

COST-BENEFIT ANALYSIS: CONCEPTS AND PRACTICE, 4th ed.**by****Boardman, Greenberg, Vining and Weimer****Test 1**

This file contains:

- Three tests for Economics 405/605, labeled versions A, B, and C.
- Some additional test questions
- A first test for Economics 405
- A mid-term test for Economics 405/605
- A first test for Economics 405/605
- A first test for Economics 405
- A mid-term test for Economics 605

Some possible answers are provided for some questions, shown in italics. Many questions appear more than once. In general, the answer to a question is not repeated. Therefore, there may be a possible answer to a particular question on another test. However, there are not answers to all questions.

Economics 405/605

NAME: _____

First Test-Version A**I. ESSAY QUESTIONS****[Instruction: Write your answers to these questions in your blue book.]**

1. The following questions all concern natural monopolies:

- a. (5 points) Use a diagram to illustrate the deadweight loss that, in the absence of government intervention, results from natural monopolies.
- b. (5 points) Briefly describe a government policy that can partially or entirely eliminate the deadweight loss resulting from natural monopolies. (If you can think of more than one policy, select *only* one.)
- c. (10 points) Using your diagram, indicate the benefits, costs, and transfers that would result from implementing your policy and briefly discuss each of these benefits, costs, and transfers. (10 points)
- d. (5 points) Describe any benefits, costs, and transfers associated with your policy that do not show up explicitly in your diagram.
- e. (5 points) Does your policy pass the Kaldor-Hicks compensation test? Briefly explain.

2. (14 points) Assume that the magnitudes of all the benefits and costs associated with a particular government policy have been accurately measured. Further assume that all these measured benefits and costs, *but one*, are commensurable with one another.

Using these data, can a "pure" cost-benefit analysis be conducted? Why or why not?

If a pure cost-benefit cannot be conducted, what alternative sort of analysis might be conducted with the data instead?

Given the data available for analysis, could the policy be subjected to the Kaldor-Hicks test? Please explain.

3. (14 points) Changes in consumer surplus, as measured by areas under empirically estimated demand curves, are frequently used in cost-benefit analysis to measure consumer willingness-to-pay for a favorable price change or to avoid an unfavorable price change. In those cases when the relevant Marshallian demand curve is known, but the relevant Hicksian demand curve is not known, is this a reasonable thing to do? Please explain.

Possible Answer: The key point is that, in principle, the Hicksian compensated demand curve

provides the appropriate measure of consumer willingness-to-pay. The Marshallian demand curve differs from the Hicksian because it incorporates both an income and a substitution effect, while the Hicksian demand curve incorporates only a substitution effect. Therefore, Marshallian demand curves provide a biased measure of willingness-to-pay. This bias is small, however, if the income effect is small, and in most situations, it is.

4. (14 points) The government of a small city decides to begin collecting the garbage produced by the city's residents. As a consequence, the two private firms that had previously been doing this work are driven out of business.

Discuss the extent to which the private firms' losses of revenues represent a true cost to society.

II. PROBLEMS [Instruction: Write your answers to these questions on the test itself.]

1. (14 points) The diagram below represents a low wage labor market. Workers in this market are not presently covered by the minimum wage, but the government is considering implementing such legislation. If implemented, this law would require employers in this market to pay workers in the market a \$5 hourly wage. Suppose all workers in this market are equally productive, the current market clearing wage rate is \$4 per hour, and that at this market clearing wage there are 1,000 employed workers. Further suppose that under the minimum wage legislation, only 800 workers would be employed.
- a. Using the capital letters indicate the areas of the graph that represent the gains or losses to various groups from this legislation in the cost-benefit accounting ledger that appears below. [Note: Some of the labeled areas do not represent either gains or losses from the policy and, hence, should not be listed in the ledger.]

	<u>Benefits</u>		<u>Costs</u>
employers (i.e., demanders)			
workers (i.e., suppliers)	_____		_____
society			

- b. Compute the actual dollar value of the impact of the policy on employers.
[Instruction: Please show your computations below so that I can give partial credit when it is appropriate to do so.]

[Instruction: *Do not* make this question more difficult than what I intended. For example, assume that the market is accurately represented in the graph and that the demand and supply curves would *not* shift as a result of adopting policy.]

2. (14 points) Suppose that the government has conducted an evaluation of two alternative hard drug control programs: A and B. The findings from this evaluation are summarized in the following table:

	<u>Program A</u>	<u>Program B</u>
Cost of full program	\$1.5 mil.	\$2.0 mil.
Number of persons screened	10,000	10,000
Number of drug addicts correctly identified by screening	120	200
Number of identified drug addicts "cured" by therapy segment of program	40	50

Assume that the cost figures cover both the screening and treatment segments of the program and that the screening test never falsely identifies a non-addict as an addict.

If the government were to fund one and only one of these two programs, which program should it select? Defend your decision. In doing this, be sure to discuss the major issues that should be considered in arriving at a decision.

Economics 405/605

NAME: _____

First Test- Version B**I. ESSAY QUESTIONS****[Write your answers to these questions in your blue book.]**

1. The following questions all concern information asymmetry:

- a. (5 points) Use a diagram to illustrate the deadweight loss that, in the absence of government intervention, results from information asymmetry.
- b. (5 points) Briefly describe a government policy that can partially or entirely eliminate the deadweight loss resulting from information asymmetry.

Possible Answer: The most obvious policy is for the government to obtain and disseminate information that consumers may not know about the product--for example, about product safety or quality. This will tend to shift $D(u)$ towards $D(i)$.

- c. (10 points) Using your diagram, indicate the benefits, costs, and transfers that would result from implementing your policy and briefly discuss each of these benefits, costs, and transfers.

Possible Answer: Area P_uacP_i is producer surplus that information asymmetry allows sellers to receive. The policy transfers this back to consumers. In addition, the policy tends to eliminate or reduce the DWL (area abc) that results from over consumption of the product. This is a pure social benefit, which is received by consumers.

- d. (5 points) Describe any benefits, costs, and transfers associated with your policy that do not explicitly show up in your diagram.

Possible Answer: The major item that does not explicitly show up in the diagram is the cost that the government incurs in collecting and disseminating information about the product.

- e. (5 points) Does your policy pass the Kaldor-Hicks compensation test? Briefly explain. (5 points)
- f. (5 points) Should all information asymmetry problems be eliminated through government intervention? If not, on what types of information asymmetry should the government focus? Briefly explain?

Possible Answer: No, the government need not intervene in all cases of information asymmetry. There are a number of different circumstances that may reduce the costs of information

asymmetry without the need for government intervention. For example, firms offer warranties on some products; sometimes individuals can obtain the needed information for themselves, especially when search or experience goods are involved; and sometimes the market produces third parties (e.g., Consumer Reports and home inspection firms) that provide buyers with the missing information. The best case for government intervention is for so-called "post-experience" goods. That is, goods that consumers cannot obtain full information on until after they have used it for a long period of time (e.g., a prescription drug). Third parties are also unlikely to provide the necessary information for these items.

- g. (5 points) Describe various circumstances that might mitigate the inefficiency associated with information asymmetry in the absence of government intervention.
2. (13 points) Changes in consumer surplus, as measured by areas under empirically estimated demand curves, are frequently used in cost-benefit analysis to measure consumer willingness-to-pay for a favorable price change or to avoid an unfavorable price change. In those cases when the relevant Marshallian demand curve is known, but the relevant Hicksian demand curve is not known, is this a reasonable thing to do? Please explain.
3. (13 points) The government of a small city decides to begin collecting the garbage produced by the city's residents. As a consequence, the two private firms that had previously been doing this work are driven out of business.

Discuss the extent to which the private firms' losses of revenues represent a true cost to society.
4. (13 points) What are the fundamental differences between cost-effectiveness analysis and cost-benefit analysis? When is each most appropriately used?

II. PROBLEMS [Instruction: Write your answers to these questions on the test itself.]

1. (13 points) The diagram below represents the rental market in a town that is considering a rent control law. If implemented, this law would lower all rents in the town to \$400 per month. Suppose all rentable properties in this town are alike, the current market clearing rent is \$500 per month, and that at this market clearing price there are 500 rental units. Further suppose that it is predicted that with rent control, the number of units available for rent will fall to 400.

a. Using the capital letters indicate the areas of the graph that represent the gains or losses to various groups from this legislation in the cost-benefit accounting ledger that appears below. [Note: Some of the labeled areas do not represent either gains or losses from the policy and, hence, should not be listed in the ledger.]

	<u>Benefits</u>		<u>Costs</u>
landlords (i.e., suppliers)			
renters (i.e., demanders)	_____		_____
society			

b. Compute the actual dollar value of the impact of the policy on landlords. [Instruction: Please show your computations below so that I can give partial credit when it is appropriate to do so.]

[Instruction: *Do not* make this question more difficult than what I intended. For example, assume that the market is accurately represented in the graph and that the demand and supply curves would *not* shift as a result of adopting the policy.]

2. (13 points) Suppose that the government has conducted an evaluation of two alternative hard drug control programs: A and B. The findings from this evaluation are summarized in the following table:

	<u>Program A</u>	<u>Program B</u>
Cost of full program	\$4.0 mil.	\$3.0 mil.
Number of persons screened	1,000	1,000
Number of drug addicts correctly identified by screening	200	120
Number of identified drug addicts "cured" by therapy segment of program	50	40

Assume that the cost figures cover both the screening and treatment segments of the program and that the screening test never falsely identifies a non-addict as an addict.

If the government were to fund one and only one of these two programs, which program should it select? Defend your decision. In doing this, be sure to discuss the major issues that should be considered in arriving at a decision.

Economics 405/605

NAME: _____

First Test - Version C**ESSAY QUESTIONS**

1. Thanks to a new federal program that will provide 50% matching funds, a city with high unemployment has decided to build a new municipal park for city residents if it can pass the Kaldor-Hicks potential compensation test. You have been hired to conduct a study to determine if the park can pass the test.
 - a. (5 points) What sort of decisions concerning standing would have to be made in conducting your study? How might these decisions affect whether or not the park passes the Kaldor-Hicks potential compensation test?
 - b. (10 points) One facility that the city builds in its park is a new swimming pool. To build the pool, the city purchases concrete from an essentially competitive market. The city purchases such a small amount of concrete that it does not affect the price of concrete. Can the city's budgetary expenditure be appropriately used as the measure of the social value of the cost that results from its purchase of concrete? Or is shadow-pricing necessary? Briefly explain. [In answering this question, demonstrate that you know what shadow pricing is and use a diagram to illustrate your discussion.]
 - c. (15 points) Assuming that many of the persons hired to work on the park would be drawn from local labor markets in which substantial unemployment exists, how should the cost of employing these persons be treated in your study? [In answering this question, please be as specific as possible, using a diagram if you can.]

Additional Potential Parts to this Question:

- d. How might willingness-to-pay for the benefits offered by the park be measured? What are the major advantages and disadvantages of the method you selected? Does the method you selected incorporate existence value? Is this likely to matter? Why or why not?
- e. Assume that the existence of the park would substantially reduce time spent by city residents in local bars on bright sunny weekends. Is it necessary to take account of this in your study? Why or why not? (Notice there are two factors to consider in responding to this question: (a) the economic effects on the local bar industry, which you may assume is essentially a competitive industry; (b) any positive or negative effects associated with the consumption of alcohol.)

- f. Are the results in your study likely to be sensitive to the discount rate you select? Why? In selecting a discount rate for your study, you must choose among several theoretical candidates. Indicate which would you choose, and why.

2. The following questions all concern negative externalities:

- a. (5 points) Use a diagram to illustrate the deadweight loss that, in the absence of government intervention, results from negative externalities that occur in the production process.
- b. (5 points) Briefly describe a government policy that can partially or entirely eliminate the deadweight loss resulting from negative externalities.
- c. (10 points) Using your diagram and a distributional accounting ledger of the sort we have used in class, indicate the benefits, costs, and transfers that would result from implementing your policy.
- d. (5 points) Does your policy pass the Kaldor-Hicks compensation test? Briefly explain.

3. (15 points) Briefly compare cost-effectiveness analysis and cost-benefit analysis.

When is each most appropriately used? What does the concept of "commensurability" have to do with when each can be used?

Can both cost-effectiveness analyses and cost-benefit analyses be subjected to the Kaldor-Hicks test? Please explain.

PROBLEMS

4. The following table, in which all figures are in millions of dollars, summarizes the results of recent cost-benefit analyses of five government projects:

<u>Project</u>	<u>Social</u> <u>Benefits</u>	<u>Social</u> <u>Costs</u>	<u>Net</u> <u>Benefits</u>	<u>B-C</u> <u>Ratio</u>
A	\$100	\$125		
B	110	100		
C	250	125		
D	100	25		
E	200	100		

- a. (5 points) In the two right-hand columns of the table appearing above, compute the net gains (i.e., net social benefits) and the benefit-cost ratio for each project.
 - b. (5 points) If the government wanted to maximize social welfare, which of the projects listed above should be undertaken? Briefly explain.
 - c. (5 points) If the government's budget was constrained to \$125 million, which project or projects should it choose in order to maximize social welfare? Briefly explain. [Note: For purposes of answering this question, assume that social costs and the government's budgetary costs are identical.]
5. (15 points) A state decides to raise money by placing a tax of \$10.00 on each clock radio sold within the state. These radios are manufactured outside the state at a fixed price -- a price that does not depend on the number bought in the state. (In other words, the supply curve for the radios is horizontal.) The state figured that this would raise \$80,000 annually since 10,000 clock radios are sold within the state each year. With the tax, however, only 8,000 radios are sold annually -- raising only \$64,000 in taxes.

What is a reasonable estimate, in dollars, of the annual amount of the excess burden (i.e., deadweight loss) resulting from this tax? [In answering this question, use a diagram and briefly indicate how you derived your answer. I'll give part credit even if your dollar figure is incorrect if you give me some indication that you are on the right track.]

ADDITIONAL TEST QUESTIONS

1. (10 points) Assume that the magnitudes of all the benefits and costs associated with a particular government policy have been accurately measured. Further assume that all these measured benefits and costs, *but one*, are commensurable with one another.
 - a. Using these data, can a "pure" cost-benefit analysis be conducted? Why or why not?
 - b. If a pure cost-benefit cannot be conducted, what alternative sort of analysis might be conducted with the data instead?
 - c. Given the data available for analysis, could the policy be subjected to the Kaldor-Hicks test? Please explain.

2. (10 points) A county is considering using a piece of park land for one of two alternative recreation projects. Project S would require construction costs of \$2 million (year 0) and generate net benefits of \$1 million per year for 10 years. (Assume the benefits are realized at the ends of years 1 through 10). Project L would require construction costs of \$4 million and generate net benefits of \$1 million per year for 20 years. (Assume the benefits are realized at the ends of years 1 through 20). If these figures are in real dollars, and the real discount rate is 8 percent, which project would the county select?

3. (10 points) Suppose that the construction of a new road by the government would divert traffic from an older road, thereby driving some of the gas stations on the older road out of business. Discuss the factors that determine the extent to which this should be treated as a component of the cost of building the new road.

Possible Answer: This question allows for a wide variety of specifics, as long as the notion of social opportunity costs comes across. For example, you could answer in terms of secondary markets, treating the new and old roads as substitutes. Or you talk about what happens to the resources employed at the gas stations that go out of business.

The major point here is that there are little or no true costs to society as long as the resources the private sector providers--the gas stations-- were using can be redirected to their next best use. However, if this is not the case--for example, if the buildings can't be used for some other purpose or workers are idled or end up in jobs where the values of their marginal products are much lower -- there will be a true social cost. It is easy, however, to imagine the workers moving from gas stations on the old road to gas stations on the new road.

4. As discussed in class and in the article by Lichtenberg and Zilberman, one way of supporting farmers is to place agricultural markets under target pricing.
 - a. (5 points) Using a demand and supply curve diagram, show the cost of target pricing to taxpayers (that is, show the tax subsidies paid to agricultural producers).

- b. (5 points) Consider now the imposition of a pesticide regulation by a government agency. Use your diagram to show how this regulation would change the cost of target pricing to taxpayers.
5. (10 points) Imagine that a government project purchases such a large amount of an input that is sold in a competitive market that the price of the input increases. Discuss whether the project's budgetary expenditure on the input is likely to be an appropriate measure of the social cost of the purchase or shadow pricing is likely to be necessary. **[NOTE: Illustrate your discussion with a diagram.]**

Possible Answer: In theory, the wedged shaped area should be subtracted from the project's budgetary expenditure, where the project's budgetary expenditure is represented by the rectangle. This can be done by simply averaging the old and new price and multiplying by the quantity the project purchases. In practice, this sort of shadow pricing may be unnecessary. For example, if the new price isn't much different from the old price, then the shadow pricing procedure won't make much difference.

6. (10 points) Suppose you own a house and are considering insulating it against the Winter cold at a cost of 300,000HUF. The insulation will save you 30,000HUF annually in heating costs (assume that these benefits are received at the end of the year.) In addition, the insulation will increase the resale value of the house by 240,000HUF. Further, suppose that you plan to sell your house 5 years after the insulation is installed and that if you do not purchase the insulation, the money needed to buy it would remain in a bank paying 4% interest annually. Finally, assume that the monetary values and the interest rate appearing above are all measured in real terms and the annual rate of inflation is 2 percent.

Should you invest in the insulation? As part of your answer, provide me with sufficient information so I can tell how you arrived at your decision.

[NOTE: If you wish, you may use the tables of conversion factors, which I have handed out, in making your calculations.]

Economics 405
First Test

NAME: _____

1. Suppose that Dryville, a town of 50,000 persons, does not currently have a public swimming pool, but, encouraged by an offer from the state government to pay 50% of the construction costs, is considering building one. Further suppose that you have been selected by Dryville's mayor to analyze the benefits and costs from building such a pool.
 - a. (10 points) Although Dryville has no experience with a public pool, assume that you have collected data from several towns that are very similar to Dryville and that do have a public swimming pool. For each town, you know what fee it charged last summer per visit and how many visits it had. The data collected for each town appear below:

<u>TOWN</u>	<u>FEE</u>	<u>NO. OF VISITS</u>
A	\$1.00	175,000
B	\$2.00	125,000
C	\$0.50	200,000

Using a diagram, indicate how you might utilize these data to predict the net benefits received by users of the pool if Dryville was to charge a fee of \$0.50 to swim in the pool. [NOTE: You need not compute this amount; just indicate clearly the area on the graph that represents the net benefit amount.]

- b. (10 points) By how much would the benefits received by swimmers change if Dryville was to increase the fee from \$0.50 to \$1.00. [NOTE: This time compute the actual dollar value.]
 - c. (5 points) Suppose that the marginal costs of operating the pool after it is built is constant at \$0.50 (i.e., the marginal cost curve is horizontal), but Dryville increases the fee from \$0.50 to \$1.00. What are the **net social** gains or losses resulting from this increase. [NOTE: Again, compute the actual dollar value.]
 - d. (10 points) Suppose Dryville purchases the land needed for the swimming pool at the market price from private developers who would have otherwise have sold the land to families who would have built houses for themselves on it. Assume that a fixed quantity of land was needed and that this land was vacant when purchased. Does the dollar amount that Dryville pays for the land adequately measure the land's social value? Is shadow pricing needed to measure the social value of the land? Please explain. [In answering this question, please be as specific as possible, using a diagram if you can.]

Possible Answer: Dryville's bugetary expenditure would equal area B. But the social opportunity cost would equal areas A and B because those who would have built the small retail establishments will lose

surplus equal to area A. Therefore, the price Dryville pays for the land understates its social value, and shadow pricing is needed.

- e. (5 points) What sort of decisions concerning standing would have to be made in conducting the cost-benefit study? How might these decisions influence whether the project passes the benefit-cost test? [**HINT:** Re-read the introduction to question 1.]

Possible Answer: A key issue is whether standing should be given to taxpayers outside Dryville. After all, they are paying for 50% of the pool's construction cost. If they are not given standing the costs they bear won't count. Therefore, the cost of the pool will be substantially reduced relative to its costs, and the pool is more likely to pass the benefit-cost test.

Extra questions:

- f. (10 points) Suppose that hiring lifeguards for the swimming pool would reduce the number of unemployed teenagers found in Dryville each summer. How should the **social** cost of employing these persons be measured in the study? [In answering this question, please be as specific as possible, using a diagram if you can.]

Possible answer: There is no perfect solution to this problem. One possibility is to use the government's budgetary cost, which is just the wage the government pays times the number of unemployed workers hired-- $W^(N_2 - N_1)$. This provides an upper bound measure of the social cost because it values the non-work time of the unemployed at the wage paid to those with jobs.*

Another possibility is to use $(1/2)(W^ + W_R)(N_2 - N_1)$. This is perhaps the best approximation, but it is impractical because the value of W_R is unlikely to be known. Thus, a more practical measure involves assuming that $W_R = 0$, giving $(1/2)W^*(N_2 - N_1)$. Because W_R is obviously greater than zero, this measure may be viewed as a lower bound.*

- g. (5 points) Construction of the pool would result in the citizens of Dryville purchasing more bathing suits and sun tan lotion than they would without the pool. Do these purchases need to be explicitly taken into account in estimating the benefits and costs resulting from building the pool? Please explain, mentioning any factors that might be important in determining whether or not the purchases need to be taken into account.

Possible Answer: If the increased demand for bathing suits and sun tan lotion doesn't drive up their price, which seems likely, these purchases do not have to be taken into account in estimating the benefits and cost resulting from building the pool. This also presumes that the manufacture and purchases of bathing suits are not associated with any important market distortions. Given an absence of price increases and market distortions, impacts in secondary markets, such as those for bathing suits and sun tan lotion, will be fully captured by the demand curve in the primary market.

2. (5 points) Changes in consumer surplus, as measured by areas under empirically

estimated Marshallian demand curves, are frequently used in cost-benefit analysis to estimate consumer willingness-to-pay for a favorable price change or to avoid an unfavorable price change. In those cases when the relevant Marshallian demand curve is known, but the relevant Hicksian demand curve is not known, is this a reasonable thing to do? Please explain.

3. The following questions all concern **positive** externalities:

- a. (5 points) Use a diagram to illustrate the deadweight loss that, in the absence of government intervention, results from positive externalities (for example, the enjoyment that nature lovers receive from trees planted by private lumber companies.)
- b. (5 points) Briefly describe a government policy that can partially or entirely eliminate the deadweight loss resulting from positive externalities.

Possible Answer: One possibility is a subsidy that would be received by consumers of the good. Another is a subsidy that would be received by producers of the good. The first policy would shift the private sector demand curve towards m; the second policy would shift the S-curve towards n.

- c. (10 points) Using your diagram and a distributional accounting ledger of the sort we have used in class, indicate the benefits, costs, and transfers that would result from implementing your policy.
- d. (5 points) Are there any benefits, costs, or transfers associated with your policy that do not show up explicitly in your diagram?

Possible Answer: A major cost that doesn't show up explicitly in the diagram is the cost of operating the subsidy program.

- e. (5 points) Does your policy pass the Kaldor-Hicks potential compensation test? Briefly explain.
4. (10 points) In making a decision about a proposed policy change, what major advantage does "pure" cost-benefit analysis offer over multigoal analysis? Given this advantage, why might multigoal analysis be used instead of pure cost-benefit analysis?

Potential Answer: With "pure" cost-benefit analysis, everything is expressed in dollars. Therefore benefits and costs can all be summed, and there is a single bottom line number. Hence, with pure CBA, it is much easier to make a decision concerning a policy than it is with multigoal analysis.

Pure CBA only addresses the goal of efficiency and can only be used if all benefits and costs can be expressed in monetary terms. If policy makers have goals other than efficiency (e.g., a more equal distribution of income) or all costs and benefits cannot be expressed in monetary terms,

multigoal analysis may be appropriate.

5. Suppose the Army Corps of Engineers has proposals for building six dams with the social benefits (B) and costs (C) listed as follows:

<u>Dam</u>	<u>B</u>	<u>C</u>	<u>Net</u> <u>Benefits</u>	<u>B-C</u> <u>Ratio</u>
1	40	20		
2	25	10		
3	30	20		
4	10	20		
5	15	10		
6	15	20		

- (5 points) Compute the net benefits and the benefit-cost ratio for each project and enter these figures in the table above.
- (5 points) If the dams were to be built on six separate rivers and the government wanted to maximize social welfare, how many of the dams should be built? Which ones should be built? Briefly explain.
- (5 points) If the dams were mutually exclusive (i.e., they are designed for the same river basin; thus, only one will be built), which one should be built? Briefly explain.

Possible Answer: Dam 1 is the one that should be built, even though Dam 2 has a higher benefit-cost ratio. The reason for building Dam 1 is that of the six listed, Dam 1 maximizes social net benefits.

Mid-Term Test

1. (10 points) What is the fundamental difference between cost-effectiveness analysis and cost-benefit analysis? As compared to "pure" cost-benefit analysis, what is the major disadvantage of cost-effectiveness analysis? Why then would cost-effectiveness analysis ever be used instead of cost-benefit analysis?

Possible answer: In CBA, at least in its pure form, all benefits and costs are measured in dollars, while in CEA, at least one benefit is quantified, but not monetized. Therefore, all benefits and costs are commensurable with one another in pure CBA and it is possible to obtain a single bottom line number and determine if a project passes the cost-benefit test (i.e., the Kaldor-Hicks test). The major disadvantage of cost-effectiveness analysis is that one cannot determine if the project passes the Kaldor-Hicks test because there is no bottom line number -- just a ratio. Nevertheless, CEA may be preferred to CBA if it is not possible to put a reliable monetary value on a project benefit or one is uncomfortable in doing so. It is still useful for comparing one project with another.

2. (5 points) A worker who is typical in all respects, works for a wage of \$20,000 per year in a perfectly safe occupation. Another typical worker does a job requiring exactly the same skills as the first worker, but in a risky occupation with a known death probability of 1 in 1,000 per year, and receives a wage of \$22,000 per year. What is the implied value of the life of a worker with these characteristics?

Possible answer: $\$22,000 - \$20,000 / .001 = \$2,000,000$

3. The Opera House in Budapest Hungary has been recently refurbished by the City at great expense. Imagine that another Eastern European city, such as Bucharest Romania, wanted to conduct a cost-benefit analysis of the Budapest experience to help determine whether they should refurbish their own opera house.
 - a. (5 points) The City of Budapest, which owns the Opera House, usually charges \$10 U.S. to attend events (usually operas or ballets) and typically attracts an audience of around 1,900, a little short of capacity. However, the City has occasionally charged a price of \$15 U.S., but found that attendance diminished to 1,500.
 Assuming that demand curves are linear, demonstrate how this information might be used to estimate the net benefits received by those attending a typical \$10 event at the Opera House. [NOTE: You need not compute the actual amount; just use a graph to indicate the area that represents the net benefit amount.]

- b. (10 points) By how much would the net benefits received by the Opera House audience change if the City increased ticket prices from \$10.00 to \$12.50 U.S.? [NOTE: This time compute the actual dollar value.]
- c. (10 points) In refurbishing the Opera House, the City used thousands of gallons of gilt paint. As Hungary is a small country, there was only one firm, a monopolist, from which they could buy this paint. Moreover, they purchased so much paint that the producer increased the price it charges. Using a diagram, discuss whether the City's budgetary expenditure on gilt paint is an appropriate measure of the social cost of the purchase or shadow pricing should be used in measuring the social cost.
- d. (5 point) The City employs 150 low-skilled workers at the Opera House to do cleaning and general maintenance work, paying them an amount equal to the Hungarian minimum wage of \$125 U.S. a month. As unemployment is high in Budapest, one can safely assume that if these persons were not employed by the Opera House, the number of unemployed persons would be 150 higher than it is. Compute a reasonable upper-bound estimate and a reasonable lower-bound estimate of the monthly dollar value of the social cost of employing these persons.

Possible Answer: UPPER BOUND: $\$125 \times 150 = \$18,750$

LOWER BOUND: $1/2 \times \$18,750 = \$9,375$

The true social cost is the value of the leisure lost by those unemployed. The upper bound is too high because most people who are willing to give up leisure to work for \$125 a month value their lost leisure at less than \$125. The lower bound is too low because it assumes that some unemployed persons have a reservation wage of zero.

- e. (10 points) As a result of refurbishing the Opera House, sales at local businesses (for example, restaurants and taxi companies) have expanded somewhat. Assuming that these businesses operate in highly competitive markets, as in fact is the case, do these expanded sales need to be taken explicitly into account in the cost-benefit analysis? Briefly explain why or why not.

Possible Answer: If the increased demand for the services of local businesses doesn't drive up their price, which seems likely, these purchases do not have to be taken into account in estimating the benefits and cost resulting from building the pool. This also presumes that there are no important distortions in these markets. (Because the question indicates that these markets are competitive, this is a reasonable assumption to make.) Given an absence of price increases and market distortions, impacts in secondary markets, such as those for restaurants and taxis, will be fully captured by the demand curve in the primary market. If prices are driven up in the secondary markets, the purchases still do not have to be taken into account as the demand curve in the primary market in question 1.a is an equilibrium demand curve.

- f. (5 point) Over half of a typical audience at the Opera House is made up of tourist and other foreigners, rather than Hungarians. Does this affect the way the benefits measured in part (a) of this question should be treated in the cost-benefit analysis? Briefly explain. [Note: in your answer, mention the name of the issue raised by the fact that much of the Opera House audience is non-Hungarian.]

Possible Answer: The issue here concerns standing. A decision will have to be made as to whether foreigners should receive standing and, hence, whether the surplus that they gain from attending events at the Opera House should be counted in the cost-benefit study. This is a judgment call. [One further point, but nothing was marked off for not mentioning this: if benefits received by foreigners are not counted, then their purchases from local businesses might be counted, but only if there are in producer surplus by local businesses.]

4. The following two questions concern **negative** externalities:
- (5 points) Use a diagram to illustrate the deadweight loss that, in the absence of government intervention, results from a negative externality such as pollution emitted from a factory.
 - (10 points) Using your diagram and a distributional accounting ledger of the sort we have used in class, indicate the benefits, costs, and transfers that would result if the government implements a policy that requires the owners of the factory to pay a tax equal to the amount of the costs the pollution imposes on third parties.
5. (5 points) The following table, in which all figures are in millions of dollars, summarizes the results of recent cost-benefit analyses of five government projects:

<u>Project</u>	<u>Social Benefits</u>	<u>Social Costs</u>
A	\$100	\$125
B	110	100
C	100	30
D	250	125
E	200	100

If these projects are mutually exclusive (i.e., only one can be undertaken), which one should be selected according to the Kaldor-Hicks criterion? Briefly explain.

Possible Answer: Following the Kaldor-Hicks rule, Project D should be the one selected as it has the largest net benefits -- 125. Note, however, that Project C has a larger benefit-cost ratio.

6. As discussed in class and in the article by Lichtenberg and Zilberman, one way of supporting farmers is to place agricultural markets under target pricing.
- a. (5 points) Using demand and supply curve diagrams, compare the surplus farmers (i.e., producers) receive under target pricing with the surplus they would receive in a competitive market in which there is no target pricing. In which situation are they likely to receive the larger amount of surplus?

You can also respond to this question using separate graphs for the target price case and the no target price case.

Possible Answer: Surplus will be greater in the target price case. That, of course is why farmers want target prices to begin with.

- b. (5 points) Consider now the imposition of a pesticide regulation by a government agency. Re-drawing the diagrams you used in part (a), compare how this regulation would change the producer surplus received by farmers under target pricing with the change in producer surplus in a competitive market without target pricing. In which situation are farmers likely to be the more resistant to the imposition a pesticide regulation? Very briefly explain.

Possible Answer: Farmers will be more resistant to the imposition of a pesticide regulation under target pricing because they are unable to respond to the higher costs imposed by the regulation by increasing their prices.

7. (10 points) Is a proposed change in public policy more likely to be able to meet the Pareto efficiency criterion or the Kaldor-Hicks criterion? Briefly explain.

*Possible Answer: The Kaldor-Hicks criterion is always more likely to be met. The Pareto efficiency criterion can only be met if the policy change does not make anyone worse off. The Kaldor-Hicks criterion can be met if those who are made better off could **POTENTIALLY** compensate those who are worse off for their losses. However, no actual compensation need take place. Therefore, it is only necessary that benefits under the change exceed costs.*

Economics 405/605

NAME: _____

First Test

1. The following questions all concern information asymmetry:

- a. (15 points) Using a diagram and a distributional accounting ledger of the sort we have used in class, indicate the benefits, costs, and transfers that would result from implementing a government policy that eliminates information asymmetry in a product market.
- b. (5 points) Mention any benefits, costs, and transfers associated with your policy that do not explicitly show up in your diagram.

Possible Answer: A government policy that eliminated information asymmetry in a product market would usually involve obtaining information about the product and disseminating the information to buyers of the product. This effort would result in costs to the government that do not show up in the diagram.

- c. (5 points) Is government intervention always needed when information asymmetry occurs or is it sometimes self-correcting? Briefly explain.

Possible Answer: No, government intervention is not always needed. It can be self-correcting if individuals can obtain the information for themselves at not too great a cost or third parties arise that provide the information at not too great a cost. This is likely to occur in the case of search goods or experience goods, but not in the case of post-experience goods.

2. The Opera House in Budapest Hungary has been recently refurbished by the City at great expense. Imagine that another Eastern European city, such as Bucharest Romania, wanted to conduct a cost-benefit analysis of the Budapest experience to help determine whether they should refurbish their own opera house.

- a. (15 points) The City of Budapest, which owns the Opera House, usually charges \$10 U.S. to attend events (usually operas or ballets) and typically attracts an audience of around 2,000, a little short of capacity. However, the City has occasionally charged a price of \$15 U.S., but found that attendance diminished to 1,500.

Assuming that the demand curve for events at the Opera House is linear, demonstrate how this information might be used to estimate the net benefits received by those attending a typical \$10 event at the Opera House. [NOTE: You need not compute the actual amount; just use a graph and clearly indicate the area that represents the net benefit amount.]

- b. (10 points) By how much would the net benefits received by the Opera House audience change if the City increased ticket prices from \$10.00 to \$12.50 U.S.? [NOTE: This time compute the actual dollar value.]
- c. (10 points) In refurbishing the Opera House, the City used thousands of gallons of gilt paint. As Hungary is a small country, there was only one firm, a monopolist, from which they could buy this paint. Moreover, they purchased so much paint that the producer increased the price it charges. Using a diagram, discuss whether the City's budgetary expenditure on gilt paint is an appropriate measure of the social cost of the purchase or shadow pricing should be used in measuring the social cost.
- d. (10 point) The City employs 150 low-skilled workers at the Opera House to do cleaning and general maintenance work, paying them an amount equal to the Hungarian minimum wage of \$125 U.S. a month. As unemployment is high in Budapest, one can safely assume that if these persons were not employed by the Opera House, the number of unemployed persons would be 150 higher than it is. Compute a reasonable upper-bound estimate and a reasonable lower-bound estimate of the monthly dollar value of the social cost of employing these persons.

*Possible Answer: UPPER BOUND: $\$125 \times 150 = \$18,750$ [government's budgetary cost]
 LOWER BOUND: $1/2 \times \$18,750 = \$9,375$ [assumes that the lowest reservation wage in the market is zero].*

The true social cost is the value of the leisure lost by those unemployed. The upper bound is too high because most people who are willing to give up leisure to work for \$125 a month value their lost leisure at less than \$125. The lower bound is too low because it assumes that some unemployed persons have a reservation wage of zero.

- 3. (10 points) In making a decision about a proposed policy change, what major advantage does "pure" cost-benefit analysis offer over qualitative cost-benefit analysis? Given this advantage, why might qualitative cost-benefit analysis be used instead of pure cost-benefit analysis?

Possible Answer: In pure CBA all benefits and costs are measured in dollars, while in qualitative CBA, at least one benefit is not monetized. Therefore, all benefits and costs are commensurable with one another in pure CBA and it is possible to obtain a single bottom line number and determine if a project passes the cost-benefit test (i.e., the Kaldor-Hicks test). The major disadvantage of qualitative CBA is that one may not be able to determine if the project passes the Kaldor-Hicks test because there is no bottom line number. Nevertheless, qualitative CBA may be preferred to pure CBA if it is not possible to put a reliable monetary value on a project benefit or one is uncomfortable in doing so. It is still useful in assessing projects. It is especially useful if those benefits and costs that cannot be monetized seem to point in the same direction as the net benefit estimate obtained from those benefits and costs that can be monetized.

4. (10 points) Briefly compare *ex ante* cost-benefit analysis with *ex post* cost-benefit analysis by indicating the major purpose or purposes served by conducting each type of analysis.

Possible Answer: Ex ante CBA is conducted prior to implementing a project, policy, or program, while ex post CBA is conducted after implementation. Ex ante CBA can be used to help make a decision on whether to adopt a specific project, policy, or program. Ex post CBA provides information that is helpful in measuring benefits and costs in conducting an ex ante CBA. It can also provide information on a whole class of policies -- for example, whether regulation of a particular industry is unlikely to be cost-effective.

5. (10 points) Is a proposed change in public policy more likely to be able to meet the Pareto efficiency criterion or the Kaldor-Hicks criterion? Briefly explain.

*Possible Answer: The Kaldor-Hicks criterion is always more likely to be met. The Pareto efficiency criterion can only be met if the policy change does not make anyone worse off. The Kaldor-Hicks criterion can be met if those who are made better off could **POTENTIALLY** compensate those who are worse off for their losses. However, no actual compensation need take place. Therefore, it is only necessary that benefits under the change exceed costs.*

Economics 405

NAME: _____

First Test

1. Thanks to a new federal program that will provide 50% matching funds Fun City has decided to build a new municipal water park with pools, water slides, and so forth if it can pass the Kaldor-Hicks potential compensation test. You have been hired to conduct a study to determine if the water park can pass the test.
 - a. (10 points) A nearby and very similar city currently has a water park similar to the one Fun City is considering. The nearby city currently charges \$10 for admission and, on a typical day, attracts 4,000 persons. Last year, it charged \$15, but only attracted 3,000 paying customers. Assuming that the demand curve for water parks is linear, demonstrate how this information might be used to estimate the net benefits received by those using the Fun City water park, if Fun City charges an admission price of \$12.50. [NOTE: You need not compute the actual amount; just use a graph and clearly indicate the area that represents the net benefit amount.]
 - b. (10 points) By how much, and in what direction, would the net benefits received by those using the water park change if Fun City charges a \$15.00 admission price, rather than \$12.50? [NOTE: This time compute the actual dollar value.]
 - c. (5 points) What sort of decisions concerning standing would have to be made in conducting your study? How might these decisions affect whether or not the park passes the Kaldor-Hicks potential compensation test?
 - d. (10 points) To build the water park, Fun City would have to purchase concrete from an essentially competitive market. As a result of this purchase, the price of concrete would increase slightly. Can the city's budgetary expenditure on concrete be appropriately used as the measure of the social value of the cost that would result from its purchase of concrete? Or is shadow-pricing necessary? Briefly explain. [In answering this question, demonstrate that you know what shadow pricing is and use a diagram to illustrate your discussion.]
 - e. (10 points) The land on which the city would build the water park was recently occupied by old buildings that have been torn down. If the city does not build the park, the owners of the land will sell the land to individuals who will build small retail establishments. If the park is built, the city will pay exactly the same amount for the land that the private individuals would have paid. Using a diagram and providing a brief explanation, indicate the social opportunity cost of purchasing the land for the park.
2. The following questions concern **positive** externalities:

- a. (5 points) Use a diagram to illustrate the deadweight loss that, in the absence of government intervention, results from positive externalities (for example, the enjoyment that nature lovers receive from trees planted by private lumber companies.)
 - b. (10 points) Using your diagram and a distributional accounting ledger of the sort we have used in class, indicate the benefits, costs, and transfers that would result if the government implements a subsidy policy that entirely eliminates the deadweight loss resulting from the positive externality. [Please draw your diagram clearly so I can identify what you are doing.]
3. (10 points) In making a decision about a proposed policy change, what major advantage or advantages does "pure" cost-benefit analysis offer over cost-effectiveness analysis? Given these advantages, why is cost-effectiveness analysis sometimes used in practice instead of pure cost-benefit analysis?
4. (5 points) Suppose project A has social benefits of \$500,000 and social costs of \$250,000, while project B has social benefits of \$200,000 and social costs of \$60,000.

First, compute the net social benefits and cost-benefit ratio for each of these project. Then indicate which of the two projects should be selected according to the Kaldor-Hicks criterion, if they are mutually exclusive (i.e., only one can be undertaken). Briefly explain.
5. (10 points) Is a proposed change in public policy more likely to be able to meet the Pareto efficiency criterion or the Kaldor-Hicks criterion? Briefly explain, using a diagram if you can.
6. (10 points) Assume that the price of wheat is artificially supported at a level above the competitive market price, and that this higher price, which is called a "target price," is the one farmers look to in making their production decisions. The wheat is sold at the price required to induce consumers to purchase all that farmers produce. The government uses tax revenues to pay farmers the difference between this price and the target price (recall Lichtenberg-Zilberman study). Now, suppose a new dam is built that produces water for irrigation, thereby increasing the productivity of the farms using the water. One can think of this new source of water as shifting downward the supply curve of wheat to the right.

Would building the dam cause the tax revenues paid to farmers to increase or decrease? Shade in the areas on a graph that represent the change in tax revenues paid to farmers that results from building the dam.

Economics 605
Mid-term Test

NAME: _____

1. Suppose that Dryville, a town of 50,000 persons, does not currently have a public swimming pool, but, encouraged by an offer from the state government to pay 50% of the construction costs, is considering building one. Further suppose that you have been selected to analyze the benefits and costs of building such a pool.
- a. (5 points) Although Dryville has no experience with a public pool, assume that you have collected data from several towns that are very similar to Dryville and that do have a public swimming pool. For each town, you know what fee it charged last summer per visit and how many visits it had. These data appear below:

<u>TOWN</u>	<u>FEE</u>	<u>NO. OF VISITS</u>
A	\$2.00	175,000
B	\$4.00	125,000
C	\$1.00	200,000

Using a diagram, indicate how you might utilize these data to predict the net benefits **received by users** of the pool if Dryville was to charge a fee of \$1.00 to swim in the pool. [NOTE: You need not compute this amount; just indicate clearly the area on the graph that represents the net benefit amount.]

- b. (10 points) Suppose that the marginal costs of operating the pool after it is built is constant at \$1.00 (i.e., the marginal cost curve is horizontal), but Dryville increases the fee from \$1.00 to \$2.00. What are the net **social** benefits or costs resulting from this increase. [NOTE: This time compute the actual dollar value.]
- c. (10 points) Suppose Dryville purchases the land needed for the swimming pool at the market price from private developers who would have otherwise have sold the land to families who would have built houses for themselves on it. Assume that a fixed quantity of land was needed and that this land was vacant when purchased. Does the dollar amount that Dryville pays for the land adequately measure the land's social value? Is shadow pricing needed to measure the social value of the land? Please explain. [In answering this question, please be as specific as possible and use a diagram.]
- d. (10 points) Construction of the pool would result in the citizens of Dryville purchasing more bathing suits and sun tan lotion than they would without the pool. Do these purchases need to be explicitly taken into account in estimating the benefits and costs resulting from building the pool? Please explain, mentioning any factors that might be important in determining whether or not the purchases need to be taken into account.
- e. (5 points) What sort of decisions concerning standing would have to be made in conducting the cost-benefit study? How might these decisions influence whether the project passes the benefit-cost test?

2. The following questions concern **negative** externalities:

- a. (5 points) Use a diagram to illustrate the deadweight loss that, in the absence of government intervention, results from negative externalities (for example, pollution emitted by a factory).
 - b. (10 points) Using your diagram and a distributional accounting ledger of the sort we have used in class, indicate the benefits, costs, and transfers that would result if the government implements a tax that entirely eliminates the deadweight loss resulting from the negative externality. [Please draw your diagram clearly so I can identify what you are doing.]
3. (10 points) In the Weimer/Vining cost-benefit analysis of a proposal for a tax on alcohol, what is the argument used to suggest that in estimating the benefits of a tax on alcohol, reductions in fatalities among drivers might need to be treated differently than reductions in fatalities among non-drivers.

Possible Answer: The argument involves double counting and externalities. If drivers are aware of the increased probability that they have an accident if they drink and drive, then they should incorporate the potential cost of the accident to them into their demand for alcohol. Therefore, double counting would result if the value of driver's lives saved were separately counted in measuring the benefits of the tax. But costs imposed on non-drivers killed by the drinking drivers will not be incorporated into the driver's demand curve for alcohol – it's a negative externality. Hence, the lives of non-drivers saved as a result of the tax should be counted as a benefit.

Alternatively:

Consider the Weimer/Vining cost-benefit analysis of a proposal for a tax on alcohol, justified on the basis of reducing alcohol-related automobile accidents.

- a. (5 points) In estimating the loss of economic well-being in the alcohol market due to the tax, the analysts use an elasticity of demand for beer consumption of .5, claiming that it is "conservative." What is the basis for this claim? Is there any way in which the assumption is "liberal"?
 - b. (5 points) In estimating the loss of economic well-being in the alcohol market due to the tax, the analysts subtract the tax revenue collected from the loss of consumer surplus due to the tax. Why?
4. A city is planning a new convention center and has received bids from two contractors. The center one contractor proposed would cost \$10,000,000 to build plus upkeep of \$150,000 per year for its expected 30-year life span. Annual revenues are anticipated to be \$1,000,000. Salvage value at the end of the 30 years is expected to be zero. The second contractor proposes a larger facility at an initial cost of \$20,000,000. This facility will also have an expected life span of 30 years and maintenance costs will be \$400,000 per year. Annual earnings for this facility are anticipated to be \$2,625,000. Finally, it is anticipated that at the end of the 30 years the entire structure will have to be torn down at a cost of \$5,000,000.

- a. (10 points) If the real social discount rate is assumed to be 7%, should the city build either facility? If so, which one? Please briefly explain the basis for your conclusions, providing sufficient information so that I can tell how you arrived at your decision. In answering these questions, assume that all the relevant benefits and costs are listed above, all the benefits and costs (with the exception of the initial construction cost) are realized at the end of each year, and all the benefits and costs are measured in real terms.
 - b. (5 points) Now, imagine that you just discovered that the 7 percent figure in (a) is actually the nominal social discount rate. Assuming the rate of inflation is currently stable at 2 percent, what social discount rate should you use?
5. (5 points) Changes in consumer surplus, as measured by areas under empirically estimated Marshallian demand curves, are often used in cost-benefit analysis to estimate consumer willingness-to-pay for a favorable price change or to avoid an unfavorable price change. In those cases when the relevant Marshallian demand curve is known, but the relevant Hicksian demand curve is not known, is this a reasonable thing to do? Please explain.
 6. (5 points) In making a decision about a proposed policy change, what major advantage does "pure" cost-benefit analysis offer over qualitative cost-benefit analysis? Given this advantage, why might qualitative cost-benefit analysis be used instead of pure cost-benefit analysis?
 7. (5 points) Suppose project A has social benefits of \$1,000,000 and social costs of \$500,000, while project B has social benefits of \$300,000 and social costs of \$100,000.

First, compute the net social benefits and cost-benefit ratio for each of these project. Then indicate which of the two projects should be selected according to the Kaldor-Hicks criterion, if they are mutually exclusive (i.e., only one can be undertaken). Briefly explain.

Possible Answer:

	<u>Net Benefits</u>	<u>B/C Ratio</u>
Project A	\$500,000	2.0
Project B	\$200,000	3.0

The Kaldor-Hicks criterion is that net benefits should be maximized. Therefore, Project A should be selected, even though Project B has a larger B/C ratio.

8. (5 points) Is a proposed change in public policy more likely to be able to meet the Pareto efficiency criterion or the Kaldor-Hicks criterion? Please briefly explain.