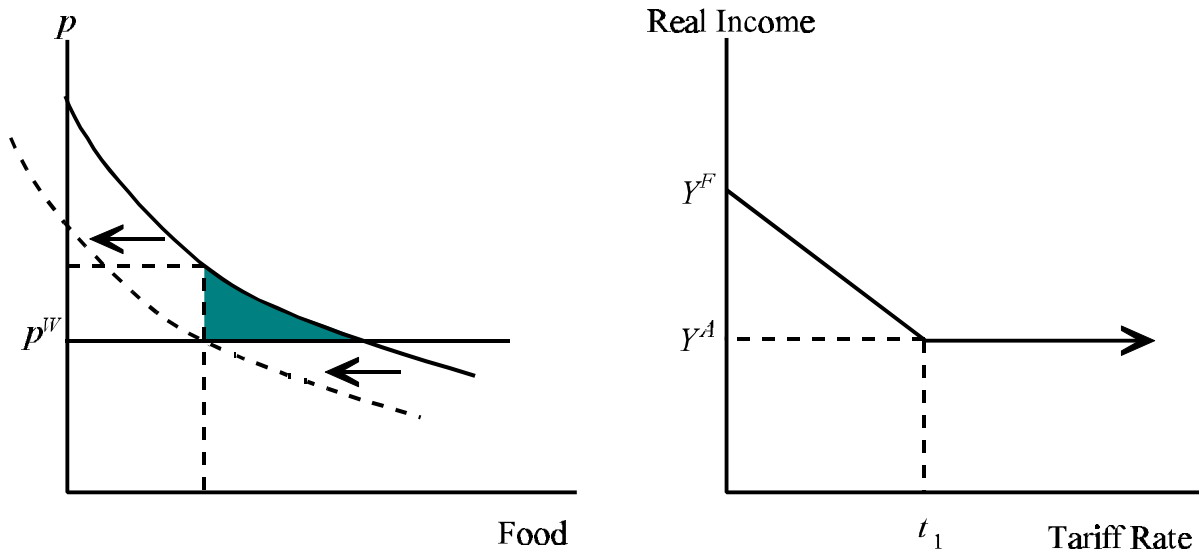


Homework #8: Answers

Text questions, Chapter 10, problems 1-5.

1. A small country is one with no power to affect the world prices of commodities. Redraw Figures 10.5 and 10.6 for such a country. (Let $p = P_F/P_C$).

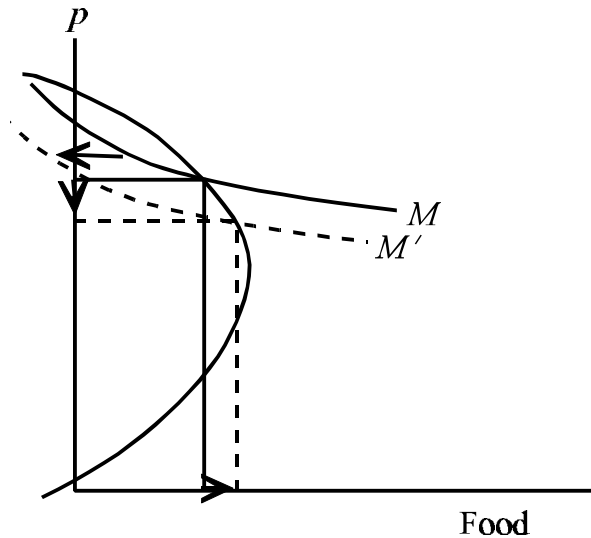
The small country faces an infinitely elastic (i.e. horizontal) Foreign excess supply curve.



The effect of any trade policy is to restrict trade without generating any source of gain to offset the loss (represented by the shaded “triangular” area). As a result, any deviation from free trade results in a reduction in real income. Further protection continues to reduce real income until the prohibitive tariff (t_1) drives the country to autarky real income. The optimal tariff rate is zero, and, as with any optimal tariff rate, real incomes fall monotonically away from that rate.

2. The foreign supply curve of exports in Figure 10.5, X^* , has been drawn with a positive slope. This implies that Foreign import demand for clothing is elastic. Suppose that for prices near the initial equilibrium point, Q , Foreign import demand is inelastic.

- a. Draw the new X^* Foreign supply curve for food exports.



- b. What is the effect of a tariff on imports of food?

As in the text, the tariff causes the import demand curve to shift to the left (i.e. for every price the importing country now demands less food imports). However, because the initial equilibrium was on the inelastic portion of the Foreign export supply curve, this results in an increase in the quantity of Food traded.

- c. Would local food producers favor such a tariff?

Even though a tariff has been imposed, the increase in the supply of food to domestic market induced by this policy results in a fall in the domestic (i.e. tariff inclusive) relative price of food to the domestic market. Thus, not only is the importable good not protected, but it is damaged by the protection. This is called the *Metzler Paradox*. In addition, Stolper-Samuelson effects are still operative, but the *abundant factor gains from the protection*. In this case, Home food producers would oppose such a policy.

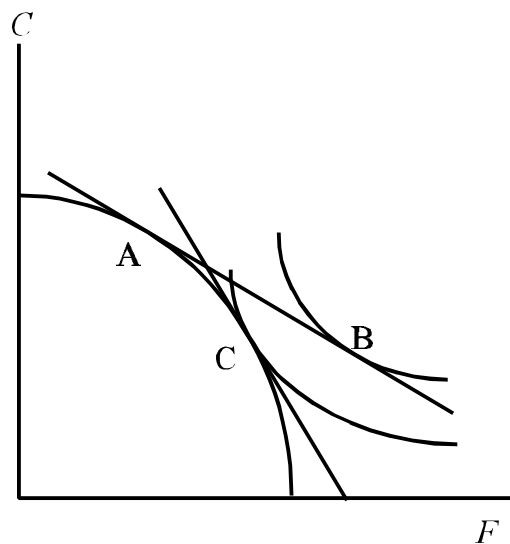
3. In figure 10.5, the tariff has shifted the demand curve for imports. Does the extent of the downward shift fall short of, equal, or exceed the amount of the tariff? [*Hint*: Ask what would happen to demand if world price were to fall by exactly the amount of the tariff—and decompose between substitution and income effects.]

The result of imposing a tariff is that the tariff-ridden import-demand curve lies below the

underlying import-demand curve by exactly the amount of the tariff. That is, for any given quantity of imports the difference between the world price and the domestic price is the tariff. Small detail: with a specific tariff, this looks like a downward parallel shift since there is a constant difference of t between the two prices; and for an *ad valorem* tariff there is the same proportional vertical distance between the two schedules. Of course, the world price will not generally be changed by the amount of the tariff. If the small country levies the tariff, there is no change at all in the world price, so the difference between the world and Home prices will be the amount of the tariff. If a large country levies a tariff, and the other country is large, the new world price will fall relative to the initial price, but by less than the amount of the tariff as the other country adjusts its price to accommodate the reduced demand.

4. Draw the initial free-trade equilibrium (for a small country facing given world prices) with a transformation schedule and indifference curves.

- a. Indicate in such a diagram the rate of the tariff that would completely wipe out world trade.



The initial free-trade equilibrium is shown with production at A and consumption at B. The prohibitive tariff would be the tariff that induced domestic prices such that there is zero excess demand in each market. This is shown at point C.

- b. What happens to production if legislators are overzealous and the tariff rate is higher than this rate?

As shown in figure 10.6 (and in problem 1 above for the small country case), there are no further effects of raising the tariff beyond the prohibitive level. No imports will occur and relative prices will be determined by the $MRS = MRT$ and income = expenditure conditions. Note that to increase p further, and thus generate an even higher output of F ,

the government would have to offer some form of subsidy to F production.

5. In the text it was assumed that the government redistributes tariff proceeds back to the private sector. Instead, suppose that the government spends the tariff revenues in a manner that differs from private citizens. Consider two extreme forms of public spending: a) The tariff revenue is spent only on clothing, the commodity exported; or b) the tariff revenue is allocated, instead, to purchases of food.

- a. Which scheme is more likely to be favored by producers who have clamored for protection?

Deviations from demand by the representative consumer have price effects. The policy of spending all tariff proceeds on the exportable (policy a) results in increased demand for the exportable relative to the case of lump-sum redistribution. Because the Home country is large, this must result in an increase in the price of the exportable relative to that of the importable. This has the effect of, to some extent, undoing the effects of the tariff. We would expect this to be opposed by the forces which lobbied for a tariff.

On the other hand, the policy of spending all tariff proceeds on the importable (policy b) results in an increased demand for the importable relative to the case of lump-sum redistribution. Unless we are in the range of one of the large country tariff paradoxes, this must result in an increase in the price of the importable relative to the exportable. Since this intensifies the effect of the tariff, one presumes that the same forces which lobbied for a tariff to increase the price of food will also be satisfied with this policy.

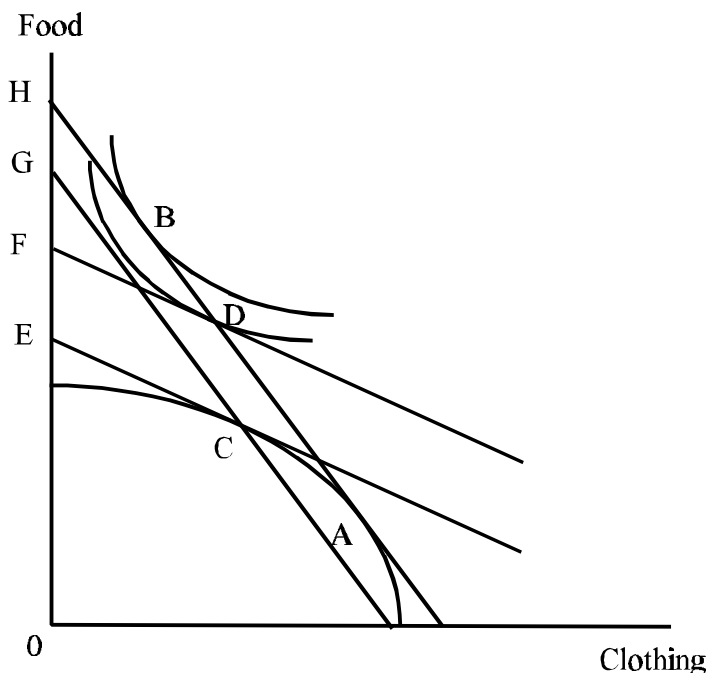
These answers assume that price-induced income effects are what is relevant. In this case there is an additional source of complexity. In the case where the government redistributes tariff income, this income enters consumer welfare, in the case where the government consumes these goods, citizens lose this income. Even if the government redistributes these commodities to citizens, unless they can reenter the world market to trade, they are still worse off than under lump-sum redistribution. Of course, if they can reenter the world market, the situation is the same as the non-distorting transfer case.

- b. What might happen to the terms of trade in case b)?

We have already seen that the relative price of food should rise further in this case, i.e.: terms-of-trade will fall further.

Workbook problems, 1, 4, and 5.

1. *Geometry of Tariffs*: It is usually assumed in tariff analysis that the government returns any tariff revenue to consumers in lump-sum fashion, i.e. each consumer receives an amount that he or she perceives as unrelated to his or her import purchases of imports. Evaluated at domestic prices, the consumer now receives income from two sources: i) ownership of domestic firms; and ii) tariff revenue.



Points A and B are the free trade production and consumption points, respectively, and points C and D give production and consumption after a tariff is levied. *Taking food as the numeraire*:

- a. The value of free trade production evaluated at world prices is given by: **d) OH**.
- b. The value of free trade consumption evaluated at world prices is: **d) OH**.
- c. The value of production when the tariff is in place is, when evaluated at world prices: **c) OG**.
- d. The value of production when the tariff is in place is, when evaluated at domestic prices: **a) OE**.
- e. The value of tariff-ridden consumption is, at world prices: **c) OG**.
- f. The value of tariff-ridden consumption is, at domestic prices: **b) OF**.
- g. The value of tariff revenue is, at domestic prices, given by: **e) EF**.

4. *The Infant Industry Tariff*: A popular argument for protection has been the so-called infant industry argument. It states that a developing country might want to protect an industry even though it is not currently competitive at world prices. The justification is supposed to be that the industry can gain strength behind the tariff wall, and eventually become a producer of exports for the country.

Consider a small country that produces manufactured goods using capital-intensive techniques and agricultural products with labor-intensive techniques. (Assume that there are only two factors of production and that these factors are mobile between industries.) This country exports a large percentage of its output of agricultural products, but the country is small enough in the world market that the quantity of its exports does not affect the world price.

- a. The government in this country would like to encourage local production of manufactured goods and is considering the imposition of a tariff on imports of manufactures to accomplish this goal. Putting yourself in the shoes of an advisor to this government, discuss the likely effects of a tariff in this situation. In particular, address whether the tariff will have the desired effect, and whether other policies can achieve this result more efficiently.

Suppose we assume that a true infant-industry is identified (i.e. one that *can* become competitive in finite time, and whose future flow of profits is sufficient, in a present value sense, to repay the current costs). This question asks you to reflect on whether or not there is a better way of accomplishing this goal. Using the standard decomposition of the welfare effects of protection (the reverse of the gains from trade), you can argue that a production subsidy welfare dominates a tariff because the short-run welfare costs are lower (i.e. only the production effect, no consumption effect).

- b. Suppose the government decides to go ahead with the tariff. What happens to the wage rate in this country? to the rental rate?

This is a HOS economy, thus we can apply the Stolper-Samuelson theorem. The protected industry is the K -intensive industry, and the effect of a tariff on a small economy is to raise the price of the protected industry by the amount of the tariff, while the price of the exportable is unchanged. Assuming an *ad valorem* tariff, so $P_M = P_M^*(1 +$

$$t): \hat{P}_M \left(= \frac{P_M^*(1+t) - P_M^*}{P_M^*} = t \right) > \hat{P}_A^* = 0. \text{ But then, we have:}$$

$$\hat{r} > \hat{P}_M (= t) > \hat{P}_A = 0 > \hat{w}.$$

Thus, the wage rate falls relative to all other prices and the rental rate rises relative to all other prices.

- c. What happens to the volume of trade?

The country is economically small, that is, it faces an infinitely elastic (i.e. horizontal) foreign excess supply curve for manufactures. The effect of the tariff is to shift in the Home country excess demand curve for manufactures, resulting in a reduced volume of trade in manufactures. But, with fixed prices, the balanced trade constraint requires that volume of exports falls as well. Thus, total volume of trade falls as well.

d. Is the country as a whole better or worse off?

Note that this question is a bit of a cheat. *If the industry really is an infant-industry*, then the country will gain in the long-run. The authors of the study guide focus on the short-run, in which there is a loss (any small country must lose from trade restriction). But if there is not sufficient gain in the long-run to offset this loss (in a present value sense), then the industry was not an infant-industry.

e. Suppose, now, that capital is internationally mobile and that before the country imposed the tariff, the domestic return to capital was equal to the world return to capital. How will foreign investors respond to the tariff? What happens to output of manufactures and agricultural products? What effect does this have on the country's volume of trade?

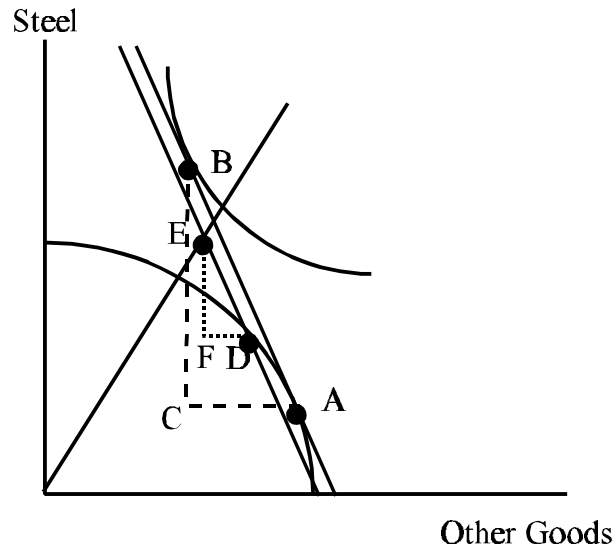
Because the tariff will raise the return to capital above the, common by factor-price equalization, world rental rate, capital will flow into the country. However, the country is economically small, so this has no effect on world commodity or factor-prices. Thus, if the small country continues to produce both goods, manufactures will increase, agricultural output will fall, until the country is in autarky equilibrium at the original, free trade, prices. Volume of trade will fall to zero. Factor mobility has substituted for final good mobility (this is Mundell's famous inverse to the FPE theorem).

f. Who benefits from this policy?

This eventually undoes the effects of the tariff. Thus, relative to the tariff-ridden equilibrium, labor-owning households gain and capital-owning households lose. Assuming that the industry really was an infant-industry, the country as a whole gains even more than they would from the tariff. Even without the infant-industry, pre-tariff national welfare is restored, so welfare rises relative to the equilibrium with protection but without international capital mobility.

5. *The Steel Quota*: Until 1992, American steel producers were protected by an import quota.

- a. Assume (unrealistically) that the US does not affect the world price of steel. Illustrate in the following diagram the effect from such an import quota where A is the initial production point and B is the initial consumption point. (*Hint*: Draw an appropriate trade triangle.)

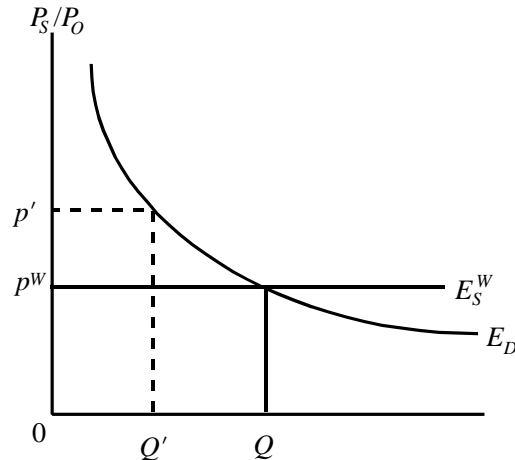


I have no idea what trade triangles are supposed to do here. You can't find the new budget (i.e. national income) line without knowing the effect of the quota on price, and even if we know that, we can't find the consumption point on that line without demand information. That is, since prices facing consumers have changed as a result of the quota, we cannot orient our analysis with respect to the initial IC-line. Thus, we will need to introduce demand information

As with the previous question, the assumption that the US is small (along with balanced trade) means that there will be smaller imports and exports following the quota. Also, because the world price will be unchanged, the new trade triangle will be similar to the old trade triangle. However, because a binding quota distorts domestic prices, consumers and producers will adjust to set MRS and MRT (respectively) to the tariff-distorted domestic price. That is, assuming homothetic preferences, we will need a sample indifference curve to find the new consumption point. For the quota to be binding, the vertical leg of the new trade triangle EF, must be shorter than the vertical leg of the free trade trade triangle BC. Because the quota is binding, the price of steel must be bid up relative to other goods because of the policy-induced scarcity. Output of steel will increase relative to the free trade output (D involves higher steel output and lower other goods output than A), consumers will substitute away from the now more expensive steel (the quota distorted IC-line through the new consumption point, E, is flatter than the one through B), $MRS' = MRT' = p'$ (where the prime denotes quota distorted values), and $income' = expenditure'$ (where $income'$ includes an allocation of the quota rents to some domestic consumer).

- b. Illustrate also the effect from the quota in the following diagrams. The left diagram maps American imports of steel as a function of the domestic price in the US and the right diagram draws US imports as a function of the world price of steel, where p is the existing world price of steel.

Note that the diagram with world price on the vertical axis is just the US excess (import) demand curve. Since the US is economically small, the World excess (export) supply curve is infinitely elastic. We reproduce this diagram below.



Unlike the tariff, a quota only has an effect on domestic prices when it is binding. Suppose that the quota is set at $0Q'$. For world prices above p' the quota will not bind so the unconstrained (i.e. free trade) excess demand curve is still the relevant excess demand curve, while below p' imports are fixed at Q' for any level of domestic demand. Thus, the excess demand curve becomes vertical at Q' . Because the country is small, there is no terms-of-trade effect, the domestic price rises from p^w to p' , so there must be welfare losses (the deadweight losses are measured by the “triangular” area above the world price and below E_D between Q' and Q).

I don't know what the other diagram is supposed to be showing. E_D is the relationship between relative price and excess demand, based on domestic supply and demand conditions. As long as US preferences, endowments, and technology, and E_s^w are fixed, all relevant information is in the above diagram. We can net out $0Q'$ from domestic excess demand to show the domestic price implied by importing $0Q'$ relative to autarky, but it is unclear to me what the value of this is—the price will, of course, fall below the autarky price.

- c. Which policy would have the same effect as the quota?

We can solve for the tariff such that $p' = p^*(1 + t)$, where p' is the quota-distorted price.