

Micro module 21: "The Market for Labor," practice problems

(The attached PDF file has better formatting.)

** Exercise 21.1: Labor markets and income taxes

A country has a tax rate of 0% on all income. If the substitution effect dominates the income effect, and the tax rate changes to 20% on all income, what happens to

- A. The demand for labor
- B. The supply of labor
- C. The equilibrium after-tax wage rate
- D. The equilibrium quantity of labor
- E. The marginal product of labor
- F. The equilibrium pre-tax wage rate

Part A: The demand for labor does not change. Firms say: "If the profit margin is \$100 for a laptop computer, and an extra worker can make one more laptop computer a day, I will pay \$100 a day for an extra worker." The tax paid by the worker on the income is not relevant.

The relevant wage rate for the employer's demand curve for labor is the pre-tax wage plus employee benefits. If the state imposes extra employee benefits on the employer, the demand curve for labor shifts. At any wage rate, employers want to hire fewer workers, so the demand curve shifts left.

Question: The state could tax workers and provide them with state funded health insurance or compel employers to provide health insurance as a work benefit. The result is the same: workers get health insurance and they ultimately pay the costs. Yet this exercise implies that the demand curve for labor shifts left with a mandatory employee benefit but does not shift with a tax on labor. Shouldn't this be like sales taxes and excise taxes, where the outcome does not depend on the legal form of the tax?

Answer: It is exactly the same. The sales tax affects the demand curve and the excise tax affects the supply curve. The resulting equilibrium quantity and net price (after tax) are the same. In this exercise, the tax on labor affects the labor supply and the mandated employee benefit affects the demand for labor. The equilibrium quantity and wage rate (after taxes) are the same.

Question: With a tax on labor income, workers demand higher wages. Won't the demand for labor decrease if the wage rate is higher?

Answer: The demand curve for labor relates the wage rate to the quantity demanded. The curve stays the same, but when the wage rate increases (because the supply curve for labor shifts), the quantity demanded changes.

Part B: The supply curve for labor shifts left. For any wage rate, people supply less labor, since they keep less of the wage.

Question: What happens if the income effect dominates the substitution effect?

Answer: If the income effect dominates the substitution effect, people work more when the marginal tax rate rises. A strong income effect may cause a backward-bending supply curve for labor. If a final exam problem does not specify otherwise, assume the substitution effect dominates the income effect.

Part C: If the same labor is provided, the after-tax wage rate drops 20%. In a moment, we will see that the decrease in the after-tax wage rate is less than 20%, but it is still a decrease.

Part D: The demand curve does not change and the supply curve shifts left, so the equilibrium quantity of labor decreases.

Part E: Labor has decreasing marginal utility, so if labor decreases, the marginal product of labor increases.

Part F: The pre-tax wage rate is the pre-tax marginal product of labor, so it increases. The final result is that the equilibrium quantity of labor decreases, the pre-tax wage rate increases (but less than 20%), and the after-tax wage rate decreases (but less than 20%).

Question: Does social welfare increase, decrease, or stay the same? People pay the tax, but other people get the benefit of government services, so this seems to cancel out. If we ignore the taxes and the offsetting uses of government funds, people work less and have more leisure time.

Answer: National income (real GDP) is roughly proportional to labor (at least within a short range). If people work less, the country produces less, and people consume less. Social welfare decreases.

Question: In the macroeconomics textbook, Barro says that the real wage rate and the marginal product of labor are pro-cyclical. Does that contradict the answer to this exercise? (The microeconomics final exam does not test whether wage rates are pro-cyclical. The last part of this dialogue is for students taking both the micro- and macro-economics on-line courses.)

Answer: Barro assumes booms and recessions are caused by changes in the technology level, not changes in the tax rate. If people work more because the technology level has improved and the marginal product of labor increases, the real wage rate is pro-cyclical.

See Landsburg *Price Theory* Chapter 16 Labor page 509

**** Exercise 21.2: Labor markets and income taxes**

Average hours worked a week is 18 in France and 25 in the United States, but French workers have slightly higher productivity than U.S. workers. French workers take more vacation each year than U.S. workers.

Question: In the United States, people are more concerned with earning money and consuming goods. In France, people are more concerned with enjoying life. The French has higher regard for non-monetary aspects of life, such as literature and art. They desire a life that is more balanced between consumption and other goods.

One reads this in magazine articles about the French standard of life and the French appreciation of art.

Answer: Your view confuses the symptoms with causes. Suppose an economist wanted to explain why black people in 1900 Alabama were less educated and earned less than white people. The economist might say: "Clearly, black people place less value on education and consumption; they are more interested in other qualities of life." That explanation is wrong: discrimination in the Alabama school system and labor system in 1900 prevented most blacks from getting good educations or good jobs.

Magazine writers like theories explaining inherent differences among nations. Economists assume all groups of people are motivated by the same forces: U.S. vs France, white vs black. Everyone wants to consume goods and enjoy leisure time. The idea that the French are inherently different from Americans makes good magazine articles but it is just a facade for the real explanation.

Question: But there is a difference. In 2010, educated blacks in the U.S. send their children to good schools and work at good jobs. They are the same as educated whites in the U.S.

Answer: The same applies to France. Fifty years ago, the French worked as many hours as Americans and took the same vacation time.

Question: So why are the French different now?

Answer: The laws in France discourage work. The French has a 35 hour work week, mandated by law. They have a retirement age of 60 (recently changed to 62), mandated by law. Employers give more vacation days, following union contracts in France. One reads about this in news articles concerning French labor laws.

You are also confusing symptoms with causes. Clearly, French laws discourage work. Our question is why the French passed these laws. Economists say: "It is not that the French want to work less, retire early, and take more vacation. Everyone wants those things: the French, Americans, Germans, Chinese, Indians. Our question is why these laws were passed in France, not in the U.S., Germany, China, or India."

Economists say: "The French have high marginal tax rates. Every country has some people who support high tax rates and some who support low tax rates. Once France adopted high tax rates, everything else fell into line. People don't want to work as much because they keep less of their earnings, so they enact laws limiting hours per week, setting early retirement, and giving more vacation time."

Answer: How does your explanation differ from mine in public policy implications?

Some people say: "To get the French to work more, one must repeal the 35 hour work week, age 60 retirement age, and long August vacations." That sound sensible, but it is not enough. If people have high tax rates, they want to work less. To get the changes in the law, one must reduce the marginal tax rate.

**** Exercise 21.3: Epidemic, labor supply, and wage rates**

An avian flu epidemic affecting young children in a western country leads many families to seek skilled nurses to care for ill children. What are the effects of the avian flue epidemic (in the *short run*) on

- A. The demand curve for skilled nurses
- B. The supply curve for skilled nurses
- C. The productivity of skilled nurses
- D. The equilibrium wage rate for skilled nurses

Part A: The demand curve for skilled nurses shift to the right. The supply and demand curves have the wage rate on the vertical axis and the quantity of labor supplied or demanded on the horizontal axis. At any wage rate, people demand more skilled nursing care, so the demand curve shifts to the right.

Question: Are you saying that the wage rate rises for skilled nurses, so they work more?

Answer: Distinguish between a rise in the wage rate causing a higher equilibrium quantity of nursing case vs a shift in the demand curve for labor.

- A higher wage rate may stem from better education of nurses or better medical tools used by nurses, both of which raise the marginal product of labor. The higher wage rate causes more nurses to seek work.
- In this exercise, the education of nurses stays the same. Demand for nurses increases, so the equilibrium wage rate rises.

Part B: The supply curve for skilled nurses does not change. An RN degree requires years of training, so the supply of skilled nurses does not change in the short run.

Question: What happens in the long run?

Answer: In the long run, the higher demand for nurses and the higher wage rate causes more people to become nurses, shifting the supply curve of labor to the right.

Part C: The productivity of skilled nurses (the marginal product of labor) rises.

Question: The skills and expertise of the nurses does not change, so why does their productivity rise?

Answer: Suppose the society has 100 skilled nurses and only 20 ill people requiring nursing care. The training and expertise of the nurses is barely used; most skilled nurses do unskilled work or are unemployed. Their contribution to society (real GDP) is low; that is, their productivity (marginal product of labor) is low.

If the same 100 skilled nurses care for 10,000 ill people, each one contributes much to society (real GDP). Their productivity is high.

Productivity depends on the contribution to society, not the training of the workers. A scholar of classic languages (Greek and Latin) may be brilliant, but his productivity is low if no one uses his services.

Part D: The equilibrium wage rate is at the intersection of the supply and demand curves. The downward sloping demand curve shifts to the right and the upward sloping supply curve does not change, so the intersection is at a higher wage rate. In general, the wage rate equals the productivity of labor.

See Landsburg, *Price Theory*, Chapter 16, "Market for Labor," page 513.

**** Exercise 21.4: Oil spill in Gulf of Mexico**

In 2010, an accident on a British Petroleum off-shore oil platform causes a catastrophic oil spill in the Gulf of Mexico. What are the effects on the supply and demand for oil rig workers and their wage rates in each of the three scenarios below?

- A. No oil rigs are closed. British Petroleum must clean up the spill within two months, though its own workers would need at least six months to clean up the spill.
- B. All oil rigs are temporarily closed in the Gulf of Mexico. The spill will be cleaned up by natural ocean tides in the Gulf of Mexico.
- C. All oil rigs are temporarily closed in the Gulf of Mexico. The oil rigs, which were very profitable, are owned by the workers on the rigs.

Part A: British Petroleum must hire extra workers for two months. The demand curve for oil workers shifts to the right, and the supply curve does not change. The wage rate for oil workers rises for two months. Since the higher wages are temporary, not permanent, the equilibrium quantity of labor rises quickly. Workers who might have taken vacations in these two months postpone them, and others work overtime.

Question: Shouldn't we consider whether the income effect or the substitution effect is stronger?

Answer: The income effect depends on expected lifetime income. If wage rates increase permanently, workers feel wealthier, so they might work less. If wage rates increase for two months, workers don't feel much richer or poorer, so the income effect is slight.

Part B: If the oil rigs close, the demand for oil workers shifts to the left: employers no longer want workers and they lay off some of their employees. The supply curve of oil workers does not change, so the wage rate falls. The changes are temporary (the rigs will reopen after the spill is cleaned up), so some workers take vacations.

Question: If the wage rate falls, fewer workers want to work. Doesn't this mean the supply curve shifts left?

Answer: This is a movement along the supply curve, not a movement of the supply curve itself. See Part C.

Part C: The difference from Part B is that oil workers have a decrease in their non-labor income. The income effect causes the supply curve for oil workers to shift to the right: for any wage rate, more labor is supplied. The demand curve shifts left and the supply curve shifts right, causing a large decrease in the wage rate.

- Movement along the supply curve: working less because the wage rate decreases.
- Shift of the supply curve itself: working more because the non-labor income decreases.

Question: Do the answers depend on the skills required to clean up oil spills?

Answer: If British Petroleum needs skilled oil workers to clean up the oil spill, the wage rate for oil workers rises much, since the supply of this skilled labor is limited. If it needs only strong bodies willing to work long hours, the wage rate does not rise as much, since the supply of unemployed persons is large.

See Landsburg, *Price Theory*, Chapter 16, "Market for Labor," page 513.

**** Exercise 21.5: Budget line and indifference curves**

The budget line and indifference curves for labor vs consumption have labor on the horizontal axis and consumption on the vertical axis.

- A. What determines the slope of the budget line?
- B. What determines the (y-axis) intercept of the budget line?
- C. How does a change in non-labor income affect the budget line?
- D. How does a change in non-labor income affect consumption?
- E. How does a change in non-labor income affect the quantity of labor?

Part A: The slope of the budget line is the consumption that can be obtained for each hour of less leisure (or each hour of more work). This is the wage rate.

Question: Landsburg draw the budget line as a straight line. But labor has decreasing marginal utility: as people work more, they produce less per hour, so consumption per hour of labor should decrease.

Answer: This is true for self-employed workers. The owner of a grocery store may make \$100 if the store is open 1 hour a day, \$500 if the store is open 12 hours a day, and \$600 if the store is open all 24 hours. In this scenario, the budget line is upward sloping and concave. Landsburg assumes the wage rate is determined by the intersection of the supply and demand curves, and this wage rate is paid for all hours of work.

Part B: The intercept on the y-axis is the consumption if labor is zero, which depends on non-labor income.

Part C: If non-labor income increases, the budget line shifts up to a higher y-axis intercept.

Part D: At any amount of labor, consumption increases if non-labor income increases.

Part E: If the wage rate remains the same and non-labor income increases, the quantity of labor decreases.

See Landsburg, *Price Theory*, Chapter 16, "Market for Labor," page 504.

**** Exercise 21.6: Income and substitution effects**

The income and substitution effects have opposite effects on the labor supply curve.

- A. If the wage rate increases, why might people work more?
- B. If the wage rate increases, why might people work less?
- C. For low income workers, which is stronger: the income effect or the substitution effect?

Part A: If the wage rate increases, people are paid more for each hour of work. They get more consumption for each hour of leisure given up, so they want to work more.

Part B: If the wage rate increases, people have more money. If they don't like work and they can buy all the goods they need, they might want more leisure time. Landsburg assumes that people prefer leisure to work (if their income does not change).

Part C: Landsburg says: for low income workers, the substitution effect is stronger. We see this from the extreme case: if the wage rate is zero, labor supplied is zero, and if the wage rate is positive (say \$1 an hour), the labor supplied is positive. This implies that the substitution effect is stronger at low wage rates.

Barro says: Look at the empirical data. 150 years ago, urban workers were paid subsistence wages, and they worked 80 hours a week. Now they are paid much higher wages, and they work 35 to 40 hours a week. This shows that the income effect is stronger for low paid workers. At subsistence wages, people had to work 80 hours a week to pay for food and shelter. As incomes rise, people want more leisure.

Question: Is the income effect stronger or the substitution effect stronger for low income workers?

Answer: Empirical data do not lie; theory can be slippery. As income has risen, average labor hours per week has fallen, particularly for blue collar workers. The income effect is strong for people at subsistence wages.

Question: What about Landsburg's extreme scenario: a person earning wages of zero works zero hours, but a person earning positive wages works a positive number of hours?

Answer: Going from wages of zero to positive wages is an infinite substitution effect. Landsburg shows that an infinite substitution effect is stronger than a small income effect. That is correct (and obvious). But above that first infinite substitution effect, the income effect is stronger for low wage workers.