Microeconomics, Module 1, "Consumer's Demand, Producer's Supply, and Equilibrium"

Homework Assignment

(The attached PDF file has better formatting.)

Homework Problem 1 is a numerical problem to be completed by all candidates. The procedure is described in Landsburg's textbook and reviewed in the practice problems.

The demand curve is Q = 200 – 20P, and the supply curve is Q = 10P – 10.

A. What is the equilibrium price and quantity? (These are P and Q at the intersection of the demand and supply curves.)
B. If a sales tax of $1 per unit is imposed on consumers, what is the revised demand curve? Explain why the demand curve changes but the supply curve does not change. Explain intuitively why the demand curve shift left = shifts down.
C. With the sales tax of $1 per unit, what is the equilibrium price and quantity? For the price, give both the pre-tax price and the after-tax price.
D. If an excise tax of $1 per unit is imposed on suppliers, what is the revised supply curve? Explain why the supply curve changes but the demand curve does not change. Explain intuitively why the supply curve shifts left = shifts up.
E. With the excise tax of $1 per unit, what is the equilibrium price and quantity? For the price, give both the pre-tax price and the after-tax price.

The following addendum is **not** required for the homework assignment. It is discussed in the Microeconomics Macroeconomics textbooks, but since it uses calculus, it is not worked out in either textbook.

Addendum: The government wishes to find the maximum tax revenue. If it charges a sales tax of $0 per unit, it collect $0 of revenue. If it charges a sales tax of $10 per unit, the after-tax price is at least $10, the quantity demanded is 200 – 20 × 10 = 0, and it collects $0 of revenue. The maximum revenue is collected with a tax between $0 and $10 per unit.

A. What tax generates the maximum revenue?
B. What is the quantity Q at the point of maximum tax revenue?
C. What is the amount of maximum tax revenue?

To solve the problem, let the sales tax per unit be T. Derive a formula for the equilibrium quantity as a function of T with a sales tax of T per unit. Multiply this quantity by T to get the tax revenue. Set the partial derivative of this tax revenue with respect to T equal to zero, and solve for T at the point of maximum tax revenue.

This addendum is **not** part of the homework assignment, but it helps you understand both Landsburg's and Barro's comments on the effects of high tax rates. You may post your solution on the discussion forum.

Homework Problem 2:

You may select either of the following two scenarios for Problem 2. They are similar, using different goods. Your solution should be about two paragraphs, showing that you have read the text. The scenarios are simplified, to create flat or steep demand and supply curves. By *slope* of the curve, we mean flat or steep, not a numerical slope.

Problem 2A: Gas Taxes

Assume all gas is produced from oil imported from the Middle East.

- Jacob believes that U.S. drivers can take public transportation (buses, trains) or walk if gas prices are too high; Rachel believes that U.S. drivers would rather pay more for gas than take public transportation or walk.
- Jacob believes that the supply of oil is fixed, and the amount supplied depends on how much can be pumped out of the ground; Rachel believes that OPEC determines the supply of oil based on potential profit, not on the supply in the ground.

The price of gas is $2.00 a gallon before any taxes. Suppose the government imposes a $1.00 per gallon sales tax on gas.

A. From Jacob's perspective, what are the slopes of the demand and supply curves for gas before the tax?
B. From Rachel's perspective, what are the slopes of the demand and supply curves for gas before the tax? (For Parts A and B, Jacob believes that a change in price affects the quantity demanded, but not the quantity supplied; Rachel believes that a change in prices affects the quantity supplied, but not the quantity demanded.)
C. From Jacob's perspective, what is the effect of the tax on the equilibrium price and quantity? How will price and quantity change, and who will pay most of the tax?
D. From Rachel's perspective, what is the effect of the tax on the equilibrium price and quantity? How will price and quantity change, and who will pay most of the tax?

Problem 2B: Cocaine Use

Assume all cocaine is produced in Latin America and imported into the U.S.

- Jacob believes that U.S. cocaine users are indifferent about the type of drugs which they use; Rachel believes that U.S. cocaine users would rather pay more for cocaine that switch to other drugs (or stop taking drugs).
- Jacob believes that cocaine is produced only in certain fields in Columbia, and other land cannot be substituted; Rachel believes that many Latin American countries produce cocoa, and almost any land can be used to produce cocaine.

The U.S. government is considering two options to deal with cocaine use:

Option 1:   Set longer prison terms for persons using cocaine, but not for other drugs.
Option 2:   Spray the cocoa fields in Columbia (but not other countries) with chemicals that destroy the crops.

A. From Jacob's perspective, what are the slopes of the demand and supply curves for cocaine before the tax?
B. From Rachel's perspective, what are the slopes of the demand and supply curves for cocaine before the tax? (For Parts A and B, Jacob believes that a change in price affects the quantity demanded, but not the quantity supplied; Rachel believes that a change in prices affects the quantity supplied, but not the quantity demanded.)
C. From Jacob's perspective, what is the effect of Option 1 (longer prison terms) on the equilibrium price and quantity? How will price and quantity change?
D. From Rachel's perspective, what is the effect of Option 1 (longer prison terms) on the equilibrium price and quantity? How will price and quantity change?
E. From Jacob's perspective, what is the effect of Option 2 (aerial spraying) on the equilibrium price and quantity? How will price and quantity change?
F. From Rachel's perspective, what is the effect of Option 2 (aerial spraying) on the equilibrium price and quantity? How will price and quantity change?

Homework assignments 2A and 2B show that public policy issues, like the effects of taxes on gas consumption and drug use, depend on the shapes of supply and demand curves.

Problem 3 (**not** required), is an insurance application of the material in Module 1. It is **not** required homework; you may post your solution on the discussion forum (or not work through the problem at all). This problem shows how Landsburg's perspective can be used to analyze the effects of premium taxes on insurance demand and supply.

In the town of East Oshkosh, auto insurance is required by law (compulsory). There are no auto insurance agents in East Oshkosh, and drivers buy insurance from agents located in other towns and selling to all consumers in the state, so the price of insurance in East Oshkosh won't affect the quantity demanded.

Permanent life insurance is bought only by wealthy consumers for the tax benefits, who buy coverage only if the returns are greater than the returns from other investments. Only one life insurance agent, a resident of East Oshkosh, sells permanent life insurance to consumers in the town. (Implication: the price of insurance has a great effect on the quantity demanded.)

The town of East Oshkosh wishes to raise tax revenues. To avoid harming less wealthy citizens (including the life insurance agent), it imposes a 10% *sales* tax on consumers of life insurance and a 10% *excise* tax on agents selling auto insurance in the town.

A. What are the slopes of the demand and supply curves for auto insurance?
B. What are the slopes of the demand and supply curves for permanent life insurance?
C. What is the effect of the life insurance sales tax on the equilibrium price and quantity? Who pays the tax: the agent or the consumers?
D. What is the effect of the auto insurance excise tax on equilibrium price and quantity? Who pays the tax: the agents or the consumers?

The point of this exercise is that the choice of sales tax vs excise tax has no effect; the shapes of the supply and demand curves determine who pays the tax.