

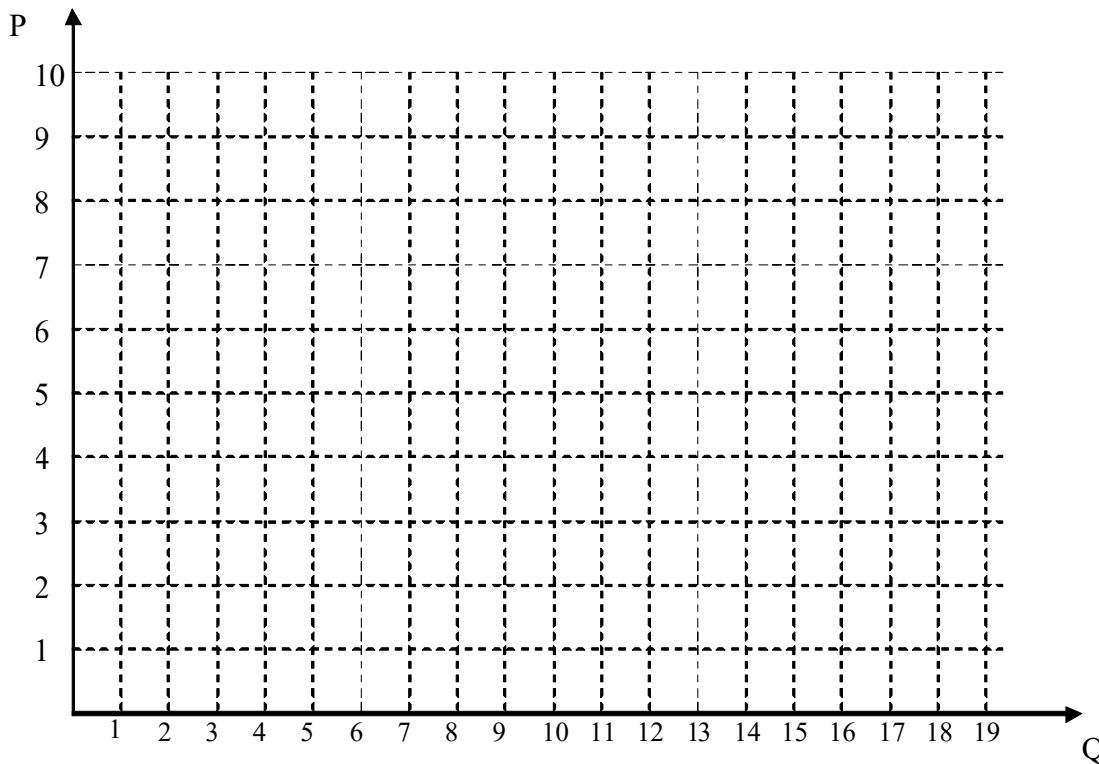
Economics for International Affairs

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EXERCISE # 2

(Question 1) Consumer & Producer Surplus. Plot the following in the graph below (or on a side-sheet, if you find it easier):

Cheese	Demand for Cheese	Supply of Cheese
\$10	2	18
\$9	3	16
\$8	5	15
\$7	6	13
\$6	8	12
\$5	9	9
\$4	10	8
\$3	12	6
\$2	14	4
\$1	17	1



Cheese Market

(A) What is the market-clearing price and quantity?

(B) Assuming the actual price settles at the market-clearing price, calculate the Total Consumer's Surplus.

[Hint: As the demand curve isn't a straight line in this example, you can *not* use the triangle area formula. Rather, you must figure out the area piecemeal, rectangle by rectangle. Filling in the following worksheet table can help you out (remember to ignore negative entries!) I give you two of the entries, you figure out the rest]

Price of Cheese	Demand for Cheese	Surplus gained (diff. from equil. price)	No. of extra demand at that price ¹	Consumer's Surplus (surplus gained × extra demand)
\$11	0		0	
\$10	2			
\$9	3	\$4	1	\$4 × 1 = \$4
\$8	5			
\$7	6			
\$6	8			
\$5	9			
\$4	10			
\$3	12			
\$2	14			
\$1	17	-	-	-
\$0	19			
				Total Consumer's Surplus =

(C) Now calculate the Total Producer's Surplus.

[Hint: Again, fill the following worksheet table below the equilibrium price. Again, I give you some entries, you figure out the rest]

Price of Cheese	Supply of Cheese	Surplus gained (diff. from equil. price)	No. of extra supply at that price	Producer's Surplus (surplus gained × extra supply)
\$11	19			
\$10	18	-	-	-
\$9	16			
\$8	15			
\$7	13			
\$6	12			

¹ By 'extra demand' I mean the number of *additional* consumers brought into the market at that price, e.g. if demand at price \$20 is 10 and demand at price \$19 is 13, then the 'extra demand' at \$19 is 3, or if you want, three additional consumers are brought into the cheese market when the price is dropped from \$20 to \$19

\$5	9			
\$4	8			
\$3	6			
\$2	4			
\$1	1	\$4	1	$\$4 \times 1 = 4$
\$0	0			
				Total Producer's Surplus = _____

(D) Who is making more welfare gains at the equilibrium price, Consumers or Producers?

(E) Suppose the government introduces a \$4 sales tax on cheese. Calculate the new market-clearing equilibrium (note: there will be a price wedge!):

Price consumers pay: _____
 Price producers receive: _____
 Market-clearing quantity traded : _____

(F) Calculate the new consumer surplus:

Price of Cheese	Demand for Cheese	Surplus gained (diff. from consumer price)	No. of extra demand	Consumer's Surplus
\$11	0			
\$10	2			
\$9	3	\$2	1	$\$2 \times 1 = \2
\$8	5			
\$7	6			
\$6	8			
\$5	9			
\$4	10			
\$3	12			
\$2	14			
\$1	17	-	-	-
				New Consumer's Surplus = _____

By how much has consumer surplus declined as a result of the tax? _____

(G) Calculate the new producer surplus:

Price of Cheese	Supply of Cheese	Surplus gained (diff. from equil. price)	No. of extra supply at that price	Producer's Surplus (surplus gained \times extra supply)
\$10	18	-	-	-
\$9	16			
\$8	15			
\$7	13			
\$6	12			
\$5	9			
\$4	8			
\$3	6			
\$2	4			
\$1	1	\$2	1	$\$2 \times 1 = 2$
\$0	0			
				New Producer's Surplus = _____

By how much has producer's surplus declined as a result of the tax? _____

(H) Who has borne the brunt of the sales tax, consumers & producers? How about in proportional terms? (i.e. loss as a % of their previous surpluses)

(I) How much revenue has the government collected from the sales tax?

(J) What is the size of the "deadweight loss"?

(Question 2) Welfare with Algebra

The surpluses calculated above was done the tiresome way (price by price, etc.). But if we have *linear* demand and supply curves, then we can figure it out by using the triangle area formula.

$$\text{area of triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$

Suppose supply and demand for lamps are governed by the following

$$Q^d = -2P + 270$$

$$Q^s = 3P - 30$$

Part I - Free Market

(A) What is the equilibrium price and equilibrium quantity?

P = _____ Q = _____

(B) What is the Consumers' Surplus?

[Hint: Because the demand and supply curves are linear, we can use the triangle formula. For Consumers' Surplus, base = quantity exchanged, and height = vertical intercept of demand curve minus equilibrium price. To find vertical intercept of demand curve set $Q^d = 0$ in demand curve, then solve for P. The resulting P from that operation will be the vertical intercept. Subtract equilibrium P from that number to get the "height" of the CS triangle)

$$\text{Consumers' Surplus} = \frac{1}{2} \times \text{_____} \times \text{_____} = \text{_____}$$

(C) What is the Producers' Surplus?

[Hint: for Producers' Surplus, base = quantity exchanged, and height = equilibrium price *minus* vertical intercept of supply curve. To find vertical intercept of supply curve set $Q^s = 0$ in demand curve equation, then

solve for P. The resulting P from that operation will be the vertical intercept of supply curve. Subtract that from the equilibrium P to get the "height" of the PS triangle.]

$$\text{Producers' Surplus} = \frac{1}{2} \times \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

(D) Who is making more gains from trade? Consumers or producers?

Part II - with Tax

Suppose the government imposes a \$10 sales tax on lamps.

(E) What is the equilibrium price for consumers, price for producers and equilibrium quantity?

[Hint: This is a little tricky. To solve it remember that it is still true that $Q^d = Q^s$. But now there is a \$10 "wedge" in prices. So adjust the formulas so:

$$Q^d = -2(\text{Price for Consumers}) + 270$$
$$Q^s = 3(\text{Price for Producers}) - 30$$

where Price for Consumers = Price for Producers + \$10 tax. Or, letting P^p be the producers price, then:

$$Q^d = -2(P^p + 10) + 270$$
$$Q^s = 3(P^p) - 30$$

Go from here.]

Price to consumers = _____

Price to producers = _____

Quantity exchanged = _____

(F) What is the new Consumer's Surplus after tax?

[Hint: use the triangle formula again. Consumers' Surplus = $\frac{1}{2} \times \text{base} \times \text{height}$. Base = new quantity. Height = vertical intercept of demand minus the price to *consumers*. Vertical intercept is the same as what you figured out in part B]

$$\text{Consumers' Surplus} = \frac{1}{2} \times \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

(G) What is the new Producers' Surplus after tax?

[Hint: again triangle formula. Height = price to producers *minus* vertical intercept of supply curve. Vertical intercept is the same as what you figured out in part C]

$$\text{Producers' Surplus} = \frac{1}{2} \times \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

(H) How much does the government take in revenue?

(I) What is the "deadweight loss" from the \$10 sales tax on lamps?

The following scribble pad might help:

CS before tax =

PS before tax =

CS after tax =

PS after tax =

Loss in CS =

Loss in PS =

Total surplus lost (= CS Loss + PS Loss) =

Government revenues =

Deadweight loss =

(Question 3) Cost-Benefit Analysis Suppose the Port Authority considers a proposition to build another bridge between New York and New Jersey. They consider selling lifetime permits for people to cross the bridge. Suppose the potential clientele for the bridge divides into three parts, commuters, shoppers and tourists. 500,000 commuters, who would use it every day, would each be willing to pay \$10 for such a pass; 1 million shoppers, who would use it only occasionally, would be willing to pay \$5; tourists wouldn't be willing to pay anything at all, in fact, they would actually demand a slight payment to go out of their way to cross it.

(A) Suppose no price is charged for the permits, what is the number of people who will cross the bridge?

(B) How much would they be willing to pay? (i.e. what is the total consumers surplus if permits are free?)

(C) If the bridge cost \$9,999,999 to build, should it be built? What if it costs \$10,000,001?

(Question 4) Cost-Benefit Analysis Again Suppose Port Authority is thinking about expanding a particular road to add another lane. Currently, that road sees 3,000 trips per hour, each trip taking around 50 minutes. Adding another lane will increase the number of trips to 4,000 per hour, each trip taking around 30 minutes. People being the busy type, let's presume they value their time at ten cents per minute (\$0.10 per minute).

(A) Calculate the social benefits (in \$ terms per hour) of adding another lane.

[*Hint:* You need to calculate separately the \$ saved on trips that would have been taken anyway *and* the \$ consumer surplus on the new trips generated. For the latter part, use the triangle formula, i.e. consumer surplus on new trips = $\frac{1}{2} \times (\text{value of time saved} \times \text{new trips})$.]

Benefit from trips that would have been taken anyway: _____

Benefit from new trips generated: _____

Total Benefit: _____

(B) The State government refuses to pay for the construction of the extra lane from general taxes. As a result, the Port Authority decides to introduce a \$1 toll on the road to pay for it. That toll will *reduce* the anticipated traffic of the expanded road from 4,000 to 3,500 trips per hour. Now calculate the social benefits from adding another lane *and* a \$1 toll.

Assuming the Port Authority has the welfare of drivers in mind, is it worth it? Why or why not?

(C) Finally, suppose that the Port Authority's construction unit comes up with an estimate that requires the toll must be \$2.50 to pay for the lane. Calculate the benefit now. Is it worth it? Why or why not?