

Economics 101
Fall 2016
Homework #3
Due November 3, 2016

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.
- **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: Excise tax

1. Norway has a sugar tax that is a tax paid on chocolate and sugar products that are either imported into Norway or produced in Norway. In 2016 the tax was around 20 Norwegian knorer (NOK) per kg.

Consider the market for candies in Norway before the introduction of this sugar tax. Market demand and market supply curves are given by the following equation below where P is the price in NOK per kg of candies and Q is the quantity in kg of candies:

Market Demand: $P = 125 - (3/8)Q$

Market Supply: $P = 5 + (1/8)Q$

- a) Given the above information, find the equilibrium price and quantity in this market.
- b) Calculate the values of consumer surplus and producer surplus before the imposition of the tax. Show them graphically in a well-labeled graph.
- c) Given this excise tax of 20 Norwegian knorer, find the new price consumers will pay for each kg of candies, the new price producers will receive for each kg of candies after they pay the excise tax, and the new equilibrium quantity of kg of candies that will be sold in the market. Show the impact of this excise tax in a well-labeled graph.

- d) Given this excise tax, calculate the value of consumer surplus with the tax, producer surplus with the tax, tax revenue the government receives from implementing the tax, and the deadweight loss due to the implementation of this excise tax. Show these areas in a well-labeled graph.
- e) Given this excise tax, calculate consumer tax incidence and producer tax incidence. Show them graphically in a well-labeled graph. Who bears the greater economic burden from this excise tax?
- f) Suppose that the number of people with diabetes starts to increase. To try to prevent the spread of diabetes the government decides to implement an excise tax in this market so that consumption of candies falls to 120 kg. Calculate the size of the excise tax (assume that you are measuring the size of this excise tax relative to there being no excise tax in the market) that would be needed for the government to accomplish this goal.
- g) Suppose that the government increases its expenditures on diabetes treatment research by 2,200 NOK and wants to finance these expenditures by using tax revenue generated from implementing an excise tax in the candy market. Calculate the size of the excise tax that would be needed for the government to accomplish this goal. Assume that there is no excise tax initially when doing your calculations.
- h) As the size of the excise tax increases, what happens to the level of tax revenue? Provide a verbal explanation. (Hint: Based on this example, you might think about what the tax revenue is when the excise tax is 0 NOK per kg of candies and what the tax revenue is when the excise tax is 120 NOK per kg of candies. Then, think about what must occur at excise taxes that are set between these two values of the excise tax).

Part II: International Trade

2. Consider the market for space fuel on our planet Earth. Market demand and market supply curves for Earth residents are given by the following equations where P is the price per gallon of space fuel and Q is the quantity in millions of gallons of fuel:

Earth's Market Demand: $P = 80 - Q$

Earth's Market Supply: $P = 20 + 2Q$

- a) Given the above information, find the equilibrium price and quantity in this market if the only producers and consumers are from Earth.
- b) Calculate the value of consumer surplus and producer surplus. Show them on a well-labeled graph.

Suppose that humans now discover that we are not alone in the universe. This means that humans can now trade of the global interplanet market for space fuel and in this market the current price of one gallon of space fuel is \$30.

- c) Given the free trade in the interplanet market, find the quantity of space fuel that is sold by domestic producers and the quantity of space fuel that is imported from other planets. Calculate the new values of consumer surplus and producer surplus. Show them graphically in a well-labeled graph.
- d) Suppose that leaders of the countries on Earth decide to protect domestic producers of space fuel by imposing a tariff of \$20 on each gallon of imported space fuel. Find the quantity that is sold by domestic producers and the quantity that is imported from other planets given this tariff. Calculate the new values of consumer surplus and producer surplus with the tariff. Calculate the revenue the earth gets from the tariff, and the deadweight loss due to the implementation of this tariff. Show these areas in a well-labeled graph.
- e) Suppose that due to the galactic energy crisis price of space fuel increases to \$40 per gallon of space fuel. Earth leaders are still imposing the tariff of \$20 per gallon of imported space fuel. Find the quantity that is sold by domestic producers and the quantity that is imported from other planets given this increase in the intergalactic price of space fuel and the tariff imposed by the earthlings. Calculate the new values of consumer surplus and producer surplus. Calculate the amount of tariff revenue the earth gets from implementing this tariff, and the deadweight loss due to the implementation of this tariff. Show all your results in a well-labeled graph.
- f) Suppose that situation normalizes and the price for a gallon of space fuel returns to \$30. During one of the Earth summits, the leader of country W suggests implementation of a per unit subsidy to domestic producers instead of a tariff that would result in the same value of producer surplus as in (d). What is the amount of this subsidy per gallon of space fuel? Calculate the total cost to Earth of this expenditures on this subsidy program.

3. Consider the market for chicken in Mexico. The domestic market demand and market supply curves are given by the following equations where P is the price in pesos per pound of chicken and Q is the quantity in millions of pounds of chicken:

Domestic Market Demand: $P = 90 - 3Q$

Domestic Market Supply: $P = 10 + Q$

- a) Given the above information, find the equilibrium price and quantity in this market if this market is closed to international trade.

- b) Calculate the value of consumer surplus and producer surplus. Show these areas in a well-labeled graph.

Suppose that now Mexico enters the international market of chicken, where a pound of chicken costs 15 pesos.

- c) Given the free trade in the international market, find the quantity that is sold by domestic producers and the quantity that is imported or exported in the Mexican market for chicken. Calculate the new values of consumer surplus and producer surplus. Show them graphically.
- d) Suppose that Mexican poultry farmers are unhappy with the results of opening this market to trade. They lobby for imposing an import quota equal to 8 million pounds of chicken. Find the market price, the quantity that is sold by domestic producers and the quantity that is imported given the implementation of this import quota. Calculate the new values of consumer surplus and producer surplus. Calculate the deadweight loss due to the implementation of this quota. Show them graphically.
- e) Suppose that government does not like the idea of an import quota and decides to implement instead a tariff that results in the same producer surplus as an import quota of 8 million pounds of chicken. What is the amount of this tariff per pound? Find the quantity that is sold by domestic producers and the quantity that is imported when this proposed tariff is implemented. Calculate the new values of consumer surplus. Calculate tax revenue the government receives from implementing the tariff, and the deadweight loss due to the implementation of this tariff. Show these areas in a well-labeled graph.
- f) Suppose that the government wants to receive the same amount of money that it receives from implementing the tariff in point (e) by selling the legal right to sell imported chicken to the foreigners who will import the chicken into Mexico. Suppose the Mexican government wants to sell the legal right to import chicken to 8 foreign producers. Suppose that the legal right allows each buyer of the legal right to sell 2 million pounds of foreign produced chicken in Mexico. Will foreign producers agree to buy this right?

Part III: Elasticity

4. Suppose your family runs a Greek yogurt factory which is famous in your town for its unique black Greek yogurt. After attending Econ 101 for nearly ten weeks, you really feel like helping your father to make better pricing decisions. To begin with, you search for a market survey company to find out the demand curve for your black Greek yogurt, which turns out to be:

$$Q = 12 - 2P + 0.1I$$

where Q is the quantity demanded in US (in thousands of packages), P is the price for a package of black Greek yogurt, and I is the median income in your town (in thousands of dollars).

Currently the price is set by your father at 2, and the median income is 40.

- a) Using the point slope elasticity formula, what is the price elasticity of demand of black Greek yogurt at the current price and income level?
- b) Based on your result in part a), do you think you should raise or lower the price in order to increase total revenue? (Think about the price elasticity of demand, and the price and quantity effects)
- c) Now verify your answer in part b) by setting a new price which is \$1 dollar higher/lower (based on your answer to part b)) than the original price of \$2 and then calculate the change in total revenue.
- d) Using the two-point elasticity formula (the arc elasticity formula), what is the price elasticity of demand when you go from the original price to the new price?

Suppose the following two scenarios happen when your yogurt is priced at the new price level in part c), and you hold your price unchanged during the following scenarios:

- e) On the Greek yogurt market, your biggest rival is a kind of green Greek yogurt. Suppose the price of green Greek yogurt suddenly goes up from \$3 to \$3.5 due to an increase in the price of spinach, which is the main ingredient of the green Greek yogurt. Then, market investigation finds that this change causes the quantity demanded for your yogurt to increase by 2 units. So what is the cross-price elasticity of demand? Provide any formulas you use.
- f) Your yogurt has an amazing effect of boosting productivity on the residents in your town, and this leads to an increase in the median income in your town: I goes from 40 to 50. Find the new quantity demanded for your yogurt and calculate the income elasticity of demand. Provide any formulas you use.

Part IV: CPI and Real/Nominal Prices

5. Suppose you find yourself unable to hold back your impulse to write a detective novel set in the 1980s. In order to make the story believable, you first decide to find out some basic economic facts in that era. (You'd better find a calculator for this exercise!)

a) You learn from Econ 101 that the CPI is a good measure of purchasing power, but you wonder what it is composed of. So you find this table showing the proportions of components in the market basket used for the CPI index:

Components of the market basket for the CPI	
Housing	41.4%
Transportation	17.8%
Food	16.2%
Energy	8.2%
Medical Care	6.4%
Apparel and Upkeep	6.1%
Other	3.9%

Suppose that in 1982, the annual average cost of these listed components are 1000, 200, 500,50,50,50,10 respectively (in dollars), then calculate the cost of the market basket in 1982.

b) Suppose the annual average cost of the market basket is \$55563 in 1983 and \$57962 in 1984. Using the average cost of market basket over 1982-84 as the base for your CPI, calculate annual CPI for 1983 and 1984.

c) You want to find the actual data, and your friend gives you a website: <https://fred.stlouisfed.org/series/CUUS0000SA0>

Go to this website and download the Semiannual CPI data from 1984 to 1990. Then calculate the annual CPI data for 1984,1985 and 1986, rounded to one place past the decimal. (Hint: just take the average of the first half year and the second half year. Exploit Excel to do the calculation job!) Once you do your calculations, put your answers in the following table:

Year	CPI

d) Now using 1985 as the base year and the data you collected from the website, calculate the CPI for 1984 and 1986. Once you do your calculations put your answers in the table below:

Year	CPI with Base Year 1985

e) (challenging) Given the data you have gotten from the web and the work you have done answer the following question. In terms of purchasing power, how many 1986 dollars do you need to have the same purchasing power as one 1984 dollar? Round your answer to two places past the decimal.

6. Looking back on the diary from your childhood, the prices and wages back in 2005 grab your attention. Then you compare prices of some goods in 2005 to what they are 2015. You collect the following data:

Year	CPI (using 1982-84 as the base)	Nominal Price of Doughnut	Nominal Price of Haircut	Nominal Price of Gas
2005	201.6	\$1.09	\$15.00	\$3.25
2015	237.0	\$1.29	\$20.00	\$4.00

- a) Using 2005 as the base year, calculate the CPI for 2015 (rounded to the first decimal).
- b) What was the real price of doughnuts in 2015 in terms of 2005 dollars? Round your answer to two places past the decimal. What was the percentage change in the real price of doughnuts from 2005 to 2015 (in terms of 2005 dollars)?
- c) What good (doughnuts, haircuts, and gas) experiences the greatest nominal increase in price? What good experiences the greatest real increase in price?