Study Questions to Accompany International Energy Markets

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Chapter 4. Energy Taxes, Subsidies, and Social Welfare

4.1 Suppose supply and demand in an energy market.

$Q_d = 66 - 2P_c$ and $Q_s = -4.6 + 1P_c$

4.1a Compute equilibrium price and quantity in this market.

4.1b Suppose the maximum price that can legally be charged for energy is $20. If the law is obeyed what do you predict would happen in this market?

4.1c Why might a black or illegal market develop?

4.1d Why would a maximum price of $30 not have any effect in this market?

4.2 Suppose that demand and supply of Chinese coal is

$Q_d = 60 – 0.5P$ and $Q_s = -15 +2P$.

4.2a What are equilibrium price and quantity in the Chinese coal market?

4.2b Compute what happens to demander price, supplier price and equilibrium quantity, if a carbon tax of $6 is charged on Chinese coal?

4.2c In a graph, show the tax revenue, loss in consumer surplus.

4.2d Compute how much tax revenue China collects?

4.2e Compute the loss in consumer surplus from the tax?

4.2f Compute the loss in producer surplus from the tax?

4.2g Compute the dead weight loss of the tax from the triangle in your diagram above and from government tax revenue minus the loss in producer surplus and the loss in consumer surplus?

4.2h Now suppose a subsidy instead of a tax is passed. What are the consumer price, supplier price, and quantity if a subsidy of $10 is paid on Chinese coal?

4.2i In a graph, show the subsidy cost, gain in consumer surplus, gain in producer surplus and deadweight loss from the tax.

4.2j What are the costs to the government of a subsidy?

4.2k What are the gains in consumer surplus from the subsidy?

4.2l What are the gains in producer surplus from the subsidy?

4.2m What are the dead weight losses of the subsidy? (Compute from triangle shown on your graph above or from government cost – gain in producer surplus - gain in consumer surplus)?

4.3 Let $Q_d=a-bP_d$ and $Q_s=c+dP_d$ and the unit tax is t_x. Mathematically show that the tax on the consumer in this competitive case is identical to the tax on the producer. Thus, unless the costs of collection are different it doesn't matter where the tax is collected.

4.4 The tax could be on the value of the product sold (ad valorem) instead of on each unit sold. Let's say the rate for an ad valorem tax is t_a, which is now a share. Such a tax on the supplier price could be represented as t_a and the market is in equilibrium where $P_d=(1+t_a)P_s$. Let supply and demand in the market be:

$Q_d = 18 - 2P_d$

$Q_s = -6 + P_s$

4.4a Compute equilibrium price and quantity in this market without the tax.

4.4b Compute demander price, supplier price, and quantity with a $t_a = 0.1$ in this market?

4.4c In a graph, show the tax revenue, loss in consumer surplus, loss in producer surplus and deadweight loss from the tax.

4.4d Compute incidence of the tax or the part of the tax each side of the market pays?

4.4e What are government revenues?

4.4f Compute the loss in consumer surplus from the tax.

4.4g Compute the loss in producer surplus from the tax.

4.4h Compute DWL for this ad valorem tax. (Compute from triangle shown on your graph above or from government cost – gain in producer surplus - gain in consumer surplus)?

4.5. If the tax is on the end demand price it could be represented by t_aP_d and equilibrium would be where $P_d(1-t_a)=P_s$. If the same tax rate were implemented on the supply price the equilibrium condition would be $P_d=P_s(1+t_a)$.

4.5a In this case, does it matter whether the tax of t_a is levied on the consumer or the producer?

4.5b What would the tax rate have to be on supply to be identical to a tax of t_a on the demand price.

4.6 How much a market participant pays of a tax or receives from a subsidy on a commodity depends on the elasticities of demand and supply.

4.6a For a unit tax, draw a graph of a market showing a case where the consumer absorbs the whole tax.

4.6b For a unit tax, draw a graph of a market showing a case where the producer absorbs the whole tax.

4.6c For a unit subsidy, draw a graph of a market showing a case where the consumer receives the whole subsidy.

4.6d For a unit subsidy, draw a graph of a market showing a case where the producer receives the whole subsidy.

4.7 Suppose the demand equation for shale gas is $Qd = 64P^{-1.5}$ and the supply equation $Qs = 4P^{0.5}$.

4.7a Compute equilibrium P and Q in this market.

4.7b Compute the price elasticity of demand?

4.7c Compute is the price elasticity of supply?

4.7d Compute the incidence of a $4 tax?

4.8. Assume the country X has an upward sloping supply for oil, but is small enough to be a price taker on world markets. Suppose X is originally importing 50% of its oil.

4.8a Graphically represent this market with no imports and again with imports.

4.8b Now suppose X wants to decrease the share of oil imports for security reasons. On four diagrams compare the effects of an oil tariff, an oil tax, an oil subsidy to domestic producers, and an import quota on domestic producers. Choose the policies so that all three have the same affect on domestic consumer price and domestic oil consumption but do not totally eliminate imports.

4.8c Discuss the differences in prices, overall consumption, changes in total welfare for the three policies?

4.8d If you were an oil producer in X, which policy would you prefer? Why?

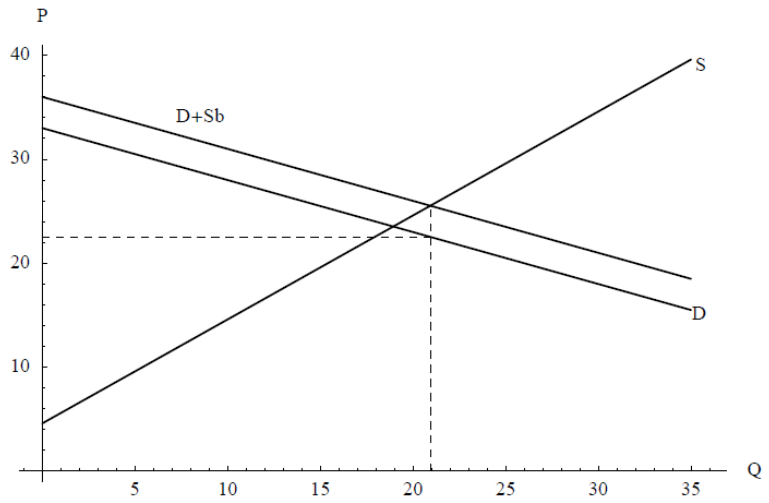
4.9 State governments frequently regard severance taxes on minerals produced in their state as a revenue source with a minimal burden to the State's own residents, especially if the taxed resources are exported to customers in other States. Assume an extreme case where a new coal mine is opened up and all the coal is shipped to another state. Assume a competitive market and explain whether all the tax will be shifted out of state or not.

4.10 Suppose demand and supply in a competitive coal market equal

$Q_d = 66 - 2P_c$

$Q_s = -4.5 + 1P_c$

with equilibrium P_C=23.5 and equilibrium Q_c=19. Suppose that the government wants 21 tons of coal produced in this market as shown in the diagram below.



4.10a Compute the unit subsidy that would be required in this market and the total cost to the government?

4.10b Now the parliament is interested in reducing spending to reduce the government deficit. They still want 21 tons but do not want to pay any producer more than their marginal cost. Explain the amount that would need to be paid to each producer and label the area abc in the figure above. Government wants to pay each marginal producer the minimum amount they are willing to accept. This is, each additional producer will receive its marginal cost.

4.10c What problems can you see in implementing this policy?

4.10d Suppose the policy succeeds and you have to determine how much extra employment the policy would generate compared to the unsubsidized market. Assume each miner produces 0.1 unit of coal per year.

4.10e Find average coal production per miner for some country. You may need to compute this value by dividing coal production by number of miners. Be sure to add definitions for any variables you use, show any computations, and include the year and the reference. Include enough information so anyone could compute the same number.

4.11 When considering investment in another country, it is important to investigate the tax regimes. http://www.taxsites.com/ is a good link for tax information and links to large accounting firms. Explore this link and find corporate tax rates and the value added or sales tax rate for one additional country. Find a country which has a tax treaty with the U.S. from link = http://www.taxsites.com/international.html. Please let me know if any links in any of the homeworks are obsolete or if you find better links than the ones I have found. Another cite for OECD statistics is http://www.oecd.org/document/60/0,3343,en_2649_345331942460_1_1_1_1,00.html

4.12 Severance taxes are one of a variety of taxes collected by U.S. states. See http://www.census.gov/govs/statetax/ to compare the different ways states collect taxes.

4.12a Check the severance tax rate for one state in Table 4.2

4.12b Find the severance tax rates for one additional energy-producing state. http://www.taxsites.com/state.html

4.12c Find a tax rate on an energy resource for another country.

4.13 We can think of the U.S. payroll tax (FICA) to fund social security as an advalorem tax on labor. At one point the rate was 12.4% for social security with the employer paying 6.2% and the employee paying 6.2% of before tax wages (Pd) up to a maximum salary of about $130,000.

4.13a What are the most recent rates and maximum limit shown at https://www.irs.gov/taxtopics/tc751.

4.13b If the rate paid by the employer and employee are equal, does this mean they share the tax equally. Why or why not?

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