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Exam 2
Spring 2007

DO NOT OPEN THIS EXAM UNTIL YOU ARE TOLD TO DO SO.

Instructions

Write your SUID in the upper right corner of this exam. Do NOT write your name.

SHOW ALL YOUR WORK. Answers without supporting work will receive little or no credit.

Do all your work on this exam. If you need extra space, write on the backs of the pages. However, if you do write an answer on the back of a page, *be sure you've noted that near the question*.

There are 80 points on the exam and you'll have 80 minutes to work on it. Budget your time accordingly.

Some helpful PV formulas:

$$(1) \ \frac{B}{(1+r)^t} \qquad\qquad\qquad (2) \ \frac{B}{r}$$

Part 1 (30 points total)

A consumer buys two goods, C and D. The C and D stand for "clean" and "dirty": the C good is environmentally friendly (clean) and the D good involves a lot of pollution (dirty). Her preferences can be represented by the Cobb-Douglas utility function shown below. Also shown are her demand equations and her expenditure function.

$$U = C^{0.6} * D^{0.4}$$
$$C = 0.6*M/Pc$$
$$D = 0.4*M/Pd$$
$$M = U * (Pc/0.6)^{0.6} * (Pd/0.4)^{0.4}$$

Initially Pc = $15, Pd = $20, and she spends $10,000 on the two goods in total.

Question 1a (10 points)

Solve for her initial consumption of C and D. Draw her budget constraint and include the numerical values of its intercepts. Also sketch several of her indifference curves and show her initial equilibrium on the diagram. Be sure to show your work and label everything.

Question 1b (10 points)

Now suppose that the government wants to *increase* consumption of *C* while simultaneously *decreasing* consumption of *D*. An analyst proposes a combined tax and subsidy policy: there would be a *$10 tax* on each unit of D and a *$5 subsidy* on each unit of C (please note that the two numbers are not the same). The analyst argues that the policy's tax revenue would just equal the subsidy.

How much does the policy change consumption of C and D? How effective is it at changing C and D in percentage terms? How much does it raise in tax revenue? How much is spent on the subsidy? What is the overall effect on the government's budget? Briefly explain what the analyst must have done wrong in calculating that the effects would balance out.

Question 1c, (10 points)

What is the CV associated with the policy? Is the consumer better off or worse off? Discuss the relationship between the CV and the net effect on the government's budget. Be quantitative wherever possible.

Part 2 (30 points total)

A city has an old elevated highway that will need substantial maintenance soon. The highway department believes that the maintenance will take 4 years (years 1-4) and will cost $80 million per year. Call this "Plan A".

Several community groups dislike the highway because it is ugly, noisy and divides nearby neighborhoods. They have been arguing that the city should remove it instead. They propose "Plan B": the city would tear down the highway and widen a number of surface streets to accommodate additional traffic. Tearing down the highway would take 2 years (years 1 and 2) and would cost $50 million per year. Widening the surface streets would be harder: it would cost $30 million per year and would take 10 years (years 1-10: it could be done simultaneously with tearing down the old highway.)

Question 2a (15 points)

Please draw cash flow diagrams for the two plans and evaluate the present value cost of each. What is the difference in the costs? Throughout the problem you should use 5% as the interest rate.

Question 2b (15 points)

The community groups argue that Plan B would be better for the city in the long run. They claim that the downtown area will prosper and property tax revenue will rise once the project is complete. However, they are not sure exactly how much new revenue will be generated. Assuming that $X of extra revenue begin to arriving in year 11 and continue forever, how large would the X have to be to make the net present value of Plan B better than that of Plan A?

Part 3 (10 points)

Suppose that an industry is currently protected from international competition by an import quota like the one used for sugar. A study has shown that this particular quota is very inefficient, and the government would like to remove it. However, eliminating the quotas would cause 10,000 employees to lose their jobs. The employees would be able to find new jobs in other industries, but they would be end up having to take jobs paying $20,000 a year less. The employees are represented by a powerful union that could block any change in policy that made its members worse off.

To solve the problem, an analyst has proposed creating a trust fund to compensate the employees for the effects of eliminating the quota. The fund would pay each of the 10,000 employees the $20,000 difference in salary every year for the rest of their working lives. If a typical employee has 30 years of work remaining (years 1-30), how much money would need to be deposited in the trust fund? If the cost of the quota to consumers is $250 million per year (in CS or CV), what is the net present value of the policy? Please use an interest rate of 5%.

Part 4 (10 points)

Do economists believe people are always rational? Discuss.