University of Toronto
Economics 336Y – Public Finance (Expenditures)

Christmas examination
6 December 2004

General Instructions: Write your name in block (capital) letters and your student number on all exam booklets you use. If you use additional booklets, place them inside the first one before handing them in. You may use pocket calculators (but you won't need to). You must not refer to books, computers, or any other aids. You have 110 minutes. Allocate your time appropriately, and be sure to attempt all parts of all the questions you choose. This exam will be graded out of 100 points.

*Part A. Short-answer questions: Answer **SIX** of the following **EIGHT** questions. Keep your answers very brief. Be careful to answer all of each question you choose: most have two parts. (Each question is worth 10 points. Total: 60 points.)*

1. TRUE, FALSE, or UNCERTAIN: According to the *Samuelson condition*, there is a unique level of spending on a pure public good which is *Pareto efficient*. Explain your answer, and define the terms in italics.

FALSE. Samuelson condition: sum of MRS equals MRT. Pareto efficiency: it is not possible to one individual better off without harming another. There may be many levels of the public good that are consistent with the Samuelson condition, depending on the distribution of income and its effect on aggregate willingness to pay.

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2. A good that is *non-excludable* in consumption is unlikely to be provided by private firms in the absence of government intervention. While a *non-rival* good may be provided by private firms, it is likely that too little of it will be provided in the absence of government intervention. Explain your answer, and define the terms in italics.

TRUE. A good is non-excludable if it is costly to supply it some consumers and not others. A good is non-rival if the marginal cost of supply additional consumers is small or zero. Because private property rights can be established in the latter case but not the former, private provbision is more likely in the latter.

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3. "The Microsoft Corporation may earn large monopoly profits, but that is a just reward for past research and development investments. A monopolist that can capture all the benefits from its inventions has efficient incentives to invest in R&D." Do you agree with this statement? Construct a numerical or graphical example to show whether a monopolist chooses the socially optimal level of investment in developing a new product.

The statement is false. A monopolist captures some of the benefits of invesdtment in the form of profit, but in general some benefits accrue to others as consumer surplus. Therefore, a monopolist invests too little in research.

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4. "Some customers of Ontario Hydro (the electric utility) pay more for their power than others do. Not only is this unfair, it is also inefficient, since efficiency requires all firms and consumers face the same prices." Do you agree with this claim? Explain your reasoning and, in particular, explain your assumptions about the budget constraint of Ontario Hydro.

Electrical transmission is a natural monopoly: average cost exceeds marginal cost. If the utility is permitted to run a deficit, then efficiency requires $p = MC$ for all customers. If prices must rise to cover average costs, then higher prices should be charged in segments of the market in which demand is less price-elastic.

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5. Explain how levels of carbon dioxide emissions are to be allocated among countries under the Kyoto protocol. What advantages does this system have over a traditional command-and-control solution? Discuss and compare two policy options available to Canada for meeting its commitments to reduce emissions under the treaty.

Under the Kyoto protocol, countries are initially allocated rights to emit CO_2, which can then be traded among countries in a market. This allows emission abatement to be done by countries that find it cheapest to do so. Canada could therefore meet its commitments by reducing emissions domestically (either through emissions taxes or by imposing regulations on firms, for example), or by purchasing permits in the international market. Studies show that costs of the latter option are apt to be lower. Notice that both options will result in the same level of global emissions.

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6. A polluting activity causes environmental damage. Explain how government can design a *Pigouvian tax* to restore efficiency, even if polluters' costs of abating pollution are not known by government. At what level should the tax be set? *Now give one example in which, in contrast to the standard theory, a Pigouvian tax on pollution alone might not lead to an efficient level of pollution.*

According to the standard theory, government should the tax equal to the marginal damage caused by pollution, irrespective of the costs of abatement. This sets polluters' private marginal cost equal to social marginal cost. However, a Pigouvian tax on pollution alone might not be sufficient to induce polluters to pay the *fixed costs* of new abatement technologies. In the absence of a subsidy to abatement capital, there might be too much pollution with an optimal Pigouvian tax. (Students might use a graph of two total cost curves associated with two technologies. If so, they should demonstrate they understand the problem of non-convexities here.)

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7. According to the *Coase theorem*, should air polluters have the right to emit pollution, or should victims have a right to clean air? Explain your answer. *Name one other factor, not considered in the Coase theorem, that would cause you to change your answer, and explain why.*

According to the Coase theorem, initial assignment of property rights is irrelevant, since polluter and victim will bargain to an efficient allocation. If the polluter has the right to pollute, then the victim can compensate for abatement up to the point where the marginal damage of pollution equals the marginal cost of abatement. Similarly, if the victim has the property rights, then the polluter can compensate for pollution up to the same point. But property rights may not be irrelevant if: (i) there is asymmetric information about the costs of pollution or of abatement, (ii) if there is a free-rider problem in bargaining because there are many polluters or victims, or (iii) compensation causes too much investment by either polluter or victim.

8. A group of 3 parents meets to determine the level of spending on education in their (small!) school district. Spending may be low, medium, or high, labelled $l < m < h$. One parent, named L, ranks the alternatives as $l \succ m \succ h$ (where $\succ$ means "is preferred to") and another, named M, ranks them as $m \succ l \succ h$. The third parent wants high spending h, but if this is not available in the public system she will purchase private education instead; her ranking is therefore $h \succ l \succ m$. Does a *majority voting equilibrium* level of spending exist? If so, what is it? If not, why not?

A majority voting equilibrium is a level of spending that defeats all alternatives in a majority vote. A MVE may not exist with opt-out. Since l beats m (supported by L and H) and l beats h (supported by L and M), l is a MVE.

*Part B. Problem-solving question: You **must** answer the following question. (Total: 40 points.)*

9. (a) In 2001, government spending in Canada equalled almost 39 per cent of Gross Domestic Product, compared to 19 per cent of GDP in 1950. Suggest *three* factors that have contributed to this growth in the size of government. (You may wish to cite the views of Dennis Mueller, 1989, "The size of government.") Does your answer suggest that government decisions reflect the preferences of a majority of voters, or other considerations? *(20 points)*

   (b) The federal government is trying to decide how many hours G of new Canadian programming to produce for broadcast on CBC television next year. Surveys have determined that only three people watch the CBC in total, two with demand curves given by

$$G_i = 15 - p_i \quad (i = 1, 2)$$

   where p_i is the price the individual pays for each hour of programming; and the third with demand curve

$$G_3 = 100 - p_3.$$

   Calculate the *Pareto efficient* level of new programming G^*, when the marginal cost of an hour of new programming is 100 units of private consumption per hour (that is, the marginal rate of transformation is 100). *(10 points)*

   (c) In the model of part (b), suppose that the government instead holds a referendum among the three CBC viewers to determine how much new programming will be provided. If each voter expects to pay an equal share (one-third) of the total cost through the tax system, what do you expect will be the *majority voting equilibrium* level $\hat{G}$ of new programming? Explain why G^* and $\hat{G}$ differ, and comment on the use of democratic decision-making procedures in such cases. *(10 points)*

(a) Mueller discusses the following factors that might have led government to grow. His arguments are divided according to views of government's primary role in the economy.

   i. Government provides public goods:

      A. price changes: if the relative price of public goods has risen and demand is inelastic, or the price has fallen and demand is elastic, then total spending should have risen

      B. taste changes: government services may be more important now than before; further, income increases may boost government's share in GDP if income elasticity of government services is greater than one.

   ii. Government redistributes income and wealth:

      A. Median voter models: as suffrage is extended to poorer people, the median voter becomes poorer. The model therefore predicts the extent of redistribution will rise.

      B. Inequality: If inequality rises, the same model predicts a rise in redistribution.

   iii. Government is the tool of interest groups:

      A. Log-rolling: According to some, log-rolling leads to more proposals being passed than is efficient. If log-rolling has become more prevalent over time, then government would have grown.

      B. Effectiveness of interest groups: The number of lobby groups has risen over time.

   iv. Bureaucracy controls government: If bureaucrats want larger government, they may have been more successful in controlling decision-making over time.

(b) Summing demand curves vertically gives aggregate marginal willingness to pay (marginal rate of substitution) $W(G) = 130 - 3G$. Thus

$$130 - 3G^* = 100$$

or $G^* = 10$.

(c) The tax price for each voter is 33.33 per hour, which exceeds the marginal willingness to pay for the first two consumers. Hence the majority voting equiibrium level of spending is zero. The problem with voting is that it does not allow voter 3 to express the intensity of his/her preference for the public good.