

Directions: The homework will be collected in a box **before** the lecture. Please place your name, TA name and section number on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade. Late homework will not be accepted so make plans ahead of time. **Please show your work.** Good luck!

Please realize that you are essentially creating “your brand” when you submit this homework. Do you want your homework to convey that you are competent, careful, and professional? Or, do you want to convey the image that you are careless, sloppy, and less than professional. For the rest of your life you will be creating your brand: please think about what you are saying about yourself when you do any work for someone else!

PART I: Demand-Supply and its Application to International Trade

1. The basics of international trade

Suppose the domestic demand for insulin in Nomansland is perfectly inelastic and is given by the equation:

$$Q = 60$$

The domestic supply of insulin is given by the following equation:

$$P = 2Q$$

where P and Q are the price per unit of insulin in dollars and the quantity of insulin in units, respectively.

- (a) Suppose Nomansland is initially in autarky (that is, Nomansland market for insulin is closed). Find the equilibrium price, equilibrium quantity and producer surplus in this market. Graphically illustrate your answers.
- (b) Let the world price be \$30 per unit of insulin and let Nomansland open this market to international trade. Find the price that insulin trades for in Nomansland. How many units of insulin are consumed and how many are imported or exported in Nomansland when this market opens to trade? What is the producer surplus for domestic producers? Graphically illustrate your answers.
- (c) Suppose the Nomansland government imposes a tariff of \$30 per unit of insulin imported. Find the price that insulin trades for in Nomansland given this tariff. How many units of insulin are consumed and how many are imported given this tariff? What is the producer surplus for domestic producers when this tariff is imposed in this market? Given the tariff, how much revenue will the government raise and what is the size of the deadweight loss? Graphically illustrate your answers.
- (d) Suppose the Nomansland government imposes an import quota for insulin of 30 units instead of the tariff described in (c). Given this import quota (and no tariff), find the price

that insulin will trade for in Nomansland. Given this import quota, how many units of insulin are consumed and how many are imported? Given this import quota, what is the producer surplus for domestic producers? How much revenue will the quota holder raise and what is the size of the deadweight loss? Graphically illustrate your answers.

2. The counterfactual analysis

(Hint: As always, although you are not instructed to draw diagrams, it is helpful to do so.)

Suppose Monona is initially a small closed economy that consumes and produces carp. The domestic demand and supply curves are given by the following equations where Q is the quantity of carps and P is the dollar price per carp:

$$\text{Domestic demand: } Q = 1000 - 2P$$

$$\text{Domestic supply: } Q = 3P - 600$$

- (a) Calculate the equilibrium price and quantity, consumer surplus, producer surplus and total surplus under autarky (that is, when Monona has a closed carp market).

Suppose Monona opens the carp market to international trade. The world price of a carp is \$250.

- (b) Calculate the price and quantity consumed in the domestic carp market. Would Monona import or export carp and how many units are imported or exported? What is the total surplus in the economy? Would the domestic producers favor opening the carp market to international trade?
- (c) A prohibitive import tariff is a tariff such that imports are not incentivized, namely, no import occurs after such a tariff is implemented. The economy reverts to autarky equilibrium. What is the prohibitive import tariff in the market for carp in Monona? Calculate the size of the deadweight loss that results from imposition of a prohibitive import tariff.

Suppose there is no tariff or quota intervention in the market for carp in Monona, but that the market for carp in Monona is open to international trade. Furthermore, suppose that the world price of carp remains at \$250/carp. Monona, if it opens this market to trade, will be able to acquire new fishery radar technology. The new radar will improve productivity and shift the domestic supply curve to:

$$\text{New domestic supply curve: } Q = 3P - 300$$

However, domestic producers are considering a campaign against the free trade policy that would open the carp market to trade. This campaign would result in the removal of the new radar technology and the economy would revert back to the equilibrium found under autarky.

- (d) Is it beneficial for domestic producers to campaign against opening the carp market to international trade? Explain your answers by calculation the benefit to producers of the two policies and then comparing the two policies.

PART II: Elasticity

3. The percentage problem and the basics of elasticity

- (a) Suppose your hourly wage falls from \$20 to \$10. What is the regular percentage decrease? What is the arc percentage decrease?
- (b) Suppose your hourly wage increases from \$10 to \$20. What is the regular percentage decrease? What is the arc percentage decrease? Compare your result to part (a).
- (c) Suppose the price of celeriac decreases from \$80 to \$60, and the quantity demanded increases from 100 to 150 bushels. What is the price elasticity of demand using the standard percentage formulas? What is the arc price elasticity of demand?
- (d) Suppose the price of celeriac increases from \$60 to \$80, and quantity demanded decreases from 150 to 100 bushels. What is the point price elasticity of demand? What is the arc price elasticity of demand? Compare your calculations here with the calculations you made in (c).
- (e) Suppose the demand for rutabaga is given by:
Demand: $Q = 50 - 0.5P$
Find the price elasticity of demand when price is \$60 using the point elasticity of demand formula.
- (f) From the demand curve in part (e), what is the price elasticity of demand when the price decreases from \$60 to \$40 using the standard percentage change formulas? What is the arc price elasticity of demand? Compare your findings to those you found in (e).

4. Own-price elasticity, cross-price elasticity and total revenue

The marketing team of Burton Snowboard is analyzing her demand for two types of snowboard – Professional and Standard models. At Thanksgiving sales, the Professional board is discounted from the original price of \$1,000. At this Thanksgiving sales, it is reported that the point cross-price elasticity of demand for the Standard board was 0.5 when there was a decrease in the quantity demanded of Standard boards by 10%. Also, you are told a total of 1,000 Professional boards have been sold at the sale, and the arc price elasticity of demand for Professional boards is equal to 1.

- (a) From the cross-price elasticity of demand, what can be said about the substitutability and complementarity of the two models?
- (b) What is the new price of the Professional snowboard after the discount? (Hint: You have to use the regular percentage change formula here)
- (c) What is the original quantity demanded of the Professional snowboard before the decrease?

- (d) What is the equation for the demand curve for Professional boards? Assume this demand curve is linear.
- (e) What is the total revenue from selling Professional boards before the Thanksgiving sales and during the Thanksgiving sales?
- (f) The name “Black Friday” is there for a reason; it is the time of the year that shopkeepers can make “black” profitable numbers instead of “red” loss numbers. Has Burton Snowboard succeeded in maximizing her revenue at the Thanksgiving sales? If not, suggest the price and quantity such that she can maximize her revenue.

5. Income elasticity and total revenue

Suppose the demand curves for Cookies and Apples in the city of Mendota are given by:

$$\text{Cookies: } P = 110 - Q + I$$

$$\text{Apples: } P = 100 - 0.5Q - 0.5I$$

where P is dollar price, Q is quantity in units and I is income expressed in thousands of dollars. Let the price of cookies and apples remain constant at \$10 per unit for both goods.

- (a) Suppose the income in the city of Mendota is \$100,000 ($I = 100$), what is the quantity demanded for cookies and apples?
- (b) Suppose the income in the city of Mendota increases to \$150,000 ($I = 150$), what is the quantity demanded for cookies and apples?
- (c) What is the income elasticity of demand for both goods when income increases from \$100,000 ($I = 100$) to \$150,000 ($I = 150$)? For each good, what can be concluded in terms of sensitivity to changes in income?
- (d) Suppose the income in the city of Mendota is \$100,000 ($I = 100$), does the price of \$10 per unit in each good maximize the revenue? If not, propose the price and quantity for each good that maximizes the revenue.

6. Elasticity and taxation

Consider the market for automobiles in Beijing City and Qingdao City (These two cities are located in China). Suppose the demand for automobiles in Beijing is given by:

$$Q = 10000$$

The demand for automobiles in Qingdao is:

$$Q = 8000 - 2P$$

The market supply for the two markets is identical, given by:

$$Q = 2P - 2000$$

Assume these two markets are totally separated from one another. (Chinese currency unit is RMB.)

- (a) Find the equilibrium price and quantity in the automobile market in both Beijing and Qingdao.
- (b) Calculate the price elasticity of demand in both Beijing and Qingdao at equilibrium.
- (c) Calculate the price elasticity of supply in both Beijing and Qingdao at equilibrium.

Now suppose the local government in Beijing imposes an excise tax of RMB 1,000/car on the producers of automobiles and the local government in Qingdao imposes an excise tax of RMB 500/car on consumers of automobiles.

- (d) Calculate the government revenue, consumers' tax incidence, producers' tax incidence, and deadweight loss in both Beijing and Qingdao due to the excise tax in each city.
- (e) Compare the fraction of the economic incidence borne by consumers to the total tax incidence in both cities. Explain your results in terms of elasticity.