**14.01 Fall 2010**
Problem Set 6 Solutions

1. (10 points) In Cambridge, shoppers can buy apples from two sources: a local orchard, and a store that ships apples from out of state. The orchard can produce up to 50 apples per day at a constant marginal cost of 25¢ per apple. The store can supply any remaining apples demanded, at a constant marginal cost of 75¢ per unit. When apples cost 75¢ per apple, the residents of Cambridge buy 150 apples in a day.

   (a) (5 points) Draw the marginal cost curve of apple production in Cambridge.
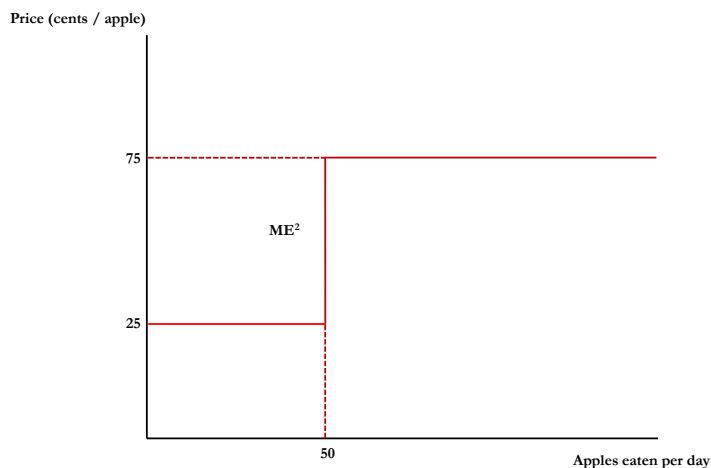

   (b) (5 points) Assume that the city of Cambridge sets the price of apples within its borders. What price should it set, and should the price vary depending on where you purchase your apples?

   The city should set the price of apples to be 75¢ since that is the marginal cost when residents eat at least 50 apples a day, which they do when the price is 75¢ or less. The price should be constant: there is no point in charging less to those who are buying their apples at the orchard, since consumers can freely substitute across the two different sources.
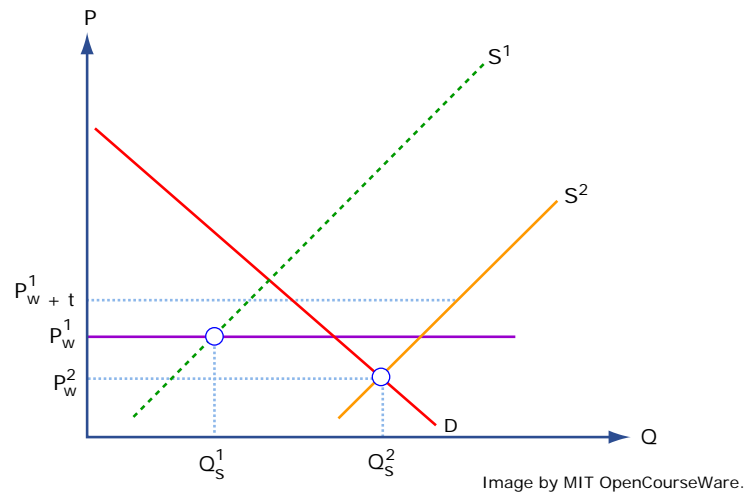
   Problem 1 solution by MIT OpenCourseWare.

2. (20 points) Tariffs are usually imposed in order to decrease imports, but they don't always have the same effect. Please draw graphs that demonstrate how shifts in the domestic supply curve for a product subject to a tariff could result in the following scenarios.

   (a) (10 points) No imports at all of that product.
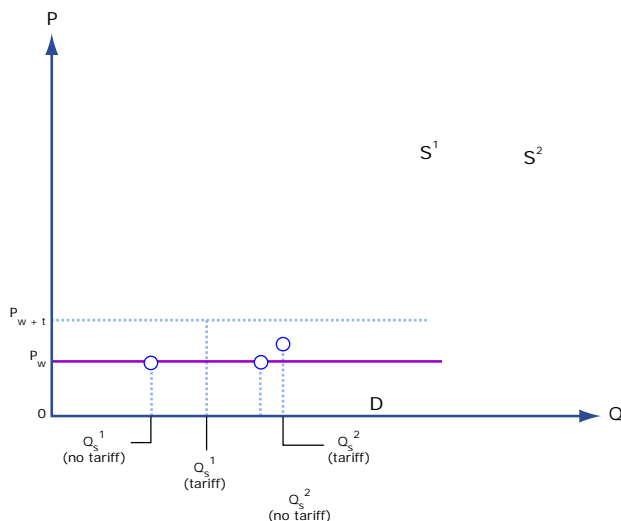
(b) (10 points) The country becoming an exporter of that product.

Image by MIT OpenCourseWare.

Problem 2 solution by MIT OpenCourseWare.

3. (35 points) *(Suggestion: It may be helpful to read section 9.6 before doing this question.)* Moldavia is a small country that currently trades freely in the world barley market. Demand and supply for barley in Moldavia is governed by the following schedules:

Demand: $Q^D = 4 - P$
Supply: $Q^S = P$

The world price of barley is $1/ bushel.

(a) (12 points) Calculate the free trade equilibrium price and quantity of barley in Moldavia. How many bushels do they import or export? On a well-labeled graph, depict this equilibrium situation and shade the gains from trade, relative to the autarkic (no trade) equilibrium in Moldavia.

In free trade, Moldavia will import barley because the world price of $1/bushel is lower than the autarkic price of $2/bushel. Free trade equilibrium price will be $1/bushel, and the free trade equilibrium quantity will be 3 bushels, of which 1 is produced at home and 2 are imported. The gains from trade are shaded in the diagram. We know that the rest of the world has a comparative advantage in the production of barley, because their opportunity costs (as reflected in the $1/bushel world price) are lower than ours (as reflected in our $2/bushel autarkic price).


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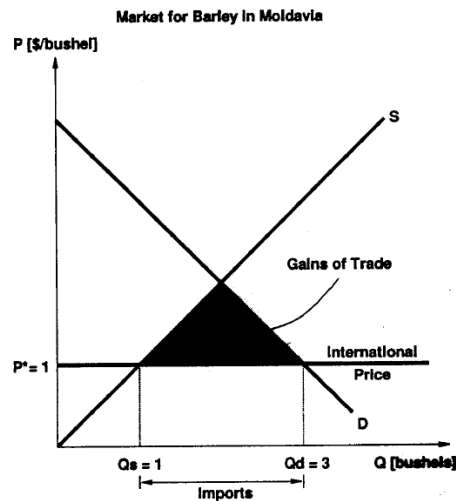
(b) (12 points) The Prime Minister of Moldavia, sympathetic as always, believes he can help those hurt by free trade in barley relative to the situation in autarky. He taxes the party that has benefited from free trade (either consumers or producers) an amount per bushel that is the difference between the autarkic price of barley and the free trade price. Furthermore, he rebates the entire government revenue of the tax back to the party harmed by free trade (again, either consumers or producers). In a new, well-labeled diagram, show this post-tax equilibrium situation. Calculate and show:

- The new equilibrium price and quantity of barley in Moldavia
- Changes in the quantity of imports or exports
- The amount of revenue collected by the Prime Minister

Who pays the larger burden of this tax, consumers or producers in Moldavia? Why?

Those harmed by free trade (domestic barley producers) will receive the tax rebate from revenues collected by the government from their \$1/bushel tax on consumers of barley in Moldavia. Consumers win with free trade here, so the \$1/bushel tax on them (the difference between the free trade price of \$1/bushel and the autarkic price of \$2/bushel) effectively shifts their demand curve down by \$1/bushel. The new equilibrium price in the barley market is still \$1/bushel (the world price and still the price to domestic producers of barley), but the market equilibrium quantity falls from 3 bushels to 2 bushels. If you drive a \$1/bushel wedge between domestic demand and the total supply curve, you will shift the entire burden of this tax on to consumers, because total supply is perfectly elastic along the relevant portion of the curve here. Thus, the price to consumers after tax will be \$2/bushel (exactly the amount of the tax higher than under free trade), and the government will collect \$2 in revenue (\$1/bushel tax · 2 bushels consumed in equilibrium). Domestic production stays at 1 bushel, but imports are reduced from 2 bushels to 1.
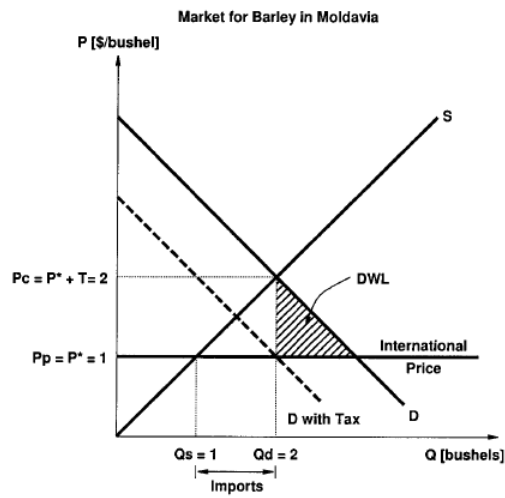
Market for Barley in Moldavia
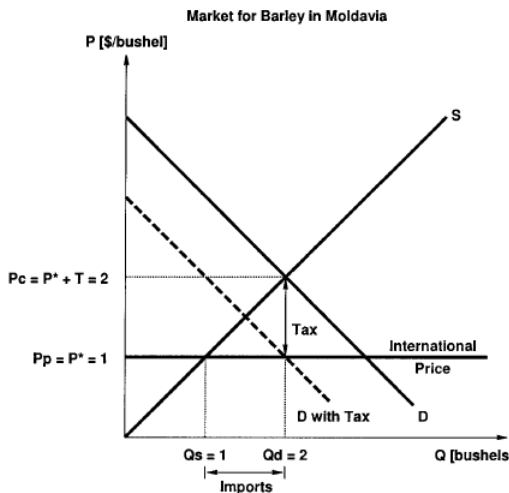
(c) (11 points) Are the free trade losers better off or worse off after the rebate than they were under autarky? Why?

On your diagram from (b), shade the DWL (if any) of this tax rebate policy, relative to the free trade equilibrium you found in (a).

The free trade losers (domestic producers) are better off under the rebate system than they were in autarky. Why? Well, their new producer surplus plus the rebate exceeds their producer surplus in autarky by the area of a triangle representing a very interesting non-distortion of this tax that is a distortion with a tariff (which by proper comparison should be the prohibitive tariff of \$1/bushel). Relative to autarky (or effectively a prohibitive tariff of \$1/bushel), then, the triangle "saved" by society (gained here by producers relative to their situation in autarky) represents bushels of barley that should be produced abroad, and are indeed produced there under our tax rebate scheme. Rather than produce those extra units (here, 1 bushel) at home, as you would with a tariff, you can give producers the same revenue with a rebate as they would have received producing those units under autarky, while saving the higher costs of producing those units at home relative to buying them from abroad. Note that you still have DWL here, coming from the

distortion to consumption as a result of the tax. See the shaded portion of the diagram. Thus, taxing barley consumption rather than putting a tariff on imported barley results in a lower DWL, and is thus more efficient.

Market for Barley in Moldavia

P [$/bushel]

S

Pc = P* + T = 2 .... DWL

Pp = P* = 1 .... International Price

D with Tax   D

Qs = 1   Qd = 2   Q [bushels]

Imports

4. Problem solution removed due to copyright restrictions. This content is presented in audio form in the Solution Video for Problem Set 6, Problem 4.

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