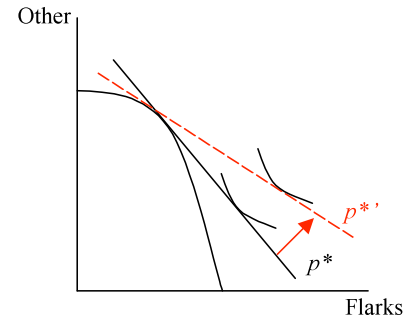


Final Exam - Answers
August 15, 2003

Answer all questions, in blue book. Plan and budget your time. The questions are worth a total of 100 points, as indicated, and you will have 120 minutes to complete the exam.

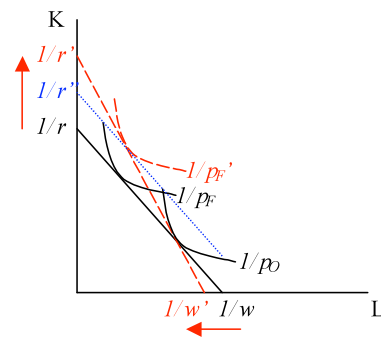
1. [25 points] You are an economic advisor to Ilovia, a relatively labor abundant developing country. The country imports flarks from the more capital-abundant rest of the world, and you've just learned that, for reasons you do not know, the relative price of flarks is about to fall on world markets. The government of Ilovia wants to know whether this change will be good or bad for the country, and also whether the separate owners of capital and or labor will gain or lose from this change. Use the Heckscher-Ohlin Model to answer these questions under each of the following assumptions, using the tools of the respective models to show how you arrive at your answer.
 - a. [15 points] The two-good model, with Ilovia producing both goods.

The effect on aggregate welfare of the country as a whole can be seen from the new community indifference curve that the fall in price (from p^ to $p^{*'}$) allows it to reach, as in the figure here. Thus the country as a whole is made better off.*



As for the owners of capital and labor, we are told that Ilovia is a relatively labor-abundant country, so from the Heckscher-Ohlin Theorem we can infer that flarks must be the relatively capital-intensive good, since Ilovia would export the other, labor-intensive good. Thus this is a fall in the relative price of the capital intensive good.

From the Stolper-Samuelson Theorem, which we verify in the Lerner Diagram below, it follows that the real rental price of capital in Ilovia goes down and the real wage of labor goes up. To see this from the Lerner Diagram, represent the fall in relative price of capital-intensive flarks by a fall in their nominal price, p_F , which shifts the unit-value flark isoquant out away from the origin (at a lower price, more flarks must be produced to be worth \$1). This causes the common tangent to both unit-value isoquants to rotate clockwise, as shown, reducing the labor intercept, $1/w$, and increasing the capital intercept, $1/r$. Thus the nominal wage rises while the nominal rental falls.

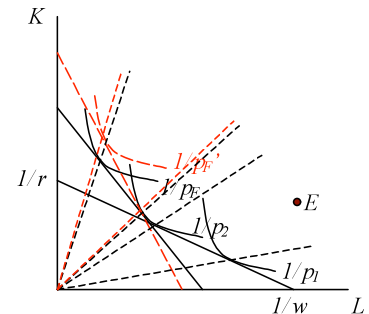


Since the price of flarks has fallen and the other price is unchanged, this rise in nominal wage is also a rise in the real wage. To know that the real rental has fallen, we must show that the nominal rental falls more than the price of flarks, so that it has fallen relative to both goods. This is seen in the Lerner Diagram by drawing the (dotted) line parallel to the old factor price line but tangent to the new flark isoquant. Its intercept, at $1/r''$, indicates how much the rental would fall if its fall equaled that of the price. Since r' has fallen by more than this, the real rental has fallen.

- b. [10 points] The two-cone model, with Ilovia producing two goods, but *not* producing flarks.

The two-cone model requires three goods, and if a labor-abundant country such as Ilovia produces two of them, then they must both be more labor intensive than the good, in this case flarks, that it does not produce. The initial equilibrium in the two-cone Lerner Diagram is as shown below, with Ilovia's factor endowment, E , in the lower cone. The fall in price of flarks shifts the flark unit-value isoquant outward, just as in the two-good case of part (a). But this has no effect at all on the allocation of factors and nominal factor prices in Ilovia, since it is in the other cone.

With both nominal factor prices unchanged and with the price of flarks falling, both other prices unchanged, both the real wage and the real rental must increase. That is, owners of both factors are better off. Since there is no other source of income in the country than these factors, with both better off, the country as a whole must be better off as well.



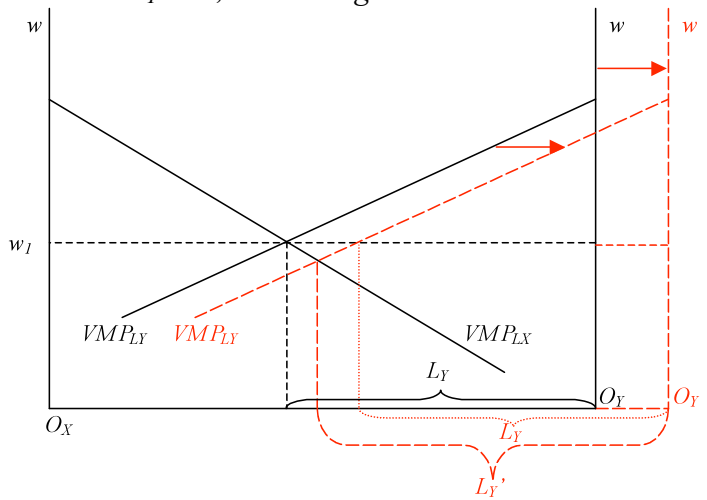
2. [10 Points] Consider a small open economy producing two goods using capital and labor. Good X is relatively labor intensive, and good Y is relatively capital intensive. Suppose that in the short run labor is perfectly mobile between the two industries, but capital cannot move at all, while in the long run both factors are perfectly mobile. Show how the output of good Y will respond, in the short run and in the long run, to an increase in the country's endowment of labor. Assume that its endowment of capital, as well as the prices of the goods, remain unchanged.

This is the (standard) specific factors model in the short run, and the Heckscher-Ohlin model (and thus the Rybczynski Theorem) in the long run.

In the short run, factor allocation is determined by the value-of-marginal-products of labor (VMP_L) in the two sectors, as shown in the specific factors diagram below. The increase in the labor force expands the diagram, making it horizontally larger. Here I choose to expand it to the right, so that the VMP_{LY} curve also shifts to the right along with the Y origin. The new intersection with the VMP_{LX} curve occurs with more

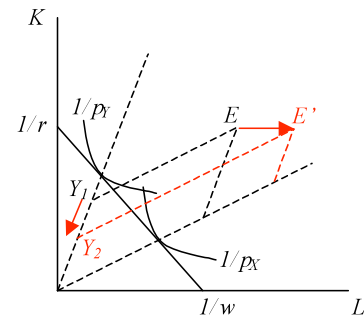
labor employed in both industries. (This is illustrated, for Y , by noting where the old level of employment, L_Y , moves relative to the new O_Y axis, and seeing that the new level of employment, L_Y' , is larger than this.) Thus, since more labor is producing Y , output of Y must go up.

In the long run, with both factors mobile, we are in the Heckscher-Ohlin model. Now the assumption that good Y is relatively capital intensive matters (it didn't matter for the short run). The effect of an increase in the labor force, holding goods prices constant, is shown in the Lerner Diagram below.



The allocation of factors to the two sectors is found by constructing the parallelogram between the origin and the endowment point, E , using the factor intensity rays that were determined by the common tangencies with the unit-value isoquants. Thus the initial allocation to the Y sector is at the point labeled Y_1 .

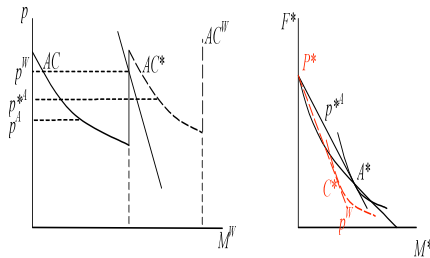
The increase in endowment of labor moves the endowment point to the right, from E to E' . Reconstructing the parallelogram, the allocation to the Y industry moves to Y_2 , with less of both factors employed and thus less output.



Thus the rise in the labor endowment causes the output of the capital intensive sector, Y , to rise in the short run but fall in the long run.

3. [15 Points] Using the model of External Increasing Returns to Scale,
 - a. [10 Points] Show and explain how it is possible for a country to lose from trade.

In this model, the smaller of the two countries (the one with the smaller labor force, since labor is the only factor) may lose from trade, since it specializes in the good (F) without increasing returns to scale. It does so because it has a higher price of the other, increasing-returns good (M) in autarky, due to producing less of it (because less is demanded by its smaller population) and thus having a higher average cost. With a higher cost, when the two countries open to trade, its producers lose money and exit the M industry, while producers of M in the larger country make profits and expand. Specializing in F does not assure a loss from trade, however, but it makes it possible, as illustrated in the diagrams below.



The diagram on the left shows the average cost of M as output of M expands, first being produced in the larger (home) country and then being produced in the smaller (foreign= $*$) country. Autarky prices are recorded consistent with what was said above, as p^A in the large country and p^{*A} in the foreign country. (These are not derived here, but just shown.) The free trade equilibrium that is shown is based on a world demand curve D^W that yields an equilibrium with the large country producing only M , the small country producing only F , and a world relative price of M , p^W , that is higher than both autarky prices.

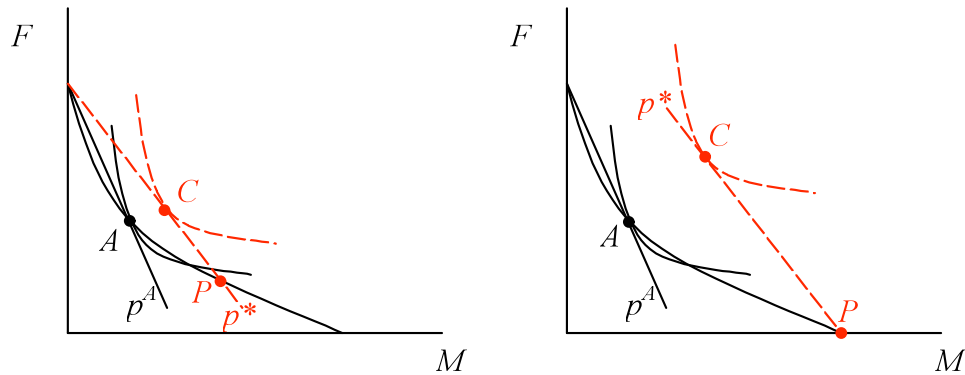
Welfare in the small country is then shown in the figure on the right. The country's autarky equilibrium is shown as A^* . Its equilibrium with trade, specializing in F at P^* , and at a price of M higher than its autarky price, consuming at C^* , on a lower indifference curve. Thus it loses from trade.

- b. [5 Points] Suppose that you knew that a country in this model would find the free trade relative price of the good that it exports – regardless of which good that is – being lower than its price in autarky. Would you, or would you not, then know that the country has lost from trade? Explain.

No, you would not know that it has lost from trade. In the case shown in part (a), the foreign country does lose from trade and does face a price of its export (F) that is lower than in autarky. But consider a country that exports the increasing-returns good, M . The two figures below show two cases for such a country in which the relative price of M falls from autarky, but the country nonetheless gains.

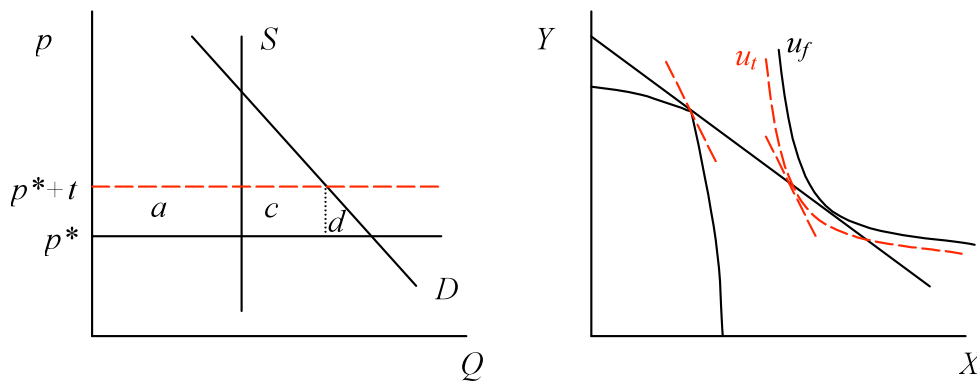
On the left, with trade it produces both goods, at P , and the price of M is its average cost, which is lower than in autarky because it is producing more. Nonetheless it is able to trade to C , on a higher indifference curve than autarky.

On the right is shown a case of specialization, producing only M at P , and here it can gain even more, even though the price is still below (flatter than) autarky. Since now its price can be higher than its even lower average cost, it can gain even more.



4. [20 Points] Suppose that a small country, starting from free trade, levies a tariff on a good that it initially imports. Unlike what usually happens, and even though the country does produce the imported good, its output of that good does not increase. First, show how this can happen, in either a partial equilibrium or a general equilibrium trade model. Then, based on your analysis, say *and explain* whether each of the following i) must be true in this situation (“true”), ii) cannot be true (“false”), or iii) could be true or not depending on information that you do not have (“it depends”).

This will happen if the supply of the good is perfectly inelastic – that is, the supply curve is vertical – so that output does not rise even though the price does. In general equilibrium this would happen if the PPF were kinked at the initial output point, so that changing the slope of the price line does not change the point of tangency. (Such a kink is in fact what we have in the extreme specific factors model, although what I



draw below is not that.) The tariff is illustrated for these two situations below.

- a. The quantity of imports does not fall.

Clearly, in both of the cases shown above, the quantity of imports does fall, so this statement cannot be true (hence FALSE). (An exception would be if the demand curve were also vertical, and the indifference curve also kinked, in which case the quantity of imports would not in fact fall. So IT DEPENDS may be the better

answer, but only if you explain all this. With a normal downward sloping demand the answer is FALSE.)

- b. Those who produce this imported good do not gain from the tariff.

This is certainly FALSE if you take the partial equilibrium perspective. Since the country is small (so that the price p^ remains unchanged), the tariff must raise the domestic price of the good. This gives more producer surplus, even though the output does not increase.*

In general equilibrium, for example in the extreme specific factors model, it is also FALSE, since the factors producing the good continue to be paid what they were before, in terms of the good they produce, but this good is worth more on the domestic market, since the domestic price of that good has gone up. (If you are clever enough, you could justify an IT DEPENDS answer here too, by using a Heckscher-Ohlin model with fixed coefficients in production to generate a kinked PPF. In that case, a la the Stolper Samuelson Theorem, some of the factors producing the good would gain while others would lose.)

- c. The dead weight loss due to the tariff is zero.

In the examples above, there is still a dead weight loss from the tariff, equal to area d in the partial equilibrium diagram and $u_f - u_i$ in the general equilibrium diagram. Like the change in imports, this depends on demand responding to the price change. So if you assume that demand is downward sloping, the answer is FALSE. If you do not, then it is IT DEPENDS, but you have to explain why.

5. [15 Points] What is the optimal policy in each of the following situations? Explain briefly, in words only, why that is the case.

- a. The optimal tax or subsidy on imports for a large country.

For a large country (defined as one large enough to affect world prices through the amount that it trades) the optimal policy on imports is to tax them, or in other words to levy a tariff. The reason is that, by doing so, the country causes the world price of the imported good to fall, so that the country pays less for them, in terms of goods exported in exchange.

- b. The optimal tax or subsidy on imports from a foreign monopoly firm that has no domestic competition.

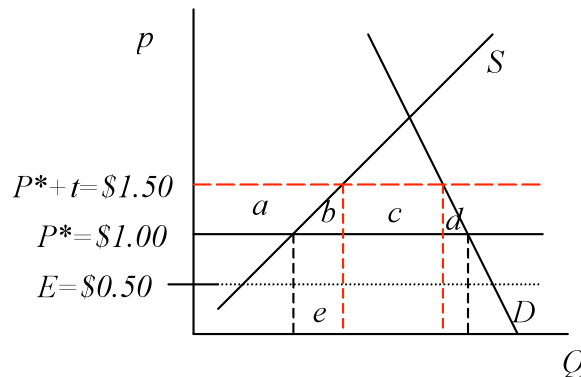
A tax on sales by the foreign firm – in other words an import tariff – is beneficial, even though it reduces consumption of the good, which was already suboptimally low. The reason is that the monopolist will raise price by less than the tariff, thus absorbing part of it himself, and the country thereby extracts part of the monopolist's profit as tariff revenue.

- c. The optimal tax or subsidy on exports for a country that is home to one of two firms in a duopoly engaged in Cournot competition selling to a third country's market.

This is the export duopoly model that appears on the cover of the textbook, and in that model, the optimal policy is an export subsidy. The reason is that it allows the domestic firm to increase its profit by moving along the other firm's reaction curve, in a manner that would not be credible for the firm to do alone. As a result, the subsidy paid by the government to its own firm alters the outcome of the strategic competition between the two firms in a way that shifts profits from the foreign to the domestic firm. This is a net gain for the country.

6. [15 Points] The small country of Jimmyjohns both produces and imports bread, the world price of which is \$1.00 per loaf. Production of the bread causes a pleasant smell, which the producers of bread are unable to charge for, and which the people in the country enjoy. In fact, it has been ascertained that the value of this smell to society is \$0.50 per loaf.
- a. Show and explain why, in the absence of any other policy, a tariff on bread in this country might be beneficial to the country as a whole.

Under normal assumptions, a tariff will stimulate production, generating more of the good smell. If the benefit from this is larger than the dead weight loss due to the tariff, then it will be beneficial as a whole. This is illustrated in the figure below.



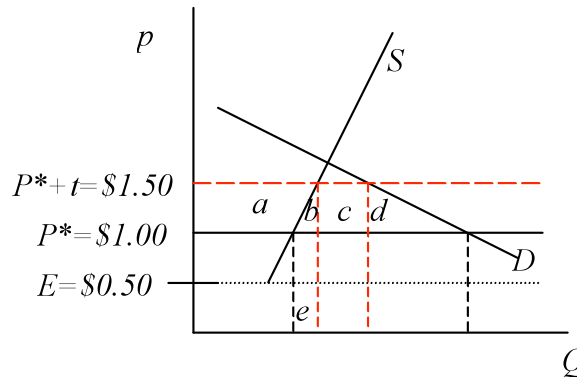
The value of the externality, $E = \$0.50$, is shown, together with the usual analysis of a tariff that is also set equal to $\$0.50$. The gains and losses from this tariff are:

<i>Suppliers gain</i>	$+a$
<i>Demanders lose</i>	$-(a+b+c+d)$
<i>Government gains</i>	$+c$
<i>Smellers gain</i>	$+e$
<i>Net for Jimmyjohn</i>	$+e - b - d$

As drawn, e is larger than $b+d$, so the country gains.

- b. Would a tariff of \$0.50 per loaf necessarily be beneficial? Why or why not?

No, not necessarily. It depends on the slopes (elasticities) of supply and demand. If supply had been more nearly vertical, then both areas *b* and *e* would be small and could easily be outweighed by *d*, especially if demand were flatter, as below.



- c. Suppose, again in the absence of any other policy, that you knew that a tariff of a certain size per loaf would be beneficial to the country as a whole, and also that a tariff of this size would reduce imports of bread by a certain percentage, say X% compared to free trade. How would the welfare of Jimmyjohn be affected if, instead of using the tariff, the country were to persuade foreign producers of bread to reduce by X% the quantity of bread that they export to the country. In other words, compare the effects on Jimmyjohn of the tariff to those of an import quota that reduces imports by the same amount, with the quota implemented by the foreign producers.

The picture can be the same as in part (a), where the tariff raised welfare of the country. The quota must raise the domestic price to the same level of \$1.50, since only at this price do domestic residents demand exactly the quantity of imports of bread that the foreign producers have now been persuaded to supply. However, the difference is now that area *c*, which was tariff revenue before, is now quota rent gotten by the foreign producers. The welfare calculations are now:

Jimmyjohn		Other countries	
Suppliers gain	+a	Producers (quota rents)	+c
Demanders lose	-(a+b+c+d)		
Government gains	0		
Smellers gain	+e		
Net for Jimmyjohn	+e-b-d-c	Net for Others	+c

So, while Jimmyjohn gets just as much extra smells from the quota, its net welfare gain is not as large and may easily be negative.