United States: January 2015," December 2018, https://www.dhs.gov/sites/default/files/publications/18_1214_PLCY_pops-est-report.pdf

U.S. immigration flows by source region, 1820s-2010s



SOURCE: Yearbook of Immigration Statistics 2022 https://www.dhs.gov/ohss/topics/immigration/yearbook/2022, table 2.

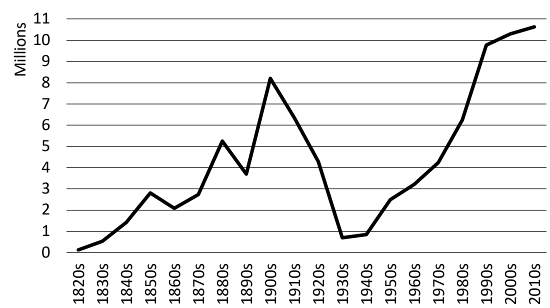
Motivation for immigration

- Absent government restrictions, motivation for immigration is mostly economic.
- Standard economic model defines net gain to migration =

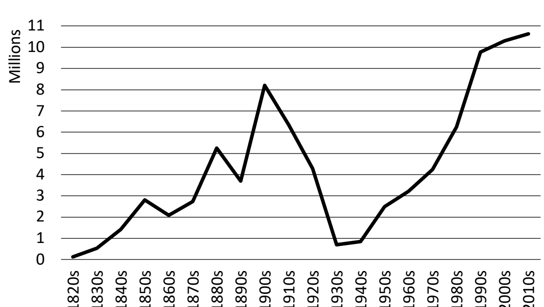
$$NGM = PV^{NEW} - PV^{OLD} - M .$$

- The worker moves if net gain ______ 0.

Explaining early immigration flows



Explaining recent immigration flows



Current U.S. policy

U.S. admits permanent immigrants in several categories:

- Family-sponsored: relatives of citizens or permanent residents (480,000).
- Employment-based: workers with skills in high demand (140,000).
- Diversity: coming from countries who have sent few immigrants in the past (50,000).
- Refugees and asylees (varies).

Kandel, W. (2018). *A primer on U.S. immigration policy*. Washington, D.C.

Conclusions

- Early U.S. immigration peaked in early 1900s, and was mostly from Europe and Canada.
- From 1920s to 1960s, a quota system limited immigration and favored northwest Europe.
- Since 1960s, immigration has increased sharply, especially from ________________ ________________.

WHO IMMIGRATES INTO THE UNITED STATES?

- Immigrants are not a random sample of people from their home countries.
- Who chooses to immigrate?

Who immigrates to U.S.?

- Wages of immigrants after arriving in U.S. vary widely.
- Some enjoy wages much higher than U.S. workers, some much lower.
- There are clear patterns in wage differentials by country of origin.

Possible reasons for wage differentials

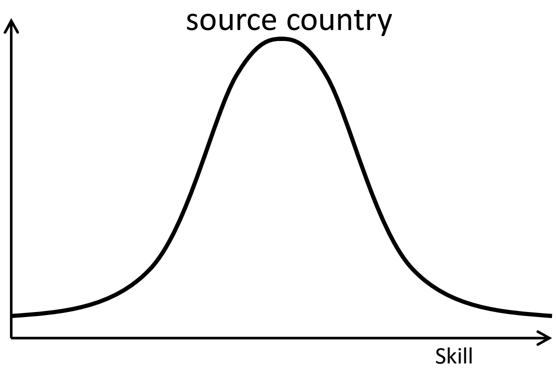
1. Immigrants from countries more similar to U.S. bring skills that are _____________ paid in the U.S. labor market.
2. Immigrants are *not* a random sample of workers from each source country. Instead, they represent those workers most likely to enjoy positive __________________ __________________________.

Roy* model

- Explanation #2 assumes that potential immigrants _________________.
- Each sending country has people with a variety of skills.
- Educational attainment of immigrants depends on which people want to move to the U.S.
- Thus it is a model of immigrant ____________.

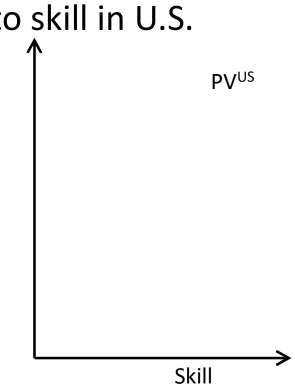
*Andrew D. Roy, "Some Thoughts on the Distribution of Earnings," *Oxford Economic Papers,* Vol. 3 (June 1951), pp. 135-146.

Distribution of skill over workers in source country



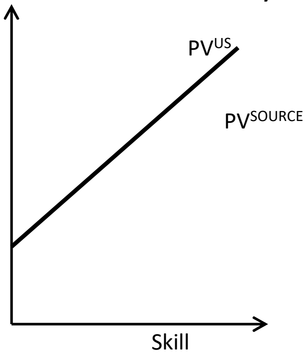
Returns to skill in U.S.

- Skill = productivity
- Not directly observed, but depends on ability and schooling.
- More skilled workers enjoy higher wages in US.



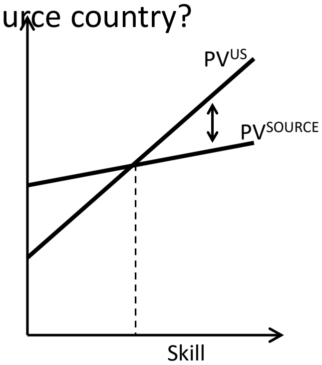
Lower returns to skill in source country

- Suppose source country has higher taxes, but better social safety net than US.
- Examples: Germany, UK, Canada.
- Then returns to skill are ___________ in source country than in US.

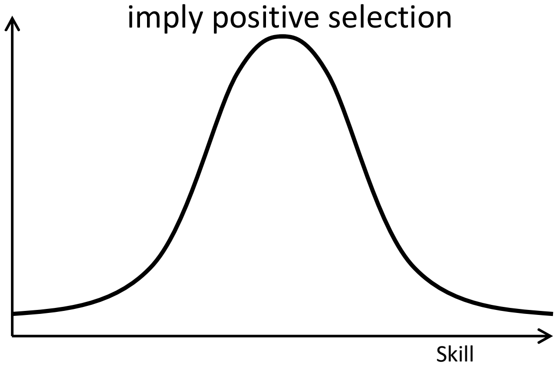


Who migrates when returns to skill are lower in source country?

- Net gains from migration will most likely be positive for workers at __________ end of the skill distribution.

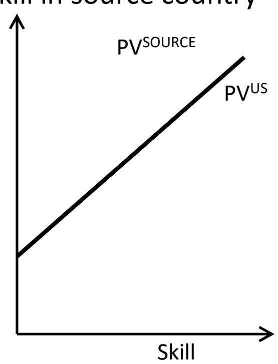


Lower returns to skill in source country imply positive selection



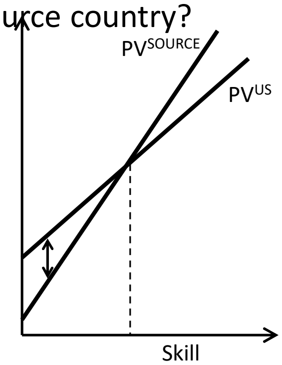
Higher returns to skill in source country

- Suppose source country has lower taxes and a smaller social safety net than US.
- Examples: Many Latin American countries.
- Then returns to skill are ___________ in source country than in US.

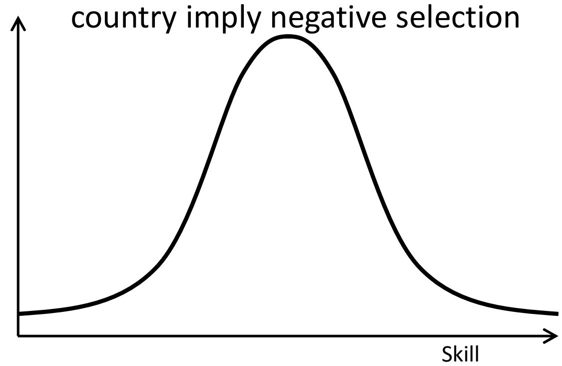


Who migrates when returns to skill are higher in source country?

- Net gains from migration will most likely be positive for workers at __________ end of the skill distribution.



Higher returns to skill in source country imply negative selection



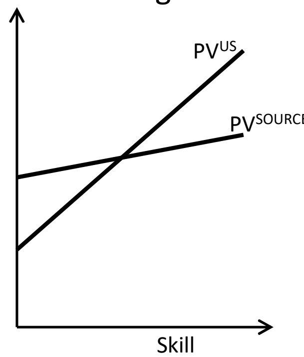
Roy* model: summary

- Returns to skill in source country, compared to returns in U.S., determine the type of selection.
- Positive selection occurs from countries with _______________ returns to skill.
- Negative selection occurs from countries with _______________ returns to skill.

*Andrew D. Roy, "Some Thoughts on the Distribution of Earnings," *Oxford Economic Papers,* Vol. 3 (June 1951), pp. 135-146.

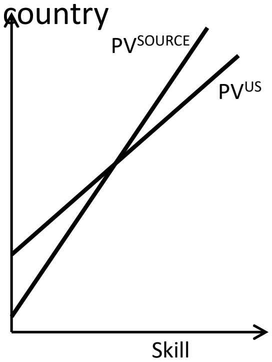
Change in base level of earnings in U.S.

- Suppose source country has lower returns to skill.
- Suppose base level of earnings in U.S. falls due to a recession.
- Number of immigrants decreases, but selection remains ____________.



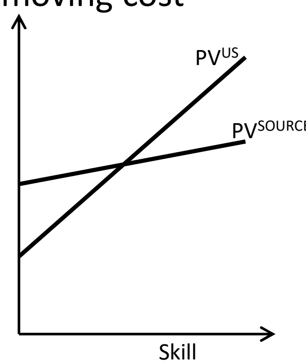
Change in base level of earnings in source country

- Suppose source country has higher returns to skill.
- Suppose base level of earnings in source country in rises due to a boom.
- Number of immigrants decreases, but selection remains ____________.



Change in moving cost

- Increase in moving cost M has same effect as decrease in U.S. earnings.
- Number of immigrants decreases, but selection is _________________.



A puzzle

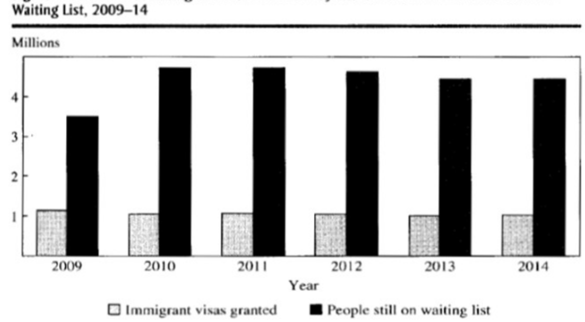
	Mexico	Algeria
Average educational attainment in home country	8.5 years	7.6 years
% of immigrants to US	27%	0.0004%
Rank of immigrants to US in educational attainment	134th	25th

The average education level of immigrants from a country is negatively related to the number of immigrants from that country.

Lazear, E. P. (2017). The rise and fall of U.S. low-skilled immigration: comment. *Brookings Papers on Economic Activity* (Spring 2017), 158-163.

A clue

Figure 1. Number of Immigrant Visas Granted by the United States and the Annual Waiting List, 2009–14



Lazear, E. P. (2017). The rise and fall of U.S. low-skilled immigration: comment. *Brookings Papers on Economic Activity* (Spring 2017), 158-163.

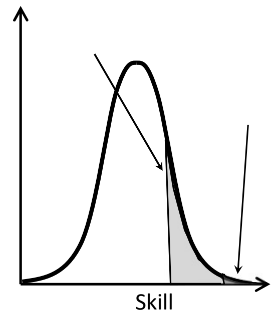
Immigration slots are rationed

- Immigrants to U.S. are not self-selecting.
- U.S. restricts immigration to about 1 million per year, in several categories.
    - family-sponsored
    - employment-based
    - diversity
- Last two categories give priority to skilled immigrants.

Kandel, W. (2018). *A primer on U.S. Immigration Policy*. Washington, D.C.

Immigrants do not entirely self-select

- U.S. law favors skilled immigrants (except for family reunification).
- So average skill level of immigrants from any country is negatively related to how many we let in from that country.



Conclusions

- According to the Roy model, the choice to immigrate depends on relative returns to skill.
- Immigrants from countries with high returns to skill tend to be ____________ skilled than natives.
- Immigrants from countries with low returns to skill tend to be ____________ skilled than natives.
- But the Roy model does not account for legal restrictions by admitting country.

IMMIGRANTS IN THE U.S. LABOR MARKET

- How well do immigrants and their children do in the U.S. labor market?

How well do immigrants do in the U.S. labor market?

- How do their earnings compare with natives?
- How fast do their earnings increase with labor market experience, compared with natives?
- Are they likely to contribute substantially in taxes, or will they be a tax burden?

Age-earnings profiles of immigrants

- Cross-section datasets collect data on individual workers at a point in time, including data on
  - younger immigrants (recently-arrived),
  - older immigrants (who arrived decades ago).
- Early studies used cross-section datasets to construct age-earnings profiles.

Findings of early cross-section studies

1. Most immigrants initially have wages below those of natives.
2. However, immigrants' wages seem to grow faster over time.
3. Immigrants seem to ________________ natives after about 14 years of labor market experience.

Explaining the findings

- *Finding #1 makes sense.* Many immigrants initially lack language skills, education, and knowledge of the U.S. job market.
- *Finding #2 makes sense.* As they learn English, gain an education, and learn about the U.S. job market, their skills and earnings should increase rapidly.
- *Finding #3 does* __________ *make sense.* Why should immigrants' skills exceed those of natives?

Assimilation hypothesis

Some tried to explain finding #3 as ________________________________.

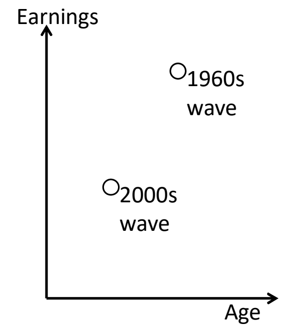
- Immigrants are more motivated than average people.
- "That is why they were willing to move so far for a better future."
- Once immigrants have assimilated, they outperform natives on the job.

Questioning finding #3

- Problem with cross-section methodology.
- Older and younger immigrants are not the same people.
- From different _______________ (groups of people born at the same time).
- Different immigrant cohorts are from different countries. May have different skills.

Cohort effects in theory

- Data on different workers correspond to _______________ cohorts.
- If we simply connect the points, we might ___________ -estimate slope of age-earnings profile.



Tracking each cohort

- By combining datasets from different years, we can control for cohort effects.
- We can track each cohort ________________, rather than lumping all cohorts together.
- It turns out that recent cohorts have started out in the US at lower wages.

Conclusions

- Early cross-section studies found that immigrants had steep age-earnings profiles, and that children of immigrants did much ______________ than their parents.
- Later studies showed that these findings were biased due to ______________________: recent immigrants brought lower skill levels than previous waves of immigrants.

JOB TURNOVER

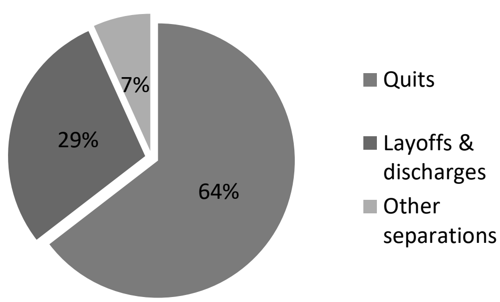
- What happens to workers when they change jobs?

Types of job separations

- Quit: worker leaves job.
- Layoff: worker loses job for economic reasons.
- Discharge: worker loses job for performance reasons.
- Other separations: retirement, death, disability, and transfers to other locations of same firm.

SOURCE: Bureau of Labor Statistics, Job Openings and Labor Turnover Survey, http://www.bls.gov/jlt/#news, accessed March 27, 2012.

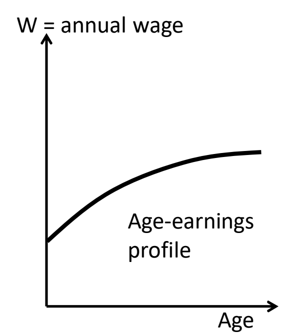
Separations, October 2023



SOURCE: Bureau of Labor Statistics, Job Openings and Labor Turnover—October 2023, https://www.bls.gov/news.release/pdf/jolts.pdf

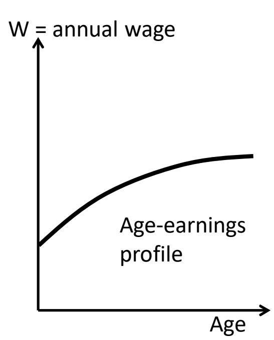
Wage consequences of quits

- Most people who quit start another job immediately.
- Young men who quit usually enjoy a wage __________.



Wage consequences of layoffs

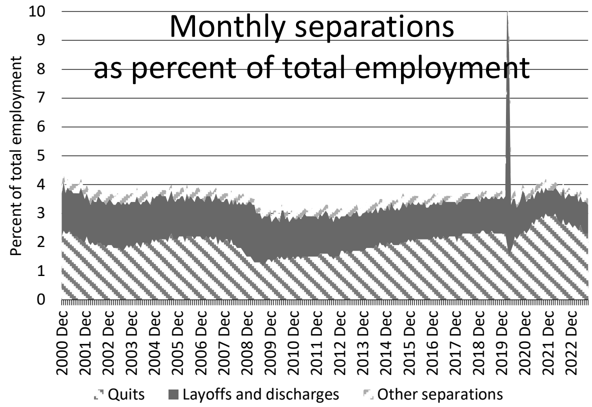
- Most people who are laid off experience unemployment before finding another job.
- Young men who are laid off usually suffer a wage ____________, sometimes a large one.

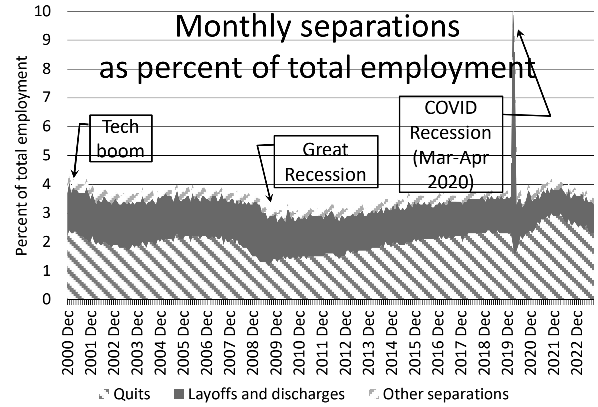


Rising job instability?

- There is some evidence that rate of job loss (layoffs and discharges) has increased since early 1980s.
  - Especially for older males and for all African-Americans.
- However, difficult to separate long-term trends from business cycles.

SOURCE: *On the Job: Is Long-Term Employment a Thing of the Past?* Edited by David Neumark. New York: Russell Sage Foundation, 2001.



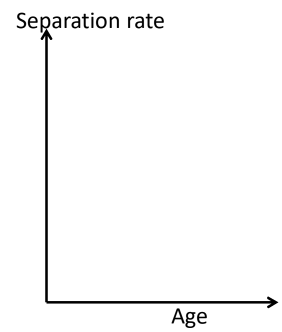


Three facts about job turnover

A. Separation rate (quits and layoffs) is negatively correlated with age of worker.
B. Separation rate (quits and layoffs) is negatively correlated with seniority (length of time on the job) of worker.
C. Wages are positively correlated with seniority.

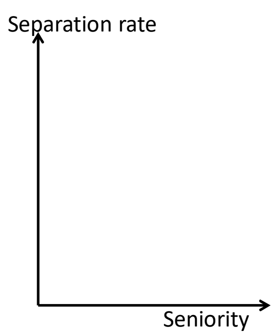
A. Quits, layoffs and age

- Frequency of quits and layoffs both _________ with age of worker.
- Possible reason: Changing jobs is costly. Older workers have shorter payback period until retirement.

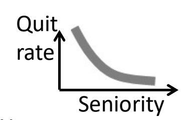


B. Quits, layoffs and seniority (years on the job)

- Frequency of quits and layoffs both _________ with seniority.
- Seniority means time with current employer.
- Why? 2 hypotheses.



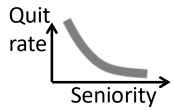
Hypothesis 1: the job match



- Workers vary in their productivity.
- Jobs vary in their amenities and working conditions.
- _____________ the hire, neither worker nor employer are perfectly informed.
- _____________ the hire, both learn whether the worker is a good match for the job.

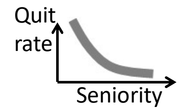
K.G. Abraham and H.S. Farber, "Job duration, seniority, and earnings," *American Economic Review*, vol. 77, no. 3 (1987), pp. 278-297.

Turnover as a matching process



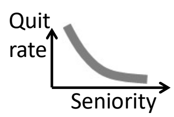
- If match is good, worker stays.
- If match is not so good, both worker and employer may continue searching for another match.
- Turnover is ______________ if it results in better matches.
- Turnover is also ______________ if it better accommodates changing demand for products.

Is job match the only explanation?



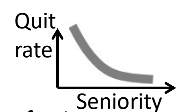
- The job-matching story says simply that good matches __________________.
- Is high seniority really indicative of a good match?
- Could there be another plausible explanation?

Hypothesis 2: movers and stayers

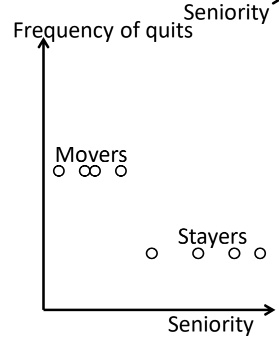


- Suppose there are two kinds of workers in the job market.
- ________________ have a high quit rate, perhaps because they have low moving costs.
- ________________ have a low quit rate, perhaps because they have high moving costs.

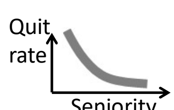
Movers and stayers look different in the data



- ______________ accumulate little seniority, on average.
- ______________ accumulate more seniority, on average.
- High seniority does not indicate a good match—just a stable worker.

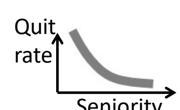


Which hypothesis is correct?

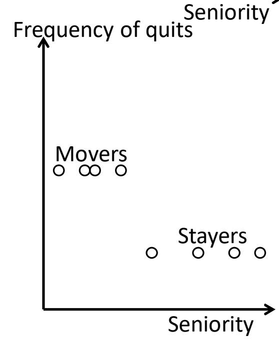


- Cannot tell simply look at cross section of workers.
- Must ____________ the same workers over time.
- In fact, better data show that a worker who quits frequently in the past *is* more likely to quit in the future.

Which hypothesis is correct? (cont'd)



- So there are movers and stayers with distinct quit propensities.
- But ________ workers quit less frequently when they have more seniority.
- So ____________ explanations are partly correct.



C. Wages and seniority

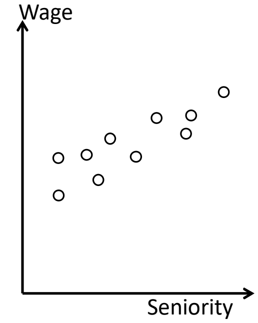
- In cross-section data, seniority is ______________ related to wages.
- If we estimate an extended Mincer equation:

  $\log W = \beta_1 + \beta_2$ Schooling $+ \beta_3$ Experience
  $+ \beta_4$ Experience$^2 + \beta_5$ **Seniority**
  $+ \beta_6$ other variables + error term

  then the estimate of β_5 is usually about __________________ and statistically significant.

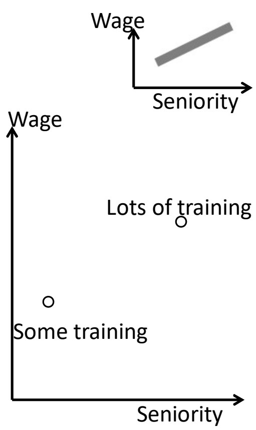
Wages and seniority (cont'd)

- Put differently, in cross-section data, wages and seniority are ________________ correlated, holding constant schooling and experience.
- Why? 2 hypotheses.



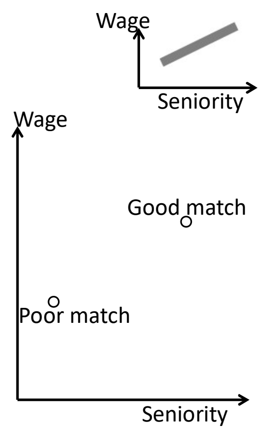
Hypothesis 1: specific human capital

- *Specific human capital*: Both worker and employer invest in human capital specific to firm and share returns.
- For worker, returns are paid in rising wages.
- Greater seniority ____________ higher wages.



Hypothesis 2: the job match

- *Matching*: When workers find a job that pays well, they stay.
- Higher wages ____________ greater seniority.
- Implies workers are receiving little specific training and turnover is not costly.

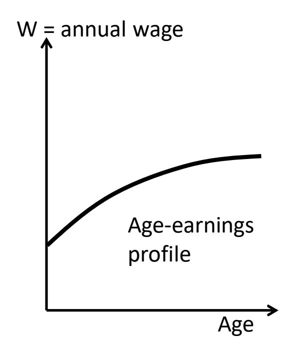


Which explanation is correct?

- Cannot simply look at cross section of workers.
- Must _____________ the wages of same worker at the same job over time.
- In fact, better data and better analysis showed that greater seniority *does cause* higher wages.

Which explanation is correct? (cont'd)

- So it appears that specific training *is* important and turnover *is* costly.
- Also helps explain why workers who are laid off suffer a wage ____________, sometimes a large one.



Conclusions

- Quits usually result in a wage gain. Layoffs usually result in a wage loss.
- Separations ________________ with a worker's age.
- Separations ________________ with seniority, both because of better job matches, and because some workers are movers and some are stayers.
- Wages ____________ with job seniority, probably because of specific human capital.

EVIDENCE OF DISCRIMINATION

- How can we measure discrimination objectively?

What is labor-market discrimination?

- Occurs when market participants consider race, gender, or other similar characteristics when making market transactions. Examples:

1. _________________ might care about gender in hiring.
2. _________________ might care about race or ethnicity of their coworkers.
3. _________________ might care about the gender or race of sellers they patronize.

Earnings differentials found worldwide

- By race in Canada, western Europe.
- By ethnicity (Malay, Indian, and Chinese) in Malaysia.
- By caste in India.
- By gender in most developed countries.
- Etc.

But are earnings differentials evidence of *discrimination*?

Other explanations for differentials:

- Compensating differentials for job characteristics (hours of work, pace of work, risk of injury, etc.)
- Differentials for worker productivity (e.g., by educational attainment).

Measuring discrimination in wages

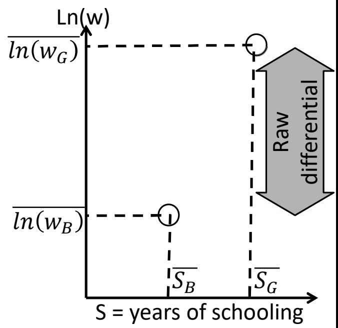
- Does the labor market reward groups differently?
- Imagine we had dataset on hourly wages and other information on blue and green workers.
- How should we measure wage differential between blue and green workers?

Raw wage differential

- Take natural logarithms of wages for all workers: $\ln(w_G)$, $\ln(w_B)$.
- Compute means by group: $\overline{ln(w_G)}$, $\overline{ln(w_B)}$
- Subtracting, raw log wage differential
  = $\Delta \ln(w)$ = $\overline{ln(w_G)} - \overline{ln(w_B)}$
  ≈ overall _______ wage advantage of green workers over blue workers.

Accounting for schooling

- Raw log wage differential is unsatisfactory measure of discrimination if blue and green workers have different levels of ______________ _______________.

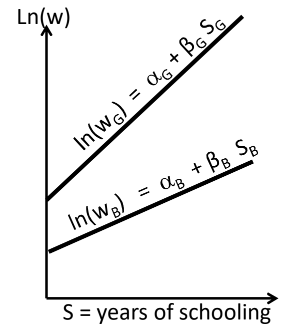


Regression equations

- So estimate regression equations for blue and green workers wages against schooling:

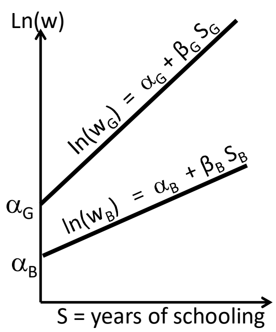
$\ln(w_G) = \alpha_G + \beta_G S_G$

$\ln(w_B) = \alpha_B + \beta_B S_B$



Interpreting regression equations

- α_G and α_B = ____________________ = values of ln(w) if worker had no schooling.
- β_G and β_B = ____________________ on schooling for green and blue workers, respectively.



Wage differential with schooling

- A property of least-squares regression is that the equation fits the sample means exactly:
  $\overline{ln(w_G)} = \alpha_G + \beta_G \overline{S_G}$,
  $\overline{ln(w_B)} = \alpha_B + \beta_B \overline{S_B}$.
- Subtracting, log wage differential
  = $\Delta \ln(w)$ = $\overline{ln(w_G)} - \overline{ln(w_B)}$
  = $\alpha_G + \beta_G \overline{S_G} - \alpha_B - \beta_B \overline{S_B}$

Interpreting wage differential with schooling

- Adding and subtracting $(\beta_G \overline{S_B})$ gives
  $\Delta \ln(w)$ =

  = $(\alpha_G - \alpha_B) + (\beta_G - \beta_B)\overline{S_B} + \beta_G(\overline{S_G} - \overline{S_B})$

  = $[(\alpha_G - \alpha_B) + (\beta_G - \beta_B)\overline{S_B}] + \beta_G(\overline{S_G} - \overline{S_B})$

- If blue and green workers have same level of schooling, then $(\overline{S_G} - \overline{S_B})$ = 0 and last term drops out.

Interpreting wage differential with schooling (cont'd)

- $\Delta \ln(w)$ =
  = $[(\alpha_G - \alpha_B) + (\beta_G - \beta_B)\overline{S_B}] + \beta_G(\overline{S_G} - \overline{S_B})$
- Term in brackets > 0 if
  - employers reward green worker's schooling more than blue worker's schooling ($\beta_G > \beta_B$), or
  - employers pay green workers more regardless of schooling ($\alpha_G > \alpha_B$) .

"Oaxaca-Blinder decomposition" of wage differential

- Log wage differential = Δ ln(w) =

$$= [(\alpha_G - \alpha_B) + (\beta_G - \beta_B)\,\overline{S_B}] + \beta_G\,(\overline{S_G} - \overline{S_B})$$

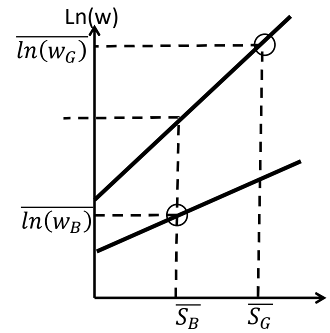
Differential due to discrimination

Differential due to difference in schooling

Oaxaca, R. L. (1973). Male-female wage differentials in urban labor markets. *International Economic Review*, 14, 693-709.
Blinder, A. S. (1973). Wage discrimination: reduced form and structural estimates. *Journal of Human Resources, 8*(4), 693-709.

Graph of Oaxaca decomposition

- Differential due to difference in schooling
- Differential due to discrimination



Extending Oaxaca's method

- Oaxaca decomposition can be applied to any groups.
- Can be applied to other variables measuring of human capital, such as labor-market _________________________________, and perhaps region, industry, and occupation.
- Usually, the more variables are included, the lower the estimated differential due to discrimination.

Examples of Oaxaca decompositions

	Blacks versus whites	Hispanics versus whites	Females versus males
Raw log wage differential (hourly wage)	-0.211	-0.305	-0.286
Differential due to differences in education, experience, personal characteristics, and city and region	-0.082	-0.193	-0.008
Differential due to discrimination	-0.134	-0.112	-0.279

Joseph Altonji and Rebecca Blank, "Race and Gender in the Labor Market," in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, Vol. 3C, Amsterdam, Elsevier, 1999. Table 5 part (B) 1995, lines 19-21, p. 3159.

Examples of Oaxaca decompositions with more variables

	Blacks versus whites	Hispanics versus whites	Females versus males
Raw log wage differential	-0.211	-0.305	-0.286
Differential due to differences in education, experience, personal characteristics, city and region, occupation, industry, and job characteristics	-0.114	-0.226	-0.076
Differential due to discrimination	-0.098	-0.079	-0.211

Joseph Altonji and Rebecca Blank, "Race and Gender in the Labor Market," in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, Vol. 3C, Amsterdam, Elsevier, 1999. Table 5 part (B) 1995, lines 19-21, p. 3159.

What does the Oaxaca decomposition measure?

- Log wage differential = Δ ln(w) =

$$= \underbrace{[(\alpha_G - \alpha_B) + (\beta_G - \beta_B)\,\overline{S_B}]} + \underbrace{\beta_G\,(\overline{S_G} - \overline{S_B})}$$

- Some would argue that differences in schooling, experience, and seniority also reflect discrimination.
- Usually termed "premarket" discrimination.

Measuring discrimination in hiring

- A number of "__________________" have tested whether real employers discriminate by race or gender in hiring.
- These studies send out fake resumes to employers, and sometimes fake job applicants to interviews.
- The response rates for callbacks or job offers are recorded.

Bertrand and Mullanaithan (2004)

- Study sent 5000 fake resumes in response to job ads in Boston and Chicago.
- Resumes did not specify race, but used names like "Emily Walsh" and "Lakisha Washington" to hint at race.
- Holding skills constant, "Emily" got 1 callback for every _______ resumes, while "Lakisha" got 1 callback for every _______ resumes.

Marianne Bertrand and Sendhil Mullanaithan, "Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination," *American Economic Review*, Vol 94 (Sept 2004), pp. 991-1013.

Cross (1990)

- Study sent matched pairs of job applicants to employers who advertised in newspapers in Chicago and San Diego.
- Applicants' characteristics were identical except one was Hispanic and one was non-Hispanic white.
- Whites were _______% more likely to be interviewed and _______% more likely to get job offers.

Harry Cross, *Employer Hiring Practices: Differential Treatment of Hispanic and Anglo Job Seekers*, Urban Institute Report 90-4, Washington, D.C.: The Urban Institute, 1990.

Sports

- Sports fans in the U.S. are mostly white, but many players are black.
- Some studies show that ticket sales are less for teams with more black players, holding players' performance statistics constant.
- Trading cards of black players tend to sell for less than cards of white players with similar performance statistics.

Conclusions

- Wage discrimination can be measured with least-squares regression, using datasets on workers' wages and human capital.
- The ______________ decomposition separates the wage differential due to differences in schooling from the wage differential due to discrimination.
- Audit studies have documented substantial discrimination in ____________.
- In sports, ticket sales and trading-card prices show fans' preferences for white players.

PREFERENCE-BASED THEORIES OF DISCRIMINATION

- Why would rational economic agents discriminate?

Prejudice as preference

- Gary Becker (1992 Nobel Prize) proposed 3 models of discrimination in his 1957 PhD dissertation.

Prejudice = difference in preference or taste by

1. employers
2. employees
3. or customers.

Gary S. Becker, *Economics of Discrimination*, 2nd edition, Chicago: University of Chicago Press, 1971 (1957).

Model 1: Employer discrimination

- Suppose some employers prefer green workers over blue workers, despite equal productivity.
- We can represent this preference as a *discrimination coefficient*.

Employers' discrimination coefficient

- Assume a competitive employer faces constant market wages for workers:
  w_G for green workers
  w_B for blue workers.
- If employer is prejudiced against blue workers, employer gets _______utility from hiring them.
- Employer *perceives* price of blue workers = w_B (1+d), where d = discrimination coefficient.

Examples

- Suppose w_B = $10.
- An employer with d=0.4 *perceives* price of blue workers = w_B (1+d) = $10 (1+0.4) = $______.
- An employer with d=0.8 *perceives* price of blue workers = w_B (1+d) = $10 (1+0.8) = $______.

Variation in d

- Employers may have higher or lower tastes for discrimination, as measured by d.
- The greater the employer's prejudice against blue workers, the greater d.
- Unprejudiced employers have d = _____.
- Some firms (perhaps blue-owned) may prefer to hire blue workers, in which case d is _______________.

Production

- Assume blue and green workers are ________________________ in production.
- Assume for simplicity there are no other inputs, so production function is
  $q = f(E) = f(E_G + E_B)$.
- If perceived prices of green and blue workers are different, employer will hire only the type of worker that is perceived cheaper.

Who gets hired

- An unprejudiced employer hires whichever workers really are cheaper:
  - Hires all green workers if $w_G < w_B$.
  - Hires all blue workers if $w_G > w_B$.
- A prejudiced employer hires whichever workers it ______________ to be cheaper:
  - Hires all green workers if $w_G < w_B (1+d)$.
  - Hires all blue workers if $w_G > w_B (1+d)$.

Implication: segregated employers

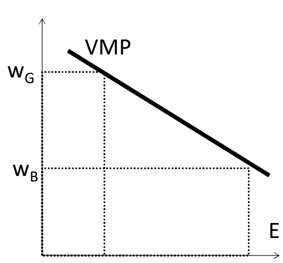
- In most situations, firms will hire segregated workforces: either all green workers or all blue workers.
- An unprejudiced employer hires a mixed workforce only if $w_G = w_B$.
- A prejudiced employer hires a mixed workforce only if $w_G =$ ___________.

Implication: wage differential

- If supply of both types of workers is perfectly inelastic (vertical) then wages will adjust until all workers are employed.
- If proportion of prejudiced firms is greater than fraction of green workers, then w_B _____________ w_G in equilibrium.

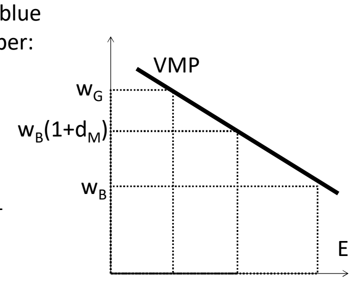
Employment determination at unprejudiced firm

- Unprejudiced firm hires only blue workers, who really are cheaper.
- Hires until $w_B = VMP$.



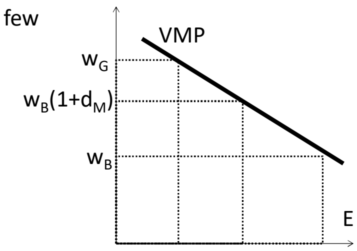
Mildly prejudiced employer hires only blue workers, but fewer of them

- Mildly prejudiced firm might still perceive blue workers to be cheaper: $w_B (1+d_M) < w_G$.
- Hires until $w_B (1+d_M) = VMP$.
- The higher d , the ____________ workers are hired.



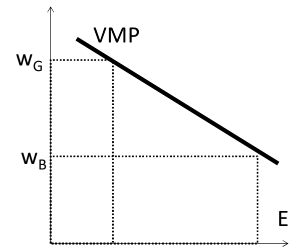
Mildly prejudiced employer has lower profit, *ceteris paribus*

- Actually pays the lower wage (w_B).
- However, hires too few workers.
- So has lower monetary profit.



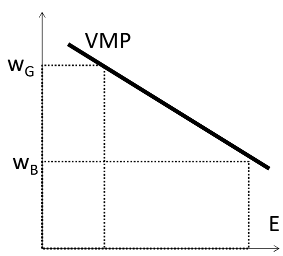
Severely prejudiced employer hires only green workers, and much fewer of them

- Severely prejudiced firm perceives green workers to be cheaper: $w_B\ (1+d_S) > w_G$.
- Hires until w_G = VMP.



Severely prejudiced employer has even lower profits, *ceteris paribus*

- Severely prejudiced firm pays workers more than necessary.
- And hires too few workers.
- So has even lower monetary profit.



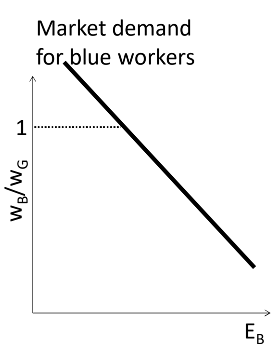
Employer discrimination leads to competitive disadvantage

- In Becker's model, employers pay for prejudice with _____________ monetary profits.
- Competition (with free entry and exit of firms) might eventually drive them out of the industry.
- Perhaps replaced by unprejudiced (hence ____________ profitable) firms in long run.

Market demand for blue workers with employer discrimination

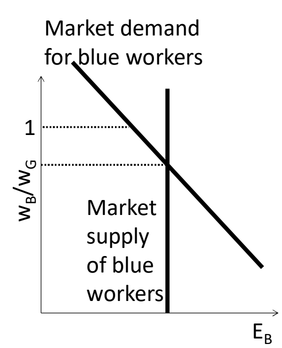
- As relative wage w_B/w_G falls, quantity demanded of blue workers increases, for two reasons.

1. Number of firms choosing to hire blue workers ___________.
2. Number of workers they hire __________.



Market equilibrium with employer discrimination

- A decline in prejudice (d) shifts market demand to the right and __________ w_B/w_G, *ceteris paribus*.
- An increase in the supply of blue workers shifts supply to the right and __________ w_B/w_G, *ceteris paribus*.



Model 2: Employee discrimination

- Suppose green workers dislike working with blue workers, but blue workers are indifferent.
- Again, we can represent this preference as a *discrimination coefficient*.

Employee's discrimination coefficient

- Suppose green workers receive wage of w_G .
- Nevertheless, they will act as if wage is w_G (1-d) , where d = discrimination coefficient, IF they are forced to work with blue workers.
- Blue workers will act as if wage is w_B , regardless of who they work with.

Example

- Suppose $w_G = w_B$ = $10 and d = 0.4.
- Then green employee who works at segregated firm perceives wage = $_______.
- Green employee who works at integrated firm perceives wage = $10 (1-0.4) = $______.
- All blue employees perceive wage = $_____.

Employee discrimination leads to segregated employers

- Unprejudiced employers will choose either an all-blue workforce or an all-green workforce.
  - An integrated workforce would require them to pay green workers more.
- In equilibrium, segregation, but ________ difference in wages, employment or profitability.
- ________ competitive disadvantage for segregation.

Model 3: Customer discrimination

- Suppose customers prefer to purchase from green workers and dislike purchasing from blue workers.
- Again, we can represent this preference as a *discrimination coefficient*.

Customer's discrimination coefficient

- Market price of the good = p.
- If purchased from a blue worker, customers perceive the price to be p(1+d).
- Example: suppose price = $10 and d = 0.5.
- If purchased from blue worker, customer perceives price to be $_______.

Customer discrimination leads to different job assignments

- Employers will respond to customer discrimination by assigning blue workers to jobs requiring less customer contact.
- Are wages different in equilibrium?
- Suppose there are enough green workers to fill high-contact positions.
- In equilibrium, _________ difference in wages, employment or profitability.

Customer discrimination can lead to wage differentials

- Suppose there are not enough green workers to fill high-contact positions.
- Then price of products sold by blue workers must ___________ to compete with products sold by green workers. So blue workers' VMP falls.
- In equilibrium, wages of blue workers will be ____________ than green workers.

Conclusions

- Becker's theory of discrimination assumes discrimination is driven by _________________.

1. **Employer** discrimination causes segregated workplaces and wage differentials, but is __________________ for prejudiced employers.
2. **Employee** discrimination causes segregation but not wage differentials.
3. **Customer** discrimination causes discriminated workers to be assigned to __________________ positions.

OTHER ECONOMIC THEORIES OF DISCRIMINATION

- Why would rational economic agents discriminate?

Other theories of discrimination

1. Statistical discrimination
   - Labor market is competitive.
   - Employer uses group membership to infer individual's productivity.
2. Monopsony wage discrimination.
   - Labor market is not competitive.
   - Employer uses group membership to set wages.

Model 1: Statistical discrimination

- Suppose employers have no personal preferences about which workers they hire.
- However, suppose membership in a group conveys information about a worker's skills and productivity, such as
  - ______________________________
  - ______________________________
  - ______________________________

Example

- Suppose a green worker and a blue worker apply for same job.
- Qualifications on paper are same.
- However, suppose employer knows that, *on average*, green workers are better team players, more willing to work overtime, and less likely to quit.
- Employer will want to use this information in hiring decision.

Impact of statistical discrimination in labor markets

- Individual workers' wages depend partly on own qualifications and partly on their group's average productivity.
- Holding personal qualifications constant, green workers will
  - be ____________ likely to be hired,
  - receive _____________ wage offers.

Statistical discrimination in other markets

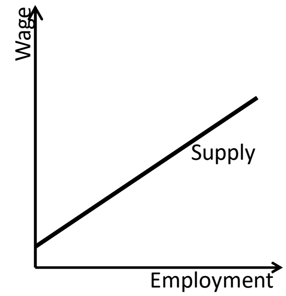
- As a group, women tend to live longer than men, so life insurance is priced ____________ for women than men.
- As a group, teenagers have more traffic accidents than older drivers, so auto insurance is priced ______________ for teenage drivers.

Model 2: Monopsony wage discrimination

- Suppose employers have no personal preferences about which workers they hire.
- But suppose employer faces _______________-sloping labor supply.
- Employer has market power, and will set wage _____________ VMP.
- In addition, employer may set different wages for different groups, even though VMP same.
- Similar to monopoly price discrimination in product markets.

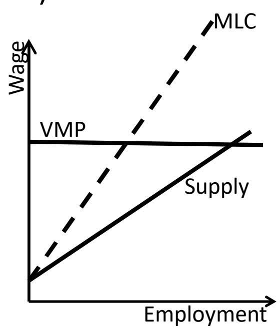
Monopsonist's marginal labor cost (review)

- Marginal labor cost
  = MLC
  = increase in labor cost (wE) that results from hiring one more unit of labor
  = Δ(labor cost) / ΔE .



Monopsony profit maximization (review)

- Monopsonist hires labor to the point where the contribution of last worker to revenue = contribution to cost.
- In other words, choose E so that VMP = MLC .



MLC and elasticity of labor supply

- We showed earlier that
$$MLC = w + E\left(\frac{\Delta w}{\Delta E}\right),$$
where Δw/ΔE = slope of labor supply curve.
- A little algebra shows that
$$MLC = w + w\,\frac{E}{w}\left(\frac{\Delta w}{\Delta E}\right)$$
$$= w + w\left(\frac{1}{\varepsilon_S}\right) = w\left(1+\frac{1}{\varepsilon_S}\right).$$

Monopsonist's wage depends on elasticity of labor supply

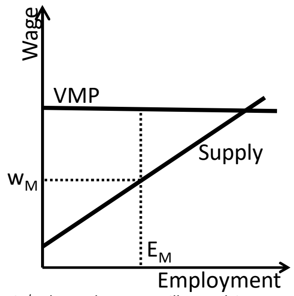
- To maximize profit, monopsonist sets MLC=MVP,
$$w\left(1+\frac{1}{\varepsilon_S}\right) = MVP,$$
to get wage formula: $w_M = \frac{MVP}{\left(1+\frac{1}{\varepsilon_S}\right)}$.
- Example: suppose MVP = $20.
  If ε_S = 3, then $w_M = \frac{\$20}{\left(1+\frac{1}{3}\right)} = \frac{\$20}{4/3} = \$$_______.
  If ε_S = 9, then $w_M = \frac{\$20}{\left(1+\frac{1}{9}\right)} = \frac{\$20}{10/9} = \$$______.

Monopsony creates gap between MVP and wage

- Again, monopsonist sets MVP=MLC,
$$MVP = w + w\left(\frac{1}{\varepsilon_S}\right).$$
- Now subtract w and divide by w to get percent gap between MVP and wage:
$$\frac{\mathrm{VMP} - \mathrm{w}_M}{\mathrm{w}_M} = \qquad .$$

Interpreting the gap

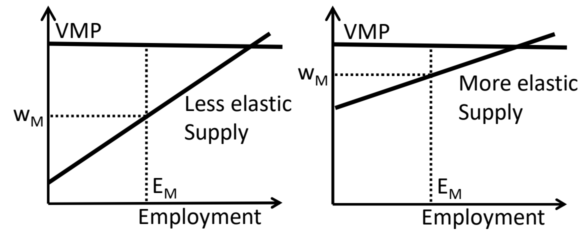
- $\frac{\mathrm{VMP}-}{\mathrm{w}} = \frac{1}{\varepsilon_S}$
  = gap between wage & VMP, as % of wage.
  = Pigou's "rate of exploitation."
- Examples:
  If $\varepsilon_S = 3$, gap = _____.
  If $\varepsilon_S = 9$, gap = _____.



Arthur C. Pigou, *The Economics of Welfare, 2nd ed.*, London: Macmillan and Co., 1924, p. 754.

Wage and labor supply elasticity

- $\frac{\mathrm{VMP}-\mathrm{w}}{\mathrm{w}} = \frac{1}{\varepsilon_S}$ implies that gap between wages and VMP is smaller, the ____________ the elasticity of labor supply ε_S .



Wage discrimination and labor supply elasticity

- Suppose different groups of workers are equally productive (same _________).
- But have different labor supply elasticities (_____).
- Then monopsonist can further increase profit by setting different wages by group.
- Group with largest elasticity (most mobile) gets the _____________ wage.

Monopsony wage discrimination by gender

- Are men more mobile than women?
- Men's elasticity of labor supply *to the market* is less than women's.
- However, men may be better able to switch employers than women. So their elasticity of supply *to a particular employer* may be greater.
- If so, monopsony predicts they will get _____________ wages than women.

Conclusions

1. Statistical discrimination occurs when employers use group membership to infer productivity.
   - Hiring and wage depend partly on individual characteristics and partly on ________________.
2. Monopsony wage discrimination occurs when employers have market power and can pay different wages to different groups.
   - Group with the more-elastic labor supply will get the ______________ wage.

BLACK-WHITE WAGE RATIO

- What has happened to the black-white wage differential in the U.S., and why?

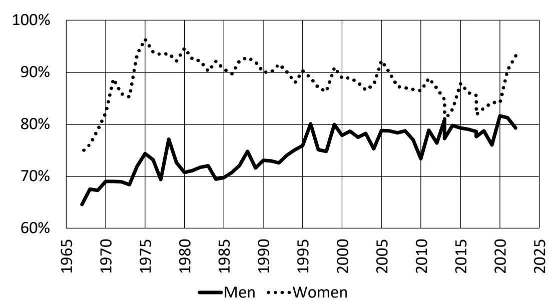
Recall Oaxaca decomposition

- Roughly half of wage differential is due to differences in human capital.
- Half is due to discrimination (in Oaxaca's sense).

	Blacks versus whites
Raw log wage differential (hourly wage)	-0.211
Differential due to differences in education, experience, personal characteristics, and city and region.	-0.082
Differential due to discrimination	-0.134

Joseph Altonji and Rebecca Blank, "Race and Gender in the Labor Market," in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, Vol. 3C, Amsterdam, Elsevier, 1999. Table 5 part (B) 1995, lines 19-21, p. 3159.

Black/white earnings ratios



SOURCE: U.S. Census,Current Population Survey, *Table P-38. Full-Time, Year-Round Workers by Median Earnings and Sex*, downloaded December 2023.

Trends in relative wages

- Ratio of black women's wages to white women's wages rose sharply from ____________________, and drifted down slightly since then.
- Ratio of black men's wages to white men's wages increased gradually from ____________________.
- Why? Several possibilities have been documented.

Possible reasons for trends

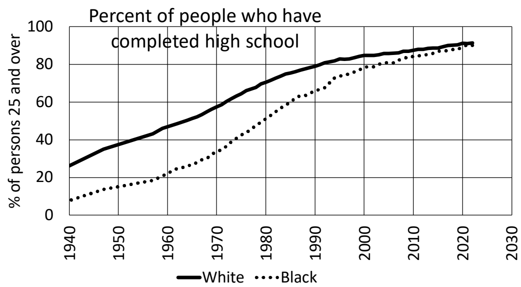
1. Quantity and quality of schooling for black workers.
2. Public policy.
3. Decline in labor force participation.

1. Quantity and quality of schooling

- Difference in quantity of schooling has narrowed.
- Years of schooling have increased for all groups.
- Yet black-white gap in schooling has closed substantially.

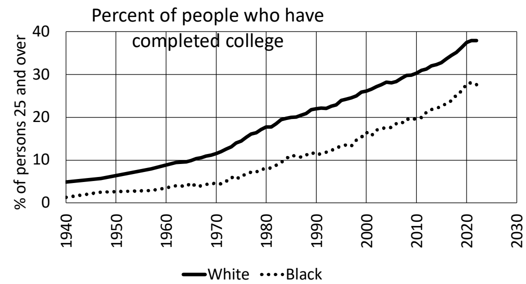
	1940	1980
Avg years schooling, 30-year-old white man	9.9	13.6
Avg years schooling, 30-year-old black man	6.0	12.2
Difference		

High school gap has closed



SOURCE: U.S. Census, *Table A-2. Percent of People 25 Years and Over Who Have Completed High School or College*, downloaded December 2023.

College gap has not closed



SOURCE: U.S. Census, *Table A-2. Percent of People 25 Years and Over Who Have Completed High School or College*, downloaded December 2023.

Difference in quality of schooling has also narrowed

- Big difference in pupil-teacher ratio in 1920s (at least in South).
- Difference had disappeared by late 1950s.
- Rate of return to schooling for blacks was only about __________ the rate of return for whites in 1940.
- Rate of return was ____________ (or greater) by late 1970s.

2. Public policy

- 1964 Civil Rights Act outlawed discrimination by race or gender.
- Executive orders 11246 (1965) and 11375 (1967) required federal contractors
  "not to discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, and to take affirmative action to ensure that applicants and employees are treated during employment without regard to their race, color, sex, or national origin."

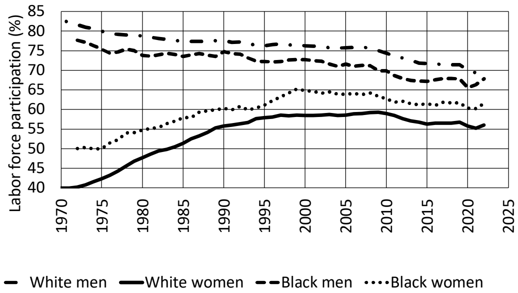
Affirmative action

- Executive orders apply to employers with at least $____________ in federal contracts and _______ employees.
- Shifted burden of proof to those employers.
- Employers must report employment by occupation, race and sex.
- If they fall short, must set employment "goals" to hire more from protected groups.

Impact of affirmative action

- There is ample evidence that affirmative action has increased __________________ of blacks at covered firms.
- Little evidence that affirmative action has directly impacted black _____________.
- However, affirmative action has increased employment of blacks at large firms, which tend to pay higher wages than small firms.

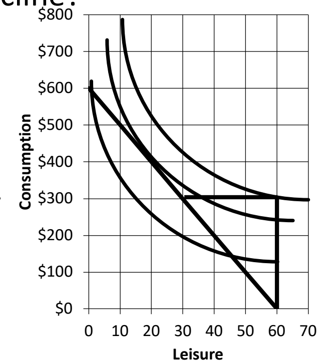
3. Decline in labor force participation of Black (and White) men



SOURCE: BLS, *Labor Force Participation Rate – 25 yrs & over*, downloaded December 2023.

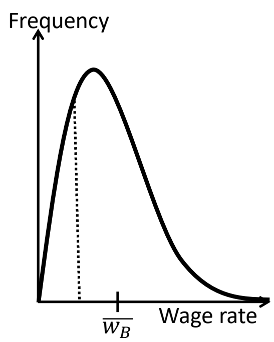
Why did labor force participation decline?

- One reason may be expansion of public assistance programs.
- Probably encouraged low-wage persons to drop out of labor force.



Impact of decline in labor force participation on relative wages

- Suppose low-wage persons drop out of the labor force.
- Then observed *average* wage rises.
- But this would NOT be progress!



Other explanations: unobserved skill differences

- It is possible that there are differences in skills between blacks and whites that are not explained by usual data on schooling, experience, etc.
- Some studies document that much of current wage differential is explained by differences in scores on Armed Forces Qualification Test (AFQT).

Unobserved skill differences (cont'd)

- What AFQT measures is not completely clear.
- Some have claimed AFQT measures innate ability, but evidence shows it is correlated with quantity and quality of _______________.
- In any case, the fact that AFQT explains much of the wage differential suggests importance of "________________" discrimination, rather than labor-market discrimination.

Conclusions

- The black-white wage ratio rose rapidly for women from 1965-1975, and gradually for men from 1965-2005. Possible reasons:
  1. Quantity and quality of blacks' schooling increased.
  2. Public policy boosted employment at higher-paying firms.
  3. Labor force participation at low end of wage distribution decreased.

FEMALE-MALE WAGE RATIO

- What has happened to the female-male wage differential, and why?

Recall Oaxaca decomposition

- Hardly any of raw wage differential is due to differences in human capital.
- Almost all is due to discrimination (in Oaxaca's sense).

	Females versus males
Raw log wage differential (hourly wage)	-0.286
Differential due to differences in education, experience, personal characteristics, and city and region.	-0.008
Differential due to discrimination	-0.279

Joseph Altonji and Rebecca Blank, "Race and Gender in the Labor Market," in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, Vol. 3C, Amsterdam, Elsevier, 1999. Table 5 part (B) 1995, lines 19-21, p. 3159.

Possible reasons for wage gap

- Women and men have nearly identical average values of schooling, age, and region, so these *cannot* be reasons.
- Possible reasons:
  1. Interrupted labor-market experience
  2. Occupational crowding

1. Interrupted labor-market experience

- Many mothers drop out of the labor force while their children are young.
- So there are __________ in these women's labor-market experience.
- It has been argued that these gaps imply
  - __________ human capital acquired on the job,
  - depreciation of human capital while not working,
  - less incentive to acquire human capital.

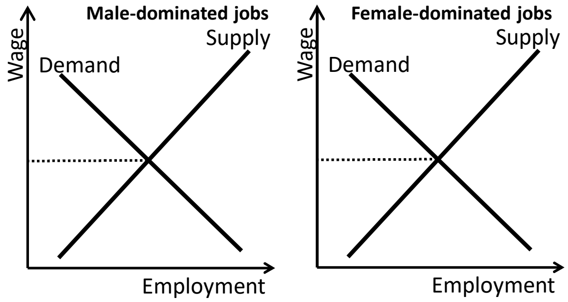
Interrupted labor market experience (cont'd)

- Evidence suggests that interrupted labor-market experience ____________ affect earnings, though unclear how much.
- Also evidence that short mandated leave under Family Medical Leave Act (FMLA of 1993) has helped women preserve their earnings level.

2. Occupational crowding

- Many occupations are predominantly held by women or men.
- "Occupational crowding" hypothesis argues
  - This is caused by employer discrimination and/or social conditioning that keeps women out of certain jobs.
  - Female supply shifts right in remaining jobs, _______________the wage.

Discrimination and/or social conditioning shifts labor supply curves



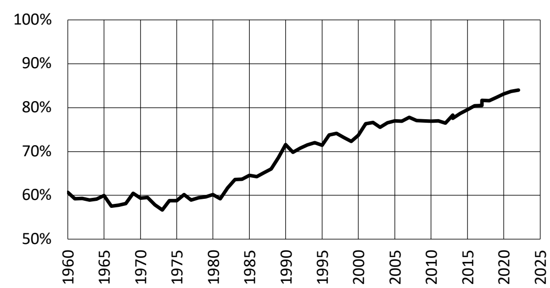
LS estimates for the multiple-regression equation

- log w = 0.924 + 0.150 s - 0.003 f
  (0.154) (0.011) (0.001)
- where f = percent female (0-100).
- Interpretation: holding female share (f) constant, if schooling increases by one year, wage increases by about __________ %.
- Holding schooling constant, if female share increases by one percentage point, wage __________________ by about __________%.

What causes an occupation to be predominantly female?

- In the past, many laws and rules barred women (especially married women) from some occupations. But these are no longer in force.
- It has been argued that women who expect to drop out of the labor force ______________ occupations that do not require constant updating of skills.

Female/male earnings ratio



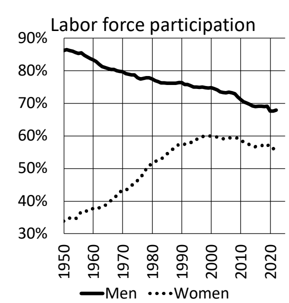
SOURCE: U.S. Census, *Table P-38. Full-Time, Year-Round Workers by Median Earnings and Sex*, downloaded December 2023.

Trends in relative wages

- Ratio of female earnings to male earnings showed
  - little trend from __________________,
  - strong upward trend since ___________.
- Why? Several possibilities documented.

Explaining little trend in relative wages from 1950 to 1980

- LFP of women was increasing rapidly.
- New women, mostly at low end of wage distribution, entered labor force.
- Controlling for this change, women's earnings were actually _____________ relative to men.



SOURCE: bls.gov

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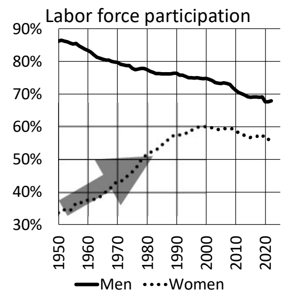


SOURCE: bls.gov

Explaining strong upward trend in relative wages since 1980

- Increasing labor-market experience—less dropping out for children or other reasons.
- Public policy (affirmative action programs) had
  - little effect on ____________ women's employment,
  - but a strong effect on ____________ women's employment and presumably wages.

Public policy: comparable worth programs

- Occupational segregation, plus weak effect of affirmative action for white women, has led some to propose "comparable worth" programs, usually in public sector.
- Outside consultants assign points to each occupation for required effort and skills, responsibility, working conditions, etc.
- Jobs with equal points get ______________ wages.

Impact of comparable worth programs

- Typically, programs raise women's wages relative to men's wages.
- However, as with minimum wage, labor markets are no longer in competitive ___________________.
- Should expect _______________ employment in occupations whose wages are raised.
- Evidence is mixed.

Conclusions

- The female-male wage ratio is still less than 1. Possible reasons:
  1. ________________ labor-market experience
  2. Occupational ________________
- The ratio has risen rapidly since at least 1980. Likely reasons:
  - Increasing labor-market ________________
  - Affirmative action programs (especially for black women)

PART 4

Unions, Incentive Pay, and Unemployment

Big ideas: Unions were once crucial in setting pay but are less prevalent than they used to be. Incentive pay schemes are still prevalent, but sometimes have unintended consequences. Unemployment is inevitable in a dynamic economy, but perhaps can be ameliorated.

LABOR UNIONS IN THE UNITED STATES

- What U.S. laws govern unions?
- Is unionism increasing or decreasing in the U.S.?
- How are unions organized?

Bread-and-butter focus of U.S. unionism

- For the last 100 years, U.S. unionism has focused on improving economic conditions of members.
- In contrast to unions in other countries, U.S. unions have generally ________ advocated socialism.
- Until perhaps recently, union members have been members of _________ political parties.

Early challenges for U.S. unionism

- Early unionism was held in check by unfavorable legal environment.
- Unions sometimes held in violation of antitrust laws.
- In early 20th century, employers sometimes required employees to sign agreements not to join union, so-called "yellow-dog contracts."
  - If union tried to organize workers, employer sued union for inducing breach of contract.

Federal legislation that overcame early challenges

- _____________________ Act of 1932
  - restricted use of court orders and injunctions against unionizing activity.
  - made yellow-dog contracts unenforceable.
- _____________________ Act of 1935
  - outlawed "unfair labor practices," including firing workers for union activities.
  - required employers to bargain "in good faith" with unions chosen by workers in certification elections.

Later legislation that regulates unions

- ___________________ Act of 1947
  - Permitted states to pass "right-to-work" laws, which prohibit unions from requiring workers be union members as a condition of employment.
  - Permits workers to hold elections to <u>de</u>certify unions.
- ___________________ Act of 1959
  - required complete disclosure of union finances.
  - required regular elections of union leaders.

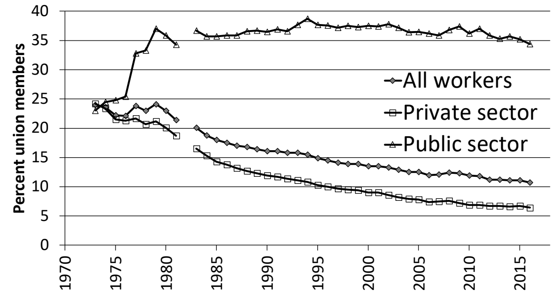
Right-to-work states (dark) as of December 2023

Wikipedia, "Right-to-Work Laws," https://en.wikipedia.org/wiki/Right-to-work_law

Legal status of public-sector unions

- Federal workers
  - Governed by Executive Order 10988 (1962) and Civil Service Reform Act of 1978.
  - Workers free to join union or not.
  - Prohibited from striking.
- State and local workers
  - Governed by ____________ laws.

Trends in labor union density: public sector versus private sector

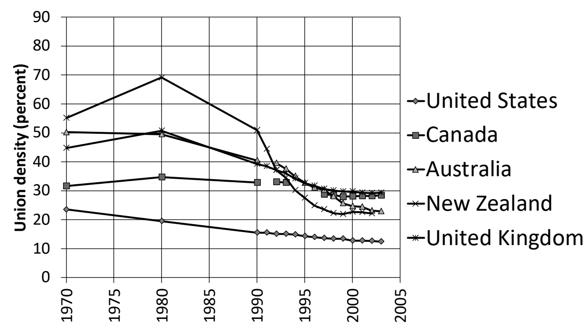


SOURCE: Barry T. Hirsch and David A. Macpherson, *Union Membership and Coverage Database from the CPS* (Unionstats.com)

Summary of U.S. trends

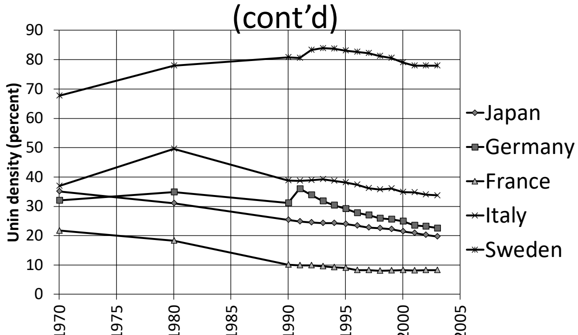
- Fraction of workers unionized was less than 10% until the mid-1930s, except for a spike during ____________________.
- From mid-1930s to mid-1940s, unionism rose to over 20%, then began falling in late 1970s.
- Private-sector unionism ________ beginning about 1970, and is now at about 7%.
- Public-sector unionism rose in 1970s to over 35%, and remains high.

International trends in union density



Visser, Jelle, "Union membership statistics in 24 countries," *Monthly Labor Review*, vol. 192, no. 1 (January 2006), pp. 38-49, table 3.

International trends in union density (cont'd)



Visser, Jelle, "Union membership statistics in 24 countries," *Monthly Labor Review*, vol. 192, no. 1 (January 2006), pp. 38-49, table 3.

International comparison

- When U.S. unionism began falling, unionism was still ___________ in many other countries, including Canada.
- After 1980 unionism began falling in many other countries.
- U.S. union density (percent of employed) is ____________ than in all other industrialized countries, except France.

Organizational structure

Federation

Federation: AFL-CIO

- Lobbies federal and state governments.
- Supports political candidates.
- Does not engage in collective bargaining.
- Current president is ________________.
- A few national unions are not members of AFL-CIO.

AFL-CIO headquarters in Washington, D.C.

National (or "international") unions

- American Federation of State, County and Municipal Employees (AFSCME).
- American Federation of Teachers (AFT).
- International Brotherhood of Electrical Workers (IBEW).
- NFL Players Association (NFLPA).
- United Automobile, Aerospace & Agricultural Implement Workers of America (UAW).
- United Mine Workers of America (UMW).
- etc.

Who bargains with employers?

- Sometimes local unions bargain, with assistance from national union (e.g. AFT with school districts).
- Other times national unions bargain directly (e.g., UAW with GM, Ford, and Chrysler).

Union dues

- Members typically pay about 1 percent of income in dues.
- Often deducted from paycheck ("______________").
- UAW allocates 38% to local union, 32% to national union, 30% to strike fund.

SOURCE: www.uaw.org/page/dues April 17, 2012.

Patterns of unionism: Who joins unions?

% of employed	Union members	Represented by unions
Women	9.6%	11.0%
Men	10.5%	11.6%
Asian	8.3%	9.2%
Black or African-American	11.6%	12.8%
Hispanic or Latino	8.8%	10.0%
White	10.0%	11.2%

SOURCE: BLS, "Union Members—2022," http://www.bls.gov/news.release/pdf/union2.pdf table 1, accessed December 2023.

Patterns of unionism: What occupations are most unionized?

% of employed	Union members	Represented by unions
Education	33.7%	37.3%
Protective service	34.6%	36.7%
Construction	16.4%	17.4%
Transportation	13.0%	14.2%
Full-time workers	11.0%	12.2%
Part-time workers	5.5%	6.3%

SOURCE: BLS, "Union Members—2022," http://www.bls.gov/news.release/pdf/union2.pdf tables 1 & 3, accessed December 2023.

Patterns of unionism: What industries are most unionized?

% of employed	Union members	Represented by unions
Private sector		
Utilities	19.6%	20.7%
Movies & sound recording	17.3%	17.8%
Transport & warehousing	14.5%	15.5%
Construction	11.7%	12.4%
Broadcasting	11.3%	11.5%
Public sector	33.1%	36.8%

SOURCE: BLS, "Union Members—2022," http://www.bls.gov/news.release/pdf/union2.pdf table 3, accessed December 2023.

Patterns of unionism: Which states are most unionized?

SOURCE: BLS, "Union Members—2022," http://www.bls.gov/news.release/pdf/union2.pdf chart 1, accessed December 2023.

Explaining the patterns of unionism

Unions are likely to be most successful when

- workforce is stable: ____________________ ____.
- they can deliver big wage increases because employers have high rents : _____________ ____.
- legal environment is favorable: ___________ ____.

Explaining the decrease in private-sector unionism

- Employment shift from manufacturing and utilities to _______________.
- __________________ shift from northeast to south, with more "right-to-work" states.
- Increase in proportion of _______________, who have lower unionization rates.
- But these explain less than 1/3 of decrease.

Explaining the decrease in private-sector unionism (cont'd)

Other changes:

- Unions are winning fewer certification elections.
- Management is more aggressively opposing union organizing drives.
- Explanation: Rents may be disappearing as international trade and deregulation make industries more __________________.

Conclusions

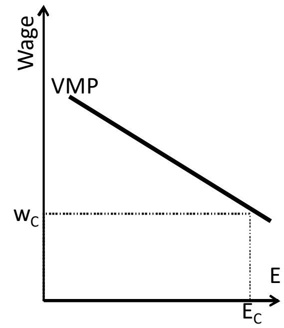
- _______________ Act (1935) gave legal protection to private-sector unions and encouraged rapid growth.
- Since 1970, union membership has ______________ in private sector but increased in public sector.
- Unions are most common today in utilities, transport, construction, telecommunications, manufacturing, and especially the _____________ sector.
- About _______% of U.S. workers are union members now.

THE MONOPOLY UNION MODEL

- If unions can only control the wage, what wage will they set?
- What will happen to employment and welfare?

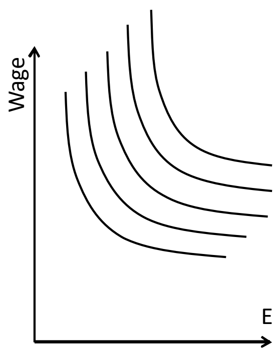
The union's problem

- Suppose union faces employer with downward-sloping labor demand.
- Suppose union first sets wages, then employer chooses employment.
- Then firm's demand curve is a ___________ for the union.



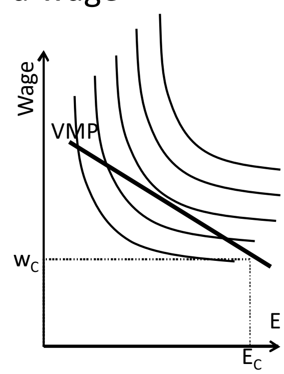
Union preferences

- Assume union values both wage and employment.
- Then union has __________________-sloping indifference curves.



Choosing a wage

- Union will choose a ______________ point between labor demand curve and highest indifference curve it can reach.
- At tangency, union's MRS = slope of demand curve.



Example

- Suppose employer's labor demand curve is
  VMP = 30 – 0.01 E.
- Suppose union's utility function is
  U(w,E) = (w-10) E.
- It can be shown with calculus that union's MU_W = E, and MU_E = (w-10).
- So union's MRS = MU_E/MU_W = ________________.

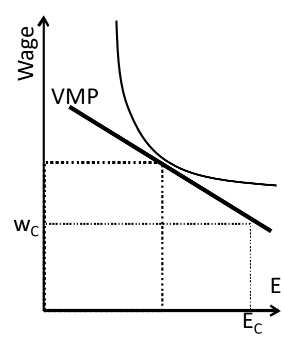
Example (cont'd)

Two equations:

1. Labor demand curve:
   w = 30 – 0.01 E.
2. Tangency condition:
   0.01 = (w-10)/E.

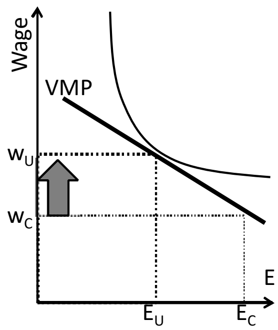
Solve jointly to get

- w_U = $ ________.
- E_U = __________.



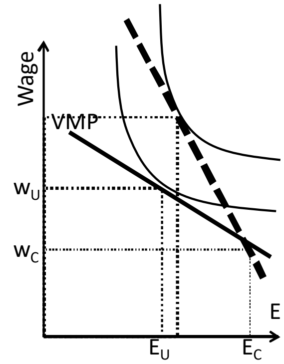
Loss of employment

- Monopoly model implies that if unions raise wages, they also decrease employment.



Elasticity of labor demand

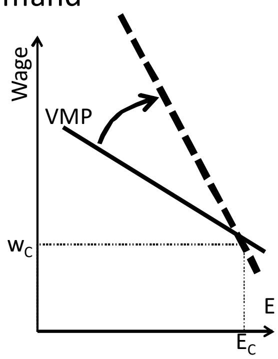
- Loss of employment is less (and union wage typically higher) if labor demand is __________ elastic.
- So unions have an incentive to try to ______________ the elasticity of demand.



How to decrease elasticity of labor demand

According to Hicks-Marshall rules, labor demand can be made less elastic by

1. ______________ elasticity of demand for output .
2. ______________ elasticity of substitution in production.



1. How to decrease elasticity of demand for output

Eliminate substitute products from the market.

- Get government to restrict imports. Example:
  - Export restraints for Japanese cars (auto workers).
- Require government to purchase only from unionized firms. Example:
  - Laws requiring companies under government contracts to pay "prevailing" (i.e., union) wage (construction workers).

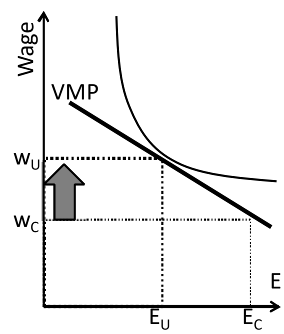
2. How to decrease elasticity of substitution in production

Limit use of nonlabor inputs—either through union contracts or through legislation.

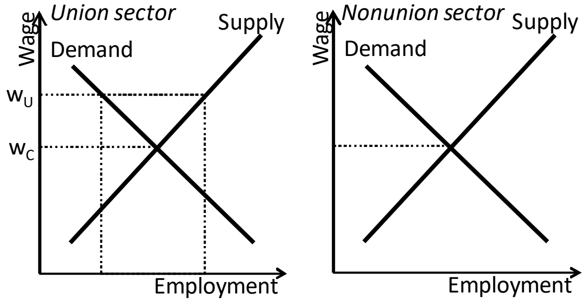
- Restrict automation. Examples:
  - Ban synthesizers from pit orchestras on Broadway (musicians).
  - Require bonus pay for workers using labor-saving machines (coal miners).
- Impose "manning" requirements. Examples:
  - At least two drivers in each locomotive (railroad unions).

Unions and the nonunion sector

- If unions decrease employment, where do the unemployed union workers go?
- Perhaps they get nonunion jobs.
- Leads to "spillover" model—seen earlier in our analysis of minimum wages.



"Spillover" model

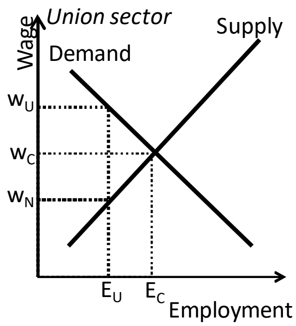


Effects of unionism on nonunion wage

- *"Spillover" model* thus predicts that unions increase employment in nonunion sector and ________________ nonunion wages.
- Alternative *"threat" model* predicts the opposite.
  - Nonunion employers want to forestall unionism.
  - __________ wages above the competitive level, so that workers have little reason to unionize.
- Some evidence for both models.

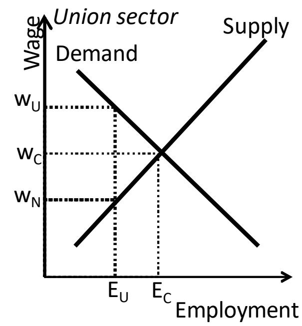
Welfare effects of monopoly unionism

- Height of demand curve = _________ in union sector.
- Height of supply curve = value of workers' time in alternative jobs = ________ in nonunion sector.



Welfare effects of monopoly unionism (cont'd)

- Welfare loss from unionism = vertical gap between demand and supply for dislocated workers = (1/2) $(w_U\text{-}w_N)$ $(E_C\text{-}E_U)$



Computing deadweight loss from unionism for U.S. economy

- Economy-wide welfare loss from unionism
  = (1/2) $(w_U\text{-}w_N)$ $(E_C\text{-}E_U)$
  $= \left(\frac{1}{2}\right)\left(\frac{w_U - w_N}{\overline{w}}\right)\left(\frac{E_C - E_U}{E_U}\right)\left(\frac{E_U}{\overline{E}}\right)(\overline{w}\overline{E})$
  where $\overline{w}$ = average wage, and
  $\overline{E} = E_U + E_N$ = total employment,
  = (1/2) × (% union wage gap)
  × (% decrease in employment in union sector)
  × (fraction of labor force unionized)
  × (total labor income).

Computing deadweight loss from unionism for U.S. economy (cont'd)

- Now divide by national income to get welfare loss from unionism *as a fraction of national income*
  = (1/2) × (% union wage gap)
  × (% decrease in employment in union sector)
  × (fraction of labor force unionized)
  × (labor's share of national income)
  = ________________________.

Conclusions

- The monopoly union model assumes union sets wage and then ___________ chooses employment.
- Unions raise wages but _______________ unionized employment as a result.
- Unions have incentive to make labor demand less elastic by eliminating ________________ products and limiting use of _______________ inputs.
- To the extent unions decrease unionized employment, they reduce welfare, but economy-wide loss of welfare is probably _______ large.

THE EFFICIENT BARGAINING MODEL

- If unions negotiate both the wage and the employment level, what wage-employment combination will be set?

An alternative model

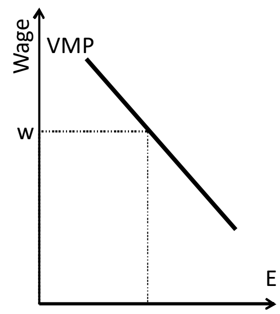
- The outcome of the monopoly union model is not efficient.
- Both union and firm can be made better off if they bargain over ____________ wages and employment.
- To see why, we must first derive the firm's _______________ curves—combinations of wages and employment that yield equal profit.

Profit and the wage (w)

- How does profit depend on *wage* level?
- Firm's profit
  = revenue - cost
  = p f(E) – wE .
- *Given* any particular level of employment (E), a lower wage *always* implies ______________ cost and ______________ profit.

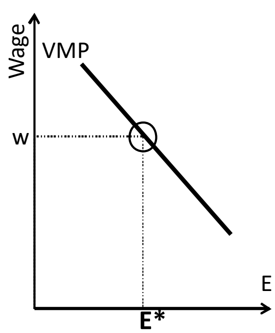
Profit and employment (E)

- How does profit depend on *employment* level?
- Given any particular wage, profit is maximized at particular level of employment.
- That level is shown by ________________ ________________.



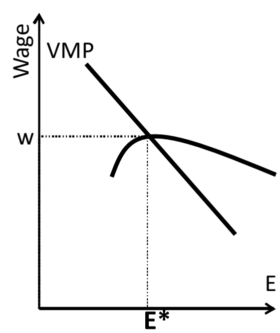
Profit and employment (E) (cont'd)

- Any employment level less than E* yields lower profit. Workers are not hired whose VMP>wage.
- Any employment level greater than E* yields lower profit. Last few workers are paid wage>VMP.



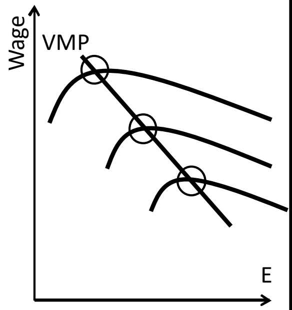
Isoprofit curve

- So if employment were increased or decreased, wage would have to _______ to keep profit constant.
- Firm's isoprofit curve therefore peaks exactly on labor demand curve.



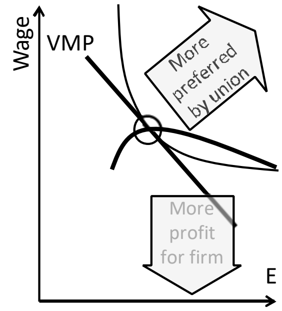
A family of isoprofit curves

- Each of the firm's isoprofit curves peak exactly on labor demand curve.
- Lower curves mean _____________ profit.



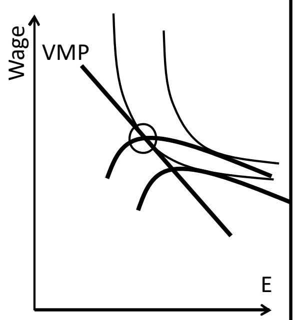
Outcome of monopoly union model is not efficient

- At monopoly outcome, union's indiff. curve is tangent to labor demand.
- So union's indiff. curve ________________ firm's isoprofit curve.
- Any combination of w and E between curves would make both sides better off.



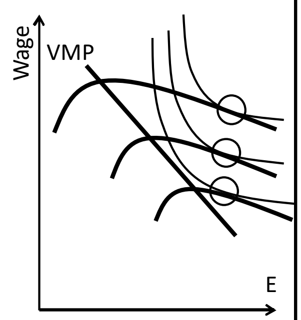
An efficient outcome

- Both parties have incentive to move to ________________ between firm's isoprofit curve and union's indifference curve.
- Such a change could be *Pareto-improving*.
- That is, there could be at least one winner and _______ losers.



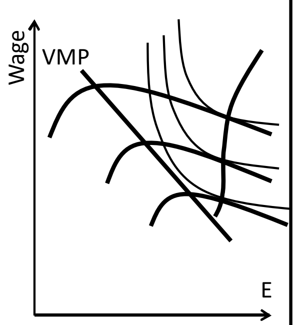
Contract curve

- Tangencies between firm's isoprofit curves and union's indifference curves are *Pareto optimal* or ________________.
- The locus of all efficient points (tangencies) is called the "contract curve."



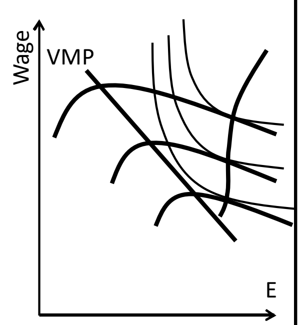
Efficient union labor agreements...

- lie *off* the labor demand curve.
- must specify both wage and employment. (firm ______________ choose employment unilaterally).
- result in ____________ employment than monopoly union model.



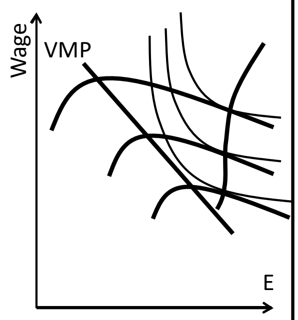
Where on the contract curve will the union and the firm end up?

- Higher point is more favorable to _________.
- Lower point is more favorable to _________.
- Outcome depends on relative bargaining strength of firm and union.



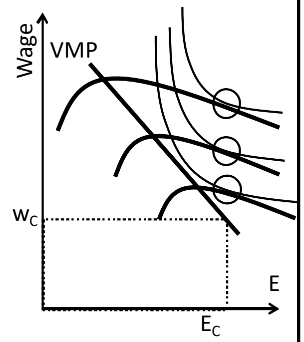
According to this model, how do unions affect employment?

- The efficient bargaining model predicts that union wage > competitive wage.
- What happens to employment depends on shape of contract curve (which depends on shape of union indifference curves).



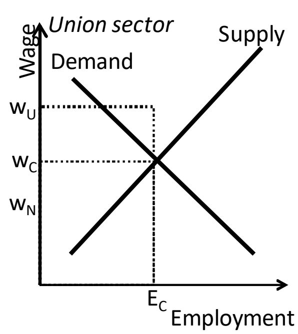
Special case: vertical contract curve

- If contract curve is vertical, then employment is ________________ under unionism as under competitive labor market.
- Employment thus depends on w_C, not w_U.



Strongly efficient contracts

- If employment is exactly the same under union as under competitive labor market, then welfare loss from unionism = _________.
- Unions just __________ value from firm owners to workers.



How can a union contract specify employment levels?

- Actual union contracts rarely contain rules that directly specify employment.
- Instead, they frequently contain rules that indirectly increase employment: "_________________________ rules."
- These are the same provisions discussed earlier that limit _________________ of capital for labor.

Featherbedding rules: examples

- Restrictions on use of prefabricated materials (construction workers).
- Limit on maximum brush size (painters).
- Prohibition of synthesizers at Broadway shows (musicians).
- Requirement of a "fireman" in the cab of diesel locomotives (railroad workers).

S.H. Slichter, *Union Policies and Industrial Management,* Washington: Brookings Institution, 1941.

Are actual union contracts efficient?

- Some contracts specify only the wage, but others contain "featherbedding" rules to boost employment.
- Lots of evidence that w_U is typically ______________ than VMP, or that employment often depends at least partly on ______, not just w_U.
- However, evidence for *strongly* efficient contracts is mixed at best.

Conclusions

- Unions and firms have incentive to move off labor demand curve.
- Efficient contracts set wage and employment at _______________ between firm's ____________ curve and union's indifference curve.
- The _______________ curve is the locus of all such tangencies.
- Strongly efficient contracts, having a ____________ contract curve, set employment at same level as under competition.

STRIKES

- Why do labor strikes occur?

Strikes are costly

- Employers lose profits.
  - Output is reduced or stopped during strike.
  - Some customers might be lost permanently.
- Workers lose income.
  - No paychecks during the strike.
  - May even lose jobs if strike is unsuccessful.

Why do strikes occur?

- Most strikes are eventually settled with a new wage agreement.
  - Union gets less than it originally demanded.
  - Firm pays more than it originally offered.
- *But both sides would be better off if they had reached the same agreement without a strike.*

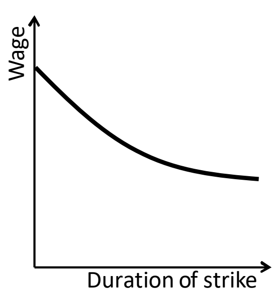
John R. Hicks, *The Theory of Wages,* London: Macmillan, 1932, pp. 144-146.

Explaining strikes

- Most economic models of strikes assume _______________ information.
- Union and workers, especially, are uncertain about how much the firm can afford to pay.
  - Firm will always claim it cannot afford to pay much.
- Strike is union's strategy for extracting this information.

Union resistance curve

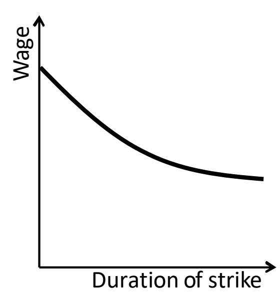
- Union initially demands a high wage.
- As strike continues, union lowers its demand.



Orley C. Ashenfelter and George E. Johnson, "Bargaining Theory, Trade Unions, and Industrial Strike Activity," *American Economic Review* 74 (March 1969), pp. 35-49.

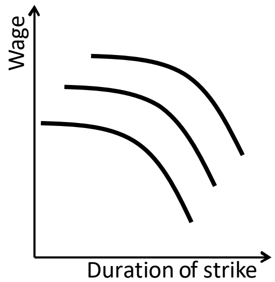
Employer response

- Employer takes union's resistance curve as given. Can either...
- settle quickly at a high wage, or
- wait out the strike for a lower wage.



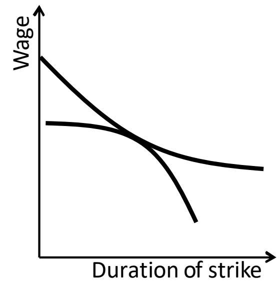
Employer isoprofit curves

- Both strikes and high wages reduce the firm's profit.
- So the firm's isoprofit curves must slope ______________.



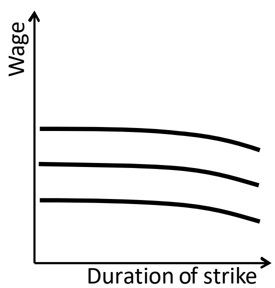
Settlement

- Employer chooses wage-duration combination that maximizes its profit.



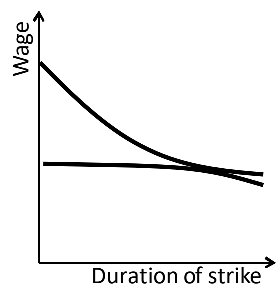
Isoprofit curves for a firm with low profit

- Typically, a firm with low profit is not hurt much by a strike.
- However, a high wage might put it out of business.
- So its isoprofit curves are fairly __________.



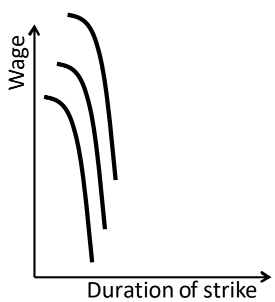
Settlement for a firm with low profit

- Firm takes a long strike, but settles for a low wage.
- Union thereby "discovers" that firm cannot afford to pay much.



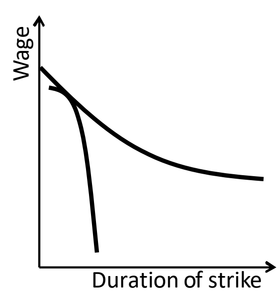
Isoprofit curves for a firm with high profit

- Typically, a firm with high profit suffers major loss from even a short strike.
- However, it can afford to pay a high wage.
- So its isoprofit curves are fairly ___________.



Settlement for a firm with high profit

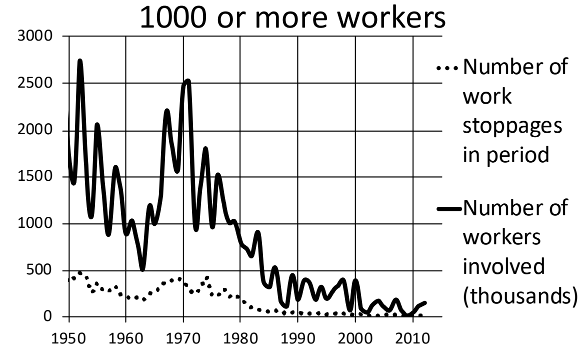
- Firm settles quickly for a high wage.
- Union thereby "discovers" that firm can afford to pay a high wage.



Strikes and the economy

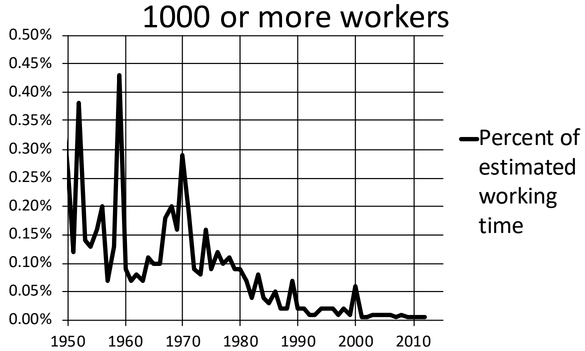
- When strikes occur, they are costly to workers and firms.
- However, strikes are rare in U.S. today.
- So U.S. economy's overall losses from strikes (lost workdays, fall in stock market value, etc.) are very small in total.

Strikes and lockouts in U.S. involving 1000 or more workers



BLS, "Major Work Stoppages in 2012," released February 8, 2013, table 1.

Strikes and lockouts in U.S. involving 1000 or more workers



BLS, "Major Work Stoppages in 2012," released February 8, 2013, table 1.

Conclusions

- Strikes are a puzzle to economists because both sides would be better off reaching same agreement without strike.
- Best explanation is ___________ information.
- Unions establish "_____________________," lowering wage demand as strike continues.
- Firms reveal their ability to pay by settling when wage demand is low enough.

MEASURING THE EFFECTS OF UNIONS

- Do unions really raise wages?
- How do they affect other aspects of the job?
- How do they affect a firm's profit?

Wage *gain* for an individual worker

- Suppose an *individual worker's* job were to change from nonunion to union.
- Percent increase in wage for that worker is called worker's ________________.
  $= (w_U - w_N) / w_N$.
- Unfortunately, jobs ____________ change union status in today's economy.

Wage *gap* for an individual worker

- However, we can find cross-section data sets on workers, both union and nonunion, and compare their wages.
- Need to control for other factors influencing pay, including human capital, industry, region, etc.

Example of dataset on workers

Worker	ln(wage)	Schooling	Experience	Union status
Smith	3.22	12	5	1
Rodrigues	3.33	14	3	0
Chiang	2.81	11	22	0
Schultz	3.47	16	17	1
Miller	3.15	13	12	0
Mambelli	4.02	18	31	0
O'Hara	2.58	9	15	1
Patel	3.85	16	19	0

Estimating wage gap for individual workers

- Estimate regression equation by least squares:
  $\log W = \beta_1 + \beta_2 S + \beta_3 Exp + \beta_4 U$
  + other control variables + error term.
- LS provides estimate of...
  β_2 = return to _________________
  β_3 = return to _________________
  β_4 = _________________________

What does wage gap measure?

- Wage gap compares _______________ workers.
- Are they comparable, on average?
- If union wage > competitive wage, then there is excess supply of workers to the union sector. Union employers can be choosy.
- So, union workers are likely to be __________ skilled than nonunion workers, even after controlling for all variables we can observe.

Wage gap > wage gain

- Since union workers are likely more skilled, estimated wage *gap* is likely ______________ than true wage *gain* for a worker becoming unionized.
- Alternative estimation strategy is to follow same worker _______________ as they change jobs.
- Boost from switching from nonunion job to union job is estimate of wage *gain*—typically about ___________%.

Wage *gain* for a whole industry

- Suppose a *whole industry* were to change from competitive to unionized.
- Percent increase in wage is called industry's __________________ = $(w_U - w_C) / w_C$.
- Virtually impossible to measure directly because industries ____________________ change from competitive to unionized in today's economy.

Wage *gap* for a whole industry

- However, we can find data sets on industries, with various levels of unionism, and note the correlation of the union wage differential $(w_U - w_N) / w_N$ with unionism.
- Again, what does this wage gap measure?
- If unions have no effect on nonunion wage ($w_N = w_C$), then wage gap _______ wage gain.

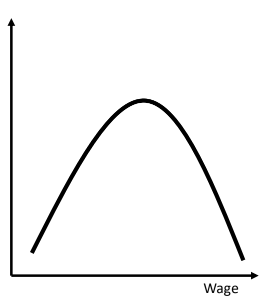
Effects of unionism on nonunion wage

1. *Spillover model* predicts that unions increase employment in nonunion sector and __________________ nonunion wages.
2. *Threat model* predicts the opposite.
   - Nonunion employers want to prevent unionism.
   - ___________ wages above the competitive level, so that workers have little reason to unionize.

- Some evidence for both models.

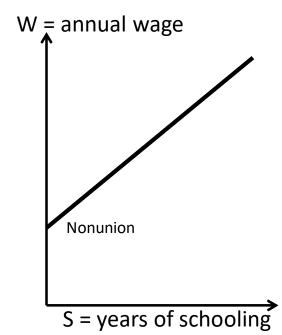
Unions and wage dispersion

- Wages are compressed in union sector.
- Unionized employers are less free to vary wages for individuals based on performance (or anything else except job title and seniority).



Unions and return to schooling

- Thus, return to schooling is much ________ in union sector than in nonunion sector.
- Return to labor-market experience is also probably __________.



Unions and fringe benefits

- Unionized workers generally receive _____________ health insurance and pensions, and ____________ vacation days and sick days.
- Raises the gap (or gain) for total compensation by 2 or 3 percentage points.

Exit-voice hypothesis

- Freeman and Medoff (1984) suggested that workers are more willing to voice grievances in a unionized firm, rather than just quitting, because their jobs are more protected.
- Quits are an _______________ way for employers to gauge worker satisfaction.
- Turnover requires training new workers and slows production.

Richard B. Freeman and James Medoff, *What Do Unions Do?*, Basic Books, 1984.

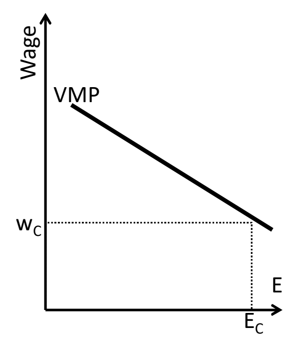
Unions and turnover

- In fact, turnover is only about half as large in union firms as nonunion firms.
- Of course, since wages are _____________, we should expect lower turnover.
- But even controlling for wages, turnover is lower in the union firms.

Richard B. Freeman, "The Exit-Voice Trade-off in the Labor Market: Unionism, Job Tenure, Quits, and Separations," *Quarterly Journal of Economics*, Vol. 94 (June 1980), pp. 643-74.

Unions and productivity

- Of course, higher union wages should decrease employment, increase use of other inputs, and raise VMP of workers.
- But even controlling for these changes, some studies show higher productivity (e.g., in construction).



Unions and profit

- Unions lower firms' profit by raising wages.
- But they raise firms' profit by lowering turnover and, perhaps, increasing productivity.
- How to measure overall effect on profit?
  - Compare profit before and after unionization.
  - Compare stock price before and after unionization.
- Most studies find unions ___________ profit.

Conclusions

- Unions increase wages.
- Wage gap between union and nonunion workers, controlling for education, experience, etc., averages about _______%
- Wage gain from unionism averages _______%.
- Unions compress the wage distribution and increase ___________________.
- Unions decrease turnover and sometimes increase productivity, but they decrease _____________.

OCCUPATIONAL LICENSING

- How common is occupational licensing?
- Does it always benefit the public?
- How does it affect pay?

What is occupational licensing?

- Govt regulation of entry into an occupation.
- Usually at _________ level in U.S.
- 22.3% of employed workers told CPS they hold a license for their occupation.
- Ostensible reason is to protect public from incompetent or untrustworthy persons that public could not otherwise avoid.

SOURCE: Bureau of Labor Statistics, "2016 data on Certifications and Licenses," https://www.bls.gov/cps/certifications-and-licenses.htm#data, accessed January 8, 2018. These data are from the Current Population Survey.

Three levels of regulation

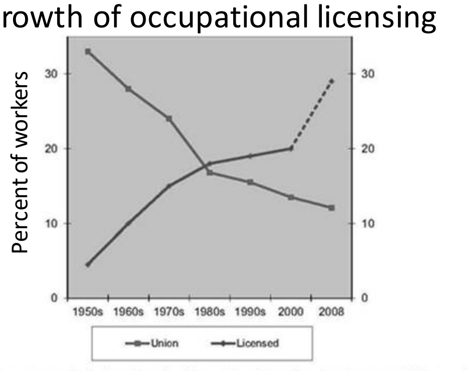
- _____________: must file name, address, and qualifications with govt agency before working in occupation. Approval is automatic.
- _____________: anyone can work in occupation, but to be "certified," must pass exam administered by govt or nonprofit organization.
- _____________: no one may work in occupation without govt approval. Must pass exam, sometimes other requirements.

What occupations are most likely to be licensed?

	Certification	License
Legal occupations	3.4%	63.4%
Education, training, & library occupations	1.9%	53.6%
Healthcare practitioners & technical occupations	4.4%	72.6%
Healthcare support occupations	3.6%	47.2%

SOURCE: Bureau of Labor Statistics, "2016 data on Certifications and Licenses," https://www.bls.gov/cps/certifications-and-licenses.htm#data, table 5, accessed January 8, 2018. These data are from the Current Population Survey.

Growth of occupational licensing



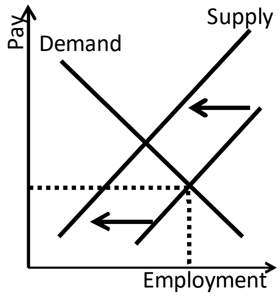
Sources: Percentages unionized are from the Current Population Report, various years; Kleiner and Krueger (2013).
*Dashed line extends from state-only estimates to the Gallup and Westat PDII estimates, which include licensing by all levels of government. PDII, Princeton Data Improvement Initiative.

Possible welfare effects of licensing

- Demand for occupation may increase overall if public has greater confidence in quality.
  - _____________ welfare.
- However, some people may not be willing to pay for higher quality.
  - _____________ welfare.
- Sometimes standards are set that do not benefit public (e.g., hard but irrelevant exam questions).

How is licensing similar to unionism?

- Licensing agencies do not set wages.
- However, by setting high standards they effectively restrict entry.
- This will raise pay indirectly, potentially generating rents.



Who enjoys the rents?

- If licensing agency restricts entry through very high standards (e.g., difficult exams) then potential entrants must invest in high levels of training (e.g., exam preparation).
- New entrants enjoy only a ___________ rate of return on their human capital investment.
- But existing practitioners who are "grandfathered" enjoy high pay without the investment—thus enjoy __________.

Effects of licensing on pay

- Tricky to estimate because licensed workers might differ from others in many ways.
- One study estimated licensing increased pay ___________, whereas union membership increased pay 10%-20%.
- Thus licensing raised pay only about half as much as union membership.

Gittleman, M. & Kleiner, M. M. (2016), "Wage effects of unionization and occupational licensing coverage in the United States," *Industrial and Labor Relations Review, (69)*1, pp. 142-172.

Licensing that does not benefit the public

- Some occupations seem to be licensed unnecessarily.
- Public should be able to recognize incompetent or untrustworthy practitioners without help.
- Possible examples:

North Carolina State Board of Dental Examiners v. Federal Trade Commission

- NC Board banned non-dentists from offering teeth-whitening services.
- Federal Trade Commission ordered Board to stop, calling ban anticompetitive, and noting that majority of Board were practicing dentists.
- FTC sustained by U.S. Supreme Court in 2015.

SOURCE: https://www.ftc.gov/system/files/documents/cases/150225ncdentalopinion.pdf . See also website of FTC's Economic Liberty Task Force (https://www.ftc.gov/policy/advocacy/economic-liberty).

Conclusions

- Almost _________ of workers are licensed.
- Licensing ostensibly protects the public from incompetent or untrustworthy practitioners.
- However, it restricts supply, sometimes in occupations where the public does ________ need protection.
- Licensing raises pay about _________ as much as unionism does.

PIECE RATES AND TIME RATES

- What are “piece rates”?
- Which employers choose them?
- Which workers choose them?
- What are their disadvantages?

Motivating effort

- Employers want to ensure their workers exert effort on the job.
- In some jobs, it is easy for employers to monitor workers’ effort. Examples:
  ____
  ____
  ____
- Hard to take even short breaks or cut corners without employer noticing.

Motivating effort (cont’d)

- In other jobs, the employer cannot easily monitor workers’ effort. Examples:
  ____
  ____
  ____
- Easy to take short breaks or cut corners without employer noticing.
- Employer has little (or much delayed) information about any particular worker’s effort.

Incentive pay

- Human resources specialists have many ideas about how to encourage employee effort.
- In this class, we will consider some *economic* ideas—that is, ideas related to pay:
  - Piece rates
  - Tournaments
  - Delayed compensation
  - Efficiency wages

What are piece rates?

- Worker receives payment based on worker’s individual _____________.
- Contrast with “time rates”: payment based on ____________ on the job.
- Employer’s preferred payment system depends on whether it is easier to measure a worker’s *output*, or a worker’s *input* (time on the job).

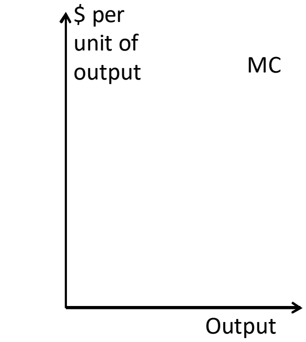
Which is easier to measure?

Easier to measure output
- Agricultural workers: e.g., picking berries.
- Clothing workers.
- Sales workers.
- Coal miners long ago.
- Tasks where quality inspection is ________.

Easier to measure input (time)
- Workers using a variety of tools, or doing a variety of tasks.
- Workers on assembly lines.
- Workers in teams.
- Tasks where quality inspection is ________.

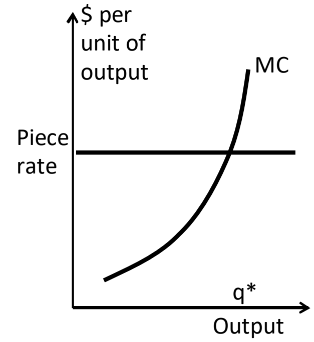
Effort and output

- Greater effort yields greater output.
- However, greater effort also yields disutility.
- *Marginal cost of output to worker* reflects rising marginal disutility of effort required to produce more output.



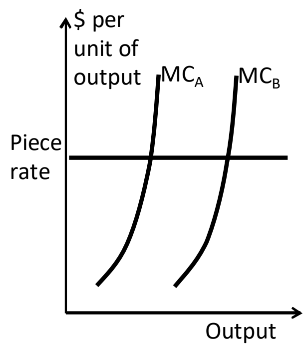
Incentives under piece rate

- Worker exerts effort until marginal cost of output equals piece rate.
- Earnings = q* × piece rate.



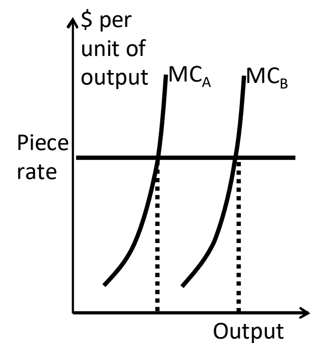
Differences across workers

- Workers will have different MC curves.
- Some will be more able, or less averse to effort, than others. (Here, worker B is more able than worker A.)
- Earnings will vary accordingly.



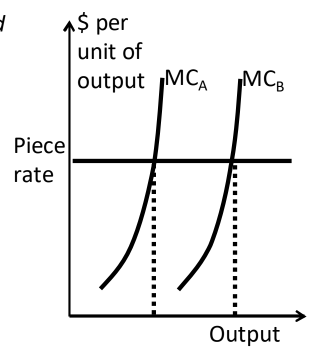
High-ability workers under piece rates

- Note that Worker B *could* work less hard, and have lower earnings.
- But chooses NOT to.
- Overall utility depends on effort and pay.
- Conclude Worker B enjoys greater overall utility by working hard.



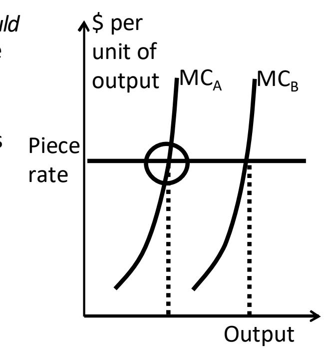
Low-ability workers under piece rates

- Similarly Worker A *could* work harder, and have higher earnings.
- But chooses NOT to.
- Overall utility depends on effort and pay.
- Conclude Worker A enjoys greater overall utility by working less hard.



Low-ability workers under piece rates

- Similarly Worker A *could* work harder, and have higher earnings.
- But chooses NOT to.
- Overall utility depends on effort and pay.
- Conclude Worker A enjoys greater overall utility by working less hard.



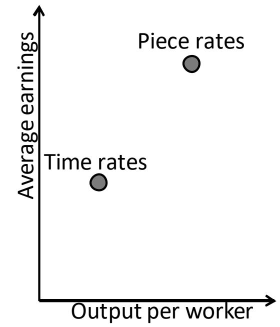
Worker choice of payment systems

- Time-rate systems offer a fixed hourly pay and typically require a fixed minimum level of effort.
- More able workers typically prefer piece rates.
- Less able workers typically prefer time rates.

Differences in earnings

On average, workers on piece rates produce more and earn more than workers on time rates. Why?

1. Partly because piece rates _____________ them to work harder.
2. Partly because more-able workers _______ piece-rate jobs.



Problems with piece rates

1. _____________ may suffer as workers rush to maximize quantity of output.
2. Less incentive to help co-workers.
3. Output and thus earnings may _____________ for reasons beyond the worker's control. Risk-averse workers will not like this. Examples:
   - Bad weather
   - Machine breakdowns
   - Raw materials not ready on time

"Ratchet effects"

- Workers may fear that increased productivity will encourage managers to _______________ their rate of pay.
- Workers will then be ______________ to work too hard or to offer labor-saving suggestions.
- However, if a firm can credibly *promise* not to reduce pay rates, workers will not fear ratchet effect and become very productive.
  - Lincoln Electric (www.lincolnelectric.com).

Related concept: bonuses

- Payments (typically annual) beyond regular wages or salary.
- Usually linked to worker's or firm's performance.
- Common for senior executives.

Related concept: profit sharing

- Payments related to the firm's profit.
- Depends on firm's ___________ performance, not individual worker's performance.
- Very common in Japan and Korea.
- _________________ problem: little direct incentive for individual worker.
- However, research suggests profit-sharing plans usually ________ increase productivity.

Conclusions

- Piece rate payment systems pay workers based on their individual _______________.
- Employer choice of payment system depends on whether it is easier to measure individual output or individual input (time).
- Piece workers earn more, partly because they are _______________ to work harder and partly because more-able workers ___________ piece rates.
- Problems of piece rates include output ___________, fluctuating earnings, and ratchet effects.

TOURNAMENTS

- Why would firms want to compensate workers according to rank order of performance?

Problems with piece rates

- One problem with piece rates is that output may _______________ for reasons beyond workers' control. Examples:
  - Bad weather
  - Machine breakdowns
  - Raw materials not ready on time

Problems with piece rates: example

- Many sales workers are paid on commission.
- Sales may fluctuate for reasons ___________ worker effort—recession, entry of competing brands, bad weather, etc.
- Creates income uncertainty for sales workers.

Problems with piece rates (cont'd)

- Another problem is that in some settings, the employer can observe the _______________ of workers' output, but not the output itself (or at least not its value). Examples:
  - On-time performance.
  - Positive ratings by consumers.
  - Etc.

Compensation by rank order

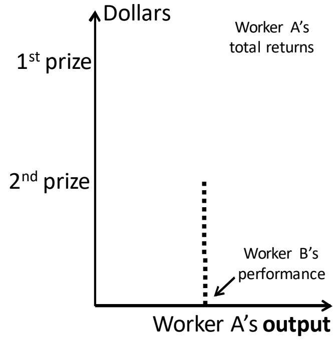
- Instead of compensating workers by output, compensate workers by *rank order*.
  - Top performer gets set amount of money ("first prize").
  - Second-best gets less ("second prize").
  - etc.
- "Prize" could be cash bonus, promotion, etc.

Examples of compensation by rank order

- Sports tournaments.

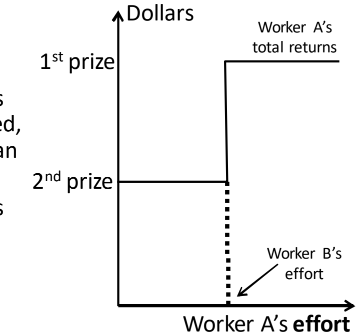
Returns to output

- Returns to worker depend on performance of other workers.
- Moving up in rank (e.g., from 2nd to 1st) brings a discrete jump in earnings.

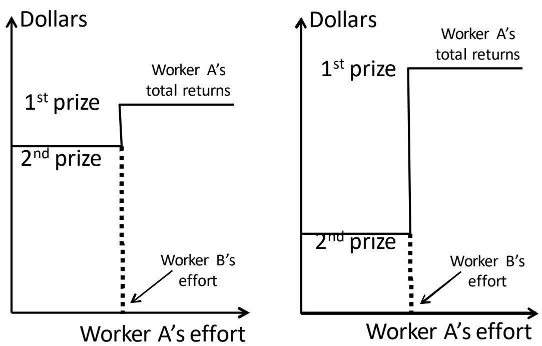


Returns to effort

- Output depends both on effort and random factors.
- Sometimes returns more than expected, sometimes less than expected.
- So *average* returns to effort are smoother, but still steep.

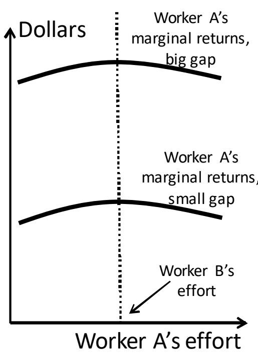


Returns curve is steeper, the bigger the gap between 1st and 2nd prizes



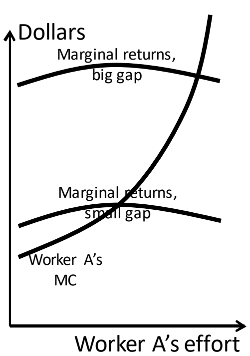
Marginal returns to effort

- Marginal returns = ____________ of total returns.
- Marginal returns are higher, the ____________ the gap between 1st and 2nd prizes.



Choosing level of effort

- Worker chooses effort to equate marginal cost and marginal returns.
- The bigger the gap, the ____________ effort exerted.



Consequences of big gap

- With a big gap between 1st and 2nd prizes, workers exert ____________ effort.
- Examples: golf or tennis tournaments.
- Of course, a bigger gap also creates more ________________ about returns (due to random factors).
- Increased risk may be unattractive to some workers.

Problems with tournaments: incentives for worker collusion

- "Let's agree to split the prize money evenly, and we can both take it easy."
- Workers' incentive to exert effort is undermined by collusion.
- _____________ firm's total output and profit.
- Examples: sports scandals where players "throw" the game.

Problems with tournaments: incentives for sabotage

- Because worker's returns depend on *relative* performance, if the prize gap is big, worker has incentive to _______________ rivals' performance.
- _____________ firm's total output and profit.
- Examples: premed students who contaminate or destroy other students' experiments.

Conclusions

- "Tournaments" compensate workers by ________________ of performance, rather than by absolute performance.
- Incentives for effort are high if ___________ between prizes is large.
- However, tournaments create incentives for worker collusion or sabotage.

DELAYED COMPENSATION

- How can employers discourage misbehavior on the job, without constantly monitoring workers?

Shirking on the job

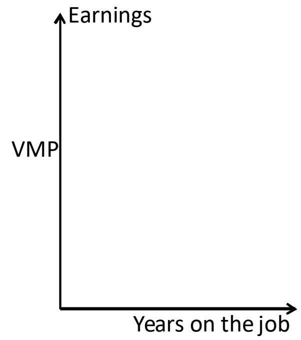
- All employers face problem of worker misbehavior.
  - Surfing the web or chatting on the phone instead of working.
  - Stealing company supplies.
  - Falsifying time records.
  - Etc.

Costs of monitoring workers

- In many workplaces, close supervision of workers is difficult and costly.
- So employer checks workers only occasionally, firing workers caught shirking.
- But unless workers pay a ________________ of some kind, they are likely to shirk anyway.
- Result is ________ of output and profit.

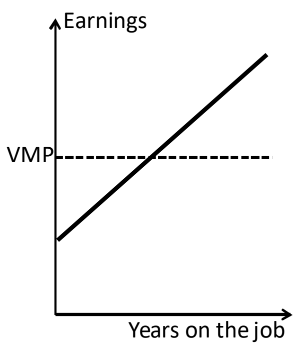
Constant-wage contract

- If employer pays a constant wage = VMP, worker has ________ incentive to exert full effort.
- If caught shirking and fired, worker will just find another job at the same wage.



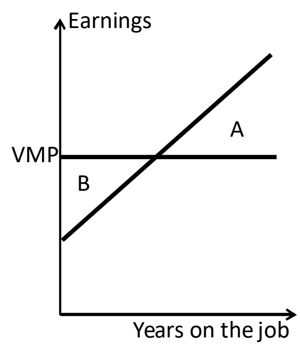
Delayed compensation contract

- Suppose instead that employer offers a ___________ wage.
- Worker is initially paid _________ than VMP.
- Later, worker is paid _________ than VMP.



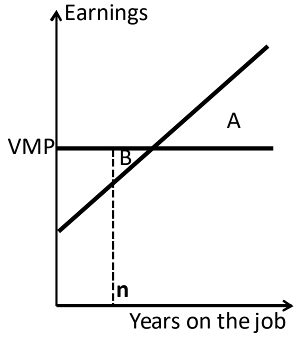
Delayed compensation contract must be competitive with constant wage

- To attract workers, PDV of delayed compensation must = PDV of constant wage.
- Put differently, PDV of shaded area A minus PDV of area B must = __________.



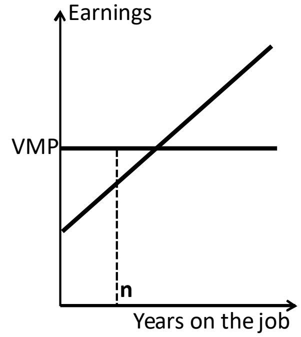
Delayed compensation means earnings are back-loaded

- Suppose worker has worked n years, mostly at a wage below VMP.
- Then PDV of remaining earnings will be ____________ than corresponding constant wage.
- PDV(A) – PDV(B) > 0.
- Firm "still owes worker money."



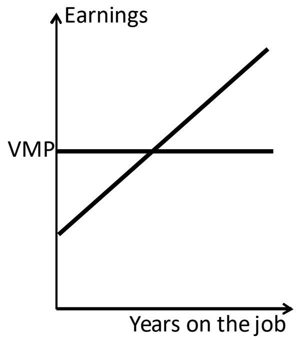
Delayed compensation discourages shirking

- If worker shirks and is caught, worker suffers a major penalty.
- Will not find a job with same PDV of earnings.
- Worker has _________ incentive to exert full effort.



Compensation at end of career

- At the end of career, worker is paid a wage much greater than VMP.
- May wish to keep working!
- But employer will want to _________ these overpayments.



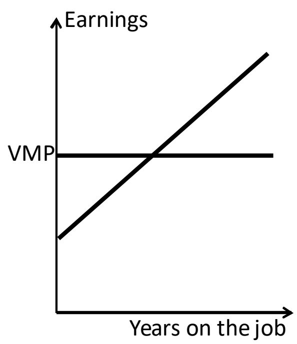
Mandatory retirement

- Mandatory retirement was common in private and public sector until banned by U.S. federal law in 1986.
- Still common in other countries.
- A legal alternative in the U.S. is to restructure ____________________ to encourage voluntary retirement from the firm.

Lazear, Edward P. 1979. "Why Is There Mandatory Retirement?" *Journal of Political Economy*, 87(6), 1261-84.

Will employer keep its promise?

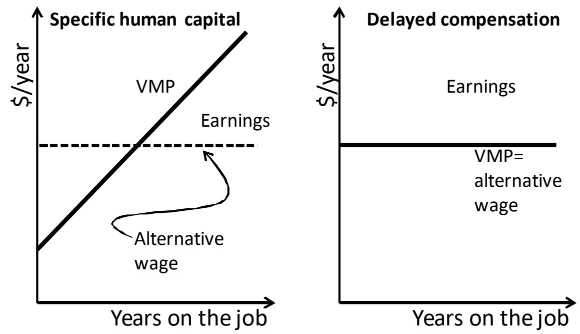
- Firm may be tempted to __________ a worker as soon as wage exceeds VMP.
- Saves the firm money in the short run.
- But if reputations are important in labor market, firm would have difficulty hiring in the long run.



Comparison with specific human capital

- Both models predict that pay ___________ with seniority.
- Both models explain why workers _______________ with same firm.
- But motivation is slightly different.
- And specific human capital model says workers are initially paid ___________ than VMP and later are paid __________ than VMP.

Delayed compensation versus specific human capital



	Specific human capital model	Delayed compensation model
Motivation	Preserve firm-specific human capital.	Discourage shirking.
Initial wage is...	________ than VMP (but less than what worker could get elsewhere).	________ than VMP.
Later wage is...	________ than VMP (but more than what worker could get elsewhere).	_________ than VMP.
Pay rises with seniority?		
Workers stay long time with same firm?		

Conclusions

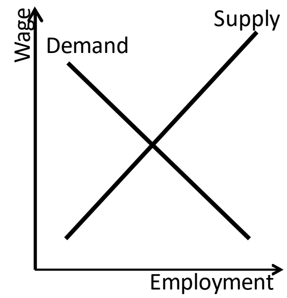
- Employers face a problem of worker shirking.
- If monitoring is expensive, shirking can still be discouraged by delayed compensation.
- Worker is initially paid ________ than VMP, later paid _________ than VMP.
- With wage > VMP, worker will want to continue working past expected retirement, so retirement incentives are necessary.

EFFICIENCY WAGES

- Why should a firm ever pay *more* than the competitive wage?

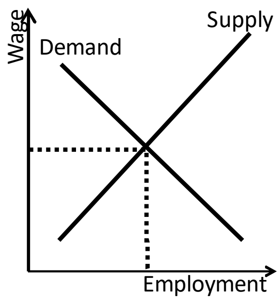
Competitive wages

- Time rates, piece rates, tournaments, and delayed compensation are similar.
- Structure of wage package varies to encourage effort.
- But ____________ of wage package is determined by market.



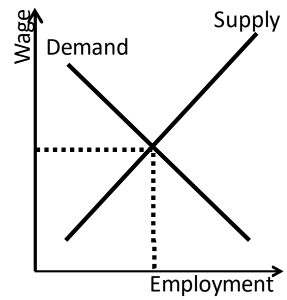
Competitive wages (cont'd)

- Firm can get all the employees and all the output it wants if it pays the competitive wage.
- ________ reason to pay more.



Wage above competitive wage

- However, in some settings, increased output can be obtained by paying more than competitive wage.
- Wages of this type are called _____________ wages.



Efficiency wages in developing economies

- Competitive wage may be at subsistence level, where workers are under-nourished.
- Increasing the wage allows workers to buy more food.
- Increases worker ___________________.

Efficiency wages in industrialized economies

- Several models relating output and the wage have been suggested.
- Each model shows why employers might have a motivation for paying __________ than the competitive equilibrium wage.
  1. Shirking model
  2. Sociological model (fairness and reciprocity)
  3. Turnover model

1. Shirking model

- Suppose workers like to shirk (reduce effort) but close supervision is difficult and costly.
- So employer checks workers intermittently, and fires any workers caught shirking.
- Now firing is _______ penalty if worker can find another job at same wage immediately.
- But if the employer pays a wage _____________ than other employers, firing IS a penalty.
- So workers have an incentive not to shirk.

2. Sociological models

- "Fair wage-effort" hypothesis: workers have a notion of a fair wage, based in part on the wages paid at other firms.
- If actual wage is less than fair wage, they ________________ effort.
- If actual wage is more, they exert __________ effort.

Akerlof, George and Janet Yellen (1990), "The Fair Wage-Effort Hypothesis and Unemployment," *Quarterly Journal of Economics*, 105 (2), (May 1990), pp. 255-283.

3. Turnover model

- Workers are constantly looking for better-paying jobs, even while employed.
- But finding and training replacement workers can be expensive.
- Firm can save money by reducing ________________.
- So employer pays a wage higher than the equilibrium so workers less likely to _______.

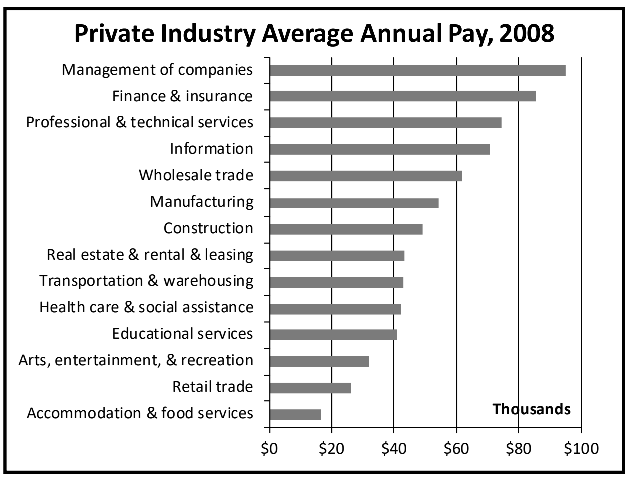
Example: Ford's $5-a-day wage

- In 1914, Ford began paying $5 a day, about ___________ the competitive wage.
- Annual turnover dropped from 370% to 16%.
- Absenteeism dropped from 10% to 2.5%.
- Productivity and profit _______________.
- However, Ford's wage did not keep up with rapid inflation from 1915-1920, so "efficiency wage" did not last long.

Raff, Daniel M. G. and Lawrence H. Summers. 1987. "Did Henry Ford Pay Efficiency Wages?" *Journal of Labor Economics*, 5(4, Part 2), S57-S86.
Maloney, T. N. and W. C. Whatley (1995). "Making the effort: the contours of racial discrimination in Detroit's labor markets, 1920-1940." *Journal of Economic History* 55(3): 465-493.

Example: fast food chains

- Fast food chains are a mix of locally-owned franchises and company-owned stores.
- Franchisees probably find it ____________ to supervise their workers than the company does.
- So we might expect company-owned stores to pay "efficiency wages" because of difficulties in supervision.
- In fact, wages are about 9% ____________ at company-owned stores than at franchises.



Explaining interindustry wage differentials

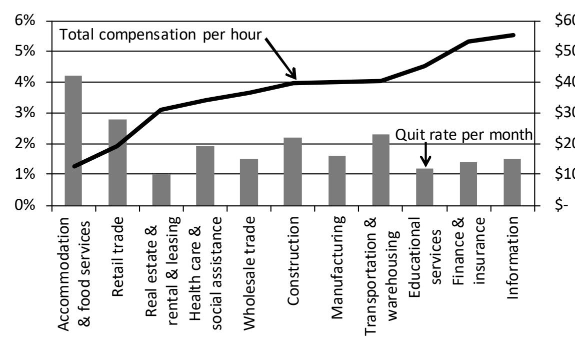
- There are substantial differences in wages across industries.
- Why? Are the *workers* different? Or are the *jobs* different?
- Differences remain even after controlling for workers' human capital, unionism, working conditions ("compensating differentials"), etc.
- Differences ____________ over time, so not caused by temporary shifts in labor demand and supply.

Explaining interindustry wage differentials (cont'd)

Two hypotheses:

- Workers in high-wage industries are more ____________ than workers in low-wage industries.
- High-wage industries are paying __________________ wages. Low-wage industries are not.

Krueger, Alan B. and Lawrence H. Summers. 1987. "Reflections on the Inter-Industry Wage Structure," in K. Lang and J. S. Leonard, eds., *Unemployment and the Structure of Labor Markets.* New York: Basil Blackwell, pp. 17-47.



SOURCES: Quit rates—BLS, "News Release: Job Openings and Labor Turnover—November 2017," table 4, https://www.bls.gov/jlt/ accessed January 9, 2018. Compensation—BLS, "News Release: Employer Costs for Employee Compensation—September 2017," table 10, https://www.bls.gov/bls/newsrels.htm#OCWC accessed January 9, 2018.

Are wage differentials caused by some industries paying efficiency wages?

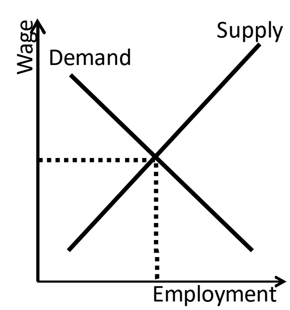
- Evidence in favor: Workers in low-wage industries ____________ more often than workers in high-wage industries.
- Evidence against: Workers who move from a low-wage industry to a high-wage industry do ___________ enjoy the full increase in wage.

Dual labor markets

- What would an economy look like if SOME industries paid efficiency wages and others did not?
- Analysis is similar to minimum wages and unionism, because in one sector wages are raised ____________ equilibrium level.

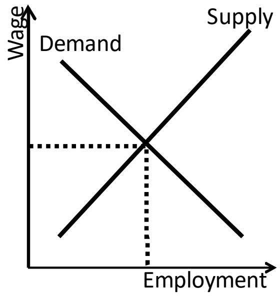
Dual labor markets: primary sector

- In "primary" sector, workers have ________ responsibility.
- Supervision is difficult.
- So employers pay efficiency wages.
- Wages are ________.
- Jobs are desirable (excess supply of labor).
- Turnover is low.



Dual labor markets: secondary sector

- In "secondary" sector, workers have ________ responsibility.
- Supervision is easy.
- So employers pay competitive wages.
- Wages are ________.
- Jobs are less desirable, but easy to get.
- Turnover is high.

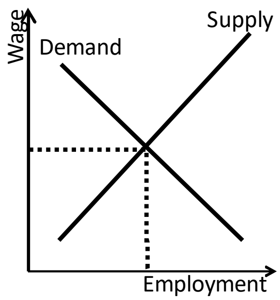


Efficiency wages and unemployment

- What would an economy look like if ALL employers paid efficiency wages?
- Again, analysis is similar to minimum wages and unionism.

Efficiency wages and unemployment (cont'd)

- ALL wages would be above equilibrium level.
- Excess supply of labor.
- Penalty for shirking or quitting would not be a lower wage.
- Instead it would be __________________.



Critique of efficiency wages

There are ___________ expensive ways to discourage shirking and quitting.

- Workers could post a bond when hired.
  - If workers quit or were caught shirking, they would lose the bond.
  - If not, firm would return the bond with interest at retirement.
- Firm could pay delayed compensation.

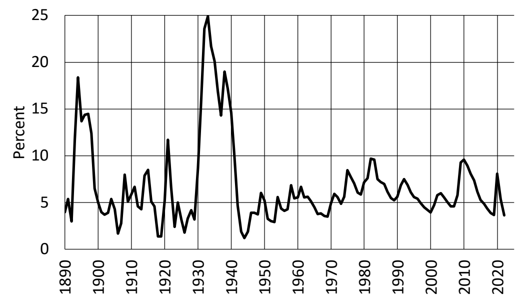
Conclusions

- Efficiency wages are above-equilibrium wages designed to discourage shirking and quitting.
- They may be profitable in settings where close supervision is ________________________.
- They may explain why some industries pay more than others: "dual labor markets."
- If all industries pay efficiency wages, __________________ results.
- Yet efficiency wages are more expensive than bonding or delayed compensation.

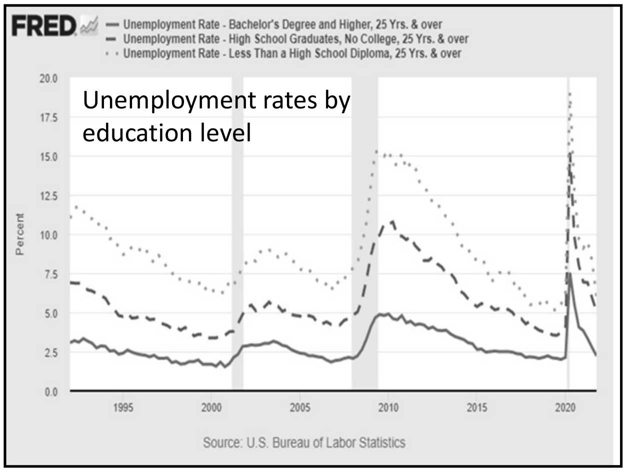
UNEMPLOYMENT IN THE UNITED STATES

- What has been the unemployment rate?
- How does unemployment vary across demographic groups?
- How long are workers unemployed?

Trends in U.S. unemployment rate



Sources: BLS; and *Hist. Stat. of the U.S.*, 1975, Series D-86.

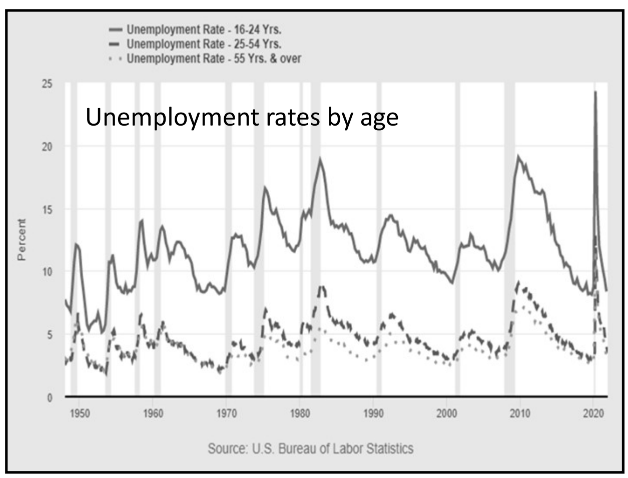


Why does education lower unemployment?

- Workers with higher education also tend to invest more in ____________ human capital.
  - Less likely to be laid off by employers.
- Workers with higher education tend to switch jobs without being _________________.
  - Perhaps have better information about jobs, and better contacts.

Why does education lower unemployment?

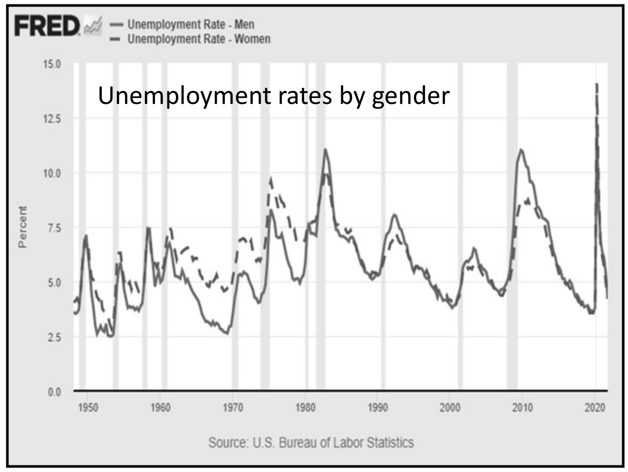
- Workers with higher education also tend to invest more in ___specific____ human capital.
  - Less likely to be laid off by employers.
- Workers with higher education tend to switch jobs without being ____unemployed____.
  - Perhaps have better information about jobs, and better contacts.



Why are unemployment rates higher for young workers?

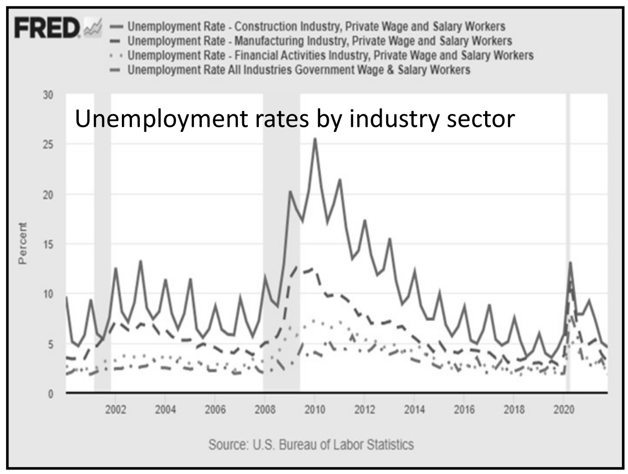
Possible reasons:

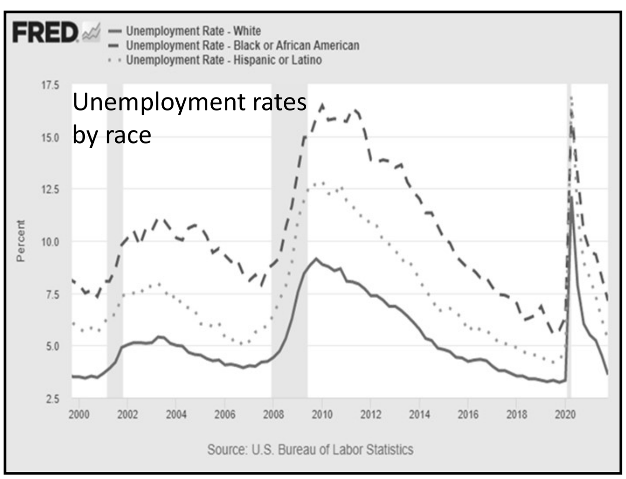
- More likely to be affected by legal _______________________.
- Have higher __________________ as they search for the ideal job.
- Have less ______________ human capital (through on-the-job training), so more likely to be laid off by employers.



Why do unemployment rates sometimes differ by gender?

- Gender differences driven by ______________ of employment.
- Many men employed in manufacturing and construction, which tend to have greater cyclical unemployment.
- Many women employed in service sectors and government, which have less cyclical unemployment.

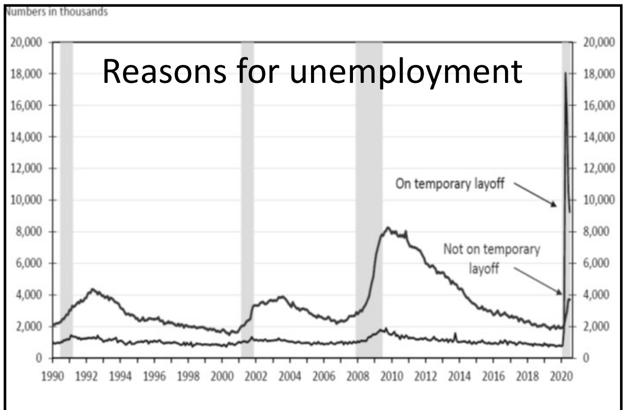




Why do unemployment rates differ by race?

- Higher for blacks than whites.
- Difference holds even after controlling for education.
- Wilson (1987) argues high unemployment is related to ______________________________.
- Spatial isolation of blacks from jobs has led to declining employment and rising unemployment.

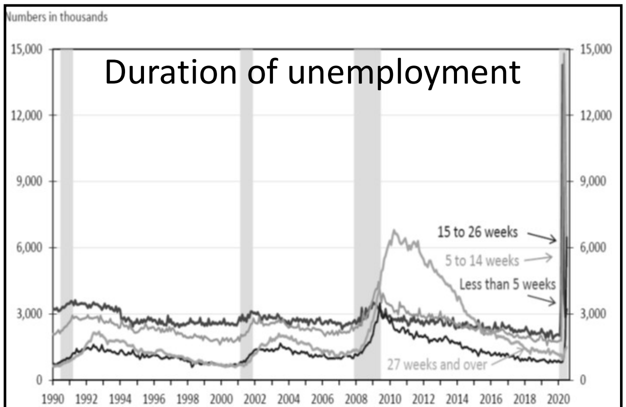
William Julius Wilson, *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy,* Chicago: University of Chicago Press, 1987.



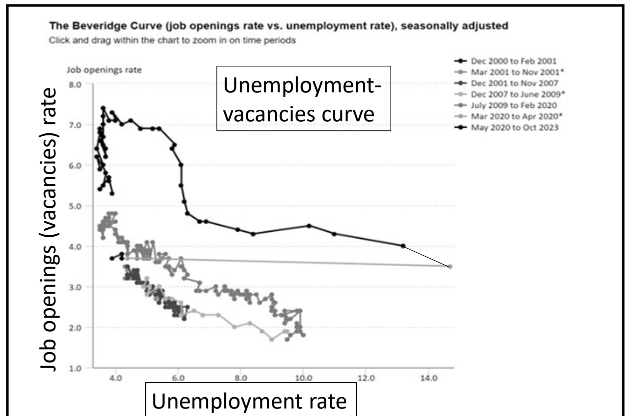
BLS, "Charting the Labor Market," August 7, 2020, chart 13, http://www.bls.gov/web/empsit/cps_charts.pdf.

Duration of unemployment

- One should be concerned not only about the number of people unemployed, but how long they remain unemployed.
- The percent of unemployed who have been unemployed longer than 27 weeks rose sharply in the Great Recession.



BLS, "Charting the Labor Market," August 7, 2020, chart 11, http://www.bls.gov/web/empsit/cps_charts.pdf.



https://www.bls.gov/charts/job-openings-and-labor-turnover/job-openings-unemployment-beveridge-curve.htm

Alternative measures of labor underutilization

U-1 = persons unemployed 15 weeks or longer.

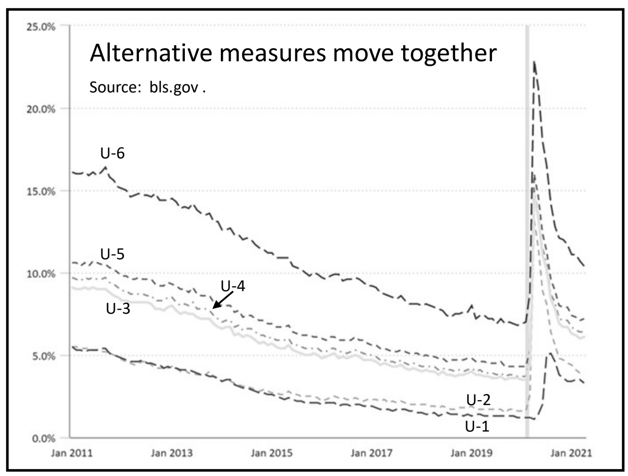
U-2 = job losers and persons who completed temporary jobs.

U-3 = unemployed (looked for work in last 4 weeks).

U-4 = U-3 + discouraged workers (looked for work in last year, but not looking now because believe not jobs available).

U-5 = U-4 + all other persons marginally attached to the labor force (looked for work in last year).

U-6 = U-5 + working part time for economic reasons.



Conclusions

- U.S. unemployment rate has fluctuated over time, reaching a peak of ____% during Great Depression.
- Unemployment rate is higher for less-educated workers, younger workers, and African-Americans.
- Unemployment rate is usually higher in construction and manufacturing than most service industries.
- Average duration of unemployment ________________ during the Great Recession.
- Over the business cycle, unemployment rate moves inversely with _____________________.

TYPES OF UNEMPLOYMENT

- Why is there unemployment?

Types of unemployment

1. _______________ unemployment
2. _______________ unemployment
3. _______________ unemployment
4. _______________ unemployment

1. Frictional unemployment

- Normal _______________ of workers and firms.
- At any point in time, some employers are expanding and some are shrinking.
- New workers enter labor market after finishing school.
- Other workers re-enter labor market after not working.

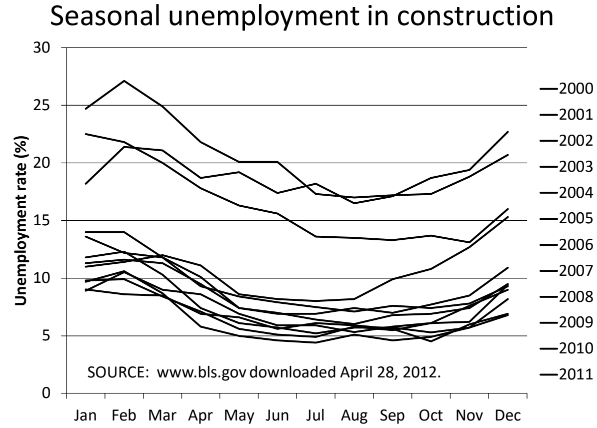
Policy issues for frictional unemployment

- Frictional unemployment may be inevitable as markets adjust to new conditions.
- It takes time for workers and employers to find a good match.
- Not a big problem for policy.
- However, government might speed matching process through job banks and employment agencies.

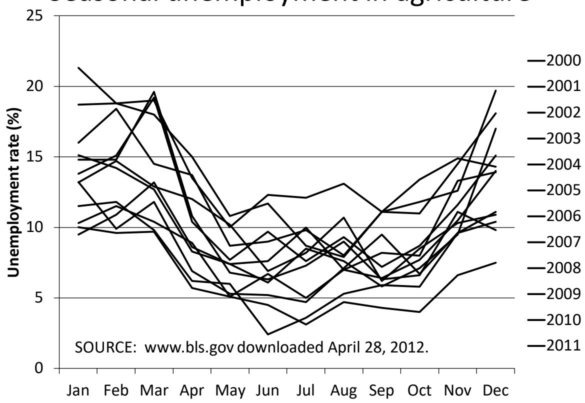
2. Seasonal unemployment

- Seasonal layoffs occur in garment industry, auto manufacturing, agriculture, and construction.
- Temporary and __________________.
- Not a big problem for policy.

Seasonal unemployment in construction



Seasonal unemployment in agriculture



3. Structural unemployment

- Whole sectors and occupations are growing, while others are shrinking.
- Suppose workers who are available for work do not have the right skills for the jobs available.
- _________________ creates so-called structural unemployment.

Policy issues for structural unemployment

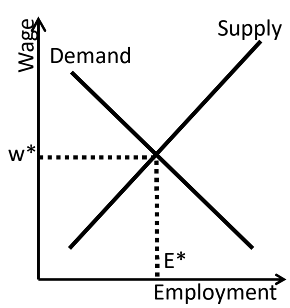
- Structural unemployment is likely to last a long time, unless workers get retrained quickly.
- Old human capital is no longer useful.
- Who will retrain the workers? Employers? Government?

4. Cyclical unemployment

- Even if workers have the right skills, the number of available workers may not match the number of available jobs due to the ____________________.
- During a recession, aggregate demand for final goods decreases.
- Derived demand for labor decreases.

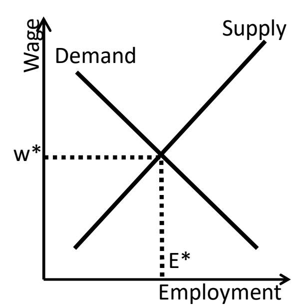
Effect of decrease in demand for labor

- One would expect that employment and wages would fall.
- In fact something else happens.



What actually happens

- Employers react by (1) reducing hiring, and (2) laying off workers.
- Hardly any change in wages—they seem to be "____________."
- Adjustment is only in employment.

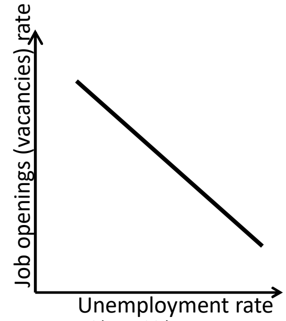


Why are wages sticky?

- Union wages and legal minimum wages.
  - But these affect few workers.
- Other economic explanations
  - Intertemporal substitution hypothesis.
  - Sectoral shifts hypothesis.
  - Efficiency wages.
  - Implicit contracts

Unemployment-vacancies curve* and cyclical unemployment

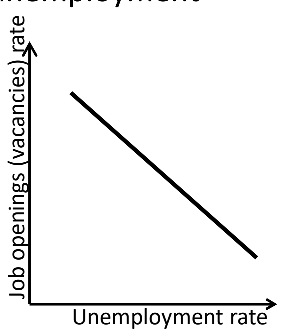
- In a recession, unemployment increases and job openings decrease.
- In a boom, unemployment decreases and job vacancies increase.
- Move ____________ U-V curve over business cycle.

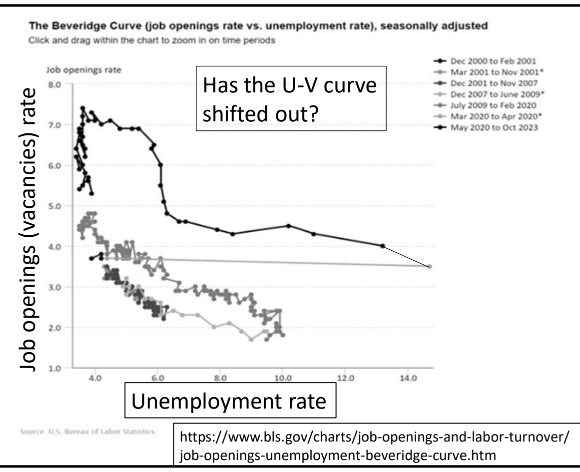


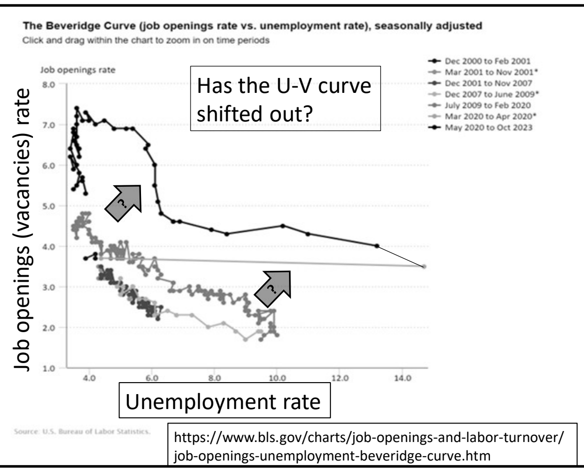
Also called "Beveridge curve," after William Henry Beveridge, British economist, though he never drew the curve.

Unemployment-vacancies curve and structural unemployment

- If economy has difficulty matching unemployed workers with jobs, then U-V curve ______________ outward.







Conclusions

- _______________ unemployment is caused by normal turnover of workers and firms.
- _______________ unemployment is temporary and predictable.
- _______________ unemployment is caused by mismatch of worker skills to jobs, or insufficient work incentives.
- _______________ unemployment is caused by recessions.

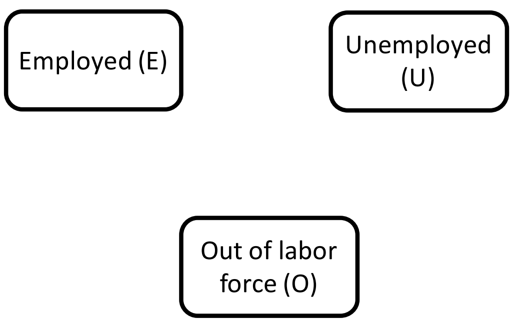
UNEMPLOYMENT DYNAMICS

- How can we describe workers' movements between employment, unemployment, and out-of-the-labor force?

States and transitions

- Most unemployed workers eventually find jobs or leave the labor market.
- In fact, workers are constantly moving between states of
  - employment
  - unemployment
  - out of the labor force.
- This suggests an approach to understanding frictional unemployment.

States and transitions (cont'd)

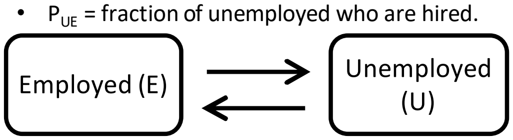


Markov models

- Markov models assume that people (or things) are in various states at any point in time.
- However they move between states with certain constant probabilities.
- The steady state of a Markov model occurs when the fraction of people in each state is constant.

Simplified model

- Suppose no one leaves or enters labor force. People just move between _______________ and ___________________.
- Let
  - P_{EU} = fraction of employed who become unemployed.
  - P_{UE} = fraction of unemployed who are hired.



2 × 2 Markov transition matrix

		To	
		Employed	Unemployed
From	Employed	P_{EE}	P_{EU}
	Unemployed	P_{UE}	P_{UU}

Note: each row must sum to ________, because everyone goes somewhere.

Steady state unemployment rate

- In steady state, flows must balance: number hired = number who become unemployed: $E\ P_{EU} = U\ P_{UE}$.
- Then $E\ P_{EU} + U\ P_{EU} = U\ P_{UE} + U\ P_{EU}$.
  $(E + U)\ P_{EU} = U\ (P_{UE} + P_{EU})$.
- Then steady-state ___________________ rate
  $= U / (E + U)$
  $= P_{EU} / (P_{UE} + P_{EU})$.

Numerical example

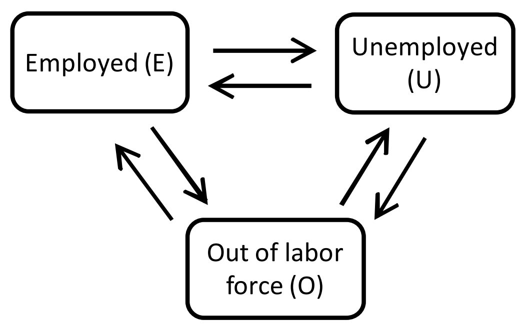
- Suppose we are given transition probabilities
  - fraction of employed who become unemployed (that is, probability of being laid off or leaving a job for unemployment) = P_{EU} = 2% = **0.02**.
  - fraction of unemployed who are hired (that is, probability of finding a job while unemployed) = P_{UE} = 30% = **0.30**.
- What is the steady-state unemployment rate?

Numerical example (cont'd)

		To	
		Employed	Unemployed
From	Employed		
	Unemployed		

Steady-state unemployment rate
= 0.02 / (0.30 + 0.02) = ____________% .

But this model is too simple. In reality, some people leave and enter the labor force.



Transitions in and out of labor force

Now consider more transitions. Let

- P_{EO} = fraction of employed who leave labor force.
- P_{UO} = fraction of unemployed who leave labor force.
- P_{OU} = fraction of OLF who begin looking for work.
- P_{OE} = fraction of OLF who get jobs immediately.

3 × 3 Markov transition matrix

			To	
		Employed	Unemployed	Out of LF
	Employed	P_{EE}	P_{EU}	P_{EO}
From	Unemployed	P_{UE}	P_{UU}	P_{UO}
	Out of LF	P_{OE}	P_{OU}	P_{OO}

Note: each row must sum to __________, because everyone goes somewhere.

In steady state, flows must balance

- Number entering employment
  = number ____________ employment:
  (1) O P_{OE} + U P_{UE} = E (P_{EO} + P_{EU}).
- Number entering unemployment
  = number ____________ unemployment:
  (2) E P_{EU} + O P_{OU} = U (P_{UE} + P_{UO}).
- Number entering OLF
  = number ____________ OLF:
  (3) E P_{EO} + U P_{UO} = O (P_{OE} + P_{OU}).

Steady state unemployment rate

- If transition probabilities (P..) are constant, tedious algebra shows that (E/U) =
  $$= \frac{(P_{UE}P_{OE} + P_{UO}P_{OE} + P_{UE}P_{OU})}{(P_{EO}P_{OU} + P_{EU}P_{OU} + P_{EU}P_{OE})}$$
- Now unemployment rate = U / (E+U)
  $$= \left(\frac{E+U}{U}\right)^{-1} = \qquad .$$

Steady state unemployment rate

- If transition probabilities (P..) are constant, tedious algebra shows that (E/U) =
  $$= \frac{(P_{UE}P_{OE} + P_{UO}P_{OE} + P_{UE}P_{OU})}{(P_{EO}P_{OU} + P_{EU}P_{OU} + P_{EU}P_{OE})}$$
- Now unemployment rate = U / (E+U)
  $$= \left(\frac{E+U}{U}\right)^{-1} = \left(\frac{\boldsymbol{E}}{\boldsymbol{U}} + \mathbf{1}\right)^{-\mathbf{1}}.$$

Transition matrix: numerical example

		To		
		Employed	Unemployed	Out of LF
	Employed	0.95	0.02	0.03
From	Unemployed	0.50	0.40	0.10
	Out of LF	0.05	0.03	0.92

Using the formula, steady-state (E/U) = _______.
So unemployment rate = _________%.

Limitations of Markov models: duration of unemployment

- The above model is adequate for describing the overall level of unemployment rate.
- However, it turns out that the probability of leaving unemployment is ________ the same for everyone.
- A small number of workers endure ________________ unemployment spells.

Conclusions

- One way to describe changes in workers' employment status is with a Markov ________________ matrix.
- In this framework, the probability of changing from, say, employment to unemployment is ________________.
- We can compute ________________ values of employment and unemployment—that is, the values when inflows exactly equal outflows.

SEARCHING FOR A JOB

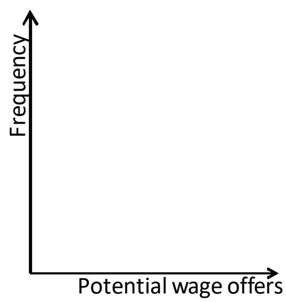
- How do unemployed workers decide how long to search and when to accept a job offer?

Frictional unemployment

- Includes
  - Workers laid off from shrinking firms.
  - Workers entering or re-entering labor market.
- These workers do not find jobs immediately even if jobs are available.
- Must _____________ for a good match.

Wage offer distribution

- Suppose employers are willing to pay a variety of different wages.
- Employers' potential wage offers form a distribution.
- Worker's job search task is to sample from distribution.

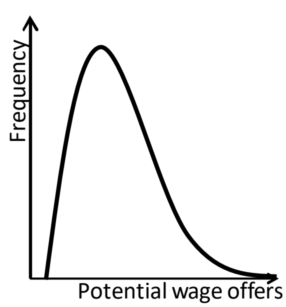


The worker's problem

- Assume worker knows distribution of potential wage offers.
- But some effort is required to get an actual job offer.
- Should worker simply get 20 offers and pick best?
- It turns out that optimal strategy is
  (1) Set a minimum acceptable wage.
  (2) Stop search when job offer above it is received—that is, accept the wage offer.

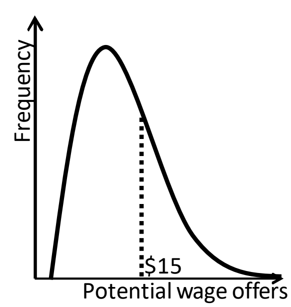
Reservation wage

- Minimal acceptable wage is called "reservation wage," or sometimes "asking wage."



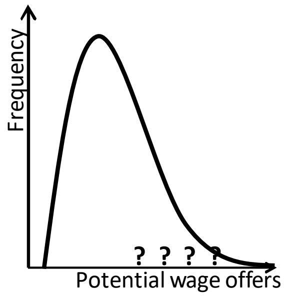
Example

- Suppose worker sets reservation wage = $15.
- Worker would _____________ offers of $11 or $14.
- Would _____________ a job offer of $17.
- But how should the worker choose a reservation wage?



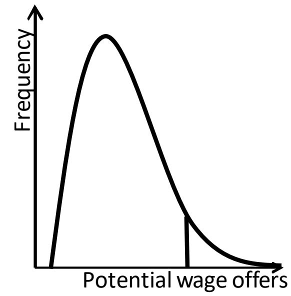
How does a worker choose a reservation wage?

- Worker considers the tradeoff.
- High reservation wage means, on average, long search but better wage in the end.
- So worker compares marginal benefit and marginal cost of continuing to search.



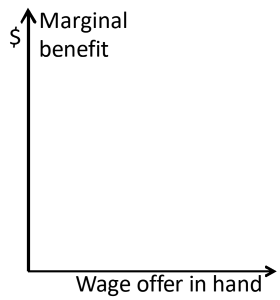
Benefits of further search

- Benefit of further search depends on the wage offer in hand.
- If the wage offer in hand is high, unlikely that further search will bring a higher wage offer.



Marginal benefit of further search

- Thus, marginal benefit of further search depends ____________ on the wage in hand.
- It also depends _______________ on worker's discount rate, since higher wages will be received in future.

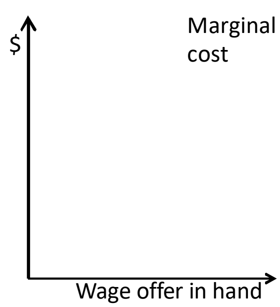


Costs of further search

- Job search is expensive.
  - Out-of-pocket-costs: transportation, printing resumes, etc.
  - Opportunity cost of worker's time.
- But opportunity cost of worker's time per hour = ________________________________.

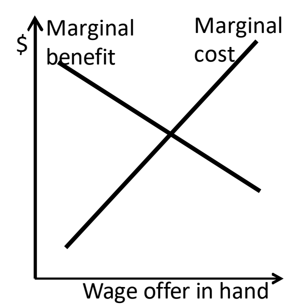
Marginal cost of further search

- Thus, marginal cost of further search depends ________________ on the wage in hand.



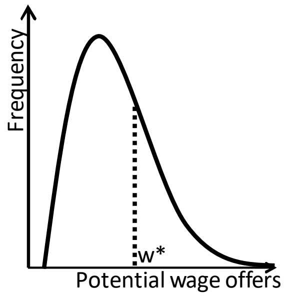
Optimal reservation wage

- Where marginal benefit equals marginal cost.
- At that point, expected net benefit of further search = ___________.



Time to a new job

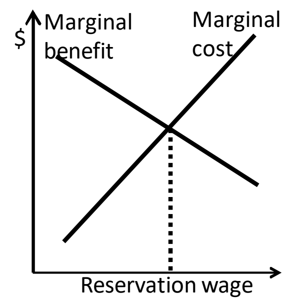
- Reservation wage determines *average* length of time to find a new job.
- The higher the reservation wage, the ____________ the *average* time to a new job.
- But *actual* time to new job is always random.



Shifts in marginal cost

Marginal cost falls if worker has another source of income while searching. Examples:

- unemployment insurance benefits.
- already employed and can work while searching.

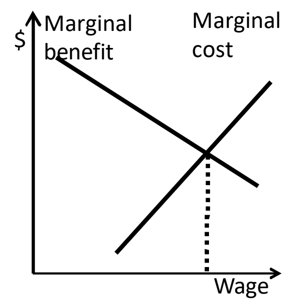


Effects of unemployment insurance (UI)

- UI benefits pay a laid-off worker (a fairly small amount of) money while searching for a new job.
- UI benefits lower the marginal cost of search and thus ___________ the reservation wage.
- This results in _____________ spell of unemployment, and ____________ wage ultimately obtained.

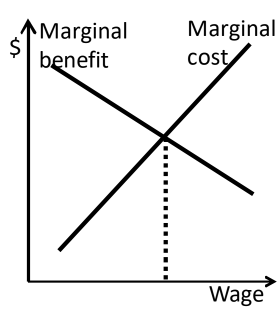
Effects of unemployment insurance (UI) (cont'd)

- However, UI benefits eventually run out (usually after 26 weeks).
- This ______________ worker's reservation wage and speeds process of finding a job.



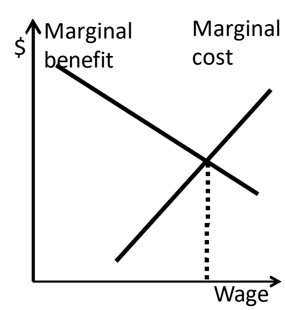
Effect of searching while employed

- Lowers cost of search, so ________________ reservation wage.
- Note that, everything else equal, employed worker's reservation wage ≥ wage currently paid.



Effect of liquidity constraints

- Suppose a worker has little savings and no access to borrowing.
- Raises cost of search, so ________________ reservation wage.

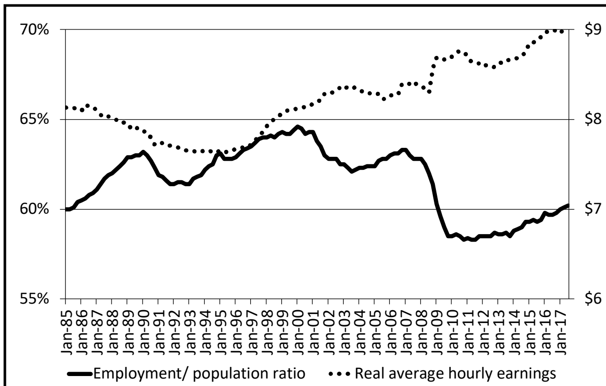


Conclusions

- Frictional unemployment consists of workers searching for available jobs.
- Optimal strategy: set a "____________________" and accept first job offer above it.
- Reservation wage is where MC=MB, or net benefit of further search is zero.
- UI benefits or searching while employed ____________ the reservation wage.
- Liquidity constraints _____________ the reservation wage.

THEORIES OF CYCLICAL UNEMPLOYMENT

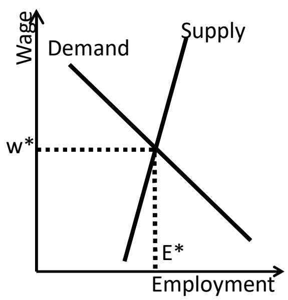
- In recessions, employment falls sharply but the real wage hardly moves.
- Why?



SOURCE: BLS (via FRED).

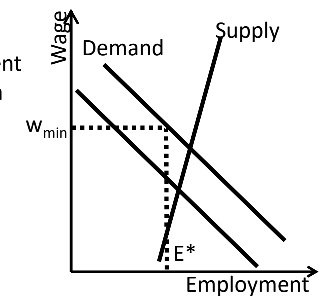
The basic facts

- Over the business cycle, employment moves a lot, but real wages hardly move.
- Why are wages so "sticky"?
- Hard to explain with simple shifts in labor demand, especially if supply is inelastic.



Minimum wages and unions

- Legal minimum wages and union wage contracts would prevent wages from falling in a recession.
- But they affect only a small minority of workers:
  union: about 10%*
  min. wage: 1.3%**.



* BLS, "Union Members—2022."
** BLS, "Characteristics of Minimum Wage Workers, 2022."

Theories of cyclical unemployment

1. Intertemporal substitution hypothesis
2. Sectoral shifts hypothesis
3. Efficiency wages hypothesis
4. Implicit contracts hypothesis

Definitions

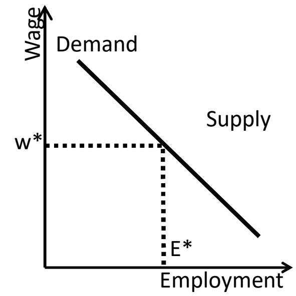
- Procyclical = _______________ correlated with changes in GDP.
  - Employment, investment spending, and tax revenue are all procyclical.
- Countercyclical = ________________ correlated with changes in GDP.
  - Unemployment is countercyclical.

More definitions

- ________________ unemployment = worker chooses not to work, even though jobs are available at market wage.
- ________________ unemployment = worker wants to work at market wage, but jobs are not available.

1. Intertemporal substitution hypothesis

- Argues that *short-run* labor supply is extremely elastic (flat).
- Small procyclical changes in the real wage are sufficient to cause large changes in labor supply.



Assessing the intertemporal substitution hypothesis

- Real wages are in fact slightly _______________, especially in recent decades.*
- Data show that short-run labor supply is indeed ____________ elastic than long-run labor supply, but not enough to explain changes in employment over the business cycle.
- Hypothesis implies that cyclical unemployment is _______________. Realistic?

*Abraham, K. G. and J. C. Haltiwanger (1995). "Real wages and the business cycle." *Journal of Economic Literature*, vol. 33, no. 3, pp. 1215-1264.

2. Sectoral shifts hypothesis

- Shocks to the economy (e.g., sudden changes in oil prices, development of the internet) cause some sectors to grow and others to shrink.
- But some workers laid off in shrinking sectors (e.g., manufacturing) do _______ have skills to take jobs in growing sectors (e.g., information technology).
- So _______________ unemployment rises until workers are retrained and economy adjusts.

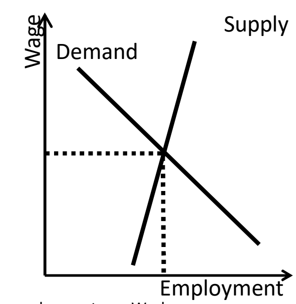
Assessing the sectoral shifts hypothesis

- In fact, during recessions, range or variance in growth rates across sectors _______________.
- However, much of this is *not* due to permanent shifts.
- Some sectors (e.g., automobiles) are just more sensitive to the recessions than other sectors (e.g., agriculture).

Abraham, K. G. and L. F. Katz (1986). "Cyclical unemployment: sectoral shifts or aggregate disturbances." *Journal of Political Economy*, vol. 94, (June), pp. 507-522.

3. Efficiency wage hypothesis

- Wages are set above equilibrium level to discourage shirking.
- If all firms do this, result is involuntary __________________.
- Why does this deter shirking?



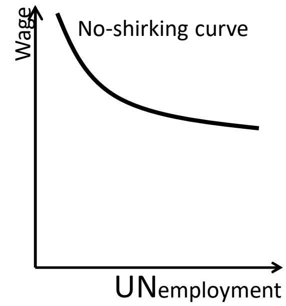
C. Shapiro and J.E. Stiglitz, "Equilibrium Unemployment as a Worker Discipline Device," *Am. Econ. Rev.*, Vol 74 (June 1984), pp. 433-444.

How efficiency wages deter shirking

- Workers who are found shirking are fired.
- If there is unemployment, then fired workers must wait awhile before finding a new job.
- If unemployment is high, then fired workers must wait a long time.
- Cost to workers of being fired thus depends _________________ on both the unemployment rate and the foregone (market) wage.
- Workers will not shirk if cost is sufficiently high.

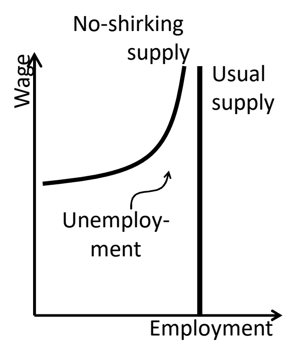
Tradeoff between unemployment and wage

- If unemployment is high, then even a __________ wage will discourage shirking.
- If unemployment is low, a ___________ wage is necessary to discourage shirking.



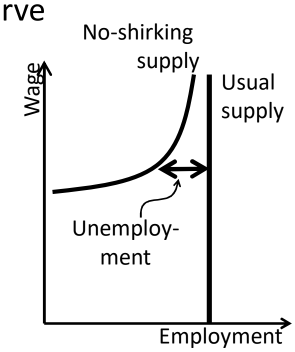
No-shirking labor supply curve

- No-shirking labor supply curve is mirror image of "no-shirking curve" on previous slide.
- No-shirking labor supply curve lies _________ of usual supply curve, because some unemployment is required to prevent shirking.



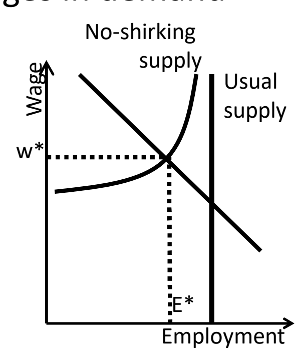
Shape of no-shirking labor supply curve

- At high wages, no-shirking labor supply approaches usual labor supply curve.
- At low wages, it slopes ______________, even if usual labor supply is perfectly inelastic (vertical).



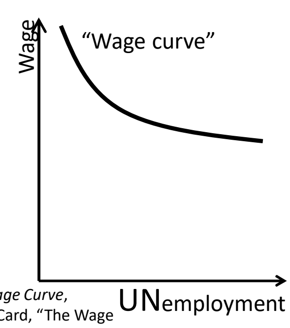
Effect of changes in demand

- Suppose labor demand shifts left, as in a recession.
- Wage falls slightly, but employment falls even ____________.
- Wages appear "sticky."
- Cyclical unemployment is ________________.



Assessing the efficiency wage hypothesis

- Studies find ______________ relation between wage and unemployment ("wage curve") across regions within many countries.
- May reflect "no shirking curve."



D.G. Blanchflower and A.J. Oswald, *The Wage Curve*, Cambridge, MA: MIT Press, 1994. Also D. Card, "The Wage Curve: A Review," *J. Econ. Lit.*, Vol 33 (June 1995), pp. 285-99.

4. Implicit contracts hypothesis

- Workers care about more than just the level of wages.
- They care about risks of wage __________________ and unemployment over time.
- Unions negotiate explicit contracts and nonunion workers negotiate implicit (unwritten) contracts to address these risks.

Implicit contracts hypothesis (cont'd)

- Under plausible assumptions about worker's utility, it can be shown that workers prefer to have ______________ wage and ________________ employment over the business cycle.
- Assuming workers are more risk-averse than their employers, such a contract will be optimal.
- In effect, firms "insure" their workers against wage fluctuations—but not against employment fluctuations.

Assessing the implicit contracts hypothesis

- The model predicts "excessively" high unemployment during slumps but also "excessively" ________ unemployment during booms.
- However, data show that quits rise during booms, which amounts to _______________ the contract when times are good.
  - Are long-term contracts really viable?

Conclusions

- Over business cycle, employment moves a lot, but real wages hardly move. Why?

1. _________________ substitution hypothesis: voluntary response by workers to procyclical real wage.
2. _____________ shifts hypothesis: shocks to economy raise structural unemployment.
3. ______________ wage hypothesis: tradeoff between wages and unemployment to deter shirking.
4. ____________ contracts hypothesis: workers prefer fluctuations in employment to fluctuations in wages.

UNEMPLOYMENT INSURANCE IN THE UNITED STATES

- How does the unemployment insurance system work?
- What problems does it have?

Unemployment insurance

- Most high-income countries have systems of unemployment insurance (UI).
- In U.S., each ____________ manages its own system.
- Rules vary by state, within broad federal guidelines.

See for example Iowa Workforce Development, "Facts About Unemployment Insurance Handbook," https://www.iowaworkforce.org/ui/handbook.htm .

Who can receive benefits?

____

- Workers who are laid off*
- Must have worked a minimum number of weeks and/or received minimum earnings in "base period."

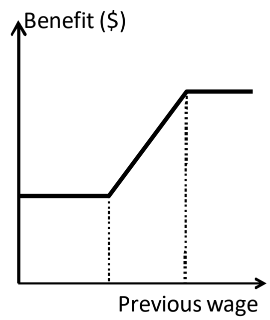
____

- Self-employed
- New entrants
- Workers who quit ("job leavers")
- Workers fired for misconduct
- Workers not available for work.

* "Redundant" in British English.

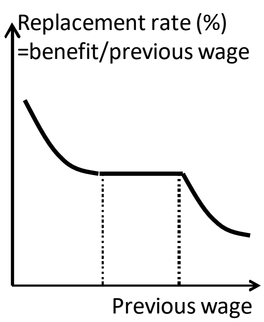
How much do they receive?

- Benefits typically depend on previous wages.
- But there is a maximum and a minimum benefit.
- Benefits normally last for a maximum of _______ weeks.



How much do they receive? (cont'd)

- Benefit formula is complicated.
- Typically about 50% of prior wages.
- In Iowa, formula adjusted upward for number of dependents.



Job search requirements

- To receive benefits, must be available for work.
- Recipient required actively to _____________ for a job, unless on temporary layoff or in a training program.
- For example, in Iowa, must contact _______ employers per week.
- Must accept any "________________" job offer, defined based on prior wages and duration of employment.

Why all the job search requirements?

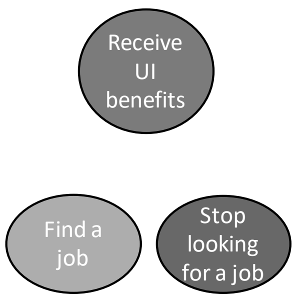
- In theory, UI should ________________ incentives for job search.
- This is an example of the principle of ___________________________, whereby insurance causes people to take less care to avoid the insured event—in this case, to exert less effort to find a job.
- Theory predicts that UI would tend to prolong unemployment.

Evidence of incentive effects on job search by workers

- Benefits vary across states, and sometimes over time, so one can potentially measure the effects of changes in UI benefit levels on job search.
- Data show a ___________ in job-finding when UI benefits end.
- A cash payment for finding a job tends to _____________ rate of job-finding.
- Studies show that an increase in benefit levels tends to increase duration of receiving benefits.

Evidence of incentive effects on job search by workers (con't)

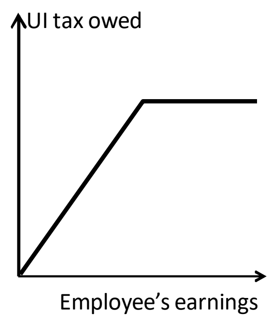
- But wait! UI benefits can end two ways: find a job or stop looking.
- A recent paper found that extension of UI benefits during Great Recession delayed "stop looking" but had _____ effect on "find a job."



Henry S. Farber and Robert G. Valletta, "Do Extended Unemployment Benefits Lengthen Unemployment Spells? Evidence from Recent Cycles in the U.S. Labor Market," Princeton University Industrial Relations Section Working Paper 573, April 2013.

Who pays for unemployment insurance?

- UI is financed by state and federal payroll taxes on each employee's earnings.
- Paid by employers only.
- Constant tax rate up to a maximum, called "wage base," which varies by state.

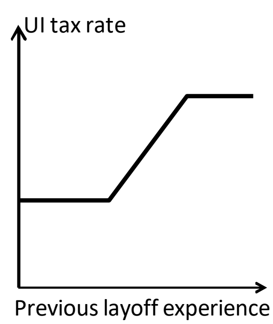


How is the UI tax rate set?

- A firm's UI tax rate depends on
  - general economic conditions
  - its particular industry
  - firm's own prior layoff experience.
- However, experience rating is _____________, so an employer does _______ bear all the UI benefit cost of its own layoffs.

Imperfect experience rating

- Each state has minimum and maximum tax rates.
- Even in range where the tax rate increases, it does not increase fast enough to cover increased UI cost of employer's own layoffs.



Evidence of incentive effects on layoffs by firms

- If employers were perfectly experience-rated, they would pay _______ the UI benefit costs of their own layoffs.
- Studies estimate that layoffs and unemployment would _______________ substantially if employers were perfectly experience-rated.

Macroeconomic effects of UI

- UI is an example of an "automatic stabilizer," a government program that
  - increases spending in _______________
  - decreases spending in _______________.
- Helps stabilize aggregate demand and thereby mitigate recessions and booms.

Conclusions

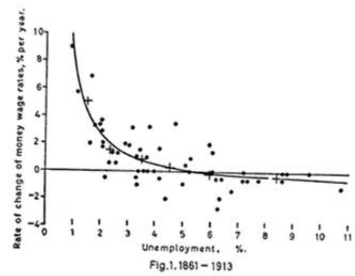
- Unemployment insurance is a state-run system that pays laid-off workers benefits while they search for a job.
- However, it may _______________ workers' incentives for job-finding.
- It is financed by payroll taxes on employers.
- However, imperfect ____________________ decreases employers' incentives for avoiding layoffs.

THE PHILLIPS CURVE

- Is there a tradeoff between inflation and unemployment?

The "Phillips curve"

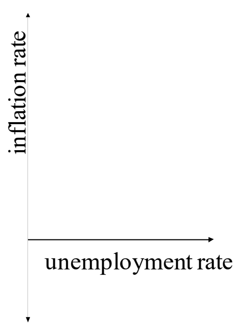
- A.W. Phillips (1958) claimed that inflation and unemployment were negatively related in British data.



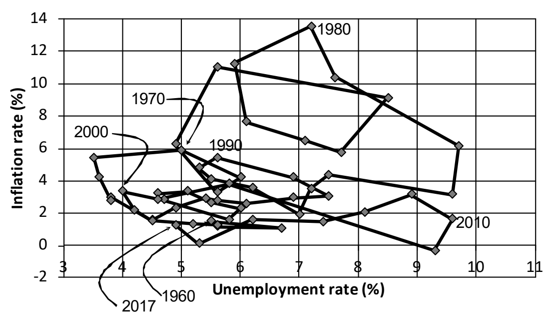
A. W. Phillips, "The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957," *Economica*, New Series, Vol. 25, No. 100 (Nov. 1958), pp. 283-299 .

A tradeoff?

- Phillips's article led many economists to believe there was a long-run tradeoff between inflation and unemployment.
- Higher inflation ⟺ lower unemployment.
- Lower inflation ⟺ higher unemployment.



What do recent U.S. data show?



SOURCE: FRED (UNRATE and CPIAUCSL)

Simple Phillips curve does not fit the facts

- It is hard to see any overall downward-sloping curve in these (U.S.) data!
- But taking a few adjacent years sometimes gives a downward sloping curve.
- Conclude: no long-run relationship, but maybe (?) a series of short-run relationships.

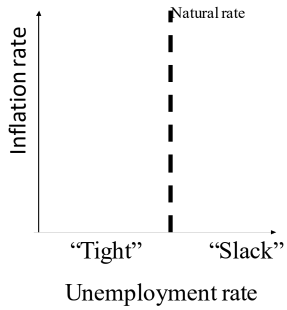
Edmund Phelps and Milton Friedman criticize the Phillips curve

- Argued that Phillips curve did not make theoretical sense.
- Argued that if inflation persists, people will eventually get used to it.
- Inflation can disturb the labor market only ________________.

Milton Friedman, "The Role of Monetary Policy," *American Economic Review*, vol. 58 (March 1968), pp. 1-17.
Edmund S. Phelps, "Money-Wage Dynamics and Labor Market Equilibrium," *Journal of Political Economy*, vol. 76 (1968), pp. 678-711.

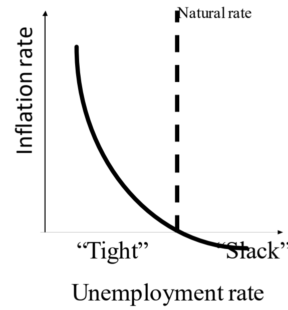
The Phelps-Friedman critique of the Phillips curve

- Suggested that there was a “natural” unemployment rate
- If unemployment < natural rate, inflation increases.
- If unemployment > natural rate, inflation decreases.



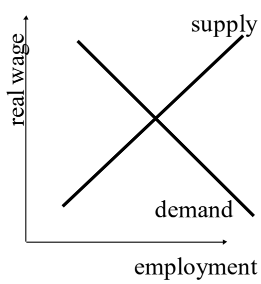
Phelps and Friedman: the long-run relationship is vertical

- Said downward-sloping relationship is ______________.
- Unemployment will always return to its natural rate, whatever the inflation rate.
- Why?



The reasoning behind the Phelps and Friedman critique

- Consider labor market.
- Quantity = number of workers employed.
- Price = *real wage* = wage divided by the price level.
- Thus real wage = purchasing power of wages.



Changes in real wage

- Real wage = wage / price level.
- Therefore % change in real wage

$$= \begin{matrix}\%\ change \\ in\ wage\end{matrix} - \begin{matrix}\%\ change\ in \\ price\ level\end{matrix}$$

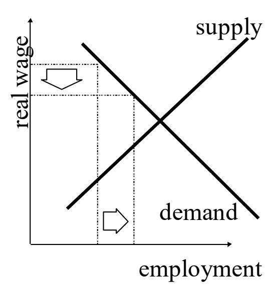
$$= \begin{matrix}\%\ change \\ in\ wage\end{matrix} -$$

Phelps and Friedman: effects of inflation on real wage

- So if the wage does not change, then a 5% increase in the price level would lower the real wage by about ______%.
- A 10% increase in the price level would lower the real wage by about ______%.
- What would happen if the price level increased suddenly, before unions or Congress could react?

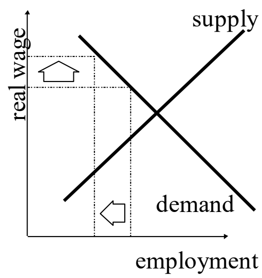
Phelps and Friedman: short-run effects of unexpected inflation

- Suppose inflation rate suddenly rose from 2% to 12%. This would:
- lower the real wage by about 10%.
- reduce U temporarily below the natural rate.
- Create a temporarily “tight” labor market.



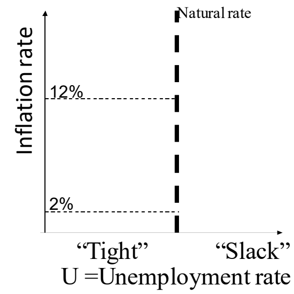
Phelps and Friedman: long-run effects of inflation

- But if inflation persisted, firms, workers, unions, and Congress would begin to _____________ it.
- Wages would catch up with inflation.
- U would return to the natural rate.



Phelps and Friedman: the long-run Phillips curve is vertical

- There is a short-run tradeoff, but no long-run tradeoff.
- Unemployment returns to its natural rate, as everyone gets used to the new inflation rate.

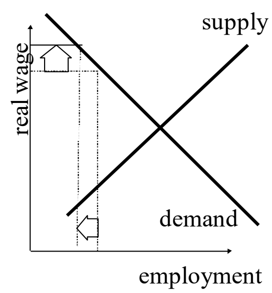


Phelps and Friedman: effects of *dis*inflation on real wage

- Similarly, if the wage does not change, then a 5% *decrease* in the price level would *raise* the real wage by about ______%.
- A 10% decrease in the price level would raise the real wage by about ______%.
- What would happen if the inflation rate *decreased* suddenly, before unions or Congress could react?

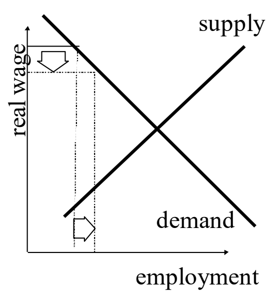
Phelps and Friedman: short-run effects of unexpected *dis*inflation

- Suppose inflation rate suddenly fell from 12% to 7%. This would:
- raise the real wage by about 5%.
- increase U temporarily above the natural rate.
- Create a temporarily “slack” labor market.



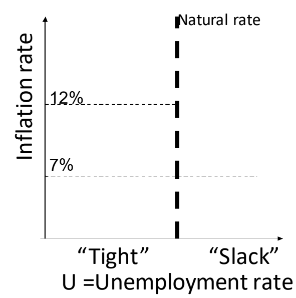
Phelps and Friedman: short-run effects of unexpected *dis*inflation

- But if new, lower rate of inflation persisted, everyone would begin to expect it.
- Real wages would fall back to their original level.
- U would return to the natural rate.



Phelps and Friedman: the long-run Phillips curve is vertical

- There is a short-run tradeoff, but no long-run tradeoff.
- Unemployment returns to its natural rate, as everyone gets used to the new inflation rate.



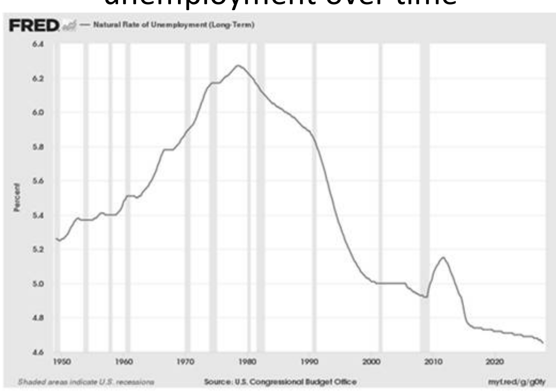
Is the natural rate of unemployment constant?

- In recent years, there have been large changes in unemployment *without* changes in inflation.
- This suggests the natural rate of unemployment has changed.

Why might the natural rate of unemployment change?

- Markov models show that steady-state unemployment rate depends on rates of job-finding and job-leaving.
- These rates differ across demographic groups, industries, and occupations.
- So, for example, aging of baby-boomer generation might decrease rate of job-leaving and lower steady-state unemployment.

One estimate of the natural rate of unemployment over time



Conclusions

- Most macroeconomists now agree with Phelps and Friedman.
- In short run, higher inflation brings lower unemployment (the "____________ curve").
- In long run, there is no tradeoff: unemployment always returns to its _____________, whatever the inflation rate.