

This is the study guide for the midterm exam. It covers the effects of taxes and subsidies and also externality problems and their solutions. The hardest questions on this study guide are harder than the hardest ones will be on the exam—and the easiest ones are easier than will be typical on the exam.

1. **Matching:** connect the definitions and facts by writing the appropriate letter in the blank to the left of the terms in the first column:

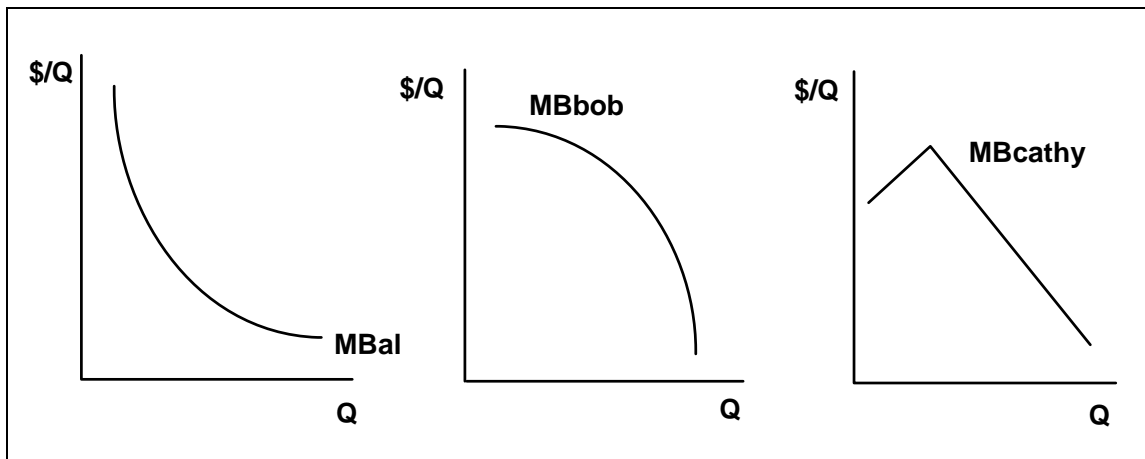
___ Alfred Pigou	(a) British Economist who argued that an optimal tax system minimizes deadweight loss
___ Tax Base	(b) A tax that does not directly alter relative prices
___ Neutral Tax	(c) The activity or thing subject to a tax.
___ Positive Statement	(d) Total benefits less total costs, maximizing it can be used as a model of rational decision making
___ Net Benefit	(e) A statement about what is, what was, or what will be.
___ Externality	(f) A British economist who argued that externalities generated by market activity should be corrected through taxes.
___ Frank Ramsay	(g) The result of any activity that imposes costs or benefits on persons not involved in a particular activity
___ James Buchanan	(h) The burden of a tax above the revenues collected.
___ Excess Burden	(i) An American economist who argued that an optimal tax system cannot be devised without knowing how the money will be spent.

2. **Identify and/or Define.** Use a few sentences to briefly define or characterize the following as clearly and precisely as possible:

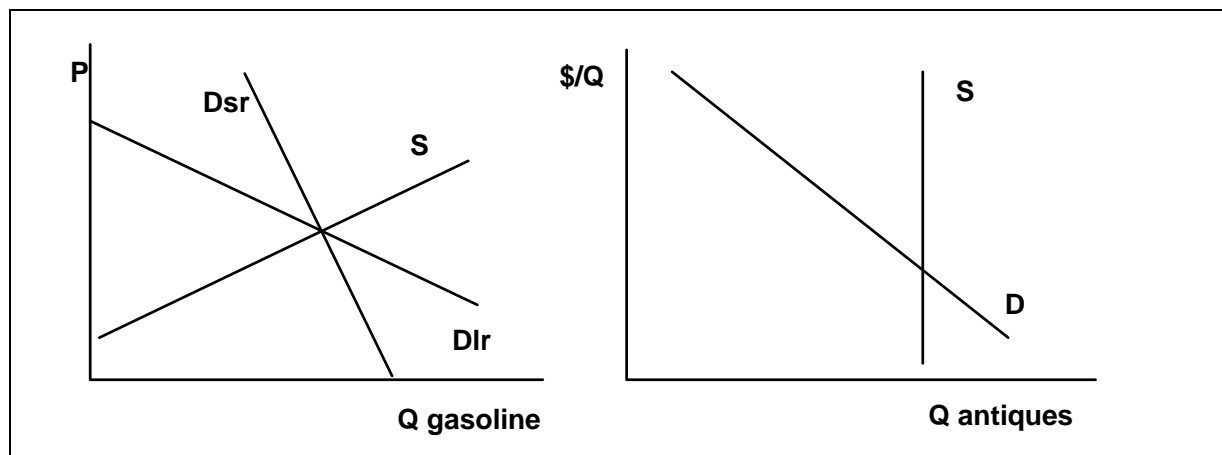
a. marginal benefit	j. proportional tax
b. marginal cost	k. lump sum subsidy
c. consumer surplus	l. conditional lump sum subsidy
d. deadweight loss	m. social net benefit
e. excise tax	n. indifference curve
f. Ramsay tax	o. lump sum tax
g. tax base	p. normative statement
h. marginal tax rate	q. negative externality
i. average tax rate	r. externality problem

3. Use diagrams for (i) a market, (ii) a typical consumer in that market, and (iii) a typical firm in that market, to show the short run and long run effects of an excise tax. Clearly label all important details and discuss the logic of your analysis.
- Show a case in which the tax burden falls mostly on consumers.
  - Show a case in which the tax burden falls mostly on firms.
  - Show the typical case in which the tax burden is shared.

4. Use the following individual marginal benefit curves to derive demand curves for each of the following consumers and in a separate diagram for the market composed of these three consumers. (Discuss your reasoning and label all important details.)



5. Show the distribution of tax burden that occurs in the following markets as a consequence of a \$2.00/unit excise tax. (Discuss your reasoning and label all important details.)



6. Use indifference curves to illustrate the superiority of a lump sum tax over an excise tax that generates the same revenue from an individual taxpayer.
- Label all important details and discuss the implication of your diagram.
  - On a separate diagram show the effects of a general sales tax that raises the prices of all goods by 20%.
  - On a separate diagram show the effects of a general income (or wealth) tax that reduces income (or wealth) of all taxpayers by 20%.
  - Are any of these taxes neutral? Explain why or why not?
7. Repeat #3, 5, and 6 for a targeted (marginal) subsidy. After doing so:
- Discuss why economists often prefer a lump sum subsidy or a negative income tax to targeted

subsidies for housing and food.

- b Are food stamps a lump sum, conditional lump sum, or a marginal subsidy?
  - c Show that there are circumstances in which a conditional lump sum subsidy can generate the same results as an unconditional lump sum subsidy.
8. Use labor supply and demand curves to analyze the effect of an excise tax (proportional tax) on labor income.
- a Show the effects of the tax on employees and employers, and note any deadweight losses that exist.
  - b Show why reducing this tax affects the magnitude of the tax burden, tax revenue, and deadweight loss.
  - c What tax rate maximizes tax revenue in your diagram?
  - d How is this income tax revenue maximizing tax affected by the price sensitivities (elasticities) of particular demand and supply curves for labor?
  - e Are there any important difference between your diagrams and ones that you would use to analyze a proportional or progressive tax on labor income?
9. It is sometimes claimed that firms and their employees "share" the social security tax, because by law **half of the money** is paid from employee salaries and the other half is paid by the firm.
- a Use the tools developed in class to analyze this assessment of the tax burden of the social security tax.
  - b Show that the slopes of the demand and supply curves in various labor markets affect how the tax is distributed among suppliers (employees) and demanders (employers) of labor.
  - c Is there any case in which the distribution of the tax burden of social security is shared equally?
  - d Show how this tax may have different effects on labor markets in the short and long run.
  - e The social security tax has a flat marginal tax rate on labor income up to approximately 130K/year. Is this tax progressive, proportional, or regressive? Explain.
10. The "Obama care" healthcare system can be thought of as a subsidy on health care for "lower middle class" citizens of the US. (a) Use a supply and demand curve for health care to show the effects on prices for persons eligible for the plan. (b) What happens to prices for other persons who are not eligible for the plan? Explain.
11. Many proposed "green energy programs" can be thought of as subsidies for particular methods of producing electricity, as with programs that support windmills, solar panels, gasahol, biomass, and battery powered cars. In the space below draw two diagrams. In the first diagram (a) show the case in which the entire value of the subsidy accrues to owners of windmills. On the second diagram (b) show the case in which half of the value of a subsidy for battery powered autos accrues to purchasers of electric automobiles. Label all important details including the cost of the subsidy.
12. The green energy programs mentioned in problem 11 may or may not be Pigovian subsidies according to their levels. Assume that alternative energy production produces a positive externality (positive external benefits). Illustrate three cases: (i) subsidies that are below Pigovian

levels, (ii) subsidies that are at Pigovian levels, and subsidies that exceed Pigovian levels. Note both their output effects, effects on social net benefits, and associated dead weight losses (if any).

13. Pigovian taxes are said to have no deadweight losses. (i) Draw an illustrating example and demonstrate that there are no deadweight losses from a Pigovian tax, because social net benefits are increased rather than reduced by such taxes (assuming that the tax revenues are not wasted). (ii) Show that a tax on an externality generating activity that is too high (above the Pigovian levels) will have a dead weight loss.
14. Draw four diagrams that illustrate (a) the normative problems associated with positive and negative **externalities** and (b) cases in which externalities exist but there is no problem.
  - a. Label all important details and briefly explain the nature of the two problematic cases.
  - b. Show how Pigovian taxes or subsidies can be used to address the cases characterized.
  - c. Now, construct two cases in which externalities exist (positive or negative), but the outcome is not a problem from the perspective of the social net benefit maximizing norm
  - d. Is there any easy way to distinguish part c from the over and under supply cases of part a in the real world? Explain.
15. An alternative to the Pigovian solution is the Coasian solution. Coase imagines individuals bargaining over an externality problem, and if bargains can be struck, negotiations and trade will reach outcomes that maximize social net benefits. In contrast with Pigovian taxes and subsidies, they do so through voluntary interactions rather than taxes, subsidies, or regulations.
  - a **Draw a 2-person externality problem. Assume that “A” controls the activity of interest and “B” is subject to the externality. Show the presence of unrealized gains to trade and discuss how bargaining might take place to realize those benefits.**
  - b **Explain why the result after all gains from trade have been realized is the same one reached using Pigovian taxes (or subsidies).**
  - c **Draw a market level externality problem and identify the unrealized gains from trade that exist at the market equilibrium (before any Coasian bargaining takes place).**
  - d **Discuss how the gains to trade might be realized and explain why the result after potential gains to trade are realized is the same as the one that maximizes social net benefits.**
  - e **Explain why the Coasian solution is less likely to emerge in case “B” than in case “A.”**

### True False Questions

- a Every possible external benefit or cost generates an externality problem.
- b An externality problem caused by an external benefit can be solved with a Pigovian Tax.
- c A broad-based subsidy costing the same amount as a targeted subsidy normally generates a larger increase in social net benefits than the equally expensive targeted subsidy.
- d A broad-based tax that generates the same tax revenue as an excise tax always has a lower deadweight loss. \_\_\_\_\_

- e A broad-based tax that generates the same tax revenue as an excise tax on a market with upward sloping supply and downward sloping demand curves always has a lower deadweight loss associated with it. \_\_\_\_\_
  - f Coasian contracts to solve externality problems generate the same outcome as generated by a Pigovian tax or Subsidy. \_\_\_\_\_
  - g The consumer surplus realized by a consumer that purchases quantities greater than zero of a good, always increases when prices fall. \_\_\_\_\_
  - h The consumer surplus realized by a consumer always falls when prices increase.
  - i The profits realized by a typical (average) firm always fall as taxes increase.
  - k The profits realized by a typical firm selling its products in a market with an upward sloping demand curve and downward sloping supply curve always fall as taxes increase.
  - l The social security tax is “split” equally between firms and employees, but that does not imply that the tax burdens borne by firms and employees are equal. \_\_\_\_\_
  - m A subsidy on an ordinary market with an upward sloping demand curve and downward sloping supply curve increases profits and consumer surplus for the firms and persons participating in such markets.
- (Hint: for the graphical questions, draw some graphs to see what the geometry implies.)

### Additional Puzzles and Applications

20. Use the neutrality, deadweight loss (Ramsay) and net benefit (Buchanan) tax principles to analyze the relative merits of a high excise tax on gasoline, a flat (proportional) corporate income tax, and a consumption tax.
  - a First assume that the same revenue is generated by each tax, and that all the revenue generated will be spent on general government services.
  - b Next assume that the gasoline tax is “earmarked” so that it is entirely spent on transportation services (roads, bicycle paths, and mass transit) and that the others are used to finance general government programs as before. How does this earmark affect your analysis of the merits of gasoline taxes under these two normative theories?
  - c Explain how positive analysis plays a role in your normative analysis of the relative merits of these tax instruments. (No diagrams are necessary for your answers, although they may help.)
21. Discuss why lump sum taxes are rarely used in spite of your answers to #6 above, although other neutral taxes such as sales taxes and VATs are widely used.
22. During the early 1980s, the Reagan administration proposed a radical "flattening" of the tax schedule faced by ordinary US income taxpayers. A very finely gradated tax schedule was replaced with one that included just three marginal tax rates 0, 15 and 28%, but generated roughly the same revenue as the previous more steeply progressive tax schedule.
  - a Analyze the effects of this tax reform using the tools developed in class. (Hint: use supply and demand for labor diagrams to show what happens to employment levels, dead weight loss,

and tax payments for low, middle, and high income earners, whose marginal tax rate is reduced.)

- b** Discuss why reductions in marginal tax rates tend to reduce excess burden. **c** Are there cases in which a reduction in tax rates can increase tax revenues? Explain why.

**23.** Many economists (and conservative commentators) argue that a consumption tax would increase the savings rates of the average person in the U.S., which would increase long term growth rates. Use indifference curves and a choice setting defined over consumption in the present ( $C_1$ ) and consumption in the future ( $C_2$ ) to analyze the effects of (i) a temporary consumption tax that affects only consumption in the current period and a permanent one that is in effect for both periods. (To simplify a bit, assume that all lifetime income or wealth will be consumed, which implies that the two-period budget constraint is  $W = C_1 + C_2/(1+r)$ , where  $r$  is the interest rate.)

- a** Use indifference curves and a budget line defined over current and future income to illustrate (i) an individual's pretax choice, (ii) the effect of a consumption tax on future consumption, and (iii) the effect of a consumption tax on both present and future consumption.
- b** Does a temporary consumption tax increase savings? (Why?) **c** Is there a deadweight loss from a temporary consumption tax? **d** Does a permanent consumption tax increase savings? (Why?) **e** Is a sales tax or a VAT (value added tax) a tax that only affects current consumption? (Why or why not?) **f** Is a sales tax normally progressive, proportional, or regressive? (In what sense?)

**24.** Determine marginal and average tax rates for the following income,  $Y$ , tax schedule:

$$T = -1000 + .20Y$$

- a** Is this tax progressive, regressive, or proportional? Explain. **b** Suppose that instead of -1000, the intercept of the tax schedule is  $C$ .
- c** Determine the values of  $C$  that makes the tax schedule
- (i) regressive
  - (ii) proportional
  - (iii) progressive.
  - (iv) [Hint, remember the definition of average and marginal tax rates and apply them to this equation with a bit of algebra.]