

ECON 1020: Principles of Microeconomics

Homework 4: Chapters 6–7

Supply, Demand, and Government Policies;
Consumers, Producers, and the Efficiency of Markets

Due on Monday, October 19 at 12:20 PM

Submissions are accepted either online through NTU COOL or as a hard copy at your recitation session.

Part A: Supply, Demand, and Government Policies

1. In a hypothetical competitive market for rice, daily demand and supply are $Q_D = 260 - 2P$ and $Q_S = 2P - 100$, where P is NT\$ per kilogram and Q is kilograms per day. Consider each policy separately. There are no illegal transactions or government purchases. Assume the smaller of quantity demanded and quantity supplied is traded.
 - (a) Find the equilibrium price and quantity without a price control.
 - (b) For a price ceiling of NT\$80, find quantity demanded, quantity supplied, the shortage or surplus, and the quantity actually traded.
 - (c) Repeat part (b) for a price floor of NT\$100. Would a price ceiling of NT\$100 instead change the uncontrolled outcome? Explain.
 - (d) Draw separate supply-and-demand diagrams for the ceiling in part (b) and the floor in part (c). Label the equilibrium, controlled price, quantities demanded and supplied, and shortage or surplus.

Question 1, Continued

- (e) A binding rent ceiling creates a shortage of apartments. Explain why some tenants may benefit while others are worse off, and give one way that apartments might be allocated when rent cannot rise to clear the market.

 - (f) Compare the short run and long run under the same binding rent ceiling. Suppose supply and demand become more elastic over time, relative to the same uncontrolled equilibrium. What happens to the shortage? Explain how landlords and tenants can adjust over time.

 - (g) In a competitive labor market with upward-sloping labor supply and downward-sloping labor demand, a minimum wage is set above equilibrium. What happens to employment and labor supplied? Identify which workers may benefit and which may lose. A written explanation is sufficient.
2. In a hypothetical competitive market for takeaway meals, demand is $Q_D = 240 - 2P_B$ and supply is $Q_S = P_S - 30$. Here P_B is the price buyers pay per meal, P_S is the amount sellers keep per meal, both in NT\$, and Q is meals per day. Initially there is no tax, so $P_B = P_S$.
- (a) Find the equilibrium price and quantity before a tax is imposed.

 - (b) The government introduces a tax of NT\$30 per meal, collected from sellers. Write the relationship between P_B and P_S . Find the buyer price, seller price, and quantity traded after the tax.

Question 2, Continued

- (c) Calculate the burden per meal on buyers and on sellers, and daily government tax revenue. Who bears more of the tax?

 - (d) Draw demand and the original supply curve, with price on the vertical axis. Mark the original equilibrium and the after-tax quantity. At that quantity, label P_B on demand and P_S on supply, and show the tax wedge.
3. Explain tax incidence in the competitive market of Question 2.
- (a) If the same tax were collected from buyers instead, would the prices paid by buyers and kept by sellers, or the quantity traded, change? Explain using the tax wedge and the market-clearing condition.

 - (b) Suppose supply becomes more price elastic while demand stays unchanged. The new supply curve passes through the original no-tax equilibrium. For a small per-unit tax, would sellers bear a larger or smaller share than before? Explain in terms of their ability to adjust quantity.

Part B: Consumers, Producers, and Market Efficiency

4. Four buyers each want at most one identical used calculator, and four sellers each own one. The table lists buyers' willingness to pay and sellers' opportunity costs, in NT\$. There are no externalities or transaction costs.

Buyer	Willingness to pay	Seller	Opportunity cost
An	500	Wen	100
Bo	400	Xin	200
Chun	300	Yi	350
Di	150	Zhen	450

- (a) At a price of NT\$320, who buys and who sells? Calculate consumer surplus, producer surplus, and total surplus.
- (b) If the price is NT\$380 instead, identify the buyers and sellers who wish to trade. Does this price clear the market? Explain.
- (c) Starting from the allocation in part (a), replace Bo with Chun as a buyer, keeping the sellers unchanged. How does total surplus change? Separately, return to part (a) and replace Xin with Yi as a seller. How does total surplus change? Explain what these comparisons show about efficiency.
- (d) The calculations above assume that all benefits and costs accrue to buyers and sellers. Explain why a market outcome need not maximize society's total surplus if (i) production pollutes a river used by other people, or (ii) a seller has market power and restricts output to raise the price. Which assumption behind the competitive-market efficiency result fails in each case?

Part B, Continued

5. In a hypothetical competitive market for notebooks, daily demand is $Q_D = 140 - P$ and supply is $Q_S = P - 20$, where P is NT\$ per notebook and Q is notebooks per day. There are no taxes or externalities. Treat quantities as continuous; the equations apply where quantities are nonnegative.
- (a) Find the equilibrium price and quantity. Draw supply and demand, label their price intercepts, and shade or outline the consumer-surplus and producer-surplus regions. Calculate both surpluses and their sum, with units.
- (b) Lower input costs change supply to $Q_S = P$. Demand is unchanged. Find the new equilibrium and calculate the new consumer surplus, producer surplus, and total surplus.
- (c) Divide the increase in consumer surplus into the gain on the original quantity purchased and the gain on additional purchases. Calculate each component and explain why the two add to the total increase.
- (d) Return to the original supply curve. Explain why producing 50 notebooks per day is too little and producing 70 is too much to maximize total surplus, assuming the highest-value buyers and lowest-cost sellers trade. Use willingness to pay and marginal cost at each quantity. Does maximizing total surplus establish that the allocation is fair? Explain briefly.