

Exam AREP 201, Fall 2002

Attempt to answer all questions. All questions have equal weight. Your explanations should be brief and to the point. In some cases it helps to use a theorem to sharpen your explanation. The role of the theorem must be clear, but you do not need to prove the theorem. Where you use graphs be sure to label the axes.

1. An undistorted economy moves from autarchy to free trade. World prices differ from autarchic prices. State and explain the effects of this change on the real return to labor in: (i) the Ricardian model, (ii) the H-O-S model, and (iii) the Ricardo-Viner (sector-specific factors) model.
2. Use a two-commodity two-country trade model. (i) Explain why there may be multiple competitive (free trade) equilibria. (ii) Explain what is meant by a “stable equilibrium”. (iii) Explain how the stability assumption is used in comparative statics experiments.
3. Consider a two-commodity two-factor (capital and labor) H-O-S model. A small country imposes a fixed tariff; there are no other distortions. The country receives a gift of capital from a foreign donor. Give a necessary condition for this gift to lower the recipient’s welfare. Give a sufficient condition. (Explain.)
4. Use a partial equilibrium model. A small country imports corn. The *import* of corn creates a negative externality for the importing country of  $\$ \gamma$  per unit of imports. (There are no other distortions.) (i) What is the first-best policy? (Tell me the type of policy and the level of the first best policy.) (ii) Suppose that the only available policy instrument is a production policy. Should corn production be taxed or subsidized? Determine the optimal production tax/subsidy and compare to the level of the first best policy.

## Sketch of answers

1. (i) Under trade the country is specialized. Use 0 profit conditions to show that one of the ratios  $\frac{w}{p_i}$  has increased and the other is unchanged, so real return has increased. Alternatively, show that national welfare has increased and say that in this model labor obtains all of national income. (ii) Use Stolper-Samuelson to conclude that if the relative price of labor intensive good has increased, real return to labor has increased. The country exports labor intensive good iff the world price of that good is higher than the autarkic price. (iii) Use a graph as in Notes #5 to show that one ratio  $\frac{w}{p_i}$  increases and the other decreases, so change in real return to labor is ambiguous.

2. (i) One country's excess supply (= its export supply) of a good may not be monotonic in price, because the income effect counteracts the substitution and production effects. Therefore, the world excess demand (= one country's demand for imports of the commodity, minus the other country's supply of exports of that commodity) may not be monotonic. Consequently there may be more than one price at which world excess demand is 0. (ii) At a stable equilibrium world excess demand slopes down. Tell a (short) story about Walrasian auctioneer: If we begin with a price near a stable equilibrium, the tatonnement converges to that equilibrium. If we begin at a price near an unstable equilibrium, the adjustment process moves us away from that equilibrium. (iii) The stability assumption is used to sign the denominator in a comparative statics expression. You could make the same point by shifting a graph, and showing how the zero changes, depending on whether we look at a point at which the graph is increasing or decreasing.

3. This is the example that I went over near the end of Notes #3. A necessary condition for the gift of capital to lower welfare is that the imported good is relatively capital intensive. Ryb... theorem says that the increased stock of capital decreases production of the labor intensive export good. Since too little of the export good was initially produced (because of the tariff), the increase in capital increases a distortion. A sufficient condition is that the BOP constraint is steeper than the Full Employment of Labor constraint (if you draw your figure as described in Notes #3); this occurs if the tariff is large and the economy remains incompletely specialized. Show that an increase in the stock of capital shifts the economy up the full

employment line for labor, thereby causing the BOP line to shift in, reducing the value of domestic production at world prices.

4. Invoke Principal of targeting to conclude that first best policy is a tariff. You can show graphically that the level of the optimal tariff is  $\gamma$ . Do this by recognizing the the social marginal benefits of imports is  $\gamma$  lower than the import demand curve. In order to induce the socially optimal level of imports, the domestic price must be  $\gamma$  higher than the world price. (ii) Everybody saw that the optimal production policy was a subsidy, in order to reduce imports. The one tricky part of the exam was to determine the level. I expected most people to make one of the following kinds of arguments: (a) Since the production subsidy creates a secondary distortion, the optimal subsidy is less than  $\gamma$ . (b) A given level of the subsidy reduces imports by less than a tariff of the same magnitude. In order to compensate for this lack of effectiveness, it is necessary to use a subsidy that is larger than  $\gamma$ .

Both of these stories are wrong, but if you said something like either of them, I gave you a lot of credit, because you were at least thinking about the question.

The right answer is that the optimal production subsidy is  $\gamma$ . The first-best policy raises the price to both consumers and producers by  $\gamma$ . (In the absence of any policy, the consumer price and the producer price are both too low, by the amount  $\gamma$ .) The production policy can affect prices only of producers. This policy has no effect on consumer behavior, since the consumer price is fixed at the world price. The production policy cannot be used to affect the consumer price. Therefore, the best that can be done using a production policy is to set the producer price at the “right” level – the world price plus  $\gamma$ .

This point might not be obvious. This is an example of a situation where a little mathematics helps. The welfare cost associated with producer price of  $p^*$  is

$$\Delta(p^*) = \left[ S(p^*) (p^* - p^w) - \int_{p^w}^{p^*} S(p) dp \right] + \gamma (S(p^w) - S(p^*)).$$

The term in square brackets is the cost to the treasury of the subsidy minus the increase in producer surplus. The second term is the social cost of imports. We do not have to include consumer welfare in the objective, since consumer welfare is constant (because the consumer price is constant).

Setting

$$\frac{d\Delta}{dp^*} = 0$$

implies

$$S'(p^*) (p^* - p^w) - \gamma S'(p^*) = 0$$

which implies that the optimal production subsidy is  $\gamma$ .