

ECO 352 – Spring 2010  
International Trade  
Problem Set 4 – Answer Key

The grade distribution was as follows:

Score/range	100	90-99	80-89	70-79	< 50
Number of students	1	19	4	3	3

Common errors:

1. The unit ‘megabucks’ in Q1 tripped up a few. It’s a bit ironic that if a student just paid no attention to the units, s/he would have got it right. However, a lot of them noticed the ‘thousand’ on either the quantity or the price but not both and as a result got the units wrong. Only 1 point was deducted for that.

2. The alternative policy in Q1. Not many students realized the possibility of taxing profit. Some suggested taxing consumers, which indeed generates no DWL given the set-up of the questions. But the profit tax falls on foreigners and is therefore better for the home country. A lot just belabored on specific or ad volorem tariff, or quota, and did not offer clear suggestion for a better policy.

3. The welfare effects on the factors. This is material from before the midterm and is exactly one of the common mistakes in the midterm. Still the majority of students fail to recognize the ambiguity of the effect on labor is related to their consumption patterns.

4. The need for a tariff when offering an export subsidy. Most students argued consumers would otherwise buy from abroad, which is similar to arbitrage by importing and re-exporting but not as powerful. In reality, consumers are not likely to have direct access to international market.

5. The US counter subsidy. Quite a few have represented the subsidy as a shift of supply curve in the left panel, which would correspond to a production subsidy, but not an export subsidy. It is unclear whether they confused the two or interpreted the US policy as a proper production subsidy.

### Question 1: (40 points)

(a) Freedonia’s import demand curve is given by

$$\text{Total demand} - \text{Domestic supply} = 40 - (p - 10) = 50 - p.$$

If Imperial Motors sets its price equal to  $p$ , its profit will be

$$(p - 10)(50 - p).$$

Using the stated rule, this is maximized when  $p = \frac{1}{2}(10 + 50) = 30$ . The resulting profit is

$$(30 - 10) \text{ thousand Bucks per car} \times (50 - 30) \text{ thousand cars} = 400 \text{ Megabucks.}$$

(b) When Freedonia's government levies an import tax of  $t$  thousand Bucks per imported auto, and Imperial Motors sets its price including tax equal to  $p$ , it receives only  $(p - t)$ . Its profit is

$$[(p - t) - 10][40 - (p - 10)] = [p - (10 + t)](50 - p).$$

This is maximized when  $p = \frac{1}{2}(10 + t + 50) = 30 + \frac{1}{2}t$ .

(c) At this price, the volume of imports is

$$40 - (30 + \frac{1}{2}t - 10) = 20 - \frac{1}{2}t.$$

The government's revenue is

$$t(20 - \frac{1}{2}t) = \frac{1}{2}t(40 - t).$$

Using the given formula (here  $a = 0$  and  $b = 40$ ), the revenue is maximized when  $t = 20$ . Then the volume of imports is  $20 - \frac{1}{2}20 = 10$  (thousand cars), and the tax revenue is 200 Megabucks.

(d) The domestic price increases from 30 to  $(30 + \frac{1}{2}20) = 40$ . Demand is inelastic at 40, so consumer surplus goes down by  $(40 - 30)40 = 400$  Megabucks.

Domestic supply increases along a straight line from  $30 - 10 = 20$  to  $40 - 10 = 30$ . Therefore domestic producer surplus increases by the trapezoidal area  $\frac{1}{2}(20 + 30)(40 - 30) = 250$ .

Imperial Motors receives only 20 thousand Bucks per car, and sells  $40 - 30 = 10$  thousand cars. Therefore its profit is  $(20 - 10)10 = 100$  Megabucks. Before the tax it was 400; so it has gone down by 300

(e) Welfare change in Freedonia equals

$$\begin{aligned} & \text{Gain in government revenue} + \text{Gain in producer surplus} - \text{Loss of consumer surplus} \\ &= 200 + 250 - 400 = 50 \end{aligned}$$

Welfare change in the rest of the world is just the loss of Imperial Motors' profit, 300.

Welfare in the world as a whole goes down by  $300 - 50 = 250$  Megabucks.

(f) The simplest would be a 50% profit tax (or profit repatriation tax) on Imperial Motors' operations in Freedonia. This would not cause any change in domestic price and create no additional consumer or producer distortions.

Even though individual consumers and producers in Freedonia have no market power, the country as a whole does have some monopsony power. It could exploit this power, for example by requiring that all imports are channeled through a "Freedonian Auto Import Board" which then bargains with Imperial Motors for a lower price. For example, it could make Imperial Motors an all-or-nothing offer: "We will take 20 thousand autos at 20 thousand Bucks each." (Of course this policy is problematic in another way: such a board may exercise its own monopoly power against Freedonian consumers, or collude with Freedonian producers to keep prices high, or become corrupt and waste resources that way.)

## Question 2: (60 points)

The figures for this problem are on separate pages, labelled by the part number, after the end of the text.

(a) The US export supply curve in the middle panel is derived by “horizontal subtraction” of the US domestic demand curve from the US domestic supply curve in the left panel. Likewise, the demand curve for US exports in the middle panel comes from horizontal subtraction of the EU export supply from the ROW demand in the right panel.

(b) All prices on the vertical axes in all three panels are world prices. When the EU implements an export subsidy of  $s$  per unit, its export supply curve shifts down in a vertically parallel way by the amount  $s$ . This is shown in the right hand panel, as the shift from the dashed to the solid position. That in turn shifts the demand curve for US exports to the left; this is shown in the middle panel as the shift from the dashed to the solid position. The world price falls, from  $A$  to  $A'$ . (The price received by EU producers goes up, and the incidence of the subsidy on the world price and the price received by EU producers depends as usual on the relative slopes of the supply curve of EU exports and the demand for EU exports; we do not need this information here.) Then US consumption goes up from  $AB$  to  $A'B'$ , US production goes down from  $AC$  to  $A'C'$ , US consumer surplus goes up by the trapezoidal area  $ABB'A'$ , US producer surplus goes down by the area  $ACC'A'$ , and US total surplus goes down by the area  $BCC'B'$ .

(c) As the price of wheat in the US falls (relative to the prices of all other goods), owners land (the factor specific to wheat production) lose, and owners of capital (the factor specific to the rest of the economy) gain. Workers' outcome is ambiguous; the wage falls but less than proportionately to the price of wheat; therefore workers gain if wheat constitutes a sufficiently large fraction of their expenditure and lose if it does not.

(d) If wheat could be brought into the US freely, then producers (or anyone else for that matter) would set up a money machine by exporting some wheat and reimporting it repeatedly, collecting the subsidy on the export each time while reimporting it freely. In fact even in the case of domestic production subsidies, governments have to take measures to prevent anyone from collecting the subsidy multiple times on the same unit of output. At one time Mexico dyed its subsidized corn green.

(e) Note that now the left panel has the US price on the vertical axis, and the middle panel has the world price. To restore exports to their old level, the US must shift down its export supply in the middle panel far enough so that it intersects the post-EU-subsidy demand curve for US exports at the same quantity as the original free trade equilibrium. This lowers the world price even further, to the level  $A''$ . The subsidy required is therefore the height  $A''A$ . Then, in the left hand panel, the price in the US must rise back to the old level  $A$ , otherwise US producers will not sell in the US market, as they would do better to collect the subsidy and sell abroad. Then, as compared to the situation in (b) where the price was  $A'$ , the US consumer surplus is restored back to its old level, for a loss of the area  $ABB'A'$ . The US producer surplus increases by the area  $ACC'A'$ . The US private sector gains by the area  $BCC'B'$  (shaded yellow, or light-shaded). But the quantity of exports,  $BC$ , is being subsidized at rate  $A''A$ , therefore the governments revenue loss is the rectangle

BCED. The difference is the area  $BB'C'CEDB$  (shaded green, or darker). This is the net loss to the US economy from its own subsidy.

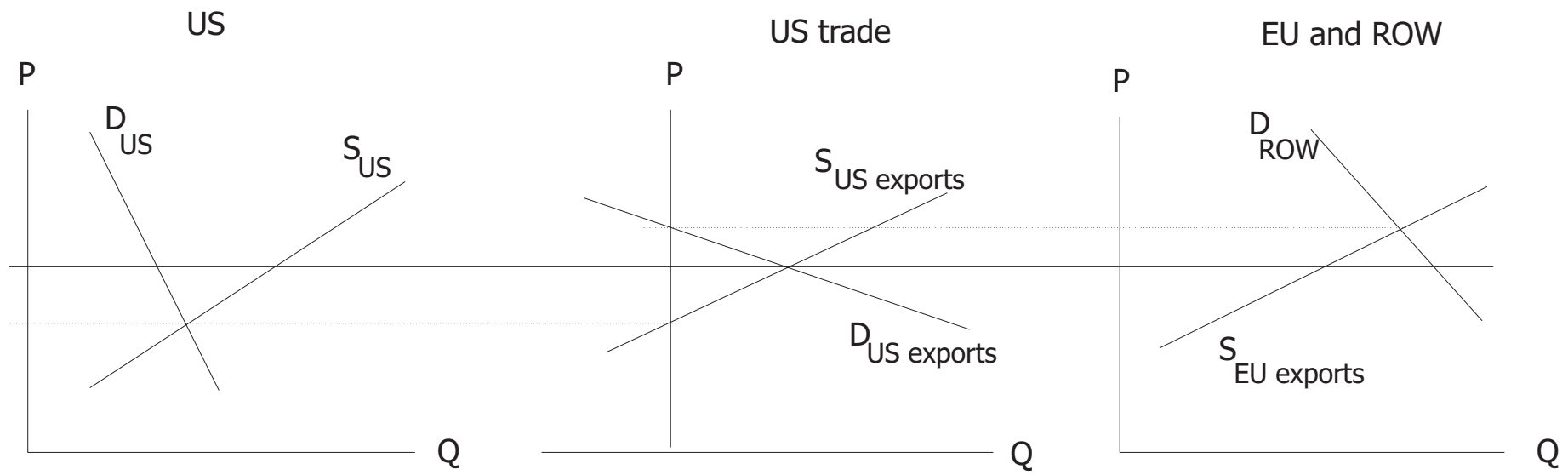
Observe that once the EU subsidy has been chosen and fixed, the import demand curve facing the US is also fixed, and the analysis of the US export subsidy proceeds in the usual way. That is why this figure and the shape of the loss area are the same as in the analysis of export subsidies in K-O (Fig. 8-11 on p. 193), which did not involve any issue of any response to anyone else's subsidy.

(f) Thus the retaliatory subsidy actually hurts the US. There may be political reasons for such a policy, e.g. the landowners who were hurt by the EU subsidy are politically crucial because Iowa is a pivotal state. Or there may be strategic reasons in negotiation: we retaliate, thereby driving down the world price and hurting EU producers, as a part of a strategy to get the EU to cut back its subsidy. But purely as an economic "getting even" strategy for the US as a whole, the subsidy is without merit.

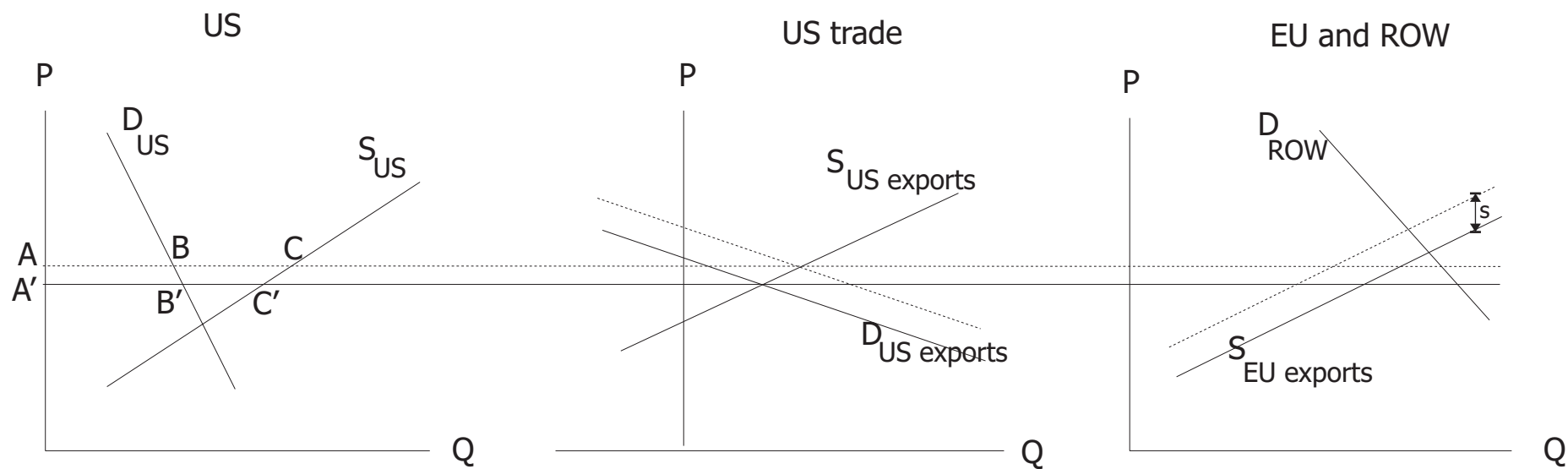
This is not a hypothetical situation; just such a retaliation was being proposed in the 1980s. President Reagan analyzed it as follows: "Imagine that you are on a lake in a boat. Another passenger pulls out a gun and shoots a hole in the bottom of the boat. There are those who would advise you to pull out your own gun and shoot another hole. They call it 'getting even.' I call it 'getting wet.' "

(g) The aircraft industry is an oligopoly, and there may be arguments for a strategic subsidy to win a bigger share of third-country markets and increase the US manufacturer's (Boeing's) oligopolistic profit. This argument would exist regardless of whether the EU was subsidizing its manufacturer (Airbus), although the optimal level of the subsidy might differ in the two situations.

(a) Free trade equilibrium



(b) Effect of EU export subsidy



(e) Effect of US export subsidy

