

Final Exam

Name _____

- The duration of the exam is 1 hour 20 minutes.
- The exam consists of 6 problems and it is worth 100 points. The extra credit problem will only be counted if you lose points on other problems.
- Please write in the space provided. If necessary, write on the back of the page.
- Please ask me if you have any questions.
- To receive full credit you have to carefully explain all your answers and show all your work.

General advice: *If you get stuck in the early parts of a problem, do not stop there. You can receive substantial partial credit by explaining how you would solve the rest of problem if you had the necessary answers from its previous parts.*

1. (20 points) Determine whether each of the statements is true or false:
 - a. In a general equilibrium model, a tax on a single factor in its use only in a particular sector can affect returns to all factors in all sectors.
True. Because of the perfect factor mobility, a tax in one sector will affect other sectors.
 - b. Working fewer hours to reduce your tax burden is tax evasion.
False. It is tax avoidance.
 - c. According to the Haig-Simons definition of income, employer contributions to health insurance of its employees are not part of income.
False. It increases the power to consume.
 - d. Tax credits are generally more equitable than tax deductions.
True. Tax credits benefit everyone in the same manner. Tax deductions benefit rich more because of their higher marginal tax rate.
 - e. If government uses flat tax only, the tax system cannot be progressive (progressivity is based on average tax rates).
False. Flat tax rate doesn't prohibit us from using a personal exemption.
 - f. The economic burden of a cigarette tax will be born by smokers as well as tobacco corporations.
False. Corporations cannot bear taxes. Only people do.
 - g. Income tax doesn't have excess burden because it doesn't distort behavior.

False. Income tax does distort behavior.

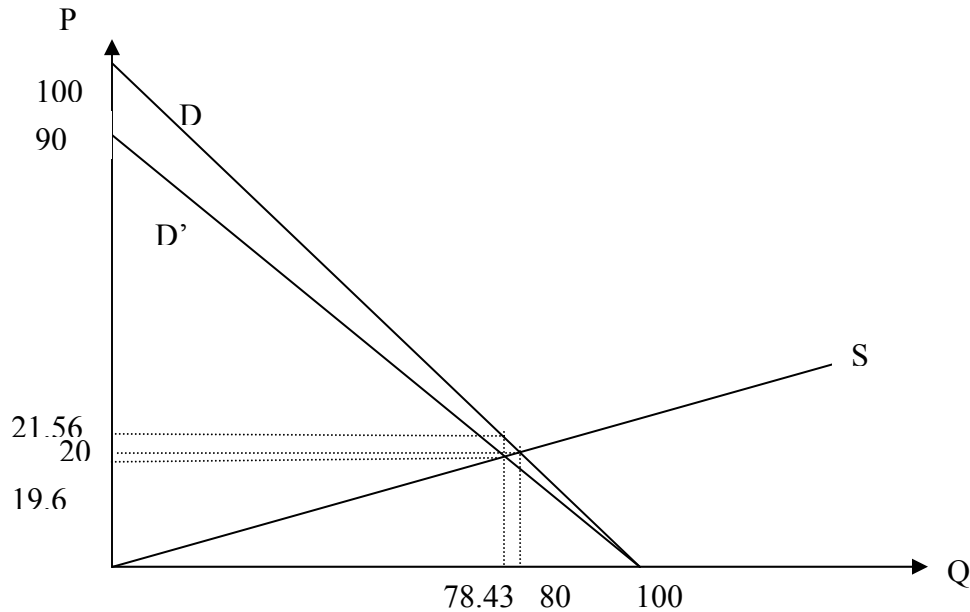
- h. Equivalent variation tells how much money a person would be willing to give up in order to avoid a tax.

True.

2. (25 points) Consider the market for shoelaces. The demand is characterized by the following equation $P_d=100-Q_d$, the supply is given by $P_s=0.25Q_s$.
- a. Determine the equilibrium quantity and price?

Set demand equal to supply: $Q^*=80, P^*=20$.

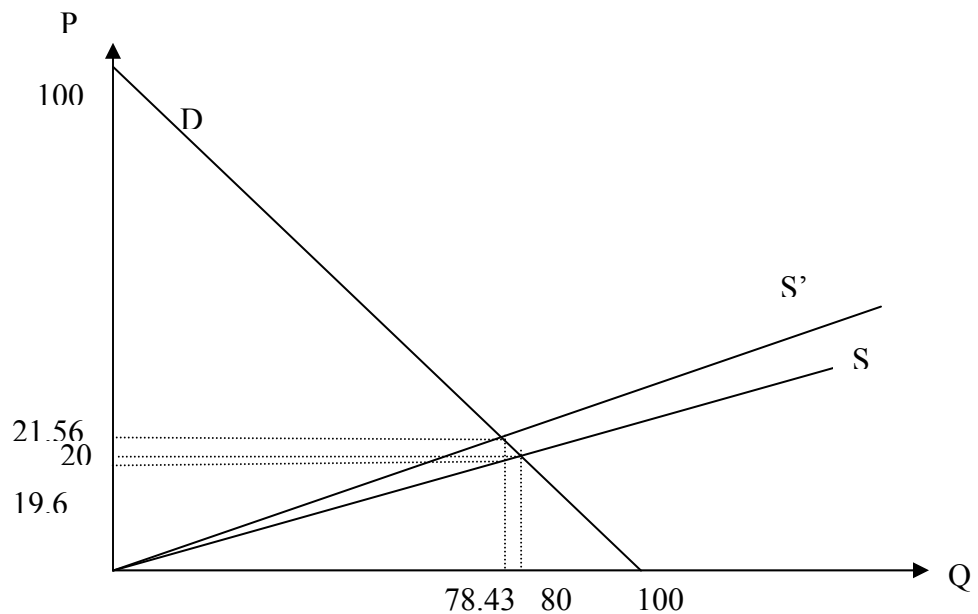
- b. Suppose an *ad valorem* tax of 10% is imposed on buyers of shoelaces. On a graph sketch what will happen to demand and supply curves. What is the new equilibrium price and quantity? What are the prices that buyers pay and suppliers get? Also determine the tax revenues and economic tax incidence on buyer and sellers.



Refer to the graph above. The tax will shift the demand down (not in a parallel fashion) to $D'=D/(1+0.1)$, so new demand curve is given by $P=(100-Q)/1.1=100/1.1-Q/1.1$. The new equilibrium is determined by setting new demand equal to the old supply: $Q=78.43, P=19.6$. The price of \$19.6 is the price that sellers will collect. The price that buyers will pay

is going to be exactly 10% higher and equal to $19.6 \times 1.1 = 21.56$. The tax revenues are equal to $78.43 \times (21.56 - 19.6) = 153.72$. The tax paid is equal to $21.56 - 19.6 = \$1.96$. The tax incidence on buyers (their share of tax) is $21.56 - 20 = \$1.56$, the tax incidence on sellers is $20 - 19.6 = \$0.4$.

- c. Now assume that an *ad valorem* tax is imposed on sellers of shoelaces. On a new graph sketch what will happen to demand and supply curves. What is the new equilibrium price and quantity? What are the prices that buyers pay and suppliers get? Also determine the tax revenues and economic tax incidence on buyer and sellers.



Refer to the graph above. The tax will shift the supply up (not in a parallel fashion) to $S' = S \times (1 + 0.1)$, so new supply curve is given by $P = 1.1 \times 0.25Q = 0.275Q$. The new equilibrium is determined by setting new supply equal to the old demand: $Q = 78.43$, $P = 21.56$. The price of \$21.56 is the price that buyers will pay. The price that sellers will collect is going to be exactly 10% lower and equal to $21.56 / 1.1 = 19.6$. The tax revenues are equal to $78.43 \times (21.56 - 19.6) = 153.72$. The tax paid is equal to $21.56 - 19.6 = \$1.96$. The tax incidence on buyers (their share of tax) is $21.56 - 20 = \$1.56$, the tax incidence on sellers is $20 - 19.6 = \$0.4$.

- d. Using your answers in (b) and (c) determine whether economic incidence changes depending on which side of the market the tax is imposed on? What about statutory incidence? Determine also how the economic tax

incidence is related to the relative slopes (elasticities) of demand and supply.

The basic result of tax incidence is that economic tax incidence doesn't depend on which side of the market the tax is imposed on. Statutory incidence is clearly different – in one case buyer pay the tax and in the other case sellers pay the tax. Clearly, supply is relatively more elastic (flat) than demand is, which reflects in relatively lower economic burden on sellers compared to buyers.

3. (15 points) Consider a general equilibrium economy with two goods – pencil sharpeners and all-other-goods produced by competitive firms using two inputs (labor and capital). Assume that production of pencil sharpeners is labor intensive and production of all-other-goods is capital intensive
- a. What is the economic incidence of a general tax on labor (labor used in both sectors)?

The general tax on labor has no general equilibrium effects because there is no incentive to shift labor between sectors. The burden of this tax will be born by workers (suppliers of labor).

- b. What is the economic incidence of a tax on labor used in pencil sharpener sector?

The costs of producing pencil sharpeners will go up, the price (to consumers) of a pencil sharpener will go up.

There are two effects:

- (1) **Substitution effect – the relative price (to owners) of labor will go down because pencil sharpener manufacturers will substitute away from labor (because it is more expensive to acquire for producers). Thus, the burden is going to be on suppliers of labor in both sectors.**
- (2) **Output effect – tax on labor in pencil sharpener production will increase the price of pencil sharpeners and decrease the level of production. In addition, the price of the input intensively used in the production of pencil sharpeners (labor) will decrease. Intuitively, the reduction in the production of pencil sharpeners will free some resources, which would need to be accommodated in the other sector. There will be relatively more labor (because pencil sharpener sector is labor-intensive) freed, so its relative (to capital) price will have to go down to accommodate it in the other sector.**

The two effects act in the same direction. The burden will be on suppliers of labor (workers).

- c. Would your analysis still apply if people in this economy had different preferences?

The analysis would become more complicated and will not necessarily apply. The tax changes the distribution of income in this economy (workers are hurt relative to capital owners). They will respond differently to these income changes by changing their optimal consumption bundles. These changes will affect two sectors differently leading to more general equilibrium effects to be studied.

4. (10 points) Suppose the demand for bread has elasticity equal to -0.5 at the current equilibrium, while the demand for caviar has elasticity of -5 at current equilibrium. Bread is mostly consumed by poor people and caviar is mostly consumed by rich people.

a. Suppose that caviar is taxed at 1% rate. What is the optimal tax rate on bread?

The efficiency requires (elasticity of demand for bread)*(tax on bread) = (elasticity of demand for caviar)*(tax on caviar), which translates into $-0.5*(\text{tax on bread}) = -5*1 = -5$, which means that bread should be taxed at 10%.

b. Do you think such a tax schedule would be feasible to implement? Explain what vertical equity means in this context.

It would be very difficult, if not impossible, to implement because this tax schedule is “unfair”. And by “unfair” we mean vertically inequitable. Vertical equity requires that rich people pay more in taxes relative to their income than poor people (rich people have higher average tax rates). Now, considering that rich eat caviar and poor eat bread, the result will be exactly the opposite – poor will be paying more than rich on average.

5. (10 points) For each of the following determine whether it should be counted as income (all of it or part of it) according to the Haig-Simons income definition:
- a. The dividends paid on Microsoft stock.

Yes. It clearly increases the ability to consume.

b. The increase in the value of the Microsoft stock.

Yes. It also increases the ability to consume (you can sell it and spend the money).

c. The value of child care services provided at home by a family member.

Yes. It increases the ability to consume. The child care services are consumed no matter how you pay for them – with money or with your own time.

- d. The price of airline ticket provided by a potential employer for an onsite visit and interview.

Generally no. It should be considered as a cost of earning income. Unless you really enjoy flying, then some part of it could be counted as income.

- e. Salary at the main job.

Yes. It clearly increases the ability to consume.

6. (20 points + 5 extra credit) Consider a country with the flat income tax rate of 20%. The individuals in this country are considering how much to donate to charity organizations. The Marginal Private benefit of charity donations is given by $MPB=100-D$, where D is the donation in after-tax dollars. The Marginal External Benefit is equal to $MEB=50-0.5D$. The Marginal Cost of donations is equal to donation itself $MC=D$.

- a. Should charity donations be subtracted from the income according to Haig-Simons income definition?

No, they should not. Charity donations are part of consumption, people consume pleasure from giving. The fact that people do donate means that they derive utility from it comparable to utility derived from, say, buying and enjoying a DVD player.

- b. What is the efficient amount of charity donations in this country?

To find the efficient amount of donations in this country, we have to set the marginal social benefit equal to the marginal cost. The marginal social benefit (MSB) is found by adding Marginal Private Benefit and Marginal External Benefit: $MSB=100-D+50-0.5D=150-1.5D$.

$MSB=MC=150-1.5D=D$, leading to $D^*=60$.

- c. Suppose that charity donations are not tax deductible. What would be the level of donations in this country?

The level of donations will be determined by setting marginal private benefit equal to marginal private costs:

$MPB=MC=100-D=D$, leading to $D_1=50$.

- d. Now suppose that charity donations are tax deductible. What would be the donation level in this country? How much money would government lose?

If donations are tax deductible, the marginal costs of making a donation will be reduced by the amount of tax that would have to be paid on it (20%

of donation). It means that out of every dollar of donation is 80 cents are donated by individual and 20 cents by federal government. So, the marginal costs of donations will become $MC' = 0.8D$.

$MPB = MC' = 100 - D = 0.8D$, leading to $D_1 = 55.5$.

The government will not collect $55.5 * 0.2 = 11.1$ in revenues.

- e. (extra credit – 5 points) Assuming that the charity donations are not tax deductible, suggest a Pigouvian subsidy that will induce efficient amount of charity donations. Alternatively, if charity donations are tax deductible, what would the income tax rate have to be to achieve the same result? For this tax rate calculate the marginal and inframarginal effects of making charity donations tax deductible.

**Pigouvian subsidy = MEB at the optimal donation = $MEB = 50 - 0.5 * 60 = \$20$.
Alternatively, the income tax rate has to be equal to 33.33% because then the level of donations will be:**

$MPB = MC'' = 100 - D = (1 - 0.3333)D$, leading to $D_1 = 60$.

The marginal effect of making donations tax deductible is the net increase in the level of donations, which result from it: $\$60 - \$50 = \$10$.

The inframarginal effect is the loss of tax money on those donations that would be donated with or without preferential tax treatment:
 $\$50 * 0.3333 = \16.7 .