

Microeconomics, Module 22, "Wages and Discrimination" (Chapter 16)

Homework Assignment

(The attached PDF file has better formatting.)

This homework assignment combines several concepts from this course: supply curves, demand curves, consumers' surplus, labor markets, and equilibrium prices and quantities.

Suppose workers have three possible occupations: plumbers, taxi drivers, and nurses. The demand curve for labor is the same for all three occupations:

$$Q = 600 - 50P, \text{ where } P \text{ is the hourly wage rate and } Q \text{ is the number of workers.}$$

- If $P = \$0$ per hour, 600 workers are demanded.
- If $P = \$6$ per hour, 300 workers are demanded.
- If $P = \$12$ per hour, no workers are demanded.

The demand may be from large employers (hospitals for nurses) or from individuals (homeowners for plumbers). If wages for nurses or plumbers are high, hospitals use orderlies and doctors to do the work of nurses and homeowners fix their plumbing themselves. If wages for taxi drivers are low, people stop buying cars and take taxis. The quantity of workers depends on the wages.

The work force has 300 men and 300 women. The labor supply is completely inelastic (the elasticity = 0). Each of the 300 men and 300 women works for the best wage available.

Question: What does it mean that the *labor supply is inelastic*?

Answer: The number of workers and the time that each of them works does not depend on the wage rate: each of the 300 men and 300 women works for the best wage available.

Question: Is this realistic?

Answer: If the workers have other uses for their time and little need for income, it is not realistic. In Western Europe, where unemployment benefits are generous and government programs provide many of life's necessities, the labor supply is elastic. In developing (third world) countries, with no unemployment benefits and few social welfare programs, people work for the best wage available.

Illustration: Compare French and Mexican farmer workers:

- French farm workers won't work for less than \$5 an hour.
- Mexican farm workers will work for \$0.50 an hour.

The difference is that French farm workers can live reasonably well from government programs even if they are not employed. Mexican farm workers take the best wage available, as long as it pays for their work expenses.

Part A: Suppose that only men are permitted to be plumbers or taxi drivers and only women are permitted to be nurses. With this discriminatory employment practice, what is the wage rate for men and what is the wage rate for women?

Procedure: Draw a graphic with the supply and demand curves for male occupations and female occupations. Combine the demand curve for plumbers with that for taxi drivers. We have done this in previous modules, and we review the procedure here.

Let Q_p be the quantity demanded of plumbers and Q_d be the quantity demanded of drivers. Each demand curve has the form $Q = 600 - 50P$. The combined demand curve is

$$Q_{\text{male}} = Q_p + Q_d = 600 - 50P + (600 - 50P) = 1,200 - 100P.$$

A perfectly inelastic supply curve is a vertical line at $Q = 300$. Draw these curves for male and female workers. Q is 300 in each case, but the wage rate differs for men vs women.

Question: Does the price elasticity of demand differ for male vs female workers?

Answer: The price elasticity of demand is the same for male and female workers. We see this in two ways:

- The demand curve for the three occupations is identical. Adding two demand curves with the same elasticity gives a combined demand curve with the same elasticity.
- For any P , the elasticity is $\partial Q/\partial P \times P/Q$.
 - For the female demand curve, this is $-50 \times P / (600 - 50P) = -P / (12 - P)$.
 - For the male demand curve, this is $-100 \times P / (1,200 - 100P) = -P / (12 - P)$.

Question: The price elasticity of demand in each occupation is the same, since the demand curves are the same. Why should we get different wage rates for men vs women?

Answer: The demand for workers in male occupations is twice as great as the demand for workers in female occupations, but the supply is the same. On your graphic, the supply curve for men and women workers is the same: a vertical line as $Q = 300$.

- The demand curve for female workers starts at the height of $P = \$12$ for zero workers and intersects the horizontal axis of $P = 0$ at $Q = 600$.
- The demand curve for male workers starts at the same height of $P = \$12$ for zero workers and intersects the horizontal axis of $P = 0$ at $Q = 1,200$, not $Q = 600$.

The demand curve for male workers intersects the vertical supply curve at $Q = 300$ at a higher P .

For the homework assignment, draw the graphics (male and female) and label the points.

{For the elasticity, we use the partial derivative $\partial Q/\partial P$; for the graphic, P is the vertical axis and Q is the horizontal axis.}

Part B: What is the consumers' surplus in this discriminatory labor market? What is the producers' surplus?

Question: For the labor market, is consumers' surplus the surplus received by the laborers and producers' surplus the surplus received by their employers?

Answer: Just the opposite. Consumers' surplus is the surplus of employers, who hire labor; producers' surplus is the surplus of the men and women workers.

Let P_m be the wage rate for men and P_w be the wage rate for women that you derive in Part A of this homework assignment.

- The consumers' surplus for the male workforce is the area under the combined demand curve for plumbers and taxi drivers, above the wage rate P_m , and out to the quantity of 300 male workers.
- The consumers' surplus for the female workforce is the area under the demand curve for nurses, above the wage rate P_w , and out to the quantity of 300 women.

Each consumers' surplus is a triangle with a base of 300 workers and a height of ($\$12$ minus the market wage rate). The market wage rate differs for men vs women.

Question: The two triangles have same base of $Q = 300$. The height differs, since it is \$12 – equilibrium wage rate. If the wage rate for men is higher, the consumers' surplus for men is lower. This means that the firms hiring men are not getting as much surplus as the firms hiring women. Does this make sense?

Answer: If firms discriminate in hiring, the firms hiring lower paid workers who do the same amount of work will perform better than other firms.

Question: This implies that firms hiring only male workers can do better by hiring both male and female workers.

Answer: This is correct, as long as there is no inherent difference between men and women that makes either men or women more competent at the job.

The producers' surplus requires a bit more thought, but it is not hard. With a vertical supply curve, the producers' surplus is the area in a rectangle, whose height is the wage rate P_m or P_w (the price) and whose base is the quantity supplied (300 men or 300 women). Intuitively, the workers accept the best wage available. They are willing to work for any wage above zero, so the entire wage is their producers' surplus.

Question: If the men receive a higher wage, they have the greater producers' surplus.

Answer: This is Landsburg's point: Wage discrimination appears to help workers receiving the higher wage, but it hurts the firm.

For the homework assignment, determine the consumers' surplus and producers' surplus for men and women.

Question: Why do you say appears to help?

Answer: If firms maximize their profits, higher paid workers lose their jobs in recessions as high cost firms fail.

Question: Just the opposite occurs! When auto manufacturers lay off workers in a recession, the workers without seniority get laid off. The higher paid workers retain their jobs.

Answer: The high cost unions of auto workers, pilots, and airline mechanics lose their jobs because their high-cost employers lose market share. In the short-run, the highly paid auto worker does well; in the long-run, the worker does not have a job.

Determine the total social welfare from trade by adding consumers' surplus and producers' surplus for both men and women workers. Trade here is the trade of labor for wages.

Part C: Now suppose the discriminatory employment practices are eliminated. Men and women can work in all three occupations, and labor markets are competitive.

Form the combined demand curve for all three occupations and the combined supply curve for all workers (men and women). What is the equilibrium price and quantity? (The equilibrium quantity must be 600 workers, since the labor supply is perfectly inelastic. Work out the equilibrium price from the supply and demand curves.)

Part D: What is the combined consumers' surplus and producers' surplus for the non-discriminatory employment scenario? Is it greater than the combined surplus in Part B?

Question: Why should the total social welfare change? We have just exchanged male for female workers.

Answer: With sexual discrimination, society had too many nurses and too few plumbers and tax drivers.

Question: Landsburg has a rosy view of business life. He thinks wage discrimination doesn't exist, and employers pay fair wages to men and women and to workers of all races. But even a cursory glance at world labor markets shows this is not true. In some countries, women cannot work in many occupations, and the best jobs are kept for members of favored ethnic groups. This is true throughout much of the Middle East and parts of Africa.

Answer: This is Landsburg's point. Wage discrimination varies inversely with the strength of free markets. When the labor market is competitive, discrimination does not occur; when the country's labor markets depend on religion, caste, or ethnic identity, wage discrimination may occur. Free markets do not cause wage discrimination; they are the antidote to wage discrimination.

Question: The United States is a free market country, but it has a history of slavery. How can you say that free markets are the antidote to discrimination?

Answer: Slavery works only in simple industries that do not rely on the innovative ability of workers and where errors do not much affect the work product. Farming and harvesting crops is a good example. Slavery doesn't work for high tech industries. If a firm tried to make laptop computers with slave labor, none of the laptops would work. Free markets and innovative industry are Landsburg's antidote to slavery.